DC Input Alarm Trips with Adjustable Setpoints

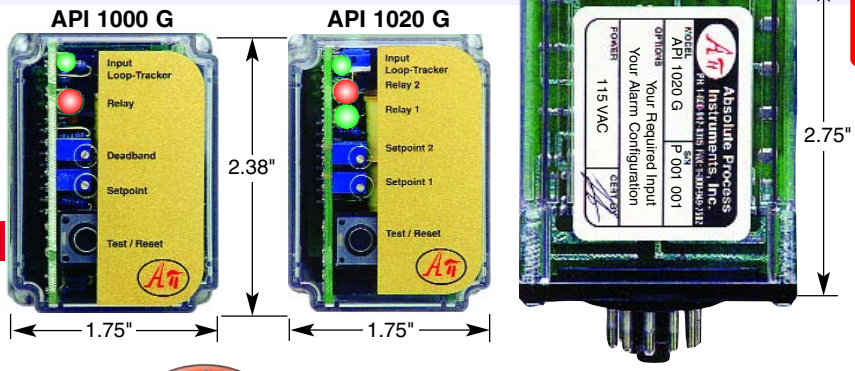
API 1000 G
API 1020 G

DC Input

Input: ***0-100 mV to 0-300 VDC, 0-1 mA to 900 mADC***

Outputs: ***One DPDT Relay or Two SPDT Relays***

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



Applications

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

LIFETIME WARRANTY

Free Factory Input & Output Calibration!

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Specifications

Input Range

Factory Configured—Please specify input range
System voltages should not exceed socket voltage rating
Typical inputs: 4-20 mA, 0-5 V, 1-5 V, 0-10 V, 0-150 VDC

	Minimum	Maximum
Voltage:	0-100 mVDC	0-300 VDC
Current:	0-1 mADC	0-900 mADC
5A Shunt:	0-1 ADC	0-5 ADC
20A Shunt:	0-5 ADC	0-20 ADC

Input Voltage Burden (Current)

1.25 VDC maximum

Input Protection, Common Mode

750 VDC or 750 VAC_p

LoopTracker

Variable brightness LED indicates input loop level and status

Relay Output

Factory Configured—See Options for other relay configurations

API 1000 G One DPDT contact
HI alarm, normal action (failsafe), non-latching standard
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load

API 1020 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 voltage rating may limit system rating.
External contact protection such as an RC snubber is recommended for inductive loads.

Alarm Setpoint

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

Deadband

API 1000 G 1.0 to 100% of span, 12 turn potentiometer. Alarm trip and reset window are adjusted symmetrically about the setpoint.
API 1020 G Fixed at 1% of span, standard
API 1020 GA 1.0 to 100% of span, 1 turn potentiometer

Functional Test/Reset Button

Toggles relay(s) to opposite state when pressed
Resets latching relay with **HT** option, available on 1000 G only

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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Description and Features

The **API 1000 G** and **API 1020 G** are factory configured for either a DC voltage or current input and provide alarm contact outputs. 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 1000 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 1020 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 input range and options

API 1000 G	DC input, DPDT HI alarm, normal action, non-latching,115 VAC
API 1000 G5A	Up to 5 amp DC input with socket and 25 W shunt, DPDT, HI alarm, normal action, non-latching, 115 VAC
API 1000 G20A	Up to 20 amp DC input with socket and 50 W shunt, DPDT HI alarm, normal action, non-latching, 115 VAC
API 1020 G	DC input, 2 SPDT, HI/LO, normal action, non-latching, 115 VAC
API 1020 G5A	Up to 5 amp DC input with socket and 25 W shunt, 2 SPDT relays, HI/LO, normal action, non-latching, 115 VAC
API 1020 G20A	Up to 20 amp DC input with socket and 50 W shunt, 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 1000 G
HT	Latching alarm with pushbutton reset, API 1000 G only
HP	Latching alarm with power-off reset, API 1000 G only
A	Adjustable deadbands for 1020 G
HH	High/High trip for 1020 G instead of High/Low
LL	Low/Low trip for 1020 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

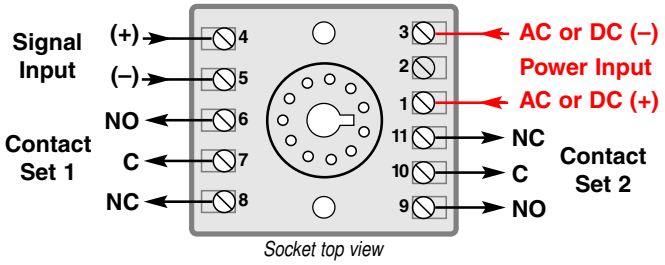
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ELECTRICAL CONNECTIONS

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.



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 1000G has a pair of relays, these relays will energize and de-energize in unison. The API 1020G will accommodate independent relay operations.

SETUP

The input 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 1020 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.

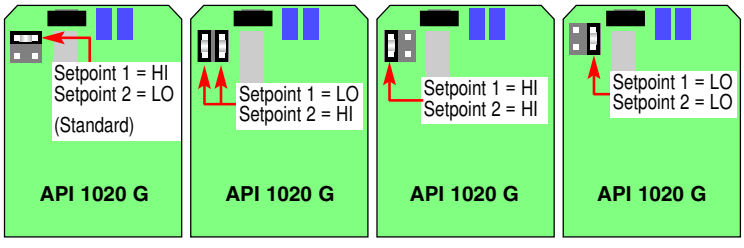
Deadband Control – The API 1000 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1020 G. The API 1020 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 1020 G Alarm Configuration – The alarm configuration of the API 1020 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.



TEST SWITCH & TEST RANGE

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 1000 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.

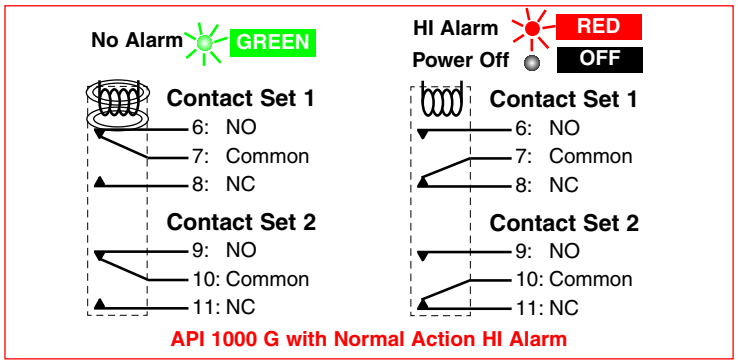
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

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.

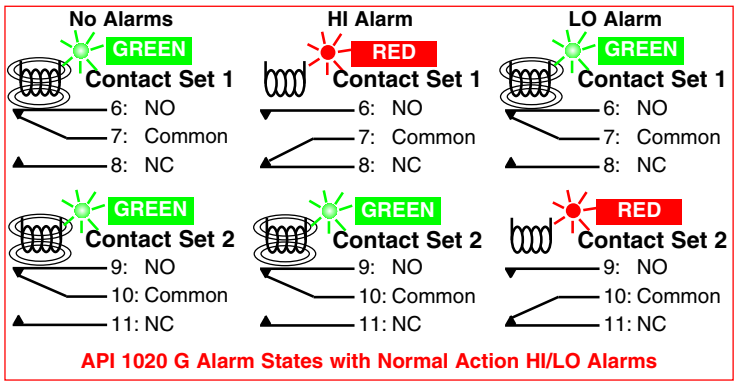
If reverse acting mode is selected (non-failsafe), the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the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

API 1000 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 1000 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 1000 G with Normal Action HI Alarm



API 1020 G Alarm States with Normal Action HI/LO Alarms

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

Monitoring Bi-Directional Flow

PROBLEM

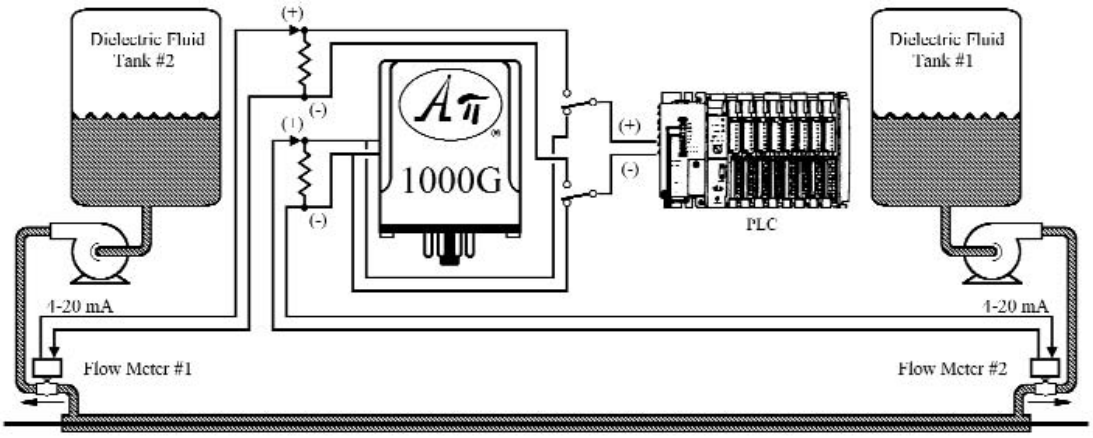
Dielectric fluid is continuously pumped through the jacket of an underground electric cable. There is a holding tank and a pump at each end of the cable and the fluid is pumped from one tank to the other and back again.

A programmable logic controller with one analog input must monitor the flow at the downstream end of the cable as a leak detection system to satisfy regulatory requirements.

SOLUTION

A flow meter with a 4-20 mA output is installed at each end of the cable. Flow Meter #1 measures the flow when the fluid is being pumped from Dielectric Fluid Tank #1, and Flow Meter #2 measures the flow when the fluid is being pumped from Dielectric Fluid Tank #2.

An **API 1000 G** DC Input Single Alarm Trip module monitors the flow at Flow Meter #2 to select which flow meter is connected to the input of the PLC.



When there is flow at Flow Meter #2, it is selected for the PLC. When there is no flow at Flow Meter #2, Flow Meter #1 is selected for the PLC. Thus, regardless of the direction, the PLC can monitor for a low flow condition that may be caused by leakage.

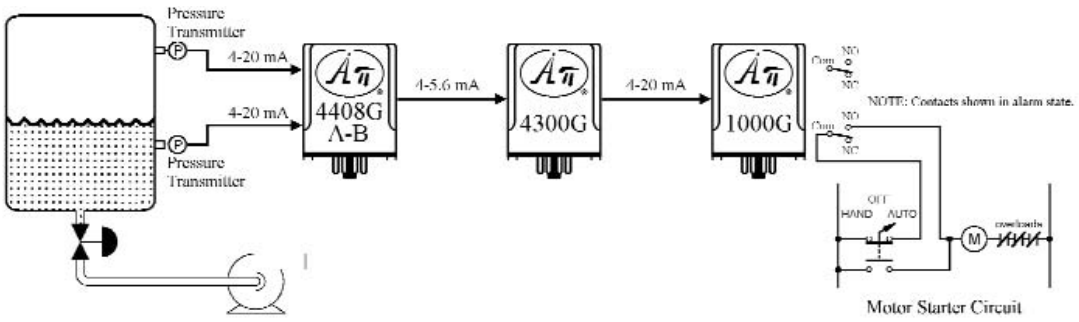
Phase Separator Water Level Control

PROBLEM

A phase separator is equipped with 2 pressure sensors, one located above the water level and one below. During operation, the maximum pressure differential is 10%. It is necessary to maintain the water level so that there is a 1% pressure differential between the sensors.

SOLUTION

Use an **API 4408 G** A-B Math Function module to obtain the pressure differential between the transmitters. With a pressure differential of 0-10%, the output of the **API 4408 G** will be 4-5.6 mA. Expand the 4-5.6 mA signal to 4-20 mA with an **API 4300 G** Isolated DC to DC Transmitter module for better resolution and control.



Use the output of the **API 4300G** to drive an **API 1000 G** DC Input Single Alarm Trip module to provide a relay contact closure to operate a water removal pump. Adjust the setpoint of the **API 1000 G** to maintain the differential pressure at 1%. The second set of isolated relay output contacts can be wired to an annunciator panel or other monitoring system as desired. The standard heavy-duty relay contacts are rated 7A @ 240VAC (resistive) and can directly control most devices.



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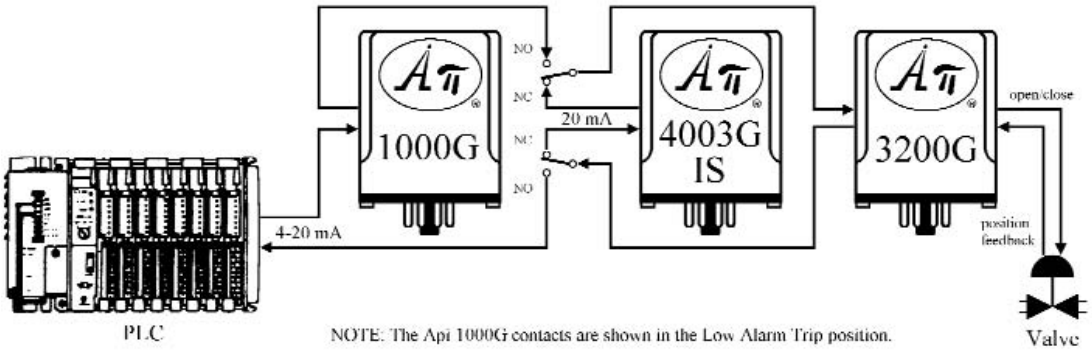
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Fail Safe Valve Control

PROBLEM
For safety reasons an automated normally closed valve used in a coal mining operation must go to the full open position if the control signal from the programmable logic controller (PLC) is lost.

SOLUTION
The valve is controlled by an **API 3200 G** Valve/Actuator Positioner/Controller module. The input to the **API 3200 G** comes through an **API 1000 G** DC Input Single Alarm Trip module, which selects either the PLC output or a constant 20 mA output from an **API 4003 GIS** DC Special Transmitter module.

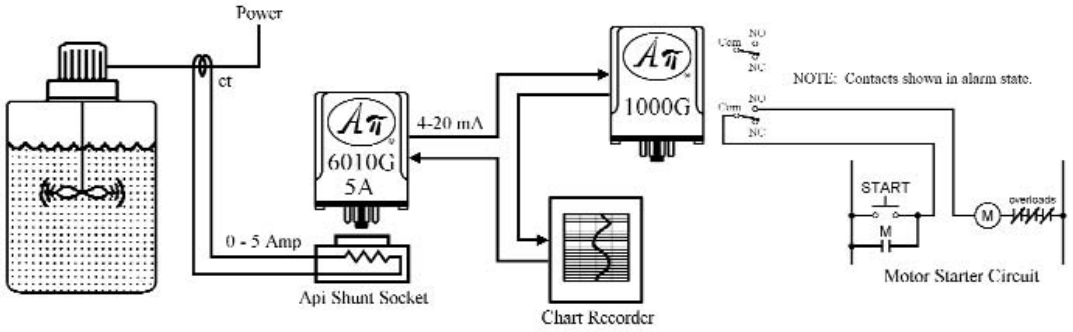


If the signal from the PLC drops below 4 mA, the **API 1000 G** will trip to a low alarm state, and select the 20 mA signal for the **API 3200 G**, thus commanding the valve to open fully. When the signal from the PLC is 4 mA or greater, the **API 1000 G** selects the PLC output signal for the **API 3200 G**, thus controlling valve position as normal.

Motor Current Monitor and Overcurrent Shutdown

PROBLEM
Monitor and record mixer motor current and provide over current shut-down.

SOLUTION
Install a properly sized current transformer in the power line feeding the motor to provide a 0-5 Amp signal for an **API 6010 G 5A** AC to DC Transmitter module. Use the 4-20 mADC output to drive an **API 1000 G** DC Input Single Alarm Trip module and a chart recorder. Use one set of relay contacts of the **API 1000 G** in the motor starter circuit to shut down the motor if the current exceeds the setpoint.



The other set of relay contacts may be wired to an annunciator or an alarm horn if so desired. The dual SPDT contacts are isolated and are rated 7A @ 240VAC resistive, making them capable of driving most loads directly.



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4-20 mA Input Alarm Trips with Loop Power Supply

API 1005 G
API 1025 G

DC Input

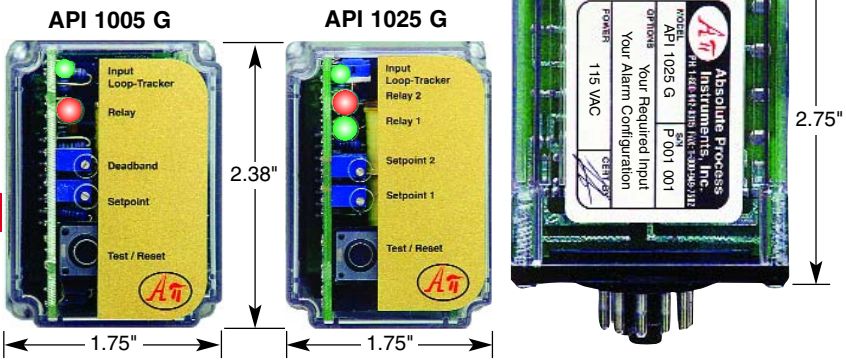
Input: ***4-20 mA***

Outputs: ***One DPDT Relay or Two SPDT Relays***

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

Applications

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



Specifications

Input
4 to 20 mADC

Input Voltage Burden (Current)
1.25 VDC maximum

Input Protection, Common Mode
750 VDC or 750 VAC_p
System voltages should not exceed socket voltage rating

Input Loop Power Supply
18 VDC nominal, unregulated, 25 mADC
Maximum ripple, less than 1.5 V_{p-p}

LoopTracker®
Variable brightness LED indicates input loop level and status

Relay Output
Factory Configured—See Options for other relay configurations

API 1005 G	One DPDT contact HI alarm, normal action (failsafe), non-latching standard 7 A @ 240 VAC resistive load 3.5 A @ 240 VAC inductive load
API 1025 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 voltage rating may limit system rating. External contact protection such as an RC snubber is recommended for inductive loads.

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

Deadband

API 1005 G	1.0 to 100% of span, 12 turn potentiometer. Alarm trip and reset window are adjusted symmetrically about the setpoint.
API 1025 G	Fixed at 1% of span, standard
API 1025 GA	1.0 to 100% of span, 1 turn potentiometer

Functional Test/Reset Button
Toggles relay(s) to opposite state when pressed
Resets latching relay with HT option, available on 1005 G only

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

LIFETIME WARRANTY

Free Factory Input & Output Calibration!

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Description and Features

The **API 1005 G** and **API 1025 G** are factory configured for 4-20 mADC input and provide alarm contact outputs. These modules include 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 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 1005 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 1025 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 & Accessories

Factory Configured—Please specify input range and options

API 1005 G	DC input, DPDT HI alarm, normal action, non-latching,115 VAC
API 1025 G	DC input, 2 SPDT, HI/LO, normal action, 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 1005 G
HT	Latching alarm with pushbutton reset, API 1005 G only
HP	Latching alarm with power-off reset, API 1005 G only
A	Adjustable deadbands for 1025 G
HH	High/High trip for 1025 G instead of High/Low
LL	Low/Low trip for 1025 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

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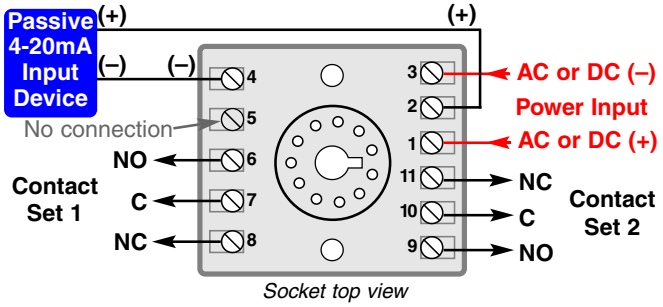
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ELECTRICAL CONNECTIONS

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 4-20 mA signal input. The positive connection (+) is applied to terminal 2 and the negative (–) is applied 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 1005 G has a pair of relays, these relays will energize and de-energize in unison. The API 1025 G will accommodate independent relay operations.

SETUP

The input 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 1025 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.

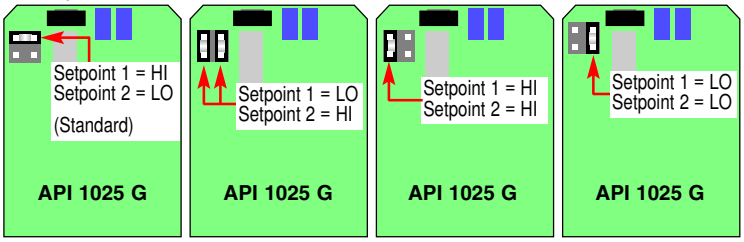
Deadband Control – The API 1005 G deadband potentiometer allows the alarm trip and reset window to be adjusted symmetrically about the setpoint from 1 to 100% of the span.

The deadband is fixed at 1% of span on the API 1025 G. The API 1025 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 1025 G Alarm Configuration – The alarm configuration of the API 1025 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 SWITCH

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 1005 GHT with the latching alarm option.

OPERATION

LEDS – The 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.

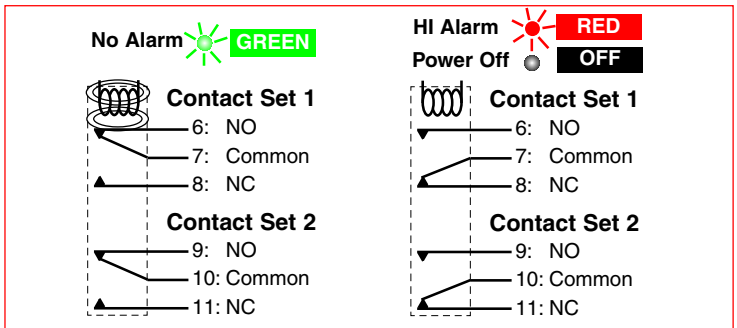
The bi-color alarm LED provides a visual indication of the alarm status. In all configurations, a GREEN LED indicates a non-alarm condition and a RED LED indicates an alarm condition.

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.

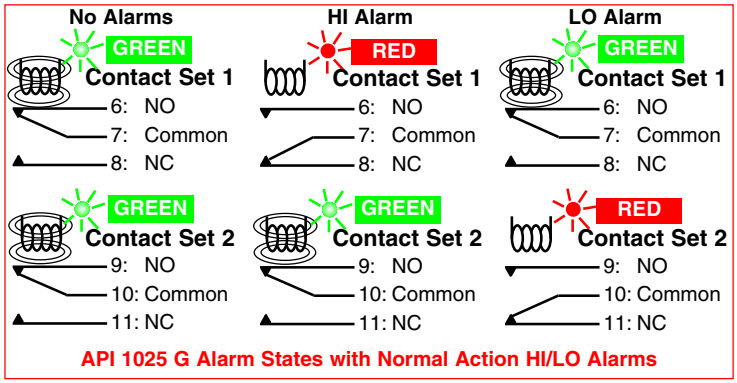
If reverse acting mode is selected (non-failsafe), the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm will activate when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then will automatically reset when the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

API 1005 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 1005 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 1005 G Alarm States with Normal Action HI Alarm



API 1025 G Alarm States with Normal Action HI/LO Alarms

DC Input Single Alarm with Transmitter & Loop Supply

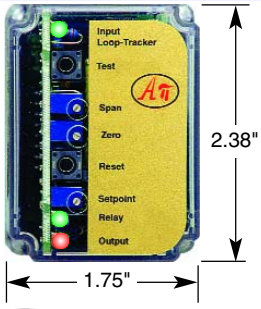
API 1040 G

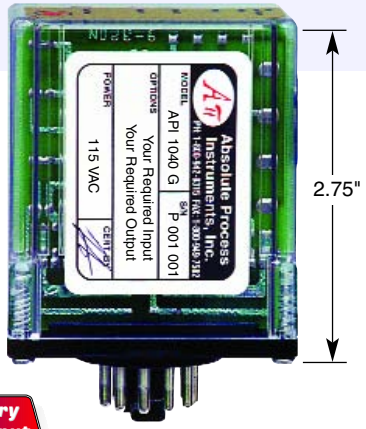
DC Input

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***





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

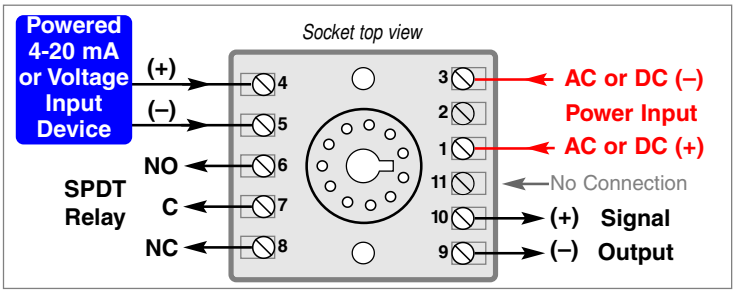
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

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.

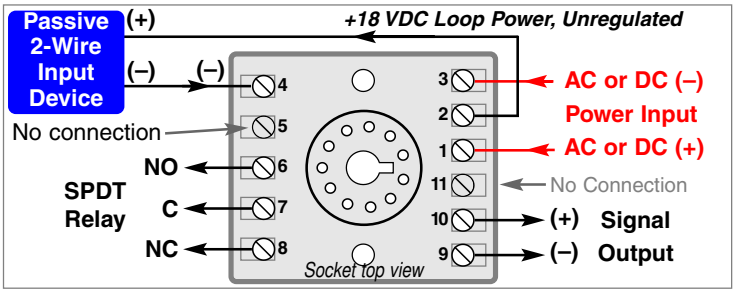
Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

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

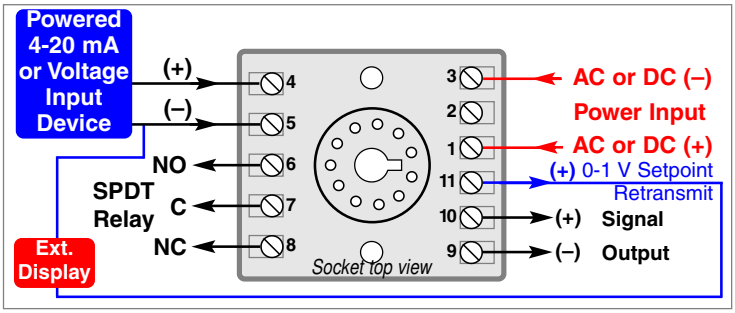
WIRING EXAMPLES



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

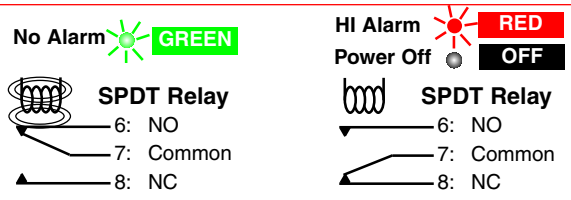
GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity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

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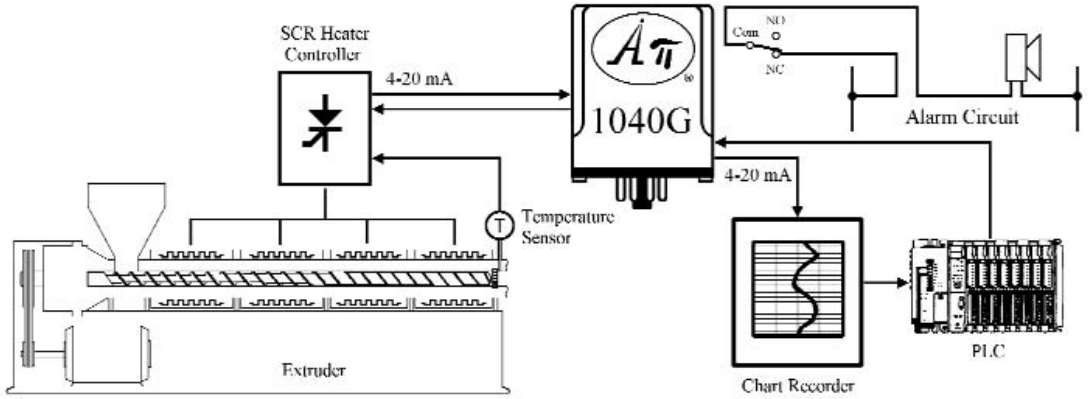
Over-Temperature Alarm with Retransmitted Temperature Signal

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.

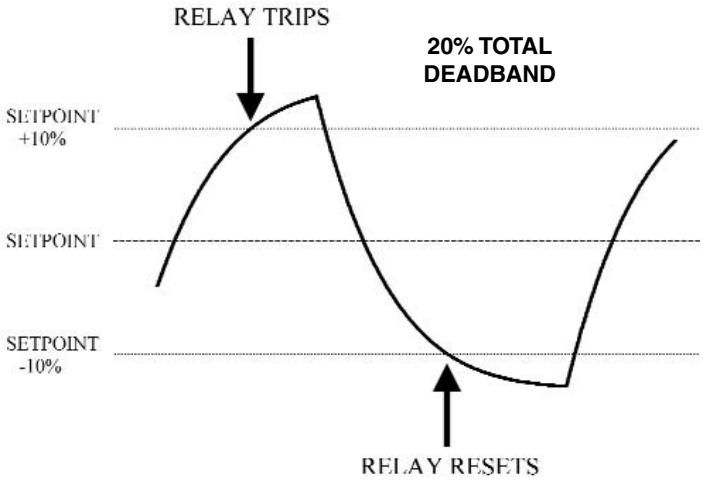
What are the relay contacts rated for in your alarm output modules for a motor load?

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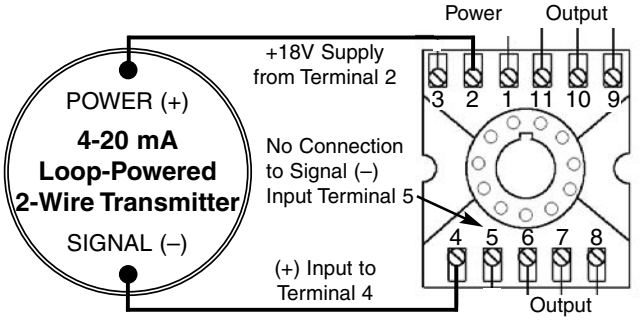
Using the Built-In 4-20 mA Loop Power Supply

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.

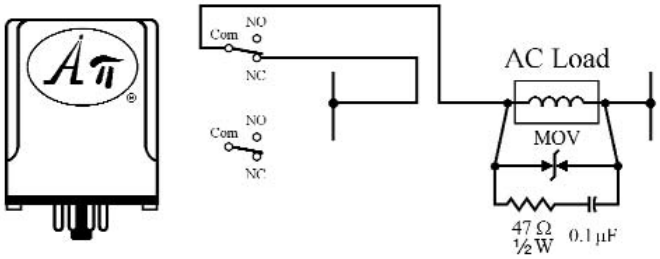


Figure 1: AC inductive loads.

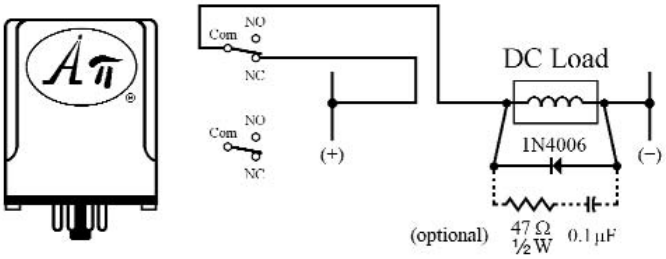
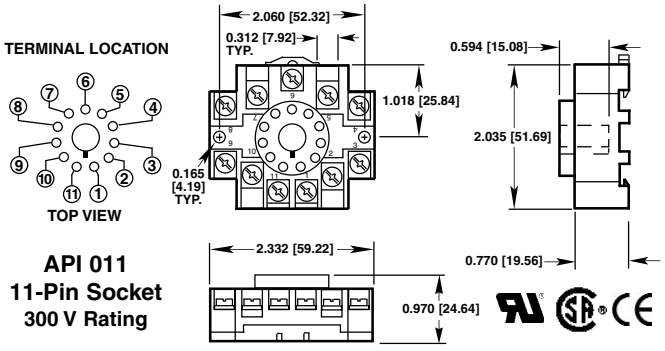
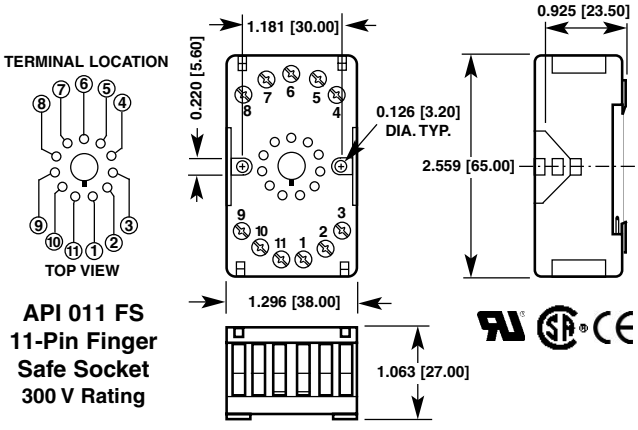


Figure 2: DC inductive loads.

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

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

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DC Input DPDT Alarm Trip

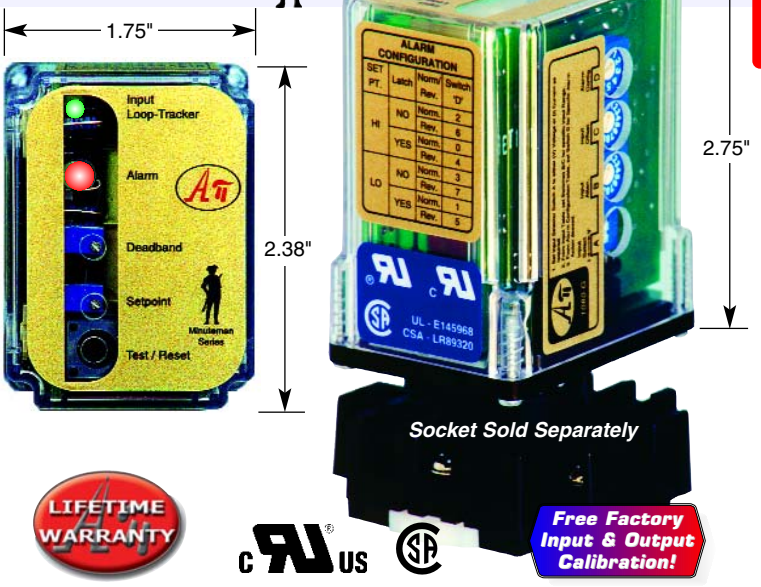
API 1080 G

DC Input

Input: ***0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA***
Output: ***One 7 Amp DPDT Relay***

Field Selectable
One Minute Setup!

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints .***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***



LIFETIME WARRANTY

Applications

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

Specifications

Input Ranges

	Minimum	Maximum
Voltage:	0-50 mVDC	±10 VDC
Current:	0-1 mADC	0-20 mADC

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

Input Impedance

Voltage inputs: 250 kΩ minimum
Current inputs: 50 Ω typical

Input Voltage Burden

1.0 VDC typical at 20 mA

Input Protection, Common Mode

750 VDC or 750 VAC_p
System voltages should not exceed socket voltage rating

Input Loop Power Supply

18 VDC nominal, unregulated, 25 mA max. Max. ripple <1.5 V_{p-p}

LoopTracker®

Variable brightness LED indicates input loop level and status

Relay Output

One DPDT contact, field configurable
7 A @ 240 VAC resistive load
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/Reset Button

Toggles relay to opposite state when pressed
Resets latching relay if latching relay mode was selected

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 1080 G** accepts a DC voltage or current input and provides a visual alarm indication and DPDT alarm relay contact output when the input exceeds a high alarm trip point or falls below a low alarm trip point. 15 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle the relay independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. 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 when the latching mode has been selected.

Heavy-duty relay contacts allow the module to directly control high capacity loads. The **API 1080 G** provides a single setpoint adjustment of the DPDT relay contacts. The alarm output can be field configured for HI or LO operation, latching or non-latching, and normal or reverse acting (also referred to as fail-safe or non-failsafe). Top-accessible, multi-turn potentiometers are used to adjust both the deadband from 1 to 100% and the alarm setpoint from 0 to 100%.

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.

Models, Options & Accessories

Free Setup—Specify input range and output range

API 1080 G	Field rangeable DC input alarm trip, 1 DPDT relay, 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
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

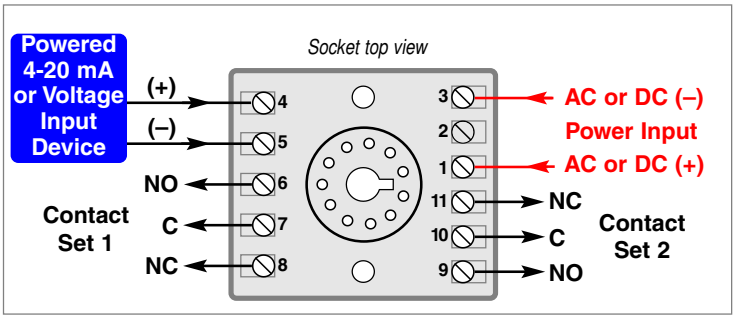
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

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.

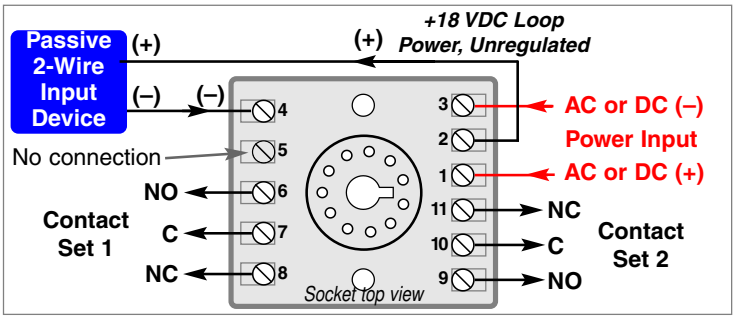
Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 4 and the negative (–) is applied to terminal 5.

Relay Output Terminals – Terminals 6, 7, 8 and 9, 10, 11 provide the appropriate connections for the desired relay operations. (NO = Normally Open, NC = Normally Closed, C = Common).

WIRING EXAMPLES



API 1080 G with Powered Current or Voltage Input



API 1080 G Using +18V Loop Power Supply

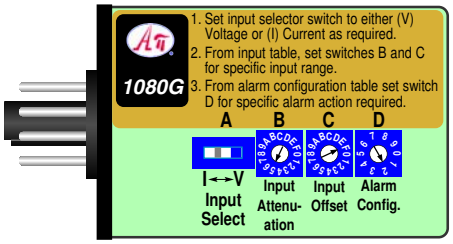
SETUP

The API 1080 G input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1080 G. Set switches A, B, C and D accordingly.

VOLTAGE Inputs Set switch **A** to "**V**"		**CURRENT** Inputs Set switch **A** to "**I**"		**ALARM CONFIGURATION**			
Range	Switches **B C**	Range	Switches **B C**	Type	Latch	Action	Switch **D**
0-50 mV	**8 1**	0-1 mA	**C 1**	HI	No	Normal	**2**
0-100 mV	**9 1**	0-2 mA	**0 1**	HI	No	Reverse	**6**
0-200 mV	**A 1**	0-4 mA	**1 1**	HI	Yes	Normal	**0**
0-250 mV	**C 1**	0-8 mA	**2 1**	HI	Yes	Reverse	**4**
0-400 mV	**B 1**	2-10 mA	**2 F**	LO	No	Normal	**3**
0-500 mV	**0 1**	0-10 mA	**4 1**	LO	No	Reverse	**7**
0-1 V	**1 1**	0-16 mA	**3 1**	LO	Yes	Normal	**1**
0-2 V	**2 1**	0-20 mA	**5 1**	LO	Yes	Reverse	**5**
0-2.5 V	**4 1**	4-20 mA	**5 F**				
0-4 V	**3 1**						
1-5 V	**5 F**						
0-5 V	**5 1**						
0-10 V	**6 1**						
±5 V	**6 4**						
±10 V	**7 4**						

SETUP (Continued)

EXAMPLE: For 4-20 mADC input, HI alarm, non-latching, normal action set switches as follows: A = **I** (current)
B = **5**
C = **F**
D = **2**



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 Switch – 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.

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.

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.

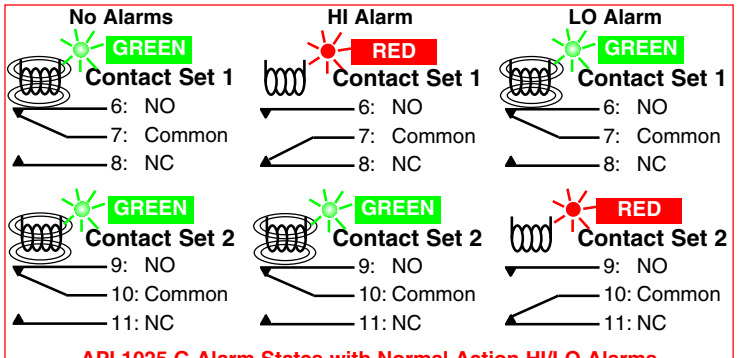
For a reverse acting alarm (non-failsafe), the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition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

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.

CALIBRATION

The module input ranges are factory calibrated and no calibration is required. 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.

Turn the deadband potentiometer clockwise if a larger amount of deadband is desired. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. The test button can be used at any time to toggle the relay state independent of the input and output to verify operation.



API 1025 G Alarm States with Normal Action HI/LO Alarms

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

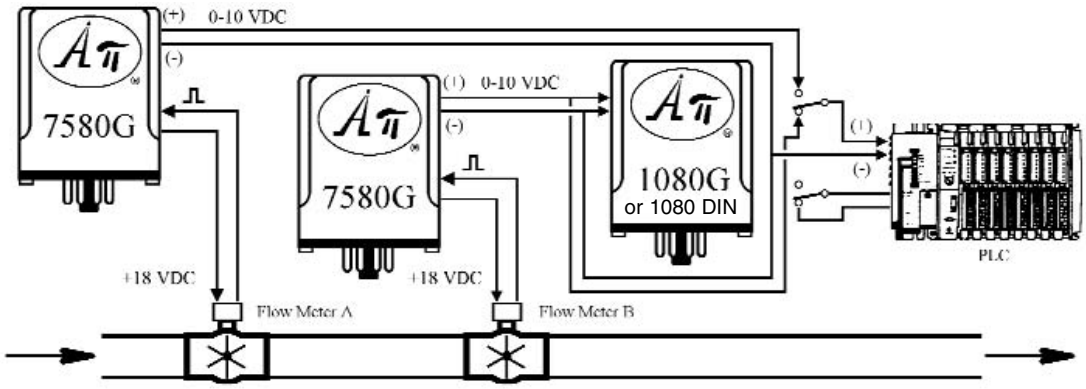
Auto-Ranging Flow Meter

PROBLEM

A flow in a process must be accurately measured throughout a wide range. The flow rate is used by a PLC to control the process. Two flow meters are utilized, one very accurate at low flow and one very accurate at high flow. A means for automatic selection of the appropriate flow meter is required.

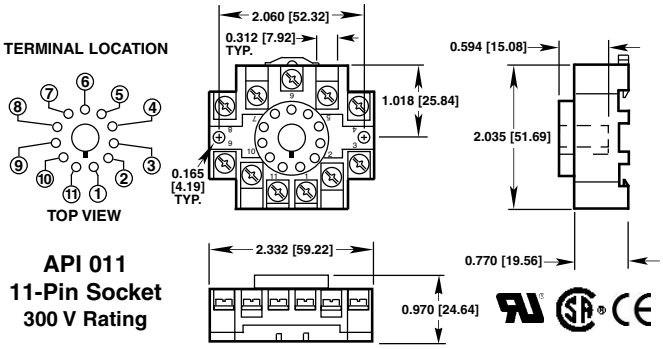
SOLUTION

An **API 7580 G** Field Selectable Isolated Frequency to DC Transmitter module is used with each flow meter to convert the frequency output to a 0-10 VDC signal proportional to flow. An **API 1080 DIN** DC Input, Wide Ranging, Field Selectable Single Alarm Trip module monitors the flow rate and transfers the PLC analog input to the flow meter appropriate for that range.

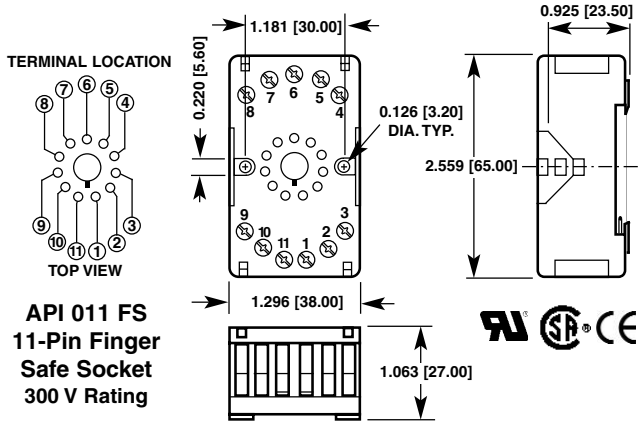


The second set of relay contacts of the **API 1080 DIN** provides a PLC binary input with a closure to indicate which flow meter is selected.

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



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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.

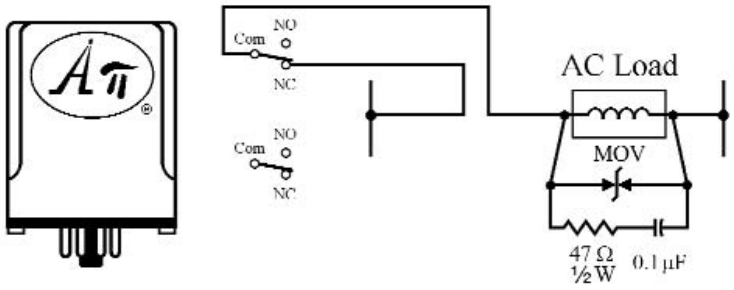


Figure 1: AC inductive loads

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.

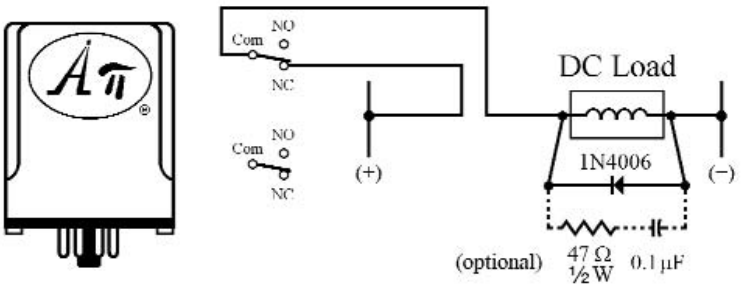


Figure 2: DC inductive loads



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DC Input DPDT Alarm Trip

API 1080 DIN

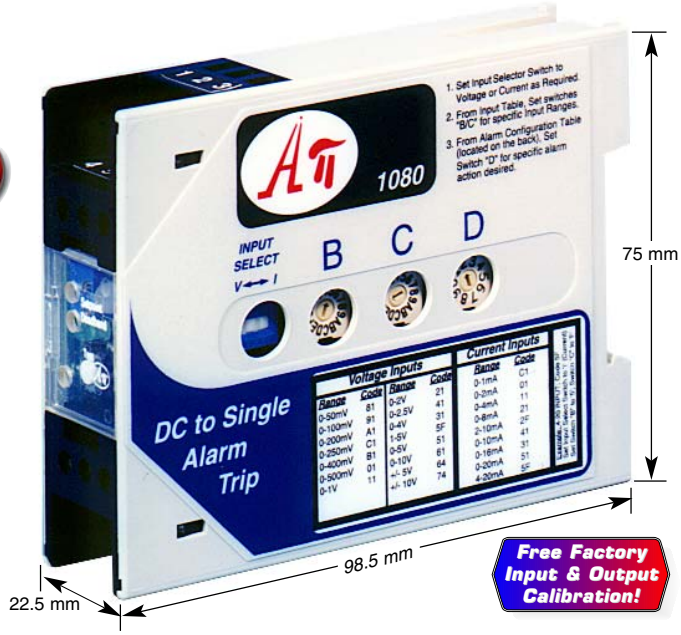
DC Input

Input: ***0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA***
Output: ***One 7 Amp DPDT Relay***

Field Selectable
One Minute Setup!

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***
- ***Compact 22.5 mm Wide DIN Package***
- ***Operates on Wide Ranges of AC or DC Power***

LIFETIME WARRANTY



Applications

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

Specifications

Input Ranges

	Minimum	Maximum
Voltage:	0-50 mVDC	±10 VDC
Current:	0-1 mADC	0-20 mADC

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

Input Impedance

Voltage inputs: 250 kΩ minimum
Current inputs: 50 Ω typical

Input Voltage Burden

1.0 VDC typical at 20 mA

Input Protection, Common Mode

750 VDC or 750 VAC_p

Input Loop Power Supply

12 VDC ±10%, regulated, 25 mA max. Max. ripple <1.5 V_{p-p}

LoopTracker

Variable brightness LED indicates input loop level and status

Relay Output

One DPDT contact, field configurable
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load

CAUTION: 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/Reset Button

Toggles relay to opposite state when pressed
Resets latching relay if latching relay mode was selected

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

Case Material

Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

Power

Any AC source 80-265 VAC 50/60 Hz, 2 W max.
or any DC source 48-300 VDC, 2 W max.

Description and Features

The **API 1080 DIN** accepts a DC voltage or current input and provides a visual alarm indication and DPDT alarm relay contact output when the input exceeds a high alarm trip point or falls below a low alarm trip point. 15 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle the relay independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. The functional test pushbutton can be used to verify the alarm and system operation and also provides the additional function of unlatching the alarm when the latching mode has been selected.

Heavy-duty relay contacts allow the module to directly control high capacity loads. The **API 1080 DIN** provides a single setpoint adjustment of the DPDT relay contacts. The alarm output can be field configured for HI or LO operation, latching or non-latching, and normal or reverse acting (also referred to as fail-safe or non-failsafe). Front-accessible potentiometers are used to adjust both the deadband from 1 to 100% and the alarm setpoint from 0 to 100%.

This module includes a regulated 12 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.

The **API 1080 DIN** is designed to mount on an industry-standard DIN rail. The narrow 22.5 mm wide DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density.

Models, Options & Accessories

Free Setup—Specify input range and output range

API 1080 DIN Field rangeable DC input, DPDT alarm trip, with loop power supply, 80-265 VAC or 48-300 VDC powered

Options—Add to end of model number

U Conformal coating for moisture resistance

Accessories—Order as a separate line item

API TK36 DIN rail, 35 mm W x 39" L, aluminum

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API 1080 DIN

Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

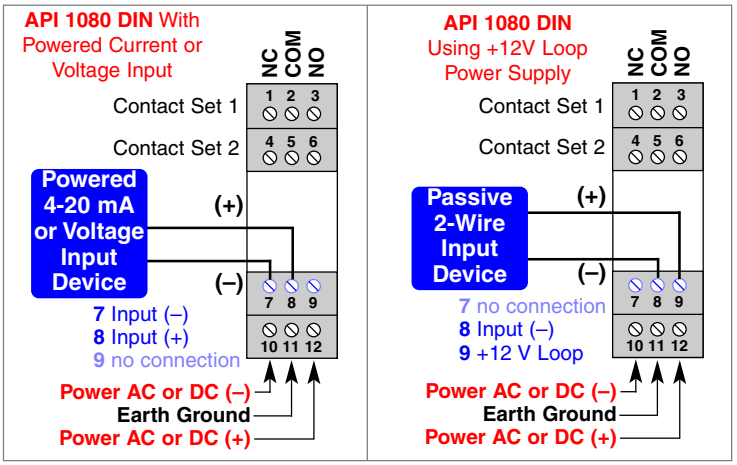
Power Input Terminals – The label on the side of the API module will indicate the voltage requirements. Power is connected to terminals 10 and 12. Observe polarity when using DC power. Positive (+) is wired to terminal 12 and negative (–) is wired to terminal 10. Terminal 11 earth ground may be used if required.

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 8 and the negative (–) is applied to terminal 7.

Using the 12 VDC Power Supply with a Passive Signal Input – This may save the expense of purchasing a separate power supply for the input device. A passive input device can be powered by the 12 volt DC power supply at terminal 9. Polarity must be observed when connecting the signal input. Typically the positive (+) lead is wired to terminal 9 and the negative (–) lead is connected to terminal 8. A typical example is shown. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

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).

WIRING EXAMPLES



RANGE SELECTION

The API 1080 DIN input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1080 DIN. Set switches A, B, C and D accordingly.

EXAMPLE: For 4-20 mADC input, HI alarm, non-latching, normal action. Set switches as follows: A = "I" (current); B = "5"; C = "F"; D = "2"

VOLTAGE Inputs Set switch **A** to "**V**"		**CURRENT** Inputs Set switch **A** to "**I**"		**ALARM CONFIGURATION**			
Range	Switches **B C**	Range	Switches **B C**	Type	Latch	Action	Switch **D**
0-50 mV	**8 1**	0-1 mA	**C 1**	HI	No	Normal	**2**
0-100 mV	**9 1**	0-2 mA	**0 1**	HI	No	Reverse	**6**
0-200 mV	**A 1**	0-4 mA	**1 1**	HI	Yes	Normal	**0**
0-250 mV	**C 1**	0-8 mA	**2 1**	HI	Yes	Reverse	**4**
0-400 mV	**B 1**	2-10 mA	**2 F**	LO	No	Normal	**3**
0-500 mV	**0 1**	0-10 mA	**4 1**	LO	No	Reverse	**7**
0-1 V	**1 1**	0-16 mA	**3 1**	LO	Yes	Normal	**1**
0-2 V	**2 1**	0-20 mA	**5 1**	LO	Yes	Reverse	**5**
0-2.5 V	**4 1**	4-20 mA	**5 F**				
0-4 V	**3 1**						
1-5 V	**5 F**						
0-5 V	**5 1**						
0-10 V	**6 1**						
±5 V	**6 4**						
±10 V	**7 4**						

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

SETUP

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 Switch and Test Range – 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.

OPERATION

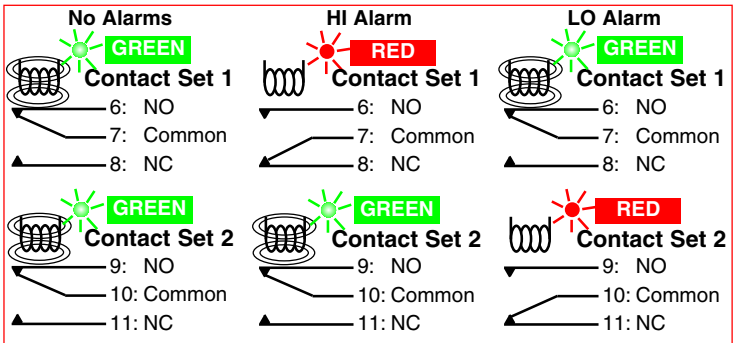
GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity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

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.

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.

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.



API 1025 G Alarm States with Normal Action HI/LO Alarms

CALIBRATION

The input ranges are factory calibrated and do not require adjustment.

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. In addition, 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.

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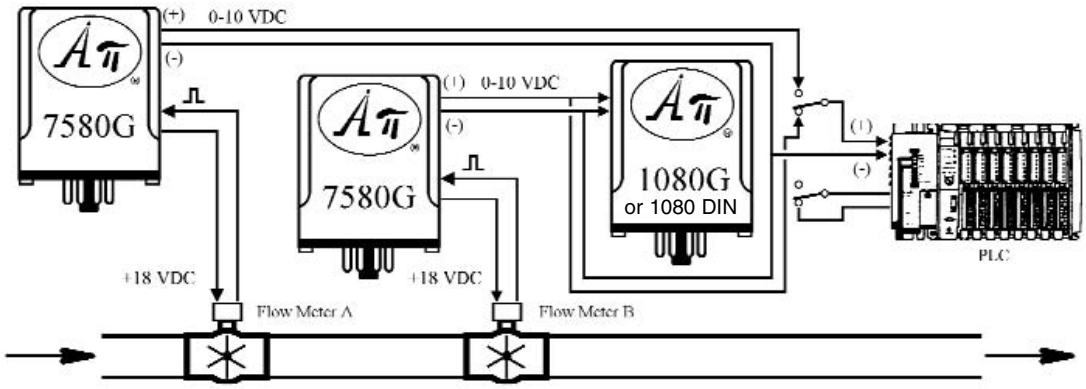
Auto-Ranging Flow Meter

PROBLEM

A flow in a process must be accurately measured throughout a wide range. The flow rate is used by a PLC to control the process. Two flow meters are utilized, one very accurate at low flow and one very accurate at high flow. A means for automatic selection of the appropriate flow meter is required.

SOLUTION

An **API 7580 G** Field Selectable Isolated Frequency to DC Transmitter module is used with each flow meter to convert the frequency output to a 0-10 VDC signal proportional to flow. An **API 1080 DIN** DC Input, Wide Ranging, Field Selectable Single Alarm Trip module monitors the flow rate and transfers the PLC analog input to the flow meter appropriate for that range.



The second set of relay contacts of the **API 1080 DIN** provides a PLC binary input with a closure to indicate which flow meter is selected.

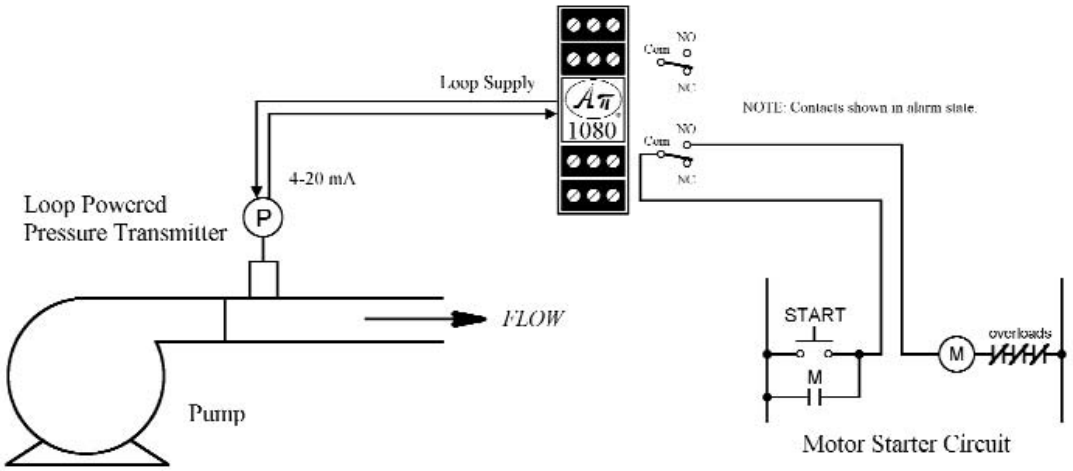
Pumping System High Pressure Shutdown

PROBLEM

High head pressure is causing pump failures. If the pressure exceeds a preset limit, the pump must be shut down. A manual reset is necessary to restart pump.

SOLUTION

A loop powered pressure transducer is installed at the discharge side of the pump. The pressure transducer is connected to an **API 1080 DIN** DC Input, Field Selectable Single Setpoint Alarm module.



The **API 1080 DIN** provides the loop power for the 4-20 mA pressure transducer from its built-in loop excitation supply. The setpoint is adjusted to the high-pressure limit. The relay contacts are wired in series with the motor starter such that if the pressure is not below the setpoint, the pump will be stopped. It is necessary to press the START push button to restart the pump. The standard heavy-duty relay contacts are rated 7A @ 240 VAC and can directly control most devices.



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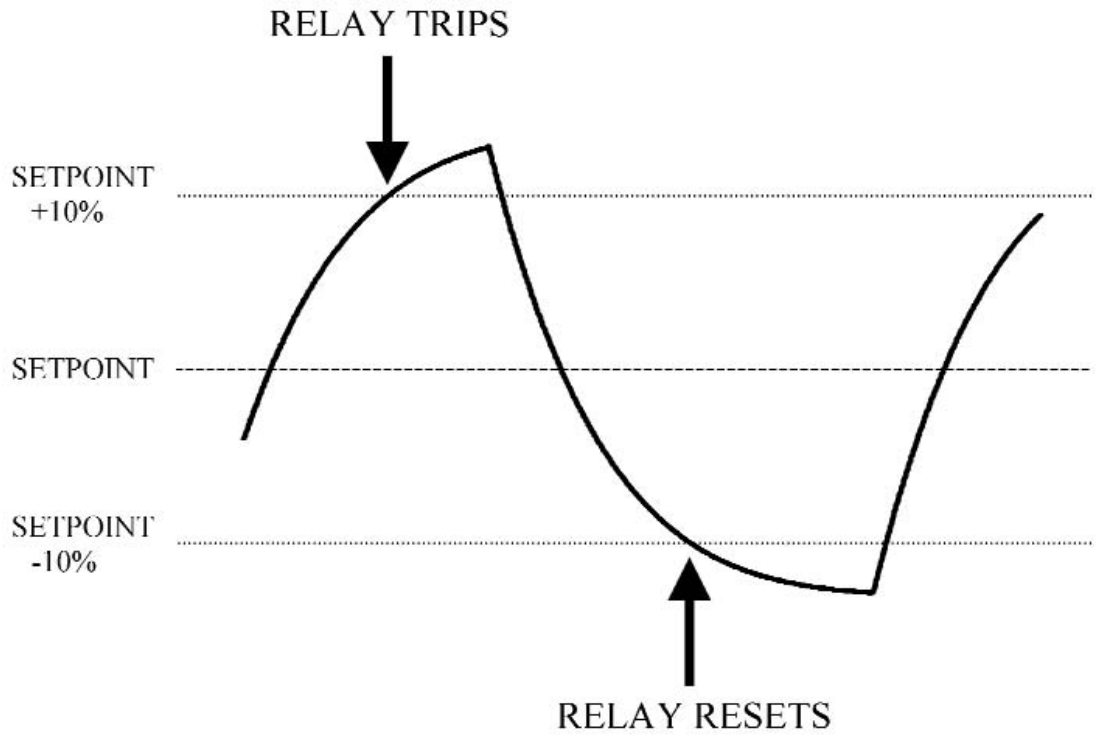
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Frequently Asked Questions

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

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.



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DC Input Dual SPDT Alarm Trip

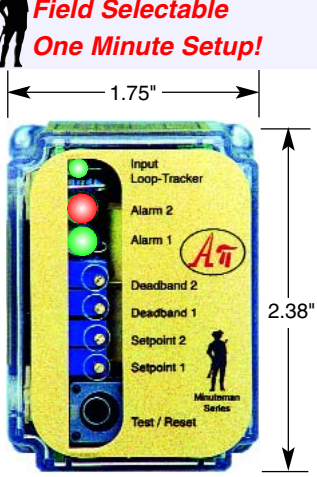
API 1090 G

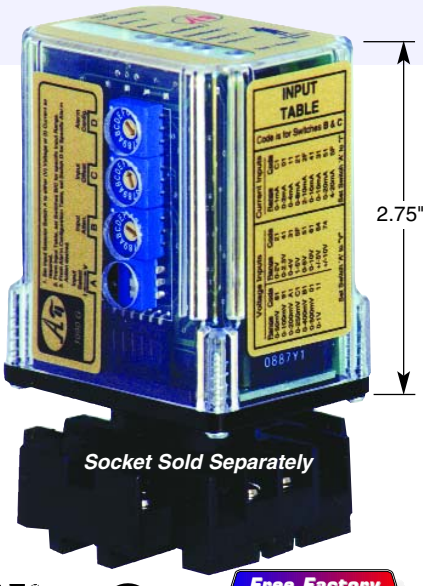
DC Input

Input: *0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA*
Outputs: *Two 7 Amp SPDT Relays*

Field Selectable
One Minute Setup!

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints .***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***





LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Applications

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

Specifications

Input Ranges

	Minimum	Maximum
Voltage:	0-50 mVDC	±10 VDC
Current:	0-1 mADC	0-20 mADC

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

Input Impedance

Voltage input: 250 kΩ minimum
Current input: 50 Ω typical

Input Voltage Burden

1.0 VDC typical at 20 mA

Input Protection, Common Mode

750 VDC or 750 VAC_p
System voltages should not exceed socket voltage rating

Input Loop Power Supply

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

LoopTracker

Variable brightness LED indicates input loop level and status

Relay Output

Two SPDT relays, field configurable
7 A @ 240 VAC resistive load, 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/Reset Button

Toggles relays to opposite state when pressed
Resets latching relays if latching relay mode was selected

Response Time

70 milliseconds typical

Ambient Temperature Range

–10°C to +60°C operating ambient

Temperature Stability

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 1090 G** accepts a DC voltage or current input and provides a visual alarm indication and two independent alarm outputs via SPDT relay contacts for each setpoint. 17 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle both relays independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. 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 when the latching mode has been selected.

Heavy-duty relay contacts allow the module to directly control high capacity loads. The alarm outputs can be configured in the field for HI/HI, LO/LO, HI/LO or LO/HI operation, latching or non-latching, and normal or reverse acting (also referred to as fail-safe or non-fail-safe). Top-accessible, multi-turn potentiometers are used to adjust the deadband from 1 to 100% and the alarm setpoints from 0 to 100%.

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.

Models, Options & Accessories

Free Setup—Specify input range and output range

API 1090 G	Field rangeable DC input alarm trip, 2 SPDT relays, 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
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

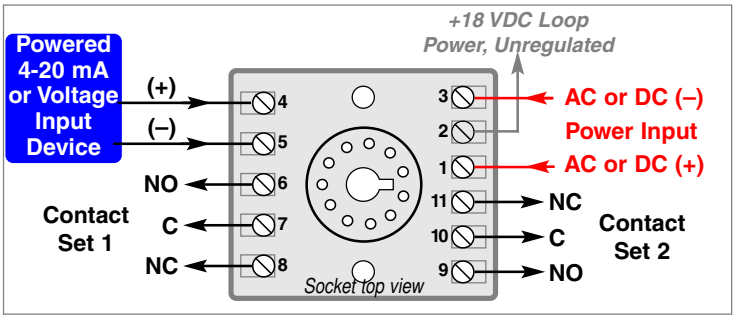
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket separately.

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.

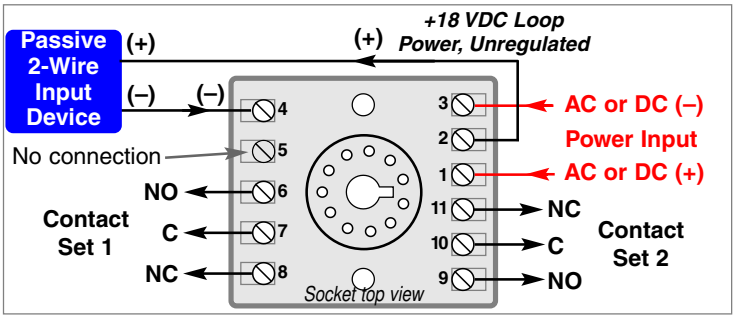
Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) connects to terminal 4 and the negative (–) is connects to terminal 5.

Relay Output Terminals – Terminals 6, 7, 8 and 9, 10, 11 provide the connections for the relays. NO = Normally Open, NC = Normally Closed, C = Common.

WIRING EXAMPLES



API 1090 G with Powered Current or Voltage Input



API 1090 G Using +18V Loop Power Supply

SETUP

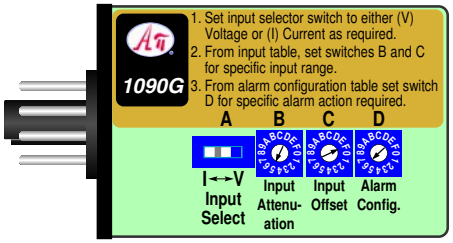
The API 1090 G input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1090 G. Set switches A, B, C and D accordingly.

VOLTAGE Inputs Set switch A to "V"		CURRENT Inputs Set switch A to "I"		ALARM CONFIGURATION			
Range	Switches B C	Range	Switches B C	SP1/SP2	Latch	Action	Switch D
0-50 mV	8 1	0-1 mA	C 1	HI/LO	No	Normal	6
0-100 mV	9 1	0-2 mA	0 1	HI/LO	No	Reverse	E
0-200 mV	A 1	0-4 mA	1 1	HI/LO	Yes	Normal	2
0-250 mV	C 1	0-8 mA	2 1	HI/LO	Yes	Reverse	A
0-400 mV	B 1	2-10 mA	2 F	HI/HI	No	Normal	4
0-500 mV	0 1	0-10 mA	4 1	HI/HI	No	Reverse	C
±50 mV	A 4	0-16 mA	3 1	HI/HI	Yes	Normal	0
±100 mV	B 4	0-20 mA	5 1	HI/HI	Yes	Reverse	8
0-1 V	1 1	4-20 mA	5 F	LO/LO	No	Normal	7
0-2 V	2 1			LO/LO	No	Reverse	F
0-2.5 V	4 1			LO/LO	Yes	Normal	3
0-4 V	3 1			LO/LO	Yes	Reverse	B
1-5 V	5 F			LO/HI	No	Normal	5
0-5 V	5 1			LO/HI	No	Reverse	D
0-10 V	6 1			LO/HI	Yes	Normal	1
±5 V	6 4			LO/HI	Yes	Reverse	9
±10 V	7 4						

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

SETUP (Continued)

EXAMPLE: For 4-20 mADC input, HI alarm, non-latching, normal action set switches as follows: A = **I** (current)
B = **5**
C = **F**
D = **6**



Setpoint Control – The multi-turn potentiometers (one for each setpoint) allow the operator to adjust the level at which each alarm is activated. These controls are adjustable from 0 to 100% of the input range.

Deadband Control – These potentiometers allow the alarm trip and reset windows to be adjusted symmetrically about the setpoint from 1 to 100% of the span for each setpoint. This allows the operator to fine tune the point at which each alarm trips and resets and is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

Test Switch – 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.

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.

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.

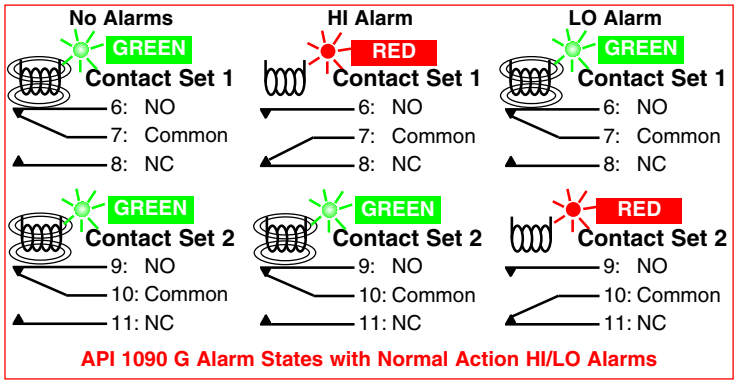
For a reverse acting alarm (non-failsafe), the relay coil is de-energized in a non-alarm condition and energized in an alarm condition. The alarm activates when the input signal exceeds the setpoint (HI alarm) or falls below the setpoint (LO alarm), then automatically resets when the alarm condition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

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.

CALIBRATION

The input ranges are factory calibrated and no field calibration is required. 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.

Turn the deadband potentiometer clockwise if a larger amount of deadband is desired. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. The test button can be used at any time to toggle the relay state independent of the input and output to verify operation.



API 1090 G Alarm States with Normal Action HI/LO Alarms

DC Input Dual SPDT Alarm Trips

API 1090 DIN
API 1090 DD

DC Input

Input: *0-50 mV to ±10 VDC or 0-1 mA to 4-20 mA*
Outputs: *Two7 Amp SPDT Relays*

Field Selectable
One Minute Setup!

- ***Field Selectable Input Ranges***
- ***Selectable Relay Configuration & Adjustable Setpoints***
- ***Input LoopTracker® & Alarm Status LEDs***
- ***Alarm Test/Reset Pushbutton***
- ***Built-In 4-20 mA Loop Power Supply***
- ***Compact 22.5 mm Wide DIN Package***
- ***Operates on Wide Ranges of AC or DC Power***

LIFETIME WARRANTY



Applications

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

Specifications

Input Ranges

	Minimum	Maximum
Voltage:	0-50 mVDC	±10 VDC
Current:	0-1 mADC	0-20 mADC

See chart on other side for standard ranges
Consult factory for other available switch selectable ranges

Input Impedance
Voltage inputs: 250 kΩ minimum
Current inputs: 50 Ω typical

Input Voltage Burden
1.0 VDC typical at 20 mA

Input Protection, Common Mode
750 VDC or 750 VAC_p

Input Loop Power Supply
12 VDC±10%, regulated, 25 mA max. Max. ripple <1.5 V_{p-p}

LoopTracker
Variable brightness LED indicates input loop level and status

Relay Output
Two SPDT relays, field configurable
7 A @ 240 VAC resistive load
3.5 A @ 240 VAC inductive load

CAUTION: 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/Reset Button
Toggles relay to opposite state when pressed
Resets latching relay if latching relay mode was selected

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

Case Material
Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

Power
API 1090 DIN Any AC source 80 to 265 VAC 50/60 Hz, 2 W max. or any DC source 48 to 300 VDC, 2 W max.
API 1090 DD 9 to 30 VDC, 2 W maximum

Description and Features

The **API 1090 DIN** and **API 1090 DD** accept a DC voltage or current input and two independent SPDT alarm outputs via relay contacts when the input exceeds a high alarm trip point or falls below a low alarm trip point. 15 voltage and 9 current input ranges can be field-configured via external rotary and slide switches. Offset ranges such as 1-5 VDC and 4-20 mADC are also included. Consult the factory for other available ranges.

API exclusive features include a ***LoopTracker*** LED that varies in intensity with changes in the process signal, a bi-color alarm status LED, and a **Functional Test Pushbutton** to toggle the relays independent of the input. The green LoopTracker LED varies in intensity with changes in the process input signal. Monitoring the state of this LED can provide a quick visual picture of your process loop at all times. The functional test pushbutton can be used to verify the alarm and system operation and also provides the additional function of unlatching the alarm when the latching mode has been selected.

Heavy duty relay contacts allow the module to directly control high capacity loads. The alarm outputs can be configured in the field for HI/HI, LO/LO, HI/LO or LO/HI operation, latching or non-latching, and normal or reverse acting (also referred to as fail-safe or non-fail-safe). Front-accessible, multi-turn potentiometers are used to adjust both the deadband from 1 to 100% and the alarm setpoints from 0 to 100%.

Also standard on the **API 1090 DIN** and **API 1090 DD** is a 12 VDC regulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 1090 DIN** and **API 1090 DD** are designed to mount on an industry-standard DIN rail. The narrow 22.5 mm wide DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density.

Models, Options & Accessories

Free Setup—Specify input range and output range

API 1090 DIN Field rangeable DC input alarm trip, 2 SPDT relays, with loop power supply, 80-265 VAC or 48-300 VDC

API 1090 DD Field rangeable DC input alarm trip, 2 SPDT relays, with loop power supply, 9-30 VDC

Options—Add to end of model number

U Conformal coating for moisture resistance

Accessories—Order as a separate line item

API TK36 DIN rail, 35 mm W x 39" L, aluminum

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API 1090 DIN
API 1090 DD

Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard DIN rail mount. Order API TK36 DIN rail separately.

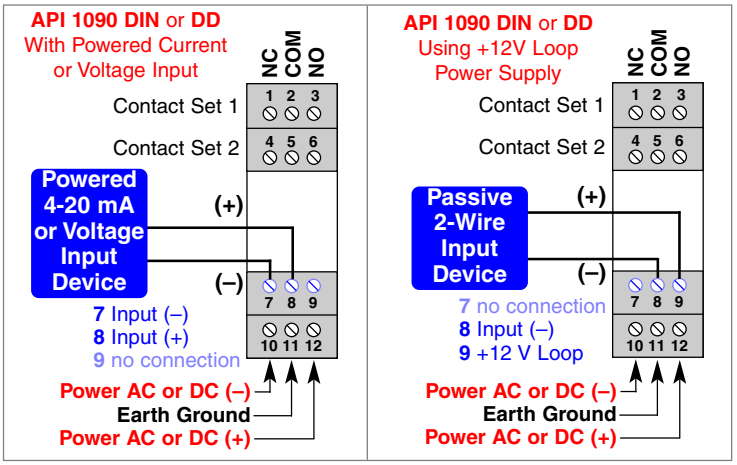
Power Input Terminals – API module power requirements are indicated on the side label. Connect power to terminals 10 and 12. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 12 and negative (–) is wired to terminal 10. Terminal 11 earth ground may be used if required.

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive signal (+) is connected to terminal 8 and the negative (–) is connected to terminal 7.

Using the 12 VDC Power Supply with a Passive Signal Input – This may save the expense of purchasing a separate power supply for the input device. A passive input device can be powered by the 12 volt DC power supply at terminal 9. Polarity must be observed when connecting the signal input. Typically, the positive (+) lead is wired to terminal 9 and the negative (–) lead is connected to terminal 8. A typical example is shown. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

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).

WIRING EXAMPLES



RANGE SELECTION

The API 1090 DIN input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 250 kΩ or greater for voltage inputs. The switch settings will determine the exact operation of the module. Following are the standard input range and alarm configuration tables used to configure the API 1090 DIN. Set switches A, B, C and D accordingly.

EXAMPLE: For 4-20 mADC input, HI alarm, non-latching, normal action set switches as follows: A = **I** (current) B = **5** C = **F** D = **6**

VOLTAGE Inputs Set switch A to "V"		CURRENT Inputs Set switch A to "I"		ALARM CONFIGURATION			
Range	Switches B C	Range	Switches B C	SP1/SP2	Latch	Action	Switch D
0-50 mV	8 1	0-1 mA	C 1	HI/LO	No	Normal	6
0-100 mV	9 1	0-2 mA	0 1	HI/LO	No	Reverse	E
0-200 mV	A 1	0-4 mA	1 1	HI/LO	Yes	Normal	2
0-250 mV	C 1	0-8 mA	2 1	HI/LO	Yes	Reverse	A
0-400 mV	B 1	2-10 mA	2 F	HI/HI	No	Normal	4
0-500 mV	0 1	0-10 mA	4 1	HI/HI	No	Reverse	C
±50 mV	A 4	0-16 mA	3 1	HI/HI	Yes	Normal	0
±100 mV	B 4	0-20 mA	5 1	HI/HI	Yes	Reverse	8
0-1 V	1 1	4-20 mA	5 F	LO/LO	No	Normal	7
0-2 V	2 1			LO/LO	No	Reverse	F
0-2.5 V	4 1			LO/LO	Yes	Normal	3
0-4 V	3 1			LO/LO	Yes	Reverse	B
1-5 V	5 F			LO/HI	No	Normal	5
0-5 V	5 1			LO/HI	No	Reverse	D
0-10 V	6 1			LO/HI	Yes	Normal	1
±5 V	6 4			LO/HI	Yes	Reverse	9
±10 V	7 4						

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

SETUP

Setpoint Control – The multi-turn potentiometers (one for each setpoint) allow the operator to adjust the level at which each alarm is activated. These controls are adjustable from 0 to 100% of the input range.

Deadband Control – These potentiometers allow the alarm trip and reset windows to be adjusted symmetrically about the setpoint from 1 to 100% of the span for each setpoint. This allows the operator to fine tune the point at which each alarm trips and resets. It is typically used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

Test Switch – 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.

OPERATION

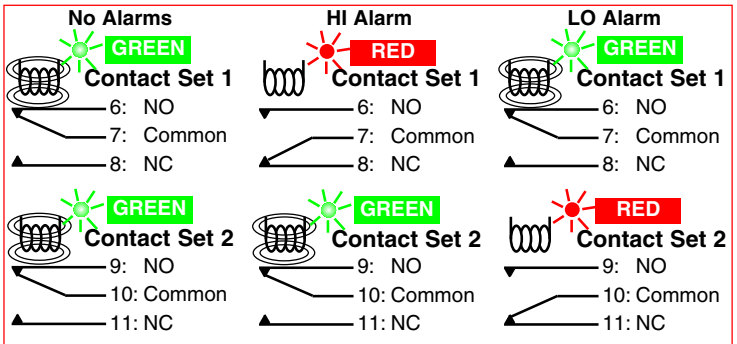
GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity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

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.

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.

When the latching mode is selected, it will be necessary to push the functional test pushbutton or remove power from the module to reset the alarm. The alarm will only reset if the alarm condition no longer exists.



API 1025 G Alarm States with Normal Action HI/LO Alarms

CALIBRATION

The input ranges are factory calibrated and no field calibration is required.

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.

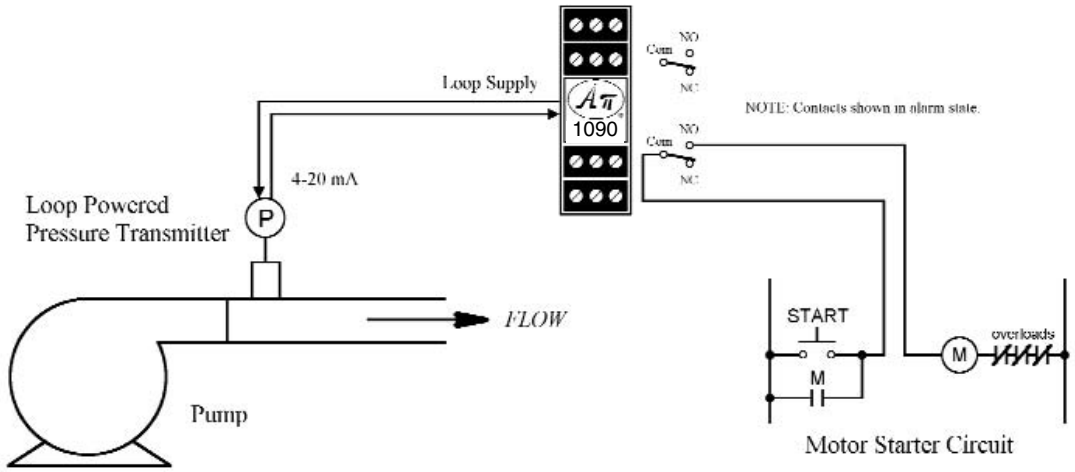
If a larger amount of deadband is desired, the deadband control may be increased by turning the control clockwise. The deadband is symmetrical about the setpoint; both transition points will change as deadband is increased. The test button can be used at any time to toggle the relay state independent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

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Pumping System High Pressure Shutdown

PROBLEM
High head pressure is causing pump failures. If the pressure exceeds a preset limit, the pump must be shut down. A manual reset is necessary to restart pump.

SOLUTION
A loop powered pressure transducer is installed at the discharge side of the pump. The pressure transducer is connected to an **API 1090 DIN** DC Input, Field Selectable Single Setpoint Alarm module.



The **API 1090 DIN** provides the loop power for the 4-20 mA pressure transducer from its built-in loop excitation supply. The setpoint is adjusted to the high pressure limit. The relay contacts are wired in series with the motor starter such that if the pressure is not below the setpoint, the pump will be stopped. It is necessary to press the START push button to restart the pump. The standard heavy-duty relay contacts are rated 7A @ 240 VAC and can directly control most devices.

Relay Protection and EMI Supression

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.

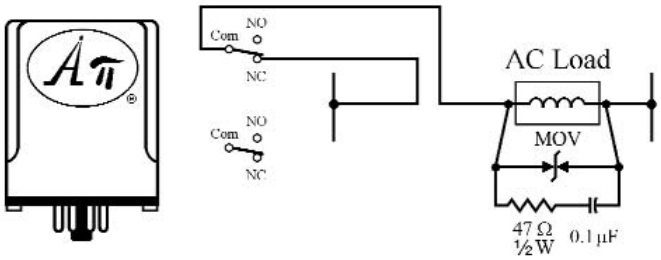


Figure 1: AC inductive loads.

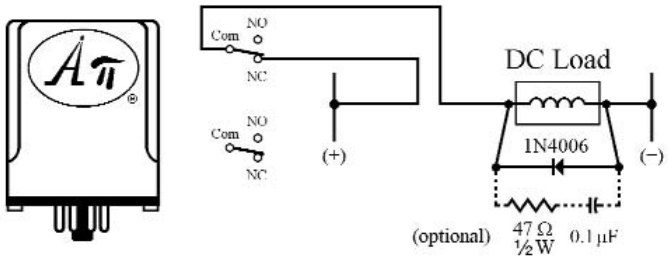


Figure 2: DC inductive loads.

FREE APPLICATION ASSISTANCE
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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.

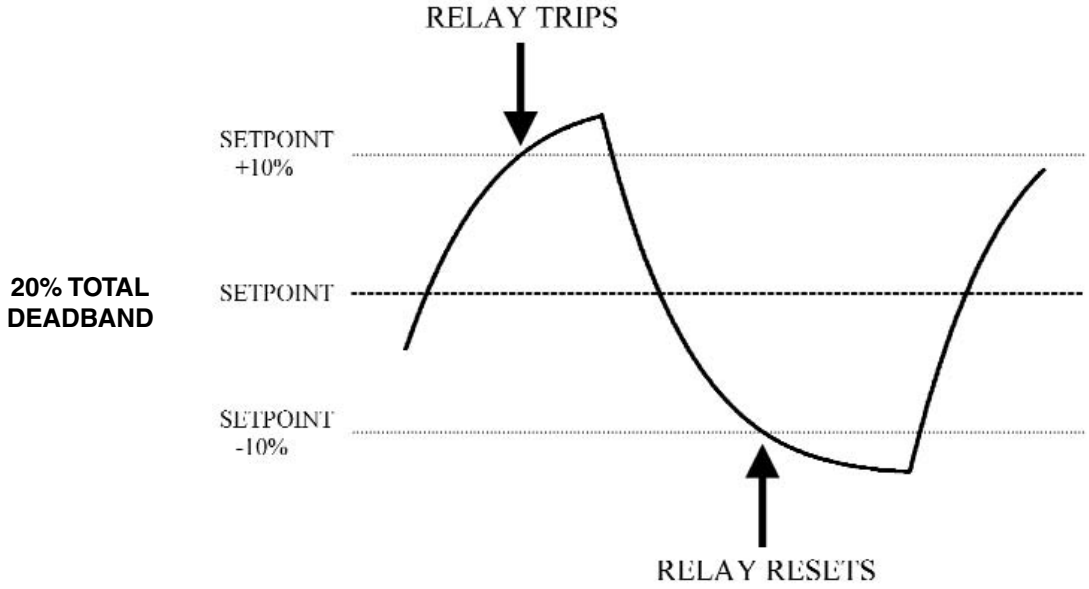
3. **Which direction do we turn the deadband potentiometer screw to give the minimum and the maximum deadband?**
   For the minimum amount (1%), turn the potentiometer screw CCW, counter-clockwise. For the maximum amount (100%), turn the potentiometer screw CW, clockwise.

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.

5. **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.

6. **We have a 4-20 mA input and require 4 set points at the output. Do you have a product for this?**
   Yes, you can connect 2 of our **API 1020 G** units in series in the 4-20 mA input loop since the input impedance for current is 50 ohms and the drop is very low.

7. **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 following graph.



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DC to DC Transmitter

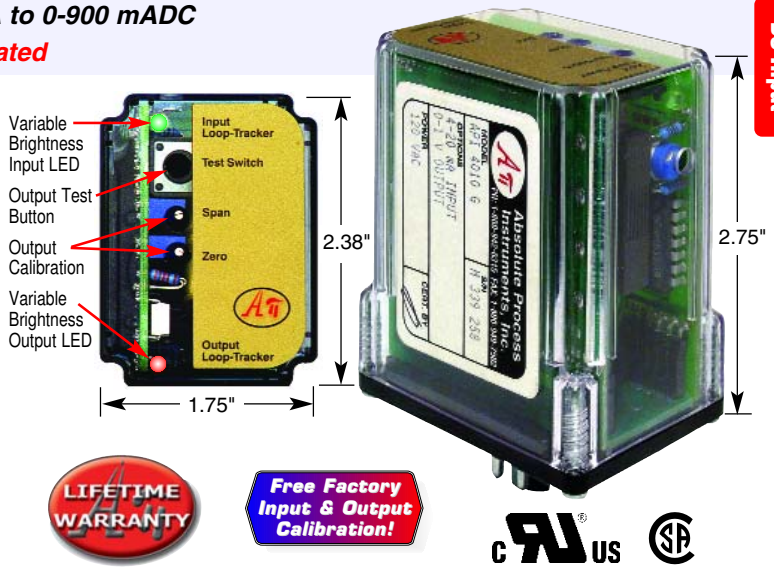
API 4010 G

DC Input

Input: ***0-100 mV to 0-500 VDC, bipolar voltages, 0-1 mA to 0-900 mADC***

Output: ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA Non-Isolated***

- ***Factory Set Input and Output Ranges***
- ***Custom Inputs and Outputs Available***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Built-In Loop Power Supply***



LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Applications

- **Convert, Boost, Rescale Process Signals**
- **Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Range

Factory Configured—Please specify input range.
See table on other side for common ranges or consult factory for special ranges.

	Minimum	Maximum
Voltage:	0-100 mVDC	0-500 VDC with API 008 socket only
Bipolar Voltage:	±100 mVDC	±10 VDC
Current:	0-1 mADC	0-900 mADC

System voltages must not exceed socket voltage rating

Input Impedance (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
Maximum 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

	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

Consult factory for special ranges

Output Linearity

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

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 4010 G** accepts a DC voltage or current input and provides a non-isolated DC voltage or current output that is linearly related to the input.

Typical applications include signal scaling, signal conversion, signal boosting or a combination of the three. The module power supply is transformer isolated from the input and output.

The **API 4010 G** is factory configured to customer requirements. Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges.

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.

Also standard on the **API 4010 G** is an 18 VDC unregulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 4010 G** plugs 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 input/output ranges and options

API 4010 G	DC to DC transmitter, non-isolated, 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
M09	High voltage output to 25 VDC
HC	High current output, >20 mA to 100 mADC
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

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905-457-6322 or 800-794-5883
www.mod-tronic.com

RANGES

Listed below are commonly ordered input and output ranges. Consult factory for other available ranges or for special ranges.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 4010 G EXTSUP with open collector output.

Common Voltage Inputs	
0 to 100 mV	0 to 50 V
0 to 200 mV	0 to 100 V
0 to 500 mV	±100 mV
0 to 1 V	±200 mV
0 to 2 V	±500 mV
0 to 5 V	±1 V
1 to 5 V	±2 V
0 to 10 V	±5 V
0 to 20 V	±10 V
Common Current Inputs	
0 to 1 mA	0 to 100 mA
0 to 10 mA	0 to 200 mA
0 to 20 mA	0 to 500 mA
4 to 20 mA	
10 to 50 mA	

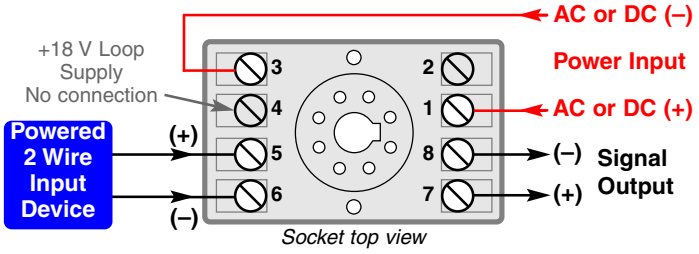
Common Voltage Outputs
0 to 1 V
0 to 5 V
1 to 5 V
0 to 10 V
±5 V
±10 V
Common Current Outputs
0 to 20 mA
4 to 20 mA

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.

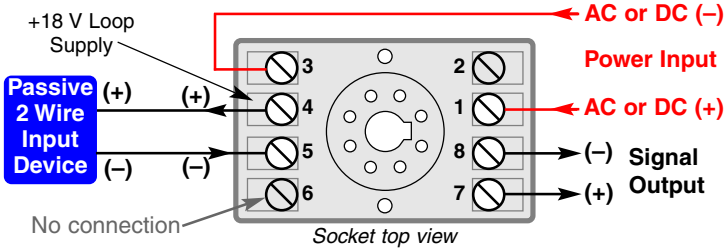
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.



Connecting an input device which provides power to the input circuit

Passive Signal Input – Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.



Using the built-in 18 VDC loop supply to power a passive input device

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. Output is powered unless option EXTSUP was ordered for a sinking output requirement.

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

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for 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 SWITCH

The Test Switch pushbutton may be used to 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. This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

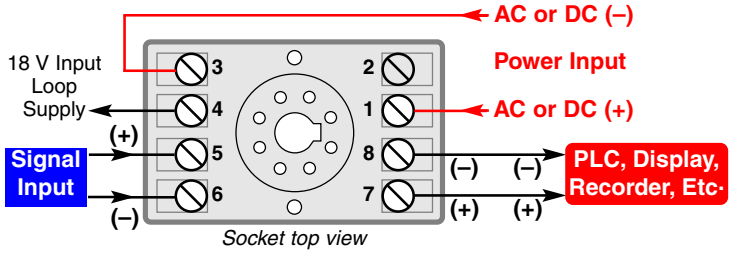
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

OPERATION

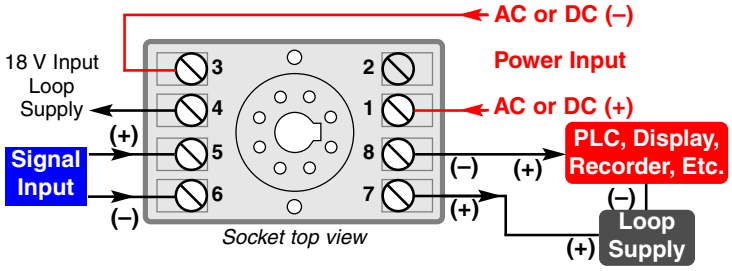
The API 4010 G is factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

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.

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 4010 G typical output wiring



API 4010 G EXTSUP typical output wiring

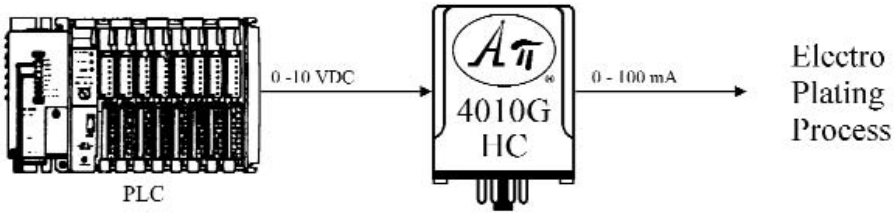
Converting a Control Signal for a Process

PROBLEM

A programmable logic controller (PLC) is to be used to control an electroplating system which requires a 0-100 mA signal. The analog output of the PLC is 0-10 VDC and is not modifiable.

SOLUTION

An **API 4010 G HC** Non-isolated DC to DC Transmitter module is connected to the 0-10 VDC analog output of the PLC.



The **API 4010 G HC** converts the PLC output to the 0-100 mA required by the electroplating system.

What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. The receiving device can't differentiate between wanted and unwanted signals, and this leads to erroneous signals.

The probability of multiple grounds and ground loops being established is especially high when new equipment such as PLCs or DCSs are installed. With many devices referenced to ground, the likelihood of establishing more than one ground point is great. If an instrumentation system seems to be acting erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, the isolator must provide three-way isolation (input, output, and power). If this is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

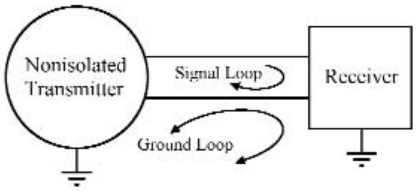


Figure 1. *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

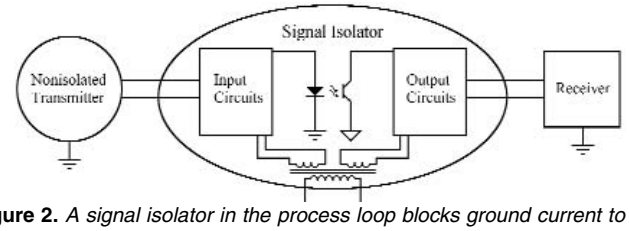
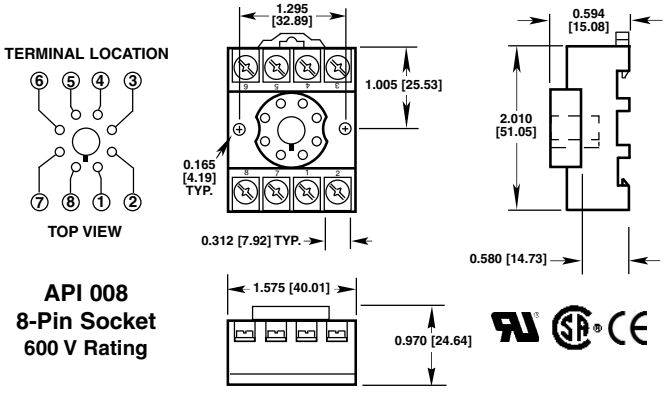
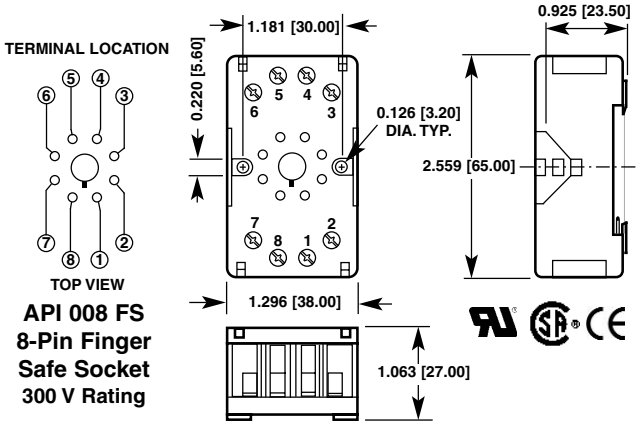


Figure 2. *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

API Sockets API 008 and API 008 FS



API 008
8-Pin Socket
600 V Rating



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



FREE APPLICATION ASSISTANCE
Call Customer Service
800-794-5883

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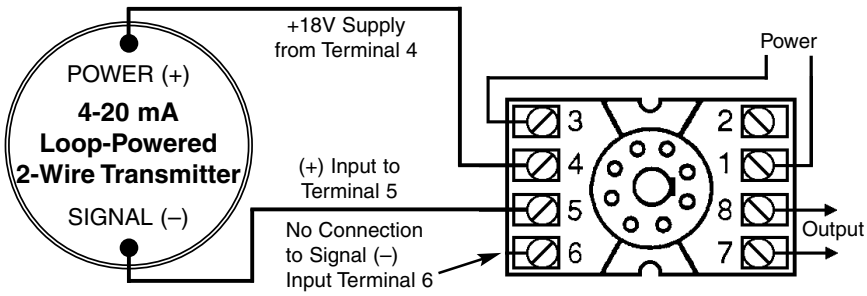
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Using the Built-In 4-20 mA Loop Power Supply

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.

8-Pin Modules
API 4010 G
API 4050 G
API 4300 G
API 4310 G
API 4380 G
API 4380 GHV
API 4385 G
API 4440 G



Frequently Asked Questions

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 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.

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 which allows a total of 1000 ohm load. Also, to prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

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

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

For the DC output models, what are the output impedances in the voltage and current mode?

The DC outputs are FET driven and are active outputs that change depending on the mode and range.

CURRENT Mode	VOLTAGE Mode	
DC output with 12 V Compliance	less than 600 ohms	greater than 1000 ohms
DC output with 20 V Compliance	less than 1000 ohms	greater than 1000 ohms

For your DC Input modules in the current mode, the input impedance rating is 50 ohms. For troubleshooting purposes, is that value the same with and without power applied to the module?

Yes.

TransZorb–Reg TM General Semiconductor



FREE APPLICATION ASSISTANCE
Call Customer Service
800-794-5883

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

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DC to DC Transmitter
Narrow Input Span

API 4050 G

DC Input

Input: ***0-10 mV to 0-100 mV, 0-100 µA to 1 mA***

Output: ***0-1 V to ±10 V or 0-1 mA to 4-20 mA Non-Isolated***

- ***Factory Set Input and Output Ranges***
- ***Low Level Current and Voltage Inputs***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Built-In Loop Power Supply***

Applications

- **Convert, Boost, Rescale Process Signals**
- **Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Range

Factory Configured—Please specify input range

	Minimum	Maximum
Voltage:	0-10 mVDC	0-100 mVDC
Bipolar Voltage:	±10 mVDC	±100 mVDC
Current:	0-100 µADC	0-1 mADC

Consult factory for special ranges

Input Impedance (Voltage)

200 kΩ minimum

Input Voltage Burden (Current)

1.25 VDC maximum

Input Protection, Common Mode

750 VDC or 750 VAC_p

System voltages must not exceed socket voltage rating

Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC

Maximum 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

	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

Consult factory for special ranges

Output Linearity

Better than ±0.1% of span

Response Time

70 milliseconds typical

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

Ambient Temperature Range

–10°C to +60°C operating ambient

Temperature Stability

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



LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Description and Features

The **API 4050 G** accepts a DC voltage or current input and provides a non-isolated DC voltage or current output that is linearly related to the input. The **API 4050 G** utilizes an ultra-stable input amplifier for reliable operation with input signals as low as 10 mVDC.

The **API 4050 G** is factory configured to customer requirements. Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges. Typical applications include signal scaling, signal conversion, signal boosting or a combination of the three. The module power supply is transformer isolated from the input and 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 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.

Also standard on the **API 4050 G** is an 18 VDC unregulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 4050 G** plugs 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 input/output ranges and options

API 4050 G	DC to DC transmitter, non-isolated, narrow input span, 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
DF	Fast response, 1 millisecond nominal response time
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

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DC Input

RANGE SELECTION

The API 4050 G is factory configured to your exact input and output requirements. Listed below are commonly ordered input and output ranges. Consult factory for other available ranges or for special ranges.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 4050 G EXTSUP with open collector output.

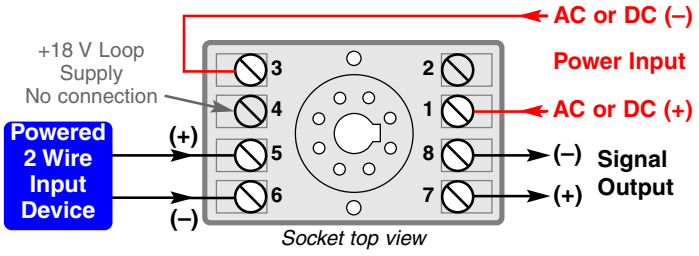
Common Voltage Inputs	
0 to 10 mV	±10 mV
0 to 20 mV	±20 mV
0 to 25 mV	±25 mV
0 to 50 mV	±50 mV
0 to 100 mV	±100 mV
Common Current Inputs	
0 to 100 µA	0 to 1 mA
0 to 200 µA	
0 to 250 µA	
0 to 500 µA	

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

ELECTRICAL CONNECTIONS

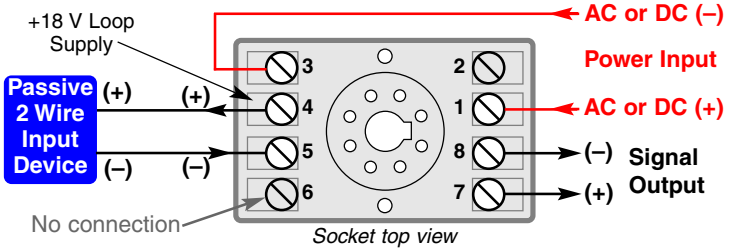
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

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.



Connecting an input device which provides power to the input circuit

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.



Using the built-in 18 VDC loop supply to power a passive input device

Passive Signal Input – Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

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. Output is powered unless option EXTSUP was ordered for a sinking output requirement. See wiring examples at right.

CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for 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 may be used to 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. This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

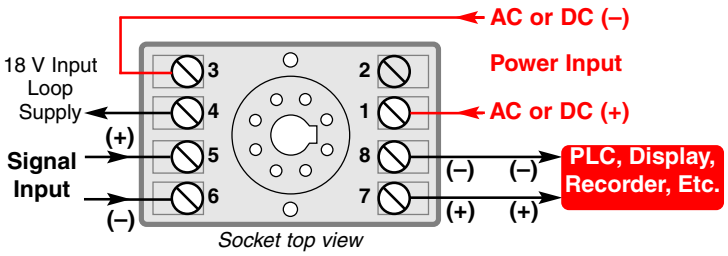
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

OPERATION

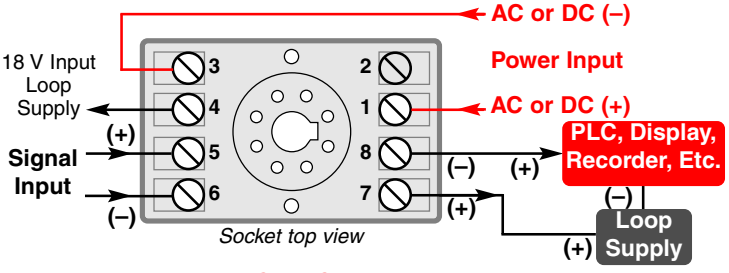
The API 4050 G is factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

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 4050 G typical output wiring



API 4050 G EXTSUP typical output wiring

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

DC to DC Isolator and Transmitter

API 4300 G

DC Input

Input: ***0-100 mV to 0-500 VDC, Bipolar Voltages, 0-1 mA to 0-900 mADC***

Output: ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA Fully-Isolated***

- ***Full 2000 V Input/Output/Power Isolation***
- ***Factory Set Custom Input and Output Ranges***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Built-In Loop Power Supply***

Applications

- **Convert, Boost, Rescale Process Signals**
- **Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges

Factory Configured—Please specify output range or consult factory
See table on other side for common ranges

	Minimum	Maximum
Voltage:	0-100 mVDC	0-500 VDC with API 008 socket only
Bipolar Voltage:	±100 mVDC	±10 VDC
Current:	0-1 mADC	0-900 mADC

System voltages must not exceed socket voltage rating

Input Impedance (Voltage)

200 kΩ minimum

Input Voltage Burden (Current)

1.25 VDC maximum

Output Zero and Span

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

Input Loop Power Supply

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

LoopTracker

Variable brightness LEDs indicate input/output loop level and status

Output Ranges

Factory Configured—Please specify output range or consult factory

	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

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. Factory set to approx. 50% of span.

Response Time

70 milliseconds typical

Common Mode Rejection

120 dB minimum

Isolation

2000 V_{RMS} minimum
Full isolation: power to input, power to output, input to output

Ambient Temperature Range and Stability

–10°C to +60°C operating ambient
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

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LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Description and Features

The **API 4300 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, conversion, boosting or a combination of the three. Full 3-way isolation (input, output, power) makes this module useful for ground loop elimination, common mode signal rejection or noise pick-up reduction.

The **API 4300 G** is factory configured to customer requirements. Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges.

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.

Also standard on the **API 4300 G** is an 18 VDC unregulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.

The **API 4300 G** plugs 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 input/output ranges and options

API 4300 G	DC to DC isolated transmitter, w. 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
5A	Up to 5 amp DC input with socket and 25 W shunt
DF	Fast response, 1 millisecond nominal response time
HC	High current output, >20 mA to 50 mADC
BP	±1 mA bipolar output current
M01	Input/output reversal, such as 4-20 mA in to 20-4 mA out
M09	High voltage output to 24 VDC
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

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RANGES

Listed below are commonly ordered input and output ranges. Consult factory for other available ranges. Contact factory for special ranges.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 4300 G EXTSUP with open collector output.

Common Voltage Inputs	
0 to 100 mV	0 to 50 V
0 to 200 mV	0 to 100 V
0 to 500 mV	±100 mV
0 to 1 V	±200 mV
0 to 2 V	±500 mV
0 to 5 V	±1 V
1 to 5 V	±2 V
0 to 10 V	±5 V
0 to 20 V	±10 V
Common Current Inputs	
0 to 1 mA	0 to 100 mA
0 to 10 mA	0 to 200 mA
0 to 20 mA	0 to 500 mA
4 to 20 mA	
10 to 50 mA	

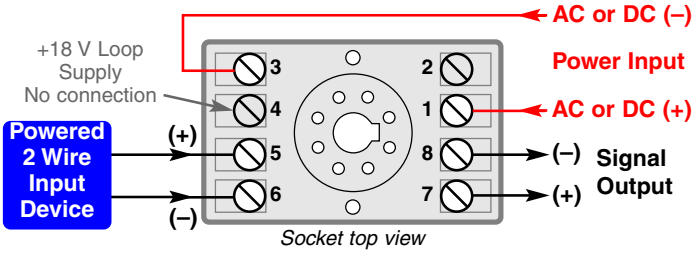
Common Voltage Outputs
0 to 1 V
0 to 5 V
1 to 5 V
0 to 10 V
±5 V
±10 V
Common Current Outputs
0 to 20 mA
4 to 20 mA

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.

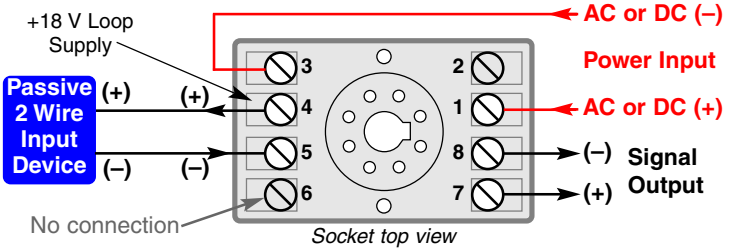
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.



Connecting an input device which provides power to the input circuit

Passive Signal Input – Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.



Using the built-in 18 VDC loop supply to power a passive input device

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. Output is powered unless option EXTSUP was ordered for a sinking output requirement.

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

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for 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 may be used to 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. This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

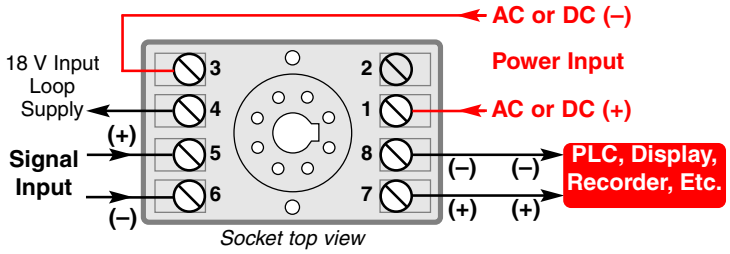
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

OPERATION

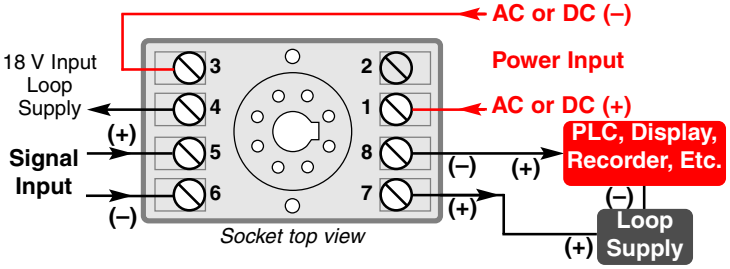
The API 4300 G is factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

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.

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 4300 G typical output wiring



API 4300 G EXTSUP typical output wiring

Frequently Asked Questions

Do you have a 4-20 mA DC transmitter that can operate a load of 1800 to 2000 ohms?

The **API 4300 G** with a 4-20 mA output can operate a maximum load of 1000 ohms maximum with its 20 Volt compliance. To control a load of 1800-2000 ohms, you can use the **API 4300 G EXTSUP**. A 42 Volt power supply is required for the 1800 ohm load, and a 48 Volt power supply is required for the 2000 ohm load. The power supply voltage can not be less than these requirements or there will not be enough power to reach 20 mA. Also, the power supply can not be more than these requirements or the **API 4300 G EXTSUP** will be damaged.

We need a 0-10 VDC input with a 0-10 VDC output and be able to adjust the output down to any lower value from the linearized output, for example, if the input is 8 V, then the output can be 8 V or less. Is this possible?

Yes. Use the **API 4300 G** set up for 0-10 VDC in and 0-10 VDC output with a 10K ohm potentiometer at the signal input. One side of the pot would wire to the (+) signal, the other side of the pot. would wire to the (–) signal and terminal 6, then wire the wiper from the pot to terminal 5 of the module.

Do you have a signal conditioner that will accept a 0-5 VDC input and provide an output of 0-500 mVDC?

Yes, the **API 4300 G** with these ranges specified at the time of ordering.

Can we use the API 4300 G for an input signal of 500 VDC with the negative side of the signal floating and not at true ground?

It depends. The socket is rated to 600 VDC maximum. So with true ground on the socket at the output side, no other point on that socket can be above 600 VDC. Even though the **API 4300 G** is isolated and the input will accept the 500 VDC differential between terminals 5 and 6, the socket rating is between two points anywhere on the surface.

We would like to use the API 4380 G DF for the 100 microsecond response time but need an input range of 0 to 25 mV. Can you do this?

Yes, however the unit will be fixed for that input and the specified output. It will not be field selectable. The new part number will be **API 4300 G M80**. The **API 4300 G** does not offer a response time as fast as the **API 4380** product.

What is the maximum current allowed for the 18 VDC unregulated loop power supply and what does the waveform look like?

The maximum current is 25 mA and the waveform is a filtered full wave rectified +18 V with a maximum ripple of 1.5 $V_{p\text{-}p}$.

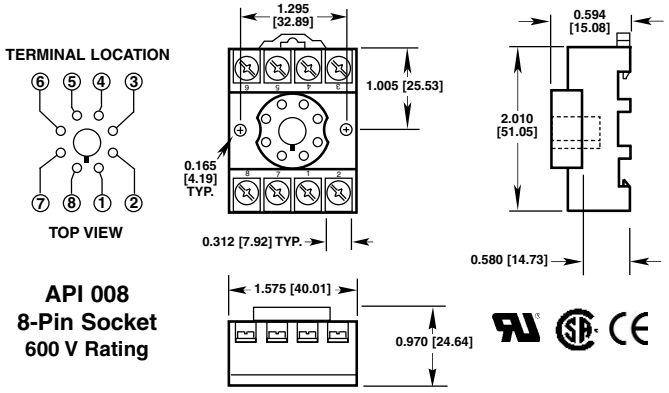
We are using a DCS system that requires a 4-20 mA isolated input that also provides 24 VDC to power the loop. Do you have an isolated signal conditioner that will sink the output loop?

Yes, the **API 4300 G EXTSUP**. This module controls the 4-20 mA output loop but derives the power from an external source. The connection from the output of the **API 4300 G EXTSUP** to the input of the DCS requires no additional components (resistors) other than the connecting wires.

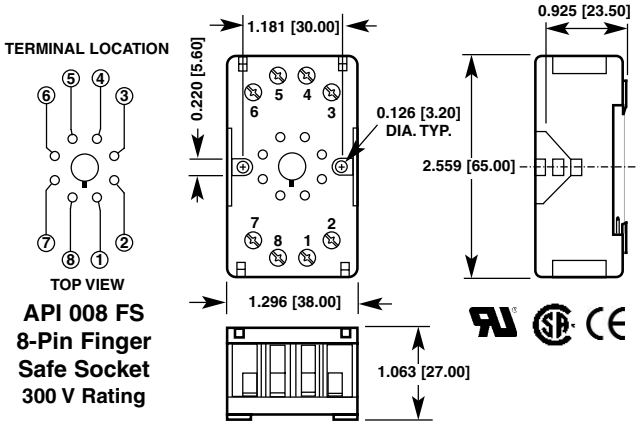
Do you have a DC-DC transmitter that will accept an input of ±5 VDC and provide an output of ±40 mA, ideally a ±20 mA minimum?

No, the maximum bipolar output we can provide is ±6 mA and possibly ±10 mA on the **API 4300 G BP**.

API Sockets API 008 and API 008 FS



API 008
8-Pin Socket
600 V Rating



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



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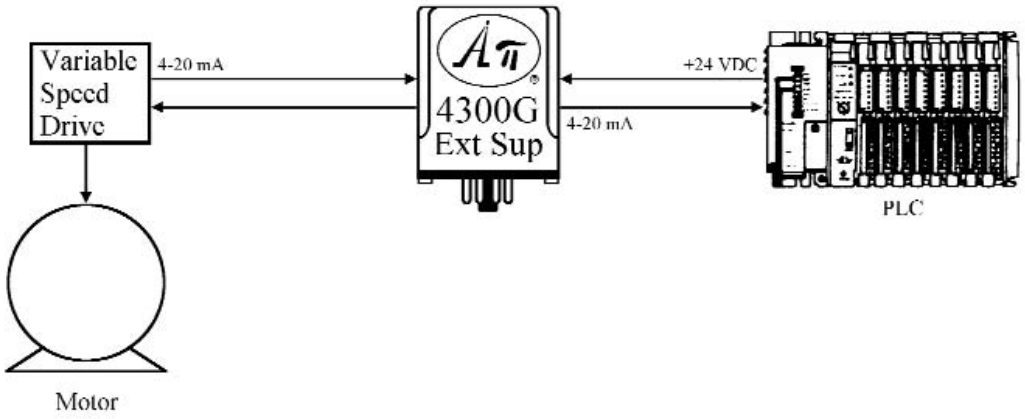
Monitoring Motor Speed with a PLC

PROBLEM

A variable speed drive has an internally powered 4-20 mA output proportional to the speed of the motor it is driving. The motor speed must be monitored by a programmable logic controller (PLC) for use in control of a process, but the 4-20 mA input of the PLC is also powered from the PLC's built-in power supply. The standard **API 4300 G** Isolated DC to DC Transmitter generates a 4-20 mA output at a 20 V compliance voltage. The output of the module would conflict with the power generated by the PLC input channel.

SOLUTION

An **API 4300 G EXTSUP** Isolated DC to DC Transmitter module with External Supply modification will allow the drive's powered output to be transmitted to the PLC's powered input.



The external supply modification uses the +24 VDC power supplied by the PLC and regulates the 4-20 mA output signal in proportion to the input signal it receives from the variable speed drive. The 2000 V isolation of the module protects against unexpected ground loops and electrical noise.

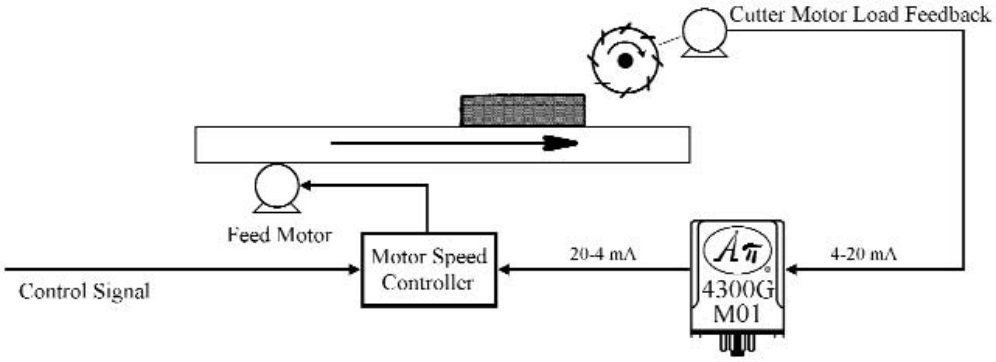
Motor Load Controller

PROBLEM

A DC motor driving a cutter may become overheated and damaged if stock is fed into the cutter too rapidly, but production requirements dictate maximum machine output.

SOLUTION

A 4-20 mADC signal proportional to the cutter motor load is available to provide feedback for the feed motor controller. An **API 4300 G M01** isolated DC to DC transmitter module reverses the feedback signal so that increasing load on the cutter will decrease the speed of the feed motor.



Conversely, decreasing load on the cutter increases the speed of the feed motor. The feed rate is controlled to maintain the optimum load on the cutter at all times. In addition, the 2000 VRMS isolation protects against unwanted ground loops and electrical noise commonly found in industrial environments.



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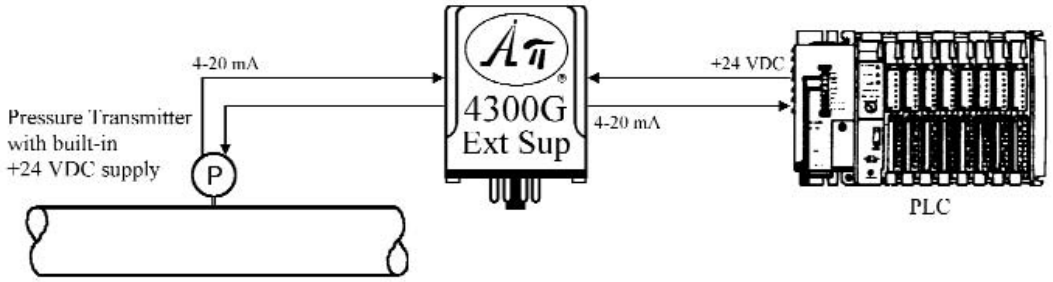
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Monitoring Pressure with a PLC

PROBLEM
A pressure transmitter with an internally powered 4-20 mA output must be monitored by a programmable logic controller (PLC) for use in control of a process, but the 4-20 mA input of the PLC is also powered from the PLC's built-in power supply. The standard **API 4300 G** Isolated DC to DC Transmitter generates a 4-20 mA output at a 20 V compliance voltage. The output of the module would conflict with the power generated by the PLC input channel.

SOLUTION
An **API 4300 G EXTSUP** Isolated DC to DC Transmitter module with External Supply modification will allow the pressure signal to be transmitted to the PLC's powered input.

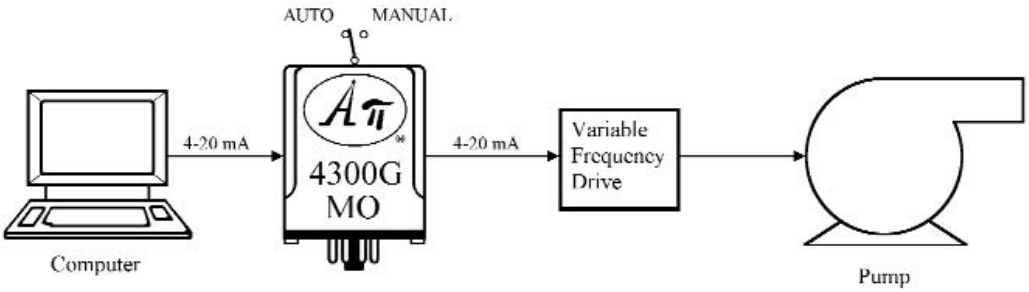


The external supply modification uses the +24 VDC power supplied by the PLC and regulates the 4-20 mA output signal in proportion to the input signal it receives from the pressure transmitter. The 2000 VRMS isolation of the module protects against unexpected ground loops and electrical noise.

Manual Override of Computer Control

PROBLEM
The speed of a pump is controlled by a computer. A means to operate the pump at a fixed speed is necessary when the computer fails or is shut down for maintenance.

SOLUTION
An **API 4300 G MO** Isolated DC to DC Transmitter module is installed between the computer and the pump's speed controller.



When the switch is in the AUTO position, the speed control signal from the computer is replicated by the output of the **API 4300 G MO** and sent to the variable frequency drive for the pump. When the switch is in the MANUAL position, the output of the **API 4300 G MO** holds a constant preset value regardless of the signal from the computer. This manual output is field adjustable via a potentiometer on top of the module.



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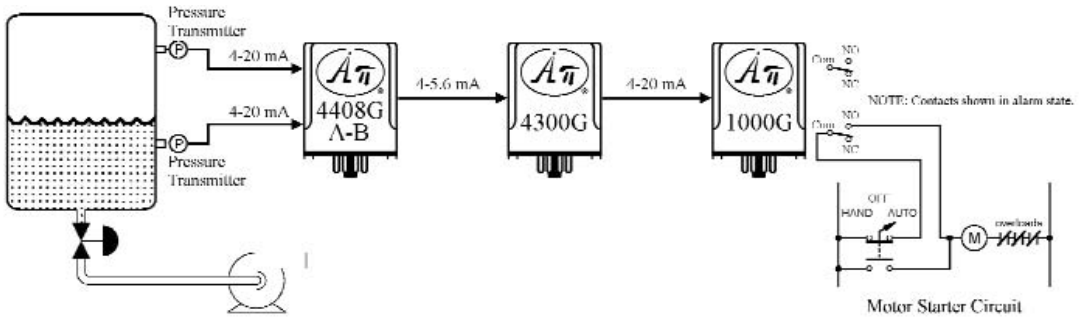
Phase Separator Water Level Control

PROBLEM

A phase separator is equipped with 2 pressure sensors, one located above the water level and one below. During operation the maximum pressure differential is 10%. It is necessary to maintain the water level so that there is a 1% pressure differential between the sensors.

SOLUTION

Use an **API 4408 G** A-B Math Function module to obtain the pressure differential between the transmitters. With a pressure differential of 0-10%, the output of the **API 4408 G** will be 4-5.6 mA. Expand the 4-5.6 mA signal to 4-20 mA with an **API 4300 G** Isolated DC to DC Transmitter module for better resolution and control.



Use the output of the **API 4300G** to drive an **API 1000 G** DC Input Single Alarm Trip module to provide a relay contact closure to operate a water removal pump. Adjust the setpoint of the **API 1000 G** to maintain the differential pressure at 1%. The second set of isolated relay output contacts can be wired to an annunciator panel or other monitoring system as desired. The standard heavy-duty relay contacts are rated 7A @ 240VAC (resistive) and can directly control most devices.

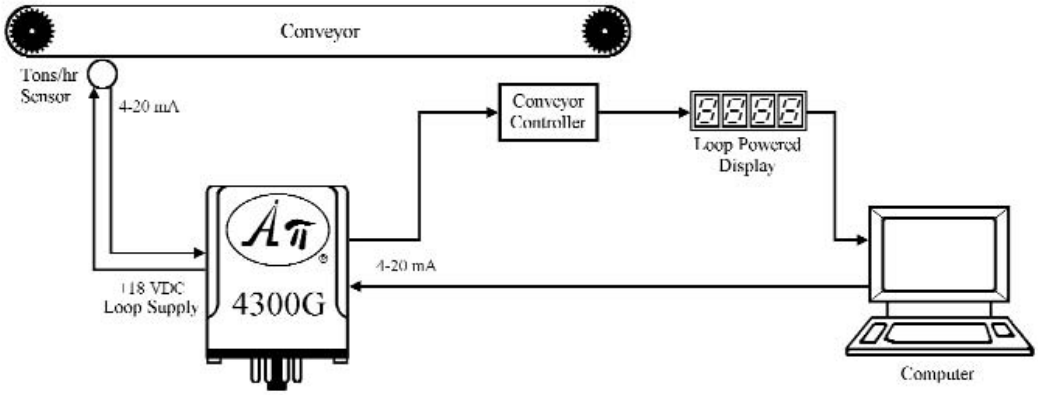
Monitoring Product Moved by a Conveyor

PROBLEM

The amount of product in tons per hour moved by a conveyor is required for the conveyor controller, for a local display, and for computer monitoring. The total loop impedance is 875 ohms.

SOLUTION

A sensor which produces an output proportional to the rate of movement of product is installed on the conveyor.



An **API 4300 G** Isolated DC to DC Transmitter module provides power for the sensor from its built-in +18 VDC loop excitation supply. The 4-20 mADC output of the sensor is replicated by the **API 4300 G** and its 4-20 mADC output loop drives the conveyor controller, a loop powered display and the computer input. The output of the **API 4300 G** is capable of driving up to 1000 ohms.



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DC to DC Isolator and Transmitter
Narrow Input Span

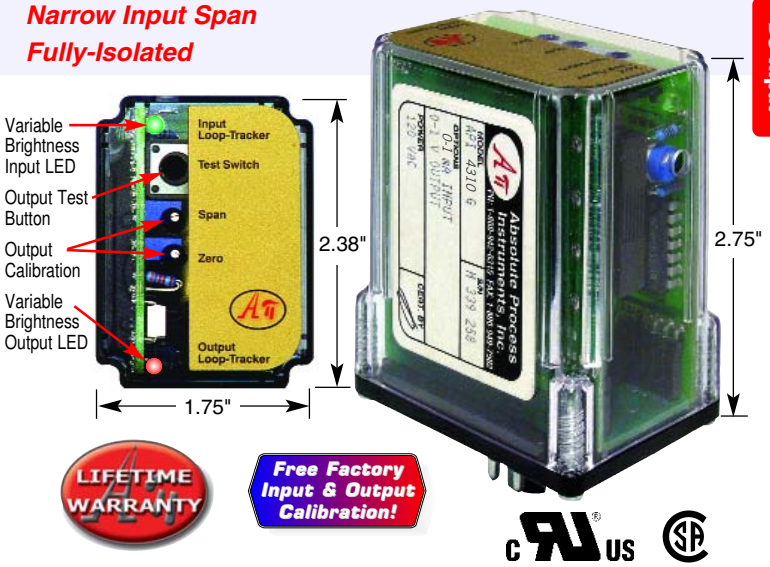
API 4310 G

DC Input

Input: ***0-10 mV to 0-100 mV, 0-100 µA to 1 mA***
Output: ***0-1 V to ±10 VDC or 0-1 mA to 4-20 mA***

- ***Full 2000 V Input/Output/Power Isolation***
- ***Factory Set Custom Input and Output Ranges***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***
- ***Built-In Loop Power Supply***

Narrow Input Span
Fully-Isolated



LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Range

Factory Configured—Please specify input range or consult factory

	Minimum	Maximum
Voltage:	0 to 10 mVDC	0 to 100 mVDC
Bipolar Voltage:	±10 mVDC	±100 mVDC
Current:	0 to 100 µADC	0 to 1 mADC

Input Impedance (Voltage)

200 kΩ minimum

Input Voltage Burden (Current)

1.25 VDC maximum

Input Loop Power Supply

18 VDC nom., 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 or consult factory

	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

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

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

Response Time

70 milliseconds typical

Isolation

2000 V_{RMS} minimum
Full isolation: power to input, power to output, input to output

Common Mode Rejection

120 dB minimum

Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
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 4310 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. The **API 4310 G** utilizes an ultra-stable input amplifier for reliable operation with input signals as low as 10 mVDC. Typical applications include signal isolation, conversion, boosting or a combination of the three. Full 3-way isolation (input, output, power) makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

The **API 4310 G** is factory configured to customer requirements. Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges.

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.

Also standard on the **API 4310 G** is an 18 VDC unregulated loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply. The **API 4310 G** plugs 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 input/output ranges and options

API 4310 G	DC to DC isolated transmitter, narrow input span, 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
BP	±1 mA output current
DF	Fast response, 1 millisecond nominal response time
HC	High current output, >20 mA to 50 mADC
M01	Input/output reversal, such as 4-20 mA in to 20-4 mA out
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

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DC Input

RANGE SELECTION

The API 4310 G is factory configured to your exact input and output requirements. Listed below are commonly ordered input and output ranges. Consult factory for other available ranges or for special ranges.

When a current output is ordered, it provides power to the output current loop (sourcing). If an unpowered (sinking) current output is required, order the API 4310 G EXTSUP with open collector output.

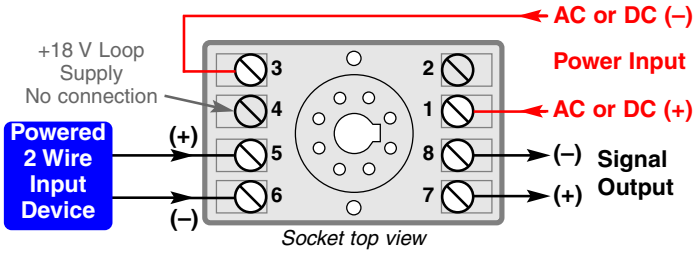
Common Voltage Inputs	
0 to 10 mV	±10 mV
0 to 20 mV	±20 mV
0 to 25 mV	±25 mV
0 to 50 mV	±50 mV
0 to 100 mV	±100 mV
Common Current Inputs	
0 to 100 µA	0 to 1 mA
0 to 200 µA	
0 to 250 µA	
0 to 500 µA	

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

ELECTRICAL CONNECTIONS

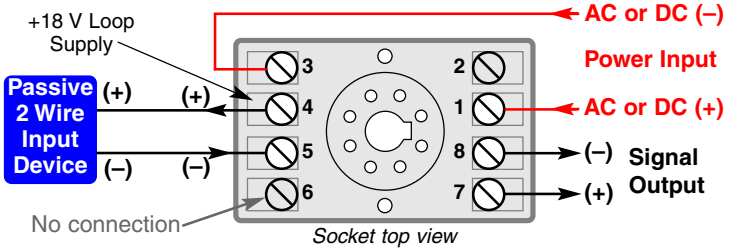
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

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.



Connecting an input device which provides power to the input circuit

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.



Using the built-in 18 VDC loop supply to power a passive input device

Passive Signal Input – Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

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. Output is powered unless option EXTSUP was ordered for a sinking output requirement. See wiring examples at right.

CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: for 4-20 mA output signal, the Zero control will provide adjustment for 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 may be used to 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. This test signal is factory set to approximately 50% of the calibrated output range. When the button is released, the output will return to normal.

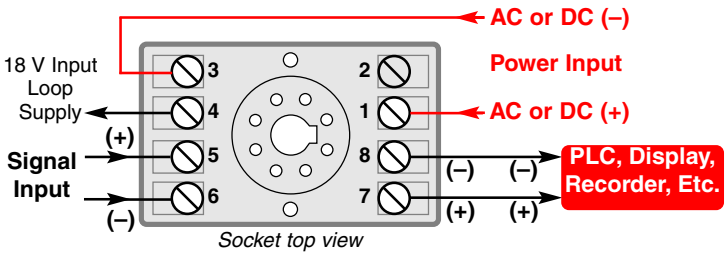
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

OPERATION

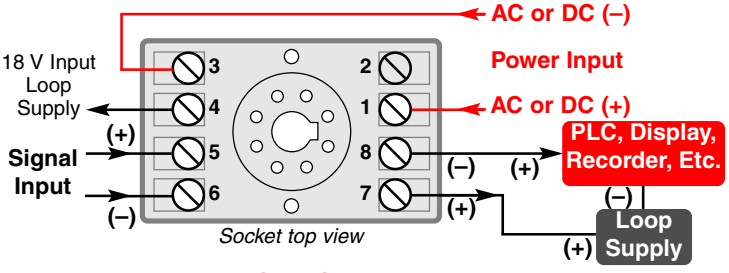
The API 4310 G is factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

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.

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 4310 G typical output wiring



API 4310 G EXTSUP typical output wiring

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

DC to DC Isolator Transmitter
Field Rangeable

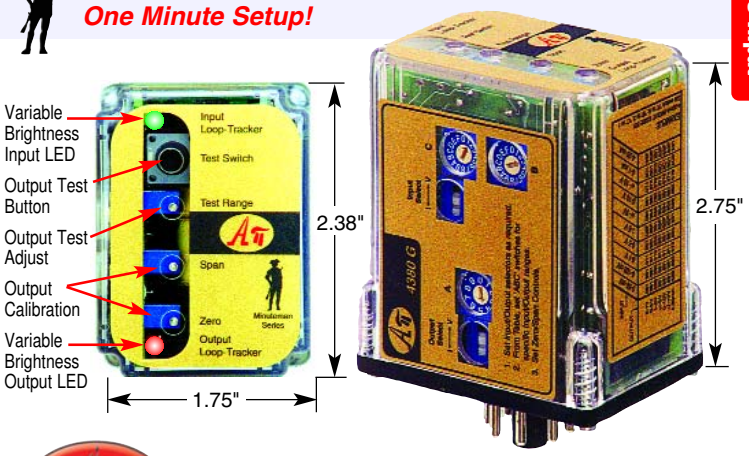
API 4380 G

DC Input

Input: ***0-50 mV to ±10 VDC, 0-1 mA to 0-20 mA***
Output: ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

- ***One Minute Setup for Hundreds of I/O Ranges***
- ***External Switches & Tables for Range Selection***
- ***2000 V Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

Wide Ranging I/O
One Minute Setup!



LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges

Consult factory for optional switch selectable ranges within input & output limits
System voltages must not exceed socket voltage rating.

	Minimum	Maximum
Voltage:	0 to 50 mV	0-10 V
Bipolar Voltage:	±50 mV	±10 V
Current:	0 to 1 mA	0 to 20 mA

Input Impedance

Voltage: 1 MΩ minimum
Current: 50 Ω typical
Input voltage burden (current) 1 VDC at 20 mA

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 and output loop levels and status

Output 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
±15% of span adjustment range typical

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 0-100% of span

Response Time

Standard: 100 milliseconds typical
High Speed: 1 milliseconds typical with **DF** option

Isolation

2000 V_{RMS} minimum
Full isolation: power to input, power to output, input to output

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 4380 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, signal conversion, signal boosting or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4380 G** can be field-configured via external rotary and slide switches. Most common ranges are built-in, and can be selected from the table on the module, however virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

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 built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

The **API 4380 G** plugs 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

API 4380 G	Field rangeable DC to DC transmitter, isolated, 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
DF	Fast response, 1 millisecond nominal response time
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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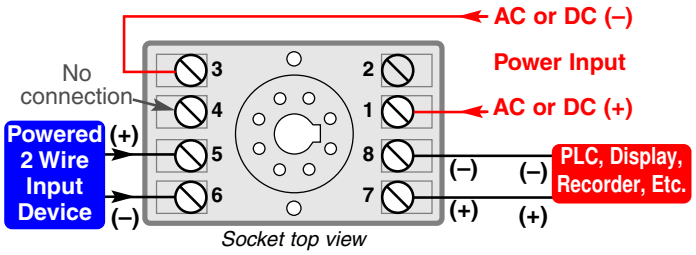
DC Input

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.

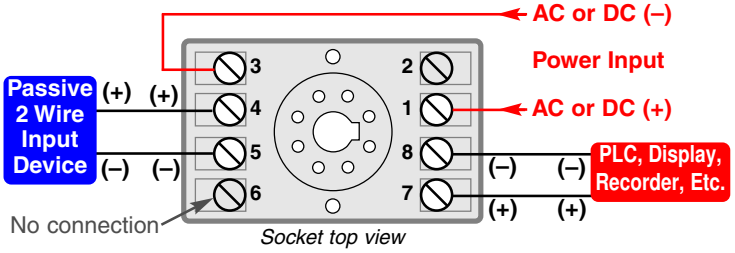
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

Powered Signal Input – Observe polarity when connecting the signal input. The positive signal (+) is wired to terminal 5 and negative (–) to terminal 6.



API 4380 G typical wiring with powered input and standard output

Passive Signal Input Using the 18 V Supply – Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

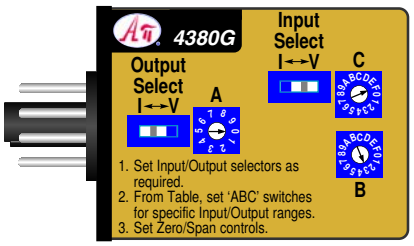


Using the built-in 18 VDC loop supply to power a passive input device

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. The API 4380 G provides power to the output loop.

RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.



1. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

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

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for 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 & 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.

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

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.

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.

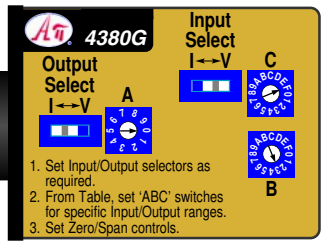
		OUTPUT RANGES								
	Rotary Switches →	0-1 V	0-2 V	0-5 V	1-5 V	0-10 V	±5 V	±10 V	4-20 mA	0-20 mA
		ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
INPUT RANGES	0-50 mV	081	181	381	283	681	881	981	583	681
	0-100 mV	091	191	391	293	691	891	991	593	691
	0-200 mV	0A1	1A1	3A1	2A3	6A1	8A1	9A1	5A3	6A1
	0-500 mV	001	101	301	203	601	801	901	503	601
	0-1 V	011	111	311	213	611	811	911	513	611
	0-2 V	021	121	321	223	621	821	921	523	621
	1-5 V	03F	13F	33F	231	63F	83F	93F	531	63F
	0-5 V	051	151	351	253	651	851	951	553	651
	0-10 V	061	161	361	263	661	861	961	563	661
	±5 V	064	164	364	266	664	864	964	566	664
	±10 V	074	174	374	276	674	874	974	576	674
	0-1 mA	0C1	1C1	3C1	2C3	6C1	8C1	9C1	5C3	6C1
	4-20 mA	03F	13F	33F	231	63F	83F	93F	531	63F
	0-20 mA	051	151	351	253	651	851	951	553	651

RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See ***www.api-usa.com*** or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (I) or voltage (V) depending on input type. The input selector switch determines the input impedance for the module, typically 50W for current and 1mW or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (I) or voltage (V) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.



INPUT RANGES	Rotary Switches →	OUTPUT RANGES 0-1 V	0-2 V	0-4 V	0-5 V	1-5 V	0-8 V	2-10 V	0-10 V	±5 V	±10 V	0-2 mA	0-10 mA	2-10 mA	0-16 mA	4-20 mA	0-20 mA
		ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
	0-50 mV	081	181	281	381	283	581	583	681	881	981	081	381	283	581	583	681
	0-100 mV	091	191	291	391	293	591	593	691	891	991	091	391	293	591	593	691
	0-200 mV	0A1	1A1	2A1	3A1	2A3	5A1	5A3	6A1	8A1	9A1	0A1	3A1	2A3	5A1	5A3	6A1
	0-250 mV	0C1	1C1	2C1	3C1	2C3	5C1	5C3	6C1	8C1	9C1	0C1	3C1	2C3	5C1	5C3	6C1
	0-400 mV	0B1	1B1	2B1	3B1	2B3	5B1	5B3	6B1	8B1	9B1	0B1	3B1	2B3	5B1	5B3	6B1
	0-500 mV	001	101	201	301	203	501	503	601	801	901	001	301	203	501	503	601
	0-1 V	011	111	211	311	213	511	513	611	811	911	011	311	213	511	513	611
	0-2 V	021	121	221	321	223	521	523	621	821	921	021	321	223	521	523	621
	0-2.5 V	041	141	241	341	243	541	543	641	841	941	041	341	243	541	543	641
	0-4 V	031	131	231	331	233	531	533	631	831	931	031	331	233	531	533	631
	1-5 V	03F	13F	23F	33F	231	53F	531	63F	83F	93F	03F	33F	231	53F	531	63F
	0-5 V	051	151	251	351	253	551	553	651	851	951	051	351	253	551	553	651
	0-10 V	061	161	261	361	263	561	563	661	861	961	061	361	236	561	563	661
	±5 V	064	164	264	364	266	564	566	664	864	964	064	364	266	564	566	664
	±10 V	074	174	274	374	276	574	576	674	874	974	074	374	276	574	576	674
	0-1 mA	0C1	1C1	2C1	3C1	2C3	5C1	5C3	6C1	8C1	9C1	0C1	3C1	2C3	5C1	5C3	6C1
	0-2 mA	001	101	201	301	203	501	503	601	801	901	001	301	203	501	503	601
	0-4 mA	011	111	211	311	213	511	513	611	811	911	011	311	213	511	513	611
	0-8 mA	021	121	221	321	223	521	523	621	821	921	021	321	223	521	523	621
	0-10 mA	041	141	241	341	243	541	543	641	841	941	041	341	243	541	543	641
	0-16 mA	031	131	231	331	233	531	533	631	831	931	031	331	233	531	533	631
	4-20 mA	03F	13F	23F	33F	231	53F	531	63F	83F	93F	03F	33F	231	53F	531	63F
	0-20 mA	051	151	251	351	253	551	553	651	851	951	051	351	253	551	553	651
	2-10 mA	02F	12F	22F	32F	221	52F	521	62F	82F	92F	02F	32F	221	52F	521	62F



FREE APPLICATION ASSISTANCE

Call API Customer Service

800-794-5883

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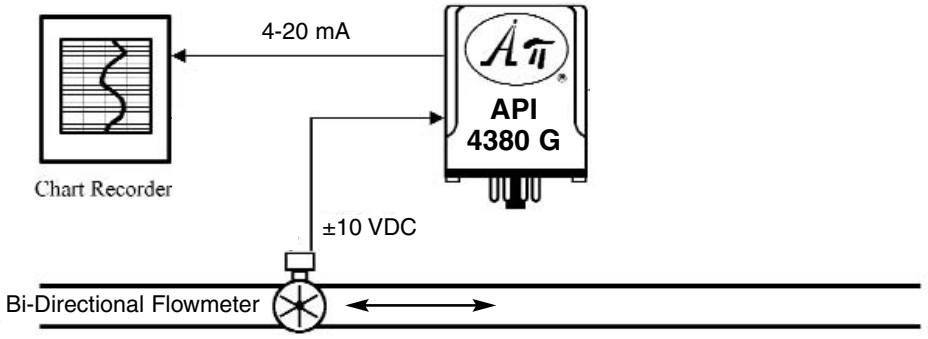
Monitoring a Dual-Paddle Flow Meter

PROBLEM

A bi-directional flowmeter has an output of +10V depending on the direction of flow. The readings need to be monitored by a chart recorder that accepts a 4-20 mA input.

SOLUTION

Use an **API 4380 G** isolated DC to DC transmitter to convert the ±10 V signal to 4-20 mA. The module switches are set so that –10 V = 4 mA, 0 V (no flow) = 12 mA and +10 V = 20 mA.



The **API 4380 G** is set up for a ±10 V signal and 4-20 mA output. The module switches are set to Input = “V”, ABC = 576 and Output = “I”

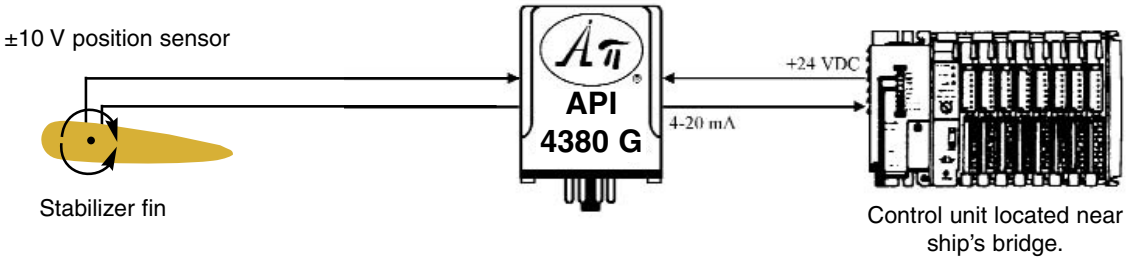
Ship Stabilizer

PROBLEM

A ship stabilizer control fin has a rotary position sensor which puts out ±10 V depending on the position of the fin. The position must be monitored by a remotely located main control unit for use in operation of the stabilization system. Due to noise immunity concerns and the distance required a 4-20 mA signal is used.

SOLUTION

The standard **API 4380 G** Isolated DC to DC Transmitter accepts the ±10 V input, converts it to an electrically isolated 4-20 mA signal which can be used by the control unit near the bridge.



The **API 4380 G** switches are set to Input select “V”, Output select “I” and A=5, B=7, and C=6 for ±10 V input and 4-20 mA output. The **API 4380 G** powers the output loop, thus eliminating the need for an additional power supply. The 2000 V_{RMS} 3-way isolation of the module protects against unexpected ground loops and electrical noise.

Frequently Asked Questions

What is the output impedance of the API 4380 G for the 4-20 mA mode?

The output drive circuit uses a MOSFET which is an active device with an impedance of at least 100 K ohms or greater in the current mode.

What is the maximum current allowed for the 18 VDC unregulated loop power supply and what does the waveform look like?

The maximum current is 25 mA and the waveform is a filtered full wave rectified +18 V with a maximum ripple of 1.5 $V_{p\text{-}p}$.

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 damage.

Do you recommend placing a fuse at the power input for protection?

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

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 which allows a total of 1000 ohm load. Also, to prevent problems from noise, it is recommended that you use shielded, twisted pair wires.

For your DC Input modules in the current mode, the input impedance rating is 50 ohms. For troubleshooting purposes, is that value the same with and without power applied to the module?

Yes.

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

High Voltage Input DC to DC Isolator Transmitter

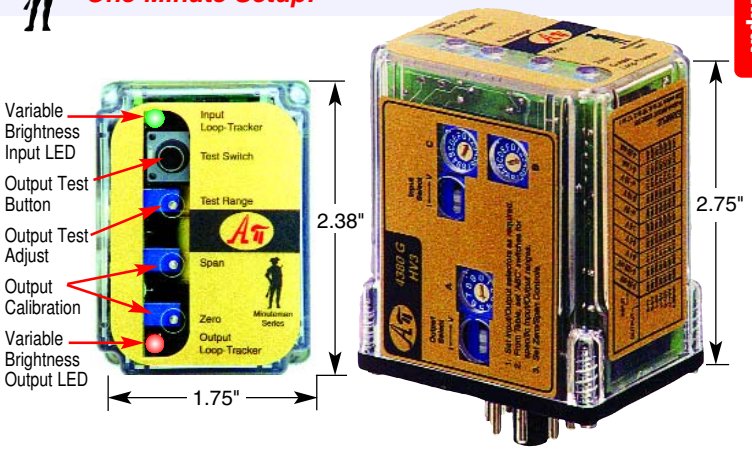
API 4380 G HV3

DC Input

Input: ***Up to ±200 VDC***
Output: ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

- ***One Minute Setup for Hundreds of I/O Ranges***
- ***External Switches & Tables for Range Selection***
- ***2000 V Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

Wide Ranging I/O
One Minute Setup!



LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges
Consult factory for optional switch selectable ranges within I/O limits
System voltages must not exceed socket voltage rating

Minimum Voltage:	0 to 1 VDC
Maximum Voltage:	0 to 200 VDC
Maximum Bipolar Voltage:	±200 VDC

Input Impedance
Voltage: 1 MΩ minimum

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

Output 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
±15% of span adjustment range typical

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

Output Linearity
Better than ±0.1% of span

Output Ripple and Noise
Less than 10 mV_{RMS}

Response Time
Standard: 100 milliseconds typical
High speed: 30 milliseconds typical with **DF** option

Isolation
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 ±0.02% 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 4380 G HV3** accepts a DC voltage input and provides an optically isolated DC voltage or current output that is linearly related to the input. This module is unique because it is field rangeable for voltage inputs to ±200 VDC. Typical applications include signal isolation and signal conversion.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4380 G HV3** can be field-configured via external rotary and slide switches. Most common ranges are built-in, and can be selected from the table on the module, however virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

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 **API 4380 G HV3** plugs 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

API 4380 G HV3	Field rangeable high voltage input DC to DC isolated transmitter, 115 VAC

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
DF	Fast response, 1 millisecond nominal response time
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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MOD-TRONIC INSTRUMENTS LIMITED
1 Delta Park Blvd #12
Brampton, ON L6T 5G1
905-457-6322 or 800-794-5883
www.mod-tronic.com

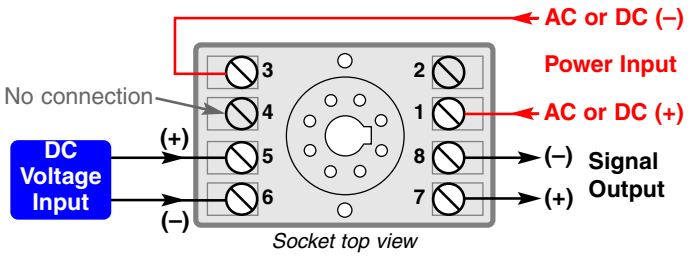
API 4380 G HV3

Installation and Setup

ELECTRICAL CONNECTIONS

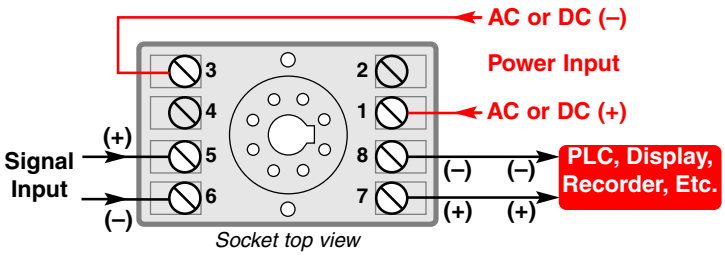
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket separately.

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.



Connecting an input device which provides power to the input circuit

Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.

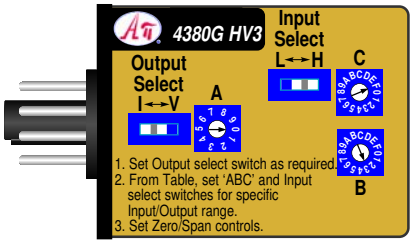


API 4380 G HV3 typical output wiring

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.

RANGE SELECTION

Two slide switches and three rotary switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module label and the table at right. See www.api-usa.com or contact factory for special ranges.



1. Locate the switch combination for your desired input and output ranges from the table.
2. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
3. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
4. Set the **INPUT SELECT** slide switch to **L** or **H** depending on table value.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for 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 & 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.

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

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.

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.

		OUTPUT RANGES								
	Rotary & Input Switches	0-1 V	0-2 V	0-5 V	1-5 V	0-10 V	±5 V	±10 V	4-20 mA	0-20 mA
		ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In
INPUT RANGES	0-20 V	011 H	111 H	311 H	213 H	611 H	811 H	911 H	513 H	611 H
	0-30 V	021 L	121 L	321 L	223 L	621 L	821 L	921 L	523 L	621 L
	0-40 V	021 H	121 H	321 H	223 H	621 H	821 H	921 H	523 H	621 H
	0-50 V	041 H	141 H	341 H	243 H	641 H	841 H	941 H	543 H	641 H
	0-60 V	031 L	131 L	331 L	233 L	631 L	831 L	931 L	533 L	631 L
	0-80 V	031 H	131 H	331 H	233 H	631 H	831 H	931 H	533 H	631 H
	20-100 V	03F H	13F H	33F H	231 H	63F H	83F H	93F H	531 H	63F H
	0-100 V	051 H	151 H	351 H	253 H	651 H	851 H	951 H	553 H	651 H
	0-150 V	061 L	161 L	361 L	263 L	661 L	861 L	961 L	563 L	661 L
	0-200 V	061 H	161 H	361 H	263 H	661 H	861 H	961 H	563 H	661 H
	±75 V	064 L	164 L	364 L	266 L	664 L	864 L	964 L	366 L	664 L
	±100 V	064 H	164 H	364 H	266 H	664 H	864 H	964 H	366 H	664 H
	±150 V	074 L	174 L	374 L	276 L	674 L	874 L	974 L	376 L	674 L
	±200 V	074 H	174 H	374 H	276 H	674 H	874 H	974 H	376 H	674 H

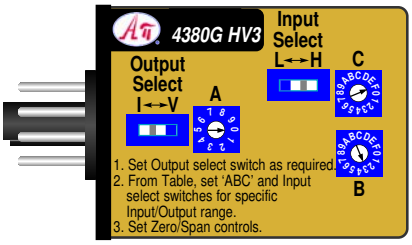
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4. Set the **INPUT SELECT** slide switch to **L** or **H** depending on table value.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.



API 4380 G HV3 OUTPUT RANGES

INPUT RANGES	Rotary Switches & Input Selector Slide Switch →	0-1 V	0-2 V	0-4 V	0-5 V	1-5 V	0-8 V	2-10 V	0-10 V	±5 V	±10 V	0-2 mA	0-10 mA	2-10 mA	0-16 mA	4-20 mA	0-20 mA
		ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In	ABC In
	0-1 V	081 H	181 H	281 H	381 H	283 H	581 H	583 H	681 H	881 H	981 H	081 H	381 H	283 H	581 H	583 H	681 H
	0-2 V	091 H	191 H	291 H	391 H	293 H	591 H	593 H	691 H	891 H	991 H	091 H	391 H	293 H	591 H	593 H	691 H
	0-3 V	0A1 L	1A1 L	2A1 L	3A1 L	2A3 L	5A1 L	5A3 L	6A1 L	8A1 L	9A1 L	0A1 L	3A1 L	2A3 L	5A1 L	5A3 L	6A1 L
	0-4 V	0A1 H	1A1 H	2A1 H	3A1 H	2A3 H	5A1 H	5A3 H	6A1 H	8A1 H	9A1 H	0A1 H	3A1 H	2A3 H	5A1 H	5A3 H	6A1 H
	0-5 V	0C1 H	1C1 H	2C1 H	3C1 H	2C3 H	5C1 H	5C3 H	6C1 H	8C1 H	9C1 H	0C1 H	3C1 H	2C3 H	5C1 H	5C3 H	6C1 H
	0-8 V	0B1 H	1B1 H	2B1 H	3B1 H	2B3 H	5B1 H	5B3 H	6B1 H	8B1 H	9B1 H	0B1 H	3B1 H	2B3 H	5B1 H	5B3 H	6B1 H
	0-10 V	001 H	101 H	201 H	301 H	203 H	501 H	503 H	601 H	801 H	901 H	001 H	301 H	203 H	501 H	503 H	601 H
	0-15 V	011 L	111 L	211 L	311 L	213 L	511 L	513 L	611 L	811 L	911 L	011 L	311 L	213 L	511 L	513 L	611 L
	0-20 V	011 H	111 H	211 H	311 H	213 H	511 H	513 H	611 H	811 H	911 H	011 H	311 H	213 H	511 H	513 H	611 H
	0-30 V	021 L	121 L	221 L	321 L	223 L	521 L	523 L	621 L	821 L	921 L	021 L	321 L	223 L	521 L	523 L	621 L
	0-40 V	021 H	121 H	221 H	321 H	223 H	521 H	523 H	621 H	821 H	921 H	021 H	321 H	223 H	521 H	523 H	621 H
	0-50 V	041 H	141 H	241 H	341 H	243 H	541 H	543 H	641 H	841 H	941 H	041 H	341 H	243 H	541 H	543 H	641 H
	0-60 V	031 L	131 L	231 L	331 L	233 L	531 L	533 L	631 L	831 L	931 L	031 L	331 L	233 L	531 L	533 L	631 L
	0-75 V	051 L	151 L	251 L	351 L	253 L	551 L	553 L	651 L	851 L	951 L	051 L	351 L	253 L	551 L	553 L	651 L
	0-80 V	031 H	131 H	231 H	331 H	233 H	531 H	533 H	631 H	831 H	931 H	031 H	331 H	233 H	531 H	533 H	631 H
	20-100 V	03F H	13F H	23F H	33F H	231 H	53F H	531 H	63F H	83F H	93F H	03F H	33F H	231 H	53F H	531 H	63F H
	0-100 V	051 H	151 H	251 H	351 H	253 H	551 H	553 H	651 H	851 H	951 H	051 H	351 H	253 H	551 H	553 H	651 H
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	±150 V	074 L	174 L	274 L	374 L	276 L	574 3	376 L	674 L	874 L	974 L	074 L	374 L	276 L	374 L	376 L	674 L
	±200 V	074 H	174 H	274 H	374 H	276 H	374 H	376 H	674 H	874 H	974 H	074 H	374 H	276 H	374 H	376 H	674 H



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800-794-5883

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Frequently Asked Questions

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 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.

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

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

For the DC output models, what are the output impedances in the voltage and current mode?

The DC outputs are FET driven and are active outputs that change depending on the mode and range.

	CURRENT Mode	VOLTAGE Mode	
DC output with 12 V Compliance		less than 600 ohms	greater than 1000 ohms
DC output with 20 V Compliance		less than 1000 ohms	greater than 1000 ohms

For your DC Input modules in the current mode, the input impedance rating is 50 ohms. For troubleshooting purposes, is that value the same with and without power applied to the module?

Yes.

TransZorb–Reg TM General Semiconductor

What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety. When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

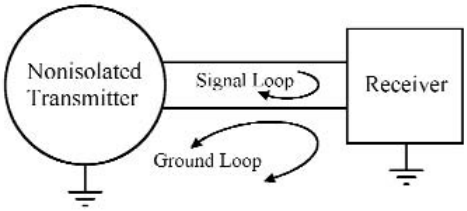


Figure 1. *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

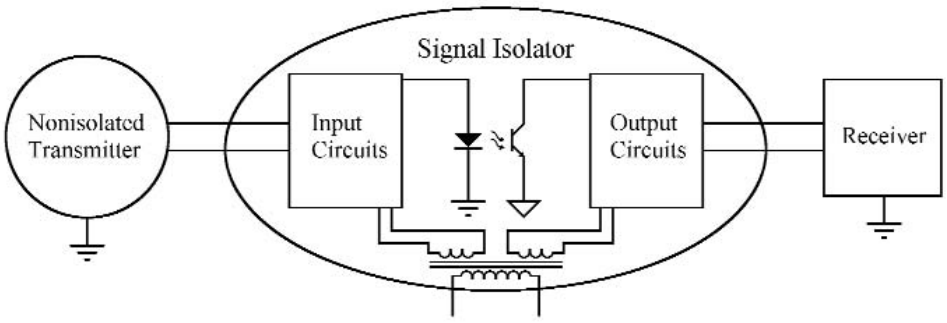


Figure 2. *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

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

DC to DC Isolator
Field Rangeable Transmitter

API 4380 DIN
API 4380 DD

DC Input

Input: ***0-50 mV to ±10 VDC, 0-1 mA to 0-20 mA***
Output: ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

Wide Ranging I/O
One Minute Setup!

- ***One Minute Setup for Hundreds of I/O Ranges***
- ***External Switches & Tables for Range Selection***
- ***2000 V Full Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges

Consult factory for optional switch selectable ranges within input & output limits.

	Minimum	Maximum
Voltage:	0 to 50 mVDC	0 to 10 VDC
Bipolar Voltage:	±50 mVDC	±10 VDC
Current:	0 to 1 mADC	0 to 20 mADC

Input Impedance

Voltage: 1 MΩ minimum
Current: 50 Ω typical
Input voltage burden (current) 1 VDC at 20 mA

Input Loop Power Supply

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

LoopTracker

Variable brightness LEDs indicate input and output loop levels and status

Output 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
±15% of span adjustment range typical

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 0-100% of span

Response Time

Standard: 100 milliseconds typical

Isolation

1000 V_{RMS} minimum
Full isolation: power to input, power to output, input to output

Ambient Temperature Range and Stability

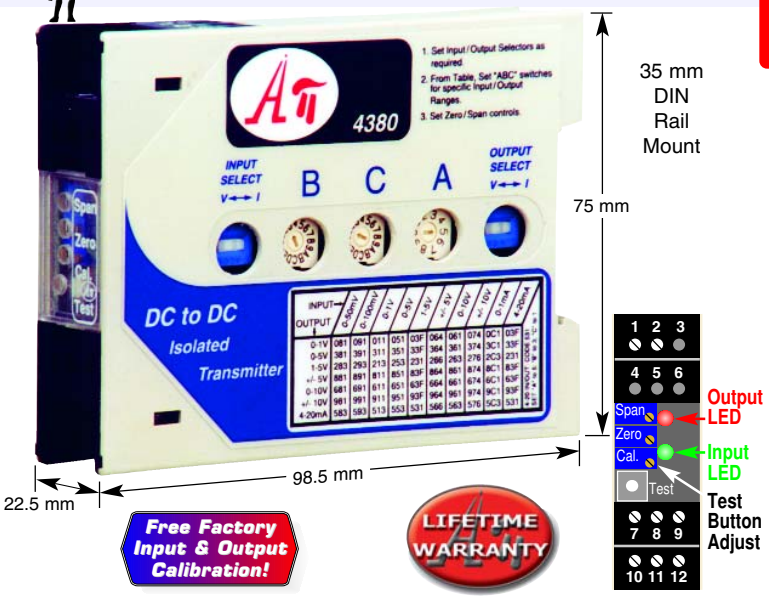
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

Case Material

Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

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 4380 DIN** and **API 4380 DD** accept a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, signal conversion, signal boosting or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4380 DIN** and **API 4380 DD** can be field-configured via external rotary and slide switches. Most common ranges are built-in, and can be selected from the table on the module, however virtually unlimited combinations are possible. Consult the factory for assistance with special ranges.

The **API 4380 DIN** and **API 4380 DD** are designed to mount on industry-standard DIN rails. The narrow DIN style housing (22.5 mm) allows for side-by-side mounting of multiple modules for maximum I/O density.

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 built-in 12 VDC regulated loop excitation power supply can be used to power passive input devices.

Models & Options

API 4380 DIN	Field rangeable DC to DC transmitter, isolated, with loop power supply, 80 to 265 VAC or 48 to 300 VDC
API 4380 DD	Field rangeable DC to DC transmitter, isolated, with loop power supply, 9 to 30 VDC

Options—Add to end of model number

U	Conformal coating for moisture resistance

Accessories—Order as separate line item

API TK36	DIN rail, 35 mm W x 39" L, aluminum

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API 4380 DIN
API 4380 DD

Installation and Setup

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.

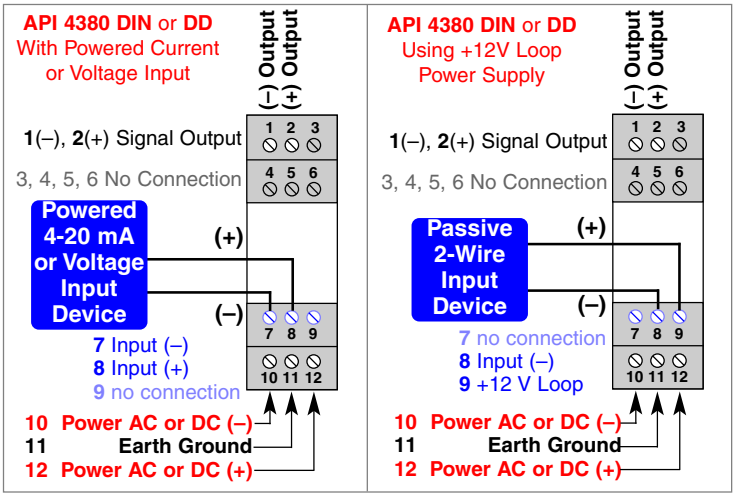
Power Input Terminals – The label on the side of the API module will indicate the power requirements. Power is connected to terminals 10 and 12. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 12 and negative (–) is wired to terminal 10. Terminal 11 earth ground may be used if required.

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 8 and the negative (–) is applied to terminal 7.

Using the 12 VDC Power Supply with a Passive Signal Input – This may save the expense of purchasing a separate power supply for the input device. A passive input device can be powered by the 12 volt DC power supply at terminal 9. Polarity must be observed when connecting the signal input. Typically the positive (+) lead is wired to terminal 9 and the negative (–) lead is connected to terminal 8. A typical example is shown. It is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 2 and the negative (–) is connected to terminal 1.

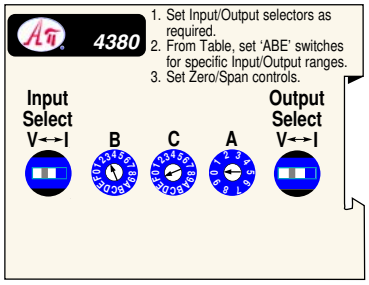
WIRING EXAMPLES



RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.



Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Front-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for 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 & 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.

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

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.

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.

		OUTPUT RANGES								
	Rotary Switches →	0-1 V	0-2 V	0-5 V	1-5 V	0-10 V	±5 V	±10 V	4-20 mA	0-20 mA
		ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
INPUT RANGES	0-50 mV	081	181	381	283	681	881	981	583	681
	0-100 mV	091	191	391	293	691	891	991	593	691
	0-200 mV	0A1	1A1	3A1	2A3	6A1	8A1	9A1	5A3	6A1
	0-500 mV	001	101	301	203	601	801	901	503	601
	0-1 V	011	111	311	213	611	811	911	513	611
	0-2 V	021	121	321	223	621	821	921	523	621
	1-5 V	03F	13F	33F	231	63F	83F	93F	531	63F
	0-5 V	051	151	351	253	651	851	951	553	651
	0-10 V	061	161	361	263	661	861	961	563	661
	±5 V	064	164	364	266	664	864	964	566	664
	±10 V	074	174	374	276	674	874	974	576	674
	0-1 mA	0C1	1C1	3C1	2C3	6C1	8C1	9C1	5C3	6C1
	4-20 mA	03F	13F	33F	231	63F	83F	93F	531	63F
	0-20 mA	051	151	351	253	651	851	951	553	651

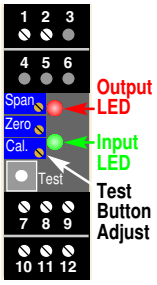
API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

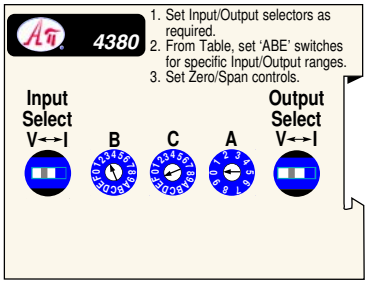
RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See ***www.api-usa.com*** or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (I) or voltage (V) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (I) or voltage (V) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.





	Rotary Switches	OUTPUT RANGES															
		0-1 V	0-2 V	0-4 V	0-5 V	1-5 V	0-8 V	2-10 V	0-10 V	±5 V	±10 V	0-2 mA	0-10 mA	2-10 mA	0-16 mA	4-20 mA	0-20 mA
		ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
INPUT RANGES	0-50 mV	081	181	281	381	283	581	583	681	881	981	081	381	283	581	583	681
	0-100 mV	091	191	291	391	293	591	593	691	891	991	091	391	293	591	593	691
	0-200 mV	0A1	1A1	2A1	3A1	2A3	5A1	5A3	6A1	8A1	9A1	0A1	3A1	2A3	5A1	5A3	6A1
	0-250 mV	0C1	1C1	2C1	3C1	2C3	5C1	5C3	6C1	8C1	9C1	0C1	3C1	2C3	5C1	5C3	6C1
	0-400 mV	0B1	1B1	2B1	3B1	2B3	5B1	5B3	6B1	8B1	9B1	0B1	3B1	2B3	5B1	5B3	6B1
	0-500 mV	001	101	201	301	203	501	503	601	801	901	001	301	203	501	503	601
	0-1 V	011	111	211	311	213	511	513	611	811	911	011	311	213	511	513	611
	0-2 V	021	121	221	321	223	521	523	621	821	921	021	321	223	521	523	621
	0-2.5 V	041	141	241	341	243	541	543	641	841	941	041	341	243	541	543	641
	0-4 V	031	131	231	331	233	531	533	631	831	931	031	331	233	531	533	631
	1-5 V	03F	13F	23F	33F	231	53F	531	63F	83F	93F	03F	33F	231	53F	531	63F
	0-5 V	051	151	251	351	253	551	553	651	851	951	051	351	253	551	553	651
	0-10 V	061	161	261	361	263	561	563	661	861	961	061	361	236	561	563	661
	±5 V	064	164	264	364	266	564	566	664	864	964	064	364	266	564	566	664
	±10 V	074	174	274	374	276	574	576	674	874	974	074	374	276	574	576	674
	0-1 mA	0C1	1C1	2C1	3C1	2C3	5C1	5C3	6C1	8C1	9C1	0C1	3C1	2C3	5C1	5C3	6C1
	0-2 mA	001	101	201	301	203	501	503	601	801	901	001	301	203	501	503	601
	0-4 mA	011	111	211	311	213	511	513	611	811	911	011	311	213	511	513	611
	0-8 mA	021	121	221	321	223	521	523	621	821	921	021	321	223	521	523	621
	0-10 mA	041	141	241	341	243	541	543	641	841	941	041	341	243	541	543	641
	0-16 mA	031	131	231	331	233	531	533	631	831	931	031	331	233	531	533	631
	4-20 mA	03F	13F	23F	33F	231	53F	531	63F	83F	93F	03F	33F	231	53F	531	63F
	0-20 mA	051	151	251	351	253	551	553	651	851	951	051	351	253	551	553	651
	2-10 mA	02F	12F	22F	32F	221	52F	521	62F	82F	92F	02F	32F	221	52F	521	62F



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

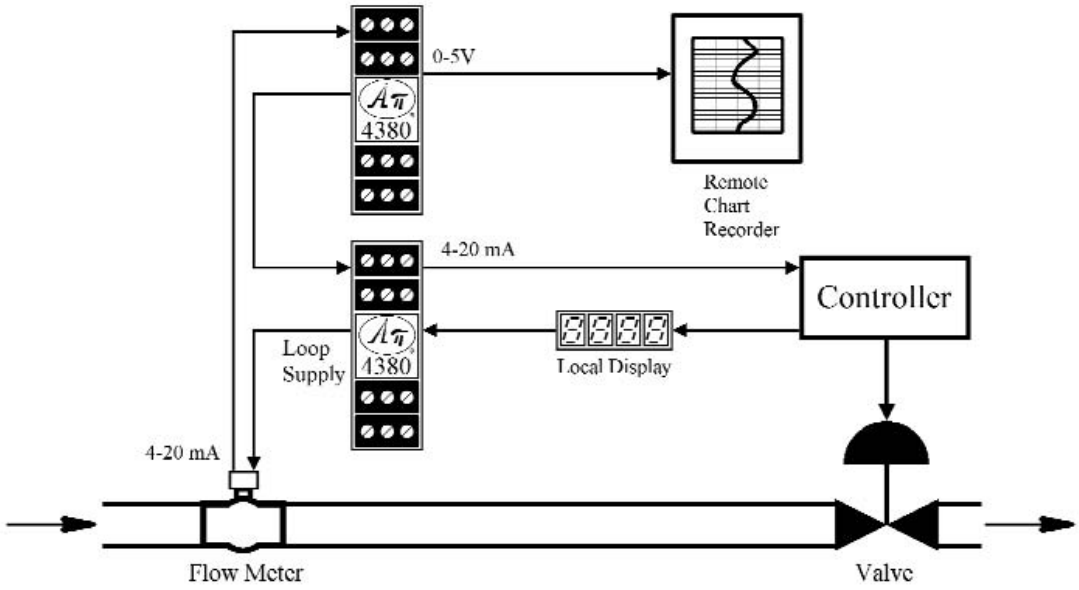
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www.mod-tronic.com

Controlling and Monitoring Liquid Flow from a Single Flowmeter

PROBLEM
A process requires a controlled flow rate of a liquid with a local display of that flow rate and a chart of the flow rate for record keeping purposes.

SOLUTION
A single flow meter can be utilized for control and monitoring of flow rate if appropriate signal conditioning is provided. In this example, the local display and the flow controller require a 4-20 mADC signal, while the remote chart recorder requires a 0-5 VDC signal.

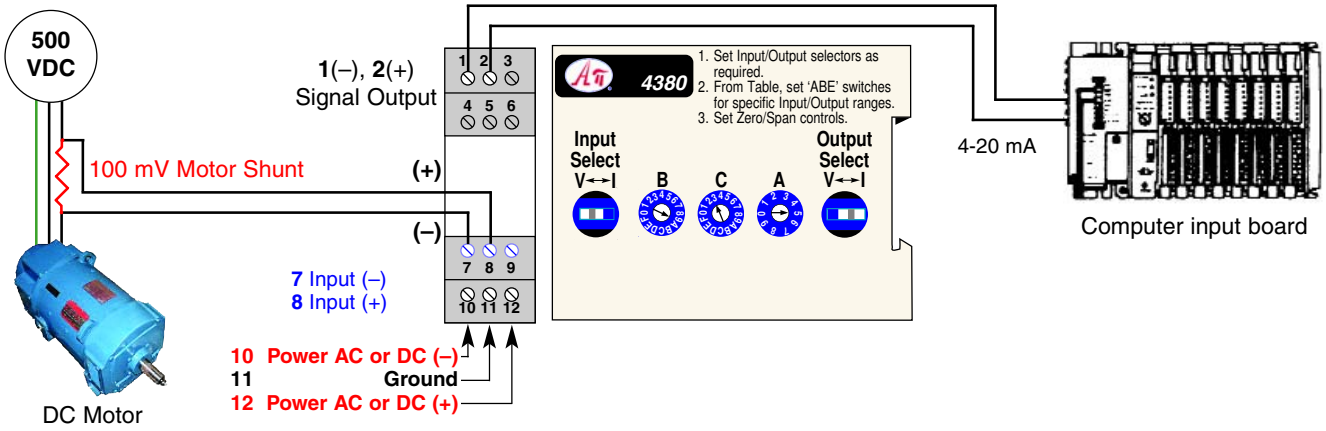


The flow meter is connected to a pair of **API 4380 DIN** Isolated, Field Ranging DC to DC Isolators. The first **API 4380 DIN** provides loop power for the flow meter from its built-in loop excitation supply, and its 4-20 mADC output drives both the local display and the flow controller. The second **API 4380 DIN** converts the 4-20 mADC signal from the flow meter to a 0-5 VDC signal which is sent to the remotely located chart recorder.

Motor Load Monitoring

PROBLEM
The load on a DC motor needs to be monitored by a computer control system. A 100 mV shunt is used to measure motor current. Due to signal noise concerns and distance, a 4-20 mA signal is used. If the shunt is connected directly to the computer measuring system, the computer system's input board would provide a voltage ground path from the DC motor. This result would be an electrical short and spectacular destruction of the computer.

SOLUTION
The standard **API 4380 DIN** Isolated DC to DC Transmitter accepts the 0 to 100 mV input, provides optical isolation and converts it to an isolated 4-20 mA signal that can be used by the computer system.



The **API 4380 DIN** switches are set to input select "V", Output select "I" and A=5, B=9, and C=3 for 100 mV input and 4-20 mA output. The **API 4380 DIN** powers the output loop, thus eliminating the need for an additional power supply. The 2000 V_{RMS} 3-way isolation of the module protects against unexpected common mode voltages, ground loops and electrical noise.

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

DC to DC Isolator
Field Rangeable Transmitter

API 4385 G

DC Input

Input: ***0-50 mV to ±10 VDC, 0-1 mA to 0-20 mA***
Output: ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

- ***Non-Interactive Zero & Span***
- ***External Switches & Tables for Range Selection***
- ***One Minute Field Setup for Hundreds of I/O Ranges***
- ***2000 V Isolation Input/Output/Power***
- ***I/O LoopTracker® LEDs and Functional Test Pushbutton***

Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges

Consult factory for optional switch selectable ranges within input & output limits
System voltages must not exceed socket voltage rating

	Minimum	Maximum
Voltage:	0 to 50 mV	0-20 V
Bipolar Voltage:	±50 mV	±10 V
Current:	0 to 200 µA	0 to 40 mA

Offset: ±100% maximum, ±75% maximum for 40 mA input

Input Impedance

Voltage: 1 MΩ minimum
Current: 50 Ω typical
Input voltage burden (current) 1 VDC at 20 mA

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 and output loop levels and status

Output 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

Internal jumper for output reversal. Consult factory for special ranges.

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

Output Ripple and Noise

Less than 10 mV_{RMS}

Functional Test Button

Sets output to test level when pressed. Adjustable 0-100% of span.
Potentiometer factory set to approximately 50% of span.

Response Time

Standard: 70 milliseconds typical
High Speed: 5 milliseconds typical with **DF** option

Isolation

2000 V_{RMS} minimum
Full isolation: power to input, power to output, input to output

Ambient Temperature Range and Temperature Stability

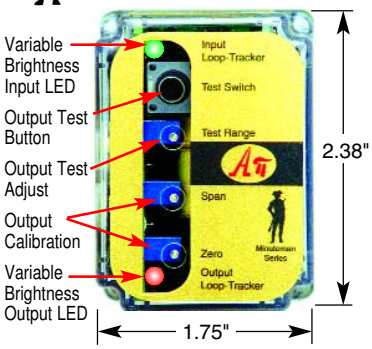
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C temperature stability

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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Wide Ranging I/O
One Minute Setup!





LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Description and Features

The **API 4385 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, signal conversion, signal boosting or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API 4385 G** input, output and zero offset can be field-configured via external rotary and slide switches. Zero offset is adjustable in 15% increments to a maximum of ±100% of span. Common range settings are on the module label. Non-interactive zero and span adjustments simplifies calibration. Output reversal (4-20 mA input to 20-4 mA output) can be changed via an internal jumper.

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 built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices. The **API 4385 G** plugs 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

API 4385 G	Field rangeable DC to DC transmitter, isolated, 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
M01	Input/output reversal, such as 4-20 mA in to 20-4 mA out
DF	Fast response, 1 millisecond nominal response time
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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API 4385 G

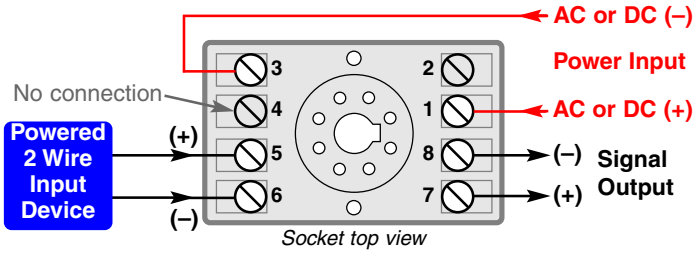
Installation and Setup

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.

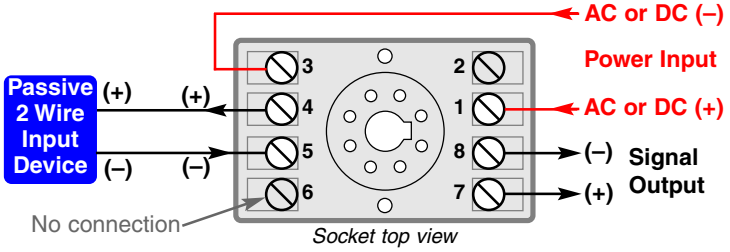
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

Powered Signal Input – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 5 and the negative (–) is applied to terminal 6.



Connecting an input device which provides power to the input circuit

Passive Signal Input – Polarity must be observed when connecting the signal input. A passive input device can be powered by the 18 volt DC power supply at terminal 4. This may save the expense of purchasing a separate power supply for the input device. A typical example is shown, however it is very important to consult the manufacturer of your specific sensor to determine its compatibility and proper wiring.

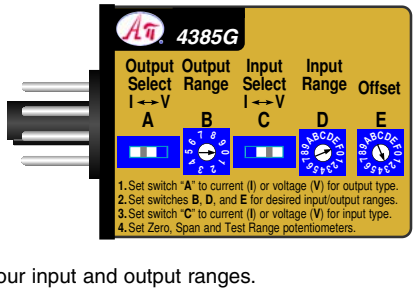


Using the built-in 18 VDC loop supply to power a passive input device

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.

RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.



1. Set the **OUTPUT SELECT** slide switch "**A**" to current (**I**) or voltage (**V**) depending on output type.
2. From the range table, find the rotary switch combination that matches your input and output ranges.
3. Set the three rotary switches **B**, **D**, and **E** to the values found in the table that match your input and output ranges.
4. Set the **INPUT SELECT** slide switch "**C**" to current (**I**) or voltage (**V**) depending on input type.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs. Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

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

Input and output ranges are pre-configured at the factory as specified on your order. Top-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for 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 & 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.

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

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.

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.

		INPUT RANGES												
	Rotary Switches	0-1 mA	4-20 mA	0-20 mA	0-50 mV	0-100 mV	0-500 mV	0-2 V	0-5 V	1-5 V	±5 V	0-10 V	±10 V	0-20 V
		BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE
OUTPUT RANGES	0-1 V	060	09A	050	020	030	000	080	050	09A	0C3	0C0	0D3	0D0
	0-2 V	860	89A	850	820	830	800	880	850	89A	8C3	8C0	8D3	8D0
	1-5 V	660	69A	650	620	630	600	680	650	69A	6C3	6C0	6D3	6D0
	0-5 V	960	99A	950	920	930	900	980	950	99A	9C3	9C0	9D3	9D0
	0-10 V	360	39A	350	320	330	300	380	350	39A	3C3	3C0	3D3	3D0
	±5 V	460	49A	450	420	430	400	480	450	49A	4C3	4C0	4D3	4D0
	±10 V	560	59A	550	520	530	500	580	550	59A	5C3	5C0	5D3	5D0
	4-20 mA	760	79A	750	720	730	700	780	750	79A	7C3	7C0	7D3	7D0
	0-20 mA	360	39A	350	320	330	300	380	350	39A	3C3	3C0	3D3	3D0

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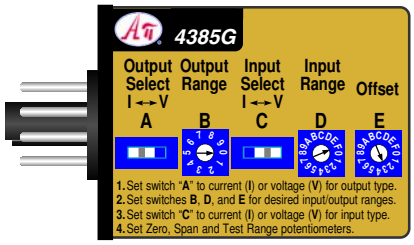
RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.

1. Set the **OUTPUT SELECT** slide switch "**A**" to current (**I**) or voltage (**V**) depending on output type.
2. From the range table, find the rotary switch combination that matches your input and output ranges.
3. Set the three rotary switches **B**, **D**, and **E** to the values found in the table that match your input and output ranges.
4. Set the **INPUT SELECT** slide switch "**C**" to current (**I**) or voltage (**V**) depending on input type.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.



		INPUT RANGES																												
	Rotary Switches	0-200 µA	0-1 mA	0-2 mA	0-4 mA	0-8 mA	0-10 mA	0-16 mA	4-20 mA	0-20 mA	10-50 mA	–50-0 mV	0-50 mV	0-100 mV	0-200 mV	0-250 mV	0-400 mV	0-500 mV	0-1 V	0-2 V	0-2.5 V	0-4 V	0-5 V	1-5 V	±5 V	0-10 V	±10 V	0-20 V	20-40 V
		BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE	BDE
OUTPUT RANGES	0-1 V	020	060	000	010	080	040	090	09A	050	0CA	02F	020	030	0A0	060	0B0	000	010	080	040	090	050	09A	0C3	0C0	0D3	0D0	0D7
	0-2 V	820	860	800	810	880	840	890	89A	850	8CA	82F	820	830	8A0	860	8B0	800	810	880	840	890	850	89A	8C3	8C0	8D3	8D0	8D7
	0-4 V	120	160	100	110	180	140	190	19A	150	1CA	12F	120	130	1A0	160	1B0	100	110	180	140	190	150	19A	1C3	1C0	1D3	1D0	1D7
	1-5 V	620	660	600	610	680	640	690	69A	650	6CA	62F	620	630	6A0	660	6B0	600	610	680	640	690	650	69A	6C3	6C0	6D3	6D0	6D7
	0-5 V	920	960	900	910	980	940	990	99A	950	9CA	92F	920	930	9A0	960	9B0	900	910	980	940	990	950	99A	9C3	9C0	9D3	9D0	9D7
	0-8 V	220	260	200	210	280	240	290	29A	250	2CA	22F	220	230	2A0	260	2B0	200	210	280	240	290	250	29A	2C3	2C0	2D3	2D0	2D7
	2-10 V	720	760	700	710	780	740	790	79A	750	7CA	72F	720	730	7A0	760	7B0	700	710	780	740	790	750	79A	7C3	7C0	7D3	7D0	7D7
	0-10 V	320	360	300	310	380	340	390	39A	350	3CA	32F	320	330	3A0	360	3B0	300	310	380	340	390	350	39A	3C3	3C0	3D3	3D0	3D7
	±5 V	420	460	400	410	480	440	490	49A	450	4CA	42F	420	430	4A0	460	4B0	400	410	480	440	490	450	49A	4C3	4C0	4D3	4D0	4D7
	±10 V	520	560	500	510	580	540	590	59A	550	5CA	52F	520	530	5A0	560	5B0	500	510	580	540	590	550	59A	5C3	5C0	5D3	5D0	5D7
	0-2 mA	020	060	000	010	080	040	090	09A	050	0CA	02F	020	030	0A0	060	0B0	000	010	080	040	090	050	09A	0C3	0C0	0D3	0D0	0D7
	2-10 mA	620	660	600	610	680	640	690	69A	650	6CA	62F	620	630	6A0	660	6B0	600	610	680	640	690	650	69A	6C3	6C0	6D3	6D0	6D7
	0-10 mA	920	960	900	910	980	940	990	99A	950	9CA	92F	920	930	9A0	960	9B0	900	910	980	940	990	950	99A	9C3	9C0	9D3	9D0	9D7
	0-16 mA	220	260	200	210	280	240	290	29A	250	2CA	22F	220	230	2A0	260	2B0	200	210	280	240	290	250	29A	2C3	2C0	2D3	2D0	2D7
	4-20 mA	720	760	700	710	780	740	790	79A	750	7CA	72F	720	730	7A0	760	7B0	700	710	780	740	790	750	79A	7C3	7C0	7D3	7D0	7D7
	0-20 mA	320	360	300	310	380	340	390	39A	350	3CA	32F	320	330	3A0	360	3B0	300	310	380	340	390	350	39A	3C3	3C0	3D3	3D0	3D7

API 4385 G RANGE SETTINGS

The tables at right list the settings of the three rotary switches, and can be used to set up special ranges.

For example, if a 1-10 V input is required

Set the Input Select switch to **V**.

Set switch **D** to position **C** = 10 V.

Set switch **E** to position **1** = +15% offset.

This will create an input range of 1.5 V to 11.5 V.

Use the output zero and span potentiometers to calibrate output to 1-10 V.

For ranges not indicated, please contact factory for assistance or to order modules with custom ranges.

Switch B Output Ranges

Voltage	Current	B
0-1 V	0-2 mA	0
0-2 V	0-4 mA	8
0-4 V	0-8 mA	1
0-5 V	0-10 mA	9
0-8 V	0-16 mA	2
0-10 V	0-20 mA	3
1-5 V	2-10 mA	6
2-10 V	4-20 mA	7
±5 V		4
±10 V		5

Switch D Input Span

Voltage	Current	D
50 mV	200 µA	2
100 mV	400 µA	3
200 mV	800 µA	A
250 mV	1 mA	6
400 mV	1.6 mA	B
500 mV	2 mA	0
1 V	4 mA	1
2 V	8 mA	8
2.5 V	10 mA	4
4 V	16 mA	9
5 V	20 mA	5
10 V	40 mA*	C
20 V		D

* Maximum allowable offset is ±75% for 40 mA range.

Switch "E" Input Offset

% of Input Span	E
+100%	7
+90%	6
+75%	5
+60%	4
+45%	3
+30%	2
+15%	1
0%	0, 8
–15%	9
–30%	A
–45%	B
–60%	C
–75%	D
–90%	E
–100%	F



FREE APPLICATION ASSISTANCE
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What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

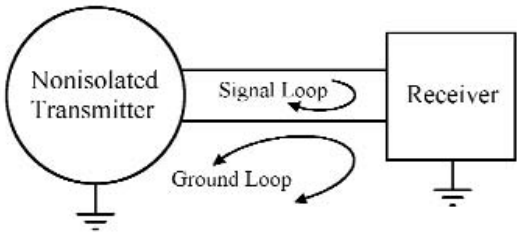


Figure 1. *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

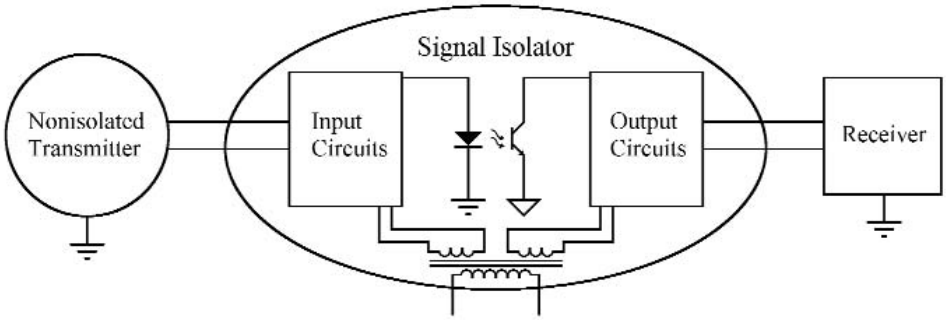
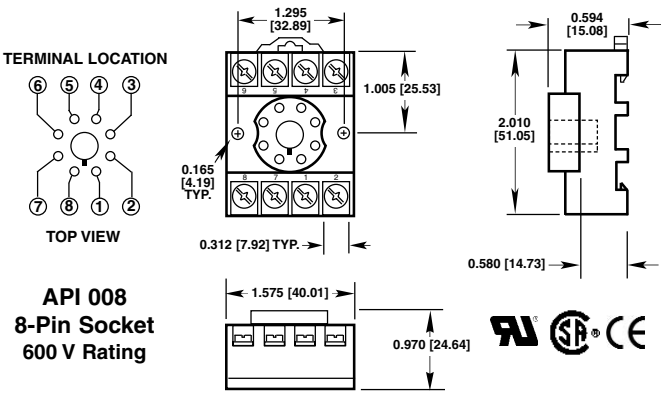
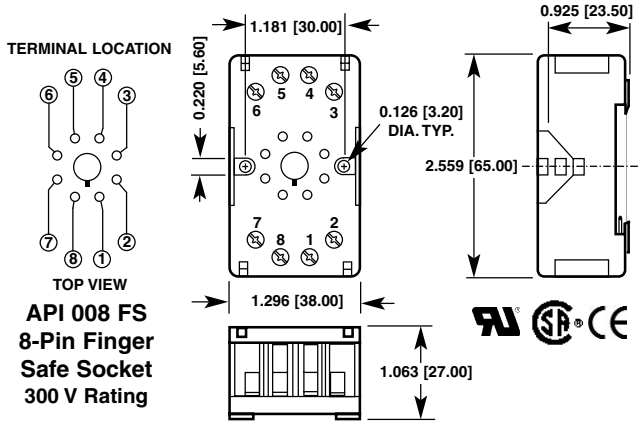


Figure 2. *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

API Sockets API 008 and API 008 FS





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

High Voltage Input DC to DC Isolator & Transmitter

API DPI HV-DC

DC Input

Input: ***0-100 VDC to 0-2000 VDC***
Output: ***0-1 VDC to ±10 VDC or 0-2 mA to 0-20 mADC***

Field Selectable I/O Ranges

- ***High Voltage Input Ranges from 100 VDC to 2000 VDC***
- ***7 Standard or 1 User Specified Input Ranges***
- ***High Input Impedance***
- ***2000 V Full Input/Output/Power Isolation***
- ***55 mm Wide DIN Style Package***
- ***I/O LoopTracker® LEDs and Functional Test Pushbutton***

LIFETIME WARRANTY



Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges
Field or factory configurable via internal jumpers.
Consult factory for special ranges.

Please specify input range.
Minimum: 0 to 100 VDC
Maximum: 0 to 2000 VDC

Input Impedance
2.5 MΩ

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

Output Ranges
Please specify output range. Field or factory configurable via internal jumpers.
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):	0-2 mADC	0-20 mADC	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

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 0-100% of span

Response Time
100 milliseconds typical

Isolation
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 ±0.02% of span per °C

Case Material
Polycarbonate, gray UL #94V-1 housing and black UL #94V-2 terminals

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

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Description and Features

The **API DPI HV-DC** accepts a DC voltage input and provides an optically isolated DC voltage or current output that is linearly related to the input. This module is unique because it is field rangeable for voltage inputs from 100 VDC to 2000 VDC. Typical applications include signal isolation, signal conversion, signal attenuation or a combination of the three.

The optical isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction. The module power supply is isolated, resulting in full 3-way (input, output, power) isolation.

The **API DPI HV-DC** input and output range settings are configured by the factory to customer requirements, but they can be reconfigured in the field via internal switches. Common range settings are on the module label. A user specified range is available that can be factory configured to meet your specific requirements. Consult the factory for assistance.

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 **API DPI HV-DC** clips to an industry standard 35 mm DIN rail. The housing also allows for surface mounting.

Models & Options

Factory Configured—Please specify input and output ranges

API DPI HVDC Field rangeable high voltage input DC to DC transmitter, isolated, 115 VAC

Options—Add to end of model number

A230 Powered by 230 VAC, 50/60 Hz
DF Fast response, 1 millisecond nominal response time
U Conformal coating for moisture resistance

Accessories—Order as separate line item

API TK36 DIN rail, 35 mm W x 39" L, aluminum

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DC Input

ELECTRICAL CONNECTIONS

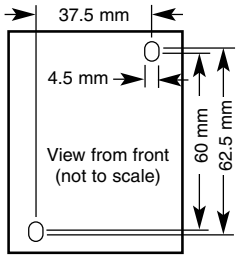
WARNING! Avoid shock hazard! Turn all power off and safely disconnect all wiring before opening case to change switch settings!

This unit is configured at the factory per your order specifications. Settings are marked on the DPI-HV-DC label. If a change to the input or output configuration is required, follow all necessary safety precautions. Use a qualified electrician or instrumentation engineer, and/or consult factory for assistance.

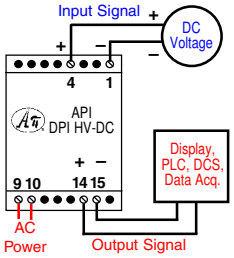
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals **9** and **10**.

Signal Input Terminals – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal **4** and the negative (–) is applied to terminal **1**.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal **14** and the negative (–) is connected to terminal **15**.



Surface mounting dimensions



Wiring example

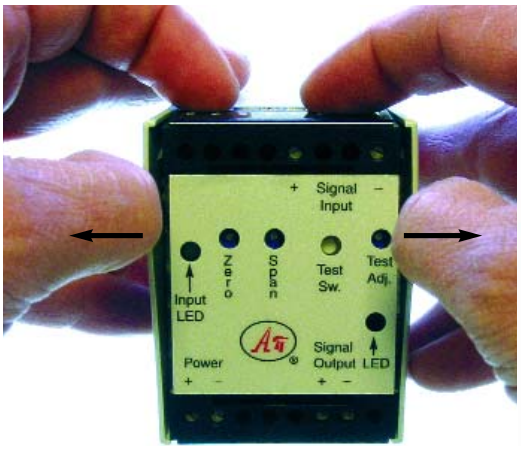
RANGE SELECTION

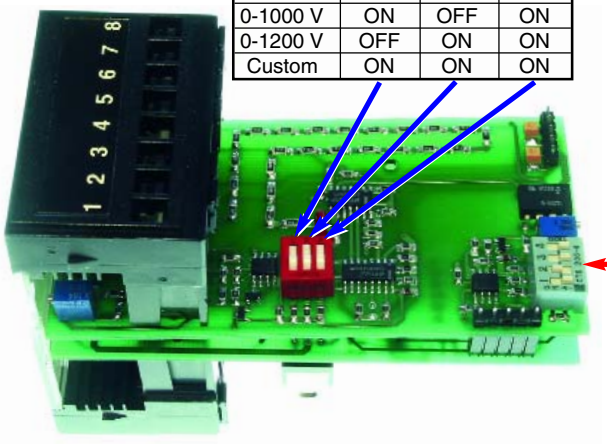
Each product is factory configured to your exact input and output requirements. See product label for input and output designations. Remove all power from the unit, follow all proper safety precautions, and consult a qualified electrician or instrumentation engineer before making any changes. Any range changes should be done before the unit is wired and installed.

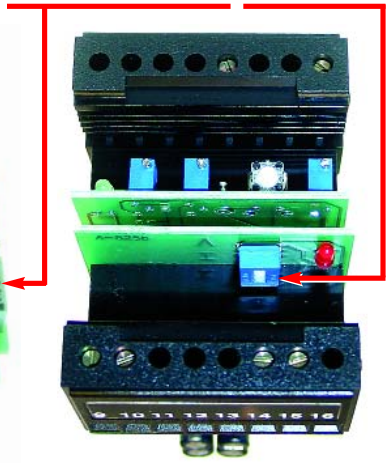
Internal selector switches determine the input range. Depending on these switch settings, the input is attenuated as required, filtered, then passed through an optical isolation circuit to the output stage.

An Internal voltage/current switch and an output selector switch determine the exact DC voltage or current output range available to the user.

1. Turn all power off and safely disconnect all wiring from unit.
2. Pry sides of case apart as shown below while sliding connector and board assembly towards you.
3. See switch assemblies for individual switch numbers. Change input/output settings according to diagrams below.
4. Remove front panel to access Voltage/Current output switch. It is located under front of unit next to the red LED.
5. Voltage/Current output switch settings “V” (switch to front) for Voltage output. “I” (switch to rear) for Current output.
6. Align circuit boards with grooves in case and slide assembly back into case until it latches.
7. Mark new settings on outside of case.







Input Range Settings

Input Voltage	SW-1	SW-2	SW-3
0-100 V	OFF	OFF	OFF
0-200 V	ON	OFF	OFF
0-300 V	OFF	ON	OFF
0-400 V	ON	ON	OFF
0-500 V	OFF	OFF	ON
0-1000 V	ON	OFF	ON
0-1200 V	OFF	ON	ON
Custom	ON	ON	ON

Output Range Settings

SW-1	SW-2	SW-3	SW-4	Voltage	Current
OFF	OFF	OFF	OFF	0-1V	0-2mA
ON	OFF	OFF	OFF	1-5V	2-10mA
OFF	ON	OFF	OFF	2-10V	4-20mA
OFF	OFF	ON	OFF	0-10V	0-20mA
OFF	OFF	OFF	ON	±10V	n/a

CALIBRATION

Input and output ranges are pre-configured at the factory as specified on your order. Front-mounted, Zero and Span potentiometers can be used should fine-tuning be necessary. Custom ranges may require factory modification.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: For 4-20 mA output signal, the Zero control will provide adjustment for 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 & 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

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

2 Channel DC to DC Isolator Transmitters

API 4390 DIN, API 4391 DIN API 4392 DIN

DC Input

2 Inputs: ***mVDC, ±10 to 0-10 VDC, 0-1 mA to 4-20 mA***

2 Outputs: ***0-5 V, 0-10 V, ±5 V, ±10 V, 0-20 mA, 4-20 mA***

- ***2 Independent Channels in a 55 mm Package***
- ***2000 V Power/Input/Output/Channel Isolation***
- ***Full Isolation Eliminates Ground Loops***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton for Each Channel***
- ***Independent Zero and Span for Each Channel***

LIFETIME WARRANTY



Free Factory Input & Output Calibration!

Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Two Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges

Factory Configured—Specify an input for each channel
Voltage: ±5 VDC, ±10 VDC, 0-100 mVDC, 0-5 VDC, 0-10 VDC, 0-100 VDC
Current: 0-1 mADC, 0-20 mA, 4-20 mA; see sinking or sourcing options
Consult factory for special ranges

Input Characteristics

Voltage: 200 kΩ minimum input impedance per channel
Current: 1.25 VDC maximum voltage burden per channel

LoopTracker

Variable brightness LEDs indicate input/output loop level and status

Output Ranges

Factory Configured—Please specify an output for each channel
Voltage: 0-100 mV, 0-5 VDC, 0-10 VDC, ±5 VDC, ±10 VDC
Current: 0-20 mA, 4-20 mA; both output channels are sourced
Consult factory for special ranges

Output Zero and Span

Multiturn zero and span potentiometers for each channel to compensate for load and lead variations. ±15% of span adjustment range typical
Ultra-low interaction zero and span, <0.001 ppt

Output Linearity

Better than ±0.1% of span

Output Ripple and Noise

Less than 10 mV_{RMS}

Functional Test Buttons

Sets output to test level when pressed. One button per channel.
Factory set to approximately 50% of span

Response Time

70 milliseconds typical. Consult factory for optional response times.

Isolation

2000 V_{RMS} minimum
Full isolation: power to channel, input to output, channel to channel

Common Mode Rejection

120 dB minimum

Ambient Temperature Range and Temperature Stability

–10°C to +60°C operating ambient
Better than ±0.04% of span per °C stability

Case Material

Polycarbonate: gray UL #94V-1 housing and black UL #94V-2 terminals

Power

Both input power supplies are fuse protected and all are fully isolated
Standard: 115 VAC ±10%, 50/60 Hz, 5 W max., four linear type
A230 option: 230 VAC ±10%, 50/60 Hz, 5 W max., four linear type
D option: 9-30 VAC/VDC, 5 W max., four switching type

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Description and Features

The **API 4390 DIN**, **API 4391 DIN** and **API 4392 DIN** accept two analog DC voltage or current inputs and provide two optically isolated analog DC voltage or current outputs that are linearly related to the inputs. For each channel the input signal is filtered, either amplified or attenuated as required, then passed through an opto-coupler to the output stage. The optical isolation between the inputs and outputs make this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

Applications include signal isolation, signal scaling, signal conversion, signal boosting or a combination of the four. The two independent channels provide an economical signal conversion solution where space is limited. This product is designed to function effectively in electrically noisy industrial environments.

API exclusive features include two ***LoopTracker*** LEDs and **Functional Test Pushbuttons** for each channel. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals and 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. This output is factory set to approximately 50% of the output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The modules clip to an industry standard 35 mm DIN rail or they can be surface mounted.

Models & Options

Specify input and output ranges for each channel and options

Model	Power	Inputs	Outputs
API 4390 DIN	115 VAC	VDC, mADC	VDC, mADC
API 4391 DIN	115 VAC	VDC, mADC	±5, ±10 VDC
API 4392 DIN	115 VAC	±VDC, ±mADC	±VDC, mADC

Options–Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VAC/VDC
DF	Fast response time, consult factory
U	Conformal coating for moisture resistance

Accessories—Order as separate line item

API TK36	DIN rail, 35 mm W x 39" L, aluminum

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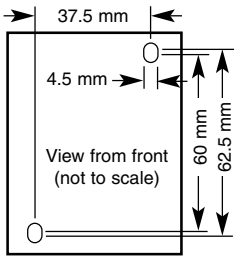
API 4390 DIN, API 4391 DIN API 4392 DIN

Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by a qualified electrician or instrumentation engineer. See wiring examples at right or consult factory for assistance.

The housing can be clipped to a standard 35 mm DIN rail or surface mounted. Each product is factory configured to your exact input and output requirements as indicated on the product label. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

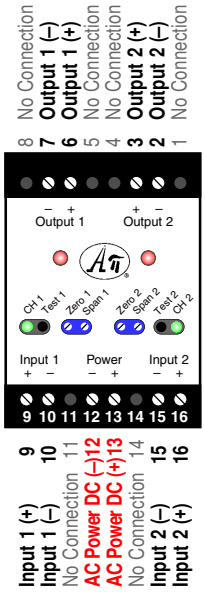


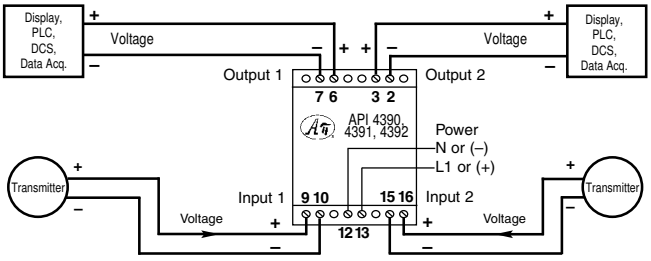
Surface mounting dimensions

Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 12 and 13.

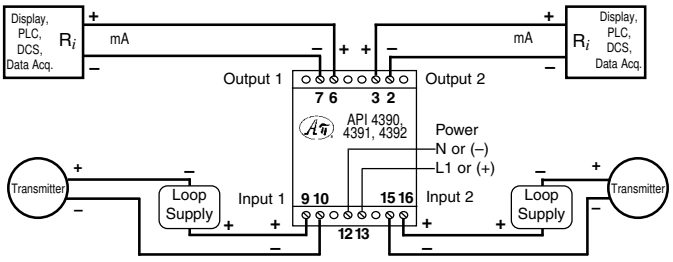
Signal Input Terminals – Polarity must be observed when connecting the signal input. The positive connection (+) for channel 1 is applied to terminal 9 and the negative (–) is applied to terminal 10. The positive connection (+) for channel 2 is applied to terminal 16 and the negative (–) is applied to terminal 15.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) for channel 1 is connected to terminal 6 and the negative (–) is connected to terminal 7. The positive connection (+) for channel 2 is connected to terminal 3 and the negative (–) is connected to terminal 2.





Voltage Inputs and Outputs



Current Inputs and Outputs

Both API inputs sink current. Both API outputs source current.

CALIBRATION

Front-mounted Zero and Span potentiometers for each channel can be used to compensate for load and lead variations.

1. Apply power to the module and allow a minimum 30 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: for 4-20 mA output, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Next, set the input at maximum, 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.
6. Repeat adjustments for second channel.

TEST BUTTONS

The Test pushbuttons are factory set to provide approximately 50% output. When depressed they will drive the output side of the loop with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When released, the output will return to normal.

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. If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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

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DC to DC Signal Isolator/Splitter

API 4393 DIN IsoSplitter™

DC Input

Input: ***mVDC, ±10 to 0-10 VDC, 0-1 mA to 4-20 mA***
2 Outputs: ***mVDC, ±10 to 0-10 VDC, 0-1 mA to 4-20 mA***

- ***One Input Dual Output Signal Splitter***
- ***2000 V Power/Input/Output/Channel Isolation***
- ***Full Isolation Eliminates Ground Loops***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton for Each Channel***
- ***Independent Zero and Span for Each Channel***

LIFETIME WARRANTY



Free Factory Input & Output Calibration!

Applications

- **Isolate, Split, Rescale Process Signals**
- **Send One Process Signal to Two Locations**
- **Interface Panel Meters, Recorders, Data Acquisition, PLCs, DCS Systems, SCADA Systems**

Specifications

Input and Output Ranges

Factory Configured—Please specify range
Consult factory for special ranges

Voltage:	0-50 mVDC, 0-100 mVDC, 0-5 VDC, 0-10 VDC
Bipolar Voltage:	±5 VDC, ±10 VDC
Current:	0-1 mA, 0-20 mA, 4-20 mA (1000 Ω maximum per channel)
	Sinking input and sourced outputs for current

Input Voltage Burden (Current)

1.25 VDC maximum

Output Linearity

Better than ±0.1% of span

Output Ripple and Noise

Less than 10 mV_{RMS}

Output Zero and Span

Multiturn zero and span potentiometers to compensate for load and lead variations
Independent zero and span potentiometers for each output channel
±15% of span adjustment range typical
Low interaction zero/span; <0.001 ppt

LoopTracker

Variable brightness LEDs indicate input/output loop level and status

Functional Test Buttons

Sets output to test level when pressed. One per output channel.
Factory set to drive output to approximately 50% of span

Response Time

70 milliseconds typical. Consult factory for other response times.

Isolation

2000 V_{RMS} minimum
Full isolation: power to channel, input to output, channel to channel

Common Mode Rejection

120 dB minimum

Ambient Temperature Range

–10°C to +60°C operating ambient

Temperature Stability

Better than ±0.04% of span per °C

Case Material

Polycarbonate: gray UL #94V-1 housing and black UL #94V-2 terminals

Power Supplies

Input power supply fuse protected and fully isolated

Standard:	115 VAC ±10%, 50/60 Hz, 5 W max., linear type
A230 option:	230 VAC ±10%, 50/60 Hz, 5 W max., linear type
D option:	9-30 VAC/VDC, 5 W typical, switching type

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Description and Features

The **API 4393 DIN *IsoSplitter*** accepts one analog DC voltage or current input and provides two optically isolated analog DC outputs that are linearly related to the inputs. The input signal is filtered, amplified, split, and then passed through an opto-coupler to the output stage. The two isolated output channels provide an economical solution where more than one output device is connected to the same input signal.

Typical applications include isolation, output splitting, output device separation and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of the three. The optical isolation between the input and outputs make this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

This product is designed to function effectively in electrically noisy industrial environments. It is designed to interface with and provide signal compatibility with recorders, data loggers, computers programmable logic controllers, and process transmitters.

API exclusive features include two ***LoopTracker*** LEDs and **Functional Test Pushbuttons** for each channel. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals and 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. This output is factory set to approximately 50% of the output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The modules clip to an industry standard 35 mm DIN rail or they can be surface mounted.

Models & Options

Factory Configured—Please specify input/output ranges and options

API 4393 DIN	IsoSplitter, 115 VAC powered
API 4393 DIN A230	IsoSplitter, 230 VAC powered
API 4393 DIN D	IsoSplitter, 9-30 VAC/VDC powered

See API 4393 L1 data sheet for more sink/source versions

Options—Add to end of model number

DF	Fast response time, consult factory
U	Conformal coating for moisture resistance

Accessories—Order as separate line item

API TK36	DIN rail, 35 mm W x 39" L, aluminum
API 535	Polycarbonate NEMA 4X enclosure for 1 module

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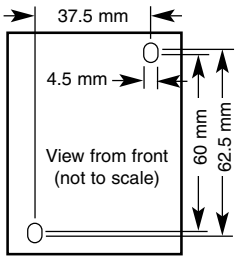
API 4393 DIN IsoSplitter™

Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by a qualified electrician or instrumentation engineer. See wiring examples at right or consult factory for assistance.

The housing can be clipped to a standard 35 mm DIN rail or surface mounted. Each product is factory configured to your exact input and output requirements as indicated on the product label. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

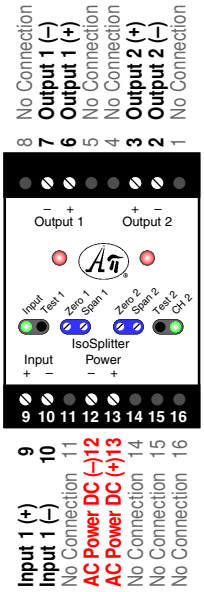


Surface mounting dimensions

Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 12 and 13. For DC-powered versions positive (+) is connected to terminal 13 and negative (–) is connected to terminal 12.

Signal Input Terminals – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 9 and the negative (–) is applied to terminal 10.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) for channel 1 is connected to terminal 6 and the negative (–) is connected to terminal 7. The positive connection (+) for channel 2 is connected to terminal 3 and the negative (–) is connected to terminal 2.



CALIBRATION

Front-mounted Zero and Span potentiometers for each channel can be used to compensate for load and lead variations.

1. Apply power to the module and allow a minimum 30 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: for 4-20 mA output, the Zero control will provide adjustment for 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.
6. Repeat adjustments for second channel.

TEST BUTTONS

The Test pushbuttons are factory set to provide approximately 50% output. When depressed they will drive the output side of the loop with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When released, the output will return to normal.

OPERATION

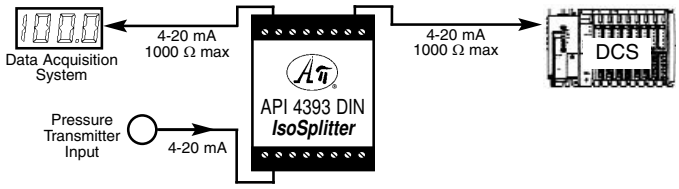
GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.

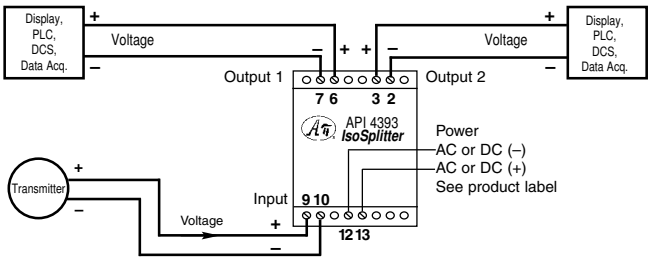
API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

TYPICAL APPLICATION

The API 4393 DIN IsoSplitter is useful where a 4-20 mA signal must be independently output to two devices. The output from a pressure transmitter needs to be monitored in two separate locations. The DCS is used for the control system and another device is used for data acquisition. The API 4393 DIN IsoSplitter provides two independent 4-20 mA loops from one input and provides isolation for each loop.

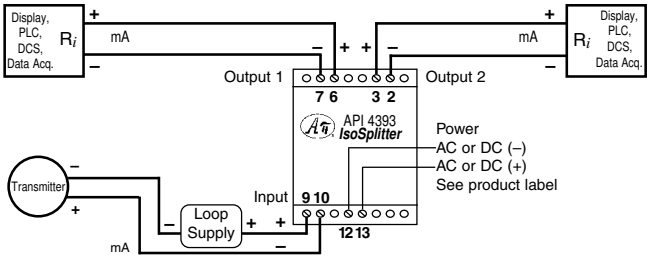


4393 DIN WITH VOLTAGE INPUT & OUTPUT



Voltage Inputs and Outputs

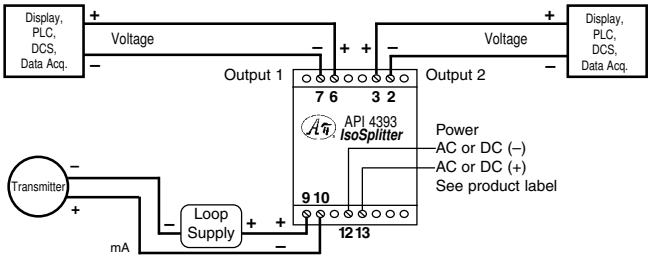
4393 DIN WITH CURRENT INPUT & OUTPUT



Current Input and Outputs

API 4393 input sources current. Both API 4393 outputs source current.

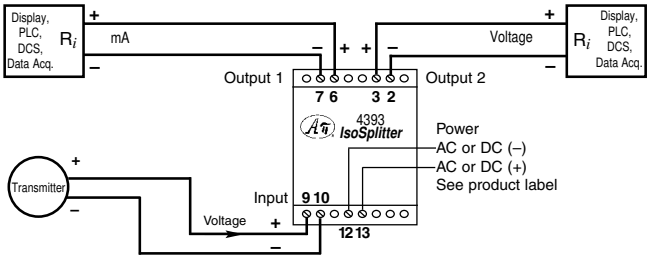
4393 DIN WITH CURRENT INPUT & VOLTAGE OUTPUT



Current Input and Voltage Outputs

API 4393 input sources current.

4393 DIN WITH VOLTAGE IN & CURRENT & VOLTAGE OUT



Voltage Input and Output 1 Current and Output 2 Voltage

API 4393 output 1 sources current.

DC to DC Signal Isolator/Splitter

API 4393 DIN L1 IsoSplitter™

DC Input

1 Input: ***4-20 mA***

2 Outputs: ***4-20 mA Source or Sink***

- ***Single 4-20 mA Input & Dual 4-20 mA Outputs***
- ***2000 V Power/Input/Output/Channel Isolation***
- ***Full Isolation Eliminates Ground Loops***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton for Each Channel***
- ***Independent Zero and Span for Each Channel***

LIFETIME WARRANTY



Free Factory Input & Output Calibration!

Applications

- **Isolate, Split, Rescale Process Signals**
- **Send One Process Signal to Two Locations**
- **Provides Optimal Isolation Between These and Others**
  DCS: TBI-Bailey (ABB), Fisher-Rosemount (DeltaV™)
  PLC: ABB, Allen Bradley (Micrologix™, Flex I/O™)
  BAS: ABB, Siemens, Johnson Controls, Invensys

Specifications

Input Range
4 to 20 mA powered by internal +18 VDC unregulated loop power source

Input Voltage Burden
2 VDC maximum, 100 Ω nominal at 20 mA

Input Loop Supply
18 VDC nominal, unregulated, 25 mADC

Output Range and Type

Model	Channel 1	Channel 2
API 4393 L1	4-20 mA source	4-20 mA source
API 4393 L1 EX1	4-20 mA sink	4-20 mA source
API 4393 L1 EX2	4-20 mA source	4-20 mA sink
API 4393 L1 EX3	4-20 mA sink	4-20 mA sink

Sinking outputs do not provide power and require an external loop supply

Output Drive
1000 ohms at 20 VDC typical

Output Linearity
Better than ±0.1% of span

Output Ripple and Noise
Less than 10 mV_{RMS}

Output Zero and Span
Independent multiturn zero and span potentiometers for each output channel to compensate for load and lead variations
±15% of span adjustment range typical, low interaction: <0.001 ppt

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

Functional Test Buttons
Sets output to test level when pressed. One per output channel.
Factory set to drive output to approximately 50% of span

Response Time
70 milliseconds typical

Isolation
2000 V_{RMS} minimum
Full isolation: power to channel, input to output, channel to channel

Common Mode Rejection
120 dB minimum

Ambient Temperature Range and Stability
–10°C to +60°C operating ambient. Better than ±0.04% of span/°C stability.

Power Supplies
Input power supply fuse protected and fully isolated

Standard:	115 VAC ±10%, 50/60 Hz, 5 W max., linear type
A230 option:	230 VAC ±10%, 50/60 Hz, 5 W max., linear type
D option:	9-30 VDC, 5 W typical, switching type

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Description and Features

The **API 4393 L1** series ***IsoSplitters*** are used for splitting a single 2-wire 4-20 mA transmitter signal into two isolated 4-20 mA outputs. Typical applications include isolation, output splitting, output device separation and redundancy (to prevent control loop failure if one loop fails), or a combination of these. The optical isolation between the input and outputs make this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

This product is designed to function effectively in electrically noisy industrial environments. It is designed to provide signal compatibility with recorders, data loggers, computers programmable logic controllers, and process transmitters.

The API 4393 L1 series features an internal 18 VDC isolated loop power supply for the input loop. API 4393 L1 versions are available with sourcing and/or sinking outputs. Sourcing outputs normally have current flowing out of the device output lead and furnish power (current) to the circuit. Sinking outputs (such as open collector outputs) normally have current flowing into the device output lead and require an external power supply in the circuit.

API exclusive features include two ***LoopTracker*** LEDs and **Functional Test Pushbuttons** for each channel. The LoopTracker LEDs (Green for input, Red for output) vary in intensity with changes in the process input and output signals and 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. This output is factory set to approximately 50% of the output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The modules clip to an industry standard 35 mm DIN rail or they can be surface mounted.

Models & Options

Factory Configured—Please specify model, power, and options

Model	4-20 mA Input	4-20 mA Ch. 1	4-20 mA Ch. 2
API 4393 L1	Source	Source	Source
API 4393 L1 EX1	Source	Sink	Source
API 4393 L1 EX2	Source	Source	Sink
API 4393 L1 EX3	Source	Sink	Sink

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 TK36	DIN rail, 35 mm W x 39" L, aluminum
API 535	Polycarbonate NEMA 4X enclosure for 1 module

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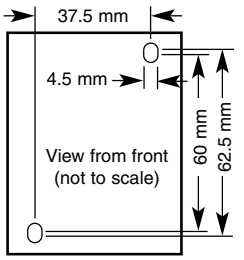
API 4393 DIN L1 IsoSplitter™

Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by a qualified electrician or instrumentation engineer. See wiring examples at right or consult factory for assistance.

The housing can be clipped to a standard 35 mm DIN rail or surface mounted. Each product is factory configured to your exact input and output requirements as indicated on the product label. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

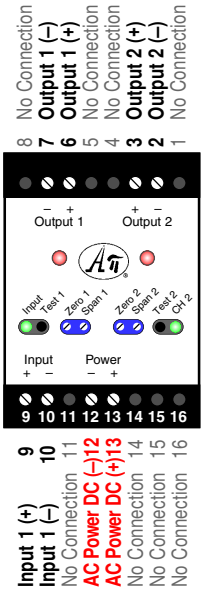


Surface mounting dimensions

Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 12 and 13. For DC-powered versions positive (+) is connected to terminal 13 and negative (–) is connected to terminal 12.

Signal Input Terminals – Polarity must be observed when connecting the signal input. The positive connection (+) is applied to terminal 9 and the negative (–) is applied to terminal 10.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) for channel 1 is connected to terminal 6 and the negative (–) is connected to terminal 7. The positive connection (+) for channel 2 is connected to terminal 3 and the negative (–) is connected to terminal 2.



CALIBRATION

Front-mounted Zero and Span potentiometers for each channel can be used to compensate for load and lead variations.

1. Apply power to the module and allow a minimum 30 minute warm up time.
2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
3. Using an accurate measurement device for 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. This will produce the corresponding minimum output signal. Example: for 4-20 mA output, the Zero control will provide adjustment for 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
5. Repeat adjustments for maximum accuracy.
6. Repeat adjustments for second channel.

TEST BUTTONS

The Test pushbuttons are factory set to provide approximately 50% output. When depressed they will drive the output side of the loop with a known good signal that can be used as a diagnostic aid during initial start-up or troubleshooting. When released, the output will return to normal.

OPERATION

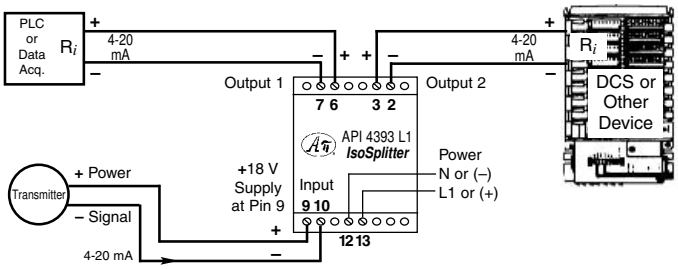
GREEN *LoopTracker*® Input LED – Provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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

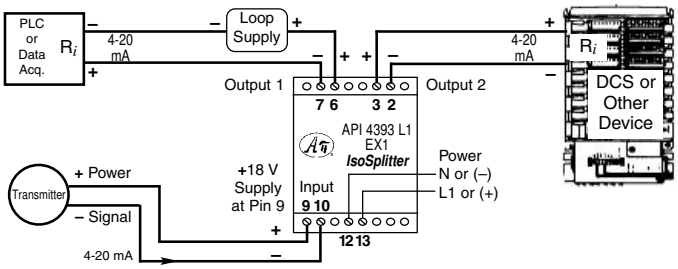
TYPICAL WIRING API 4393 L1

Use the API 4393 L1 IsoSplitter when a 2-wire loop-powered (passive) transmitter signal must be output to two passive devices. The API 4393 L1 output loop power supplies drive each output channel.



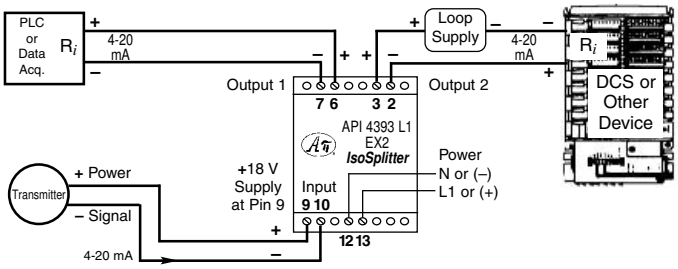
TYPICAL WIRING API 4393 L1 EX1

Use the API 4393 L1 EX1 IsoSplitter when a 2-wire loop-powered (passive) transmitter signal is output to two loops where the device on Output 1 uses an external loop power supply or provides its own power to the loop, and the loop on Output 2 is powered by the API 4393 L1 EX1.



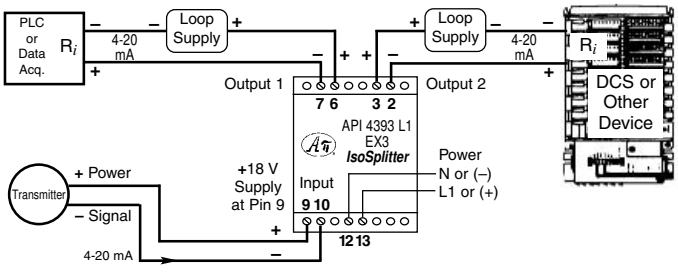
TYPICAL WIRING API 4393 L1 EX2

Use the API 4393 L1 EX2 IsoSplitter when a 2-wire loop-powered transmitter signal is output to two loops where the loop on Output 1 is powered by the API 4393 L1 EX2 and the device on Output 2 uses an external loop power supply or provides its own power to the loop.



TYPICAL WIRING API 4393 L1 EX3

Use the API 4393 L1 EX3 IsoSplitter when a 2-wire loop-powered transmitter signal is output to two loops where each device has an integral loop supply or uses an external loop power supply as a drive source.



Loop-Powered Passive Isolators
Single and Dual Channel

API LPI-1, API LPI-2

DC Input

Input: ***4-20 mA DC***
Output: ***4-20 mA DC***

- ***Single or Twin Pack Fully Isolated Transmitters***
- ***High Output Drive***
- ***Low Input Voltage Burden***
- ***Output LoopTracker® LED***
- ***Functional Test Switch***

Applications

- **Isolate 4-20 mA Process Signals**
- **Isolate Two Loops With One API LPI-2**
- **Eliminate Ground Loops, Reduce Noise Effects**



LIFETIME WARRANTY

Free Factory Input & Output Calibration!

c UL us

Specifications

Inputs

API LPI-1	One channel:	4 to 20 mADC
API LPI-2	Channel 1:	4 to 20 mADC
	Channel 2:	4 to 20 mADC

System voltages must not exceed socket voltage rating.

Input Voltage Burden

Approximately 9 VDC at 20 mA
See graph on back

Outputs

API LPI-1	One channel:	4 to 20 mADC
API LPI-2	Channel 1:	4 to 20 mADC
	Channel 2:	4 to 20 mADC

Output Drive Capability

Up to 1000 Ω with 20 V compliance at 20 mA at 30 VDC or approximately 750 Ω at 24 VDC depending on the supply voltage of the input loop.
See graph on back.

Change in Load Effect

Less than ±0.08% of span for load changes from 0 Ω to 1000 Ω

Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±10% of span adjustment range typical

LoopTracker®

Continuous visual indication of output loop current
LED brightness varies with current level over 4-20 mA range

Functional Test Switch

Momentary contact switch with spring-loaded return
Sets output to calibration reference level of 4 mA to allow testing of module circuits and output loop

Calibration Reference Level

4.0 mA ±0.10 mA
Requires a minimum of 4 mA input current

Isolation

API LPI-1	1200 V_{RMS} minimum, input to output
API LPI-2	1200 V_{RMS} minimum, input to output, channel to channel

Accuracy

Combined effects of linearity, hysteresis, and repeatability
±0.1% span per °C

Response Time

60 milliseconds typical

Common Mode Rejection

Negligible output effect for 50/60 Hz common mode signals

Ambient Temperature Range

–10°C to +60°C operating

Temperature Stability

Better than ±0.2% of span per °C

Description and Features

The **API LPI-1** is a single channel loop-powered isolator that accepts a 4-20 mADC input and provides a linear and isolated output current proportional to the input.

The **API LPI-2** contains two completely independent and identical channels in the same housing. When calculating power usage and reviewing specifications, consider each channel separately.

The **API LPI-1** and each channel of the **API LPI-2** function as two-wire transmitters that derive their operating power from the input loop eliminating the need for external power supplies and additional power wiring.

Due to the unique design, the calibration and linearity of each channel is unaffected by output load changes from 0 to 1000 Ω. The **API LPI-1** and **API LPI-2** provide a cost effective, drop-in solution for eliminating the ground loops and noise problems commonly found in process loops.

API exclusive features include two ***LoopTracker*** LEDs and a **Functional Test Switch**. The API LPI-2 has one LED and one switch for each channel.

The LoopTracker LED varies in intensity with changes in the process input signal. The LED will extinguish if either the input or output loops should open. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The spring return functional test switch substitutes a stable 4.0 mADC signal into the input loop to allow easy calibration or system testing without the need for external calibrators or wiring modifications. Both the LoopTracker LEDs and functional test switch greatly aid in saving time during initial startup and/or troubleshooting.

The **API LPI-1** and **API LPI-2** modules plug into an industry standard 8-pin socket sold separately. The convenient plug-in design simplifies installation and wiring. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

Models & Options

Factory configured for 4-20 mA input and output

API LPI-1	Loop-powered 4-20 mA isolator, single channel
API LPI-2	Loop-powered 4-20 mA isolator, 2 channel

Optional—Add to end of model number

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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API LPI-1, API LPI-2 Installation and Setup

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.

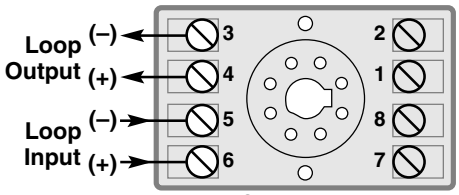
Signal Input – Polarity must be observed when connecting the signal input.

Signal Output – Polarity must be observed when connecting the signal output to the load.

API LPI-1 Single Loop

API LPI-1 Input
Terminal 5 negative (–)
Terminal 6 positive (+)

API LPI-1 Output
Terminal 3 negative (–)
Terminal 4 positive (+)



Socket top view

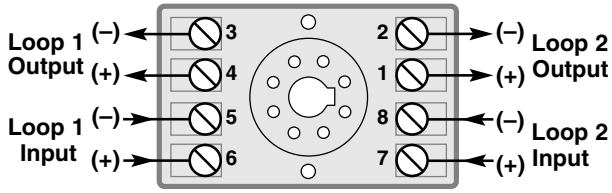
API LPI-2 Dual Loop

API LPI-2 Loop 1 Input
Terminal 5 negative (–)
Terminal 6 positive (+)

API LPI-2 Loop 1 Output
Terminal 3 negative (–)
Terminal 4 positive (+)

API LPI-2 Loop 2 Input
Terminal 8 negative (–)
Terminal 7 positive (+)

API LPI-2 Loop 2 Output
Terminal 2 negative (–)
Terminal 1 positive (+)



Socket top view

CALIBRATION

The API LPI-1 and API LPI-2 are factory calibrated and should not require recalibration in the field for loads of 0-1000 Ω.

On the API LPI-2, each channel is totally independent from the other and each input is isolated from its corresponding output.

Should recalibration (fine-tuning) be desired, independent Zero and Span controls (one set for each channel of the API LPI-2) are accessible through the top of the unit to adjust the module's output.

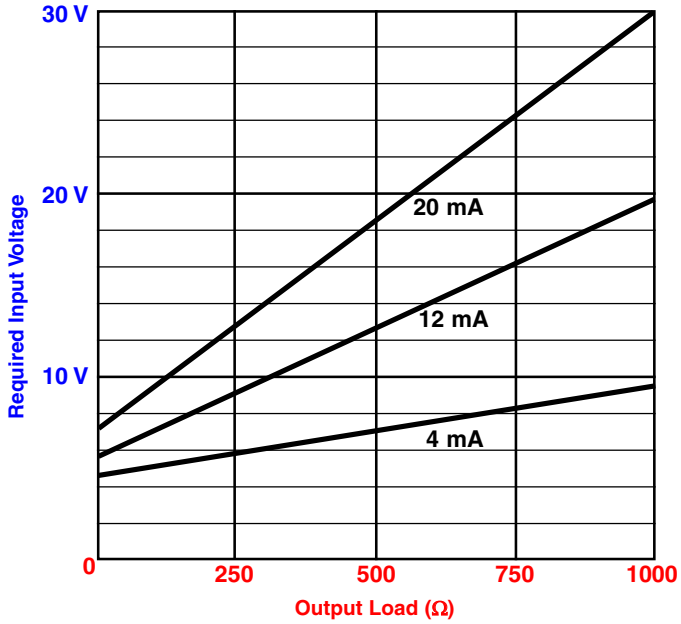
1. Wire unit as shown, apply power to the input and output loops, and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide a 4 mA input to module.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer to 4 mA. The Zero control should only be adjusted when the input signal is at its minimum. This will produce a 4 mA output signal.
4. Using an accurate calibration source, provide 20 mA input to module.
5. Using an accurate measurement device for the output, adjust the Span potentiometer to 20 mA. The Span control should only be adjusted when the input signal is at its maximum. This will produce a 20 mA output signal.
6. Repeat adjustments for the second channel on the API LPI-2.

TEST SWITCH

The Test switch may be used to drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal which can be used as a system diagnostic aid during initial start-up or during troubleshooting. This test signal is factory set to 4 mA. When the switch is released, the output will return to normal.

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

INPUT VOLTAGE BURDEN CHART

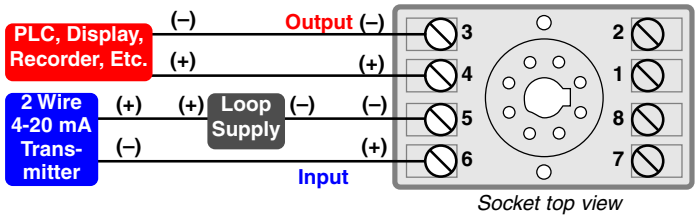


NOTE: The required input voltage is for one channel only.

OPERATION

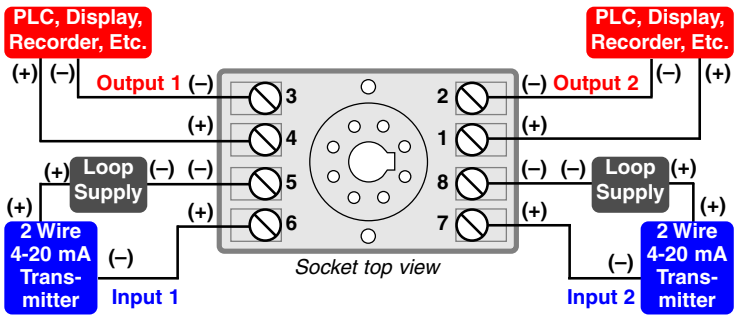
The API LPI-1 and API LPI-2 are passive devices that draw a small amount of power from the input loop to operate their isolation circuitry.

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. The RED LED will only light if the output loop current path is complete. 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.



Socket top view

API LPI-1 typical wiring



Socket top view

API LPI-2 typical wiring

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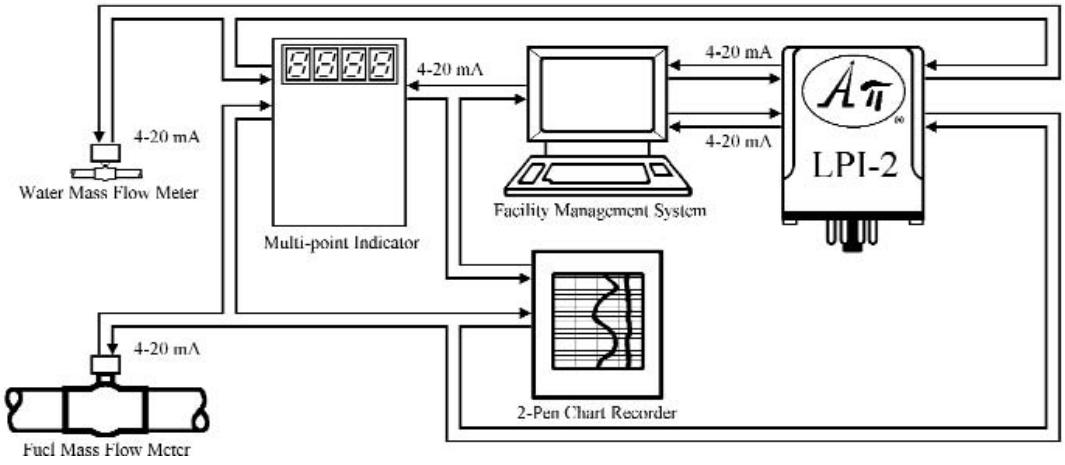
Monitoring and Recording Mass Flow and Mass Flow Ratio

PROBLEM

A natural gas turbine is equipped with water injection to satisfy environmental regulations. Mass flow meters are installed on the fuel and water injection lines to the turbine, and are monitored by a local multi-point indicator which also calculates, displays and provides an analog output of the water to fuel mass flow ratio. The fuel mass flow and the water to fuel mass flow ratio need to be plotted on a 2-pen chart recorder and also be monitored by a computer-based facility management system. The mass flow meters and the multi-point indicator are independently self-powered.

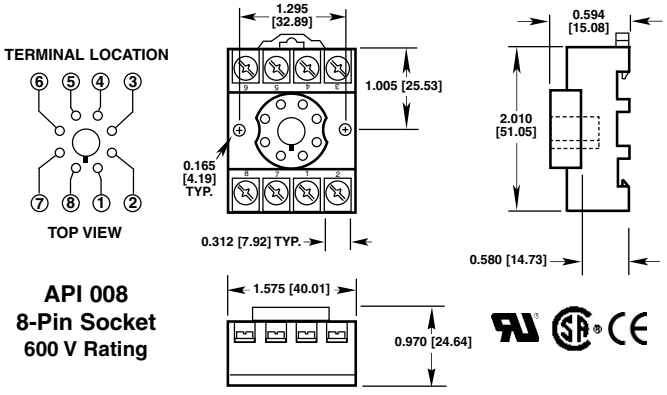
SOLUTION

Use an **API LPI-2** Loop Powered Isolator Twin-Pack module to prevent ground loops.

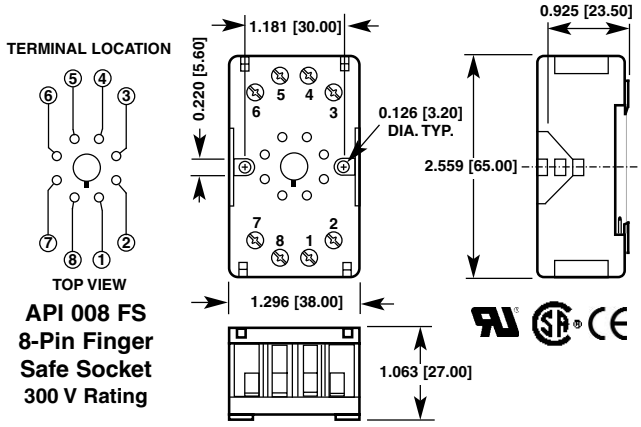


The **API LPI-2** allows the Facility Management System computer to monitor both the inputs and the output of the multi-point indicator without introducing errors due to ground loops.

API Sockets API 008 and API 008 FS



API 008
8-Pin Socket
600 V Rating



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



FREE APPLICATION ASSISTANCE
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What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

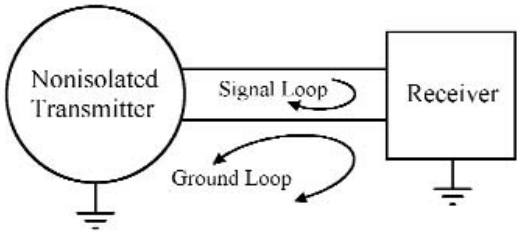


Figure 1. *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

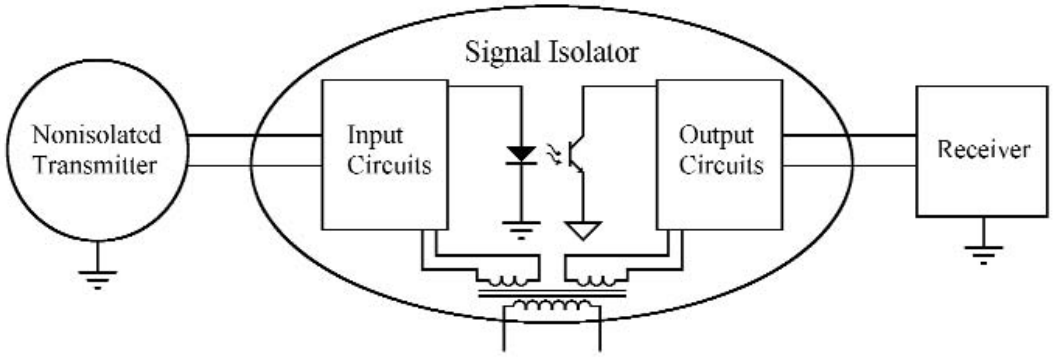


Figure 2. *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*



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

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

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Loop-Powered Passive Isolator
Dual Channel

API DPI-2

DC Input

Two Inputs: ***4-20 mADC***
Two Outputs: ***4-20 mA DC***

- ***2 Fully Independent Loop Powered Isolators***
- ***1000 Ω Output Drive Capability***
- ***Calibration Unaffected by Change in Load***
- ***Compact 22.5 mm Wide DIN Style Case***
- ***Output LoopTracker® LED***

LIFETIME WARRANTY



Free Factory Input & Output Calibration!

Applications

- **Isolate 4-20 mA Process Signals**
- **Isolate Two Loops With One API DPI-2**
- **Eliminate Ground Loops, Reduce Noise Effects**

Specifications

Inputs
Channel A: 4 to 20 mADC
Channel B: 4 to 20 mADC

Input Voltage Burden
See graph on back

Outputs
Channel A: 4 to 20 mADC
Channel B: 4 to 20 mADC

Output Load Capability
Up to 1000 Ω with 20 V compliance at 20 mA
depending on the supply voltage of the input loop

Change in Load Effect
Less than ±0.08% of span for load changes from 0 Ω to 1000 Ω

Output Zero and Span
Multiturn potentiometers to compensate for load and lead variations, ±10% of span adjustment range typical

LoopTracker
Continuous indication of current flow in the output loop
LED brightness varies with current level over 4-20 mA range

Accuracy
Combined effects of linearity, hysteresis, and repeatability
±0.1% span per °C maximum

Response Time
60 milliseconds typical

Common Mode Rejection
Negligible output effect for 50/60 Hz common mode signals

Isolation
1200 V_{RMS} minimum, input to output

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

Temperature Stability
Better than ±0.2% of span per °C

Case Material
Polycarbonate
Gray UL #94V-1 housing and black UL #94V-2 terminals

Description and Features

The **API DPI-1** is a two channel loop-powered isolator that accepts two separate 4-20 mADC inputs and provides two linear and isolated 4-20 mA outputs. The **API LPI-2** contains two completely independent and identical channels in the same housing. When calculating power usage and reviewing specifications, consider each channel separately. The **API LPI-2** derive their operating power from the input loop eliminating the need for external power supplies and additional power wiring.

Due to the unique design, the calibration and linearity of each channel is unaffected by output load changes from 0 to 1000 Ω. The **API LPI-2** provides a cost effective, drop-in solution for eliminating the ground loops and noise problems commonly found in process loops.

API exclusive features include two ***LoopTracker*** LEDs for each channel. The LoopTracker LED varies in intensity with changes in the process input signal. The LED will extinguish if either the input or output loops should open. Monitoring the state of these LEDs can provide a quick visual picture of your process loop and saves time during initial startup and/or troubleshooting.

The API DPI-2 is factory calibrated and should not require re-calibration in the field for loads up to 1000 Ω. Each channel is totally independent from the other and each input is optically isolated from its corresponding output.

Should re-calibration (fine-tuning) be desired, independent Zero and Span controls for each channel are accessible through the front of the unit.

The **API DPI-2** is designed to mount on an industry-standard DIN rail. The narrow 22.5 mm DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density with as many as 36 channels (18 modules) in a 19-inch rack.

Models & Options

Factory Configured for 4-20 mA input and output

API DPI-2 Loop-powered 4-20 mA isolator, 2 channel

Optional—Add to end of model number

U Conformal coating for moisture resistance

Accessories—Order as separate line item

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 is mounted to an industry-standard DIN rail. Use **API TK36 DIN** rail.

Signal Input – Polarity must be observed when connecting the signal input.

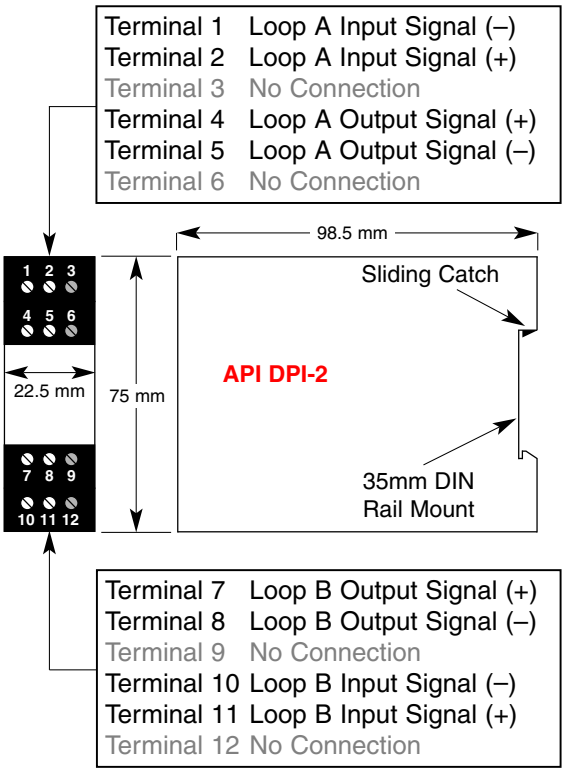
Signal Output – Polarity must be observed when connecting the signal output to the load.

API DPI-2 Loop A Input
Terminal 1 negative (–)
Terminal 2 positive (+)

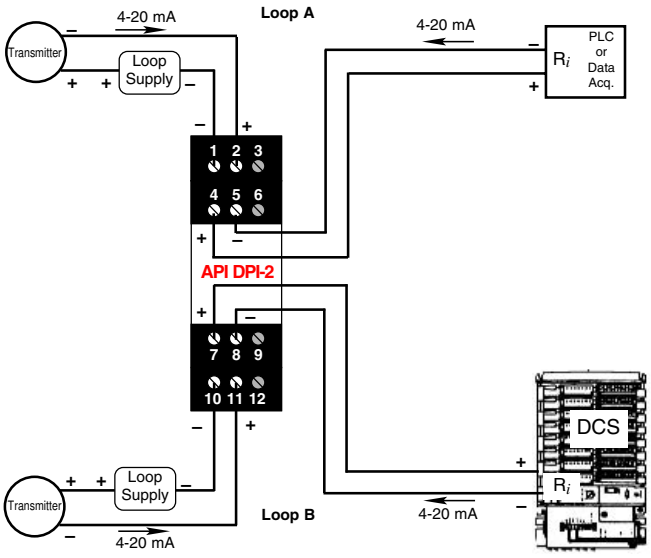
API DPI-2 Loop A Output
Terminal 4 negative (–)
Terminal 5 positive (+)

API DPI-2 Loop B Input
Terminal 8 negative (–)
Terminal 7 positive (+)

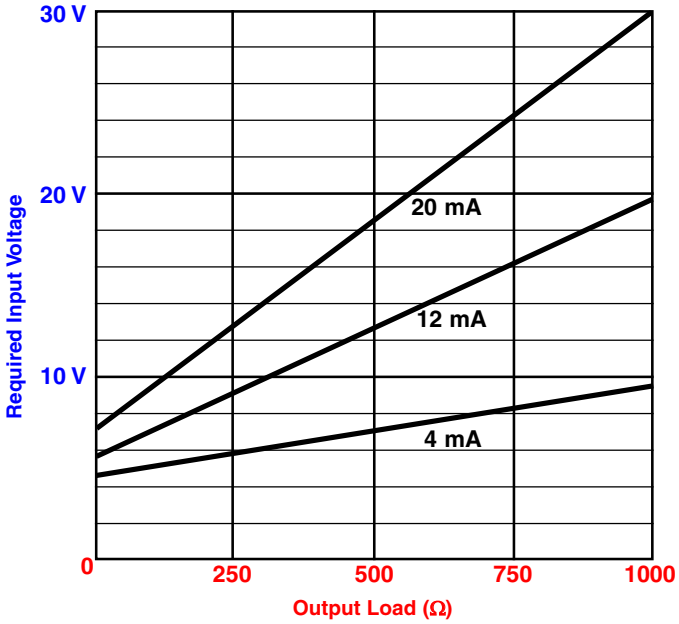
API DPI-2 Loop B Output
Terminal 10 negative (–)
Terminal 11 positive (+)



WIRING EXAMPLE



INPUT VOLTAGE BURDEN CHART



NOTE: The required input voltage is for one channel only.

CALIBRATION

The **API DPI-2** is factory calibrated and should not require recalibration in the field for loads of 0-1000 Ω.

Each channel is totally independent from the other and each input is isolated from its corresponding output.

Should recalibration (fine-tuning) be desired, independent Zero and Span controls for each channel are accessible through the front of the unit to adjust the module's output.

1. Wire unit as shown, apply power to the input and output loops, and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide a 4 mA input to module.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer to 4 mA. The Zero control should only be adjusted when the input signal is at its minimum. This will produce a 4 mA output signal.
4. Using an accurate calibration source, provide 20 mA input to module.
5. Using an accurate measurement device for the output, adjust the Span potentiometer to 20 mA. The Span control should only be adjusted when the input signal is at its maximum. This will produce a 20 mA output signal.
6. Repeat adjustments for the second channel on the **API DPI-2**.

OPERATION

The **API DPI-2** is a passive device which draws a small amount of power from the input loop to operate its isolation circuitry.

The RED ***LoopTracker*** output LEDs provide a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. The RED LED will only light if the output loop current path is complete. 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.

FAQ

Can the API DPI-2 have an input of 0-20 mA and an output of 0-20 mA?

No. The loop-powered device requires a minimum of 4 mA to supply power to the module.

What is the maximum 4-20 mA input loop voltage for the API DPI-2?

60 VDC is the maximum voltage that can be used to power the input loop.

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

Regulated DC Power Supplies — API 9046 Series

Input: *115 VAC or Optional 230 VAC*
Output: *5 VDC to 32 VDC or ±5 VDC to ±15 VDC*

- ***Wide Range of Output Voltages***
- ***High Output Capability***
- ***Conservative Design for High Reliability***
- ***Available as 115 VAC or 230 VAC Powered***
- ***Power Indicator LED***
- ***Output Power LED***

Applications

- **Power Passive 4-20 mA Sensors**
- **Plug-in Spare Loop Supply**
- **Reliable, Proven Design**

Specifications

Input Voltage

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

Output Voltages and Currents

Model	Voltage	Current
API 9046-05	5 VDC	250 mA
API 9046-06	6 VDC	200 mA
API 9046-09	9 VDC	150 mA
API 9046-10	10 VDC	140 mA
API 9046-12	12 VDC	125 mA
API 9046-15	15 VDC	100 mA
API 9046-18	18 VDC	85 mA
API 9046-24	24 VDC	75 mA
API 9046-28	28 VDC	60 mA
API 9046-32	32 VDC	50 mA
API 9046-CH-05	±5 VDC	150 mA
API 9046-CH-06	±6 VDC	150 mA
API 9046-CH-12	±12 VDC	150 mA
API 9046-CH-15	±15 VDC	150 mA

Other output voltages available
Consult factory with your requirements

Noise and Ripple

Less than 5 mV

Regulation

Line: Less than ±0.5% of output for V_{in} ±10%
Load: Less than ±3% for load range of 10 to 100% of rating

Output Adjustment (9046)

Potentiometer for fine output adjustment
±10% of span adjustment range typical

Output Adjustment (9046-CH)

None

Ambient Temperature Range

–10°C to +60°C operating ambient



Description and Features

The **API 9046** power supplies are designed to provide DC power to two-wire transmitters, panel meters, or any device requiring a source of well-regulated DC voltage.

The **API 9046-CH** bipolar power supplies are designed to work with devices requiring dual, balanced DC supplies with excellent line and load regulation while maintaining output voltage ripple at a minimum.

Features include a power indicator LED and short-circuit protection for the output. The transformer secondary is full-wave rectified, filtered and regulated. The designs include high-rated temperature components, increased regulator heat sinking for excellent reliably, and greater output current capabilities than competitive designs. Input voltages of 115 VAC or 230 VAC are factory configured via a dual primary power transformer.

API 9046 output voltage is factory selected and may be fine-tuned by adjusting the top-accessible output voltage fine adjust potentiometer.

The **API 9046** and **API 9046-CH** plug into an industry standard 8-pin socket sold separately. The convenient plug-in design simplifies installation and wiring. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

Models & Options

API 9046-05	5 VDC output, 115 VAC powered
API 9046-06	6 VDC output, 115 VAC powered
API 9046-09	9 VDC output, 115 VAC powered
API 9046-10	10 VDC output, 115 VAC powered
API 9046-12	12 VDC output, 115 VAC powered
API 9046-15	15 VDC output, 115 VAC powered
API 9046-18	18 VDC output, 115 VAC powered
API 9046-24	24 VDC output, 115 VAC powered
API 9046-28	28 VDC output, 115 VAC powered
API 9046-32	32 VDC output, 115 VAC powered
API 9046-CH-05	±5 VDC output, 115 VAC powered
API 9046-CH-06	±6 VDC output, 115 VAC powered
API 9046-CH-12	±12 VDC output, 115 VAC powered
API 9046-CH-15	±15 VDC output, 115 VAC powered

Optional—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
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
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www.mod-tronic.com

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API 9046 Series — Installation and Setup

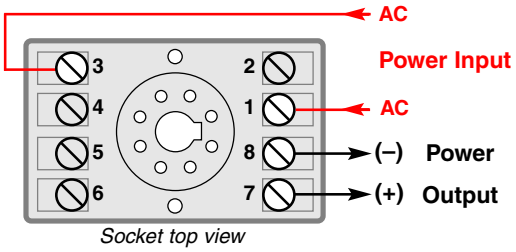
ELECTRICAL CONNECTIONS

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 – Power supplies operate on 115 VAC. Models with A230 option operate on 230 VAC.

Power Output – Polarity must be observed when connecting the power output to the load.

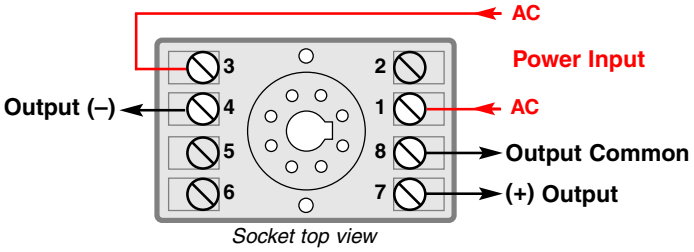
API 9046 Power Input	API 9046 Output
Terminal 1 AC	Terminal 8 negative (–)
Terminal 3 AC	Terminal 7 positive (+)



Socket top view

API 9046 Series

API 9046-CH Power Input	API 9046-CH Output
Terminal 1AC	Terminal 4 negative (–)
Terminal 3 AC	Terminal 7 positive (+)
	Terminal 8 output common



Socket top view

API 9046-CH Bipolar Output Models

CALIBRATION

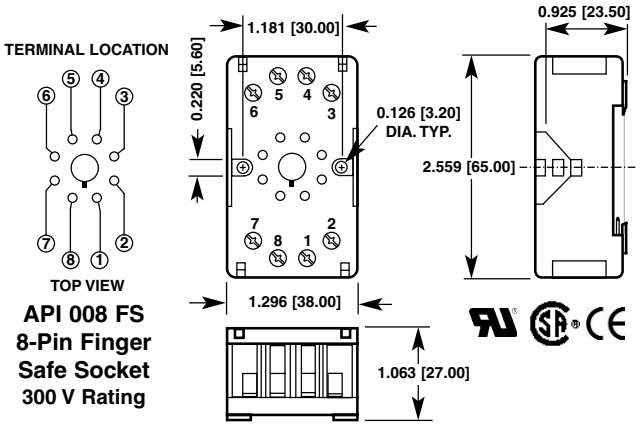
The **API 9046** is factory calibrated and should not require recalibration in the field. Should recalibration (fine-tuning) be desired, an Output Adjust potentiometer is accessible through the top of the unit to adjust the voltage output for non-CH models.

1. Wire unit as shown, apply power, and allow a minimum 20 minute warm-up time.
2. Using an accurate voltmeter, adjust the Output Adjust potentiometer to the desired voltage.

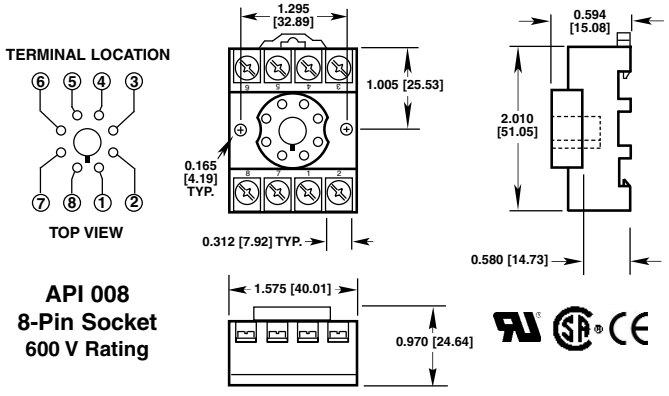
OPERATION

The dual-primary transformer is factory-configured for 115 VAC or 230 VAC operation. The transformer secondary is full-wave rectified, filtered and regulated by an adjustable IC regulator which also provides output short-circuit protection.

Output voltage is factory selected and may be fine-tuned by adjusting the output voltage fine adjust potentiometer on non-CH models. The RED power LED provides a visual indication that the unit is functioning. Failure to illuminate may indicate a problem with the module power.



API 008 FS Finger-Safe Socket



API 008 Socket

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

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