DC to DC Transmitter

Discontinued
See API 4300 G

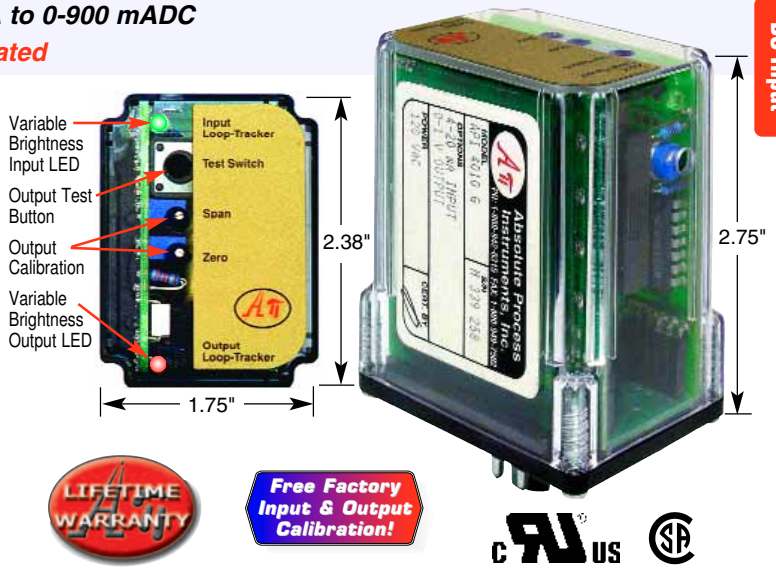
API 4010 G

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***

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

ABSOLUTE PROCESS INSTRUMENTS, Inc. api-usa.com
1220 American Way
Libertyville, IL 60048
Phone: 800-942-0315
Fax: 800-949-7502

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	

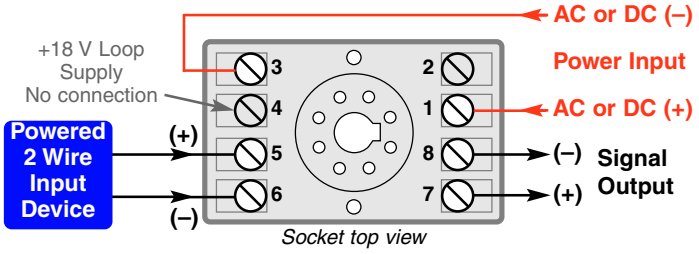
Common Voltage Outputs
0 to 1 V
0 to 5 V
1 to 5 V
0 to 10 V
±5 V
±10 V
Common Current Outputs
0 to 20 mA
4 to 20 mA

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.

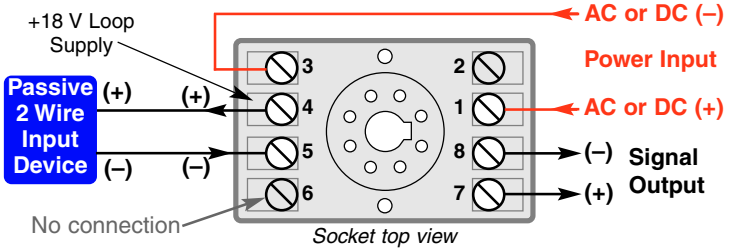
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

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.

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.

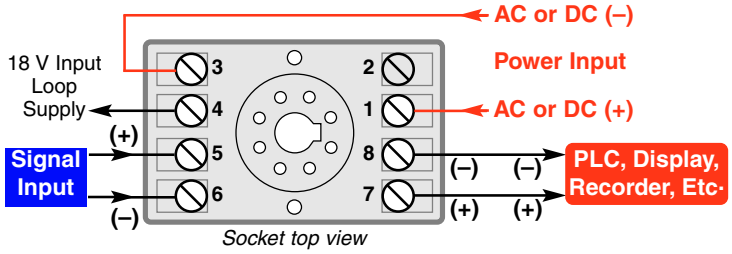
Example: If you are checking a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be approximately 12 mA.

OPERATION

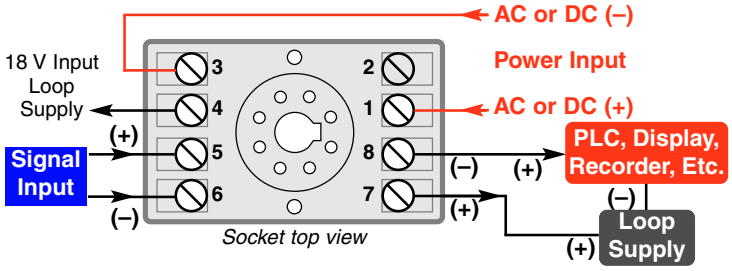
The API 4010 G is factory configured to your exact input and output requirements. The input is filtered, either amplified or attenuated as required, then passed through to the output stage.

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

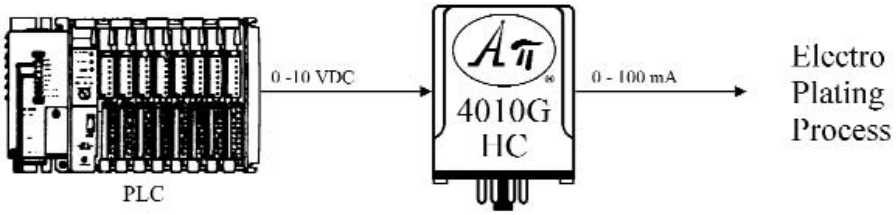
Converting a Control Signal for a Process

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.

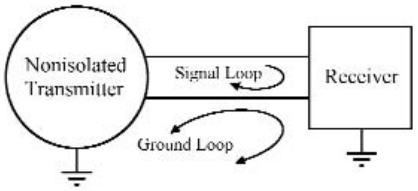


Figure 1. *Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.*

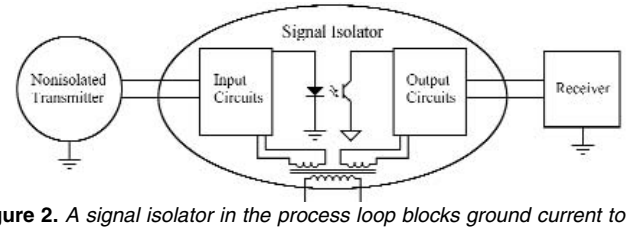
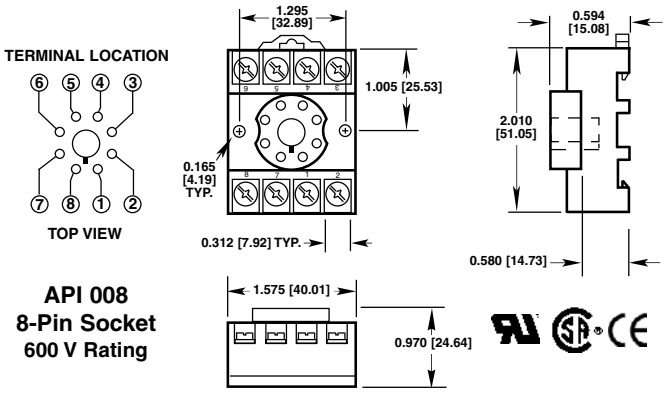
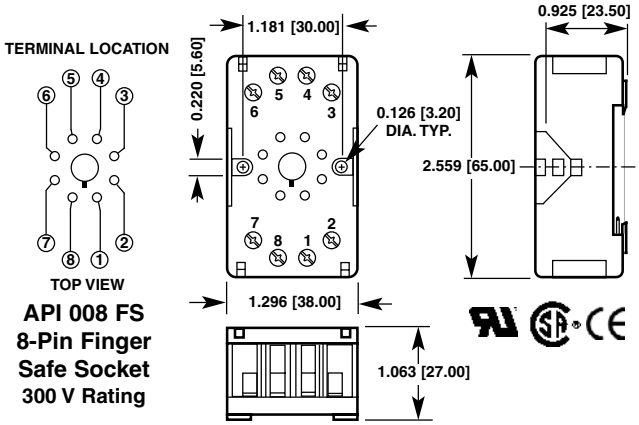


Figure 2. *A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.*

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
800-942-0315

ABSOLUTE PROCESS INSTRUMENTS, Inc. api-usa.com
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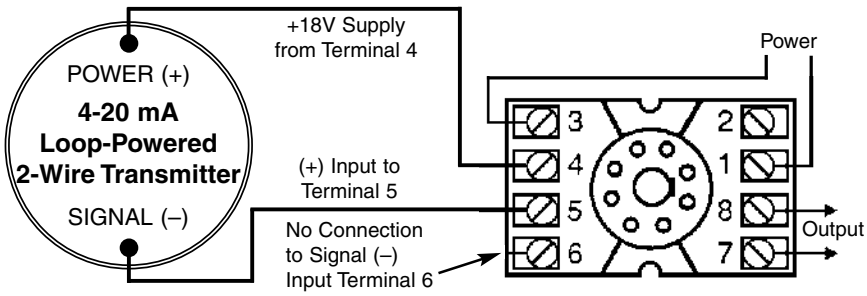
Fax: 800-949-7502

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