

**Input:** 0-25 Hz to 0-20 kHz

**Output:** 0-1 V to 0-10 VDC,  $\pm 1$  VDC to  $\pm 10$  VDC, 0-1 mA to 20 mADC

- Precision Frequency to DC Converter
- Plug In Design for Faster Installation
- Full 2000 V Input/Output/Power Isolation
- Input and Output LoopTracker® LEDs
- Functional Test Button
- Built-In Loop Power Supply for Output

### Applications

- Monitor and Control Motor or Line Speed
- Convert Speed and Frequency Signals
- Simplify Interfacing of Frequency Sensors

### Frequency Input Range

Factory configured, please specify input range  
 Frequency: 0-25 Hz to 0-20 kHz  
 5  $\mu$ sec minimum pulse, 100 mV minimum amplitude change

### Input Amplitude Range

100 mV to 150 V<sub>RMS</sub>

### Input Impedance

10 k $\Omega$  nominal (maximum sensitivity)  
 100 k $\Omega$  nominal (minimum sensitivity)

### Input Sensitivity/Hysteresis

Single turn potentiometer for sensitivity adjustment  
 Maximum sensitivity:  $\pm 25$  mV typical  
 Minimum sensitivity:  $\pm 2.5$  V typical

### Input Protection

Normal mode: 200% of input rating  
 Common mode: 600 VDC or 600 VACp input to ground  
 System voltages must not exceed socket voltage rating

### Input Power Supply

18 VDC  $\pm 10\%$ , unregulated, 25 mADC, max. ripple, <1.5 V<sub>P-P</sub>  
 May be used to power sensor

### LoopTracker

Variable brightness LEDs indicate I/O loop level and status

### DC Output Range

Factory configured, please specify output range  
 Voltage: 0-1 VDC to 0-10 VDC  
 Bipolar voltage:  $\pm 1$  VDC to  $\pm 10$  VDC  
 Current: 0-2 mADC to 0-20 mADC  
 20 V compliance, 1000  $\Omega$  at 20 mA

### Output Calibration

Multi-turn zero and span potentiometers  
 $\pm 15\%$  of adjustment range typical

### Output Loop Power Supply

20 VDC nominal, regulated, 25 mADC, max. ripple <10 mV<sub>RMS</sub>

### Output Test

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

### Output Ripple and Noise

Less than 10 mV<sub>RMS</sub>

### Linearity

Better than  $\pm 0.3\%$  of span

### Ambient Temperature Range and Stability

-10°C to +60°C operating ambient  
 Better than  $\pm 0.02\%$  of span per °C stability, calculated, not tested

### Response Time

70 milliseconds typical

### Isolation

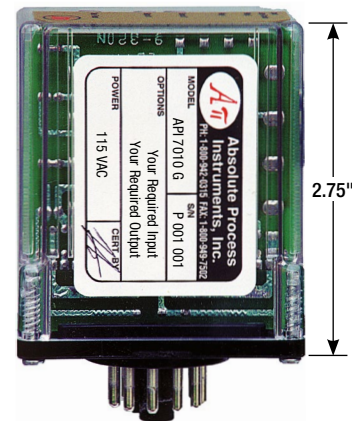
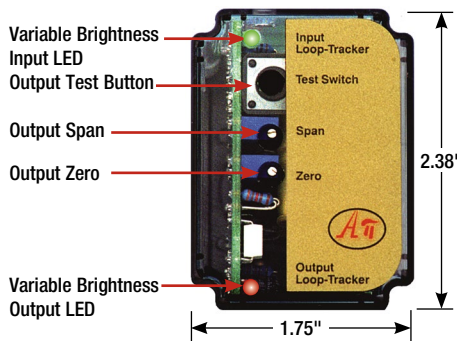
2000 V<sub>RMS</sub> minimum  
 Full isolation: power to input, power to output, input to output

### Installation Environment

IP 40, requires installation in panel or enclosure  
 Use with API 008 or API 008 FS socket  
 Socket mounts to 35 mm DIN rail or can be surface mounted  
 UL 508C pollution degree 2 environments or better

### Power

Standard: 115 VAC  $\pm 10\%$ , 50/60 Hz, 2.5 W max.  
 A230 option: 230 VAC  $\pm 10\%$ , 50/60 Hz, 2.5 W max.  
 P option: 85-265 VAC 50/60 Hz, 60-300 VDC 2.5 W typ.  
 D option: 9-30 VDC, 2.5 W typical



Free Factory I/O Setup!

Hot Swappable Plug-In Design



Quick Link [api-usa.com/7010](http://api-usa.com/7010)

  
 E145968  
 115 VAC, 230 VAC models

### Description

The API 7010 G accepts a frequency input and provides an optically isolated DC voltage or current analog output that is linearly proportional to the input.

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

Also standard on the API 7010 G is an 18 VDC input excitation supply. If needed, this supply can be used to power a passive sensor, eliminating the need for an additional external power supply.

Common applications include frequency to DC conversions from frequency output type devices such as rotary encoders, magnetic pick-ups, variable speed drives and flow meters.

The API 7010 G can also be used to convert a PLC pulse rate output to a proportional analog signal.

### Output Loop Power Supply

Standard on the API 7010 G is an 20 VDC loop excitation supply. This supply can be used to power passive input devices, often eliminating the need for an additional external power supply.



### LoopTracker

API exclusive features include two LoopTracker LEDs (green for input, red for output) that vary in intensity with changes in the process input and output signals. These provide a quick visual picture of your process loop at all times and can greatly aid in saving time during initial startup and/or troubleshooting.

### Output Test

An API exclusive feature includes the test button to provide a fixed output (independent of the input) when held depressed. The test output level is potentiometer adjustable 100% of the output span.

The output test button greatly aids in saving time during initial startup and/or troubleshooting.

Model	Input	Output	Power
API 7010 G	Factory ranged Specify frequency range 0-25 Hz to 0-20 kHz	Factory configured specify output range in volts or mA	115 VAC 
API 7010 G A230			230 VAC 
API 7010 G P			85-265 VAC or 60-300 VDC
API 7010 G D			9-30 VDC

### Option—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 CLP1** Module hold-down spring for high vibration or mobile applications



## Precautions

**WARNING!** All wiring must be performed by a qualified electrician or instrumentation engineer. See diagram for terminal designations and wiring examples. Consult factory for assistance.

**WARNING!** Avoid shock hazards! Turn signal input, output, and power off before connecting or disconnecting wiring, or removing or installing module.

## Précautions

**ATTENTION!** Tout le câblage doit être effectué par un électricien ou ingénieur en instrumentation qualifié. Voir le diagramme pour désignations des bornes et des exemples de câblage. Consulter l'usine pour assistance.

**ATTENTION!** Éviter les risques de choc! Fermez le signal d'entrée, le signal de sortie et l'alimentation électrique avant de connecter ou de déconnecter le câblage, ou de retirer ou d'installer le module.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. See [api-usa.com](http://api-usa.com) for latest product information. Consult factory for your specific requirements.

**WARNING!** This product can expose you to chemicals including lead, which is known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## Socket and Mounting

Install module in a protective panel or enclosure. Allow space around module for air flow. Use API 008 or API 008 FS socket. See specifications for maximum allowable socket voltages. The socket clips to a standard 35 mm DIN rail or can be mounted to a flat surface.

## Output Wiring

The output range is pre-configured at the factory as specified on your order. Polarity must be observed when connecting the signal output to the load. See the table below and the wiring diagrams at right.

If ordered with a mA output, the API 7010 G provides power to drive the current loop.

Type of Device for Output	Output -	Output +
Measuring/recording device accepts a voltage input.	8 (-)	7 (+)
Measuring/recording device accepts a mA (current) input and the input is unpowered or passive. API module provides the loop power.	8 (-)	7 (+20 V)

## Input Wiring

The input range is pre-configured at the factory as specified on your order. No input calibration is necessary. The API 7010 G is compatible with most types of sensors as long as the waveform produces a minimum 100 mV amplitude change and a minimum 5 microsecond pulse width.

An 18 VDC supply is available at terminal 4 to power the sensor if required. Always refer to the sensor manufacturer's data sheet to determine supply voltage compatibility, proper wiring, and if a load or bleed resistor is required. Polarity must be observed.

Sensor Type	Signal +	Sensor Power	Signal Com.
2 wire or Namur with external power	5	4	n/a
2 wire self generating (VR)	5	n/a	6
3 wire PNP current sourcing output	5	4	6
3 wire NPN current sinking output	5	4	6

## Sensor Load

The signal input of the API 7010 G is capacitively coupled to prevent any DC in the input. Some sensors, typically those without an internal load resistor, require a resistive load in order to function.

The resistor value may be specified by the sensor manufacturer as the "minimum resistive load" or calculated from the sensor manufacturer's specified "load current range".

The 18 VDC power supply is capable of providing 25 mA. A load current range of 3 mA to 25 mA would typically use a 6 kΩ to 720 Ω resistor.

NPN sensors may require an external resistor across sensor signal and sensor power. See sensor manufacturer's specifications.

PNP sensors may require an external resistor across sensor signal and sensor ground. See sensor manufacturer's specifications.

## Module Power

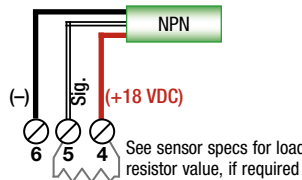
Check model/serial number label for module operating voltage to make sure it matches available power.

When using DC power, polarity must be observed. See wiring diagram.

### Three wire NPN

Typical wire colors

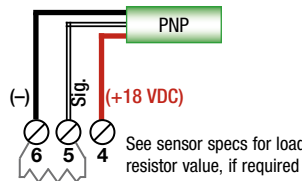
- 5 Signal, Black or White
- 4 Power (+18 VDC) Brown or Red
- 6 Common (-), Blue or Black



### Three wire PNP

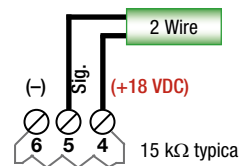
Typical wire colors

- 5 Signal, Black or White
- 4 Power (+18 VDC) Brown or Red
- 6 Common (-), Blue or Black



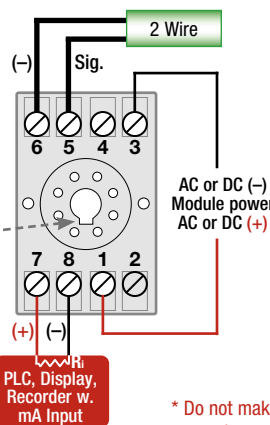
### Two wire powered

- 5 Signal
  - 4 Power (+18 VDC)
- Some sensors may require a bleed resistor to common.



### Two wire self-generating

- 5 Signal (+)
- 6 Common (-)



### Socket top view

Key down when panel mounting

Sourcing mA output  
20 V loop power

### Voltage output



\* Do not make connections to unused terminals!

To maintain full isolation avoid combining power supplies in common with input, output, or unit power.

## Output Calibration

The output range is pre-configured at the factory as specified on your order (at 24°C ±1°C). Top-mounted Zero and Span potentiometers are used to calibrate the output to compensate for load and lead variations.

- Apply power to the module and allow a minimum 20 minute warm up time. An accurate frequency calibration source such as a signal generator may be required for calibration.
- Provide an input to the module equal to the minimum input required for the application. In the most cases the minimum input signal will be 0 Hz.
- 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10V output.
- Set the frequency to the maximum input required for the application. This is generally done using a signal generator.
- Using an accurate measurement device for the output, 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.
- Repeat adjustments for maximum accuracy.

## Sensitivity Adjustment

This multi-turn potentiometer provides an adjustable threshold level that the incoming signal must overcome before an output can be produced.

This is used to limit noise and minimize false input signals that may cause erroneous readings.

When fully clockwise (maximum sensitivity), the input threshold is typically ±25 mV.

In the fully counterclockwise position (minimum sensitivity), the input threshold is typically ±2.5 volts.

## Output Test Function

When the Test button is depressed it will drive the output 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.

The Test Cal. value is factory set to approximately 50% output.

## Operation

The API 7010 G accepts a frequency input and provides an optically isolated DC voltage or current output that is linearly related to the input. The frequency input can be virtually any type of signal (sine wave, sawtooth, square wave, etc.) as long as there is a sufficient change in amplitude (greater than 100 mV).

The frequency input to the API 7010 G is capacitively coupled (to remove any DC component at the input) to a comparator whose threshold is determined by the setting of the sensitivity control. The output from the comparator passes through an optocoupler to the output stage.

The green LoopTracker® input LED provides a visual indication that a signal is being sensed by the input circuitry of the module. The LED illuminates when the input is sufficiently large to trigger the input comparator depending on the input sensitivity adjustment.

It also indicates the input signal range by changing in intensity as the frequency changes from minimum to maximum. If the LED fails to illuminate, or change in intensity as the frequency changes, it may indicate a problem with module power, or signal input wiring.

Note that it may be difficult to see the LEDs under bright lighting conditions.

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.