**Input:**     One 350 Ω Sensor, 1 mV to 2000 mV, 4-10 VDC Excitation

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

- *Factory Set for Your Specified Range*
- *Full 3-Way Input/Output/Power Isolation*
- *Internal Excitation Power Supply*
- *DC Voltage or Current Output*
- *Simple Plug-In Design for Faster Installation*
- *Input and Output LoopTracker® LEDs*
- *Output Test or Calibration Resistor Options*

## Applications

- *Load Cell Weighing Systems and Scales*
- *Strain Gauge Pressure Sensors and Transducers*
- *Tanks, Scales, Extruder Melt Pressure, Crane Loads*

### Strain Gauge Input Range
Factory configured, please specify sensor mV/V and mV range
Minimum sensor range   1 mV
Maximum sensor range:   2000 mV
Millivolt output range is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.

   mV/V sensitivity  X  excitation voltage  =  total mV range

### Input Impedance
1 MΩ minimum

### Common Mode Rejection
100 dB minimum

### Calibration Resistor Options
M01 option:   Toggle switch with calibration resistor inside module. Specify resistor value.
M02 option:   Toggle switch for external (load cell) calibration resistor.

### Excitation Voltage
Factory configured, please specify excitation voltage
Maximum output:         10 VDC maximum at 30 mA
Internal adjustment:     4 to 10 VDC
Stability:                    ±0.01% per °C
Designed for one 350 Ω (or greater) sensor

### LoopTracker
Variable brightness LEDs for input/output loop level and status

### DC Output Range
Factory configured, please specify output range
Voltage (10 mA max.):         0-1 VDC    to   0-10 VDC
Bipolar voltage (±10 mA max.):   ±1 VDC    to   ±10 VDC
Current:                         0-1 mADC   to   0-20 mADC
Compliance, drive at 20 mA:     20 V, 1000 Ω drive

### Output Calibration
Multi-turn zero and span potentiometers
±15% of span adjustment range typical

### Output Test
Sets output to test level when pressed
Adjustable 0-100% of span
Not available with M01 or M02 options

### Output Ripple and Noise
Less than 10 mV$_{RMS}$

### Linearity
Better than ±0.1% of span

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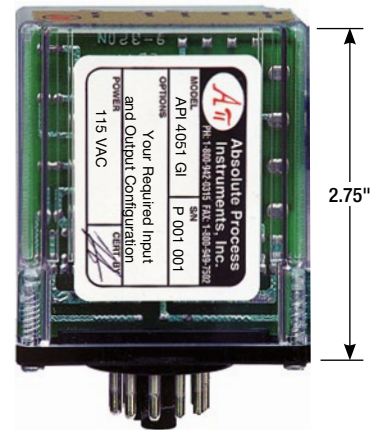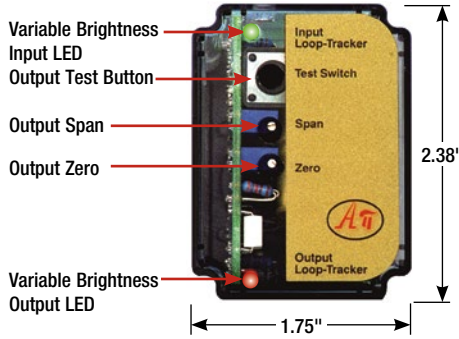Better than ±0.02% of span per °C stability

### Response Time
70 milliseconds (14.2 Hz) typical
Contact factory for other response times
Option DF: 10 milliseconds (100 Hz) response time typical

### Isolation
1200 V$_{RMS}$ min.
Full isolation: power to input, power to output, input to output

### Housing and Sockets
IP 40, requires installation in panel or enclosure
Plugs into API 011 or API 011 FS socket
Socket mounts to 35 mm DIN rail or can be surface mounted



Variable Brightness Input LED
Output Test Button
Output Span
Output Zero
Variable Brightness Output LED

2.38"
1.75"

LIFETIME WARRANTY

MADE IN USA



Hot Swappable
Plug-In Design

2.75"

*Free Factory I/O Setup!*

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

### Description
The API 4051 GI accepts a strain gauge, bridge, or load cell input and provides a proportional, isolated DC voltage or current output. It includes filtering and processing to allow effective use of low-level transducers in the noisy environments common in industrial applications.

The built-in bridge excitation power supply generates a stable source of excitation voltage to drive a 350 Ω (or greater) bridge type sensor such as a load cell, pressure transducer, or strain gauge and amplifies and converts the resulting millivolt signal into the factory configured output.

The API 4051 GI is factory configured to a specific excitation voltage, millivolt input (mV/V rating of the sensor multiplied by the excitation voltage), DC voltage or DC current output, and power. The input can be configured as zero-based (i.e., 0 to 20 mV), bi-polar (i.e., −30 to +30 mV) for push-pull applications, or offset (i.e., 5 to 33 mV) to electronically compensate for deadweight (tare).

The output can be configured as zero-based, bi-polar, or offset. In addition to the standard output ranges, the API 4051 GI output can be configured meet most non-standard requirements. Contact the factory for assistance.

### 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 output test button greatly aids in saving time during initial startup and/or troubleshooting. The test output level is potentiometer adjustable from 0 to 100% of output span.

The output test is not available with the M01 or M02 options. A calibration resistor switch replaces the test button.

### Mounting
The API 4051 GI plugs into an industry standard 11-pin octal socket sold separately. Sockets API 011 and finger-safe API 011 FS allow either DIN rail or panel mounting.

| Model | Input | Output | Power |
|---|---|---|---|
| **API 4051 GI** | Factory ranged specify mV/V and excitation voltage | Factory ranged specify voltage or milliamp range | 115 VAC |
| **API 4051 GI A230** | | | 230 VAC |
| **API 4051 GI P** | | | 85-265 VAC or 60-300 VDC |
| **API 4051 GI D** | | | 9-30 VDC |

### Options—add to end of model number
**M01**   Switch with built-in calibration resistor. Specify resistor value.
**M02**   Switch for external calibration resistor
**DF**    10 millisecond response time, or consult factory. DF option will cause output noise levels greater than standard specifications.
**U**     Conformal coating for moisture resistance

### Accessories—order as a separate line item
**API 011**     11-pin socket, DIN rail or surface mount
**API 011 FS**  11-pin finger safe socket, DIN rail or surface mount
**API CLP1**    Module hold-down spring for high vibration or mobile applications



Input LED
Test Switch
M01/M02 Switch

API 011 FS
300 V Rating

API 011
300 V Rating

API CLP1
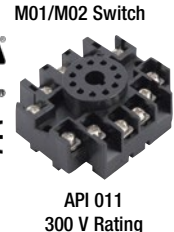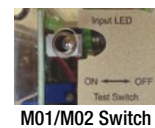
## Precautions

**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 for latest product information. Consult factory for your specific requirements.

⚠️ **WARNING:** This product can expose you to chemicals including lead and nickel, which are 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

## Socket and Mounting

The module installation requires a protective panel or enclosure. Use API 011 or finger-safe API 011 FS socket. The socket clips to a standard 35 mm DIN rail or can be attached to a flat surface using the two mounting holes. Provide air flow around module.

## Electrical Connections

See model/serial number label for module power requirements, input range, excitation voltage, output range, and options.

## Signal Input Terminals

Refer to wiring diagram at right and strain gauge manufacturer's data sheet for wiring and color-coding. Polarity must be observed when connecting input. Sensor shield wire (if equipped) should be grounded at one end only.

## Excitation Voltage

The excitation voltage should match the sensor manufacturer's recommendations.

CAUTION: Never short the excitation leads together. This will cause internal damage to the module.

Although generally not required, an internal adjustment is available to trim the excitation voltage. Consult factory for assistance.

## Signal Output Terminals

Polarity must be observed when connecting the signal output. When a current output is ordered, it provides power to the output current loop (sourcing). If the output does not function, check all wiring polarity.

## Module Power Terminals

The label on the side of the module will indicate the power requirements. AC power can be connected with either polarity.

For DC powered modules, polarity MUST be observed. See wiring diagram.

## Calibration

This procedure and does not account for offset or tare weight calibration. To achieve optimum results, it is recommended that the API 4051 G be calibrated using an accurate bridge simulator.

1. Power the module and allow a minimum 20 minute warm up time.
2. Using an accurate voltmeter across terminals 7 and 8, adjust the excitation voltage fine adjust potentiometer to the required voltage.
3. With the input set at zero or the minimum, adjust the front Zero pot for a zero or low-end output (for example, 4 mA for a 4-20 mA output or −10 V with a ±10V output).
4. The zero pot may also be adjusted for a zero reading on the output display instrumentation, e.g. control system or process indicator. Adjusting the zero pot this way eliminates calibration errors in the display instrumentation.
5. Set the input at maximum, and then adjust the Span potentiometer 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.
6. The calibration procedure should be repeated to achieve the desired accuracy over the selected range.

## Calibration, Models with Option M01 or M02

The M01 option uses a switch and a calibration resistor inside the API module. Ensure that the correct resistance value was specified.

The M02 option uses a switch for the transducer's internal calibration resistor. The transducer's calibration resistor wires are connected to terminals 5 and 6 on the API 4051 G socket.

The sensor manufacturer should provide the percentage of full-scale transducer output when using the calibration resistor.

1. Power the module and allow a minimum 20 minute warm up time.
2. Using an accurate voltmeter across terminals 7 and 8, adjust the excitation voltage fine adjust potentiometer to the required voltage.
3. Provide an input to the module equal to zero or the minimum input required for the application.
4. Using an accurate measurement device for the module output, adjust the Zero potentiometer for the exact minimum output signal desired. The Zero control should only be adjusted when the input signal is at its minimum. The zero pot may also be adjusted for a zero reading on the output display instrumentation, e.g. control system or process indicator. Adjusting the zero pot this way eliminates calibration errors in the display instrumentation.
5. Set the Test toggle switch to the Test position. The calibration resistor is switched into the circuit to unbalance the bridge.
6. Adjust the span pot for an 80% FS output or 80% reading on the process indicator, or per the manufacturer's percentage of FS output.
7. Return the Test switch to the opposite position and readjust the zero pot if necessary. The calibration procedure should be repeated to achieve the desired accuracy over the selected range.

## Output Test Function

Note that models with the M01 or M02 option do not have a TEST function. With this option the Test switch operates the calibration resistor and the Test Cal. potentiometer is non-functional.

The output test potentiometer is factory set to provide approximately 50% output. 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. potentiometer can be used to set the test output to the desired level. It is adjustable from 0 to 100% of the output span. Press and hold the Test button and adjust the Test Cal. potentiometer for the desired output level.

## Operation

Strain gauges and load cells are normally passive devices that are commonly referred to as bridges due to their four-resistor Wheatstone bridge configuration. These sensors require a precise excitation source to produce an output that is directly proportional to the load or pressure that is applied to the sensor.

The exact output of the sensor (measured in millivolts) is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.

The API 4051 GI provides the excitation voltage to the sensors and receives the resulting millivolt signal in return. This input signal is filtered and amplified, then offset, if required, and passed to the output stage. Depending on the output configuration ordered, a DC voltage or current output is generated.

**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 level 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.
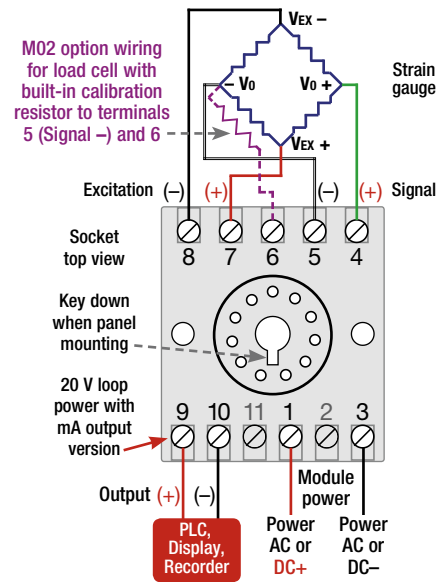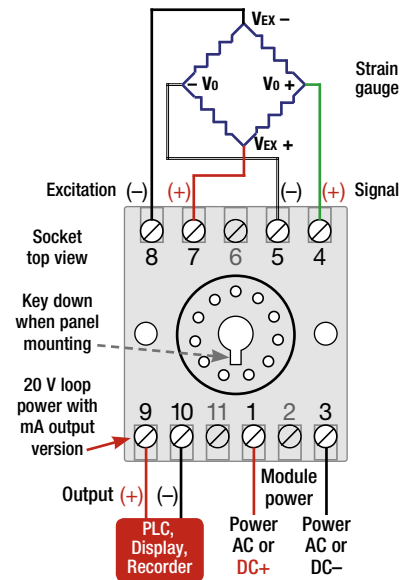




API 4051 Wiring with M02 Option

## Diagnostic Voltage Measurements

Using a meter with at least 10 megaohm input impedance, measure the voltage coming from the strain gauge at the locations shown. Sensitivity is measured in mV/V.

| Positive Meter Lead | Negative Meter Lead | Meter Reading No pressure/load | Meter Reading Full pressure/load |
|---|---|---|---|
| + Exc. | − Exc. | Excitation Voltage | Excitation Voltage |
| + Sig. | − Exc. | + ½ Excitation Voltage | ½ Excitation Voltage + (½ Excitation Voltage x Sensitivity) |
| − Sig. | − Exc. | + ½ Excitation Voltage | ½ Excitation Voltage − (½ Excitation Voltage x Sensitivity) |
| + Sig. | − Sig. | Zero Volts | Excitation Voltage x Sensitivity |