Input: One to Four 350 Ω Sensors, 0-5 mV to 0-400 mV, 4-10 VDC Excitation
Output: 0-1 V to ±10 V or 0-1 mA to 4-20 mA, Isolated

- Drive up to Four 350 Ω Bridges
- Adjustable Excitation Power Supply
- Sense Load Compensation
- Easy to Cancel or Tare Out Deadweights
- One Minute Setup for Hundreds of I/O Ranges
- Full 3-Way Input/Output/Power Isolation
- Hot-Swappable Plug-In Design
- Non-Interactive Zero and Span
- Full 3-Way Input/Output/Power Isolation
- 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 Ranges
Minimum: 0 to 5 mV range
Max: 400 mV/V sensitivity

Millivolt output range is determined by the sensor sensitivity (mV/V) and the excitation voltage:
mV sensitivity x excitation voltage = total mV range

Input Impedance
200 kΩ typical

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
Maximum output: 10 VDC maximum at 120 mA
Drive capability: Up to four 350 Ω bridges at 10 VDC

Switch-selectable: 0-10 VDC in 1 V increments

Fine adjustment: ±5% via multi-turn potentiometer

Stability: ±0.01% per °C

Sense Lead Compensation
Better than ±0.01% per 1 Ω change in leadwire resistance. 10 Ω max. for 10 VDC excitation w. 350 Ω bridge

Zero Offset (Tare)
±100% of span in 15% increments

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

DC Output Ranges
Voltage: 0-1 VDC to 0-10 VDC
Bipolar voltage: ±1 VDC to ±10 VDC
Current: 0-2 mA DC to 0-25 mA DC
20 V compliance, 1000 Ω at 20 mA

Non-interactive 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 mVrms

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 millisecond typical (14.2 Hz)
DF option: 10 millisecond response time typical (100 Hz)

Isolation
2000 Vrms minimum
Full isolation: power to input, power to output, input to output

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

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

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
The API 4059 G accepts a strain gauge, bridge, load cell, or a summed input from up to four sensors, 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 found in industrial applications. The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

The 120 mA adjustable bridge excitation power supply generates a stable source of excitation voltage to drive from one to four 350 Ω (or greater) bridge type sensors such as load cells, pressure transducers and strain gauges and amplifies and converts the resulting millivolt signal into the selected output. Sense lead circuitry is included to cancel the effects of leadwire resistance, if required.

Input, output, excitation and zero offset are field configurable, via external rotary and slide switches. Common ranges are on the module label. Output offset and/or zero can be used to cancel sensor offsets or non-zero deadweights (taring). Non-interactive zero and span simplifies calibration.

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 4059 G 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.
Input Terminals

To refer to diagram and strain gauge manufacturer’s data sheet for wiring and color coding. Polarity must be observed when connecting inputs. Connect up to 4 strain gauges or load cells. Sensor shield wire (if equipped) should be grounded at one end only.

Excitation Voltage Connection

Polarities must be observed when connecting the excitation leads together. This will cause internal damage to the module.

Signal Output Terminals

Polarity must be observed when connecting the signal output. Current output provides power to the output loop (sourcing). Power the module and allow a minimum 20 minute warm up time. The module operates over voltage range 0-200 mV to 0 VDC excitation = 0-200 mV output with a ±10 V output.

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. Note: Perform the following calibration procedure any time switch settings are changed.

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 ±10 V 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 M02 option uses a switch for the transducer’s internal calibration resistor. The transducer’s calibration resistor wires are connected to terminals 5 and 11 on the API 4059 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. 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 ±10 V 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 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.

Using Offset Switch D

Offset switch D can be used to cancel or tune zero-readings by offsetting the low end of the input range. This can be used to compensate for variations in weights or scale deviation over ranges. This switch is only used at the low end of the input range. Offset switch D does not interact with any other switch and is the only switch used to correct zero offsets. Its purpose is to adjust or cancel the low end of the input range not corresponding nominally to 0 mA. Setting switch D to “0” results in no offset.

2. To raise the output zero, rotate switch D clockwise from 1 through 7 until the zero potentiometer is within range of your desired output.

3. To lower the output zero, rotate switch D through ranges 9 through 11 until the zero potentiometer is within range of your desired output. This range is often used for elevated input ranges.

Output Test Function

Note that models with the M01 or M02 option do not have a Test function 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 test the 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 commonly referred to as bridges due to their four-resistor Wheatstone bridge configuration. These sensors use a precise excitation source to produce an output voltage that is directly proportional to the load, pressure, etc. 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. For example, a load cell rated for 3 mV/V sensitivity and 10 VDC excitation will produce an output of 0 to 30 mV for load variations from 0 to 100%.

3 mV/V sensitivity X 10 VDC excitation = 30 mV range

The module provides a precise excitation voltage to the sensors and receives the resulting millivolt signal in return. The input signal is filtered and amplified, then offset if required, and passed to the output stage. An isolated 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 is functioning, the output 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.