Strain Gauge (Bridge) to DC Transmitter, Non-Isolated

API 4058 G

Input: ***0-5 mV to 0-1200 mVDC, 4-10 V Excitation***
Output: ***0-1 V to ±10 V or 0-1 mA to 4-20 mA Non-Isolated***

Field Selectable
One Minute Setup!

- ***Drive up to Four 350 Ω Bridges***
- ***Selectable Excitation Voltage***
- ***Selectable Voltage or Current Outputs***
- ***Easy-to-use External Rotary Switches and Setup Tables***
- ***Input and Output LoopTracker® LEDs***



LIFETIME WARRANTY

Free Factory Input & Output Calibration!

Applications

- **Strain Gauge or Load Cell Weighing Systems**
- **Strain Gauge Pressure Sensors**
- **Monitor Tanks, Hoppers, Scales, Etc.**

Specifications

Input Range

Minimum range:	0 to 5 mV
Maximum range:	0 to 1200 mV
Minimum sensitivity:	0.5 mV/V
Maximum sensitivity:	120 mV/V

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 typical

Excitation Voltage

Maximum output:	10 VDC maximum at 115 mA
Drive capability:	Up to four 350 Ω bridges at 10 VDC
Adjustability:	Switch-selectable, 0 to 10 VDC in 1 V increments
Fine adjustment:	±2.5% via multiturn potentiometer
Stability:	±0.01% per °C

Internal Shunt Calibration Resistor Option

Option **M01**: Toggle switch for ??? Ω internal shunt resistor

Zero Offset

±100% of span in 15% increments

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	0-25 mADC	1000 Ω at 20 mA

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. Adjustable 0-100% of span
Potentiometer factory set to approximately 50% of span

Response Time

70 milliseconds typical, faster response times are available

Common Mode Rejection

100 dB minimum

Ambient Temperature Range and Stability

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

Power

Standard:	115 VAC ±10%, 50/60 Hz, 3.5 W max.
A230 option:	230 VAC ±10%, 50/60 Hz, 2.5 W max.
D12 option:	12 VDC, 3 W typical with 4 load cells
D24 option:	24 VDC, 3 W typical with 4 load cells

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Description and Features

The **API 4058 G** accepts a strain gauge, bridge, load cell, or a summed input from up to four sensors, and provides a proportional, non-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 built-in 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.

Input, output, excitation and zero offset are field-configurable, via external rotary and slide switches. Common ranges are on the module label. An offset switch is standard for applications requiring cancellation of sensor offsets or non-zero deadweights (taring).

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 adjusted 0-100% output span. Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting.

The **API 4058 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.

Models & Options

Please specify power and options

API 4058 G	Field selectable strain gauge to DC transmitter, non-isolated, 115 VAC

Options—Add to end of model number

A230	Powered by 230 VAC, 50/60 Hz
D12	Powered by 12 VDC
D24	Powered by 24 VDC
M01	Toggle switch with internal shunt calibration resistor
DF	Fast response, 1 millisecond nominal response time
U	Conformal coating for moisture resistance

Accessories—Order as 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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905-457-6322 or 800-794-5883
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Strain Gauge

ELECTRICAL CONNECTIONS

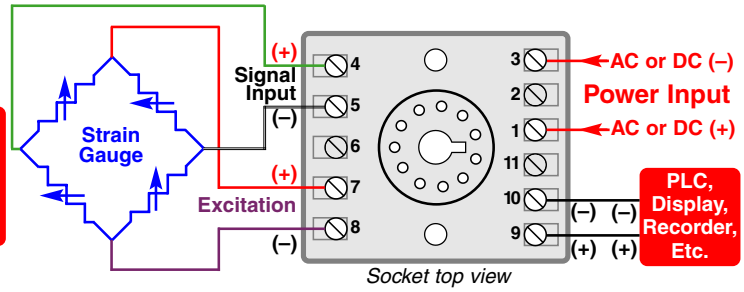
WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 11-pin socket. Order API 011 or finger-safe API 011 FS socket.

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.

Strain Gauge Input – Refer to strain gauge manufacturer's data sheet for wire color-coding. 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.

Excitation Voltage – *CAUTION: Never short the excitation leads together. This will cause internal damage to the API 4058 G.* Refer to strain gauge manufacturer's data sheet for wire color-coding. Terminals 7 and 8 provide connections for the DC voltage that is used to excite the strain gauge load cell. Polarity must be observed when connecting the Excitation Output. The positive connection (+) is applied to terminal 7 and the negative (–) is applied to terminal 8.

Signal Output Terminals – Polarity must be observed when connecting the signal output to the load. The positive connection (+) is connected to terminal 9 and the negative (–) is connected to terminal 10.

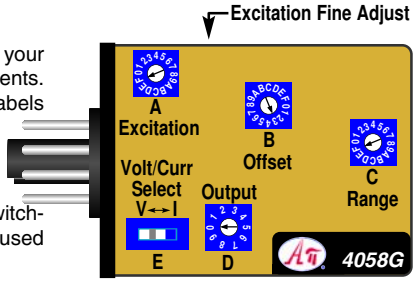


API 4058 G typical wiring.
Refer to strain gauge manufacturer's data sheet for wire color coding.

RANGE SELECTION

The API 4058 G is configurable to your exact input and output requirements. Ranges are listed on the module labels and at right. See www.api-usa.com or contact factory for special ranges.

Four rotary switches and a slide switches on the side of the module are used to select input and output ranges.



1. See table and set **Excitation** rotary switch **A** to desired excitation voltage.

Excitation Voltage	10 V	9V	8 V	7 V	6 V	5 V	4 V	3 V	2 V	1 V	0 V
Switch A	A	9	8	7	6	5	4	3	2	1	0

2. Set **Volt/Curr** switch **E** to voltage (**V**) or current (**I**) depending on output type.
3. From the table, find the rotary switch combination that match your input/output ranges and set rotary switches **B**, **C**, and **D**.
4. The Excitation Fine Adjust, Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

		API 4058 G INPUT RANGES										
	Rotary Switches →	0-5 mV	0-10 mV	0-20 mV	0-25 mV	0-30 mV	0-40 mV	0-50 mV	0-100 mV	0-200 mV	0-250 mV	0-1000 mV
		BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD
OUTPUT RANGES	Switch E to V											
	0-1 V	E10	E90	E30	E50	ED0	EB0	E00	E80	E20	E40	E60
	0-2 V	E11	E91	E31	E51	ED1	EB1	E01	E81	E21	E41	E61
	0-5 V	E13	E93	E33	E53	ED3	EB3	E03	E83	E33	E43	E63
	1-5 V	C12	C92	C32	C52	CD2	CB2	C02	C82	C22	C42	C62
	0-10 V	E16	E96	E36	E56	ED6	EB6	E06	E86	E26	E46	E66
	±5 V	E18	E98	E38	E58	ED8	EB8	E08	E88	E28	E48	E68
	±10 V	E19	E99	E39	E59	ED9	EB9	E09	E89	E29	E49	E69
	E to I											
	4-20 mA	C15	C95	C35	C55	CD5	CB5	C05	C85	C25	C45	C65
	0-20 mA	E16	E96	E36	E56	ED6	EB6	E06	E86	E26	E46	E66

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

Top-mounted, Zero and Span potentiometers can be used should fine-tuning of the output be necessary. An excitation voltage fine adjust potentiometer is located on the side of the module.

1. Apply power to 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 for the exact output desired.
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 desired. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal.
5. 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.
6. This procedure may have to be repeated several times to achieve the desired accuracy over the selected range. This is a basic calibration procedure and does not account for offsets or tare weights. To achieve optimum results, it is recommended that the API 4058 G be calibrated by an accurate bridge simulator before being placed in service.

TEST BUTTON

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

Strain gauges and load cells are normally passive devices that are commonly referred to as "bridges" due to the four-resistor Wheatstone bridge configuration used in their design. These sensors require a precise excitation source to produce an output that is directly proportional to the load, pressure, etc. 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. 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 API 4058 G consists of four rotary switches and one slide switch that must be configured to match the specifications of the input sensor(s) and the output requirements.

The API 4058 G 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 selected, 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 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.

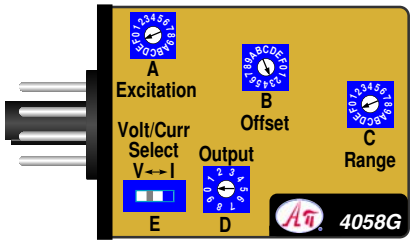
Strain Gauge

RANGE SELECTION

The API 4058 G is configurable to your exact input and output requirements. Ranges are listed on the module labels and at right. See www.api-usa.com or contact factory for special ranges.

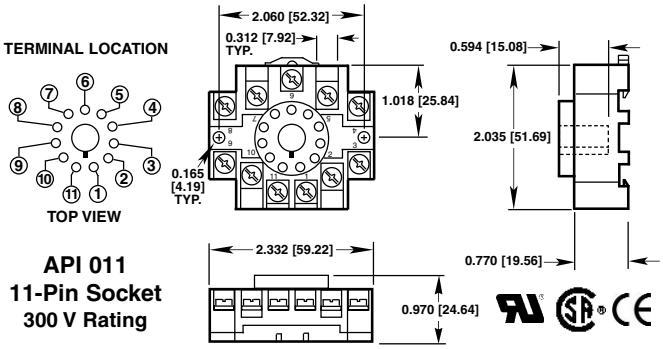
Four rotary switches and a slide switches on the side of the module are used to select input and output ranges.

1. See table and set **Excitation** rotary switch **A** to desired excitation voltage.
2. Set **Volt/Curr** switch **E** to voltage (**V**) or current (**I**) depending on output type.
3. From the table, find the rotary switch combination that match your input/output ranges and set rotary switches **B**, **C**, and **D**.
4. The Excitation Fine Adjust, Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

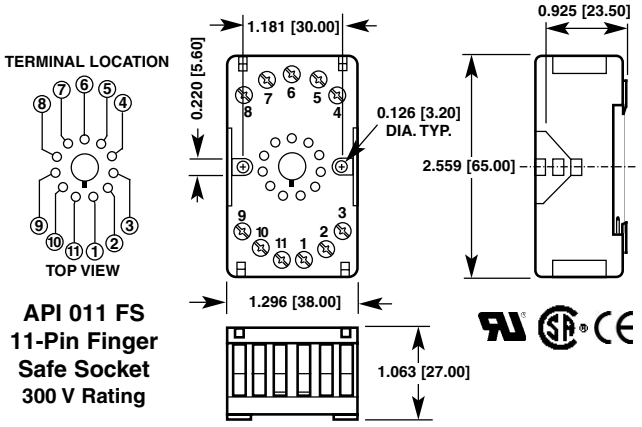


		API 4058 G INPUT RANGES																		
	Rotary Switches →	0-5 mV	±10 mV	0-10 mV	±20 mV	0-20 mV	0-25 mV	±30 mV	0-30 mV	0-40 mV	0-50 mV	0-100 mV	0-200 mV	0-250 mV	0-300 mV	0-400 mV	±500 mV	0-1000 mV	0-1200 mV
		BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD	BCD
OUTPUT RANGES	Switch E to "V"	0-1 V	E10		E90		E30	E50		ED0	EB0	E00	E80	E20	E40	EC0	EA0	A60	E60	EE0
		0-2 V	E11		E91		E31	E51		ED1	EB1	E01	E81	E21	E41	EC1	EA1	A61	E61	EE1
		0-4 V	E12		E92		E32	E52		ED2	EB2	E02	E82	E22	E42	EC2	EA2	A62	E62	EE2
		0-5 V	E13	A33	E93	AB3	E33	E53	A03	ED3	EB3	E03	E83	E33	E43	EC3	EA3	A63	E63	EE3
		1-5 V	C12		C92		C32	C52		CD2	CB2	C02	C82	C22	C42	CC2	CA2	AE3	C62	CE2
		0-8 V	E15		E95		E35	E55		ED5	EB5	E05	E85	E25	E45	EC5	EA5	A65	E65	EE5
		2-10 V	C15		C95		C35	C55		CD5	CB5	C05	C85	C25	C45	CC5	CA5	AE6	C65	CE5
		0-10 V	E16	A36	E96	AB6	E36	E56	A06	ED6	EB6	E06	E86	E26	E46	EC6	EA6	A66	E66	EE6
		±5 V	E18	A38	E98	AB8	E38	E58	A08	ED8	EB8	E08	E88	E28	E48	EC8	EA8	A68	E68	EE8
		±10 V	E19	A39	E99	AB9	E39	E59	A09	ED9	EB9	E09	E89	E29	E49	EC9	EA9	A69	E69	EE9
	Switch E to "I"	0-2 mA	E10		E90		E30	E50		ED0	EB0	E00	E80	E20	E40	EC0	EA0	A60	E60	EE0
		0-10 mA	E13		E93		E33	E53		ED3	EB3	E03	E83	E23	E43	EC3	EA3	A63	E63	EE3
		2-10 mA	C12		C92		C32	C52		CD2	CB2	C02	C82	C22	C42	CC2	CA2	AE3	C62	CE2
		0-16 mA	E15		E95		E35	E55		ED5	EB5	E05	E85	E25	E45	EC5	EA5	A65	E65	EE5
		4-20 mA	C15	A35	C95	AB5	C35	C55	A05	CD5	CB5	C05	C85	C25	C45	CC5	CA5	AE6	C65	CE5
		0-20 mA	E16		E96		E36	E56		ED6	EB6	E06	E86	E26	E46	EC6	EA6	A66	E66	EE6

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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Frequently Asked Questions

What is the performance over the entire range for the API 4058 G? How well does the output track the input over the entire range?

The linearity specification for the **API 4058 G** is ±0.1% of span. The **API 4059 G** is the same.

Is the API 4058 G approved for Europe's CE standards?

No, but if the entire system in the application needs to be CE approved, then our unit does not.

Our weighing scale uses a strain gauge with an excitation voltage of 10 V and a calibrated sensitivity of 2.2447 mV/V. The API 4058 G has been set up for an input of 0-20 mV. Are these switch settings correct?

If you are using all of the available range of the strain gauge, the maximum input signal to the module will be 22.447 mV, which is beyond the switch settings. You need to verify the maximum load conditions and change the switch settings to 0-25 mV if required.

When trying to adjust the span potentiometer on an API 4058 G the output signal, which drives a numerical display, jumps by too large an amount when barely turning the potentiometer screw. What is wrong?

The resolutions of the zero and span potentiometers are related to the amount of turns of the pot screw and the amount of adjustment capability (±15%). The factory can provide a finer resolution which means that the potentiometer screw must be turned more to have the same amount of change in signal, however the total amount of adjustment capability of the potentiometer will be reduced.

We have a load cell application with a very low output signal and we would like to drive the cell with a higher excitation voltage (the load cell is rated 24 VDC max. and 10 VDC typical). Can your modules provide an excitation voltage higher than 10 VDC?

No, however you can use an **API 9046-24** power supply with 24 VDC output to excite the load cell. The output signal would then be higher for the same load which could then drive an API 4310 G, narrow input span.

We are trying to set up your API 4059 G to allow a ±30 mV input signal (3mV/V load cell operating in the tension/compression mode) with a ±10 V output signal. The unit does not have a code to select for the input of ±30 mV. Can we have this input option?

No, the **API 4059 G** will not accept ±30 mV and the span potentiometer does not have enough adjustment for this special range. You can lower the excitation voltage to 7 VDC so that you would have a ±20 mV input (7V excitation x 3 mV/V = 21 mV). If isolation is not necessary, select the **API 4058 G** which allows a ±30 mV to ±10 VDC input/output combination.

What would be the input range for our load cell that has a maximum capacity of 200 pounds, an excitation voltage of 10 VDC, a rating of 2 mV/V, operating in the tension/compression mode, and measuring 75 pounds full scale?

Full-scale input to our module would be

$$(75 / 200) \times 10\ V \times 2\ mV/V = 7.5\ mV.$$

For tension and compression, the signal will be ±7.5 mV.

We have an API 4058 G and need to set it up with a load cell for tension and compression operation. The load cell has a sensitivity of 2 mV/V and a maximum capacity of 50 pounds. Our largest load will be 40 pounds. We also need the output to provide a 4-20 mA signal. What are the switch settings?

The maximum input signal to our module will be

$$\pm(40 / 50 \times \text{Excitation Voltage} \times 2\ mV/V)$$

This input value needs to be close to one of the available input ranges for the **API 4058 G**. If we had an excitation voltage of 10 V, then the input signal would be ±16 mV. this would be 25% too low for the ±20 mV range since the zero and span potentiometers only have ±15% adjustment.

The excitation voltage should be lowered to provide an input signal that is close to our next lower range of ±10 mV. If the excitation voltage is set to 6 V, then the signal from the load cell will be

$$\pm(40 / 50 \times 6 \times 2) = \pm 9.6\ V$$

Then we can adjust the zero and span potentiometers to allow a 4 mA output for a –9.6 V input and a 20 mA output for a +9.6 V input.

We have 4 load cells in our application each with a resistance of 350 ohms. Can we use your API 4051 G in this application?

No. The **API 4051 G** excitation circuit can only source 30 mA maximum. Since your 4 load cells require about 114 mA total current, you must use either the **API 4058 G** or the **API 4059 G**.

Strain Gauge



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