DC to DC Transmitter, Isolated, Field Rangeable — API 4380 G

Input: ***0-50 mV to ±10 VDC, 0-1 mA to 0-20 mA***
Output: ***0-1 V to ±10 VDC or 0-2 mA to 4-20 mA***

Wide Ranging I/O
One Minute Setup!

- ***One Minute Setup for Hundreds of I/O Ranges***
- ***External Switches & Tables for Range Selection***
- ***2000 V Isolation Input/Output/Power***
- ***Input and Output LoopTracker® LEDs***
- ***Functional Test Pushbutton***

Applications

- **Isolate, Convert, Boost, Rescale Process Signals**
- **One Model to Interface Process Signals with Panel Meters, Recorders, Data Acquisition Cards, PLCs, DCS Systems, SCADA Systems**

Specifications

Input Ranges

Consult factory for optional switch selectable ranges within input & output limits
System voltages must not exceed socket voltage rating.

	Minimum	Maximum
Voltage:	0 to 50 mV	0-10 V
Bipolar Voltage:	±50 mV	±10 V
Current:	0 to 1 mA	0 to 20 mA

Input Impedance

Voltage: 1 MΩ minimum
Current: 50 Ω typical
Input voltage burden (current) 1 VDC at 20 mA

Input Loop Power Supply

18 VDC nominal, unregulated, 25 mADC, max. ripple, less than 1.5 V_{p-p}

LoopTracker

Variable brightness LEDs indicate input and output loop levels 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	0-20 mADC	1000 Ω at 20 mA

Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
±15% of span adjustment range typical

Output Linearity

Better than ±0.1% of span

Output Ripple and Noise

Less than 10 mV_{RMS}

Functional Test Button

Sets output to test level when pressed
Potentiometer factory set to approximately 50% of span
Adjustable 0-100% of span

Response Time

Standard: 100 milliseconds typical
High Speed: 1 milliseconds typical with **DF** option

Isolation

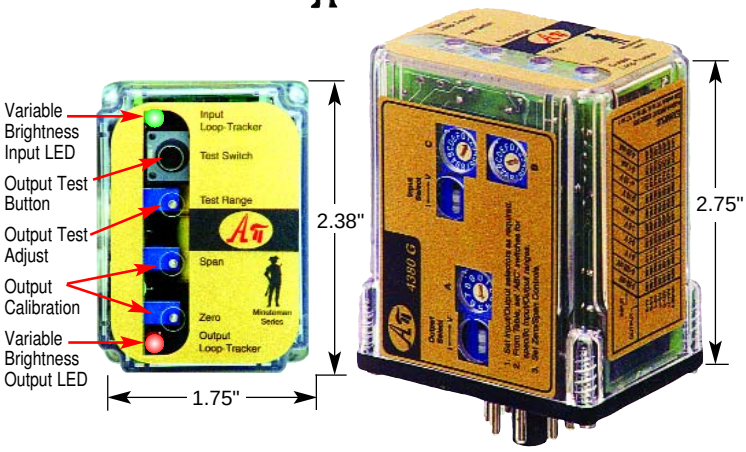
2000 V_{RMS} minimum
Full isolation: power to input, power to output, input to output

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.
P option: 80-265 VAC or 48-300 VDC, 50/60 Hz, 2.5 W typical
A230 option: 230 VAC ±10%, 50/60 Hz, 2.5 W max.
D option: 9-30 VDC, 2.5 W typical



LIFETIME WARRANTY

c UL us

Free Factory Input & Output Calibration!

Description and Features

The **API 4380 G** accepts a DC voltage or current input and provides an optically isolated DC voltage or current output that is linearly related to the input. Typical applications include signal isolation, signal conversion, signal boosting or a combination of the three.

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

The **API 4380 G** can be field-configured via external rotary and slide switches. Most common ranges are built-in, and can be selected from the table on the module, however virtually unlimited combinations 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 can be field-adjusted via a multiturn potentiometer.

Both the LoopTracker LEDs and functional test pushbutton greatly aid in saving time during initial startup and/or troubleshooting. The built-in 18 VDC unregulated loop excitation power supply can be used to power passive input devices.

The **API 4380 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

API 4380 G	Field rangeable DC to DC transmitter, isolated, with loop power supply, 115 VAC

Options—Add to end of model number

P	Powered by 80-265 VAC or 48-300 VDC, 50/60 Hz
A230	Powered by 230 VAC, 50/60 Hz
D	Powered by 9-30 VDC
DF	Fast response, 1 millisecond nominal response time
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

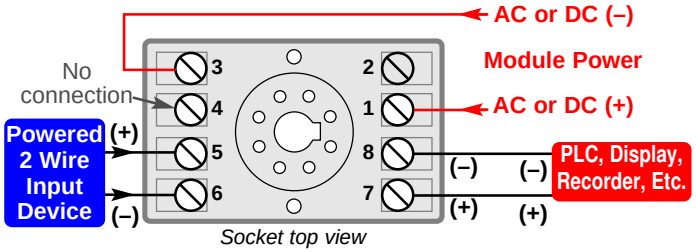
DC Input

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.

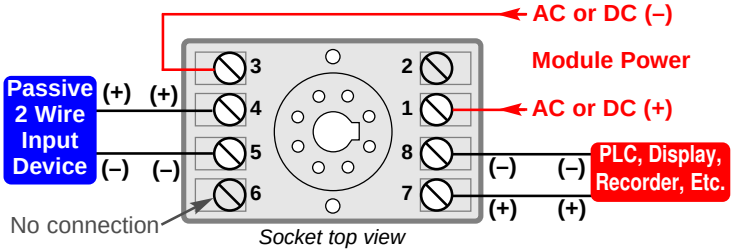
Power Input Terminals – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity MUST be observed. Positive (+) is wired to terminal 1 and negative (–) is wired to terminal 3.

Powered Signal Input – Observe polarity when connecting the signal input. The positive signal (+) is wired to terminal 5 and negative (–) to terminal 6.



API 4380 G typical wiring with powered input and standard output

Passive Signal Input Using the 18 V Supply – 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.



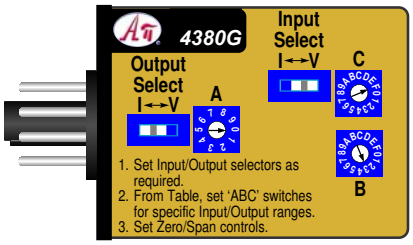
Using the built-in 18 VDC loop supply to power a passive input device

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. The API 4380 G provides power to the output loop.

RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See www.api-usa.com or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on input type. The input selector switch determines the input impedance for the module, typically 50 Ω for current inputs and 1 MΩ or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (**I**) or voltage (**V**) depending on output type.



3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.

Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

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 BUTTON & TEST RANGE

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.

Example: If you are isolating a 4-20 mA current loop, when the pushbutton is held depressed, the output from the module will be a constant signal between 4 and 20 mA depending on the setting of the Test Range adjustment pot.

OPERATION

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 out-

		OUTPUT RANGES								
	Rotary Switches →	0-1 V	0-2 V	0-5 V	1-5 V	0-10 V	±5 V	±10 V	4-20 mA	0-20 mA
		ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
INPUT RANGES	0-50 mV	081	181	381	283	681	881	981	583	681
	0-100 mV	091	191	391	293	691	891	991	593	691
	0-200 mV	0A1	1A1	3A1	2A3	6A1	8A1	9A1	5A3	6A1
	0-500 mV	001	101	301	203	601	801	901	503	601
	0-1 V	011	111	311	213	611	811	911	513	611
	0-2 V	021	121	321	223	621	821	921	523	621
	1-5 V	03F	13F	33F	231	63F	83F	93F	531	63F
	0-5 V	051	151	351	253	651	851	951	553	651
	0-10 V	061	161	361	263	661	861	961	563	661
	±5 V	064	164	364	266	664	864	964	566	664
	±10 V	074	174	374	276	674	874	974	576	674
	0-1 mA	0C1	1C1	3C1	2C3	6C1	8C1	9C1	5C3	6C1
	4-20 mA	03F	13F	33F	231	63F	83F	93F	531	63F
	0-20 mA	051	151	351	253	651	851	951	553	651

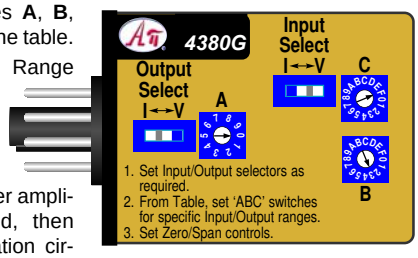
DC Input

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

RANGE SELECTION

Three rotary switches and two slide switches located on the side of the module are used to select input and output ranges. Most popular ranges are listed on the module labels. See ***www.api-usa.com*** or contact factory for special ranges.

1. Set the **INPUT SELECT** slide switch to current (I) or voltage (V) depending on input type. The input selector switch determines the input impedance for the module, typically 50W for current and 1mW or greater for voltage inputs.
2. Set the **OUTPUT SELECT** slide switch to current (I) or voltage (V) depending on output type.
3. From the table, find the rotary switch combination that matches your input and output ranges.
4. Set the three rotary switches **A**, **B**, and **C** to the values found in the table.
5. The Zero, Span and Test Range potentiometers can now be adjusted for the desired output range.



Depending on the rotary switch settings, the input is filtered, either amplified or attenuated as required, then passed through an optical isolation circuit to the output stage.

		OUTPUT RANGES															
	Rotary Switches →	0-1 V	0-2 V	0-4 V	0-5 V	1-5 V	0-8 V	2-10 V	0-10 V	±5 V	±10 V	0-2 mA	0-10 mA	2-10 mA	0-16 mA	4-20 mA	0-20 mA
		ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC	ABC
INPUT RANGES	0-50 mV	081	181	281	381	283	581	583	681	881	981	081	381	283	581	583	681
	0-100 mV	091	191	291	391	293	591	593	691	891	991	091	391	293	591	593	691
	0-200 mV	0A1	1A1	2A1	3A1	2A3	5A1	5A3	6A1	8A1	9A1	0A1	3A1	2A3	5A1	5A3	6A1
	0-250 mV	0C1	1C1	2C1	3C1	2C3	5C1	5C3	6C1	8C1	9C1	0C1	3C1	2C3	5C1	5C3	6C1
	0-400 mV	0B1	1B1	2B1	3B1	2B3	5B1	5B3	6B1	8B1	9B1	0B1	3B1	2B3	5B1	5B3	6B1
	0-500 mV	001	101	201	301	203	501	503	601	801	901	001	301	203	501	503	601
	0-1 V	011	111	211	311	213	511	513	611	811	911	011	311	213	511	513	611
	0-2 V	021	121	221	321	223	521	523	621	821	921	021	321	223	521	523	621
	0-2.5 V	041	141	241	341	243	541	543	641	841	941	041	341	243	541	543	641
	0-4 V	031	131	231	331	233	531	533	631	831	931	031	331	233	531	533	631
	1-5 V	03F	13F	23F	33F	231	53F	531	63F	83F	93F	03F	33F	231	53F	531	63F
	0-5 V	051	151	251	351	253	551	553	651	851	951	051	351	253	551	553	651
	0-10 V	061	161	261	361	263	561	563	661	861	961	061	361	236	561	563	661
	±5 V	064	164	264	364	266	564	566	664	864	964	064	364	266	564	566	664
	±10 V	074	174	274	374	276	574	576	674	874	974	074	374	276	574	576	674
	0-1 mA	0C1	1C1	2C1	3C1	2C3	5C1	5C3	6C1	8C1	9C1	0C1	3C1	2C3	5C1	5C3	6C1
	0-2 mA	001	101	201	301	203	501	503	601	801	901	001	301	203	501	503	601
	0-4 mA	011	111	211	311	213	511	513	611	811	911	011	311	213	511	513	611
	0-8 mA	021	121	221	321	223	521	523	621	821	921	021	321	223	521	523	621
	0-10 mA	041	141	241	341	243	541	543	641	841	941	041	341	243	541	543	641
	0-16 mA	031	131	231	331	233	531	533	631	831	931	031	331	233	531	533	631
	4-20 mA	03F	13F	23F	33F	231	53F	531	63F	83F	93F	03F	33F	231	53F	531	63F
	0-20 mA	051	151	251	351	253	551	553	651	851	951	051	351	253	551	553	651
	2-10 mA	02F	12F	22F	32F	221	52F	521	62F	82F	92F	02F	32F	221	52F	521	62F

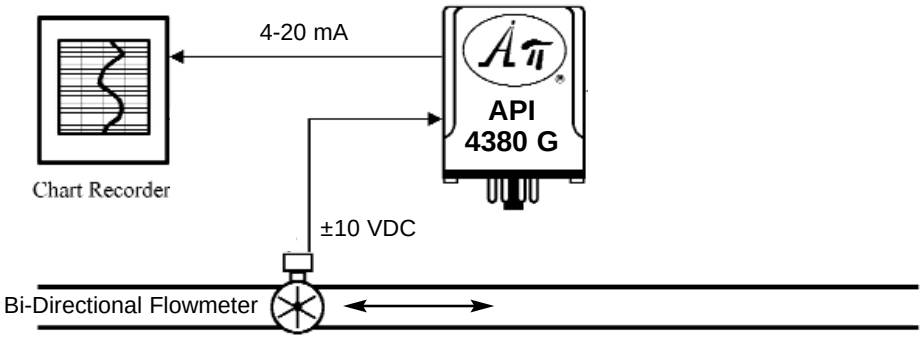
API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

For Your Local Area Representative See *www.api-usa.com*

Monitoring a Dual-Paddle Flow Meter

PROBLEM
A bi-directional flowmeter has an output of +10V depending on the direction of flow. The readings need to be monitored by a chart recorder that accepts a 4-20 mA input.

SOLUTION
Use an **API 4380 G** isolated DC to DC transmitter to convert the ±10 V signal to 4-20 mA. The module switches are set so that –10 V = 4 mA, 0 V (no flow) = 12 mA and +10 V = 20 mA.

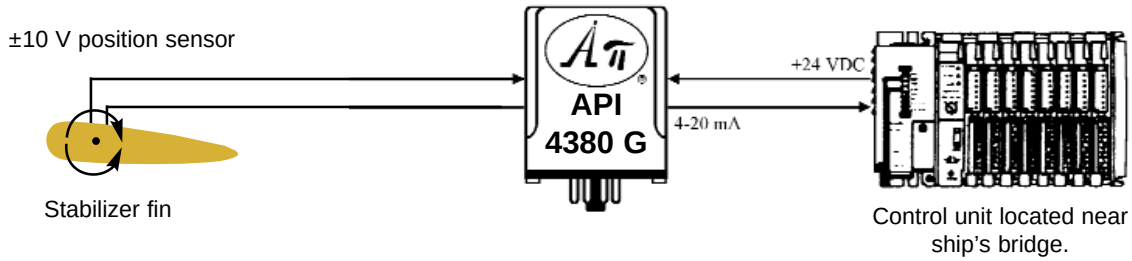


The **API 4380 G** is set up for a ±10 V signal and 4-20 mA output. The module switches are set to Input = "V", ABC = 576 and Output = "I"

Ship Stabilizer

PROBLEM
A ship stabilizer control fin has a rotary position sensor which puts out ±10 V depending on the position of the fin. The position must be monitored by a remotely located main control unit for use in operation of the stabilization system. Due to noise immunity concerns and the distance required a 4-20 mA signal is used.

SOLUTION
The standard **API 4380 G** Isolated DC to DC Transmitter accepts the ±10 V input, converts it to an electrically isolated 4-20 mA signal which can be used by the control unit near the bridge.



The **API 4380 G** switches are set to Input select "V", Output select "I" and A=5, B=7, and C=6 for ±10 V input and 4-20 mA output. The **API 4380 G** powers the output loop, thus eliminating the need for an additional power supply. The 2000 V_{RMS} 3-way isolation of the module protects against unexpected ground loops and electrical noise.

Frequently Asked Questions

What is the output impedance of the API 4380 G for the 4-20 mA mode?
The output drive circuit uses a MOSFET which is an active device with an impedance of at least 100 K ohms or greater in the current mode.

What is the maximum current allowed for the 18 VDC unregulated loop power supply and what does the waveform look like?
The maximum current is 25 mA and the waveform is a filtered full wave rectified +18 V with a maximum ripple of 1.5 V_{p-p}.

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 damage.

Do you recommend placing a fuse at the power input for protection?
It is not required, but a ½ Amp Fast Blow fuse can be used for each module.

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 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

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