

# DC to DC Isolator Transmitter Field Rangeable

# API 4380 G

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

- 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: | $\pm 50$ mV | $\pm 10$ V |
| Current:         | 0 to 1 mA   | 0 to 20 mA |

### Input Impedance

|          |                                               |
|----------|-----------------------------------------------|
| Voltage: | 1 M $\Omega$ minimum                          |
| Current: | 50 $\Omega$ 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<sub>p-p</sub>

### 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:           | $\pm 1$ VDC | $\pm 10$ VDC |                        |
| Current (20 V compliance): | 0-2 mADC    | 0-20 mADC    | 1000 $\Omega$ at 20 mA |

### Output Zero and Span

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

### Output Linearity

Better than  $\pm 0.1\%$  of span

### Output Ripple and Noise

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

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

### Ambient Temperature Range and Temperature Stability

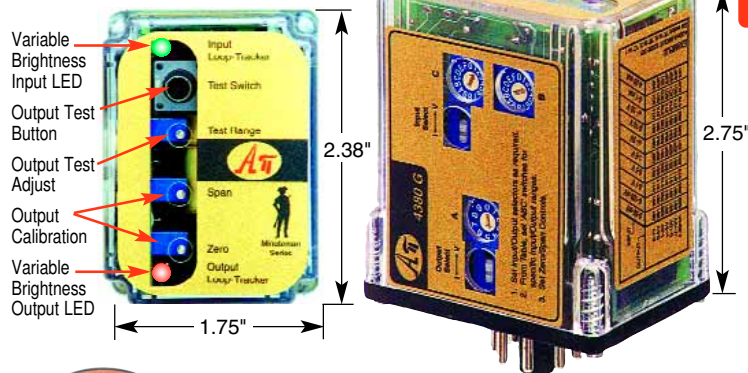
$-10^{\circ}\text{C}$  to  $+60^{\circ}\text{C}$  operating ambient  
 Better than  $\pm 0.02\%$  of span per  $^{\circ}\text{C}$  temperature stability

### 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. |
| D option:    | 9-30 VDC, 2.5 W typical                   |



Wide Ranging I/O  
One Minute Setup!



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

|             |                                                    |
|-------------|----------------------------------------------------|
| <b>A230</b> | Powered by 230 VAC, 50/60 Hz                       |
| <b>D</b>    | Powered by 9-30 VDC                                |
| <b>DF</b>   | Fast response, 1 millisecond nominal response time |
| <b>U</b>    | Conformal coating for moisture resistance          |

Accessories—Order as separate line item

|                   |                                     |
|-------------------|-------------------------------------|
| <b>API 008</b>    | 8-pin socket                        |
| <b>API 008 FS</b> | 8-pin finger-safe socket            |
| <b>API TK36</b>   | DIN rail, 35 mm W x 39" L, aluminum |

**MOD-TRONIC**  
INSTRUMENTS LIMITED

1 Delta Park Blvd #12  
 Brampton, ON L6T 5G1  
 905-457-6322 or 800-794-5883  
 www.mod-tronic.com



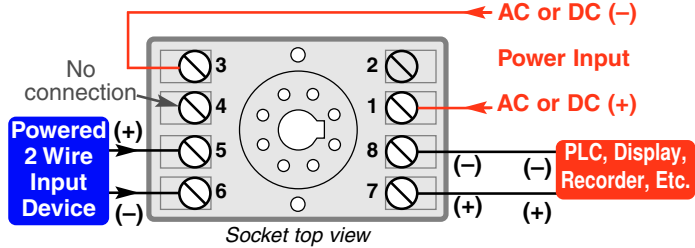
DC Input

## 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.

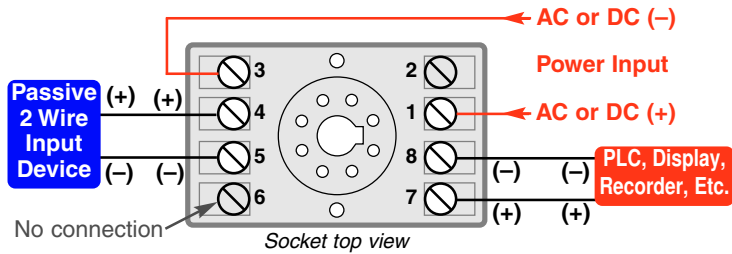
**Power Input Terminals** – The white label on the side of the API module will indicate the power requirements. AC power is connected to terminals 1 and 3. For DC powered modules, polarity **MUST** be observed. Positive (+) is wired to terminal 1 and negative (-) is wired to terminal 3.

**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.



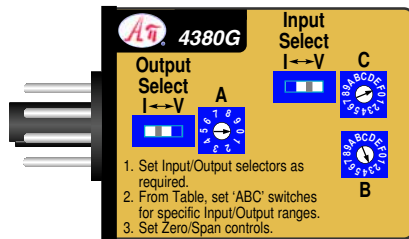
Using the built-in 18 VDC loop supply to power a passive input device

**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](http://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 output wiring.

|                            |          | 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     |
| I<br>N<br>P<br>U<br>T      | 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     |
| R<br>A<br>N<br>G<br>E<br>S | 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     |
| S                          | ±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     |



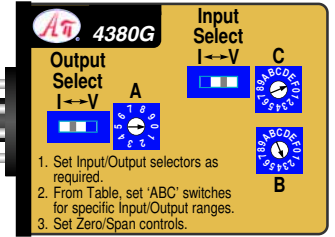
## RANGE SELECTION

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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.



DC Input

|                   |          | 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             | 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     |
| RANGES            | 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     | 263     | 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     |         |



**FREE APPLICATION ASSISTANCE**

Call Customer Service

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DC Input

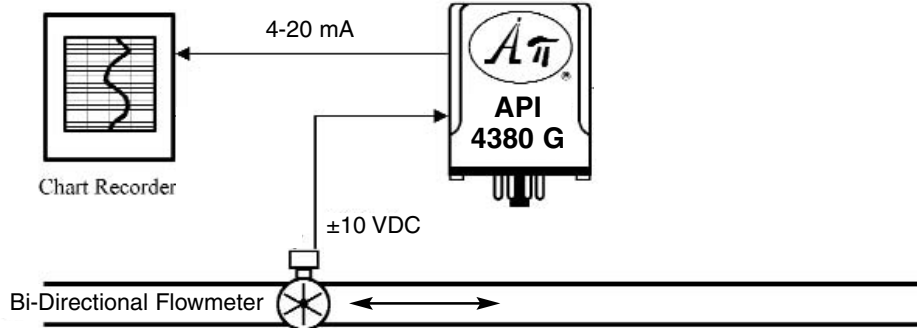
## Monitoring a Dual-Paddle Flow Meter

### 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  $\pm 10$  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  $\pm 10$  V signal and 4-20 mA output. The module switches are set to Input = "V", ABC = 576 and Output = "I"

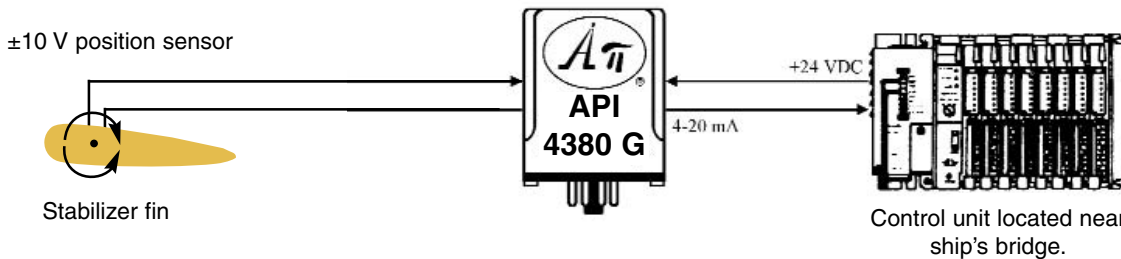
## Ship Stabilizer

### PROBLEM

A ship stabilizer control fin has a rotary position sensor which puts out  $\pm 10$  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  $\pm 10$  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  $\pm 10$  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<sub>p-p</sub>.

### 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 1/2 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

$$\text{total load} = \text{impedance of the instrument} + \text{impedance of the wire}$$

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.