DC to DC Math Function Transmitters, Isolated

**Input:** 0-100 mV to 0-10 VDC or 0-1 mA to 0-20 mA

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

- Add, Subtract, or Average up to 4 DC Inputs
- Factory Set Custom I/O Ranges
- Easy-to-Install Plug-In Design
- Full 2000 V Input/Output/Power Isolation
- Input and Output LoopTracker® LEDs
- Output Test Button

**DC Input Ranges**
Factory configured, please specify each input range

<table>
<thead>
<tr>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-100 mVDC</td>
<td>0-10 VDC</td>
</tr>
<tr>
<td>±100 mVDC</td>
<td>±10 VDC</td>
</tr>
<tr>
<td>0-1 mA</td>
<td>0-20 mA, 4-20 mA</td>
</tr>
<tr>
<td>0-1 VDC, 0-5 VDC, 1-5 VDC, 0-10 VDC, ±5 VDC, ±10 VDC, 0-20 mA, 4-20 mA</td>
<td></td>
</tr>
</tbody>
</table>

**Output Ranges**

| 20 V compliance, 1000 Ω at 20 mA |

**System voltages must not exceed socket voltage rating**
Inputs are converted to a percentage and then the math function is applied. Consult factory for mixed ranges, special ranges or non-standard functions.

**Input Impedance**
Voltage: 100 kΩ per volt nominal
Current: 50 Ω nominal

**Input Voltage Burden (Current)**
1.0 V RMS maximum

**Balance Between Inputs**
Better than ±0.5% of span

**LoopTracker**
Variable brightness LEDs indicate I/O loop level and status

**DC Output Range**
Factory configured, please specify output range or consult factory. See table on other side for common ranges.

| Voltage, 10 mA max. | Bipolar voltage: ±1 V to ±10 VDC |
| Current, 20 V compliance, 1000 Ω at 20 mA |

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

**Output Loop Power Supply**
20 VDC nominal, regulated, 25 mA DC, max. ripple <10 mVRMS

**Output Test**
Sets output to test level when pressed. Adjustable 0-100% of span

**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**
100 milliseconds typical, faster response times are available

**DF option:** 1 millisecond response time

**Isolation**
2000 VRMS minimum
Full isolation: power to input, power to output, input to output
Individual inputs are single-ended (common ground)

**Housing and Sockets**
IP 40, requires installation in panel or enclosure
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.

**P option:** 85-265 VAC or 60-300 VDC, 2.5 W

**A230 option:** 230 VAC ±10%, 50/60 Hz, 2.5 W max.

**D option:** 9-30 VDC, 2.5 W typical

**Power options—add to end of model number**

<table>
<thead>
<tr>
<th>Model</th>
<th>Model</th>
<th>Factory Configured Input</th>
<th>Output</th>
<th>Power</th>
</tr>
</thead>
<tbody>
<tr>
<td>API 4400 G</td>
<td>(A + B + C + D) / 4</td>
<td>Specify 4 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4401 G</td>
<td>(A + B + C) / 3</td>
<td>Specify 3 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4402 G</td>
<td>(A + B) / 2</td>
<td>Specify 2 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4403 G</td>
<td>(A + B + C - D) / 3</td>
<td>Specify 4 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4404 G</td>
<td>(A + B - C - D) / 2</td>
<td>Specify 4 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4405 G</td>
<td>(A + B - C) / 2</td>
<td>Specify 3 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4406 G</td>
<td>A = - B = C</td>
<td>Specify 3 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4407 G</td>
<td>A - B</td>
<td>Specify 2 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
<tr>
<td>API 4408 G</td>
<td>A - B</td>
<td>Specify 2 input ranges</td>
<td>115 VAC</td>
<td></td>
</tr>
</tbody>
</table>

Factory configured, specify output range

**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 Functional Test Button to provide a fixed output (independent of the input) when held depressed. The output test level is adjustable from 0% to 100% of output span.
The functional test button greatly aids in saving time during initial startup and/or troubleshooting.

**Installation**
The API 4400 G through API 4408 G plug into an industry standard 11-pin octal socket sold separately. Sockets API 011 and 011 FS allow either DIN rail or panel mounting. The plug-in design, 3-way isolation, and robust electronics allows the module to be quickly hot-swapped without removing the power or I/O signals.

**Description**
The API 4400 G through API 4408 G are factory configured to accept two to four DC voltage or current inputs and provide an optically isolated DC voltage or current output that is proportional to the sum, average and/or difference of the inputs depending on the model.
The A, B, C, and D inputs should be the same type, and mixed input ranges are allowable. Consult the factory when selecting mixed input ranges.

Inputs are converted to a percentage and then the math function is applied. Consult the factory if true voltage math is required.
The API 4400 G series uses no transformers or choppers in the signal path for best noise immunity and freedom from AC artifacts in the output. The inputs are not isolated from each other and use the same signal common connection. The modules do features full 3-way (input, output, power supply) isolation. A wide bandwidth 1 millisecond response model is available for high-speed applications.

Common ranges as well as custom ranges are possible. Consult the factory for assistance with special ranges.

**Applications**
- Add, Subtract, Average Flow Signals
- Average Multiple Signals

**Variable Brightness Input LED**

**Output Test Button**

**Output Test Adjust**

**Output Span**

**Variable Brightness Output LED**

**API 011 FS**
300 V Rating

**API 011**
300 V Rating

**API CLP1**

**API USA**
Made in USA

**Lifetime Warranty**

**Free Factory I/O Setup!**

**Quick Link**
api-usa.com/4400

**Conformal Coating**
For moisture resistance

**API 4400 G**
300 V Rating

**API 4401 G**
300 V Rating

**API 4402 G**
300 V Rating

**API 4403 G**
300 V Rating

**API 4404 G**
300 V Rating

**API 4405 G**
300 V Rating

**API 4406 G**
300 V Rating

**API 4407 G**
300 V Rating

**API 4408 G**
300 V Rating

**API 011**
11-pin socket

**API 011 FS**
11-pin finger-safe socket

**API CLP1**
Module hold-down spring for high vibration or mobile applications

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

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**Installation and Setup**

**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!** Évitez 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**

Install module in a protective panel or enclosure. Allow space around module for air flow. Use API 011 or API 011 FS socket. See specifications for maximum allowable socket voltages. The socket clips to a standard 35 mm DIN rail or can be mounted to a flat surface.

**Ranges**

See the model/serial number label for module information, module power requirements, options, and I/O range information.

API 4400 G through API 4408 G input and output ranges are factory configured as indicated on the serial number label.

**Signal Inputs**

Polarity must be observed when connecting the signal input. Terminals 4, 5, 6, 7, 8 provide the appropriate connections for the input signal. Polarity must be observed when connecting the signal input.

The negative (–) connection for all inputs is connected to terminal 5.

The positive (+) connection for input A is to terminal 4.

The positive (+) connection for input B is to terminal 6.

The positive (+) connection for input C is to terminal 7.

The positive (+) connection for input D is to terminal 8.

**Signal Output**

Polarity must be observed for output wiring connections. If the output does not function, check wiring and polarity.

When a current output is ordered, it provides power to the output current loop (sourcing).

Terminals 9 (+) and 10 (–) provide the connections for the output. Note that the output provides power to the output loop.

**Module Power**

Check model/serial number label for module operating voltage to make sure it matches available power.

AC power is connected to terminals 1 and 3.

For DC powered modules (D option), polarity MUST be observed.

Positive (+) is wired to terminal 1

Negative (–) is wired to terminal 3.

**Calibration**

Input and output ranges as specified on your order are factory pre-configured (at 24°C ±1°C), Top-mounted. Zero and Span potentiometers can be used to calibrate the output to compensate for load and lead variations.

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. For example: 4 mA for a 4-20 mA output or –10 V for a ±10 V output.

4. Next, set the input at maximum, 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, the Span control will provide adjustment for the 20 mA or high end of the signal.

5. Repeat adjustments for maximum accuracy.

**Output Test Function**

The test button may be used to drive the device on the output (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial startup or during troubleshooting.

When depressed it will drive the output with a known good signal. When released, the output will return to normal.

The Test Range potentiometer is factory adjusted to approximately 50% of the output span. It can be field adjusted if required.

Press and hold the Test button and adjust the potentiometer for the desired output level. When released, the output will return to normal.

**Operation**

The API 4400 G through API 4408 G are factory configured series to your exact input and output requirements.

Up to four inputs can be scaled and connected to either additive or subtractive amplifier inputs according to the model designation.

The input signal is filtered, and cancels any offset of the input relative to the output. 50 Ω shunts are used at the input for current-to-voltage conversion if required.

The 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, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

The 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.