Input: Two 100 Ω 0.00385 RTDs

Output: 0-1 V to 0-10 V, ±1 V to ±10 V, 0-1 mA to 20 mA, 4-20 mA

- RTD Leadwire Compensation
- RTD Linearization
- Voltage or Current Output
- Input and Output LoopTracker® LEDs
- Output Test Button
- Built-In Loop Power Supply for Sourcing Output

Applications
- Monitor Heat Exchanger ΔT
- Convert and Transmit Δ RTD Signals
- Rescale Δ RTD Temperature to Full 4-20 mA

RTD Inputs
Two RTDs, 1 hot and 1 cold
100 Ω Platinum, 0.00385 DIN curve
3-wire recommended
2-wire acceptable for short lead length applications

Input Differential Span
Minimum: 20°F or 10°C
Maximum: 900°F or 500°C

Input Common Mode Temperature
Entire Pt 100 range: –325 to 1300°F (–200 to 700°C)

RTD Excitation Current
5 mA for each input

Leadwire Compensation
< ±0.02% of span per 1 Ω change in leadwire resistance
40 Ω maximum allowable leadwire resistance

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

DC Output Range
Factory ranged, please specify output type and range
Voltage: 0-1 VDC to 0-10 VDC, 10 mA max
Bipolar voltage: ±1 VDC to ±10 VDC
Current: 0-1 mADC to 0-25 mADC, 4-20 mADC
20 V compliance, 1000 Ω at 20 mA
Outputs clamped not to exceed ±5% over- or under-range

Common Output Ranges
Voltage	Bi-polar voltage	Current
0 to 1 V	±5 V	0 to 20 mA
0 to 5 V	±10 V	4 to 20 mA
1 to 5 V		
0 to 10 V		

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

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

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

Accuracy
±0.1% of span (includes adjustment resolution and linearity)

Response Time
100 milliseconds typical

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

Ambient Temperature Range and Stability
–10°C to +60°C operating ambient
Better than 0.02% of span per °C

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.
P option: 85-265 VAC 50/60 Hz, 60-300 VDC 2.5 W typ.
D option: 9-30 VDC, 2.5 W typical

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

Input Loop-Tracker
Test Switch
Test Range
Span
Zero
Output Loop-Tracker

2.38"
1.75"
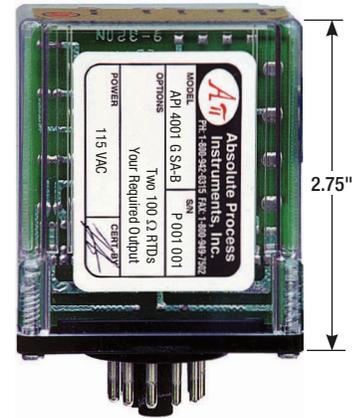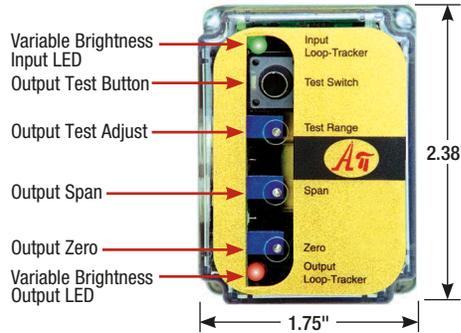
Hot Swappable
Plug-In Design

2.75"

LIFETIME WARRANTY

Free Factory I/O Setup!

MADE IN USA

Description
The API 4001 G SA-B accepts two DIN curve 100 Ω platinum RTD inputs and provides a linear DC voltage or current output proportional to the difference in temperature of the two RTDs.

The API 4001 G SA-B is factory configured to a specific RTD temperature span (°C or °F), and corresponding DC voltage or current output.

Differential or single-ended input ranges from 20°F through 900°F (10°C through 500°C) can be accommodated.

Consult factory for offset or non-standard differential ranges.

3-wire RTD leadwire compensation and linearization for accurate output over a wide temperature range is standard.

Eight common DC output ranges are standard. Consult factory for other outputs. The module power supply is isolated from the input and the output.

LoopTracker
API exclusive features include LoopTracker LEDs (green for input, red for output) that vary in intensity with changes in the process input and output signals.

They provide a quick visual picture of your process loop at all times and can greatly aid in saving time during initial startup and troubleshooting.

Output Test
An API exclusive feature includes an output test button to provide a fixed output (independent of the input) when held depressed. The output test greatly aids in saving time during initial startup and/or troubleshooting.

The output test level is adjustable from 0 to 100% of span.

Mounting
The API 4001 G SA-B 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.

Model	Input	Output	Power
API 4001 G SA-B	Factory configured Specify maximum differential temperature in °F or °C	Factory configured specify output range in volts or mA	115 VAC
API 4001 G SA-B A230			230 VAC
API 4001 G SA-B P			85-265 VAC or 60-300 VDC
API 4001 G SA-B D			9-30 VDC

Option—add to end of model number
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 CLP1 — Module hold-down spring for high vibration or mobile applications

API 011 FS
300 V Rating

API 011
300 V Rating

API CLP1

recautions

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! Éviter 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.

Socket and Mounting

The module installation requires a protective panel or enclosure. Use API 011 or finger-safe API 011 FS socket.

The socket clips to a standard 35 mm DIN rail or can be attached to a flat surface using the two mounting holes.

Electrical Connections

The sensor type and temperature range are factory configured. See the model/serial number label for power requirements, sensor type, temperature range and options.

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

3 Wire RTD Input

Note that RTD wire color-coding varies.

For the **Low** temperature input, connect the red (or black) wire to terminal 4 and connect the other two wires with the same colors to terminals 5 and 6.

For the **High** temperature input, connect the red (or black) wire to terminal 8 and connect the other two wires with the same colors to terminals 6 and 7.

2 Wire RTD Input

For the **Low** temperature input, connect the red (or black) wire to terminal 4 and the other wire to terminal 5.

Install a jumper from terminal 5 to terminal 6.

For the **High** temperature input, connect the red (or black) wire to terminal 8 and the other wire to terminal 7.

Install a jumper from terminal 6 to terminal 7.

Signal Output Terminals

Polarity must be observed when connecting the signal output to the load.

Positive (+) is connected to terminal 9.

Negative (–) is connected to terminal 10.

Note that with current outputs the module provides power to the output loop.

Module Power Terminals

Check white 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, polarity MUST be observed.
Positive (+) is wired to terminal 1
Negative (–) is wired to terminal 3
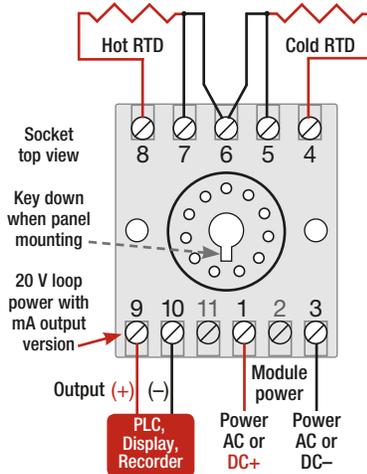
API 4001 G SA-B with 3-wire RTD inputs
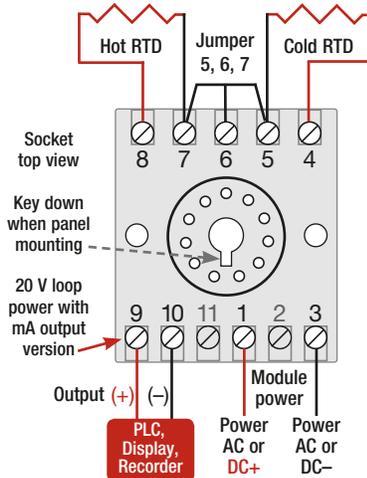
API 4001 G SA-B with 2-wire RTD inputs
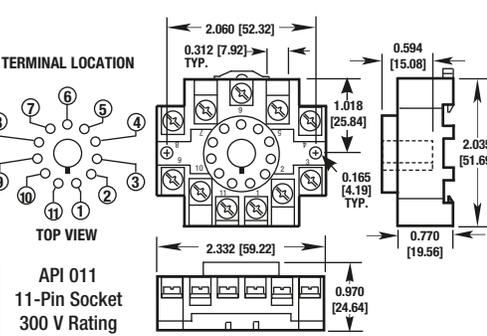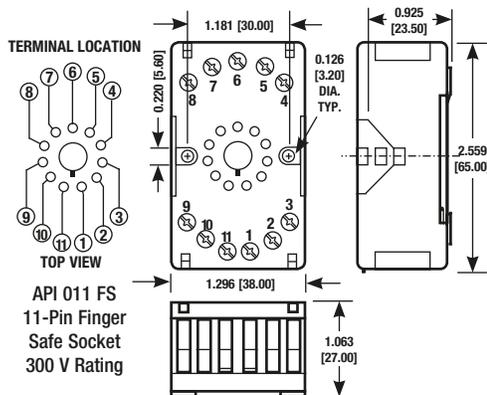
API 011 FS
11-Pin Finger
Safe Socket
300 V Rating

API 011
11-Pin Socket
300 V Rating

Calibration

The API 4001 G SA-B is factory configured to your exact input and output requirements.

Input and output ranges are listed on module labels. Input changes require factory modification.

Top-mounted Zero and Span potentiometers can be used should fine-tuning of the output be necessary.

1. Recalibration of the API 4001 G SA-B will require two accurate, matched RTD simulators, plus an accurate DC digital voltmeter, for best results.

2. Be aware that measuring small temperature differentials (20°F to 40°F or 10°C to 20°C) on large offsets such as 800°F (400°C) or more will require very precise matching (±0.1%) of RTDs for acceptable results.

3. To calibrate, connect two RTD simulators to the module input, and an accurate DC voltmeter (or milliammeter, as required) to the module output.

4. For best accuracy, calibrate the unit near the actual ambient temperatures the unit will encounter in the application.

5. Set the cold RTD simulator to the low-end differential temperature compared to the hot RTD simulator.

6. Adjust the module's zero control for the specified 0% (low end) output.

7. Set the hot RTD simulator to the high differential value.

8. Adjust the module span control for the specified high (100%) output level. The zero and span controls normally have little interaction, but adjustments may be repeated for maximum accuracy.

Output Test Function

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.

Example: If you are checking a 4-20 mA current loop, when the push button is held depressed, the output from the module will be approximately 12 mA.

Turn the multi-turn Test Range potentiometer while holding the Test Switch depressed until the desired output test level is reached. It can be adjusted to vary the output signal from 0 to 100% of the calibrated output range.

Operation

The API 4001 G SA-B excites the "hot" and "cold" RTDs with constant 5 mA current sources which are linearized for 100 Ω platinum, DIN-curve RTDs.

A switched-capacitor technique is used to convert the temperature differential signal into a single-ended signal. A precision amplifier then amplifies this signal.

Non-interactive zero and span controls provide a standard level signal to the output stage. The output stage is internally configured for voltage or current output and the gain is scaled to the specific user-requested limits.

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 output changes from minimum to maximum.

For a current output, 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.