

Input: RTD, Thermistor, or Custom Sensor
Output: 0-1 V to 0-10 V, ± 5 V, ± 10 V, 0-2 mA to 4-20 mA

Quick Link: api-usa.com/apd4002

- For All Common RTDs and Thermistors
- Zero and Span for Output
- Full 1200 V Isolation
- Input LoopTracker® LED
- Output Test Function
- Built-In Loop Power Supply for Sink/Source Output

Applications

- Convert/Isolate Temperature Sensors for PLC Input, Control and/or Validation
- Interface Temperature Sensors with Panel Meters, PLCs, Recorders, Data Acq., DCS, & SCADA Systems

Input Types, Factory Set

RTDs: 2, 3, or 4 wire, 10 Ω to 8000 Ω RTDs
 4 wire with or without current rotation
 Cu-10, Cu-100, Ni-100, Ni-120,
 Ni-Fe-500, Ni-Fe-1000, Ni-Fe-2000,
 Pt-10, Pt-25, Pt-50, Pt-100, Pt-200,
 Pt-470, Pt-500, Pt-1000

Thermistors: 44004/44033 2.252 k Ω at 25°C
 44005/44030 3.000 k Ω at 25°C
 44007/44034 5.000 k Ω at 25°C
 44006/44031 10.00 k Ω at 25°C
 44008/44032 30.00 k Ω at 25°C
 YSI 400 2.252 k Ω at 25°C
 Spectrum 1003k 1 k Ω

Custom: Provide sensor specifications, temperature curve data, and temperature range

LoopTracker

Variable brightness green LED indicates input level and status

Status LED

Yellow LED for setup and operational status

DC Output Ranges, Factory Set

Voltage: 0-1 V to 2-10 V, ± 5 VDC, ± 10 VDC
Current: 0-2 mA to 4-20 mA
 20 V compliance, 1000 Ω at 20 mA

Consult factory for reverse output

Output Calibration

Zero and span set by using up/down buttons, $\pm 10\%$ range

Output Loop Power Supply

20 VDC nom., regulated, 25 mADC, <10 mVrms max. ripple
 May be selectively wired for sinking or sourcing mA output

Output Test

Front push button switch enables/disables test level output
 Adjustable 0-100% of span via up/down buttons

Output Resolution

18 bit

Output Ripple and Noise

Less than $\pm 0.2\%$ of span

Accuracy

$\pm 0.1^\circ\text{C}$ accuracy and 0.001°C resolution

Ambient Temperature Range and Stability

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

Response Time

300 milliseconds nominal

Isolation

Full 3-way isolation: input, output, power, 1200 Vrms min.
 600 VACp or 600 VDC common mode protection
 75 dB minimum common mode rejection
 Simultaneous 50 Hz and 60 Hz rejection

Housing and Connectors

IP 40, requires vertical installation on a 35 mm DIN rail inside a panel or enclosure

For use in Pollution Degree 2 Environment

Four 4-terminal removable connectors, 14 AWG max. wire size

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 3 W maximum
 D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 3 W maximum



Applications Link
api-usa.com/apps

Free Factory I/O Setup!

Dimensions

Height includes connectors
 0.89" W x 4.62" H x 4.81" D (22.5 x 117 x 122 mm)

Description

The APD 4002 accepts an RTD or thermistor temperature input and provides an optically isolated and linearized DC voltage or current output.

The sensor type, temperature range and output range are factory set. A custom RTD or thermistor can be set up with customer provided sensor data.

Microprocessor-based linearization uses 41 to 55 segments or up to a 14th order polynomial depending on the sensor type. The input is sampled, digitally converted to a linearized temperature signal and then passed through an optocoupler to the output stage.

Full 3-way isolation (input, output, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

The low noise 18 bit analog output is isolated and can be set for common voltage and milliamp output types.

How to Order

Models are factory ranged. You must specify the sensor type and the following information.

RTD: Resistance, alpha curve, number of wires
 If 4 wire: with or without current rotation

Thermistor: Sensor model/type, resistance

Custom: Complete sensor data over temperature range

Temperature: Range in $^\circ\text{F}$ or $^\circ\text{C}$

Output: Range and type (mV, V, mA)

Model	Description	Power
APD 4002	RTD or Thermistor input to DC output isolated transmitter	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 4002 D		9-30 VDC or 10-32 VAC

Sink or Source
mA Output

Setup and Status
LED

Adjustable Output
Test Function

Zero and Span for
Output

Input LoopTracker
LED

RTD or Thermistor
Input

Universal
Power



Output Sink/Source Versatility

Standard on the APD 4002 is a 20 VDC loop excitation supply for the milliamp output. The output can be selectively wired for sinking or sourcing allowing use with a powered or unpowered milliamp device.

LoopTracker

An API exclusive feature includes a green LoopTracker LED that varies in intensity with changes in the process input signal.

It provides a quick visual picture of your process input 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 switch to provide a fixed output (independent of the input) when pressed. The output test greatly aids in saving time during initial startup and/or troubleshooting. The test output level is adjustable from 0 to 100% of the output span.

Options and Accessory

Options—add to end of model number

NC5 5 point NIST traceable calibration certificate
NC11 11 point NIST traceable calibration certificate
U Conformal coating for moisture resistance
R Consult factory for reverse output

Accessory—order as separate line item

API BP4 Spare removable 4 terminal plug, black

Note: Units are set up at the factory, but an appropriate simulator and multimeter may be required to adjust calibration in the field.

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! 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.

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 nickel, which is 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

Electrical Connections

See wiring diagrams. A multimeter and a temperature simulator may be used to check setup. Input and output ranges are factory calibrated (at $24^{\circ}\text{C} \pm 1^{\circ}\text{C}$).

The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

Input

The temperature sensor input is connected as shown in the wiring diagrams. If a custom input was specified, see the model/serial number label for sensor type, temperature range and options.

Output

For milliamp ranges, determine if your device provides power to the current loop or if the loop must be powered by the APD module. Typical voltage may be 9-24 VDC at your device's terminals if it provides power to the loop. If the output does not function, check wiring and polarity.

Module Power

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

When using DC power, either polarity is acceptable, but for consistency with similar API products, positive (+) can be wired to terminal 13 and negative (-) can be wired to terminal 16.

Calibration

The module is factory calibrated, but the output may be adjusted to account for lead length and load variations.

1. Connect a multimeter to the output terminals 2 - 3, or 3 - 4 depending on output type. See wiring diagram at right.
2. Connect a temperature simulator to the input of the module.
3. Connect power to the unit (terminals 13, 14, and 16) and apply power to the module.
4. Wait until the yellow Status LED starts blinking once per second.

Low End Input Calibration

5. Use the simulator to apply the low end of the input signal.
6. Push the Set button to store the low end input value.
7. The Status LED will turn on to indicate the reading was saved.
8. Use the Up and Down buttons to adjust the output to the desired low output reading. For example: 4 mA for a 4-20 mA output or -10 V for a $\pm 10\text{V}$ output.

9. Press and release the Set button to store the low output.

High End Input Calibration

10. Wait until the Status LED blinks once per second.
11. Use the simulator to apply the high end of the input signal.
12. Push the Set button to store the high end input value.
13. The Status LED will turn on to indicate the reading was saved.
14. Use the Up and Down buttons to adjust the output to the desired high output reading (i.e. 20 mA for a 4-20 mA output).
15. Press and release the Set button to store the high output.

Output Test Level Adjustment

16. Wait until the Status LED turns on and stays on.
17. Using the Up and Down buttons adjust the test output for the desired level (i.e. 12 mA for a 4-20 mA output).
18. Press and release the Set button to store the test output.
19. Wait until the Status LED starts blinks once per second.
20. To change any value, turn off the power and repeat above steps.

Saving Setup

21. Press and release the Set button to store the value and lock it into memory. The Status LED will turn on during the storing process.
22. Once the Status LED turns off, setup and configuration is complete. Turn off power to the unit and remove the simulator and multimeter.

Adjusting Output After Installation

It may be necessary to fine-tune the output signal after installation

to account for offset, tare, lead length, or operating temperature.

1. Press and release the **Set** button. This will turn on the yellow Status LED.
2. Use the **Up** and **Down** buttons to adjust the output to the desired level. The Status LED will turn off during the adjustment.
3. Once the desired output level has been met, press and release the **Set** button to save the adjustment. The "Status" LED will flash indicating that the change has been made.

The unit has an auto Zero/Span detection for knowing which to adjust. If the output signal is greater than 50% of the Span, the unit will adjust the output signal Span.

If the output signal is less than 50% of the Span, the unit will adjust the output signal Zero.

Resetting to Factory Values

To reset the unit calibration and test output back to factory default, press and hold the Set button while the module is being powered up.

Mounting to a DIN Rail

Install module vertically on a 35 mm DIN rail in a protective enclosure away from heat sources. Do not block air flow. Allow 1" (25 mm) above and below housing vents for air circulation.

1. Tilt front of module downward and clip the lower mount with spring clips to the bottom edge of DIN rail.
2. Push front of module upward until upper mount snaps into place.

Removal

Avoid shock hazards! Turn signal input, output, and power off before removing module.

1. Push up on bottom back of module.
2. Tilt the front of module downward to release upper mount from top edge of DIN rail.
3. The module can now be removed from the DIN rail.

Output Test Function

When the Test button is pressed 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 pressed again, the output will return to normal. The button allows hands-free operation of the Test Mode.

The Test level can be adjusted by using the Up and Down buttons.

The level can be set by pressing the Set button, or it can default back to the setup value by not pressing the Set button.

Operation

The APD 4002 accepts an RTD or Thermistor input and provides a linearized and optically isolated DC voltage or current output.

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 yellow status LED provides a visual indication of operational modes.

Normal operation: Off
Push-to-Test mode: Steadily on
Operational error: Blinking 2 digit code

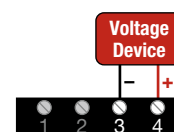
Operational Error Codes, Yellow LED

If an error occurs during operation, the yellow Status LED blinks an error code. Check sensor, wiring, or consult factory.

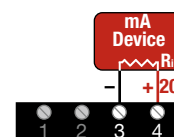
- | | |
|---|---------------------|
| 11 Analog-digital converter out-of-range | ● — ● |
| 12 Sensor under range | ● — ● ● |
| 13 Sensor over range | ● — ● ● ● ● |
| 16 Hard ADC out-of-range | ● — ● ● ● ● ● ● |
| 17 Sensor hard fault, open circuit, or hard ADC fault | ● — ● ● ● ● ● ● ● ● |



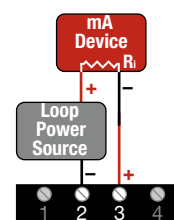
To avoid damage to the module, do not make any connections to unused terminals

Voltage Output**Current Sourcing Output**

Module powers mA output loop

**Current Sinking Output**

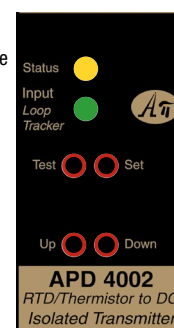
Module mA output is unpowered



Do Not Connect to Unused Terminals 1, 5, 6, 7, 8



Yellow status LED
Off: normal operation
2 digit code: error code

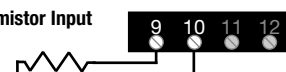
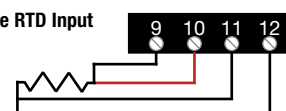
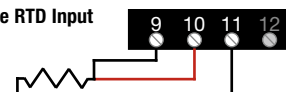
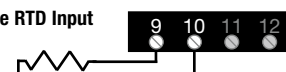


Green LoopTracker LED brightness varies with input level

Wire terminal torque
0.5 to 0.6
Nm or
4.4 to 5.3
in-lbs

To maintain full isolation and avoid malfunctions, do not connect power supplies in common with input, output or unit power.

Do not connect any devices to unused terminals.

Thermistor Input**4 Wire RTD Input****3 Wire RTD Input****2 Wire RTD Input**

- | | | | |
|---------------------|-----------------|---------------------|----|
| 13 Power AC or DC + | 14 Earth Ground | 15 Power AC or DC - | 16 |
|---------------------|-----------------|---------------------|----|
- Cu 60/75°C conductors
14 AWG max.