

**Input:** Thermocouple or Custom Thermocouple Type  
**Output:** 0-1 V to 0-10 V,  $\pm 5$  V,  $\pm 10$  V, 0-2 mA to 4-20 mA

- $\pm 0.1\%$  Accuracy for All Common Thermocouples
- 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 Thermocouples for PLC Input, Control and/or Validation
- Interface Thermocouples with Panel Meters, PLCs, Recorders, Data Acq., DCS, & SCADA Systems

## Input Types, Factory Set

Thermocouples: J, K, T, E, R, S, N, B, C, D, G, M, P  
 Full ANSI temperature ranges  
 Automatic CJC

T/C burnout: Upscale, downscale or last valid output

Custom: Provide thermocouple specifications, temp. vs. millivolt data, and temp. 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, 0-2 V, 0-4 V,  
 0-5 V, 1-5 V,  
 0-8 V, 0-10 V, 2-10 V,  
 $\pm 5$  VDC,  $\pm 10$  VDC

Current: 0-2 mA, 0-4 mA,  
 0-8 mA, 0-10 mA, 2-10 mA,  
 0-16 mA, 0-20 mA,  
 4-20 mA  
 20 V compliance, 1000  $\Omega$  at 20 mA

Consult factory for reverse output

## Output Calibration

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

## Output Ripple and Noise

Less than  $\pm 0.2\%$  of span

## 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

## Accuracy and Resolution

$\pm 0.1^\circ\text{C}$  accuracy, 0.001 $^\circ\text{C}$  resolution, 18 bit

## Response Time

300 milliseconds typical

## 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

## Ambient Temperature Range and Stability

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

## 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

## Dimensions

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



Quick Link  
[api-usa.com/4131](http://api-usa.com/4131)

Free Factory  
 I/O Setup!

Sink or Source  
 mA Output

Setup and Status  
 LED

Adjustable Output  
 Test Function

Zero and Span for  
 Output

Input LoopTracker  
 LED

Universal  
 Temperature Input



Universal  
 Power

Removable Plugs

Actual Size

## Description

The APD 4131 accepts a thermocouple temperature input and provides an optically isolated and linearized DC voltage or current output.

The thermocouple type, temperature range and output range are factory set. The unit can be set up for all commonly available thermocouple types and temperature ranges.

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 is factory 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.

T/C: Thermocouple type, burnout setting  
 Custom: Complete T/C 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 4131	Thermocouple input to DC output isolated transmitter	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 4131 D		9-30 VDC or 10-32 VAC

## Output Sink/Source Versatility

Standard on the APD 4131 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.

### Electrical Connections

See wiring diagrams at right. A multimeter and a temperature simulator may be used to check setup. Observe polarity. If the output does not function, check wiring and polarity.

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

### Input

The thermocouple is connected as shown in the wiring diagrams at right. If a custom input was specified, see the model/serial number label for thermocouple 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.

### 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 (i.e. 4 mA for a 4-20 mA 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.

### 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.

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 4131 accepts a temperature 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.

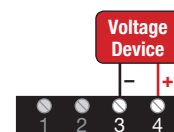
Normal operation: Off  
Push-to-Test mode: Steadily on  
Operational error: Blinking 2 digit code

### Operational Error Codes, Yellow LED

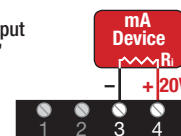
If an error occurs during operation, the yellow Status LED blinks an error code. Check sensor, wiring, or consult factory.

- |  |                   |
|--|-------------------|
| 11 Analog-digital converter out-of-range | ● — ●             |
| 12 Sensor under range                    | ● — ● ●           |
| 13 Sensor over range                     | ● — ● ● ●         |
| 14 CJC sensor abnormal range             | ● — ● ● ● ●       |
| 15 CJC failure                           | ● — ● ● ● ● ●     |
| 16 Hard ADC out-of-range                 | ● — ● ● ● ● ● ●   |
| 17 Sensor hard fault                     | ● — ● ● ● ● ● ● ● |
- Open circuit, hard ADC fault, or hard CJC fault

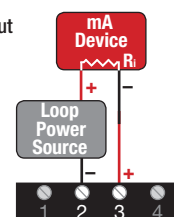
### Voltage Output Switch E set to "V"



### Current Sourcing Output Switch E set to "I"



### Current Sinking Output Switch E set to "I"

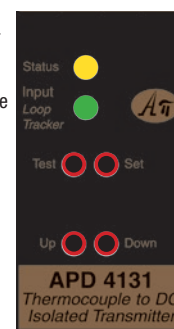


### Do Not Connect to Unused Terminals 1, 5, 6, 7, 8



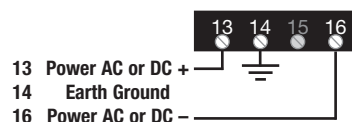
Yellow status LED Setup: blinks once per second  
Off: normal operation  
2 digit code: error code  
**To maintain full isolation and avoid malfunctions, do not connect power supplies in common with input, output or unit power.**

**Do not connect any devices to unused terminals.**



Green LoopTracker LED brightness varies with input level

### Thermocouple Input



Cu 60/75°C conductors 14 AWG max.