

**Input:** 0-50 mV to 2-10 VDC,  $\pm 25$  mVDC to  $\pm 10$  VDC, 0-500  $\mu$ A to 4-20 mA  
**Output:** 0-1 V to 0-10 V,  $\pm 5$  V,  $\pm 10$  V, 0-2 mA to 4-20 mA, Reverse Acting Optional

- One Model Covers All Common DC Sensors
- 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 DC Sensors for PLC Input, Control and/or Validation
- Interface DC Sensors with Panel Meters, PLCs, Recorders, Data Acq., DCS, & SCADA Systems

### Input Types and Ranges, Field Selectable

DC volts 35 ranges from  $\pm 25$  mVDC to  $\pm 10$  VDC  
 DC mA 20 ranges from  $\pm 0.5$  mA to  $\pm 20$  mA

### LoopTracker

Variable brightness green LED indicates input level and status

### Status LED

Yellow LED for setup and operational status

### DC Output Ranges, Field Selectable

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

### Reverse Acting Output, Factory Set

R option: Reverse acting output  
 increasing input = decreasing output signal

Reverse acting models cannot be converted to direct acting

### Output Calibration

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

### Output Loop Power Supply

20 VDC nom., regulated, 25 mA,  $< 10$  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

### Linearity

$\pm 0.1\%$  span

### Ambient Temperature Range and Stability

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

### 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

### 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)



Applications Link  
[api-usa.com/apps](http://api-usa.com/apps)

Free Factory  
 I/O Setup!

### Description

The APD 4381 accepts a DC input and provides an optically isolated and high accuracy DC voltage or current output.

The input and output ranges are field configurable.

The input type is set with switches and its range is configured using front buttons, a multimeter and an input simulator.

This provides a versatile solution that works with all commonly available DC inputs.

The input is sampled 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 up for common voltage and milliamp output types.

### How to Order

Models are field rangeable. For free setup specify the following.

DC: Range and mV, volts, or mA

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

Default: 4-20 mA input, 4-20 mA output

Model	Description	Power
APD 4381	DC input to DC output isolated transmitter	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 4381 D		9-30 VDC or 10-32 VAC

Sink or Source  
 mA Output



1 2 3 4

Removable Plugs

5 6 7 8

Setup and Status  
 LED

Adjustable Output  
 Test Function

Zero and Span for  
 Output

Input LoopTracker  
 LED

Universal DC Input  
 9 10 11 12

Universal  
 Power  
 13 14 15 16

See Wiring  
 Diagrams on  
 Next Page

### Output Sink/Source Versatility

Standard on the APD 4381 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 Reverse acting output

Accessory—order as separate line item

API BP4 Spare removable 4 terminal plug, black

Note: An appropriate simulator and a multimeter are required for setup. We can set up the I/O ranges at no extra charge.

**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](http://api-usa.com) for latest product information. Consult factory for your specific requirements.

 **WARNING:** This product can expose you to chemicals including 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](http://www.P65Warnings.ca.gov)

**Range Selection**

Select ranges before installation. Use the tables on the next page to select the I/O ranges. The module side label lists output ranges. Ranges can also be found at [api-usa.com/4381](http://api-usa.com/4381)

Check the model/serial number label for module power, options, or custom range information. A custom range uses switch settings described in the Custom Range Table.

Models with **R** reverse acting output use the same switch settings, except the output range is reversed (4-20 mA is 20-4 mA).

1. Set switches A, B, and C from the table to set input type and range.

2. Set switches D and E from the table to set the output range and set switch E: V for voltage or I for current output.

For output ranges that fall between the listed ranges use the next highest setting. The output can be trimmed using the zero and span buttons.

**Electrical Connections**

See wiring diagrams at right. A multimeter and an input signal simulator are required for 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 DC input is connected as shown in the wiring diagrams at right. If a custom input was specified, see the model/serial number label for type, range, or options. Your device must provide loop power for a milliamp input.

**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.

**Range Calibration**

Note: Perform the following calibration procedure any time input or output settings are changed.

1. Connect a multimeter to the output terminals 2 and 3, or 3 and 4 depending on output type. See wiring diagram at right.
2. Connect an appropriate VDC or mADC 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 blinks (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 ±10V output.
9. Press and release the Set button to store the low output.

**High End Input Calibration**

10. Wait until the yellow 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.

**Blinking Yellow LED Setup Error Codes**

If an error occurred or invalid selection was made, the yellow Status LED blinks an error code. Check switches A, B, C, and input wiring.

- |  |  |
|--|--|
| 2 1 Invalid sensor selected                        |     |
| 2 6 Invalid DC range selected                      |    |
| 2 7 Invalid input setting (Zero greater than Span) |  |

**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 steps 1 to 19.

**Saving Setup**

21. Press and release the Set button to store the settings and lock them into memory. The Status LED will be on during this 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.

**Changing I/O Setup**

To reset the unit back to factory default without changing any input switch settings press and hold the Set button while the module is being powered up.

If using a new input switch setting, the unit will automatically start in setup mode to allow you to calibrate and store your new configuration.

**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 4381 accepts a DC input and provides an optically isolated DC voltage or current output.

The green LoopTracker<sup>®</sup> 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.



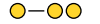


The yellow status LED provides a visual indication of operational modes.

- Normal operation: Off
- Push-to-Test mode: Steadily on
- User setup mode: Blinking once per second

Note that it may be difficult to see the LEDs under bright lighting conditions.

**Blinking Yellow LED Operational Error Codes**

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

- |   |   |
|---|---|
| 1 1 Analog-digital converter out-of-range           |  |
| 1 2 Sensor under range                              |  |
| 1 3 Sensor over range                               |  |
| 1 6 Hard ADC out-of-range                           |  |
| 1 7 Sensor hard fault, open circuit, hard ADC fault |  |



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

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

**Mounting to a DIN Rail**

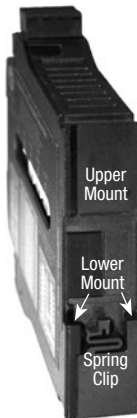
Install module vertically on a 35 mm DIN rail in a protective enclosure away from heat sources. Do not block air flow. Allow 1" (25 mm) above and below housing vents for air circulation.

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.

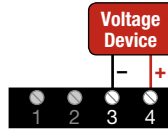
**Removal**

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.



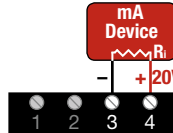
**Voltage Output**  
Switch E set to "V"



mA output: determine if receiving device has a passive or powered input. The module can be wired for a sinking or sourcing mA output.

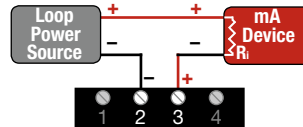
**Current Sourcing Output**  
Switch E set to "I"

Module powers mA output loop



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

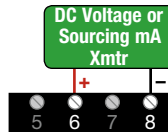
Module mA output is unpowered



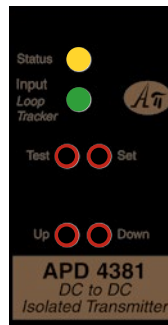
3- or 4-wire transmitter or 2 wire transmitter with external power supply

**Do Not Connect to Unused Terminals**  
1, 5, 7

**DC Input**  
Module does not power mA loop



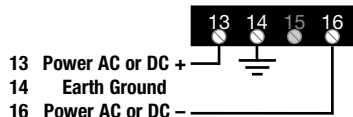
To maintain full isolation and avoid malfunctions, do not connect power supplies in common with input, output or unit power.  
Do not connect any devices to unused terminals.



Yellow status LED Setup: blinks once per second  
Off: normal operation  
2 digit code: error code

Green LoopTracker LED brightness varies with input level

**Do Not Connect to Unused Terminals**  
9, 10, 11, 12



Cu 60/75°C conductors  
14 AWG max.

