

Input: One 350 Ω Sensor, 1 mV to 2000 mV, 4-10 VDC Excitation**Output:** 0-1 V to ±10 V or 0-1 mA to 4-20 mA, IsolatedQuick Link: api-usa.com/4051

- Factory Set for Your Specified Range
- Full 3-Way Input/Output/Power Isolation
- Internal Excitation Power Supply
- DC Voltage or Current Output
- Removable Plugs for Faster Installation
- Input and Output LoopTracker® LEDs
- Adjustable Output Test

Applications

- Load Cell Weighing Systems and Scales
- Strain Gauge Pressure Sensors and Transducers
- Tanks, Scales, Extruder Melt Pressure, Crane Loads

Strain Gauge Input

Factory configured, please specify sensor mV/V and mV range
Minimum sensor range 1 mV
Maximum sensor range: 2000 mV

Millivolt output range is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.
mV/V sensitivity X excitation voltage = total mV range

Input Impedance

1 MΩ minimum

Common Mode Rejection

100 dB minimum

Excitation Voltage

Range: 4 to 10 VDC factory set, please specify

Adjustment: ±10% via front potentiometer

Maximum output: 10 VDC maximum at 30 mA

Stability: ±0.01% per °C

Designed for one 350 Ω (or greater) sensor

LoopTracker

Variable brightness LEDs for input/output loop level and status

DC Output Range

Factory configured, please specify output range

Voltage (10 mA max.): 0-1 VDC to 0-10 VDC

Bipolar voltage (±10 mA max.): ±1 VDC to ±10 VDC

Current: 0-1 mA to 0-20 mA

Compliance, drive at 20 mA: 20 V, 1000 Ω drive

Can be wired for sinking or sourcing mA output

Output Calibration

Multi-turn zero and span potentiometers

±15% of span adjustment range typical

Output Test

Sets output to test level when pressed

Adjustable 0-100% of span

Potentiometer factory set to approximately 50% of span

Output Ripple and Noise

Less than 10 mVRMS ripple and noise

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

Nominal time at 63.2% of step change

Standard: 70 milliseconds (14.3 Hz)

DF10 option: Fast response time, 10 milliseconds (100 Hz) nominal. DF option will cause output noise levels to be greater than standard specifications. See APD 4059 for custom response times.

Isolation

1200 VRMS min.

Full isolation: power to input, power to output, input to output

Housing and Connectors

IP 40, requires installation in panel or enclosure

For use in Pollution Degree 2 Environment

Mount vertically to a 35 mm DIN rail

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

Power

Standard: 85-265 VAC, 50/60 Hz or 60-300 VDC

D option: 9-30 VDC (either polarity) or 10-32 VAC

2.5 W typical



Connect mA Output for Sink or Source

1 2 3 4

Removable Plugs

Custom I/O Range 5 6 7 8



Output LoopTracker LED



Adjustable Output Test Function

Zero and Span for Output

Input LoopTracker LED

Connect One 350 Ω or Greater Load Cell

9 10 11 12

Universal Power 13 14 15 16

See Wiring Diagrams on Next Page

Applications Link api-usa.com/apps

Free Factory I/O Setup!

Dimensions

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

Description

The APD 4051 accepts a strain gauge, bridge, or load cell input and provides a proportional, isolated DC voltage or current output. It includes filtering and processing to allow effective use of low-level transducers in the noisy environments common in industrial applications.

The built-in bridge excitation power supply generates a stable source of excitation voltage to drive a 350 Ω (or greater) bridge type sensor such as a load cell, pressure transducer, or strain gauge and amplifies and converts the resulting millivolt signal into the factory configured output.

The APD 4051 is factory configured to a specific excitation voltage, millivolt input (mV/V rating of the sensor multiplied by the excitation voltage), DC voltage or DC current output, and power. The input can be configured as zero-based (i.e., 0 to 20 mV), bi-polar (i.e., -30 to +30 mV) for push-pull applications, or offset (i.e., 5 to 33 mV) to electronically compensate for deadweight (tare).

The output can be configured as zero-based, bi-polar, or offset. In addition to the standard output ranges, the APD 4051 output can be configured to meet most non-standard requirements. Contact the factory for assistance.

Sink/Source Versatility

For maximum versatility the APD 4051 milliamp output can be selectively wired for sinking or sourcing. This allows connection to any type of mA input receiving device.

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 test button to provide a fixed output (independent of the input) when held depressed. The test output level is potentiometer adjustable from 0 to 100% of output span.

The output test button greatly aids in saving time during initial startup and/or troubleshooting.

Model	Input	Output	Power
APD 4051	Factory ranged, specify mV/V and excitation voltage	Factory ranged, specify voltage or milliamp range	85-265 VAC or 60-300 VDC
APD 4051 D	mV/V and excitation voltage	voltage or milliamp range	9-30 VDC or 10-32 VAC

Options—add to end of model number

DF10 10 millisecond response time or consult factory

U Conformal coating for moisture resistance

Accessory—order as separate line item

API BP4 Spare removable 4 terminal plug, black

Instructions

APD 4051



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. Observe polarity.

* Do not make any connections to unused terminals or use them as wiring junctions for external devices. This may cause permanent damage to the module!

Ranges

The APD 4051 is factory configured to your exact input and output ranges are pre-configured at the factory as specified on your order. The model/serial number label will indicate input range, excitation voltage and output range.

Input

Refer to wiring diagram at right and strain gauge manufacturer's data sheet for wiring and color-coding. Polarity must be observed when connecting input. Sensor shield wire (if equipped) should be grounded at one end only.

Excitation Voltage

The excitation voltage is factory set and should match the sensor manufacturer's recommendations. A front potentiometer allows approximately $\pm 10\%$ fine adjustment of the excitation voltage. **CAUTION:** Never short the excitation leads together. This will cause internal damage to the module.

Output

Polarity must be observed when connecting the signal output. When a current output is ordered, it can be wired to power the output current loop (sourcing APD 4051 output) or used with devices that provide their own power (sinking APD 4051 output). If the output does not function, check wiring and polarity.

Type of Device for Output	- Term.	+ Term.
mA (current) input device powers the current loop	2 (-)	3 (+)
mA (current) input device that is passive. APD module provides the loop power.	3 (-)	4 (+20 V)
Device accepts a voltage input.	3 (-)	4 (+)

Module Power

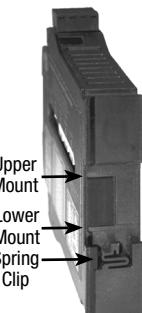
Check model/serial number label for module operating voltage to make sure it matches available power.

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.

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.

- Tilt front of module downward and position against DIN rail.
- Clip lower mount to bottom edge of DIN rail.
- Push front of module upward until upper mount snaps into place.



Removal

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

Calibration

Input and output ranges are factory pre-configured (at 24°C $\pm 1^\circ\text{C}$). Use the front-mounted Zero and Span potentiometers to calibrate the output.

This calibration procedure does not account for offsets or tare weights. To achieve optimum results, it is recommended that the APD 4051 be calibrated using an accurate bridge simulator before being placed in service.

- Apply power to the module and allow a minimum 20 minute warm up time.
- Using an accurate voltmeter on terminals 10 and 12 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- Provide an input to the module equal to zero or the minimum input required for the application.
- 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.
- Examples: for a 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal. For a $\pm 10\text{ V}$ output signal, the Zero control will provide adjustment for the -10 V or low end of the signal.
- Set the input at maximum, and 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 signal, the Span control will provide adjustment for the 20 mA or high end of the signal.
- This procedure may have to be repeated several times to achieve the desired accuracy over the selected range.

Output Test Function

The output test potentiometer is factory set to provide approximately 50% output. 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.

The Test Cal. potentiometer can be used to set the test output to the desired level. It is adjustable from 0 to 100% of the output span.

Press and hold the Test button and adjust the Test Cal. potentiometer for the desired output level.

Operation

Strain gauges and load cells are normally passive devices that are commonly referred to as bridges due to their four-resistor Wheatstone bridge configuration. These sensors require a precise excitation source to produce an output that is directly proportional to the load or pressure that is applied to the sensor. The exact output of the sensor (measured in millivolts) is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.

The APD 4051 provides the excitation voltage to the sensors and receives the resulting millivolt signal in return. This input signal is filtered and amplified, then offset, if required, and passed to the output stage. Depending on the output configuration ordered, a DC voltage or current output is generated.

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 level 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, this may indicate a problem with module power or signal input wiring.

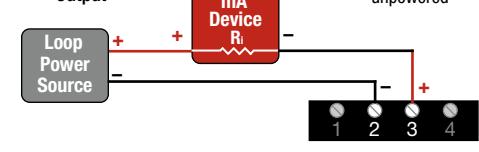
RED LoopTracker Output LED – Provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. For current outputs, the RED LED will only light if the output loop current path is complete. For either current 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.



* 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

Current Sinking Output



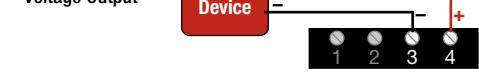
Module mA output is unpowered

Current Sourcing Output



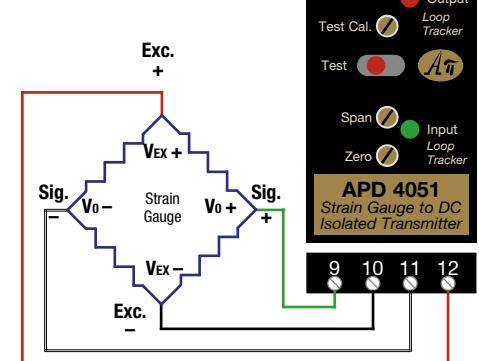
Module powers mA output loop

Voltage Output



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

Not used



Shield wires should be grounded at one end only

Colors shown are an example only.
See manufacturer's specifications for wiring designations.

To maintain full isolation avoid combining power supplies in common with input, output, or unit power.

