Adjustable Excitation Power Supply
One Minute Setup for Hundreds of I/O Ranges
Removable Plugs for Faster Installation
Input and Output LoopTracker™ LEDs
Output Test or Calibration Resistor Options

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

Output LoopTracker
Universal Power
13 14 15 16

Output Calibration
- Multi-turn zero and span potentiometers
- ±15% of span adjustment range typical
- Zero offset switch: ±100% of span in 15% increments

Output Test
- Sets output to test level when pressed
- Potentiometer adjustable 0-100% of span
- Not available with M01 or M02 options

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.

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
- Power: 2 to 5 Watts depending on number of load cells

Dimensions
- 0.89" W x 4.62" H x 4.81" D
- 22.5 mm W x 117 mm H x 122 mm D

Output Type (V or mA)
- The APD 4058 milliamp output can be selectively wired for sinking or sourcing. This allows connection to any type of mA input receiving device.

Options
- AD:Selectable ringing frequency
- M01: Switch with built-in calibration resistor.
- M02: Switch for external (load cell) calibration resistor.
- R: Input/output reversal, such as 20-4 mA output
- 0.5 mA/V to 120 mV/V, 1-10 VDC Excitation
- Switch selectable: 0-10 VDC in 1 V increments
- Drive capability: One 100 Ω load Cell
- Sink/Source Versatility
- For maximum versatility the APD 4058 milliamp output can be selectively wired for sinking or sourcing. This allows connection to any type of mA input receiving device.

Output LoopTracker
- API exclusive feature includes 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 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 the test button to provide a fixed output (independent of the input) when held depressed. The output test button greatly aids in saving time during initial startup and troubleshooting. The test output level is potentiometer adjustable from 0 to 100% of output span.
- The output test is not available with the M01 or M02 options. A calibration resistor switch replaces the test button.

Output LoopTracker
- For maximum versatility the APD 4058 milliamp output can be selectively wired for sinking or sourcing. This allows connection to any type of mA input receiving device.

Model
APD 4058 Field configurable. Specify the following if factory is to set switches
APD 4058 D Bridge mV/V or mV range

Input
Output
APD 4058
Field configurable. Specify following if factory is to set switches
Bridge mV/V or mV range
Excitation voltage
APD 4058 D
Field configurable. Specify following if factory is to set switches
Output range
Output type (V or mA)

Options—add to end of model number
M01: Switch with built-in calibration resistor. Specify resistor value.
M02: Switch for external calibration resistor.
R: Input/output reversal, such as 20-4 mA output
DF10: 10 millisecond response time.

Options—add to end of model number
U: Conformal coating for moisture resistance

Accessory—order as separate line item
API BP4: Spare removable 4 terminal plug, black

Strain Gauge/Bridge/Load Cell/Pressure Transducer to DC Transmitters, Field Rangeable
APD 4058

Quick Link: api-usa.com/4058

APD 4058
Strain Gauge/Bridge/Load Cell/Pressure Transducer to DC Transmitters, Field Rangeable

Adjustable Output
Input Voltage
- 9-30 VDC or 10-32 VAC

Strain Gauge Pressure Sensors and Transducers
- Tanks, Scales, Extruder Melt Pressure, Crane Loads

Load Cell Weighing Systems and Scales
- One Minute Setup for Hundreds of I/O Ranges
- Fast response time, 10 milliseconds (100 Hz)
- Standard: 70 milliseconds (14.3 Hz)

Nominal time at 63.2% of step change

Response Time
- Better than ±0.02% of span per °C stability
- −10°C to +60°C operating ambient
- ±0.1% per °C

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.

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
- Power: 2 to 5 Watts depending on number of load cells

Dimensions
- 0.89" W x 4.62" H x 4.81" D
- 22.5 mm W x 117 mm H x 122 mm D

Output LoopTracker
- API exclusive feature includes 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 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 the test button to provide a fixed output (independent of the input) when held depressed. The output test button greatly aids in saving time during initial startup and troubleshooting. The test output level is potentiometer adjustable from 0 to 100% of output span.
- The output test is not available with the M01 or M02 options. A calibration resistor switch replaces the test button.

Output LoopTracker
- For maximum versatility the APD 4058 milliamp output can be selectively wired for sinking or sourcing. This allows connection to any type of mA input receiving device.

Model
APD 4058
Field configurable. Specify the following if factory is to set switches
APD 4058 D
Bridge mV/V or mV range
Excitation voltage

Input
Output
APD 4058
Field configurable. Specify following if factory is to set switches
Bridge mV/V or mV range
Excitation voltage
APD 4058 D
Field configurable. Specify following if factory is to set switches
Output range
Output type (V or mA)

Options—add to end of model number
M01: Switch with built-in calibration resistor.
M02: Switch for external calibration resistor.
R: Input/output reversal, such as 20-4 mA output
DF10: 10 millisecond response time.

Options—add to end of model number
U: Conformal coating for moisture resistance

Accessory—order as separate line item
API BP4: Spare removable 4 terminal plug, black

1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com © 11-19
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 di-agramme 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. Observe polarity. If the output does not function, check wiring and 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!

Range Selection

It is generally easier to select ranges before installing the module on the DIN rail. The tables list available settings for excitation voltages, ranges and offsets. Any custom range settings will be listed on the module’s serial number label.

Rotary switches and a slide switches on the side of the module are used to select i/O ranges to match your application.

### Offset Switch C

<table>
<thead>
<tr>
<th>Offset % of Span</th>
<th>Switch C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0–95%</td>
<td>7</td>
</tr>
<tr>
<td>96%–105%</td>
<td>0</td>
</tr>
<tr>
<td>106%</td>
<td>3</td>
</tr>
<tr>
<td>107%–115%</td>
<td>2</td>
</tr>
</tbody>
</table>

### Excitation Voltage Setup Switch A

<table>
<thead>
<tr>
<th>Excitation</th>
<th>Switch A</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 V</td>
<td>A</td>
</tr>
<tr>
<td>9 V</td>
<td>9</td>
</tr>
<tr>
<td>8 V</td>
<td>8</td>
</tr>
<tr>
<td>7 V</td>
<td>7</td>
</tr>
<tr>
<td>6 V</td>
<td>6</td>
</tr>
<tr>
<td>5 V</td>
<td>5</td>
</tr>
<tr>
<td>4 V</td>
<td>4</td>
</tr>
<tr>
<td>3 V</td>
<td>3</td>
</tr>
<tr>
<td>2 V</td>
<td>2</td>
</tr>
<tr>
<td>1 V</td>
<td>1</td>
</tr>
<tr>
<td>0 V</td>
<td>0</td>
</tr>
</tbody>
</table>

### Range Selection

Switch A: Excitation voltage
Switch B: Input range
Switch C: Input offset
Switch D: Output range
Switch E: Set to “V” for voltage output or “I” for current output

Determine how much output in millivolts the load cell will produce at full load. Multiply the manufacturer’s mV/V sensitivity specification by the applied excitation voltage.

For example, a load cell rated for 3 mV/V sensitivity using 10 VDC excitation will produce an output of 0 to 30 mV for load variations from 0 to 100%.

3 mV/V sensitivity X 10 VDC excitation = 30 mV range

### Excitation Voltage Setup Switch A

Refer to the sensor manufacturer’s recommendations to determine what excitation voltage to use.

Set Excitation rotary switch A to desired excitation voltage. See table above.

After installation the excitation, fine adjust potentiometer may be used to precisely trim this voltage, if desired.

### I/O Range Selection B, C, D, E

1. From the table below, find the rotary switch combination that matches your i/O ranges and set rotary switches B, C, and D.

2. Set switch E to “V” for voltage output or “I” for current output.

3. For ranges that fall between the listed ranges use the next highest setting and trim the input signal with the zero and span potentiometers as described in the Calibration section.

### Output

<table>
<thead>
<tr>
<th>Switches</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>±2.5 mV</td>
<td>18V</td>
</tr>
<tr>
<td>±5 mV</td>
<td>19V</td>
</tr>
<tr>
<td>±10 mV</td>
<td>20V</td>
</tr>
<tr>
<td>±12.5 mV</td>
<td>21V</td>
</tr>
<tr>
<td>±20 mV</td>
<td>22V</td>
</tr>
<tr>
<td>±25 mV</td>
<td>23V</td>
</tr>
<tr>
<td>±50 mV</td>
<td>24V</td>
</tr>
<tr>
<td>±60 mV</td>
<td>25V</td>
</tr>
<tr>
<td>±100 mV</td>
<td>26V</td>
</tr>
<tr>
<td>±120 mV</td>
<td>27V</td>
</tr>
<tr>
<td>±125 mV</td>
<td>28V</td>
</tr>
<tr>
<td>±150 mV</td>
<td>29V</td>
</tr>
<tr>
<td>±200 mV</td>
<td>30V</td>
</tr>
<tr>
<td>±200 mV</td>
<td>31V</td>
</tr>
<tr>
<td>±400 mV</td>
<td>32V</td>
</tr>
<tr>
<td>±1000 mV</td>
<td>33V</td>
</tr>
<tr>
<td>±1200 mV</td>
<td>34V</td>
</tr>
</tbody>
</table>

### Calibration Settings

<table>
<thead>
<tr>
<th>Excitation</th>
<th>Switch A</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 V</td>
<td>A</td>
</tr>
<tr>
<td>9 V</td>
<td>9</td>
</tr>
<tr>
<td>8 V</td>
<td>8</td>
</tr>
<tr>
<td>7 V</td>
<td>7</td>
</tr>
<tr>
<td>6 V</td>
<td>6</td>
</tr>
<tr>
<td>5 V</td>
<td>5</td>
</tr>
<tr>
<td>4 V</td>
<td>4</td>
</tr>
<tr>
<td>3 V</td>
<td>3</td>
</tr>
<tr>
<td>2 V</td>
<td>2</td>
</tr>
<tr>
<td>1 V</td>
<td>1</td>
</tr>
<tr>
<td>0 V</td>
<td>0</td>
</tr>
</tbody>
</table>

### Offset Switch C

Offset switch C allows canceling or taring of non-zero deadweights or other sensor offsets as such:

- Compensate for tare weights or scale deadweight to get zero output when a load is on the platform.
- Compensate for low-output sensors (e.g., less than 1 mV/V) that may have large zero offsets. Switch C can realign the zero control so it has enough range to produce the desired zero output.
- Raising the offset to allow calibration of bipolar sensors such as ±10 mV.
- Lowering the offset to compensate for elevated input ranges such as 10-20 mV.

1. Switch C does not interact with any other switch and is the only switch needed to correct zero offsets. Its only purpose is to adjust or cancel effects of the low end of the input range not corresponding nominally to 0 mV. Setting this switch to “0” results in no offset.

2. To RAGE the zero output, rotate switch C from “1” thru “7”, until the Zero control can be set for your application.

3. To LOWER the output zero, rotate switch C from “9” thru “F”, until the Zero control can be set for your application.

4. If switch positions are changed, repeat the calibration procedure on the last page.

Fax: 800-949-7502

Precautions, Range Setup

APD 4058

1220 American Way Libertyville, Illinois 60048
Phone: 800-949-0315 Fax: 800-949-7502

api-usa.com
Wiring and Installation

APD 4058

Settings for Push-Pull Load Cells
The input range can be thought of as a percentage scale. Zero percent of the signal range will be a negative number for push-pull load cells. The high end of the signal will be a positive number. Add these together to get the span (100% of the total signal range).

For example, if a load cell has a 1.5 mV/V sensitivity with 10 V excitation, the range for push-pull will be -15 mV to +15 mV. This is a span of 30 mV and we would select 30 mV as our input range. If the range does not match up to what is in the table, select the next highest input range setting.

For push-pull applications it is common to use a ±5 V or ±10 V output setting. Use the table below to find your switch settings. We also need to use “Offset Switch C” to bring the negative end of our input range up by 50% to 0 mV. The closest setting is position “B” 45%. This can be adjusted to 50% with the zero potentiometer when output calibration is done.

M01 Option: Internal Calibration Resistor
The APD 4058 M01 has a user-specified internal calibration resistor. A switch on the front of the module allows switching of the APD’s internal calibration resistor in or out of the circuit. The sensor manufacturer should provide the percentage of full-scale output for the transducer when using the APD’s internal resistor for calibration.

M02 Option: Load Cell Calibration Resistor
The APD 4058 M02 has provisions for a load cell with its own calibration resistor. A switch on the front of the module allows switching of the load cell internal calibration resistor in or out of the circuit. Refer to the load cell manufacturer’s specifications and the wiring diagram when connecting a transducer with its own internal calibration resistor. The transducer’s calibration resistor wires are connected to terminals 5 and 11 on the APD 4058. If the transducer only has one calibration resistor wire, connect it to terminal 5.

Input
Refer to the strain gauge manufacturer’s data sheet for wire color-coding and identification. Polarity must be observed when connecting inputs. CAUTION: Do not miswire the load cell and never short the excitation leads together. This will cause internal damage to the module.

No Sense Leads
When no sense leads are used, jumper terminals 6 and 12.

With Sense Leads
Some bridges or load cells have one or two sense leads. Sense leads allow the APD 4058 to compensate for leadwire resistance effects. Connect the sense leads if used. Polarity must be observed. Never jumper terminals 6 and 12 when using sense leads.

Output
Polarity must be observed when connecting the signal output. If your device accepts a current input, determine if it provides power to the current loop or if it must be powered by the APD module. Use a multi-meter to check for voltage at the device’s input terminals. Typical voltage may be 9-24 VDC.

Module Power
Check model/serial number label for module operating voltage to make sure it matches available power. Connect power last. 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. CAUTION: To maintain full isolation avoid wiring DC power supplies in common with output and unit power.

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 position against DIN rail.
2. Clip lower mount to bottom edge of DIN rail.
3. Push front of module upward until upper mount snaps into place.

Removal
1. Push up on the bottom back of the module.
2. Tilt 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 Wiring
Current sinking output switch E set to “I”.

External device provides power to output loop.

Current sourcing output switch E set to “V”.

Module powers mA output loop.

Voltage output switch E set to “V”.

△ * Do not make connections to unused terminals!

No Sense Leads
M02 option for load cell with built-in cal. resistor. Connect to terminals 5 and 11.

With Sense Leads
M02 option for load cell with built-in cal. resistor. Connect to terminals 5 and 11.

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.

△ * Do not make connections to unused terminals!

Module Power
Cu 80/75°C 13 conductors
14 AWG max.
14 Power AC or DC
16 Earth Ground
16 Power AC or DC
Basic Calibration

The Zero, Span, and Excitation potentiometers are used to calibrate the output. This calibration procedure does not account for offsets or tare weights. If your system has an offset, tare weight or deadweight, refer to the Offset Switch procedure.

Note: Perform the following calibration procedure any time switch settings are changed.

Input and output ranges, if specified on your order, are factory pre-configured (at 24°C ±1°C).

To achieve optimum results, the system should be calibrated using an accurate bridge simulator, pressure calibrator, or calibration weights depending on the application.

1. Apply power to the module and allow a minimum 20 minute system warm up time.

2. Using an accurate voltmeter across terminals 10 and 12, adjust the Excitation voltage potentiometer on front of the APD 4058 for the exact voltage desired.

3. With the input set at zero or the minimum, adjust the front Zero pot for a zero or low-end output (for example, 4 mA for a 4-20 mA output or ~10 V with a ±10V output).

4. The zero pot may also be adjusted for a zero reading on the output display instrumentation, e.g. control system or process indicator. Adjusting the zero pot this way eliminates calibration errors in the display instrumentation.

5. 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.

Push-Pull Calibration

Use this calibration procedure for tension-compression applications and you will use a precision resistor for calibration.

Note: Perform the following calibration procedure any time switch settings are changed.

1. Apply power to the module and allow a minimum 20 minute system warm up time.

2. Using an accurate voltmeter across terminals 10 and 12, adjust the Excitation voltage potentiometer to the exact voltage desired.

3. Connect the precision resistor between Exc+ and Sig+.

4. Adjust the Zero control to ~80% output since the resistor is scaled for 80% of detection.

5. Remove the precision resistor.

6. Connect the precision resistor between Exc– and Sig–.

7. Adjust the span pot for ~80% output since the resistor is scaled for 80% of detection.

8. Remove the precision resistor. The output should be near 0 V. It is possible for zero to be off a small amount due to stacking of tolerances within both the load cell, wiring, and the module.

Diagnostic Voltage Measurements

Using a meter with at least 10 megaohm input impedance, measure the voltage coming from the strain gauge at the locations shown. Sensitivity is measured in mV/V.

<table>
<thead>
<tr>
<th>Positive Meter Lead</th>
<th>Negative Meter Lead</th>
<th>Meter Reading No pressure/load</th>
<th>Meter Reading Full pressure/load</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ Exc.</td>
<td>– Exc.</td>
<td>Excitation Voltage</td>
<td>Excitation Voltage</td>
</tr>
<tr>
<td>+ Sig.</td>
<td>– Exc.</td>
<td>+½ Excitation Voltage</td>
<td>½ Excitation Voltage + (½ x Excitation Voltage x Sensitivity)</td>
</tr>
<tr>
<td>– Exc.</td>
<td>+½ Excitation Voltage</td>
<td>–½ Excitation Voltage</td>
<td>½ Excitation Voltage – (½ x Excitation Voltage x Sensitivity)</td>
</tr>
<tr>
<td>+ Sig.</td>
<td>– Sig.</td>
<td>Zero Volts</td>
<td>Excitation Voltage x Sensitivity</td>
</tr>
</tbody>
</table>

Output Test Function

Models with the M01 or the M02 option do not have a Test function. With either of these options the Test Cal. potentiometer is non-functional.

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 factory set to approximately 50% output. 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.

Calibration with Resistor Options M01 or M02

Use this calibration procedure if your APD 4058 is ordered with a calibration resistor or if your sensor has its own internal calibration resistor.

Note: Perform the following calibration procedure any time switch settings are changed.

1. Apply power to the module and allow a minimum 20 minute system warm up time.

2. Using an accurate voltmeter across terminals 10 and 12, adjust the Excitation voltage potentiometer on front of the APD 4058 for the exact voltage desired.

3. With the input set at zero or the minimum, adjust the Zero pot until ~80% output since the resistor is scaled for 80% of detection.

4. Remove the precision resistor.

5. Connect the precision resistor between Exc+ and Sig+.

6. Adjust the span pot to the for the % output specified by the manufacturer.

7. Return the Test switch to the opposite position and readjust the excitation voltage potentiometer on front of the APD 4058 for the exact voltage desired.

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, pressure, etc. 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.

An additional input, the sense lead, monitors the voltage drop in the sensor leads and automatically compensates the excitation voltage at the module in order to maintain a constant excitation voltage at the sensor.

The APD 4058 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 selected, 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.