Duopak® Two Channel Signal Converter/Isolator/Transmitter

Channel 1: Bridge/Strain Gauge/Load Cell to DC

- Two Independent Channels with Full Isolation
- Zero and Span for Each Output
- Input and Output LoopTracker™ LEDs
- Output Test/Manual Override for Each Channel
- Built-in I/O Power Supplies

Applications
- Monitor Weight or Pressure and Speed
- Convert/Isolate Dual Output Transmitters

Channel 1 Bridge Input Range
Factory configured, please specify sensor mV/V and mV/Range
Sensor range: 0-1 mV to 0-2000 mV
Millivolt output range is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.

Channel 1 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

Channel 2 Frequency Input Range
Factory configured, please specify input range
Frequency: 0-25 Hz to 0-2 kHz
Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 Vrms amplitude

Channel 2 Sensor Power Supply
15 VDC ±10%, regulated, 25 mA/DC, <100 mVrms max. ripple

Channel 2 Characteristics
Impedance at max. sensitivity: 10 kΩ nom.
Impedance at min. sensitivity: 100 kΩ nom.
Sensitivity/hysteresis adjustment: Multi-turn potentiometer
Sensitivity/hysteresis range: ±25 mV to ±2.5 V typical
Normal mode protection: 200% of input rating
Common mode protection: 600 V input to ground

LoopTracker
Variable brightness LEDs indicate I/O levels for each channel

Channel 1 and Channel 2 Output Ranges
Factory configured, please specify for each output channel
Voltage: 0-1 VDC to 0-10 VDC, 10 mA max up to 20 VDC with M19, M29, M39
Bipolar voltage: ±1 VDC to ±10 VDC
Current: 0-1 mA DC to 0-25 mA DC, 4-20 mA DC
20 V compliance, 1000 Ω ± 20 mA

Output Calibration
Multi-turn zero and span potentiometers for each output channel

Output Characteristics
Linearity: ±0.1% of span
Temperature stability: Better than 0.04% span/°C
Output ripple and noise: Less than 10 mVrms
Isolation
Full 5-way, 1200 Vrms minimum

Response Time
70 milliseconds typical

Output Loop Power Supplies
20 VDC nominal, regulated, 25 mA/DC for each output channel
May be selectively wired for sinking or sourcing mA output

Output Test
Front buttons set each output to test level when pressed
Each test level potentiometer adjustable 0-100% of span

Installation Environment
Mount vertically to a 35 mm DIN rail
For use in Pollution Degree 2 Environment
IP 40 housing, requires installation inside an enclosure
−10°C to +60°C operating ambient

Connectors
Eight 4-terminal removable connectors, 14 AWG max wire size

Model Description Power
APD 2057 DuoPak 2 channel Strain-DC, Freq.-DC converter/isolator/transmitter 85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2057 D 9-30 VDC or 10-32 VAC

Options
Options—add to end of model number
R1 Channel 1 I/O reversal (i.e. 20-4 mA out)
R2 Channel 2 I/O reversal (i.e. 20-4 mA out)
R3 Channel 1 and channel 2 I/O reversal
M19 Channel 1 high voltage output >10 V up to 20 V
M29 Channel 2 high voltage output >10 V up to 20 V
MD9 Channel 1 and channel 2 high voltage output
U Conformal coating for moisture resistance

Accessory—order as separate line item
API BP4 Spare removable 4 terminal plug, black
**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! Évitez 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 relier ou d’installer le module. 

**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

**Electrical Connections**

Polarity must be observed for signal wiring connections. If the input and/or output do not function, check wiring and polarity. Each product is factory configured to your exact input and output ranges as indicated on the serial number label.

**Outputs**

For milliamp ranges determine if your devices provide 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.

**Device for Output Channel 1**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage power device</td>
<td>3 (–)</td>
</tr>
<tr>
<td>Unpowered or passive mA input device</td>
<td>4 (+)</td>
</tr>
<tr>
<td>Device for Output Channel 2</td>
<td>8 (+)</td>
</tr>
<tr>
<td>Unpowered or passive mA input device</td>
<td>7 (–)</td>
</tr>
<tr>
<td>mA input device powers the current loop</td>
<td>8 (+20 V)</td>
</tr>
<tr>
<td>mA input device powers the current loop</td>
<td>7 (+)</td>
</tr>
<tr>
<td>Device for Output Channel 2</td>
<td>7 (+)</td>
</tr>
</tbody>
</table>

**Bridge Input Channel**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excitation voltage</td>
<td>17 (+)</td>
</tr>
<tr>
<td>Excitation voltage</td>
<td>19 (–)</td>
</tr>
<tr>
<td>Bridge Input Channel</td>
<td>18 (–)</td>
</tr>
</tbody>
</table>

**Input 2, Frequency**

The input range is pre-configured at the factory. No input calibration is necessary. The frequency input is compatible with most types of sensors that produce a minimum 100 mV amplitude change and a minimum 5 microsecond pulse width.

A 15 VDC supply is available to power the sensor if required. Always refer to the sensor manufacturer’s data sheet to determine supply voltage compatibility and proper wiring.

**Module Power Terminals**

Check label for module operating voltage to make sure it matches available power. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.

When using DC power, either polarity is acceptable, but for consistency, wire positive (+) to terminal 25 and negative (–) to terminal 28.

**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 down and position the loop power clips against the bottom edge of DIN rail.
2. Push front of module upward until upper mount snaps into place.

**Removal**

Avoid shock hazard! Turn signal input, output, and power off.

1. Push up on bottom back of 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.

**Calibration**

Front-mounted Zero and Span potentiometers for each channel can be used to compensate for load and lead variations.

1. Apply power to the module and allow min. 30 minute warm up time.
2. Using an accurate voltmeter on terminals 18 and 20 adjust the excitation voltage 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.
3. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
4. Using an accurate measurement device for the output, adjust the Zero potentiometer for the exact minimum output desired.
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. This will produce the corresponding maximum output signal. Example: for 4-20 mA output, set the Span control to 20 mA.
6. Repeat adjustments for both channels for maximum accuracy.

**Ch. 2 Sensitivity Adjustment**

This multi-turn potentiometer provides an adjustable threshold level that the incoming signal must overcome before an output can be produced. This is used to limit noise and minimize false input signals that may cause erroneous readings.

Fully clockwise: (max. sensitivity), input threshold is ±2.5 mV.

Fully counterclockwise: (min. sensitivity), input threshold is ±2.5 volts.

**Output Test Function**

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.

Each Test Cal. potentiometer is factory set to approximately 50% of full supply. Each can be adjusted to set the test output from 0% to 100% of the output span. Press and hold the Test button and adjust the corresponding Test Cal. potentiometer for the desired output level. They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

**Operation**

The APD 2057 accepts one strain gauge input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicate the input signal strength by changing in intensity as the process changes from minimum to maximum. If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or input wiring. Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum. For a current output 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. Note that it may be difficult to see the LEDs under bright lighting conditions.

**Frequency Sensor Ch. 2**

<table>
<thead>
<tr>
<th>Signal</th>
<th>Com.</th>
<th>Power</th>
<th>Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Wire or Namur requiring external power</td>
<td>n/a</td>
<td>22 (+15 V)</td>
<td>23 (+)</td>
</tr>
<tr>
<td>2 Wire self-generating (VR)</td>
<td>21 (+)</td>
<td>n/a</td>
<td>23 (+)</td>
</tr>
<tr>
<td>3 Wire FPN or NPN</td>
<td>21 (+)</td>
<td>22 (+15 V)</td>
<td>23 (+)</td>
</tr>
</tbody>
</table>

**Sensor Load**

The frequency signal input is capacitively coupled to prevent any DC in the input. Some sensors, typically those without an internal load resistor, require a resistive load in order to function.

The resistor value may be specified by the sensor manufacturer as the “minimum resistive load” or calculated from the sensor manufacturer’s specified “load current range”.

The 15 VDC power supply is capable of providing 25 mA. A load current range of 3 mA to 25 mA would typically use a 5 kΩ to 500 Ω resistor.

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

**See manufacturer’s specifications for wiring designations. Shield wires should be grounded at one end only.**

**Wire terminal torque**

0.5 to 0.6 Nm or 4.4 to 5.3 in-lbs

**Cu 60/75°C conductors 14 AWG max.**

**To maintain full isolation avoid combining power supplies in common with inputs, outputs, or unit power.**

**Power AC or DC**

26 Earth Ground

**Power AC or DC +**

25 Power AC or DC +