Channel 1: DC to DC

Channel 2: DC 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

- Monitor Two DC Signals
- Convert/Isolate Dual Output Transmitters

Channel 1 DC Input Range

Factory configured, please specify input type and range

Voltage: 0-10 mVDC to 0-100 VDC Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

Voltage input impedance: 200 k Ω minimum Current input impedance: $50~\Omega$ typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply: 25 mADC, may be connected

for sinking or sourcing mA input

Channel 2 DC Input Range

Factory configured, please specify input type and range

Voltage: 0-10 mVDC to 0-100 VDC Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC

Voltage input impedance: 200 k Ω minimum Current input impedance: 50Ω typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA Input loop power supply: 15 VDC, ±10%, regulated, 25 mADC, may be connected for sinking or sourcing mA input

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

0-1 VDC to 0-10 VDC, 10 mA max Voltage: up to 20 VDC with M19, M29, M39

Bipolar voltage: +1 VDC to +10 VDC

0-1 mADC to 0-20 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Ripple and Noise

Less than 10 mV_{BMS}

Linearity

Better than ±0.1% of span

Ambient Temperature Range and Stability

-10°C to +60°C operating ambient Better than ±0.04% of span per °C stability

Isolation

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

IP 40, requires installation in panel or enclosure with adequate ventilation

For use in Pollution Degree 2 Environment

Mount vertically (as shown in picture) to a 35 mm DIN rail allowing minimum 1" (25 mm) above and below housing vents for air circulation

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

I/O Setup

Dimensions and Connectors

1.78" W x 4.62" H x 4.81" D

Connect Sink or Source mA Input for Each Channel

> Universal Power

45 mm W x 117 mm H x 122 mm D Eight 4-terminal removable connectors, 14 AWG max wire size

The APD 2000 DuoPak accepts two DC voltage or current inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2000 are 15 VDC loop excitation supplies for each input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2000	DuoPak 2 channel	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2000 D	DC-DC converter/ isolator/transmitter	9-30 VDC or 10-32 VAC





5 6 7 8

1_2 3 4

18

See Wiring Diagrams on **Next Page**

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out)

Channel 2 I/O reversal (i.e. 20-4 mA out) R2

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2000

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.

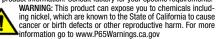
WARNING! Avoid shock hazards! Turn signal input, output, and power off before connecting or disconnecting wiring, or removing or installing module.

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.



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. See note about terminating an unused mA output channel.

Device for Output Channel 1	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Inputs. DC

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.

DC Input Channel 1	Terminal	Terminal
·		
Sensor or transmitter with voltage output.	17 (–)	19 (+)
Transmitter with a mA output that powers the current loop. Typically a 3 or 4-wire device.	17 (–)	19 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.	19 (–)	18 (+15 V)
DC Input Channel 2	Terminal	Terminal
DC Input Channel 2 Sensor or transmitter with voltage output.	Terminal 21 (–)	Terminal 23 (+)
•	21 (–)	

Module Power Terminals

Check model/serial number 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 lower spring clips against 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.

- 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.

Upper Mount

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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy

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% output. 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.

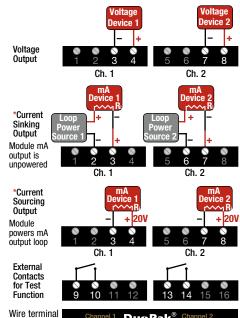
They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

The APD 2000 accepts two independent DC voltage or current inputs and provides two independent and optically isolated DC voltage or current outputs that are linearly related to each input. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright

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.



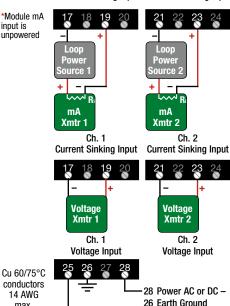
Duo Pak torque 0.5 to 0.6 Nm or 4.4 to 5.3 in-lbs To avoid damage to the module. do not make any con-**APD 2000** nections to unused

*Module powers mA input loop

terminals

mΑ mΑ Xmtr 1 Xmtr 2 Ch. 1 Ch. 2 **Current Sourcing Input Current Sourcing Input**

*Module mA input is unpowered



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

25 Power AC or DC +

* To avoid damage to the module, do not leave any unused mA inputs or outputs disconnected. Use a 1000 0hm 1/2 Watt resistor across unused mA terminals



Channel 1: DC to DC

Channel 2: RTD Temperature to DC

5 6 7 8

1_2 3 4

- 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

Monitor a DC Signal and Temperature

■ Convert/Isolate Dual Output Transmitters

Channel 1 DC Input Range

Factory configured, please specify input type and range Voltage: 0-10 mVDC to 0-100 VDC

Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

Voltage input impedance: 200 k Ω minimum Current input impedance: $50~\Omega$ typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply: 25 mADC, may be connected

for sinking or sourcing mA input

Channel 2 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range, 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω . 2 or 3 wire

Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in leadwire resistance, 3 wire sensor

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 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

0-1 mADC to 0-20 mADC, 4-20 mADC Current: 20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC 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

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only

> Output LoopTracker LED for Each Channel

Sink or Source



Adjustable Output **Test Function for Each Channel**



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Connect Sink or Source mA for DC Input

Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2001 DuoPak accepts one DC voltage or current input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2001 is a 15 VDC loop excitation supply for the DC input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2001	DuoPak 2 channel DC-DC, RTD-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2001 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a guick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2001 A au

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, DC

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.

DC Input Channel 1	Terminal	Terminal
Sensor or transmitter with a voltage output.	17 (-)	19 (+)
mA output transmitter that powers the current loop. Typically a 3 or 4-wire device.	17 (–)	19 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		18 (+15 V)

Input 2, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 2	Term.	Term.	Term.
Two wire RTD	21 RTD	Jumper 22 & 23	23 RTD
Three wire RTD	21 RTD	22 Exc.	23 RTD

Module Power Terminals

Check model/serial number 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.

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output channels for maximum accuracy.

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% output. 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

lighting conditions.

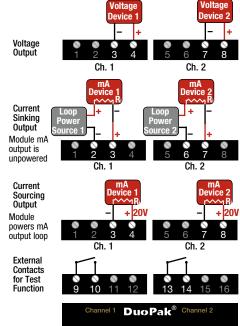
The APD 2001 accepts one DC voltage or current input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright

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

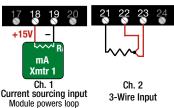
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



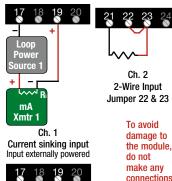


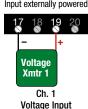












terminals

Wire terminal
torque
0.5 to 0.6 Nm or

4.4 to 5.3 in-lbs

to unused

Cu 60/75°C conductors
14 AWG max.

25 26 27 28

28 Power AC or DC 26 Earth Ground
25 Power AC or DC +

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

Channel 1: DC to DC

Channel 2: Potentiometer to DC

5 6 7 8

1 2 3 4

- 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

Monitor a DC Signal and Position

■ Convert/Isolate Dual Output Transmitters

Channel 1 DC Input Range

Factory configured, please specify input type and range Voltage: 0-10 mVDC to 0-100 VDC

Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

Voltage input impedance: 200 k Ω minimum Current input impedance: $50~\Omega$ typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply: 25 mADC, may be connected

for sinking or sourcing mA input

Channel 2 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100~\Omega$ Maximum range: $0-1~\text{M}\Omega$

 100Ω to 1 $M\Omega$ minimum Input impedance: Input com. mode rejection: 100 dB minimum

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 mADC to 0-20 mADC, 4-20 mADC

20 V compliance. 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only

Sink or Source mA Output for **Each Channel**

Output LoopTracker LED for Each Channel



Adjustable Output **Test Function for Each Channel**



Zero and Span for Each Channel



Custom I/O Ranges



Connect Sink or Source mA for DC Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2003 DuoPak accepts one DC voltage or current input and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2003 is a 15 VDC loop excitation supply for the DC input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2003	DuoPak 2 channel DC-DC, PotDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2003 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a guick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2003

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 are known to the State of California to cause cancer or birth defects or other reproductive harm. For more nformation 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.

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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, DC

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.

DC Input Channel 1	Terminal	Terminal
Sensor or transmitter with voltage output.	17 (–)	19 (+)
mA output transmitter that powers the current loop. Typically a 3 or 4-wire device.	17 (–)	19 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		18 (+15 V)

Input 2, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 2	Terminal
Full scale or high side of potentiometer	21 (+1 VDC)
Zero or low end of potentiometer	22 (-)
Potentiometer wiper arm	23

Module Power Terminals

Check model/serial number 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 lower spring clips against 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.

- 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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy.

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% output. 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.

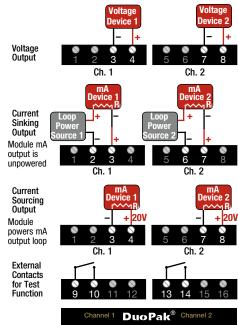
They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

The APD 2003 accepts two independent DC voltage or current inputs and provides two independent and optically isolated DC voltage or current outputs that are linearly related to each input. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright

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.







To avoid damage to the module. do not make anv connections to unused terminals

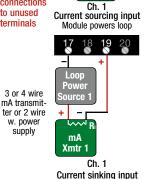
> w. power supply

Cu 60/75°C

conductors

14 AWG

max.



mΑ

Xmtr 1

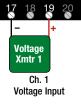


23 Wiper Arm *May be switched for reverse output

21 Full Scale*

22 Minimum*

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



Input externally not

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



28 Power AC or DC -26 Earth Ground 25 Power AC or DC +

See Wiring

Diagrams on

Next Page

Channel 1: DC to DC

Channel 2: Bridge/Strain Gauge/Load Cell to DC

5 6 7 8

1_2 3 4

Duo Pak®

- 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

Monitor a DC Signal and Weight or Pressure

■ Convert/Isolate Dual Output Transmitters

Channel 1 DC Input Range

Factory configured, please specify input type and range Voltage:

0-10 mVDC to 0-100 VDC Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

Voltage input impedance: 200 k Ω minimum Current input impedance: $50~\Omega$ typical

Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply: 25 mADC, may be connected

for sinking or sourcing mA input

Input com. mode rejection: 120 dB minimum

Input common mode rejection: 100 dB minimum

Channel 2 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.

mV/V sensitivity X excitation voltage = total mV range Input impedance: 1 $\mbox{M}\Omega$ minimum

Channel 2 Excitation Voltage

4 to 10 VDC factory set, please specify Range: 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 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

0-1 mADC to 0-20 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only

Sink or Source mA Output for **Each Channel**

Output LoopTracker LFD for Each Channel



Adjustable Output **Test Function for Fach Channel**



Ouick Link

Each Channel Input LoopTracker

LED for Each

Channel

Zero and Span for



Custom I/O Ranges



Sink or Source mA for DC Input, **Built-in Excitation Voltage for** Strain Gauge Input

Dimensions

1.78" W x 4.62" H x 4.81" D Universal 45 mm W x 117 mm H x 122 mm D Power Height includes connectors

Description

The APD 2005 DuoPak accepts one DC voltage or current input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2005 is a 15 VDC loop excitation supply for the DC input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range

Channel 2 input range, excitation voltage

Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2005	DuoPak 2 channel DC-DC. Strain-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2005 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

18

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a guick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output M39

Conformal coating for moisture resistance

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

MOD-TRONIC

Instructions APD 2005 A au

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, DC

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.

DC Input Channel 1	Terminal	Terminal
Sensor or transmitter with a voltage output.	17 (–)	19 (+)
mA output transmitter that powers the current loop. Typically a 3 or 4-wire device.	17 (–)	19 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.	19 (–)	18 (+15 V)

Input 2, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 2	- Terminal	+ Terminal
Strain gauge signal input	21 (+)	23 (-)
Excitation voltage	22 (-)	24 (+)

Module Power Terminals

to terminal 28.

Check model/serial number 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 (-)

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 down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 2. 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate voltmeter on terminals 22 and 24 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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.

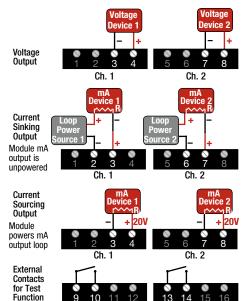
They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

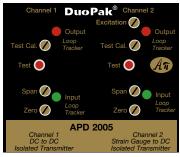
Operation

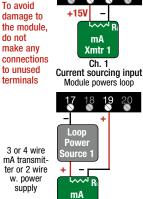
The APD 2005 accepts one DC voltage or current input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal 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.

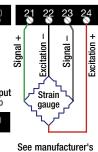






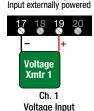


Xmtr 1



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



Ch. 1

Current sinking input

28 Power AC or DC –
26 Earth Ground
25 Power AC or DC +

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



Cu 60/75°C

conductors

14 AWG

max.

See Wiring

Diagrams on

Next Page

Channel 1: DC 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

Monitor a DC Signal and an AC Signal

■ Convert/Isolate Dual Output Transmitters

Channel 1 DC Input Range

Factory configured, please specify input type and range Voltage: 0-10 mVDC to 0-100 VDC

Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

Voltage input impedance: 200 k Ω minimum Current input impedance: $50~\Omega$ typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply: 25 mADC, may be connected

for sinking or sourcing mA input

Channel 2 AC Input Range

Factory configured, please specify input type and range

Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC Measurement type: True RMS

40 Hz to 1000 Hz sinusoidal Frequency:

Voltage input impedance: 220 kΩ minimum Current input voltage burden: 1.0 VRMs maximum

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 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

±1 VDC to ±10 VDC Bipolar voltage:

Current: 0-1 mADC to 0-20 mADC, 4-20 mADC

20 V compliance. 1000 Ω at 20 mA

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC for each output channel May be selectively wired for sinking or sourcing mA output

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC 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

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only

Sink or Source mA Output for **Each Channel**

Output LoopTracker LFD for Each Channel



Adjustable Output **Test Function for Each Channel**



Zero and Span for **Each Channel**



Custom I/O Ranges



Connect Sink or Source mA for DC Input

Universal

Power

Dimensions

Description

to the inputs.

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

18

LoopTracker

Channel 2: AC to DC

5 6 7 8

1_2 3 4

Duo Pak®

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a guick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode

signal rejection, and noise pickup reduction.

device fails), or a combination of these.

I/O Sink/Source Versatility Standard on the APD 2006 is a 15 VDC loop excitation supply for the DC input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any

The APD 2006 DuoPak accepts one DC voltage or current input

and one AC voltage or current input provides two optically

isolated DC voltage or current outputs that are linearly related

The input ranges and the output ranges for each channel are

independent and can be specified as required. This provides an

Typical applications include signal conversion, isolation, and

redundancy (i.e. to prevent failure of the entire loop if one

Each input signal is filtered, amplified, and then passed

through an opto-coupler to the output stages. Full 5-way

economical two channel solution in one device.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

combination of powered or unpowered milliamp I/O devices.

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2006	DuoPak 2 channel DC-DC, AC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2006 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions

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 are known to the State of California to cause cancer or birth defects or other reproductive harm. For more nformation 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.

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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, DC

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.

DC Input Channel 1	Terminal	Terminal
Sensor or transmitter with a voltage output.	17 (-)	19 (+)
mA output transmitter that powers the current loop. Typically a 3 or 4-wire device.	17 (–)	19 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		18 (+15 V)

Input 2, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 2	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	21	23
Transmitter power supply.	22 (+15 VDC)	23

Module Power Terminals

Check model/serial number 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 lower spring clips against 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.

- 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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ± 10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy.

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% output. 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.

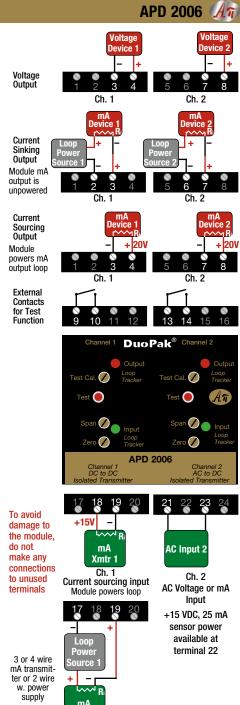
They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

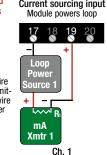
The APD 2006 accepts one DC voltage or current input and one AC voltage or current input provides two optically isolated DC voltage or current outputs that are linearly related to the inputs. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright

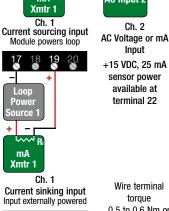
Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum.

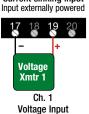
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.











0.5 to 0.6 Nm or 4.4 to 5.3 in-lbs

Cu 60/75°C conductors 14 AWG 28 Power AC or DC max. 26 Earth Ground ·25 Power AC or DC +

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

Channel 1: DC to DC

Channel 2: Frequency to DC

5 6 7 8

1_2 3 4

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

■ Monitor a DC Signal and Speed

■ Convert/Isolate Dual Output Transmitters

Channel 1 DC Input Range

Factory configured, please specify input type and range Voltage: 0-10 mVDC to 0-100 VDC

Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

Voltage input impedance: 200 k Ω minimum Current input impedance: $50~\Omega$ typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply: 25 mADC, may be connected

for sinking or sourcing mA input

Channel 2 Frequency Input Range

Factory configured, please specify input range 0-25 Hz to 0-20 kHz Frequency:

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 2 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 2 Characteristics

Impedance at max. sensitivity: 10 k Ω nom. Impedance at min. sensitivity: 100 kO 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 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

0-1 mADC to 0-20 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel

±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span Better than 0.04% span/°C Temperature stability:

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only

Output LoopTracker LED for Each Channel

Sink or Source

Adjustable Output **Test Function for Each Channel**

Zero and Span for **Fach Channel**

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

I/O Setup!

Sink or Source mA for DC Input, Sensor Power Available for Frequency Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2007 DuoPak accepts one DC voltage or current input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2007 are 15 VDC excitation supplies for each input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2007	DuoPak 2 channel DC-DC, FreqDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2007 D	converter/isolator/	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

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

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item API BP4 Spare removable 4 terminal plug, black **Instructions** APD 2007 🥂 📆

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

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, DC

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.

DC Input Channel 1	Terminal	Terminal
Sensor or transmitter with a voltage output.	17 (–)	19 (+)
mA output transmitter that powers the current loop. Typically a 3 or 4-wire device.	17 (–)	19 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		18 (+15 V)

Input 2, Frequency

The input range is pre-configured at the factory and no calibration is needed. The frequency input is compatible with most types of sensors that product 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. Refer to the sensor manufacturer's data sheet to determine supply voltage and wiring requirements.

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 k Ω to 500 Ω resistor.

Frequency Sensor Ch. 2	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	22 (+15 V)	23 (+)
2 wire self generating (VR)	21 (–)	n/a	23 (+)
3 wire PNP or NPN	21 (-)	22 (+15 V)	23 (+)

Module Power Terminals

Check model/serial number 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

Upper Mount

Sprina Clips

for air circulation

- 1. Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 2. Tilt front of module downward to release upper mount from top edge
- 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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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.
- 5. Repeat adjustments for both output channels for max. accuracy.

Ch. 1 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 ±25 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% output. 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

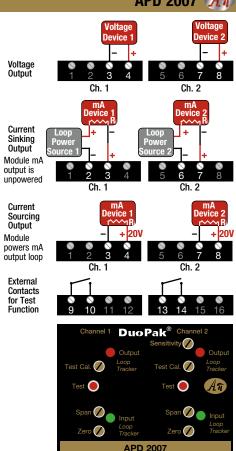
The APD 2007 accepts one DC voltage or current input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

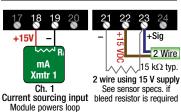
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

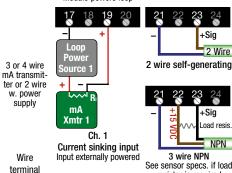
Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum.

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.









torque 0.5 to 0.6 Nm or 4.4 to 5.3 in-lbs Cu 60/75°C Voltage conductors Xmtr 1

14 AWG

max.

avoid com-

supplies in

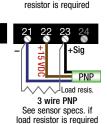
inputs, out-

puts, or unit

power.

common with







28 Power AC or DC -26 Earth Ground 25 Power AC or DC +

Channel 2: DC to DC

5 6 7 8

1 2 3 4

Duo Pak®

Removable Plugs

See Wiring

Diagrams on

Next Page

Channel 1: RTD or Thermistor Temperature 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

- Monitor Temperature and a DC Signal
- Convert/Isolate Dual Output Transmitters

Channel 1 RTD or Thermistor Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

Resistance at 0°C RTD input:

Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω . 2 or 3 wire Typically 10 Ω : 10 mA, 100 Ω : 2 mA, **Excitation current:** 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in leadwire resistance, 3 wire sensor

Thermistor input: Type (NTC or PTC)

Temperature curve data Temperature range in °F or °C

Thermistor resist.:Typically 2 k Ω to 20 k Ω

Channel 2 DC Input Range

Factory configured, please specify input type and range

0-10 mVDC to 0-100 VDC Voltage: ± 50 mVDC to ± 10 VDC Bipolar voltage:

0-1 mADC to 0-50 mADC, 4-20 mADC

Voltage input impedance: 200 k Ω minimum Current input impedance: 50Ω typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply:

25 mADC, may be connected for sinking or sourcing mA input

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 mADC to 0-20 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

±0.1% of span Linearity:

Temperature stability: Better than 0.04% span/°C Less than 10 mVRMS Output ripple and noise:

Isolation

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

85-265 VAC. 50/60 Hz or 60-300 VDC. 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for**

Output LoopTracker LED for Each

Channel

Sink or Source

mA Output for

Each Channel



Zero and Span for Each Channel

Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

I/O Setup

Connect Sink or Source mA for DC Input

Dimensions

Description

to the inputs.

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

18

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a guick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode

device fails), or a combination of these.

signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility Standard on the APD 2010 is a 15 VDC loop excitation supply for the DC input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be

selectively wired for sinking or sourcing allowing use with any

combination of powered or unpowered milliamp I/O devices.

The APD 2010 DuoPak accepts one RTD or thermistor input

and one DC voltage or current input and provides two optically

isolated DC voltage or current outputs that are linearly related

The input ranges and the output ranges for each channel are

independent and can be specified as required. This provides an

Typical applications include signal conversion, isolation, and

redundancy (i.e. to prevent failure of the entire loop if one

Each input signal is filtered, amplified, and then passed

through an opto-coupler to the output stages. Full 5-way

economical two channel solution in one device.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2010	DuoPak 2 channel RTD-DC, DC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2010 D	converter/isolator/	9-30 VDC or 10-32 VAC

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

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

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item



Instructions APD 2010 A au

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temprature Input Ch. 1	Term.	Term.	Term.
Two wire RTD or thermistor	17 RTD	Jumper 18 & 19	19 RTD
Three wire RTD	17 RTD	18 Exc.	19 RTD

Input 2, DC

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.

to minute in it provides porter to the loop.			
DC Input Channel 2	Terminal	Terminal	
Sensor or transmitter with a voltage output.	21(–)	23 (+)	
Transmitter with a mA output that powers the current loop. Typically a 3 or 4-wire device.	21 (–)	23 (+)	
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		22 (+15 V)	

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.

Upper Mount

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output channels for maximum accuracy.

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% output. 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 2010 accepts one RTD or thermistor input and one DC voltage or current 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 indicates 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

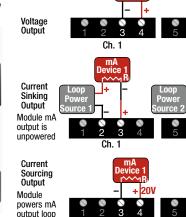
the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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



External

To avoid

do not

damage to

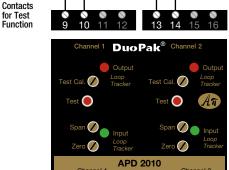
the module.

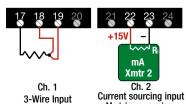
make any

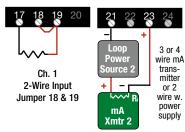
to unused

terminals

connections

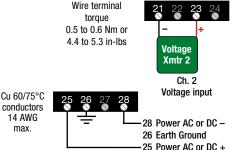






Ch. 2 Current sinking input Input externally powered

Module powers loop



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



power or signal output wiring.

Channel 1: RTD Temperature to DC

Channel 2: RTD Temperature to DC

5 6 7 8

1 2 3 4

- 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

- Monitor Two Temperature Sensors
- Convert/Isolate Dual Output Transmitters

Channel 1 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

> Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω , 2 or 3 wire Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA. 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in leadwire resistance, 3 wire sensor

Channel 2 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

Resistance at 0°C RTD input:

Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω , 2 or 3 wire Typically 10 Ω : 10 mA, 100 Ω : 2 mA, **Excitation current:** 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in leadwire resistance. 3 wire sensor

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 mADC to 0-20 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Less than 10 mVRMS

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

±0.1% of span Linearity: Temperature stability: Better than 0.04% span/°C

Output ripple and noise:

Isolation Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel

Adjustable Output

Test Function for

Each Channel



Zero and Span for **Each Channel**

Input LoopTracker LFD for Fach Channel



Custom I/O Ranges

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2011 DuoPak accepts two RTD inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2011 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2011	DuoPak 2 channel	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2011 D	RTD-DC converter/ isolator/transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

30

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2011 $A_{\overline{\eta}}$

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 1	Term.	Term.	Term.
Two wire RTD	17	Jumper	19
	Signal –	18 & 19	Signal +
Three wire RTD	17	18	19
	Signal –	Exc.	Signal +

Input 2, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 2	Term.	Term.	Term.
Two wire RTD	21	Jumper	23
	Signal –	22 & 23	Signal +
Three wire RTD	21	22	23
	Signal –	Exc.	Signal +

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.

Upper Mount

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output channels for maximum accuracy.

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% output. 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

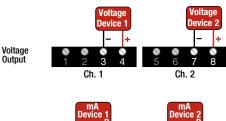
The APD 2011 accepts two RTD inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

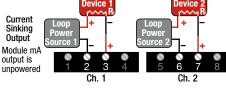
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

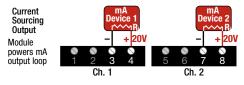
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions

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.

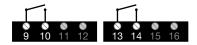
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



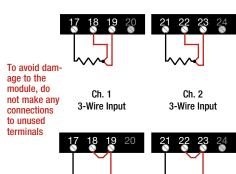


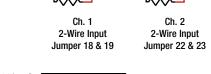


External Contacts for Test Function











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

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

See Wiring

Diagrams on

Next Page

Channel 1: RTD Temperature to DC

Channel 2: Potentiometer to DC

Sink or Source

mA Output for

Each Channel

- 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

- Monitor Temperature and Position
- Convert/Isolate Dual Output Transmitters

Channel 1 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

> Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω , 2 or 3 wire Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in

leadwire resistance, 3 wire sensor

Channel 2 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: 0-100 O Maximum range: 0-1 MO.

100 Ω to 1 $\text{M}\Omega$ minimum Input impedance: Input com. mode rejection: 100 dB minimum

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 mADC to 0-20 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel

±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span

Temperature stability: Better than 0.04% span/°C Output ripple and noise: Less than 10 mVRMS

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

Power

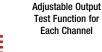
85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel









18

1 2 3 4

Duo Pak®

5 6 7 8

Custom I/O Ranges

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

Description

The APD 2013 DuoPak accepts one RTD input and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2013 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2013	DuoPak 2 channel RTD-DC, PotDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2013 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2013

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 1	Term.	Term.	Term.
Two wire RTD	17	Jumper	19
	Signal –	18 & 19	Signal +
Three wire RTD	17	18	19
	Signal –	Exc.	Signal +

Input 2, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 2	Terminal
Full scale or high side of potentiometer	21 (+1 VDC)
Zero or low end of potentiometer	22 (-)
Potentiometer wiper arm	23

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 lower spring clips against 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.

- 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.

Upper Mount

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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ± 10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum

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% output. 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.

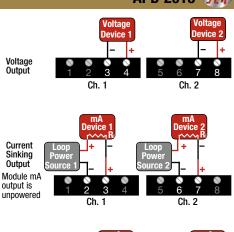
The APD 2013 accepts one RTD input and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

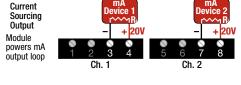
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.





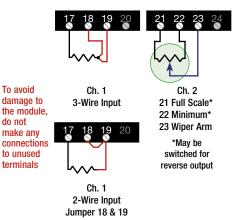
External Contacts for Test

To avoid

do not









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

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

Channel 1: RTD Temperature to DC

Channel 2: Bridge/Strain Gauge/Load Cell to DC

5 6 7 8

1 2 3 4

- 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

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

Channel 1 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

Curve (385, 3916, 392 etc.) Temperature range in °F or °C

Typically 10 Ω to 2000 Ω , 2 or 3 wire RTD resistance: Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in leadwire resistance, 3 wire sensor

Channel 2 Bridge Input Range

Factory configured, please specify sensor mV/V and mV range

0-1 mV to 0-2000 mV Sensor range:

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 1 $M\Omega$ minimum Input impedance:

Input com. mode rejection: 100 dB minimum

Channel 2 Excitation Voltage

Range: 4 to 10 VDC factory set, please specify Adjustment: ±10% via front potentiometer Maximum output: 10 VDC maximum at 30 mA

±0.01% per °C Stability: Designed for one 350 Ω (or greater) sensor

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

0-1 mADC to 0-20 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span Temperature stability: Better than 0.04% span/°C Output ripple and noise: Less than 10 mVRMs

Isolation

Current:

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz. 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel

Sink or Source

mA Output for



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Built-in Excitation Voltage for Strain **Gauge Input**

Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2015 DuoPak accepts one RTD input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2015 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range

Channel 2 input range, excitation voltage

Channel 1 output range

Channel 2 output range

Model	Description	Power
APD 2015	DuoPak 2 channel RTD-DC, Strain-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2015 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2015 A au

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 1	Term.	Term.	Term.
Two wire RTD	17 RTD	Jumper 18 & 19	19 RTD
Three wire RTD	17 RTD	18 Exc.	19 RTD

Input 2, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 2	- Terminal	+ Terminal
Strain gauge signal input	21 (+)	23 (-)
Excitation voltage	22 (-)	24 (+)

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.

Upper Mount

Sprina Clips

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate voltmeter on terminals 22 and 24 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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.

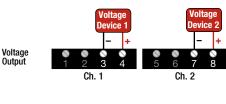
Operation

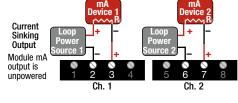
The APD 2015 accepts one RTD input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

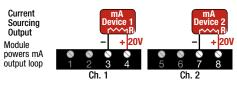
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal 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.

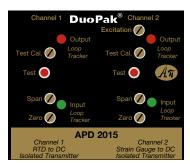




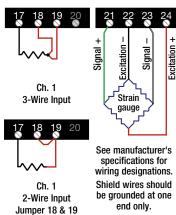














To maintain full isolation avoid combining power supplies in common with inputs, outputs, or unit power.

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

Channel 1: RTD Temperature 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

- Monitor Temperature and AC Voltage or Current
- Convert/Isolate Dual Output Transmitters

Channel 1 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω , 2 or 3 wire Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in

leadwire resistance, 3 wire sensor

Channel 2 AC Input Range

Factory configured, please specify input type and range 0-50 mVAC to 0-300 VAC Voltage: 0-1 mAAC to 0-1000 mAAC Current

Measurement type:

40 Hz to 1000 Hz sinusoidal Frequency: Voltage input impedance: 220 k Ω minimum Current input voltage burden: 1.0 V_{RMS} maximum

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 mADC to 0-20 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel

±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span

Temperature stability: Better than 0.04% span/°C Output ripple and noise: Less than 10 mVRMS

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel

Sink or Source

mA Output for









Custom I/O Ranges

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Channel 2: AC to DC

5 6 7 8

1 2 3 4

Description

The APD 2016 DuoPak accepts one RTD input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2016 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2016	DuoPak 2 channel RTD-DC, AC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2016 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 1	Term.	Term.	Term.
Two wire RTD	17	Jumper	19
	Signal –	18 & 19	Signal +
Three wire RTD	17	18	19
	Signal –	Exc.	Signal +

Input 2, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 2	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	21	23
Transmitter power supply.	22 (+15 VDC)	23

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.

Upper Mount

- Tilt front of module down and position the lower spring clips against 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.

- Push up on bottom back of 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- $5. \ \ Repeat \ adjustments \ for \ both \ output \ channels \ for \ best \ accuracy.$

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% output. 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

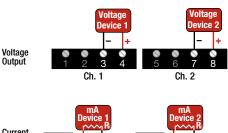
The APD 2016 accepts one RTD input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

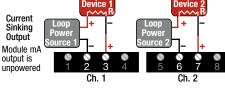
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

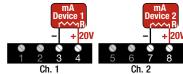
Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum.

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.





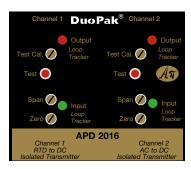




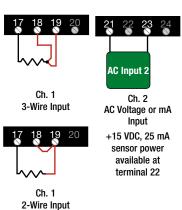
External Contacts for Test Function







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



Cu 60/75°C conductors
14 AWG max.

25 26 27 28

28 Power AC or DC –
26 Earth Ground

Jumper 18 & 19

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

25 Power AC or DC +

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

Channel 1: RTD Temperature to DC

Channel 2: Frequency to DC 1 2 3 4

- 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

- Monitor Temperature and Speed
- Convert/Isolate Dual Output Transmitters

Channel 1 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

> Curve (385, 3916, 392 etc.) Temperature range in °F or °C

Typically 10 Ω to 2000 Ω , 2 or 3 wire RTD resistance: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, **Excitation current:** 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in

leadwire resistance, 3 wire sensor

Channel 2 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 kHz

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 2 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mVRMs max. ripple

Channel 2 Characteristics

Impedance at max, sensitivity: 10 kO nom. Impedance at min. sensitivity: 100 k Ω 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 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

0-1 mADC to 0-20 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span Temperature stability: Better than 0.04% span/°C Less than 10 mVRMs Output ripple and noise:

Isolation

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

85-265 VAC. 50/60 Hz or 60-300 VDC. 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel

Sink or Source

mA Output for



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Sensor Power Available for Frequency Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

18 19

Each Channel 14 15 16 **DuoPak®**

5 6 7 8

Universal

Power

Diagrams on **Next Page** 29 30 31

See Wiring

Description

The APD 2017 DuoPak accepts one RTD input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2017 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2017	DuoPak 2 channel RTD-DC, FreqDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2017 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2017 🥠 🛪

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 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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Passive or unpowered mA device. APD module provides the loop power.	3 (–)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Voltage input device.	7 (–)	8 (+)
Passive or unpowered mA device.	7 (–)	8 (+20 V)
APD module provides the loop power.	<i>'</i> (-)	0 (120 0)

Input 1, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 1	Term.	Term.	Term.
Two wire RTD	17 RTD	Jumper 18 & 19	19 RTD
Three wire RTD	17 RTD	18 Exc.	19 RTD

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 product 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.

Frequency Sensor Ch. 2	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	22 (+15 V)	23 (+)
2 wire self generating (VR)	21 (-)	n/a	23 (+)
3 wire PNP or NPN	21 (-)	22 (+15 V)	23 (+)

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 k Ω to 500 Ω resistor.

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 lower spring clips against the bottom edge of DIN rail.
- 2. Push front of module upward until upper mount snaps into place.

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

- 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.

Upper Mount

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 a minimum 30 minute warm up time
- 2. Using an accurate calibration source, provide an input to the module equal to 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output 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 ±25 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% output. 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

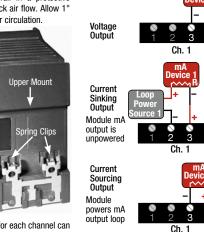
The APD 2017 accepts one RTD input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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

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

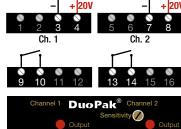


External

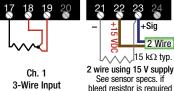
Contacts

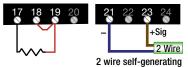
for Test

Function









Ch. 1 2-Wire Input Jumper 18 & 19

Wire terminal

torque

0.5 to 0.6 Nm or

4.4 to 5.3 in-lbs

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

To avoid

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

Cu 60/75°C conductors 14 AWG max.



See sensor specs. if load resistor is required



See sensor specs, if load resistor is required



See Wiring

Diagrams on

Next Page

Channel 1: Potentiometer 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

Monitor Position and a DC Signal

■ Convert/Isolate Dual Output Transmitters

Channel 1 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$ Maximum range: 0-1 MO.

Input impedance: 100 Ω to 1 $\text{M}\Omega$ minimum Input com. mode rejection: 100 dB minimum

Channel 2 DC Input Range

Factory configured, please specify input type and range

0-10 mVDC to 0-100 VDC Voltage: ±50 mVDC to ±10 VDC Bipolar voltage:

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

200 k Ω minimum Voltage input impedance: Current input impedance: 50 Ω typical mV_{RMS} 120 dB minimum Input com. mode rejection: Current input voltage burden: 1.25 VDC max. at 20 mA Input loop power supply: 15 VDC, ±10%, regulated,

> 25 mADC, may be connected for sinking or sourcing mA input

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 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

Current: 0-1 mADC to 0-25 mADC, 4-20 mADC

20 V compliance. 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel

Sink or Source



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

for DC Input

Connect Sink or Source mA

Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

mA Output for **Each Channel DuoPak®** 18

Channel 2: DC to DC

5 6 7 8

1_2 3 4

Description

The APD 2030 DuoPak accepts one potentiometer input and one DC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2030 is a 15 VDC loop excitation supply for the DC input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

ľ	Model	Description	Power
API	D 2030	DuoPak 2 channel DC-DC converter/	85-265 VAC, 50/60 Hz or 60-300 VDC
API	D 2030 D	isolator/transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a guick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item API BP4 Spare removable 4 terminal plug, black **Instructions APD 2030**

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 1	Terminal
Full scale or high side of potentiometer	17 (+1 VDC)
Zero or low end of potentiometer	18 (-)
Potentiometer wiper arm	19

Input 2, DC

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 ningle if it provides nower to the loor

terminals in it provides power to the loop.		
DC Input Channel 2	Terminal	Terminal
Sensor or transmitter with a voltage output.	21 (-)	23 (+)
mA output transmitter that powers the current loop. Typically a 3 or 4-wire device.	21 (–)	23 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		22 (+15 V)

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 lower spring clips against 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.

- 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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy.

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.

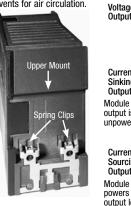
Each Test Cal. potentiometer is factory set to approximately 50% output. Each can be adjusted to set the test output from 0 to 100% of the output span. Press and hold the Test button and adjust the corresponding Test Cal. potentiometer for the desired output level.

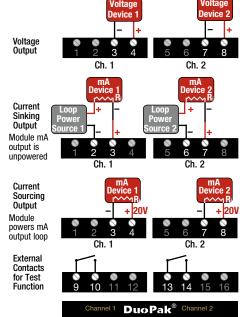
They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

The APD 2030 accepts one potentiometer input and one DC voltage or current 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 indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright

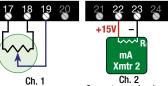
Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum.

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.









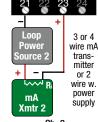
To avoid damage to the module, do not make any connections to unused terminals

18 Minimum* 19 Wiper Arm *May be switched for reverse output

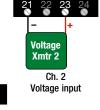
Wire terminal torque 0.5 to 0.6 Nm or

4.4 to 5.3 in-lbs

Current sourcing input 17 Full Scale* Module powers loop



Current sinking input Input externally powered



Cu 60/75°C conductors 14 AWG 28 Power AC or DC max. 26 Earth Ground

·25 Power AC or DC +

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

Channel 1: Potentiometer to DC

Channel 2: RTD Temperature to DC

5 6 7 8

1_2 3 4

- 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

- Monitor Position and Temperature
- Convert/Isolate Dual Output Transmitters

Channel 1 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$ Maximum range: $0-1~\mathrm{M}\Omega$

Input impedance: 100 Ω to 1 $\text{M}\Omega$ minimum Input com. mode rejection: 100 dB minimum

Channel 2 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

> Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω , 2 or 3 wire

Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in

leadwire resistance, 3 wire sensor

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 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

Linearity:

±0.1% of span Temperature stability: Better than 0.04% span/°C

Output ripple and noise: Less than 10 mVRMS

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

Power

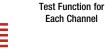
85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel



Each Channel

Zero and Span for

Each Channel

Adjustable Output

Input LoopTracker LFD for Fach Channel



Custom I/O Ranges



1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2031 DuoPak accepts one potentiometer input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2031 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2031	DuoPak 2 channel PotDC, RTD-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2031 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

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 are known to the State of California to cause cancer or birth defects or other reproductive harm. For more nformation 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 1	Terminal
Full scale or high side of potentiometer	17 (+1 VDC)
Zero or low end of potentiometer	18 (–)
Potentiometer wiper arm	19

Input 2, Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 2	Term.	Term.	Term.
Two wire RTD	21	Jumper	23
	Signal –	22 & 23	Signal +
Three wire RTD	21	22	23
	Signal –	Exc.	Signal +

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.

Upper Mount

- 1. Tilt front of module down and position the lower spring clips against 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.

- 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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy.

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% output. 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.

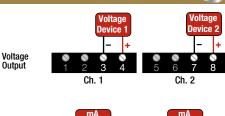
The APD 2031 accepts one potentiometer input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

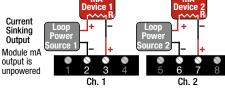
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If an LED fails to illuminate, or fails to change in intensity as

the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright

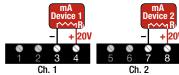
Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum.

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.







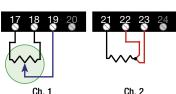


External Contacts for Test









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

Ch. 1 17 Full Scale* 18 Minimum* 19 Wiper Arm *Mav be switched for

reverse output



3-Wire Input

Ch. 2 2-Wire Input Jumper 22 & 23



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

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

Channel 1: Potentiometer to DC

Channel 2: Potentiometer to DC

1 2 3 4

- 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

Monitor Two Position Sensors

■ Convert/Isolate Dual Output Transmitters

Channel 1 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$ Maximum range: 0-1 MO.

Input impedance: 100 Ω to 1 $\text{M}\Omega$ minimum Input com. mode rejection: 100 dB minimum

Channel 2 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$ Maximum range: $0-1 M\Omega$

Input impedance: 100 Ω to 1 M Ω minimum Input com. mode rejection: 100 dB minimum

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 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 mADC to 0-25 mADC, 4-20 mADC 20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

I inearity: ±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 mADC 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

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Channel Adjustable Output

Output LoopTracker LED for Each





Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Use any 3-Wire Full-Range Potentiometer

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2033 DuoPak accepts two potentiometer inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2033 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

How to Order

Model	Description	Power
APD 2033	DuoPak 2 channel PotDC converter/	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2033 D	isolator/transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

Next Page

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source is used to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 1	Terminal
Full scale or high side of potentiometer	17 (+1 VDC)
Zero or low end of potentiometer	18 (–)
Potentiometer wiper arm	19

Input 2, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source is used to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 2	Terminal
Full scale or high side of potentiometer	21 (+1 VDC)
Zero or low end of potentiometer	22 (-)
Potentiometer wiper arm	23

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.

Upper Mount

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output channels for maximum accuracy.

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% output. 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

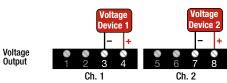
The APD 2033 accepts two potentiometer inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

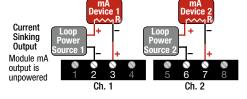
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

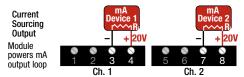
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.



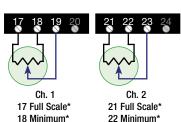








To avoid damage to the module, do not make any connections to unused terminals



*May be switched for reverse output

23 Wiper Arm



19 Wiper Arm

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

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

Channel 1: Potentiometer to DC

Channel 2: Bridge/Strain Gauge/Load Cell to DC

5 6 7 8

1_2 3 4

- 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

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

Channel 1 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$ Maximum range: $0-1~\mathrm{M}\Omega$

Input impedance: 100 Ω to 1 $\text{M}\Omega$ minimum Input com. mode rejection: 100 dB minimum

Channel 2 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.

mV/V sensitivity X excitation voltage = total mV range

1 M Ω minimum Input impedance: Input com. mode rejection: 100 dB minimum

Channel 2 Excitation Voltage

Range: 4 to 10 VDC factory set, please specify ±10% via front potentiometer Adjustment: 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 indicate I/O levels for each channel

Channel 1 and Channel 2 Output Ranges

Factory configured, please specify for each output channel

0-1 VDC to 0-10 VDC, 10 mA max Voltage: up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

85-265 VAC. 50/60 Hz or 60-300 VDC. 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for**

Each Channel

Output LoopTracker LED for Each

Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

Built-in Excitation Voltage for Strain

Gauge Input



Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

Sink or Source Removable Plugs mA Output for **Each Channel** Duo Pak® 18 See Wiring Diagrams on

Description

The APD 2035 DuoPak accepts one potentiometer input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2035 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range

Channel 2 input range, excitation voltage

Channel 1 output range

Channel 2 output range

Model	Description	Power
APD 2035	DuoPak 2 channel PotDC, Strain-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2035 D	converter/isolator/	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

Next Page

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

M29 Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 1	Terminal
Full scale or high side of potentiometer	17 (+1 VDC)
Zero or low end of potentiometer	18 (-)
Potentiometer wiper arm	19

Input 2, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 2	- Terminal	+ Terminal
Strain gauge signal input	21 (+)	23 (-)
Excitation voltage	22 (-)	24 (+)

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.

Upper Mount

Spring Clips

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate voltmeter on terminals 22 and 24 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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.

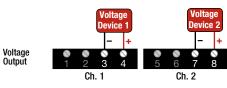
Operation

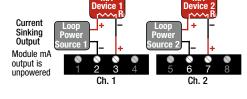
The APD 2035 accepts one potentiometer input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

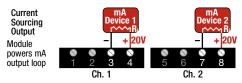
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal 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.

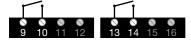
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.





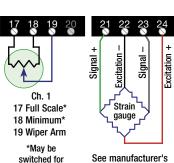


External Contacts for Test Function





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 specifications for wiring designations. Shield wires should be grounded at one end only.

Cu 60/75°C

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

reverse output



Channel 1: Potentiometer 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

- Monitor Position and AC Voltage or Current
- Convert/Isolate Dual Output Transmitters

Channel 1 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$

Maximum range: $0-1~\mathrm{M}\Omega$ Input impedance: 100 Ω to 1 $\text{M}\Omega$ minimum Input com. mode rejection: 100 dB minimum

Channel 2 AC Input Range

Factory configured, please specify input type and range

0-50 mVAC to 0-300 VAC Voltage: Current: 0-1 mAAC to 0-1000 mAAC

Measurement type: True RMS

40 Hz to 1000 Hz sinusoidal Frequency: Voltage input impedance: 220 $k\Omega$ minimum

LoopTracker

Variable brightness LEDs indicate I/O levels for each channel

Channel 1 and Channel 2 Output Ranges

Current input voltage burden: 1.0 VRMs maximum

Factory configured, please specify for each output channel

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 mADC to 0-25 mADC, 4-20 mADC 20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

I inearity: ±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 mADC 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

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

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only

VARRAN



Output LoopTracker LED for Each Channel

Sink or Source





Input LoopTracker LFD for Fach Channel



Custom I/O Ranges

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

mA Output for **Each Channel DuoPak®** See Wiring Diagrams on Next Page

Channel 2: AC to DC

5 6 7 8

1_2 3 4

Description

The APD 2036 DuoPak accepts one potentiometer input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2036 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2036	DuoPak 2 channel PotDC, AC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2036 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 1	Terminal
Full scale or high side of potentiometer	17 (+1 VDC)
Zero or low end of potentiometer	18 (–)
Potentiometer wiper arm	19

Input 2, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 2	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	21	23
Transmitter power supply.	22 (+15 VDC)	23

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 yents for air circulation.

Upper Mount

- Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 2. 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output channels for maximum accuracy.

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% output. 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.

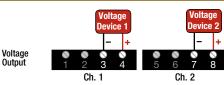
Operation

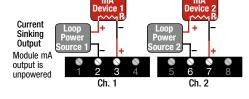
The APD 2036 accepts one potentiometer input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

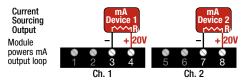
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.







External Contacts for Test Function



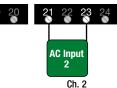


To avoid damage to the module, do not make any connections to unused terminals



Ch. 1 17 Full Scale* 18 Minimum* 19 Wiper Arm

*May be switched for reverse output



Input +15 VDC, 25 mA sensor power available at terminal 22

AC Voltage or mA



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

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

Channel 1: Potentiometer 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

Monitor Position and Speed

■ Convert/Isolate Dual Output Transmitters

Channel 1 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$ Maximum range: $0-1~\mathrm{M}\Omega$

Input impedance: 100 Ω to 1 $\text{M}\Omega$ minimum Input com. mode rejection: 100 dB minimum

Channel 2 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 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 mADC, <10 mV_{RMS} max. ripple

Channel 2 Characteristics

Impedance at max, sensitivity: 10 kO nom. Impedance at min. sensitivity: 100 k Ω 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 ±1 VDC to ±10 VDC

Bipolar voltage: 0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Sensor Power Available for Frequency Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Channel 2: Frequency to DC

5 6 7 8

1_2 3 4

Description

The APD 2037 DuoPak accepts one potentiometer input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2037 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2037	DuoPak 2 channel PotDC, FreqDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2037 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

Next Page

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output

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! 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. Arr maintains a constant entit to upgrate 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 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.

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.

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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (-)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Voltage input device.	Terminal 7 (-)	Terminal 8 (+)
•		

Input 1, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 1	Terminal
Full scale or high side of potentiometer	17 (+1 VDC)
Zero or low end of potentiometer	18 (–)
Potentiometer wiper arm	19

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 product 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.

Frequency Sensor Ch. 2	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	22 (+15 V)	23 (+)
2 wire self generating (VR)	21 (-)	n/a	23 (+)
3 wire PNP or NPN	21 (-)	22 (+15 V)	23 (+)

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 k Ω to 500 Ω resistor.

Module Power Terminals

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, 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

Upper Mount

- 1. Tilt front of module down and position the lower spring clips against the bottom edge of DIN rail.
- 2. Push front of module upward until upper mount snaps into place.

Removal

for air circulation

Avoid shock hazards! 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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy.

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 ±25 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% output. 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.

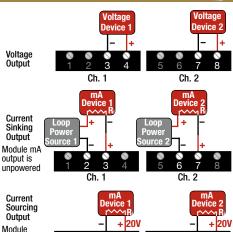
The APD 2037 accepts one potentiometer input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright lighting

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.





powers mA

output loop





To avoid damage to the module, do not make any connections switched for to unused reverse output terminals

17 Full Scale* 18 Minimum* 19 Wiper Arm *May be



2 wire using 15 V supply

See sensor specs.

bleed resistor is required

_15 kΩ typ.

2 wire self-generating

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



3 wire NPN See sensor specs. if load resistor is required

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



Cu 60/75°C conductors 14 AWG max

28 Power AC or DC -26 Earth Ground 25 Power AC or DC +

Channel 2: DC to DC

5 6 7 8

1_2 3 4

DuoPak®

APD 2050

18

Removable Plugs

See Wiring

Diagrams on

Next Page

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 a DC Signal
- 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.

mV/V sensitivity X excitation voltage = total mV range

 $\begin{array}{ll} \text{Input impedance:} & 1 \text{ M}\Omega \text{ minimum} \\ \text{Input com. mode rejection:} & 100 \text{ dB minimum} \end{array}$

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

Stability: $\pm 0.01\%$ per °C Designed for one 350 Ω (or greater) sensor

Channel 2 DC Input Range

Factory configured, please specify input type and range

Voltage: 0-10 mVDC to 0-100 VDC Bipolar voltage: ±50 mVDC to ±10 VDC

Current: 0-1 mADC to 0-50 mADC, 4-20 mADC

25 mADC, may be connected for sinking or sourcing mA input

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 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel $\pm 15\%$ of span adjustment range typical

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel

Sink or Source

mA Output for

Each Channel

Adjustable Output Test Function for Fach Channel



Zero and Span for Each Channel

Input LoopTracker LED for Each Channel

Custom I/O Ranges

Free Factory I/O Setup!

Built-in Excitation Voltage for Strain Gauge Input, Sink or Source mA for DC Input

Dimensions

1.78" W x 4.62" H x 4.81" D Universal 45 mm W x 117 mm H x 122 mm D Power Height includes connectors

Description

The APD 2050 DuoPak accepts one strain gauge input and one DC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2050 is a 15 VDC loop excitation supply the DC input channel and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Orde

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range, excitation voltage

Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2050	DuoPak 2 channel Strain-DC, DC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2050 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

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

M39 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

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 1	– Terminal	+ Terminal
Strain gauge signal input	17 (+)	19 (–)
Excitation voltage	18 (–)	20 (+)

Input 2, DC

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.

DC Input Channel 2	Terminal	Terminal
Voltage output sensor or transmitter	21(-)	23 (+)
Transmitter with a powered mA output. Typically a 3 or 4-wire device.	21 (–)	23 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		22 (+15 V)

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.

- 1. Tilt front of module down and position the lower spring clips against 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.

- 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 a minimum 30 minute warm up time.
- 2. Using an accurate voltmeter on terminals 18 and 20 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ± 10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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

They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

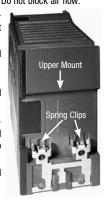
Operation

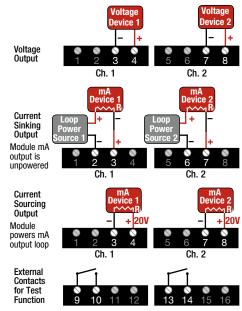
The APD 2050 accepts one strain gauge input and one DC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in

intensity as the process changes from minimum to maximum.

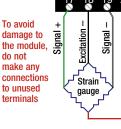
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change 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.









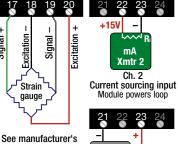
specifications for

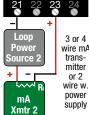
wiring designations.

Shield wires should

be grounded at one

end only.





Current sinking input

Input externally powered

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

unit power.

combining power supplies in

common with inputs, outputs, or

To maintain full isolation avoid

Voltage Xmtr 2 Ch. 2

Cu 60/75°C conductors 14 AWG 28 Power AC or DC max.

Voltage input

26 Earth Ground 25 Power AC or DC +

See Wiring

Diagrams on

Next Page

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

Channel 2: RTD Temperature to DC

5 6 7 8

1_2 3 4

DuoPak®

APD 2051

- 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 Temperature
- 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.

mV/V sensitivity X excitation voltage = total mV range

Input impedance: 1 M $\!\Omega\!$ minimum Input com. mode rejection: 100 dB minimum

Channel 1 Excitation Voltage

Range: 4 to 10 VDC factory set, please specify Adjustment: ±10% via front potentiometer

Adjustment: $\pm 10\%$ via front potentiomete Maximum output: 10 VDC maximum at 30 mA

Stability: $\pm 0.01\%$ per °C Designed for one 350 Ω (or greater) sensor

Channel 2 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

Curve (385, 3916, 392 etc.) Temperature range in °F or °C Typically 10 Ω to 2000 Ω , 2 or 3 wire

Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $<\pm0.05\%$ of span per 1 Ω change in leadwire resistance, 3 wire sensor

LoopTracker

RTD resistance:

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 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel $\pm 15\%$ of span adjustment range typical

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output Test Function for

Each Channel

Output LoopTracker LED for Each

Channel

Sink or Source

mA Output for

Each Channel



Zero and Span for Each Channel

Input LoopTracker LED for Each Channel

Custom I/O Ranges

Built-in Excitation Voltage for Strain Gauge Input

Universal

Power



Dimensions

Description

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors



LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

device fails), or a combination of these.

Output Sink/Source Versatility
Standard on the APD 2051 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

The APD 2051 DuoPak accepts one strain gauge input and one

RTD input and provides two optically isolated DC voltage or

The input ranges and the output ranges for each channel are

independent and can be specified as required. This provides an

Typical applications include signal conversion, isolation, and

redundancy (i.e. to prevent failure of the entire loop if one

Each input signal is filtered, amplified, and then passed

through an opto-coupler to the output stages. Full 5-way

isolation (input 1, input 2, output 1, output 2, power) make

current outputs that are linearly related to the inputs.

economical two channel solution in one device.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range, excitation voltage

Channel 2 input range Channel 1 output range

Channel 2 output range

Model	Description	Power
APD 2051	DuoPak 2 channel Strain-DC, RTD-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2051 D	converter/isolator/	9-30 VDC or 10-32 VAC

Options and Accessories

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

M39 Channel 1 and channel 2 high voltage output

U Conformal coating for moisture resistance

Accessory—order as separate line item

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 are known to the State of California to cause cancer or birth defects or other reproductive harm. For more nformation 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, Bridge, Strain Gauge, Load Cell

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.

The excitation voltage is factory set and should match the sensor manufacturer's recommendations. A front potentiometer allows approximately ±10% fine adjustment of the excitation voltage.

CAUTION: Never short the excitation leads together. This will cause internal damage to the module.

Bridge Input Channel 1	- Terminal	+ Terminal
Strain gauge signal input	17 (+)	19 (–)
Excitation voltage	18 (-)	20 (+)

Input 2, Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 2	Term.	Term.	Term.
Two wire RTD	21 RTD	Jumper 22 & 23	23 RTD
Three wire RTD	21 RTD	22 Exc.	23 RTD

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.

Upper Mount

- 1. Tilt front of module down and position the lower spring clips against 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.

- 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 a minimum 30 minute warm up time.
- 2. Using an accurate voltmeter on terminals 18 and 20 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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.

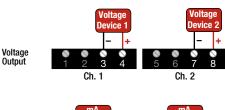
They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

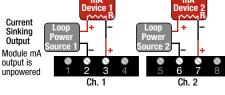
Operation

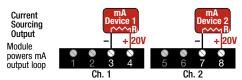
The APD 2051 accepts one strain gauge input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs. Green LoopTracker® input LEDs provide a visual indication that

each signal is being sensed by the input circuitry of the module. They also indicates 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 signal 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

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.







External Contacts **Function**

To avoid

do not

damage to

make anv

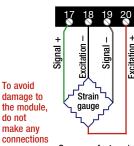
to unused

terminals

the module.

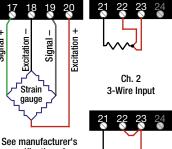






specifications for wiring designations. Shield wires should be grounded at one

end only.



Ch. 2 2-Wire Input Jumper 22 & 23



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

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

minimum to maximum.

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

Channel 2: Potentiometer to DC

5 6 7 8

1 2 3 4

- 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

- Monitor Weight or Pressure and Position
- 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.

mV/V sensitivity X excitation voltage = total mV range Input impedance: 1 MΩ minimum

Input com. mode rejection: 100 dB minimum

Channel 1 Excitation Voltage

4 to 10 VDC factory set, please specify Range: 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 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

 $0-100~\Omega$ Minimum range: Maximum range: $0-1 M\Omega$

Input impedance: 100 O to 1 MO minimum

Input com. mode rejection: 100 dB minimum

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

0-1 VDC to 0-10 VDC, 10 mA max Voltage: up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

Built-in Excitation Voltage for Strain **Gauge Input**

Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2053 DuoPak accepts one strain gauge input and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2053 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range, excitation voltage

Channel 2 input range Channel 1 output range

Channel 2 output range

Model	Description	Power
APD 2053	DuoPak 2 channel Strain-DC, Pot. DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2053 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 1	– Terminal	+ Terminal	
Strain gauge signal input	17 (+)	19 (-)	
Excitation voltage	18 (-)	20 (+)	

Input 2, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 2	Terminal
Full scale or high side of potentiometer	21 (+1 VDC)
Zero or low end of potentiometer	22 (–)
Potentiometer wiper arm	23

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.

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate voltmeter on terminals 18 and 20 adjust the excitation voltage fine adjust potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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

Each Test Cal. potentiometer is factory set to approximately 50% output. 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

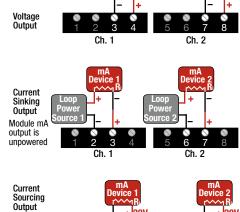
The APD 2053 accepts one strain gauge input and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal 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

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.





External Contacts for Test Function

To avoid

do not

damage to

the module.

make any

to unused

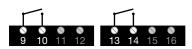
terminals

connections

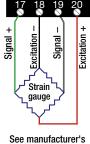
Module

powers mA

output loop

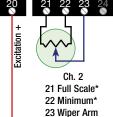




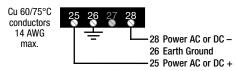


See manufacturer's specifications for wiring designations. Shield wires should be grounded at one

end only.



*May be switched for reverse output



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

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

minimum to maximum.

See Wiring

Diagrams on

Next Page

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

Channel 2: Bridge/Strain Gauge/Load Cell to DC

5 6 7 8

1_2 3 4

DuoPak®

- 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

- Monitor Two Strain Gauges or Load Cells
- 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. mV/V sensitivity X excitation voltage = total mV range

Input impedance: 1 M Ω minimum Input com. mode rejection: 100 dB minimum

Channel 1 Excitation Voltage

4 to 10 VDC factory set, please specify Range: Adjustment: ±10% via front potentiometer Maximum output: 10 VDC maximum at 30 mA ±0.01% per °C Stability:

Designed for one 350 Ω (or greater) sensor

Channel 2 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.

mV/V sensitivity X excitation voltage = total mV range

Input impedance: 1 M Ω minimum Input com. mode rejection: 100 dB minimum

Channel 2 Excitation Voltage

4 to 10 VDC factory set, please specify Range: 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 indicate I/O levels for each channel

Channel 1 and Channel 2 Output Ranges

Factory configured, please specify for each output channel 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 mADC to 0-25 mADC, 4-20 mADC 20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel $\pm 15\%$ of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span Better than 0.04% span/°C Temperature stability: 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 mADC 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

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



File E145968 85-265 VAC, 60-300 VDC model only



Channel Adjustable Output

Output LoopTracker LED for Each

Sink or Source

mA Output for

Each Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Built-in Excitation Voltage for Strain **Gauge Inputs**

18

Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum

D versions: 9-30 VDC or 10-32 VAC 50/60 Hz.

6 W maximum

Power

Description

The APD 2055 DuoPak accepts two stain gauge inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2055 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range, excitation voltage

Channel 2 input range, excitation voltage

Channel 1 output range

Channel 2 output range

Model	Description	Power
APD 2055	DuoPak 2 channel Strain-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2055 D	converter/isolator/	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

30

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

R2 Channel 2 I/O reversal (i.e. 20-4 mA out)

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

Channel 1 and channel 2 high voltage output M39 Conformal coating for moisture resistance

Accessory—order as separate line item



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 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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (-)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Voltage input device.	7 (–)	8 (+)
		- /
Unpowered or passive mA input device. APD module provides the loop power.	7 (–)	8 (+20 V)

Input 1, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 1	- Terminal	+ Terminal
Strain gauge signal input	17 (+)	19 (-)
Excitation voltage	18 (-)	20 (+)

Input 2, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 2	- Terminal	+ Terminal
Strain gauge signal input	21 (+)	23 (-)
Excitation voltage	22 (-)	24 (+)

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.

Upper Mount

- 1. Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 2. 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate voltmeter on terminals 18 and 20, and then 22 and 24, adjust the excitation voltage fine adjustment potentiometers to the strain gauge manufacturer's recommended values.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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.

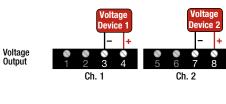
Operation

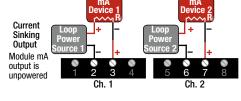
The APD 2055 accepts two stain gauge inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

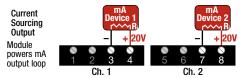
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum. If an LED fails to illuminate, or fails to change in intensity as the

process changes, check the module power or signal 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.







External Contacts for Test Function

To avoid

do not

damage to

make any connections

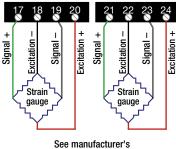
to unused

terminals

the module.







specifications for wiring designations. Shield wires should be grounded at one end only.



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

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

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 Strain or Pressure and an AC Signal

■ 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.

mV/V sensitivity X excitation voltage = total mV range

Input impedance: 1 $\mbox{M}\Omega$ minimum Input com. mode rejection: 100 dB minimum

Channel 1 Excitation Voltage

Range: 4 to 10 VDC factory set, please specify Adjustment: $\pm 10\%$ via front potentiometer Maximum output: 10 VDC maximum at 30 mA Stability: $\pm 0.01\%$ per °C Designed for one 350 Ω (or greater) sensor

Channel 2 AC Input Range

Factory configured, please specify input type and range

Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC

Measurement type: True RMS

Frequency: 40 Hz to 1000 Hz sinusoidal Voltage input impedance: 220 k Ω minimum Current input voltage burden: 1.0 V_{RMS} maximum

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 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel $\pm 15\%$ of span adjustment range typical

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel

Sink or Source

mA Output for

Each Channel

Adjustable Output Test Function for Each Channel



Zero and Span for Each Channel

Input LoopTracker LED for Each Channel

Custom I/O Ranges

)

Built-in Excitation Voltage for Strain Gauge Input

Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors Universal Power



Channel 2: AC to DC

5 6 7 8

1_2 3 4

Description

The APD 2056 DuoPak accepts one strain gauge input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2056 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range, excitation voltage

Channel 2 input range Channel 1 output range Channel 2 output range

 Model
 Description
 Power

 APD 2056
 DuoPak 2 channel Strain-DC, AC-DC
 85-265 VAC, 50/60 Hz or 60-300 VDC

 APD 2056 D
 Oververter/isolator/ APD 2056 D
 9-30 VDC or 10-32 VAC

transmitter

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

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

 $\textbf{M29} \quad \text{Channel 2 high voltage output} > 10 \text{ V up to 20 V}$

M39 Channel 1 and channel 2 high voltage output U Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 1	– Terminal	+ Terminal
Strain gauge signal input	17 (+)	19 (–)
Excitation voltage	18 (-)	20 (+)

Input 2, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 2	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	21	23
Transmitter power supply.	22 (+15 VDC)	23

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 lower spring clips against the bottom edge of DIN rail.
- Push front of module upward until upper mount snaps into place.

Removal

Avoid shock hazards! 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate voltmeter on terminals 18 and 20 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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

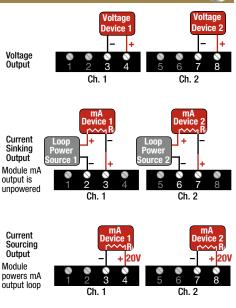
The APD 2056 accepts one strain gauge input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input

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.





External Contacts for Test Function



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

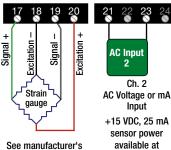
Cu 60/75°C

conductors

14 AWG

max





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

28 Power AC or DC –

26 Earth Ground

25 Power AC or DC +

terminal 22

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

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

Channel 2: Frequency to DC

5 6 7 8

1 2 3 4

12

DuoPak®

Channel 1 APD 2057

Channel 2

30

Removable Plugs

See Wiring

Diagrams on

Next Page

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

- 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.

mV/V sensitivity X excitation voltage = total mV range

Input impedance: 1 M Ω minimum Input com. mode rejection: 100 dB minimum

Channel 1 Excitation Voltage

4 to 10 VDC factory set, please specify Range: Adjustment: ±10% via front potentiometer Maximum output: 10 VDC maximum at 30 mA

±0.01% per °C Stability: Designed for one 350 Ω (or greater) sensor

Channel 2 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 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 $\pm 10\%$, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 2 Characteristics

Impedance at max. sensitivity: 10 k Ω nom. Impedance at min. sensitivity: 100 kO 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 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

±1 VDC to ±10 VDC Bipolar voltage:

Current: 0-1 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

±0.1% of span Linearity: 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 mADC 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



File E145968 85-265 VAC, 60-300 VDC model only



Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel

Sink or Source

mA Output for

Each Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

ree Factor I/O Setup!

Built-in Excitation Voltage for Strain Gauge Sensor Input Power Available for Frequency

17 18

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

Power 85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W

maximum

D versions: 9-30 VDC or 10-32 VAC 50/60 Hz,

6 W maximum

Description

The APD 2057 DuoPak 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.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2057 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range, excitation voltage

Channel 2 input range

Channel 1 output range

Channel 2 output range

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

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

R2 Channel 2 I/O reversal (i.e. 20-4 mA out)

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

Channel 1 and channel 2 high voltage output M39

Conformal coating for moisture resistance Accessory—order as separate line item



Instructions APD 2057 🥂 📆

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. Arr maintains a constant entit to upgrate 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 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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (–)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Voltage input device.	Terminal 7 (–)	Terminal 8 (+)

Input 1, Bridge, Strain Gauge, Load Cell

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.

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

Bridge Input Channel 1	- Terminal	+ Terminal
Strain gauge signal input	17 (+)	19 (–)
Excitation voltage	18 (-)	20 (+)

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 product 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.

Frequency Sensor Ch. 2	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	22 (+15 V)	23 (+)
2 wire self generating (VR)	21 (–)	n/a	23 (+)
3 wire PNP or NPN	21 (–)	22 (+15 V)	23 (+)

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 k Ω to 500 Ω resistor.

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 lower spring clips against the bottom edge of DIN rail.
- 2. Push front of module upward until upper mount snaps into place.

Avoid shock hazards! 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 fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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 ±25 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% output. 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 indicates 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 signal 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.



Function

To avoid

do not

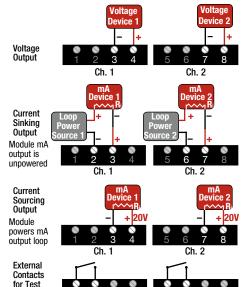
damage to

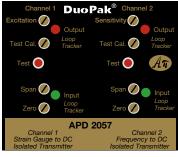
make any

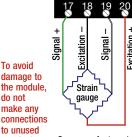
to unused

terminals

the module,

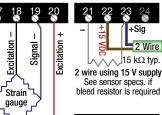






See manufacturer's specifications for wiring designations. Shield wires should be grounded at one end only.

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

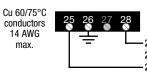


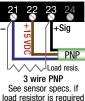


2 Wire

3 wire NPN See sensor specs. if load resistor is required

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





28 Power AC or DC -26 Earth Ground 25 Power AC or DC +

Channel 1: AC 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

Monitor an AC Signal and a DC Signal

■ Convert/Isolate Dual Output Transmitters

Channel 1 AC Input Range

Factory configured, please specify input type and range Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC

Measurement type: True RMS

Frequency: 40 Hz to 1000 Hz sinusoidal Voltage input impedance: 220 k Ω minimum Current input voltage burden: 1.0 V_{RMS} maximum

Channel 2 DC Input Range

Factory configured, please specify input type and range

0-10 mVDC to 0-100 VDC Voltage: ±50 mVDC to ±10 VDC Bipolar voltage:

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

Voltage input impedance: 200 kΩ minimum Current input impedance: 50 Ω typical 120 dB minimum Input com. mode rejection: Current input voltage burden: 1.25 VDC max. at 20 mA Input loop power supply: 15 VDC, ±10%, regulated,

> 25 mADC, may be connected for sinking or sourcing mA input

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 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

Bipolar Voltage: ±1 VDC to ±10 VDC

Current: 0-1 mADC to 0-25 mADC, 4-20 mADC

20 V compliance. 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LFD for Each Channel

Sink or Source

mA Output for

Each Channel

Adjustable Output **Test Function for Each Channel**



Zero and Span for **Fach Channel**

Input LoopTracker LED for Each Channel

Custom I/O Ranges



Connect Sink or Source mA for DC Input

Dimensions

I/O Setup

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

18 LoopTracker

DuoPak®

5 6 7 8

Channel 2: DC to DC

1_2 3 4

See Wiring Diagrams on **Next Page**

Description

The APD 2060 DuoPak accepts one DC voltage or current input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2060 is a 15 VDC loop excitation supply for the DC input and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2060	DuoPak 2 channel AC-DC, DC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2060 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

These provide a guick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

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

MOD-TRONIC

Instructions APD 2060 A au

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.	Terminal 7 (–)	Terminal 8 (+)
Measuring/recording device accepts a		

Input 1, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 1	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	17	19
Transmitter power supply.	18 (+15 VDC)	19

Input 2, DC

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.

DC Input Channel 2	Terminal	Terminal
Sensor or transmitter with a voltage output.	21 (-)	23 (+)
mA output transmitterthat powers the current loop. Typically a 3 or 4-wire device.	21 (–)	23 (+)
Transmitter with an unpowered mA output. Typically a 2-wire device. APD module provides loop power.		22 (+15 V)

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 yents for air circulation.

- Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 2. 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output channels for maximum accuracy.

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% output. 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

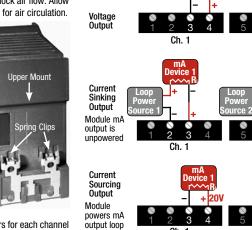
The APD 2060 accepts one DC voltage or current input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.

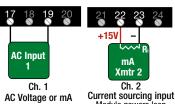
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



External Contacts for Test Function







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

Wire terminal

0.5 to 0.6 Nm or

4.4 to 5.3 in-lbs

To maintain

full isolation

common with

inputs, outputs, or unit

avoid combining power supplies in

torque

+15 VDC, 25 mA sensor power available at terminal 18

Input

Loop Power Source 2 + - or 2 Wire w. power mA

Module powers loop

Ch. 2 Current sinking input Input externally powered

Xmtr 2

vlagus



Voltage input



Channel 1: AC to DC

Channel 2: RTD Temperature to DC

5 6 7 8

1_2 3 4

- 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

Monitor an AC Signal and RTD Temperature

■ Convert/Isolate Dual Output Transmitters

Channel 1 AC Input Range

Factory configured, please specify input type and range Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC

Measurement type: True RMS

Frequency: 40 Hz to 1000 Hz sinusoidal Voltage input impedance: 220 k Ω minimum Current input voltage burden: 1.0 V_{RMS} maximum

Channel 2 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

RTD input: Resistance at 0°C

> Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω , 2 or 3 wire

Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA, 1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA

Leadwire comp.: $< \pm 0.05\%$ of span per 1 Ω change in leadwire resistance, 3 wire sensor

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 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span

Temperature stability: Better than 0.04% span/°C Output ripple and noise: Less than 10 mVRMS

Full 5-way, 1200 VRMs minimum

Response Time

70 milliseconds typical

Output Loop Power Supplies

20 VDC nominal, regulated, 25 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel



Zero and Span for

Each Channel

Adjustable Output



I/O Setup!

Custom I/O Ranges



1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

Sink or Source Removable Plugs mA Output for **Each Channel DuoPak®** See Wiring Diagrams on **Next Page**

Description

The APD 2061 DuoPak accepts one AC voltage or current input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2061 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2061	DuoPak 2 channel AC-DC, RTDDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2061 D	converter/isolator/	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a		

Input 1. AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 1	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	17	19
Transmitter nower supply	18 (+15 VDC)	19

Input 2, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

			-
Temperature Input Ch. 2	Term.	Term.	Term.
Two wire RTD	21	Jumper	23
	Signal –	22 & 23	Signal +
Three wire RTD	21	22	23
	Signal –	Exc.	Signal +

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.

Upper Mount

- 1. Tilt front of module down and position the lower spring clips against 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.

- 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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ± 10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy.

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% output. 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

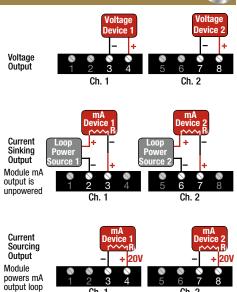
The APD 2061 accepts one AC voltage or current input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

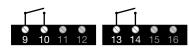
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.

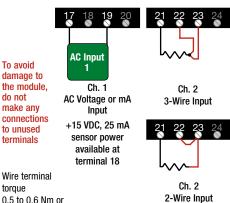
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.



External Contacts **Function**







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

To avoid

do not

damage to

make any

to unused

terminals

Jumper 22 & 23



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

See Wiring

Diagrams on

Next Page

Channel 1: AC to DC

Channel 2: Potentiometer to DC

5 6 7 8

1 2 3 4

DuoPak®

- 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 an AC Signal and Position
- Convert/Isolate Dual Output Transmitters

Channel 1 AC Input Range

Factory configured, please specify input type and range Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC

Measurement type: True RMS

Frequency: 40 Hz to 1000 Hz sinusoidal Voltage input impedance: 220 $k\Omega$ minimum

Current input voltage burden: 1.0 V_{RMS} maximum

Channel 2 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

 $\begin{array}{ll} \mbox{Minimum range:} & \mbox{0-100} \ \Omega \\ \mbox{Maximum range:} & \mbox{0-1} \ \mbox{M} \Omega \\ \end{array}$

Input impedance: 100Ω to 1 M Ω minimum Input com. mode rejection: $100~\mathrm{dB}$ minimum

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 mADC to 0-25 mADC, 4-20 mADC 20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel $\pm 15\%$ of span adjustment range typical

Output Characteristics

Linearity: $\pm 0.1\%$ 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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Output LoopTracker LED for Each Channel

Sink or Source

mA Output for

Each Channel





Input LoopTracker LED for Each Channel



Custom I/O Ranges

17 18 19 20 21 22 23 24

Universal Power

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Description

The APD 2063 DuoPak accepts one AC voltage or current input and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2063 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2063	DuoPak 2 channel AC-DC, PotDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2063 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

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

 $\textbf{M19} \quad \text{Channel 1 high voltage output} > 10 \text{ V up to 20 V}$

M29 Channel 2 high voltage output >10 V up to 20 V

M39 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

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 1	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	17	19
Transmitter power supply.	18 (+15 VDC)	19

Input 2, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 2	Terminal
Full scale or high side of potentiometer	21 (+1 VDC)
Zero or low end of potentiometer	22 (–)
Potentiometer wiper arm	23

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.

Upper Mount

- Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 2. 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output channels for maximum accuracy.

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% output. 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.

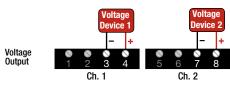
Operation

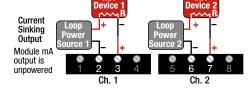
The APD 2063 accepts one AC voltage or current input and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs. Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

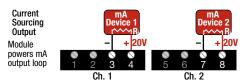
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.

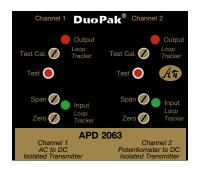
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring.











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



AC Voltage or mA Input +15 VDC, 25 mA sensor power

available at

terminal 18

Ch. 2 21 Full Scale* 22 Minimum* 23 Wiper Arm

*May be switched for reverse output



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

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

Channel 1: AC to DC

Channel 2: Bridge/Strain Gauge/Load Cell to DC

5 6 7 8

1_2 3 4

- 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

Monitor AC Signal and Weight or Pressure

■ Convert/Isolate Dual Output Transmitters

Channel 1 AC Input Range

Factory configured, please specify input type and range Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC Measurement type: True RMS

Frequency: 40 Hz to 1000 Hz sinusoidal Voltage input impedance: 220 k Ω minimum Current input voltage burden: 1.0 V_{RMS} maximum

Channel 2 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.

mV/V sensitivity X excitation voltage = total mV range

1 M Ω minimum Input impedance: Input com. mode rejection: 100 dB minimum

Channel 2 Excitation Voltage

Range: 4 to 10 VDC factory set, please specify ±10% via front potentiometer Adjustment: 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 indicate I/O levels for each channel

Channel 1 and Channel 2 Output Ranges

Factory configured, please specify for each output channel

0-1 VDC to 0-10 VDC, 10 mA max Voltage: up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

85-265 VAC. 50/60 Hz or 60-300 VDC. 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Channel Adjustable Output

Test Function for

Each Channel

Output LoopTracker LED for Each



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Built-in Excitation Voltage for Strain Gauge Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2065 DuoPak accepts one AC voltage or current input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2065 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range

Channel 2 input range, excitation voltage

Channel 1 output range

Channel 2 output range

Model	Description	Power
APD 2065	DuoPak 2 channel AC-DC, Strain-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2065 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

Next Page

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2065 $A\pi$

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1. AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 1	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	17	19
Transmitter power supply.	18 (+15 VDC)	19

Input 2, Bridge, Strain Gauge, Load Cell

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.

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.

Bridge Input Channel 2	– Terminal	+ Terminal
Strain gauge signal input	21 (+)	23 (-)
Excitation voltage	22 (-)	24 (+)

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.

Upper Mount

- Tilt front of module down and position the lower spring clips against 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.

- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate voltmeter on terminals 22 and 24 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 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. The Zero control should only be adjusted when the input signal is at its minimum. This will produce the corresponding minimum output signal. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 6. Repeat adjustments for both channels for maximum accuracy.

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% output. 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

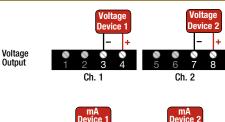
The APD 2065 accepts one AC voltage or current input and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

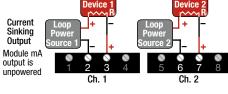
Green LoopTracker $^{\circ}$ input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

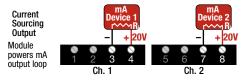
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring.

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.





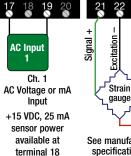


External Contacts for Test Function





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.

Signal



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

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

Channel 1: AC 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

Simultaneous Voltage and Current Monitoring

■ Convert/Isolate Dual Output Transmitters

Channel 1 AC Input Range

Factory configured, please specify input type and range Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC Measurement type: True RMS

Frequency: 40 Hz to 1000 Hz sinusoidal Voltage input impedance: 220 $k\Omega$ minimum Current input voltage burden: 1.0 V_{RMS} maximum

Channel 2 AC Input Range

Factory configured, please specify input type and range 0-50 mVAC to 0-300 VAC Voltage:

Current: 0-1 mAAC to 0-1000 mAAC

Measurement type: True RMS

40 Hz to 1000 Hz sinusoidal Frequency: Voltage input impedance: 220 $k\Omega$ minimum Current input voltage burden: 1.0 $\ensuremath{\text{V}_{\text{RMS}}}$ maximum

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 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 mADC to 0-25 mADC, 4-20 mADC 20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

I inearity: ±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 mADC 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

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

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



Sink or Source mA Output for **Each Channel**



Output LoopTracker LED for Each Channel



Test Function for Each Channel

Adjustable Output



Input LoopTracker LFD for Fach Channel



Custom I/O Ranges

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

Removable Plugs Duo Pak® See Wiring Diagrams on Next Page

Channel 2: AC to DC

5 6 7 8

1_2 3 4

Description

The APD 2066 DuoPak accepts two AC voltage or current inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2066 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2066	DuoPak 2 channel AC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2066 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

M29 Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

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 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	Terminal	Terminal
Measuring/recording device accepts a voltage input.	3 (–)	4 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	3 (–)	4 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Measuring/recording device accepts a voltage input.		Terminal 8 (+)
Measuring/recording device accepts a	7 (–)	

Input 1, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available for each channel as shown below, but is not commonly used with AC inputs.

AC Input Channel 1	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	17	19
Transmitter power supply.	18 (+15 VDC)	19

Input 2. AC

Any polarity may be used for an AC input. A transmitter DC power supply is available for each channel as shown below, but is not commonly used with AC inputs.

AC Input Channel 2	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	21	23
Transmitter power supply.	22 (+15 VDC)	23

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.

Upper Mount

Spring Clips

- Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 2. 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for maximum accuracy.

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% output. 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

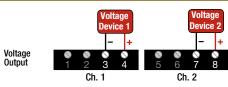
The APD 2066 DuoPak accepts two AC voltage or current inputs and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

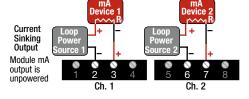
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

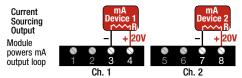
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

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.



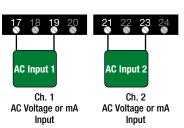




External Contacts for Test Function 9 10 11 12 13 14 15 16



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



+15 VDC, 25 mA sensor power available at terminals 18 & 22



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

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

Channel 1: AC to DC

Channel 2: Frequency 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

- Monitor AC Voltage or Current and Speed
- Convert/Isolate Dual Output Transmitters

Channel 1 AC Input Range

Factory configured, please specify input type and range Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC

Measurement type: True RMS Frequency:

40 Hz to 1000 Hz sinusoidal Voltage input impedance: 220 $k\Omega$ minimum Current input voltage burden: 1.0 V_{RMS} maximum

Channel 2 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 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 mADC, <10 mV_{RMS} max. ripple

Channel 2 Characteristics

Impedance at max, sensitivity: 10 kO nom. Impedance at min. sensitivity: 100 k Ω 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

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

±0.1% of span Linearity: 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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum



File E145968 85-265 VAC, 60-300 VDC model only



LED for Each Channel

Output LoopTracker

Adjustable Output **Test Function for Each Channel**



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Sensor Power Available for Frequency Input

Universal

Power

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors



Description

The APD 2067 DuoPak accepts one AC voltage or current input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2067 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2067	DuoPak 2 channel AC-DC, FreqDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2067 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

Diagrams on

Next Page

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

R3 Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

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

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 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.

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.

The second secon		
Device for Output Channel 1	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (–)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Voltage input device.	7 (–)	8 (+)
Unpowered or passive mA input device. APD module provides the loop power.		

Input 1, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 1	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	17	19
Transmitter power supply.	18 (+15 VDC)	19

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 product 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.

Frequency Sensor Ch. 2	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	22 (+15 V)	23 (+)
2 wire self generating (VR)	21 (-)	n/a	23 (+)
3 wire PNP or NPN	21 (-)	22 (+15 V)	23 (+)

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 $k\Omega$ to 500 Ω resistor

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 lower spring clips against 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.

- 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.

Spring Clips

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 a minimum 30 minute warm up time
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or $-10 \ V$ for a ±10 V output.
- 4. 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.
- 5. Repeat adjustments for both output 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 ±25 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. 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

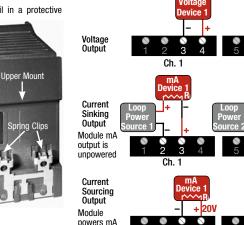
The APD 2067 accepts one AC voltage or current input and one frequency input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions

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

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.



output loop

External

Contacts

for Test

Function

To avoid

do not

make any

to unused

terminals

connections

Wire terminal

0.5 to 0.6 Nm or

4.4 to 5.3 in-lbs

To maintain

full isolation

bining power

common with

avoid com-

supplies in

inputs, out-

puts, or unit

power.

torque

damage to

the module.

DuoPak **APD 2067**



+15 VDC, 25 mA sensor power available at terminal 18

Input

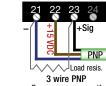


2 Wire

2 wire self-generating



3 wire NPN See sensor specs. if load resistor is required



See sensor specs. if load resistor is required



Cu 60/75°C

conductors

14 AWG

max.

28 Power AC or DC -26 Earth Ground 25 Power AC or DC +

Channel 1: Frequency 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

- Monitor Motor Speed and a DC Signal
- Convert/Isolate Dual Output Transmitters

Channel 1 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 kHz

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 1 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 1 Characteristics

Impedance at max. sensitivity: 10 kO nom. Impedance at min. sensitivity: 100 k Ω 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

Channel 2 DC Input Range

Factory configured, please specify input type and range

Voltage: 0-10 mVDC to 0-100 VDC Bipolar voltage: ±50 mVDC to ±10 VDC

0-1 mADC to 0-50 mADC, 4-20 mADC Current:

200 k Ω minimum Voltage input impedance: Current input impedance: $50~\Omega$ typical Input com. mode rejection: 120 dB minimum Current input voltage burden: 1.25 VDC max. at 20 mA 15 VDC, ±10%, regulated, Input loop power supply:

25 mADC, may be connected for sinking or sourcing mA input

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 0-1 VDC to 0-10 VDC, 10 mA max up to 20 VDC with M19, M29, M39

 ± 1 VDC to ± 10 VDC Bipolar voltage:

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span

Better than 0.04% span/°C Temperature stability: 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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum







Zero and Span for **Fach Channel**

Output LoopTracker LED for Each

Channel

Adjustable Output

Test Function for

Each Channel

Sink or Source

mA Output for

Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges

ree Factor I/O Setup!

Sensor Power Available for Frequency Input, Sink or Source mA for DC Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power

DuoPak® See Wiring Diagrams on Next Page

Channel 2: DC to DC

5 6 7 8

1 2 3 4

Description

The APD 2070 DuoPak accepts one frequency and one DC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

I/O Sink/Source Versatility

Standard on the APD 2070 is a 15 VDC loop excitation supply for the DC input and 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2070	DuoPak 2 channel FreqDC, DC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2070 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item API BP4 Spare removable 4 terminal plug, black Instructions APD 2070 $(A \pi)$

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 are known to the State of California to cause cancer or birth defects or other reproductive harm. For more information go to www.P6SWarnings.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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (–)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Voltage input device.	Terminal 7 (–)	Terminal 8 (+)
•		

Input 1, 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 product 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.

Frequency Sensor Ch. 1	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	18 (+15 V)	19 (+)
2 wire self generating (VR)	17 (-)	n/a	19 (+)
3 wire PNP or NPN	17 (-)	18 (+15 V)	19 (+)

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 k Ω to 500 Ω resistor.

Input 2. DC

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.

DC Input Channel 2	Terminal	Terminal
Sensor or transmitter with a voltage output.	21(-)	23 (+)
Powered mA output transmitter. Typically a 3 or 4-wire device.	21 (-)	23 (+)
Unpowered mA output transmitter. Typically a 2-wire device. APD module provides loop power.		22 (+15 V)

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

Upper Mount

1" (25 mm) above and below housing vents for air circulation.

- Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of module.
- 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.

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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.
- 5. Repeat adjustments for both output channels for max. accuracy.

Ch. 1 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 ±25 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 example

Each Test Cal. potentiometer is factory set to approximately 50% output. 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.

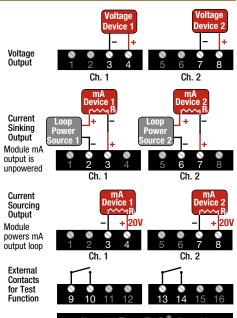
Operation

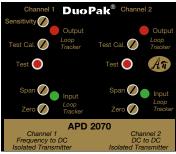
The APD 2070 accepts one frequency and one DC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

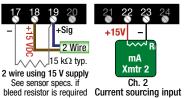
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

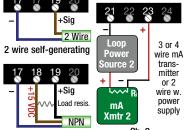
Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum. For a current output the red LED will only light if the output loop current path is complete. For either 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.

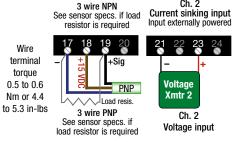






Module powers loop







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

To avoid

do not

make anv

to unused

terminals

connections

damage to

the module.

Channel 1: Frequency to DC

Channel 2: RTD Temperature to DC

5 6 7 8

1_2 3 4

DuoPak®

- 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

- Monitor Motor Speed and Temperature
- Convert/Isolate Dual Output Transmitters

Channel 1 Frequency Input Range

Factory configured, please specify input range 0-25 Hz to 0-20 kHz Frequency:

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 1 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 1 Characteristics

Impedance at max. sensitivity: 10 k Ω nom. Impedance at min. sensitivity: 100 k Ω nom.

Sensitivity/hysteresis adjustment: Multi-turn potentiometer Sensitivity/hysteresis range: ±25 mV to ±2.5 V typical Normal mode protection: 200% of input rating 600 V input to ground Common mode protection:

Channel 2 RTD Input Range

Factory configured, please provide complete sensor specifications and temperature range. 100°F (55°C) minimum span.

Resistance at 0°C

Curve (385, 3916, 392 etc.) Temperature range in °F or °C

RTD resistance: Typically 10 Ω to 2000 Ω , 2 or 3 wire Excitation current: Typically 10 Ω : 10 mA, 100 Ω : 2 mA.

1000 Ω : 0.5 mA, 2000 Ω : 0.2 mA $< \pm 0.05\%$ of span per 1 Ω change in leadwire resistance, 3 wire sensor

LoopTracker

Leadwire comp.:

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 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

Current: 0-1 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

Linearity: ±0.1% of span

Better than 0.04% span/°C Temperature stability: 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 mADC for each output channel May be selectively wired for sinking or sourcing mA output

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

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum







Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Sensor Power Available for Frequency Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Sink or Source mA Output for **Each Channel**





See Wiring Diagrams on **Next Page**

Description

The APD 2071 DuoPak accepts one frequency input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2071 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2071	DuoPak 2 channel FregDC, RTD-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2071 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

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

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. Arr maintains a constant entit to upgrate 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 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.

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.

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	Terminal	Terminal
Voltage input device.	3 (-)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (–)	4 (+20 V)
mA input device powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Voltage input device.	Terminal 7 (–)	Terminal 8 (+)
•		

Input 1. 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 product 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.

Frequency Sensor Ch. 1	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	18 (+15 V)	19 (+)
2 wire self generating (VR)	17 (–)	n/a	19 (+)
3 wire PNP or NPN	17 (–)	18 (+15 V)	19 (+)

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 $k\Omega$ to 500 Ω resistor.

Input 2, RTD Temperature

The sensor type and temperature range are factory configured. See the model/serial number label for sensor type and range.

Temperature Input Ch. 2	Term.	Term.	Term.
Two wire RTD	21 RTD	Jumper 22 & 23	23 RTD
Three wire RTD	21 RTD	22 Exc.	23 RTD

Module Power Terminals

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, 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

Upper Mount

Function

To avoid

do not

make anv

to unused

terminals

connections

damage to

the module.

vents for air circulation.

- 1. Tilt front of module down and position the lower spring clips against 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.

- 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 a minimum 30 minute
- 2. Using an accurate calibration source, provide an input to the module equal to 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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, the Span control will provide adjustment for the 20 mA or high end of the signal
- 5. Repeat adjustments for both output channels for maximum accuracy.

Ch. 1 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 ±25 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% output. 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

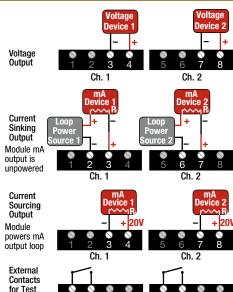
The APD 2071 accepts one frequency input and one RTD input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

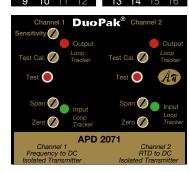
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum

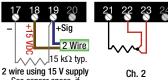
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting

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

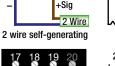
For a current output the red LED will only light if the output loop current path is complete. For either current or voltage outputs, failure to illuminate or a failure to change in intensity as the process changes may indicate a problem with the module power or signal output wiring







3-Wire Input bleed resistor is required







3 wire NPN See sensor specs. if load resistor is required

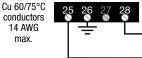


0.5 to 0.6 Nm or 4.4 to 5.3 in-lbs

Wire terminal

torque

3 wire PNP See sensor specs. if load resistor is required



28 Power AC or DC -26 Earth Ground 25 Power AC or DC +

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

Channel 1: Frequency to DC

Channel 2: Potentiometer 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

- Monitor Motor or Line Speed and Position
- Convert/Isolate Dual Output Transmitters

Channel 1 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 kHz

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 1 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 1 Characteristics

Impedance at max. sensitivity: 10 kO nom. Impedance at min. sensitivity: 100 k Ω 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

Channel 2 Potentiometer Input Range

Use any 3 wire full-travel potentiometer 1 VDC excitation provided to potentiometer Consult factory for other ranges and configurations

Minimum range: $0-100 \Omega$ Maximum range: $0-1 M\Omega$

Input impedance: 100Ω to 1 $M\Omega$ minimum Input common mode rejection: 100 dB minimum

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

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum





Adjustable Output **Test Function for Each Channel**

Output LoopTracker LED for Each

Channel



Zero and Span for Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Sensor Power Available for Frequency Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Universal Power



Description

The APD 2073 DuoPak accepts one frequency and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2073 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2073	DuoPak 2 channel FreqDC, PotDC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2073 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

Diagrams on

Next Page

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V

Channel 1 and channel 2 high voltage output Conformal coating for moisture resistance

Accessory—order as separate line item

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. Arr maintains a constant entit to upgrate 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 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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (-)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Voltage input device.	Terminal 7 (–)	Terminal 8 (+)
•		

Input 1, 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 product 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.

Frequency Sensor Ch. 1	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	18 (+15 V)	19 (+)
2 wire self generating (VR)	17 (-)	n/a	19 (+)
3 wire PNP or NPN	17 (-)	18 (+15 V)	19 (+)

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 k Ω to 500 Ω resistor.

Input 2, Potentiometer

The potentiometer must be connected to all three signal input terminals as shown. 0-100% of the potentiometer range must be used. A stable 1 VDC source to excite the potentiometer. Voltage drop is measured across the potentiometer, thus allowing any full-range potentiometer to be used.

Potentiometer Input Channel 2	Terminal
Full scale or high side of potentiometer	21 (+1 VDC)
Zero or low end of potentiometer	22 (–)
Potentiometer wiper arm	23

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 lower spring clips against 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.

- 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.

Upper Mount

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 a minimum 30 minute warm up time.
- 2. Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- 5. Repeat adjustments for both output channels for max. accuracy.

Ch. 1 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 ±25 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% output. 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

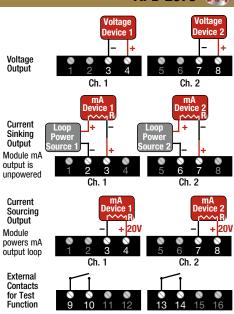
The APD 2073 accepts one frequency and one potentiometer input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum

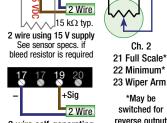
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions

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.







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

to unused

terminals

Cu 60/75°C

conductors

14 AWG

max.



2 wire self-generating

See sensor specs. if load resistor is required





load resistor is required



To maintain full isolation avoid combining power supplies in common with inputs, out-puts, or unit bower.



See Wiring

Diagrams on

Next Page

Channel 1: Frequency to DC

Channel 2: Bridge/Strain Gauge/Load Cell to DC

5 6 7 8

1_2 3 4

DuoPak®

- 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

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

Channel 1 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 kHz

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 1 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 1 Characteristics

Impedance at max. sensitivity: 10 k Ω nom. Impedance at min. sensitivity: 100 k Ω 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

Channel 2 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.

mV/V sensitivity X excitation voltage = total mV range Input impedance: 1 M Ω minimum Input common mode rejection: 100 dB minimum

Channel 2 Excitation Voltage

4 to 10 VDC factory set, please specify Range: 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 indicate I/O levels for each channel

Channel 1 and Channel 2 Output Ranges

Factory configured, please specify for each output channel 0-1 VDC to 0-10 VDC, 10 mA max Voltage:

up to 20 VDC with M19, M29, M39

Bipolar voltage: ±1 VDC to ±10 VDC

Current: 0-1 mADC to 0-25 mADC, 4-20 mADC

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

Output Characteristics

±0.1% of span Linearity: 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 mADC 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 only

Adjustable Output **Test Function for** Each Channel

Output LoopTracker LED for Each

Channel

Sink or Source

mA Output for

Each Channel



Zero and Span for **Each Channel**

Input LoopTracker LFD for Each Channel



Custom I/O Ranges

Sensor Input Power Available for Frequency **Built-in Excitation Voltage for** Strain Gauge Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum

D versions: 9-30 VDC or 10-32 VAC 50/60 Hz,

6 W maximum

Description

The APD 2075 DuoPak accepts one frequency and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2075 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range

Channel 2 input range, excitation voltage

Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2075	DuoPak 2 channel FreqDC, Strain-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2075 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

18

Universal

Power

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

30

These provide a quick 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 output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

R2 Channel 2 I/O reversal (i.e. 20-4 mA out)

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

Channel 1 and channel 2 high voltage output M39 Conformal coating for moisture resistance

Accessory—order as separate line item



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. Arr maintains a constant entit to upgrate 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 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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (–)	4 (+20 V)
mA input device powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Voltage input device.	Terminal 7 (–)	Terminal 8 (+)
•		

Input 1. 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 product 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.

Frequency Sensor Ch. 1	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	18 (+15 V)	19 (+)
2 wire self generating (VR)	17 (–)	n/a	19 (+)
3 wire PNP or NPN	17 (-)	18 (+15 V)	19 (+)

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 $k\Omega$ to

Input 2, Bridge, Strain Gauge, Load Cell

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.

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

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Bridge Input Channel 2	- Terminal	+ Terminal
Strain gauge signal input	21 (+)	23 (-)
Excitation voltage	22 (-)	24 (+)

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

Upper Mount

- 1. Tilt front of module down and position the lower spring clips against the bottom edge of DIN rail.
- 2. Push front of module upward until upper mount snaps into place.

Removal

for air circulation.

Avoid shock hazards! 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 22 and 24 adjust the excitation voltage fine adjustment potentiometer to the strain gauge manufacturer's recommended value.
- 3. Using an accurate calibration source, provide an input to the module equal to 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 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. 1 Sensitivity Adjustment

A 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 ±25 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.

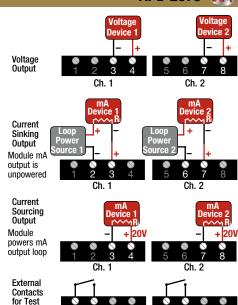
Each Test Cal. potentiometer is factory set to approximately 50% output. Each can be adjusted to set the test output from 0 to 100% of the output span. Press and hold the Test button and adjust the corresponding Test Cal. potentiometer for the desired output level.

They may optionally be externally wired for remote test operation or a manual override. See wiring diagram at right.

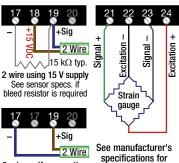
The APD 2075 accepts one frequency and one strain gauge input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates 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 signal 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.







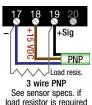
2 wire self-generating

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

Function



See sensor specs. if load resistor is required



Cu 60/75°C conductors 14 AWG



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

wiring designations.

Shield wires should

be grounded at one

end only.

To maintain full isolation avoid com-bining power supplies in common with inputs, outputs, or unit power.

28 Power AC or DC -26 Earth Ground

25 Power AC or DC +

Channel 1': Frequency 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

- Monitor Speed and AC Voltage or Current
- Convert/Isolate Dual Output Transmitters

Channel 1 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 kHz

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 1 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 1 Characteristics

Impedance at max. sensitivity: 10 kO nom. Impedance at min. sensitivity: 100 k Ω 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

Channel 2 AC Input Range

Factory configured, please specify input type and range

Voltage: 0-50 mVAC to 0-300 VAC Current: 0-1 mAAC to 0-1000 mAAC Measurement type: True RMS

40 Hz to 1000 Hz sinusoidal Frequency: Voltage input impedance: 220 $k\Omega$ minimum Current input voltage burden: 1.0 V_{RMS} maximum

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

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC 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

Power

85-265 VAC, 50/60 Hz or 60-300 VDC, 6 W maximum D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 6 W maximum







Zero and Span for Each Channel

Output LoopTracker LED for Each

Channel

Adjustable Output

Test Function for

Each Channel

Sink or Source

mA Output for

Each Channel

Input LoopTracker LFD for Each Channel

Custom I/O Ranges



Sensor Power Available for Frequency Input

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Power

DuoPak® 18 Universal

Channel 2: AC to DC

5 6 7 8

1_2 3 4

See Wiring Diagrams on **Next Page**

Description

The APD 2076 DuoPak accepts one frequency input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device.

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2076 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

How to Order

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2076	DuoPak 2 channel FreqDC, AC-DC	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2076 D	converter/isolator/ transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each 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 troubleshooting.

Output Test

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options-add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out) R1

Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal

Channel 1 high voltage output >10 V up to 20 V

Channel 2 high voltage output >10 V up to 20 V Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item

Instructions APD 2076 $A\pi$

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 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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (-)	4 (+20 V)
mA input device powers the current loop.	2 (-)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Voltage input device.	7 (–)	8 (+)
Voltage input device. Unpowered or passive mA input device. APD module provides the loop power.	7 (-) 7 (-)	8 (+) 8 (+20 V)

Input 1, 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 product 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.

Freq Sensor Channel 1	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	18 (+15 V)	19 (+)
2 wire self generating (VR)	17 (-)	n/a	19 (+)
3 wire PNP or NPN	17 (-)	18 (+15 V)	19 (+)

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 k Ω to 500 Ω resistor.

Input 2, AC

Any polarity may be used for an AC input. A transmitter DC power supply is available at terminals 22 and 23, but is not commonly used with an AC input.

AC Input Channel 2	Terminal	Terminal
Device with an AC voltage or AC milliamp output.	21	23
Transmitter power supply.	22 (+15 VDC)	23

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

Upper Mount

Function

vents for air circulation.

1. Tilt front of module down and position the lower spring clips against 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.

- 1. Push up on bottom back of 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

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

- Apply power to the module and allow a minimum 30 minute warm up time.
- Using an accurate calibration source, provide an input to the module equal to the minimum input required for the application.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10 V output.
- 4. 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, the Span control will provide adjustment for the 20 mA or high end of the signal.
- Repeat adjustments for both output 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 ±25 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% output. 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

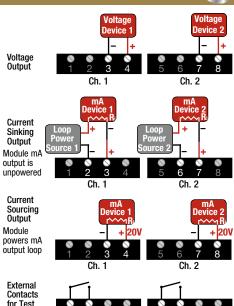
The APD 2076 accepts one frequency input and one AC voltage or current input and provides two optically isolated DC voltage or current outputs that are linearly related to the inputs.

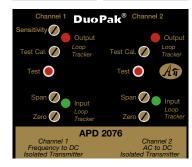
Green LoopTracker® input LEDs provide a visual indication that each signal is being sensed by the input circuitry of the module. They also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

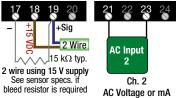
If an LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions.

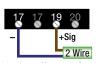
Two red LoopTracker output LEDs provide a visual indication that the output signals are functioning. They become brighter as the input and each corresponding output change from minimum to maximum

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.





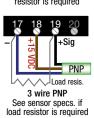




2 wire self-generating



3 wire NPN See sensor specs. if load resistor is required



Cu 60/75°C conductors 14 AWG max

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

Input

+15 VDC, 25 mA

sensor power

available at

terminal 22

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

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

28 Power AC or DC –26 Earth Ground25 Power AC or DC +

See Wiring

Diagrams on

Next Page

Channel 1: Frequency to DC

Channel 2: Frequency to DC

5 6 7 8

1_2 3 4

Duo Pak®

- 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

- Monitor and Control Motor or Line Speed
- Convert Speed and Frequency Signals

Channel 1 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 kHz

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 1 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 1 Characteristics

Impedance at max. sensitivity: 10 kO nom. Impedance at min. sensitivity: 100 k Ω 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

Channel 2 Frequency Input Range

Factory configured, please specify input range Frequency: 0-25 Hz to 0-20 kHz

Any waveform with 5 microsecond min. pulse, 100 mV min. amplitude change, 100 mV to 150 V_{RMS} amplitude

Channel 2 Sensor Power Supply

15 VDC ±10%, regulated, 25 mADC, <10 mV_{RMS} max. ripple

Channel 2 Characteristics

Impedance at max. sensitivity: 10 k Ω nom. Impedance at min. sensitivity: 100 k Ω nom. Sensitivity/hysteresis adjustment: Multi-turn potentiometer Sensitivity/hysteresis range: ±25 mV to ±2.5 V typical Normal mode protection: 200% of input rating

LoopTracker

Common mode protection:

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

0-1 mADC to 0-25 mADC, 4-20 mADC Current:

20 V compliance, 1000 Ω at 20 mA

600 V input to ground

Output Calibration

Multi-turn zero and span potentiometers for each output channel ±15% of span adjustment range typical

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 mADC 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 only



Output LoopTracker LFD for Each

Channel

Sink or Source

mA Output for

Each Channel

Adjustable Output **Test Function for Fach Channel**

Each Channel Input LoopTracker LED for Each

Zero and Span for

Custom I/O Ranges

Channel



15 VDC Sensor Power Available for Each Channel

Universal

Power

Dimensions

1.78" W x 4.62" H x 4.81" D 45 mm W x 117 mm H x 122 mm D Height includes connectors

Power

85-265 VAC. 50/60 Hz or 60-300 VDC.

6 W maximum

D versions: 9-30 VDC or 10-32 VAC 50/60 Hz. 6 W maximum

Description

The APD 2077 DuoPak accepts two frequency inputs and provides two optically isolated DC voltage or current analog outputs that are linearly proportional to the inputs.

The input ranges and the output ranges for each channel are independent and can be specified as required. This provides an economical two channel solution in one device

Typical applications include signal conversion, isolation, and redundancy (i.e. to prevent failure of the entire loop if one device fails), or a combination of these.

Each input signal is filtered, amplified, and then passed through an opto-coupler to the output stages. Full 5-way isolation (input 1, input 2, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

Output Sink/Source Versatility

Standard on the APD 2077 are 20 VDC loop excitation supplies for each output channel. These power supplies can be selectively wired for sinking or sourcing allowing use with any combination of powered or unpowered milliamp I/O devices.

Models are factory ranged. See I/O ranges above left. Ranges and options for each channel must be specified on order

Channel 1 input range Channel 2 input range Channel 1 output range Channel 2 output range

Model	Description	Power
APD 2077	DuoPak 2 channel	85-265 VAC, 50/60 Hz or 60-300 VDC
	FreqDC converter/ isolator/transmitter	9-30 VDC or 10-32 VAC

LoopTracker

API exclusive features include four LoopTracker LEDs (green for each input, red for each output) that vary in intensity with changes in the process input and output signals.

30

These provide a quick visual picture of your process loop at all times and can greatly aid in saving time during initial startup and troubleshooting.

Output Test/Manual Override

Channel

An API exclusive feature includes output test buttons for each channel to provide a fixed output (independent of the input) when held depressed.

Terminals are also provided to operate the test functions remotely for each channel. This also allows use as a remote manual override to provide a temporary fixed output if desired.

The test output level for each channel is potentiometer adjustable from 0 to 100% of the output span. The output test greatly aids in saving time during initial startup and/or troubleshooting.

Options and Accessories

Options—add to end of model number

Channel 1 I/O reversal (i.e. 20-4 mA out)

R2 Channel 2 I/O reversal (i.e. 20-4 mA out)

Channel 1 and channel 2 I/O reversal R3

M19 Channel 1 high voltage output >10 V up to 20 V

M29 Channel 2 high voltage output >10 V up to 20 V

M39 Channel 1 and channel 2 high voltage output

Conformal coating for moisture resistance

Accessory—order as separate line item API BP4 Spare removable 4 terminal plug, black **Instructions** APD 2077 🥂 📆

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. Arr maintains a constant entit to upgrate 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 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	Terminal	Terminal
Voltage input device.	3 (–)	4 (+)
Unpowered or passive mA input device. APD module provides the loop power.	3 (–)	4 (+20 V)
mA input device powers the current loop.	2 (–)	3 (+)
Device for Output Channel 2	Terminal	Terminal
Device for Output Channel 2 Voltage input device.	Terminal 7 (–)	Terminal 8 (+)

Inputs, Frequency

The input ranges are pre-configured at the factory. No input calibration is necessary. The frequency input is compatible with most types of sensors that product 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.

Frequency Sensor Ch. 1	Signal Com.	Sensor Power	Signal Input
2 wire or Namur requiring external power	n/a	18 (+15 V)	19 (+)
2 wire self generating (VR)	17 (-)	n/a	19 (+)
3 wire PNP or NPN	17 (-)	18 (+15 V)	19 (+)
Frequency Sensor Ch. 2	Signal Com.	Sensor Power	Signal Input
Frequency Sensor Ch. 2 2 wire or Namur requiring external power			
2 wire or Namur	Com.	Power	Input

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 k Ω to 500 Ω resistor.

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 lower spring clips against 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.

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

Upper Mount

Output Calibration

The output range is pre-configured at the factory as specified on your order. Zero and Span potentiometers are used to calibrate the output to compensate for load and lead variations

- 1. Apply power to the module and allow a minimum 30 minute warm up time. An accurate frequency calibration source such as a signal generator may be required for calibration.
- 2. Provide an input to the module equal to the minimum input required for the application. In the most cases this will be 0 Hz.
- 3. 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. For example: 4 mA for a 4-20 mA output or -10 V for a ± 10 V output.
- 4. Set the frequency to the maximum input required for the application.
- 5. Using an accurate measurement device for the output, 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.
- 6. Repeat adjustments for each channel for maximum accuracy.

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 ±25 mV. Fully counterclockwise: (min. sensitivity), input threshold is ± 2.5 volts.

Output Test Function

When a 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. They may optionally be externally wired for remote test operation or a manual override. See wiring diagram

Each Test Cal. potentiometer 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.

Operation

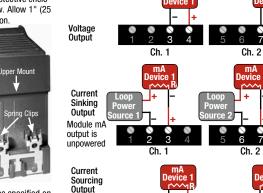
The APD 2077 accepts two frequency inputs and provides two optically isolated DC voltage or current analog outputs that are linearly proportional to the inputs.

Each frequency input is capacitively coupled (to remove any DC component at the input) to a comparator whose threshold is determined by the setting of the sensitivity control. The output from the comparator passes through an opto-coupler to the output stage.

Green LoopTracker® input LEDs provide a visual indication that a signal is being sensed by the input circuitry of each channel. The LEDs illuminate when the input is sufficiently large to trigger the input comparator depending on the input sensitivity adjustment.

They also indicate the input signal range by changing in intensity as the frequency changes from minimum to maximum. If an LED fails to illuminate, or change in intensity as the frequency changes, it may indicate a problem with module power, or signal input wiring. Note that it may be difficult to see the LEDs under bright lighting conditions

Red LoopTracker output LEDs provide a visual indication that the output signals are functioning. Each 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.



External Contacts for Test Function

To avoid

do not

damage to

the module.

make anv

to unused

terminals

Wire

terminal

torque

0.5 to 0.6

Nm or

4.4 to 5.3

in-lbs

To maintain

full isolation

avoid com-

supplies in

inputs, out-

puts, or unit

power.

bining power

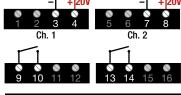
common with

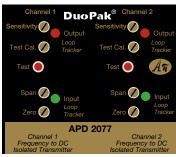
connections

Module

powers mA

output loop



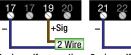




2 wire using 15 V supply 2 wire using 15 V supply bleed resistor is required bleed resistor is required

 $15 \text{ k}\Omega \text{ tvp.}$

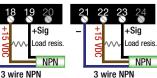
-Sig



2 wire self-generating 2 wire self-generating



3 wire NPN See sensor specs. if load resistor is required



resistor is required

See sensor specs. if load

△ I nad resis 3 wire PNP See sensor specs. if load resistor is required

3 wire PNP See sensor specs if load resistor is required Cu 60/75°C conductors



14 AWG max.

△ I nad resis

28 Power AC or DC -26 Earth Ground

25 Power AC or DC +