DuoPak® Two Channel Signal Converter/Isolator/Transmitter — APD 2005

Channel 1: DC to DC | Channel 2: 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 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
Current:	0-1 mADC to 0-50 mADC, 4-20 mADC
Voltage input impedance:	200 kΩ minimum
Current input impedance:	50 Ω typical
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
Input com. mode rejection:	120 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 MΩ minimum
Input common 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
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
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

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

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

LIFETIME WARRANTY

MADE IN USA

Quick Link
api-usa.com/2000

Free Factory I/O Setup!

Sink or Source mA Output for Each Channel

Removable Plugs

Output LoopTracker LED 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

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

Universal Power

See Wiring Diagrams on Next Page

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 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.

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.

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 2005	DuoPak 2 channel DC-DC, Strain-DC converter/isolator/transmitter	85-265 VAC, 50/60 Hz or 60-300 VDC
APD 2005 D		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

API BP4 Spare removable 4 terminal plug, black

ABSOLUTE PROCESS INSTRUMENTS
1220 American Way Libertyville, IL 60048
Phone: 800-942-0315 Fax: 800-949-7502
api-usa.com

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**
Measuring/recording device accepts a voltage input.	7 (–)	8 (+)
Measuring/recording device has an unpowered or passive mA input. APD module provides the loop power.	7 (–)	8 (+20 V)
Measuring/recording device has a mA input and powers the current loop.	6 (–)	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.	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 ±10% fine adjustment of the excitation voltage. CAUTION: Never short the excitation leads together. This will cause internal damage to the module.

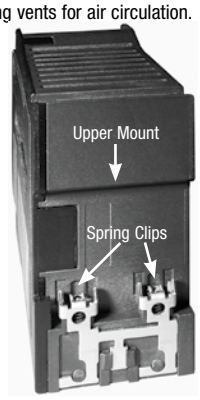
Bridge Input Channel 2	– Terminal	+ Terminal
Strain gauge signal input	21 (+)	23 (–)
Excitation voltage	22 (–)	24 (+)

Module Power Terminals
Check 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 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.
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.