Frequency to DC Transmitters, Isolated, Factory Ranged — APD 7010

Input: 0-25 Hz to 0-20 kHz
Output: 0-1 V to 0-10 VDC, ±1 VDC to ±10 VDC, 0-1 mA to 20 mADC

- *Precision Frequency to DC converter*
- *Removable Plugs for Faster Installation*
- *Full 1200 V Input/Output/Power Isolation*
- *Input and Output LoopTracker® LEDs*
- *Output Test Button*
- *Built-In Loop Power Supply for Sink/Source Output*

Applications

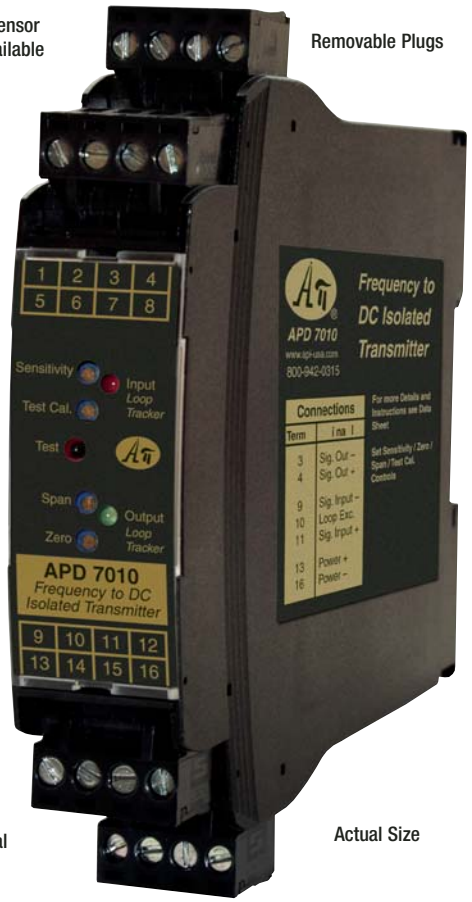
- *Monitor and Control Motor or Line Speed*
- *Convert Speed and Frequency Signals*
- *Simplify Interfacing of Frequency Sensors*

LIFETIME WARRANTY

Free Factory I/O Setup!

Quick Link api-usa.com/7010

Made in USA



Input Range
Factory configured—please specify input range
Frequency: 0-25 Hz to 0-20 kHz
Sine wave, sawtooth, or square wave with min. 5 µsec pulse

Input Impedance
10 kΩ nominal (maximum sensitivity)
100 kΩ nominal (minimum sensitivity)

Input Sensitivity/Hysteresis
Multi-turn potentiometer for sensitivity adjustment
Maximum sensitivity: ±25 mV typical
Minimum sensitivity: ±2.5 V typical

Input Amplitude Range
100 mV to 150 V_{RMS}
Any waveform with minimum 100 mV amplitude change

Input Power Supply
15 VDC ±10%, regulated, 25 mADC
Max. ripple, less than 10 mV_{RMS}
May be used to power sensor

Input Protection
Normal mode: 200% of input rating
Common mode: 600 VDC or 600 VAC_p input to ground

LoopTracker
Variable brightness LEDs indicate I/O loop level and status

Output Range
Factory configured—please specify output range

Voltage:	0-1 VDC	to	0-10 VDC
Bipolar Voltage:	±1 VDC	to	±10 VDC
Current:	0-2 mADC	to	0-20 mADC
	20 V compliance, 1000 Ω at 20 mA		

Output Calibration
Multi-turn zero and span potentiometers
±15% of adjustment range typical

Linearity
Better than ±0.1% of span

Output Loop Power Supply
20 VDC nominal, regulated, 25 mADC
Max. ripple, less than 10 mV_{RMS}
May be selectively wired for sinking or sourcing mA output

Output Ripple and Noise
Less than 10 mV_{RMS}

Functional Test
Front button sets output to test level when pressed
Potentiometer adjustable 0-100% of span

Response Time
70 milliseconds typical

Isolation
1200 V_{RMS} minimum
Full isolation: power to input, power to output, input to output

Ambient Temperature Range and Stability
–10°C to +60°C operating ambient
Better than ±0.02% of span per °C stability

Power
60-265 VAC, 50/60 Hz or 85-300 VDC, 2.5 W maximum
D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 2.5 W max.

Housing
IP 40, mounts to standard 35 mm DIN rail

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

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

Description
The APD 7010 accepts a frequency input and provides an optically isolated DC voltage or current analog output that is linearly proportional to the input.

The full 3-way (input, output, power) isolation between input and output makes this module useful for ground loop elimination, common mode signal rejection or noise pickup reduction.

Also standard on the APD 7010 is a 15 VDC input excitation supply. If needed, this supply can be used to power a passive sensor, eliminating the need for an additional external power supply.

Common applications include frequency to DC conversions from frequency output type devices such as rotary encoders, magnetic pick-ups, variable speed drives and flow meters.

For PLCs that do not have analog outputs, often the pulse rate of a discreet output can be programmed to vary. By connecting the APD 7010 to this output, a proportional analog signal can be generated.

Sink/Source Versatility
For maximum versatility the output can be selectively wired for sinking (unpowered) or sourcing (powered) milliamp output.

The 20 VDC loop excitation supply can be used to power a milliamp current loop if required. The output can also be wired for an externally powered loop.

LoopTracker
API exclusive features include two LoopTracker LEDs (green for input, red for output) that vary in intensity with changes in the process input and output signals. These provide a quick visual picture of your process loop at all times and can greatly aid in saving time during initial startup and/or troubleshooting.

Output Test
An API exclusive feature includes the test button to provide a fixed output (independent of the input) when held depressed. The test output level is potentiometer adjustable 100% of the output span.

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

How to Order

All models are factory configured.
Order APD 7010 D for operation on low voltage power
Milliamp outputs can be field wired for sink or source.

Please specify
Model
Input range in Hz
Output range
Options as required

Model	Input	Output	Power
APD 7010	Factory ranged 0-25 Hz to 0-20 kHz	Factory ranged voltage or milliamps	60-265 VAC or 85-300 VDC
APD 7010 D			9-30 VDC or 10-32 VAC

Options–add to end of model number

M01	Input/output reversal, such as 20-4 mA output
U	Conformal coating for moisture resistance

Accessories—order as separate line item

API TK36	DIN rail, 35 mm W x 39" L, aluminum
API BP4	Spare removable 4 terminal plug, black

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1220 American Way Libertyville, IL 60048
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Electrical Connections

WARNING! All wiring must be performed by a qualified electrician or instrumentation engineer. Consult factory for assistance.

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

Polarity must be observed for input and output wiring connections. If the input and/or output do not function, check switch settings and wiring polarity.

Output Wiring

Polarity must be observed when connecting the signal output to the load. See the table below or the wiring diagrams at right.

The APD 7010 output can be wired to provide power to drive a current loop. Determine if your receiving device provides power to the current loop or if the loop must be powered by the APD module.

Use a multi-meter to check for voltage at your device's input terminals. Typical voltage may be 9-24 VDC if it provides power to the loop.

Type of Device for Output	Output –	Output +
Measuring/recording device accepts a voltage input. Switch E set to "V"	3 (–)	4 (+)
Measuring/recording device accepts a mA (current) input and the input is unpowered or passive. APD module provides the loop power. Switch E set to "I"	3 (–)	4 (+20 V)
Measuring/recording device accepts a mA (current) input and provides power to the current loop. Switch E set to "I"	2 (–)	3 (+)

Input Wiring

The input range is pre-configured at the factory as specified on your order. No input calibration is necessary. The APD 7010 is compatible with most types of sensors as long as the waveform produces 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.

Sensor Type	Signal +	Sensor Power	Signal Common
2 wire or Namur requiring external power	9	10	n/a
2 wire self generating (VR)	9	n/a	11
3 wire PNP current sourcing output	9	10	11
3 wire NPN current sinking output	9	10	11

Sensor Load

The signal input of the APD 7010 is capacitively coupled to prevent any DC in the input. Some sensors, typically those without an internal load resistor, require a resistive load in order to function.

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

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

NPN sensors use an external resistor across terminals 9 and 10 if required.

PNP sensors use an external resistor across terminals 9 and 11 if required.

Module Power

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

When using DC power, either polarity is acceptable, but for consistency with similar products, positive (+) can be wired to terminal 13 and negative (–) can be wired to terminal 16.

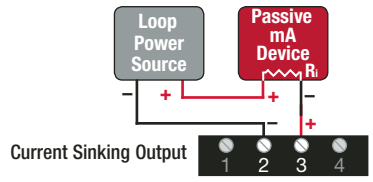
Mounting to a DIN Rail

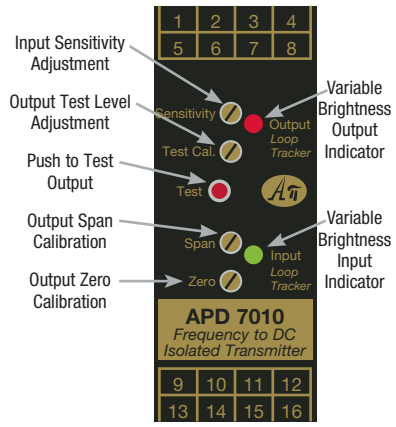
The housing clips to a standard 35 mm DIN rail. The housing is IP40 rated and requires a protective panel or enclosure.

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

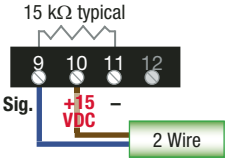
Removal

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

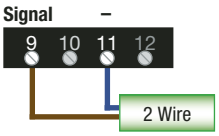




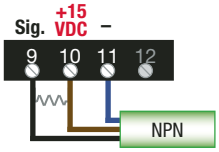
Two wire powered
9 Signal
11 Power (+15 VDC)
Some sensors may require a bleed resistor.



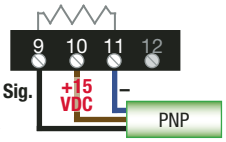
Two wire self-generating
9 Signal (+)
11 Common (–)

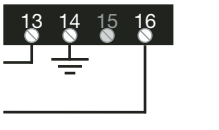


Three wire NPN
Typical wire colors shown.
9 Signal, Black or White
10 Power (+15 VDC) Brown or Red
11 Common (–), Blue or Black
Some sensors may require a load resistor.



Three wire PNP
Typical wire colors shown.
9 Signal, Black or White
10 Power (+15 VDC) Brown or Red
11 Common (–), Blue or Black
Some sensors may require a load resistor.





Output Calibration

The output range is pre-configured at the factory as specified on your order. Front-mounted 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 20 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 the minimum input signal 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. Example: for 4-20 mA output signal, the Zero control will provide adjustment for the 4 mA or low end of the signal.
4. Set the frequency to the maximum input required for the application. This is generally done using a signal generator.
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 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.

When fully clockwise (maximum sensitivity), the input threshold is typically ±25 mV.

In the fully counterclockwise position (minimum sensitivity), the input threshold is typically ±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.

The Test Cal. potentiometer is factory set to approximately 50% output. It 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 Test Cal. potentiometer for the desired output level.

Operation

The APD 7010 accepts a frequency input and provides an optically isolated DC voltage or current output that is linearly related to the input. The frequency input can be virtually any type of signal (sine wave, sawtooth, square wave, etc.) as long as there is a sufficient change in amplitude (greater than 100 mV).

The frequency input to the APD 7010 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 optocoupler to the output stage.

The green LoopTracker® input LED provides a visual indication that a signal is being sensed by the input circuitry of the module. The LED illuminates when the input is sufficiently large to trigger the input comparator depending on the input sensitivity adjustment.

It also indicates the input signal range by changing in intensity as the frequency changes from minimum to maximum. If the 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.

The red LoopTracker output LED provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum.

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

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