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

Quick Link: api-usa.com/7010

- *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*

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

LIFETIME WARRANTY

MADE IN USA

Quick Link
api-usa.com/apps

Free Factory I/O Setup!

Frequency 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 Amplitude Range
100 mV to 150 VRMS
Any waveform with minimum 100 mV amplitude change

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

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

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

DC Output Range
Factory configured, please specify output range

Voltage:	0-1 VDC	to	0-10 VDC
Voltage, **M09** option:	0-10 VDC	to	0-20 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% adj. range typ.

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

Output Test/Override
Front momentary button or external contact closure sets output to test level. Potentiometer adjustable 0-100% of span.

Output Ripple and Noise
Less than 10 mVRMS ripple and noise

Linearity
Better than ±0.1% of span

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

Response Time
70 milliseconds typical

Isolation
1200 VRMS minimum
Full isolation: power to input, power to output, input to output

Housing and Connectors
IP 40, requires installation in panel or enclosure
For use in Pollution Degree 2 Environment
Mount vertically to a 35 mm DIN rail
Four 4-terminal removable connectors, 14 AWG max wire size

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

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, and 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.

A PLC pulse rate 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	Factory ranged	85-265 VAC or 60-300 VDC
APD 7010 D	0-25 Hz to 0-20 kHz	voltage or milliamps	9-30 VDC or 10-32 VAC

Options–add to end of model number

M01	Input/output reversal, such as 20-4 mA output
M09	High voltage output up to 20 V (specify range)
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

Output

The output range is pre-configured at the factory as specified on your order. Polarity must be observed when connecting the signal output to the load. See the table below and 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 +
Device accepts a voltage input.	3 (–)	4 (+)
Device accepts an unpowered or passive mA (current) input. APD module provides the loop power.	3 (–)	4 (+20 V)
Device accepts a mA (current) input and provides power to the current loop.	2 (–)	3 (+)

Input

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.

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

Sensor Type	Signal –	Sensor Power	Signal +
2 wire or Namur, externally powered	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 may require an external resistor across sensor signal and sensor power. See sensor manufacturer's specifications.

PNP sensors may require an external resistor across sensor signal and sensor ground. See sensor manufacturer's specifications.

Module Power

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 with similar products, positive (+) can be wired to terminal 13 and negative (–) can be wired to terminal 16.

Mounting to a DIN Rail

Install module vertically on a 35 mm DIN rail in a protective enclosure away from heat sources. Do not block air flow. Allow 1" (25 mm) above and below housing vents for air circulation.

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

Removal

1. Push up on the bottom back of the module.
2. Tilt front of module downward to release upper mount from top edge of DIN rail.

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.

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 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.

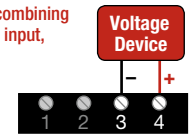
The red LoopTracker output LED provides a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum.

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.

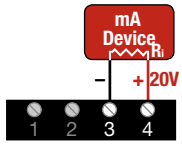
To avoid damage to the module, do not make any connections to unused terminals

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

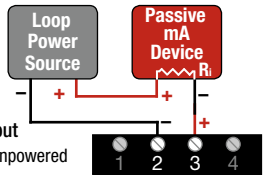
To maintain full isolation avoid combining power supplies in common with input, output, or unit power.



Voltage Output

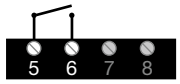


Current Sourcing Output
Module powers mA output loop

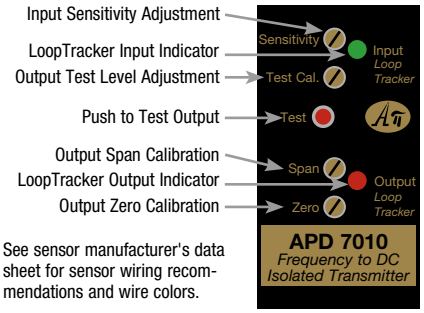


3- or 4-wire transmitter or 2 wire transmitter with external power supply

Current Sinking Output
Module mA output is unpowered

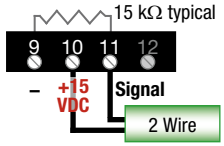


External Contact for Test Function

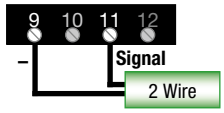


See sensor manufacturer's data sheet for sensor wiring recommendations and wire colors.

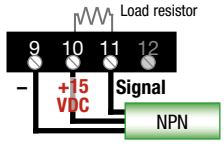
Two wire powered
10 Power (+15 VDC)
11 Signal
Some sensors may require a bleed resistor from signal to ground.



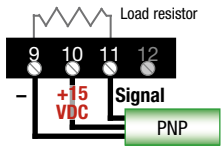
Two wire self-generating
9 Common (–)
11 Signal



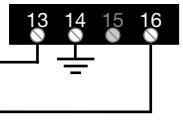
Three wire NPN
9 Common (–), Blue or Black
10 Power (+15 VDC) Brown or Red
11 Signal, Black or White
Some sensors may require a load resistor from 10 to 11



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



Cu 60/75°C conductors
14 AWG max.



13 Power AC or DC +
14 Earth Ground
16 Power AC or DC –

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