

**1 Input:** Any Thermocouple  
**2 Outputs:** Any 2 Thermocouples, Alarm Relay Options

[Quick Link: api-usa.com/tc](http://api-usa.com/tc)

- Split or Convert a T/C to Any Two T/C Types
- Add Additional Isolated Output to Existing T/C
- Zero and Span Output Calibration
- Input LoopTracker®

**Applications**

- Split/Convert Thermocouples for PLC Input, Control or Validation
- Interface Thermocouples with Panel Meters, PLCs, Recorders, Data Acq., DCS, & SCADA Systems

**Thermocouple Input, Factory Set**

T/C types: J, K, T, E, M, N, P, R, S, B, C, D, G  
 Temp. range: Full ANSI range, or specify °F or °C range  
 Linearity: ±0.1°C and 0.001°C resolution  
 Linearization: Polynomials, 1°C segments for types M and P  
 T/C CJC: Automatic  
 T/C current: Less than 10 µA, including burnout sense  
 T/C burnout: Upscale (standard), B: downscale, N: none  
 Custom: Provide T/C millivolt data, °F or °C range

**Status LEDs**

LoopTracker: Variable brightness green for input level  
 Yellow LED: Error status  
 Red/green LED: Alarm state (with alarm option only)

**Thermocouple Output, Channel 1, Factory Set**

T/C types: J, K, T, E, M, N, P, R, S, B, C, D, G  
 Temp. range: Limited by smallest ANSI T/C range  
 Linearity: To temperature  
 Linearization: Polynomials, 1°C segments for types M and P  
 T/C CJC: Automatic, can be factory disabled

**Thermocouple Output, Channel 2, Factory Set**

T/C types: J, K, T, E, M, N, P, R, S, B, C, D, G  
 Temp. range: Limited by smallest ANSI T/C range  
 Linearity: To temperature  
 Linearization: Polynomials, 1°C segments for types M and P  
 T/C CJC: Automatic, can be factory disabled

**Output Calibration**

Zero and span potentiometers for each output, ±15% range

**Output Resolution**

16 bit

**Output Ripple and Noise**

Less than ±0.2% of span

**Optional Alarm Relay**

Single setpoint dual DPST contact sets, factory configured 1 Form A (NO) and 1 Form B (NC) contact sets (4 terminals) May be field wired for Form C operation

8 A max @ 240 VAC resistive load

Use external contact protection (RC snubber) for inductive loads

Red/Green bi-color LED for alarm status

One set point, 12 turn potentiometer, 0-100% of span

One reset point, 12 turn potentiometer, 0-100% of span

Default: HI alarm, non-latching, normal acting (failsafe)

Relay Test button toggles relay to opposite state or resets relay with HT option

**Ambient Temperature Range and Stability**

-10°C to +60°C operating ambient  
 Better than ±0.02% of span per °C stability

**Response Time**

500 milliseconds minimum

**Isolation**

Full 4-way galvanic: input, output 1, output 2, power  
 1200 VRms min.  
 600 VACp or 600 VDC common mode protection  
 75 dB minimum common mode rejection  
 Simultaneous 50 Hz and 60 Hz rejection



[Applications Link](http://api-usa.com/apps)  
[api-usa.com/apps](http://api-usa.com/apps)

**Free Factory I/O Setup!**



**Housing and Connectors**

IP 40, requires vertical installation on a 35 mm DIN rail inside a panel or enclosure. Allow room for air flow.  
 For use in Pollution Degree 2 Environment  
 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

**Dimensions**

1.78" W x 4.62" H x 4.81" D  
 (45 mm W x 117 mm H x 122 mm D)

**Description**

The APD 41390 accepts a thermocouple temperature input and provides two independent thermocouple outputs. This makes it useful to match up the available thermocouple type with an instrument T/C input, for data recording, or when isolating inputs and outputs.

The thermocouple types are factory set. Both output temperatures correspond to the input temperature and are limited by the smallest ANSI temperature range of the three T/C types you select. Each T/C type may be different if desired. Use appropriate thermocouple extension wire as needed.

The input is sampled, CJC compensated, digitally converted to a linearized temperature signal, and then passed to the output stages where it is converted to two simulated thermocouple outputs with CJC compensation. Contact factory if the CJC compensation is to be disabled.

**How to Order—Factory Ranged and Configured**

How to Order—Factory Ranged and Configured						Options	
Model	Power	Input	Outputs	Alarm	Code	Description	
APD 41390	85-265 VAC, 60-300 VDC	Specify T/C type, temperature range in °F or °C	Ch. 1 specify T/C type Ch. 2 specify T/C type	none	-	Upscale burnout (standard)	
APD 41390 D	9-30 VDC, 10-32 VAC				B	Downscale burnout	
APD 41390 H	85-265 VAC, 60-300 VDC				N	No burnout, last valid value	
APD 41390 DH	9-30 VDC, 10-32 VAC			HI alarm (failsafe std.)	RA	Reverse-acting alarm	
APD 41390 L	85-265 VAC, 60-300 VDC				HP	Latching relay, power-off reset	
APD 41390 DL	9-30 VDC, 10-32 VAC	LO alarm (failsafe std.)	HT	Latching relay, push button reset			
			U	Conformal coating for moisture resistance			



Removable Plugs

Optional Alarm Relay

Zero and Span for Each Output

Status LED

Input LoopTracker LED

Universal Power

See Wiring Diagrams on Next Page

Note: Temperature range is limited by the smallest ANSI range of the three T/C types selected.

Full 4-way galvanic isolation (input, output 1, output 2, power) make this module useful for ground loop elimination, common mode signal rejection, and noise pickup reduction.

**LoopTracker**

An API exclusive feature includes a green LoopTracker LED that varies in intensity with changes in the process input signal. It provides a quick visual picture of your process input at all times and can greatly aid in saving time during initial startup and troubleshooting.

**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](http://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](http://www.P65Warnings.ca.gov)

**Electrical Connections**

This module is factory configured. See the model/serial number label for thermocouple types, range, and options.

\* Do not make any connections to unused terminals or use them as wiring junctions for external devices. This may cause permanent damage to the module!

See wiring diagram at right. Thermocouples must match the types indicated on the model/serial number label. Use thermocouple extension wire that matches your T/C types as needed.

The T/C outputs are generally connected to temperature measurement devices that accept the same T/C types. Note that red is negative for most thermocouples.

**Module Power**

See model/serial number label to make sure available power matches module operating voltage. The power supply is fuse protected and the unit may be returned to us for fuse replacement. For DC power, either polarity is acceptable, but for consistency, wire positive (+) to terminal 25 and negative (-) to terminal 28.

**Mounting to a DIN Rail**

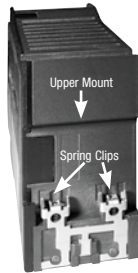
Install module vertically on a 35 mm DIN rail in a protective enclosure away from heat sources. Do not block air flow. Allow 1" (25 mm) above and below housing vents for air circulation.

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, outputs, 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. Remove module from the DIN rail.



**Calibration**

Input and output ranges are factory pre-configured (at 24°C ±1°C). Zero and Span potentiometers can be used to calibrate each output channel as required.

1. It will be necessary to simulate or create a low and a high temperature input to the module and use an accurate measurement device to calibrate each output.
2. Apply power to the module. Allow 20 minutes for warm up time and ensure the module is at a stable temperature during calibration.
3. Set the input to your minimum value for the Zero calibration.
4. Using an accurate measurement device for each output, adjust the Zero potentiometers for the exact minimum output readings desired. The Zero controls should only be adjusted when the input signal is at its minimum.
5. Next, set the input at maximum, then adjust the Span pots for the exact maximum output readings desired. The Span controls should only be adjusted when the input signal is at its maximum.
6. Repeat adjustments for maximum accuracy. You may also be able to fine-tune the outputs by adjusting the calibration of the devices you have connected to the module outputs.

**Optional Alarm Relay**

See model/serial number label for the factory configured relay option codes, if equipped. A red/green bi-color LED is provided to indicate alarm state. It will be green during a non-alarm condition and red during an alarm condition.

**High Alarm (H):** The alarm relay changes state when the temperature exceeds the trip point. The relay resets when the temperature drops below the reset point. For a high alarm, the trip point is above the reset point.

**Low Alarm (L):** The alarm relay changes state when the temperature goes below the trip point. The relay resets when the temperature exceeds the reset point. For a low alarm the trip point is below the reset point.

**HT:** Latching alarm with push button reset.

**HP:** Latching alarm with power-off reset. Module power must be turned off to reset alarm.

**RA:** Reverse-acting alarm. Relay coils energized in an alarm condition. No alarm condition with module power off.

**Relay Terminals**

See diagram for alarm contact wiring. The module does not provide power to the relay contacts. Use an appropriate RC snubber for inductive loads (motors, solenoids, contactors, etc.) to ensure good relay contact life.

The dual DPST contact sets are in a Form A (NO) and a Form B (NC) configuration and operate in unison with a single setpoint. They may be field wired for Form C operation as required.

**Set Point Adjustment**

This multi-turn potentiometer allows adjustment of the alarm trip point. This control is adjustable from 0 to 100% of the input range.

**Reset Point Adjustment**

This multi-turn potentiometer allows adjustment of the alarm reset point. This control is adjustable from 0 to 100% of the input range. Sufficient deadband (difference between trip and reset point) should be used to prevent chattering of the relays or false trips when the process signal is unstable or changes rapidly.

**Alarm Adjustments**

Set the input signal to a level that represents the desired set point. Adjust the Set Point potentiometer to the point at which the relay changes state from a non-alarm to an alarm condition.

Set the input signal to a level that represents the desired reset point. Adjust the Reset Point potentiometer to the point at which the relay changes state from an alarm to a non-alarm condition.

Operate the signal source through the set and reset points to confirm desired operation and adjust if necessary.

**Relay Test Function**

This can be used as a diagnostic aid during initial start-up or troubleshooting, or as a manual over-ride function. When the front Relay Test button is depressed or terminals 11 and 12 closed, it will drive the relay and the bi-color alarm LED to their opposite states. When released, the relay and LED will return to their prior states. The Relay Test button also resets the relay on models with the HT option.

**Operation**

The APD 41390 accepts a thermocouple input and provides two thermocouple outputs that are linearized to T/C input temperature.

The green LoopTracker® input LED provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

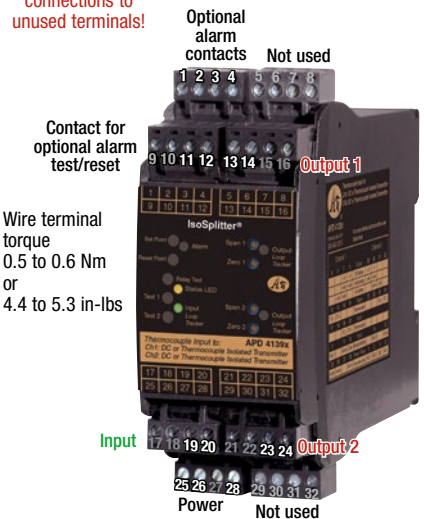
If the LED fails to illuminate, or fails to change in intensity as the process changes, check the module power or signal input wiring. Note that it may be difficult to see the LED under bright lighting conditions.

**Yellow LED Functions**

Normal operation: Off  
Operational error: Blinking 2 digit code  
If an error occurs during operation, the yellow Status LED blinks an error code. Check sensor, wiring, or consult factory.

- 1 1 Analog-digital converter out-of-range ●—●
- 1 2 Sensor under range ●—●●
- 1 3 Sensor over range ●—●●●
- 1 4 CJC sensor abnormal range ●—●●●●
- 1 5 CJC failure ●—●●●●●
- 1 6 Hard ADC out-of-range ●—●●●●●●
- 1 7 Sensor hard fault, open circuit, hard ADC fault, or hard CJC fault ●—●●●●●●●

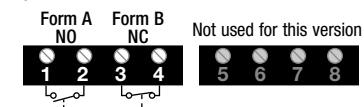
⚠ \* Do not make connections to unused terminals!



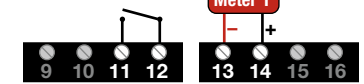
Thermocouple outputs do not feature Output LoopTracker LEDs or Output Test 1 or Test 1 buttons

⚠ \* Do not make connections any to unused terminals!

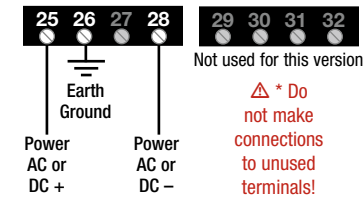
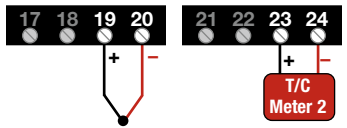
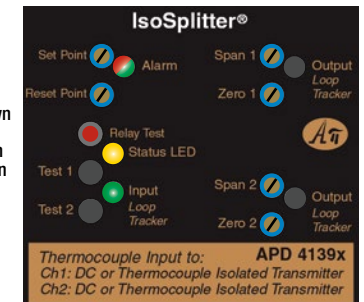
**Optional alarm contacts**



Customer supplied contact for optional alarm test/reset



Shown with alarm option



Cu 60/75°C conductors  
14 AWG max.

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