

DCM 817 PCB-Mounted Loop Isolators

Input: 0-20 mA to 4-20 mA

Output: 0-20 mA to 4-20 mA

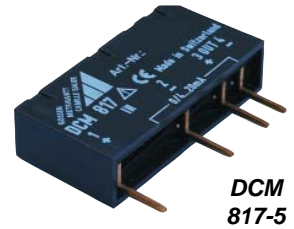
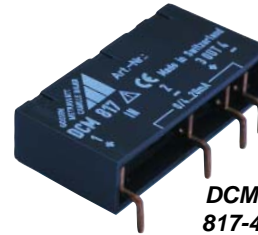
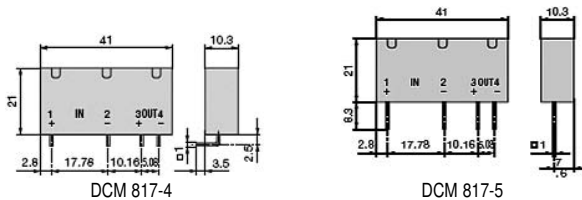
- Passive Isolator, No Power Supply Required
- Available in Any Quantities
- Circuit Board Mounting—Straight or 90° Pins
- Isolate I/O Signals and Eliminate Ground Loops

Applications

- OEM Products & Custom Circuit Assemblies
- Applications Where Space is a Premium

Specifications

Input	0-20 mA to 4-20 mA, 50 mA limit
Voltage Limiter	18 V \pm 5% (with zener diode)
Voltage Drop	Less than 2 V for 500 Ω burden
Output	0-20 mA to 4-20 mA, approx. 30 mA limit
Burden	600 Ω , max.
Accuracy	\pm 0.1% typical at 100 Ω burden
Output Ripple	Less than 20 mVss
Time Constant	Less than 5 milliseconds, approx.
Dielectric Test	500 VAC
Temperature	Operation: -20 to 65°C Storage: -40 to 85°C
Power Supply	Passive, powered by input loop



DCM 817-5

ISO 9001 : 2000

Description and Features

The **DCM 817** series signal isolators serve to electrically isolate an analog DC signal in the range 0 to 20 mA or 4 to 20 mA. It operates passively, i.e. it does not require a separate power supply. The input signal is converted to an AC waveform, passed through an isolation transformer and converted back to an identical DC signal. This electrically isolates the input and output signal preventing the transfer of interfering voltages and currents. The **DCM 817** series inexpensively solves grounding problems in meshed signal networks.

The signal isolator is available in two versions which differ in the shape of the connection pins. Its modular design enables one or several signal isolators to be mounted on a printed circuit board.

Models

Model	Input	Output	Pins
DCM 817-4	0/4-20 mA	0/4-20 mA	90°
DCM 817-5	0/4-20 mA	0/4-20 mA	Straight

See www.apicb.com for technical data sheet or consult factory.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

TI 816 Passive DC Signal Isolator

Input: 0-20 mA to 4-20 mA

Output: 0-20 mA to 4-20 mA, 0-10 V to 2-10 V

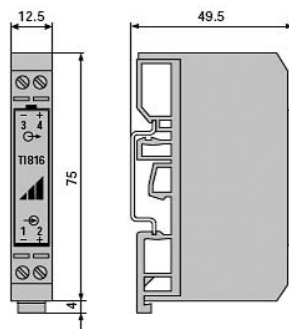
- No Power Supply Required
- Compact Size
- Isolate I/O Signals and Eliminate Ground Loops
- Low Cost

Applications

- Multi-Channel Isolation Blocks
- DIN Rail Applications Where Space is a Premium

Specifications

Input	0-20 mA to 4-20 mA, 50 mA limit
Voltage Limiter	18 V \pm 5% (with zener diode)
Voltage Drop	Less than 2 V for 500 Ω burden
Output	0-20 mA to 4-20 mA, 0-10 V to 2-10 V
Burden	Current: 600 Ω , max. Voltage: 500 Ω , max.
Accuracy	\pm 0.1% at 20 mA, \pm 0.2 V at 10 V typical
Time Constant	Less than 5 milliseconds, approx.
Dielectric Test	500 VAC
Ambient	Operation -20 to 65°C Storage -40 to 85°C
Power Supply	Passive, powered by input loop



DIN Rail Mount
Only 0.5" (12.5 mm) Wide!



ISO 9001 : 2000

Description and Features

The **TI 816** signal isolator serves to electrically isolate an analog DC signal in the range 0 to 20 mA which, depending on the version, is then converted to a current or voltage signal (0 to 20 mA or 0 to 10 V). The input signal is converted to an AC waveform, passed through an isolation transformer and converted back to an identical DC signal. This electrically isolates the input and output signal preventing the transfer of interfering voltages and currents. It operates passively and does not require a separate power supply, but derives the little auxiliary energy it needs from the DC input signal.

Its narrow casing is designed for mounting on a standard DIN rail. A number of signal isolators can be mounted together to form a compact isolator block.

Model	Input	Output
TI 816-5110	0-20 mA to 4-20 mA	0-20 mA to 4-20 mA
TI 816-5111	0-20 mA to 4-20 mA	0-10 V to 2-10 V

See www.apicb.com for technical data sheet or consult factory.



Sineax SI 815, TI 807 Signal Isolators

SI 815 One or Two Channel Passive Isolators w. Power Supply Transfer

Input: 0-20 mA or 4-20 mA

Output: 0-20 mA or 4-20 mA

- **Output Loop Powered (12-30 VDC)**
- **Transfers Power From Output Loop to Input Loop**
- **Optional FSK Compatible with HART Communications**

Specifications

Input	4-20 mA, 50 mA limit
Voltage	12-30 VDC
Voltage Drop	Less than 2.7 V at 12-22 V Less than 3.5 V at 12-22 V w. communications
Output	4-20 mA, optional FSK
Accuracy	±0.2% max at 20 mA
Time Constant	5 milliseconds, approx.
Dielectric Test	2300 VAC
Ambient	Operation -25 to 55°C, storage -40 to 70°C
Power Supply	Passive, powered by loop

Description and Features

The **SI 815** series signal isolators electrically isolate the 4-20 mA input circuit of a 2-wire transmitter. They are powered on the output loop and also conduct the power needed to the input to operate a 2-wire input transmitter. The isolator itself does not require an power supply. Optional FSK communication is used with intelligent HART capable 2-wire transmitters.

815-5
Single
Channel



ISO 9001 : 2000



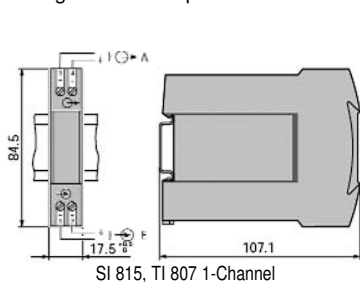
815-1
Two
Channel



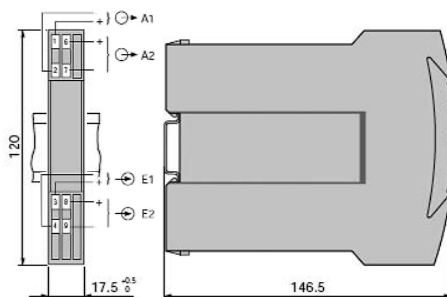
Models

Model	Channels	FSK	Input/Output
815-51100	1	no	4-20 mA
815-51110	1	yes	4-20 mA
815-11200	2	no	4-20 mA
815-11220	2	yes	4-20 mA

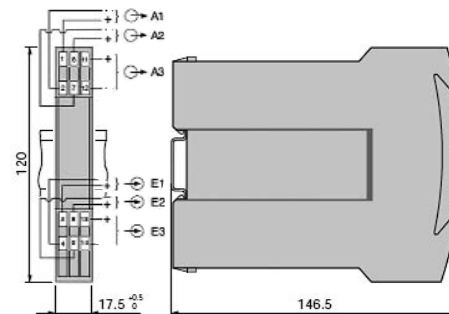
See www.apicb.com for technical data sheet or consult factory.



SI 815, TI 807 1-Channel



SI 815, TI 807 2 Channel



TI 807 3-Channel

TI 807 1, 2, or 3 Channel Passive Isolators, 4 kV Isolation

Input: 0-20 mA to 4-20 mA

Output: 0-20 mA to 4-20 mA, or 0-10 V

- **Passive Isolator, No Power Supply Required**
- **Compact Size**
- **Isolate I/O and Eliminate Ground Loops**

Specifications

Input	0-20 mA to 4-20 mA, 50 mA limit
Voltage Limiter	27 V ±5% (with zener diode)
Output	0-20 mA, 4-20 mA, 0-10 V to 2-10 V
Voltage Drop	<2.6 V at 1000 Ω (current) or 500 Ω (voltage)
Burden	Current: 1000 Ω, max., voltage: 500 Ω, max.
Accuracy	±0.1% at 20 mA, ±0.2% at 10 V, typical
Time Constant	3 milliseconds, approx.
Dielectric Test	4000 VAC
Ambient	Operation -20 to 55°C, storage -40 to 70°C
Power Supply	Passive, powered by loop

See diagrams above for dimensions and wiring

The **TI 807** signal isolators electrically isolate an analog 0-20 mA DC input signal and convert it to a current or voltage signal (0-20 mA or 0-10 V). It operates passively and does not require a separate power supply, but derives the little auxiliary energy it needs from the DC input signal.

API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

ISO 9001 : 2000



807-5
Single
Channel



807-1
Two or
Three
Channel



Model	Channels	Input	Output
807-51100	1	0-20 mA to 4-20 mA	0-20 mA to 4-20 mA
807-11200	2	0-20 mA to 4-20 mA	0-20 mA to 4-20 mA
807-11300	3	0-20 mA to 4-20 mA	0-20 mA to 4-20 mA
807-_____	Specify	0-20 mA to 4-20 mA	0-10 V or Specify

See www.apicb.com for technical data sheet or consult factory.

4-20 mA Loop-Powered Isolators

API LPI-1, API LPI-2



Input: 4-20 mA DC
Output: 4-20 mA DC

- Single or Twin Pack Fully Isolated Transmitters
- High Output Drive
- Low Input Voltage Burden
- Output LoopTracker® LED
- Functional Test Switch

Applications

- Isolate 4-20 mA Process Signals
- Isolate Two Loops With One API LPI-2
- Eliminate Ground Loops, Reduce Noise Effects

Specifications

Inputs

API LPI-1	One channel:	4 to 20 mADC
API LPI-2	Channel 1:	4 to 20 mADC
	Channel 2:	4 to 20 mADC

System voltages must not exceed socket voltage rating.

Input Voltage Burden

Approximately 9 VDC at 20 mA
See graph on back

Outputs

API LPI-1	One channel:	4 to 20 mADC
API LPI-2	Channel 1:	4 to 20 mADC
	Channel 2:	4 to 20 mADC

Output Drive Capability

Up to 1000 Ω with 20 V compliance at 20 mA at 30 VDC or approximately 750 Ω at 24 VDC depending on the supply voltage of the input loop.
See graph on back.

Change in Load Effect

Less than $\pm 0.08\%$ of span for load changes from 0 Ω to 1000 Ω

Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations
 $\pm 10\%$ of span adjustment range typical

LoopTracker®

Continuous visual indication of output loop current
LED brightness varies with current level over 4-20 mA range

Functional Test Switch

Momentary contact switch with spring-loaded return
Sets output to calibration reference level of 4 mA to allow testing of module circuits and output loop

Calibration Reference Level

4.0 mA ± 0.10 mA
Requires a minimum of 4 mA input current

Isolation

API LPI-1	1200 V _{RMS} minimum, input to output
API LPI-2	1200 V _{RMS} minimum, input to output, channel to channel

Accuracy

Combined effects of linearity, hysteresis, and repeatability
 $\pm 0.1\%$ span per $^{\circ}\text{C}$

Response Time

60 milliseconds typical

Common Mode Rejection

Negligible output effect for 50/60 Hz common mode signals

Ambient Temperature Range

-10°C to $+60^{\circ}\text{C}$ operating

Temperature Stability

Better than $\pm 0.2\%$ of span per $^{\circ}\text{C}$



**Free Factory
Input & Output
Calibration!**

Description and Features

The **API LPI-1** is a single channel loop-powered isolator that accepts a 4-20 mADC input and provides a linear and isolated output current proportional to the input.

The **API LPI-2** contains two completely independent and identical channels in the same housing. When calculating power usage and reviewing specifications, consider each channel separately.

The **API LPI-1** and each channel of the **API LPI-2** function as two-wire transmitters that derive their operating power from the input loop eliminating the need for external power supplies and additional power wiring.

Due to the unique design, the calibration and linearity of each channel is unaffected by output load changes from 0 to 1000 Ω . The **API LPI-1** and **API LPI-2** provide a cost effective, drop-in solution for eliminating the ground loops and noise problems commonly found in process loops.

API exclusive features include two **LoopTracker** LEDs and a **Functional Test Switch**. The **API LPI-2** has one LED and one switch for each channel.

The LoopTracker LED varies in intensity with changes in the process input signal. The LED will extinguish if either the input or output loops should open. Monitoring the state of these LEDs can provide a quick visual picture of your process loop at all times.

The spring return functional test switch substitutes a stable 4.0 mADC signal into the input loop to allow easy calibration or system testing without the need for external calibrators or wiring modifications. Both the LoopTracker LEDs and functional test switch greatly aid in saving time during initial startup and/or troubleshooting.

The **API LPI-1** and **API LPI-2** modules plug into an industry standard 8-pin socket sold separately. The convenient plug-in design simplifies installation and wiring. Sockets **API 008** and finger-safe **API 008 FS** allow either DIN rail or panel mounting.

Factory configured for 4-20 mA input and output

API LPI-1 Loop-powered 4-20 mA isolator, single channel

API LPI-2 Loop-powered 4-20 mA isolator, 2 channel

Optional—Add to end of model number

U

Conformal coating for moisture resistance

Accessories—Order as separate line item

API 008 8-pin socket

API 008 FS 8-pin finger-safe socket

API TK36 DIN rail, 35 mm W x 39" L, aluminum



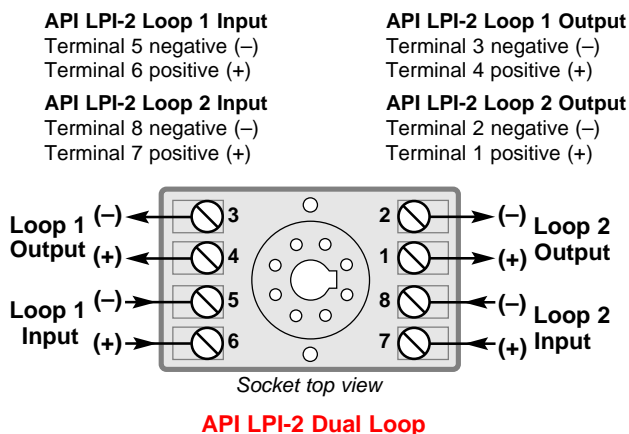
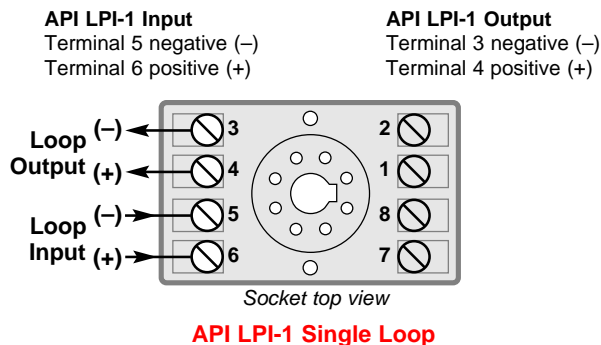
API LPI-1, API LPI-2 Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module requires an industry-standard 8-pin socket. Order API 008 or finger-safe API 008 FS socket.

Signal Input – Polarity must be observed when connecting the signal input.

Signal Output – Polarity must be observed when connecting the signal output to the load.



CALIBRATION

The API LPI-1 and API LPI-2 are factory calibrated and should not require recalibration in the field for loads of 0-1000 Ω .

On the API LPI-2, each channel is totally independent from the other and each input is isolated from its corresponding output.

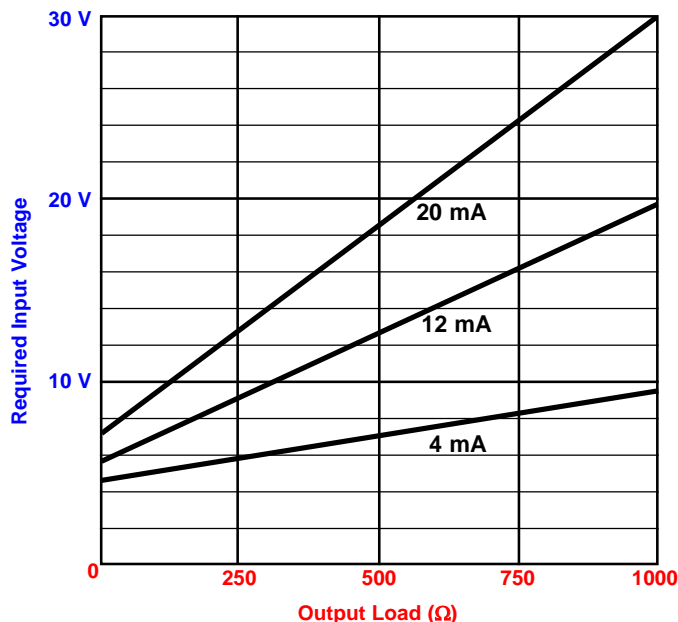
Should recalibration (fine-tuning) be desired, independent Zero and Span controls (one set for each channel of the API LPI-2) are accessible through the top of the unit to adjust the module's output.

1. Wire unit as shown, apply power to the input and output loops, and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide a 4 mA input to module.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer to 4 mA. The Zero control should only be adjusted when the input signal is at its minimum. This will produce a 4 mA output signal.
4. Using an accurate calibration source, provide 20 mA input to module.
5. Using an accurate measurement device for the output, adjust the Span potentiometer to 20 mA. The Span control should only be adjusted when the input signal is at its maximum. This will produce a 20 mA output signal.
6. Repeat adjustments for the second channel on the API LPI-2.

TEST SWITCH

The Test switch may be used to drive the device on the output side of the loop (a panel meter, chart recorder, etc.) with a known good signal which can be used as a system diagnostic aid during initial start-up or during troubleshooting. This test signal is factory set to 4 mA. When the switch is released, the output will return to normal.

INPUT VOLTAGE BURDEN CHART

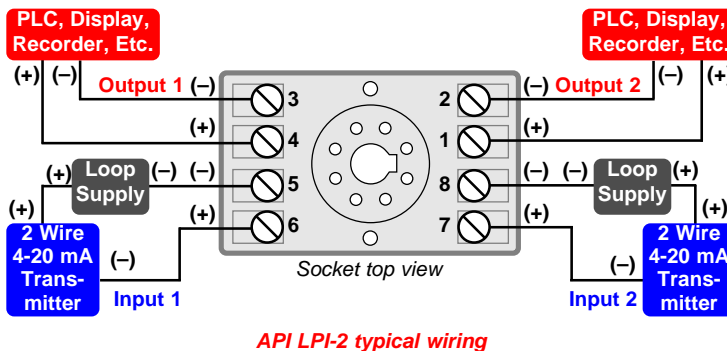
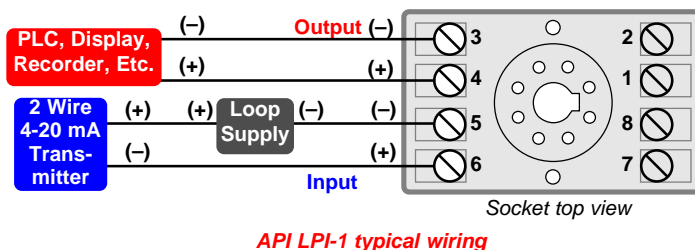


NOTE: The required input voltage is for one channel only.

OPERATION

The API LPI-1 and API LPI-2 are passive devices that draw a small amount of power from the input loop to operate their isolation circuitry.

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. The RED LED will only light if the output loop current path is complete. 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.



API maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.



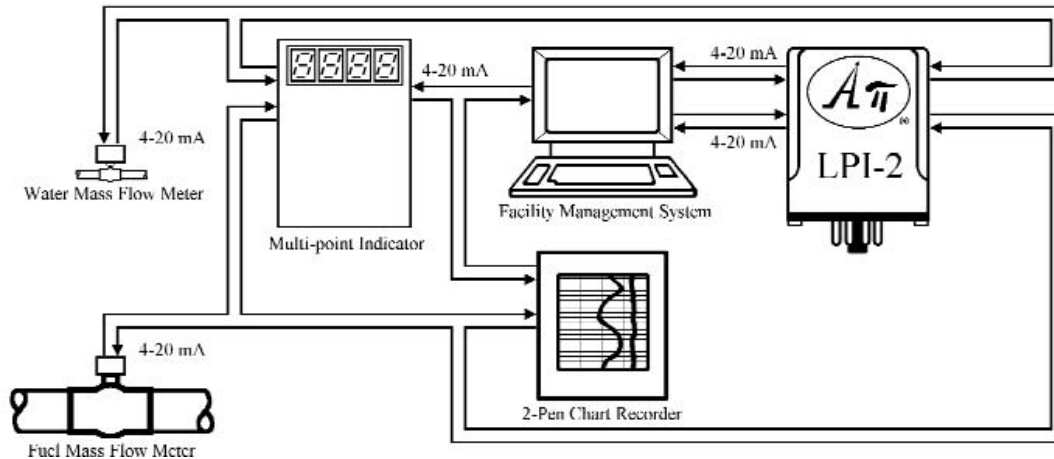
Monitoring and Recording Mass Flow and Mass Flow Ratio

PROBLEM

A natural gas turbine is equipped with water injection to satisfy environmental regulations. Mass flow meters are installed on the fuel and water injection lines to the turbine, and are monitored by a local multi-point indicator which also calculates, displays and provides an analog output of the water to fuel mass flow ratio. The fuel mass flow and the water to fuel mass flow ratio need to be plotted on a 2-pen chart recorder and also be monitored by a computer-based facility management system. The mass flow meters and the multi-point indicator are independently self-powered.

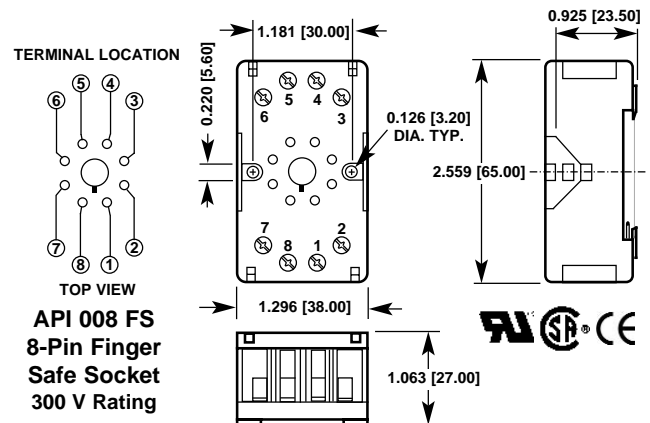
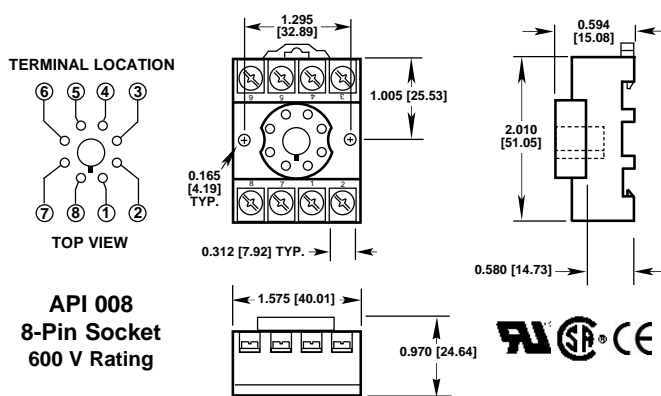
SOLUTION

Use an **API LPI-2** Loop Powered Isolator Twin-Pack module to prevent ground loops.



The **API LPI-2** allows the Facility Management System computer to monitor both the inputs and the output of the multi-point indicator without introducing errors due to ground loops.

API Sockets API 008 and API 008 FS



FREE APPLICATION ASSISTANCE
Call Customer Service
800-942-0315



What is a Ground Loop?

In a process control loop, a ground loop circuit can develop when each device's ground is tied to a different earth potential thereby allowing current to flow between the grounds by way of the process loop (Figure 1).

Ground loops cause problems by adding or subtracting current or voltage from the process loop. This addition and/or subtraction causes the receiving device to be unable to differentiate between the wanted and unwanted signals and thus can't accurately reflect actual process signals.

The probability of multiple grounds and ground loops being established is especially high when new programmable logic controllers (PLCs) or distributed control systems (DCSs) are installed. With so many conditions within a facility referenced to ground, the likelihood of establishing more than one ground point is great. Thus, if an instrumentation system seems to be acting strangely or erratically, and the problem seems to point toward ground loops, the chore of eliminating all unintended ground connections becomes overwhelming.

Keep in mind that eliminating ground loops just isn't feasible for some instruments, such as thermocouples and some analyzers, because they require a ground to obtain accurate measurements. In addition, some instruments must be grounded to ensure personnel safety.

When ground loops can't be eliminated, the solution lies in the use of signal isolators. These devices break the galvanic path (DC continuity) between all grounds while allowing the analog signal to continue throughout the loop. An isolator also can eliminate the electrical noise of AC continuity (common mode voltage).

Signal isolators can use numerous techniques to achieve their function but the best signal isolators usually employ optical isolators (Figure 2). Regardless of the isolation method used, an isolator must provide input, output, and power isolation. If this three-way isolation is not provided, then an additional ground loop can develop between the isolator's power supply and the process input and/or output signal.

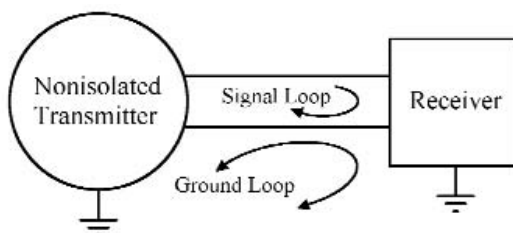


Figure 1. Ground loops may develop with non-isolated transmitters and receivers, resulting in inaccuracy and unreliability.

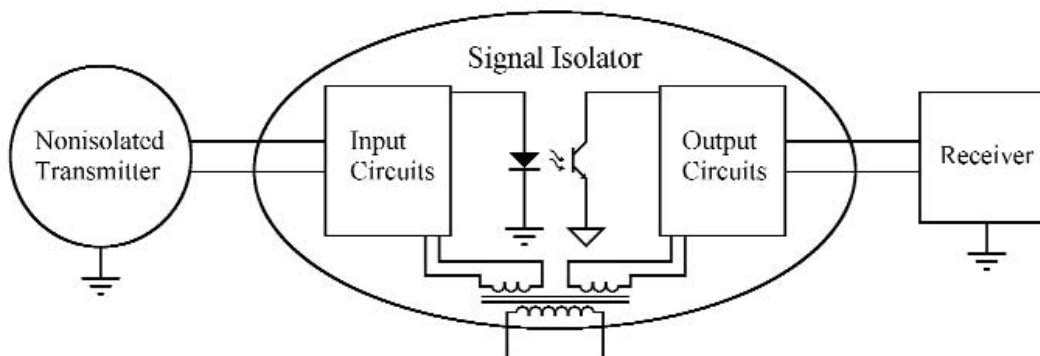


Figure 2. A signal isolator in the process loop blocks ground current to restore signal accuracy and reliability.



FREE APPLICATION ASSISTANCE

Call  Customer Service

800-942-0315

For Your Local Area Representative See www.api-usa.com

Dual Channel 4-20 mA Loop-Powered Isolator

API DPI-2**Two Inputs:** 4-20 mA**Two Outputs:** 4-20 mA

- 2 Fully Independent Loop Powered Isolators
- 1000 Ω Output Drive Capability
- Calibration Unaffected by Change in Load
- Compact 22.5 mm Wide DIN Style Case
- Output LoopTracker® LED

Applications

- Isolate 4-20 mA Process Signals
- Isolate Two Loops With One API DPI-2
- Eliminate Ground Loops, Reduce Noise Effects

Specifications

Inputs

Channel A: 4 to 20 mADC

Channel B: 4 to 20 mADC

Input Voltage Burden

See graph on back

Outputs

Channel A: 4 to 20 mADC

Channel B: 4 to 20 mADC

Output Load Capability

Up to 1000 Ω with 20 V compliance at 20 mA depending on the supply voltage of the input loop

Change in Load Effect

Less than $\pm 0.08\%$ of span for load changes from 0 Ω to 1000 Ω

Output Zero and Span

Multiturn potentiometers to compensate for load and lead variations, $\pm 10\%$ of span adjustment range typical

LoopTracker

Continuous indication of current flow in the output loop
LED brightness varies with current level over 4-20 mA range

Accuracy

Combined effects of linearity, hysteresis, and repeatability
 $\pm 0.1\%$ span per $^{\circ}\text{C}$ maximum

Response Time

60 milliseconds typical

Common Mode Rejection

Negligible output effect for 50/60 Hz common mode signals

Isolation

1200 V_{RMS} minimum, input to output

Ambient Temperature Range

 -10°C to $+60^{\circ}\text{C}$ operating

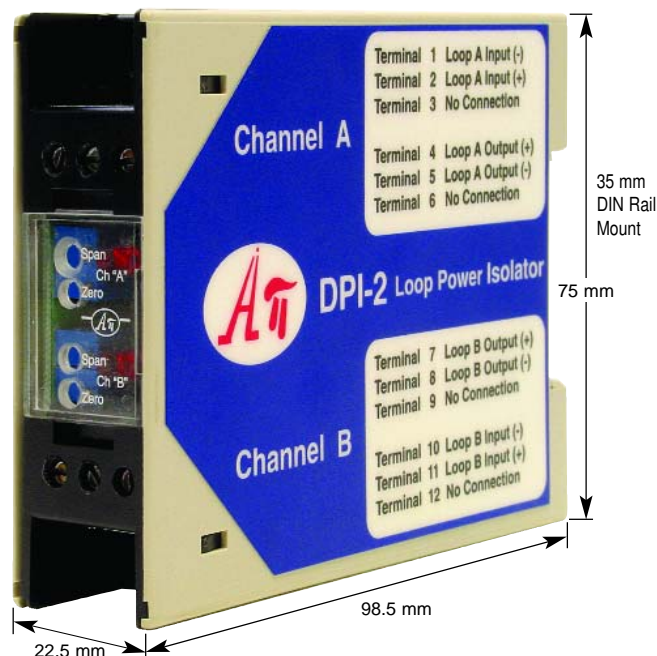
Temperature Stability

Better than $\pm 0.2\%$ of span per $^{\circ}\text{C}$

Case Material

Polycarbonate

Gray UL #94V-1 housing and black UL #94V-2 terminals



DC Input

Description and Features

The **API DPI-2** is a two channel loop-powered isolator that accepts two separate 4-20 mADC inputs and provides two linear and isolated 4-20 mA outputs. The **API DPI-2** contains two completely independent and identical channels in the same housing. When calculating power usage and reviewing specifications, consider each channel separately. The **API DPI-2** derives its operating power from the input loop eliminating the need for external power supplies and additional power wiring.

Due to the unique design, the calibration and linearity of each channel is unaffected by output load changes from 0 to 1000 Ω . The **API DPI-2** provides a cost effective, drop-in solution for eliminating the ground loops and noise problems commonly found in process loops.

API exclusive features include two **LoopTracker** LEDs for each channel. The LoopTracker LED varies in intensity with changes in the process input signal. The LED will extinguish if either the input or output loops should open. Monitoring the state of these LEDs can provide a quick visual picture of your process loop and saves time during initial startup and/or troubleshooting.

The **API DPI-2** is factory calibrated and should not require re-calibration in the field for loads up to 1000 Ω . Each channel is totally independent from the other and each input is optically isolated from its corresponding output.

Should re-calibration (fine-tuning) be desired, independent Zero and Span controls for each channel are accessible through the front of the unit.

The **API DPI-2** is designed to mount on an industry-standard DIN rail. The narrow 22.5 mm DIN style housing allows for side-by-side mounting of multiple modules for maximum I/O density with as many as 36 channels (18 modules) in a 19-inch rack.

Factory Configured for 4-20 mA input and output

API DPI-2 Loop-powered 4-20 mA isolator, 2 channel

Optional—Add to end of model number

U Conformal coating for moisture resistance

Accessories—Order as separate line item

API TK36 DIN rail, 35 mm W x 39" L, aluminum



API DPI-2 Installation and Setup

ELECTRICAL CONNECTIONS

WARNING! All wiring must be performed by qualified personnel only. This module is mounted to an industry-standard DIN rail. Use **API TK36 DIN** rail.

Signal Input – Polarity must be observed when connecting the signal input.

Signal Output – Polarity must be observed when connecting the signal output to the load.

API DPI-2 Loop A Input

Terminal 1 negative (–)
Terminal 2 positive (+)

API DPI-2 Loop B Input

Terminal 10 negative (–)
Terminal 11 positive (+)

API DPI-2 Loop A Output

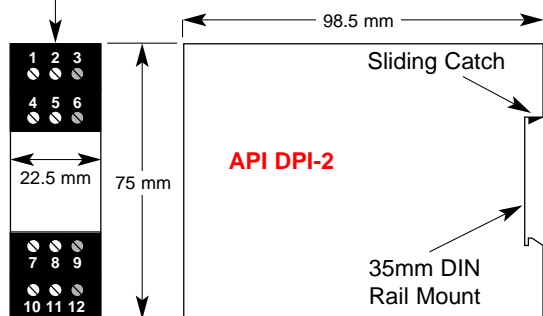
Terminal 4 negative (–)
Terminal 5 positive (+)

API DPI-2 Loop B Output

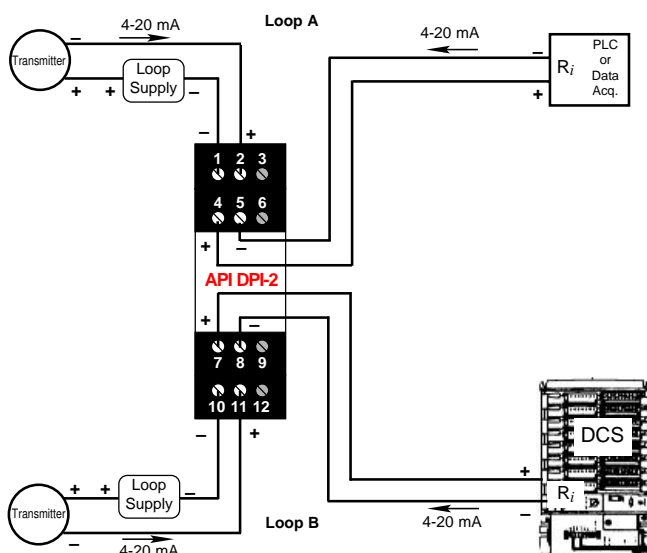
Terminal 8 negative (–)
Terminal 7 positive (+)

Terminal 1 Loop A Input Signal (–)
Terminal 2 Loop A Input Signal (+)
Terminal 3 No Connection
Terminal 4 Loop A Output Signal (+)
Terminal 5 Loop A Output Signal (–)
Terminal 6 No Connection

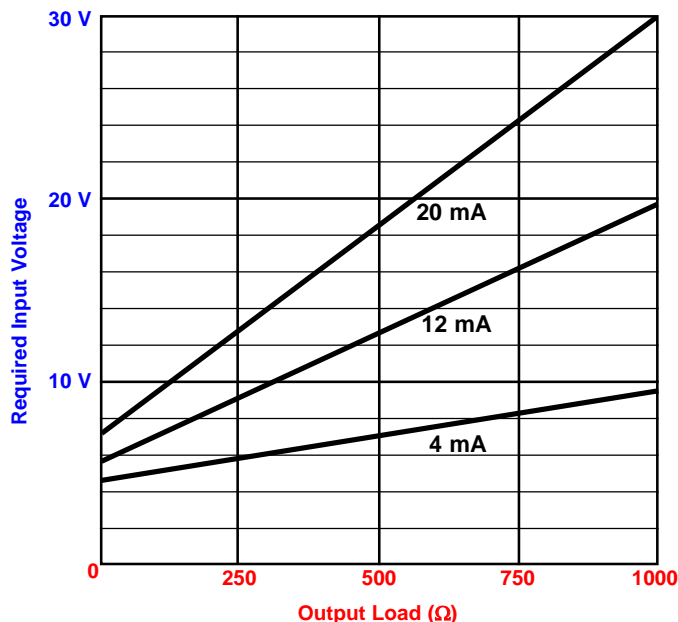
Terminal 7 Loop B Output Signal (+)
Terminal 8 Loop B Output Signal (–)
Terminal 9 No Connection
Terminal 10 Loop B Input Signal (–)
Terminal 11 Loop B Input Signal (+)
Terminal 12 No Connection



WIRING EXAMPLE



INPUT VOLTAGE BURDEN CHART



NOTE: The required input voltage is for one channel only.

CALIBRATION

The **API DPI-2** is factory calibrated and should not require recalibration in the field for loads of 0-1000 Ω.

Each channel is totally independent from the other and each input is isolated from its corresponding output.

Should recalibration (fine-tuning) be desired, independent Zero and Span controls for each channel are accessible through the front of the unit to adjust the module's output.

1. Wire unit as shown, apply power to the input and output loops, and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide a 4 mA input to module.
3. Using an accurate measurement device for the output, adjust the Zero potentiometer to 4 mA. The Zero control should only be adjusted when the input signal is at its minimum. This will produce a 4 mA output signal.
4. Using an accurate calibration source, provide 20 mA input to module.
5. Using an accurate measurement device for the output, adjust the Span potentiometer to 20 mA. The Span control should only be adjusted when the input signal is at its maximum. This will produce a 20 mA output signal.
6. Repeat adjustments for the second channel on the **API DPI-2**.

OPERATION

The **API DPI-2** is a passive device which draws a small amount of power from the input loop to operate its isolation circuitry.

The **RED LoopTracker** output LEDs provide a visual indication that the output signal is functioning. It becomes brighter as the input and the corresponding output change from minimum to maximum. The RED LED will only light if the output loop current path is complete. 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.

FAQ

Can the API DPI-2 have an input of 0-20 mA and an output of 0-20 mA?

No. The loop-powered device requires a minimum of 4 mA to supply power to the module.

What is the maximum 4-20 mA input loop voltage for the API DPI-2?

60 VDC is the maximum voltage that can be used to power the input loop.