DC to DC Math Function Transmitters, Isolated, Factory Configured

Input: 0-50 mV to 0-10 VDC, ±25 mV to ±10 VDC, 0-1 mA to 0-20 mA, ±0.5 to ±20 mA
Output: 0-1 V to ±10 VDC or 0-2 mA to 0-20 mA, 4-20 mA

- Add, Subtract, Average, Multiply, Divide
- Square Root, Square, Custom Math Function
- Factory Set Custom I/O Ranges
- 1200 V Input/Output/Power Isolation
- Input LoopTracker® LED and Functional Test Button
- Built-In Loop Power Supply for Output

**Applications**
- Average Output From Metering Pumps
- Linearize Output From Flow Meter
- Output Differential Between Two Flow Meters

**DC Input Range**
Factory configured, please specify each input range
Consult factory for special ranges and/or functions
Each input can have different ranges and/or units
Reverse acting input(s) available
Specify order of math functions if required
Milliamp inputs are sinking
APD 4400 through APD 4406 can have a scaling or weighting factor for each input. Division factor not included in formula.
Voltage: 0-50 mVDC to 0-10 VDC
Bipolar voltage: ±25 mVDC to ±10 VDC
Current: 0-1 mA to 0-20 mA
Bipolar current: ±0.5 mA to ±20 mA

**Input Impedance**
Voltage: 50 kΩ minimum
Current: 50 Ω nominal

**Balance Between Inputs**
Better than ±0.5% of span

**LoopTracker**
Variable brightness LED indicates input loop level and status

**DC Output Range**
Factory configured, please specify output range
Voltage, 10 mA max.: 0-1 VDC to 0-10 VDC
Bipolar voltage: ±1 VDC to ±10 VDC
Current: 0-2 mA to 0-20 mA
20 V compliance, 1000 Ω at 20 mA
Milliamp output can be field wired for sink or source
Reverse acting output available

**Output Calibration**
Multi-turn zero and span potentiometers
±15% of output span typical

**Output Loop Power Supply**
20 VDC nominal, regulated, 25 mA, <10 mVrms max. ripple
May be selectively wired for sinking or sourcing mA output

**Output Test**
Front button sets output to test level. Enabled via pushbutton.
Default setting approximately 50% of span
Potentiometer adjustable 0-100% of span

**Output Ripple and Noise**
Less than ±0.2% of span

**Linearity**
Better than ±0.25% 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**
50 milliseconds, nominal per channel used

**Isolation**
1200 VRMS minimum
Full isolation: power to each input, power to output, each input to output.
Non-isolated: input to input

**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, 50/60Hz or 60-300 VDC, 4W maximum
D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 4 W maximum

**Specifications**
- (A + B + C + D) / 4
- (A + B) / 2
- (A + B + C - D) / 3
- (A + B - C - D) / 2
- A - B - C
- A - B
- A + B
- A / B
- Input or output squared
- Square root of input or output

**How to Order**
All models are factory ranged
The APD 44xx models are configured to your specifications
Each input can have different ranges and/or units
With the model number, please specify
The range and units for each input
Output range
Options as required

**Model** | **Power** | **Model** | **Power** | **Function** | **Input(s)** | **Output**
--- | --- | --- | --- | --- | --- | ---
APD 4400 | APD 4400 D | APD 4401 | APD 4401 D | (A + B + C + D) / 4 | Factory configured | Specify VDC or mADC range for each input as required by function.
APD 4402 | APD 4402 D | APD 4403 | APD 4403 D | (A + B) / 2 | Specify weighting or scaling factor for each input if required.
APD 4404 | APD 4404 D | APD 4405 | APD 4405 D | (A + B + C - D) / 3 | Provide data table or graph for custom linearization.
APD 4406 | APD 4406 D | APD 4407 | APD 4407 D | (A + B - C - D) / 2 | Factory configured | Specify VDC or mADC output range.
APD 4408 | APD 4408 D | APD 4410 | APD 4410 D | A - B | Factory configured | Specify VDC or mADC output range.
APD 4420 | APD 4420 D | APD 4430 | APD 4430 D | A / B | Factory configured | Specify VDC or mADC output range.
APD 4440 | APD 4440 D | APD 44xx | APD 44xx D | Input or output squared | Accessory—order as separate line item

**Options**
- Input/output reversal, such as 4-20 mA input to 20-4 mA output
- Conformal coating for moisture resistance

**References**
- API BP4 Spare 4-terminal plug, black

**Dimensions**
22.5 mm W x 4.62" H x 4.81" D
Height includes connectors

**Specifications**
- Better than ±0.5% of span
- ±15% of output span typical
- Better than ±0.25% of span
- ±0.02% of span per °C stability
- 50 milliseconds, nominal per channel used
- 1200 VRMS minimum
- 1200 V Input/Output/Power Isolation
- Input LoopTracker LED for easy visibility
- Custom I/O Ranges
- Built-In Loop Power Supply for Output
- Universal Power
- Free Factory Setup
- API BP4 Spare 4-terminal plug, black

**Accessories**
- API exclusive features include a green LoopTracker LED that varies in intensity with changes in the process input signal. It provides a quick indication of your process input at all times and can greatly aid in saving time during initial startup and/or troubleshooting.
- Functional Test
- An API exclusive feature included in the Functional Test Button to provide a fixed output (independent of the input) when enabled. The test output level is potentiometer adjustable from 0 to 100% of output span. The functional test button can greatly aid in saving time during initial startup and/or troubleshooting.

**How to Order**
All models are factory ranged
The APD 44xx models are configured to your specifications
Each input can have different ranges and/or units
With the model number, please specify
The range and units for each input
Output range
Options as required

**Specifications**
- (A + B + C + D) / 4
- (A + B) / 2
- (A + B + C - D) / 3
- (A + B - C - D) / 2
- A - B - C
- A - B
- A + B
- A / B
- Input or output squared
- Square root of input or output

**Testing**
- LoopTracker
- The APD 44xx series has a green LoopTracker LED that varies in intensity with changes in the process input signal. It provides a quick indication of your process input at all times and can greatly aid in saving time during initial startup and/or troubleshooting.
Installation and Setup

APD 44xx

Electrical Connections

See wiring diagrams. Observe polarity. If the output does not function, check all wiring and polarity.

* 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!

Inputs

Polarity must be observed when connecting the signal inputs. Inputs may each be different ranges and types.

For a transmitter with a current output, it must provide power to the current loop. This is typically a 3- or 4-wire device, and the input is unpowered or passive. The transmitter needs a loop power supply. Use a multi-meter to check for voltage at the transmitter output terminals. Typical voltage may be in the range of 9 to 24 VDC.

Output

Polarity must be observed when connecting the signal output.

If your device requires a current input, determine if it provides power to the current loop. This is typically a 3- or 4-wire device, or a passive transmitter with a loop power supply. Use a multi-meter to check for voltage at the input terminals. Typical voltage may be in the range of 9 to 24 VDC.

Specifications are subject to change without notice. See api-usa.com for latest product information. Consult factory for your specific requirements.

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

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.

Connections

ATTENTION! Tout le câblage doit être effectué par un électricien ou ingénieur en instrumentation qualifié. Voir le diagramme pour des terminaux 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.

Ranges

See the model/serial number label for module information, options, and I/O range information.

Electrical Connections

See wiring diagrams. Observe polarity. If the output does not function, check all wiring and polarity.

* 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!

Outputs

Polarity must be observed when connecting the signal output. Outputs may each be different ranges and types.

For a transmitter with a current output, it must provide power to the current loop. This is typically a 3- or 4-wire device, or a passive transmitter with a loop power supply. Use a multi-meter to check for voltage at the transmitter output terminals. Typical voltage may be in the range of 9 to 24 VDC.

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.
3. The module can now be removed from the DIN rail.

Calibration

Input and output ranges are factory pre-configured (at 24°C ±1°C). Use the front-mounted Zero and Span potentiometers to calibrate the output:

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate calibration source, provide an input to each channel equal to the minimum input required for the application.
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. For example: 4 mA for a 4-20 mA output or −10 V for a ±10 V output.
4. Next, set all of the inputs at maximum, 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.
5. Repeat adjustments for maximum accuracy.

Output Test Function

The test button may be used to drive the device on the output (a panel meter, chart recorder, etc.) with a known good signal that can be used as a system diagnostic aid during initial start-up or during troubleshooting.

When pressed it will drive the output with a known good signal. When pressed again, the output will return to normal.

Operation

The APD 44xx is factory configured to your exact input and output requirements. Each input is filtered, either amplified or attenuated as required, then passed through to the output stage.

The output level is determined by the levels of inputs and the math function depending on the model.

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.

Input powers are fuse protected and the unit may be returned to API for fuse replacement.

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.

Precautions

ATTENTION! Tout le câblage doit être effectué par un électricien ou ingénieur en instrumentation qualifié. Voir le diagramme pour des terminaux 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

Ranges

See the model/serial number label for module information, options, and I/O range information.

Electrical Connections

See wiring diagrams. Observe polarity. If the output does not function, check all wiring and polarity.

* 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!

Inputs

Polarity must be observed when connecting the signal inputs. Inputs may each be different ranges and types.

For a transmitter with a current output, it must provide power to the current loop. This is typically a 3- or 4-wire device, or a passive transmitter with a loop power supply. Use a multi-meter to check for voltage at the transmitter output terminals. Typical voltage may be in the range of 9 to 24 VDC.

Version

Channels: + Terminal – Terminal

All
.flexible | senorial 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 API products, positive (+) can be wired to terminal 3 and negative (−) can be wired to terminal 16. The power supplies are fuse protected and the unit may be returned to API for fuse replacement.