Potentiometer Input to DC Transmitters, Isolated, Field Rangeable — APD 4008

Input: 100 Ω to 1 MΩ Potentiometers, 0 to 90% Offset
Output: 0-1 V to ±10 VDC, or 0-2 mA to 20 mADC

- *One Minute Setup for Hundreds of I/O Ranges*
- *External Switches & Table for Range Selection*
- *Removable Plugs for Faster Installation*
- *Full 1200 V Input/Output/Power Isolation*
- *Input and Output LoopTracker® LEDs*
- *Functional Output Test Button*
- *Selectable Sink/Source for Current Output*

Applications

- *Over, Under, Out-of-Range Position Monitoring*
- *Remote Control of Positioning Devices*
- *Simplify Control of Potentiometer Outputs*











Potentiometer Input Ranges
Field selectable ranges via switch settings
See table for complete listing
3 wire connection required

Minimum:	0-100 Ω
Maximum:	0-1 MΩ
Input span:	10-100% of potentiometer range
Input offset:	0-90% in 10% increments

Input Impedance
10 MΩ minimum

LoopTracker
Variable brightness LEDs indicate I/O level and status

Output Ranges
Field selectable ranges via switch settings
See table for complete listing

Voltage:	0-1 VDC to 0-10 VDC, 10 mA max
Bipolar Voltage:	±5 VDC or ±10 VDC
Current:	0-2 mADC to 0-20 mADC 20 V compliance, 1000 Ω at 20 mA

Output Linearity
Better than ±0.1% of span

Output Logic
Normal (standard) or reverse acting with M01 option

Output Zero and Span
Multi-turn potentiometers to compensate for load and lead variations, ±15% of span adjustment range typical

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}

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

Response Time
70 milliseconds typical
1 millisecond typical with DF option

Common Mode Rejection
120 dB minimum

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
80-265 VAC or 48-300 VDC, 2 W maximum
D versions: 9-30 VDC or 10-32 VAC 50/60 Hz, 2 W maximum

Housing
Mounts to standard 35 mm DIN rail
IP 40

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 4008 accepts a resistance input from potentiometer, slidewire, linear position, displacement, or rotational devices and provides an optically isolated DC voltage or current output that is linearly related to the potentiometer position.

The APD 4008 will accept any potentiometer with a value of 0-100 Ω through 0-1 MΩ without recalibration and without affecting accuracy. The APD 4008 output can be field-configured via external rotary and slide switches. Offsets and/or input ranges other than 0 to 100% of the potentiometer range can also be selected.

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

Sink/Source Output
The APD 4008 has a 20 VDC loop excitation supply for the output. This power supply can be used to power a passive mA device. If not required, the APD 4008 output can be wired as a passive output. Sinking/sourcing versatility allows the APD 4008 to produce a powered or unpowered mA output allowing it to work with powered or unpowered mA devices.

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 from 0 to 100% of output span.

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

How to Order

All models are field rangeable
Models can be pre-set to your specifications.
Order APD 4008 D for operation on low voltage power.

Please specify
Model
Input range (if factory is to pre-set)
Output range (if factory is to pre-set)
Options as required

Model	Input	Output	Power
APD 4008	Field configurable—specify range if factory is to set switches	Field configurable—specify range if factory is to set switches	80-265 VAC or 48-300 VDC
APD 4008 D			9-30 VDC or 10-32 VAC

Options–add to end of model number

M01	Input/output reversal, such as 4-20 mA input to 20-4 mA output
DF	Fast response time, consult factory
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 4-terminal plug, black

Range Selection

See white model/serial number label for module power requirements, and any applicable options or custom ranges. It is generally easier to select ranges before wiring and installation.

See table on next page for module range settings. From the table, find the rotary switch setting that matches your input and output range.

For most applications 0-100% of the potentiometer range is used. The APD 4008 can be set up to use part of the potentiometer range. Input switch B controls the percent of the potentiometer range to use. Input switch C controls the percent of the range offset from zero.

Make sure to set the V—I switch for voltage or current output respectively.

Electrical Connections

WARNING! All wiring must be performed by a qualified electrician or instrumentation engineer. See diagram below for terminal designations and wiring examples. Consult factory for assistance.

Avoid shock hazards! Turn off all power off before connecting or disconnecting wiring.

Polarity must be observed for output wiring connections. If the output does not function, check switch settings and wiring polarity.

Module Power Terminals

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

Signal Input Terminals

The potentiometer must be connected to all three signal input terminals as shown. The APD 4008 utilizes a stable 1 VDC source to excite the potentiometer.

Potentiometer Input	Terminal
Full scale or high side of potentiometer	**9** (+1 VDC)
Zero or low end of potentiometer	**10** (–)
Potentiometer wiper arm	**11**

Signal Output Terminals

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 or if it must be powered by the APD module. Use a multi-meter to check for voltage at the input terminals. Typical voltage may be in the range of 9 to 24 VDC. In this case, wire the device to terminals 2 and 4.

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

Calibration

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.
2. Set the input potentiometer to its minimum value to provide an input to the module equal to the minimum input required for the application.
3. Connect an accurate measurement device to the module output. Adjust the module's Zero potentiometer for the exact minimum output desired. The Zero control should only be adjusted when the input signal is at its minimum to produce the corresponding minimum output signal. Example: for a 4-20 mA output signal, the Zero control will allow adjustment of the 4 mA or low end of the signal.
4. Set the input potentiometer at its maximum, and then adjust the module's 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.
5. Repeat adjustments for maximum accuracy.

Output Test Function

The output test potentiometer is factory set to provide approximately 50% output. When the test button is depressed it will drive the output side of the loop 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 can be used to set the test output to the desired level. It is adjustable 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 4008 utilizes a stable 1 VDC source to excite the potentiometer. This voltage is stabilized against the potentiometer resistance value variations over the entire operating range.

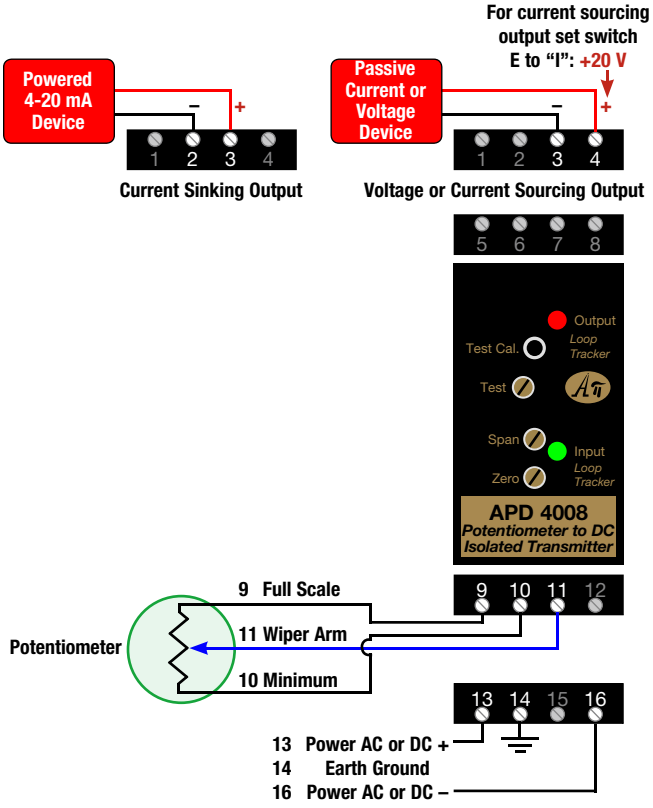
The resulting potentiometer wiper voltage is amplified and passed through an optical coupler to the output stage where it is scaled to the desired output range.

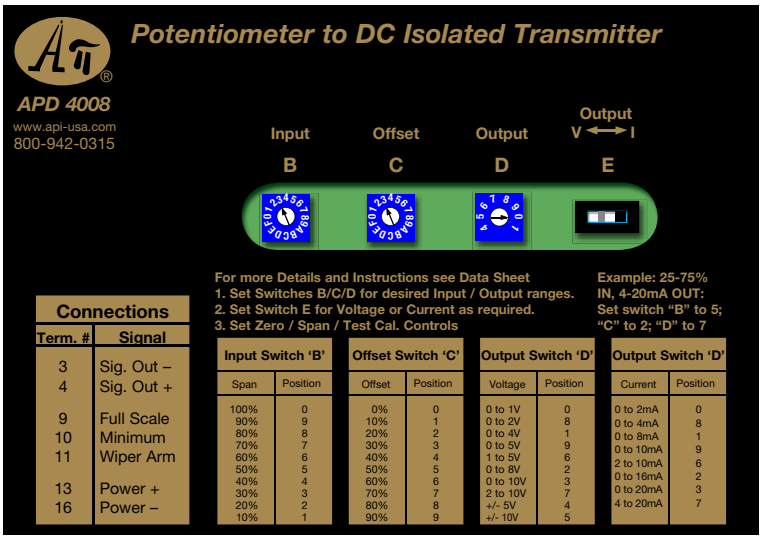
The green LoopTracker® input LED provides a visual indication that a signal is being sensed by the input circuitry of the module. It also indicates the input signal strength by changing in intensity as the process changes from minimum to maximum.

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 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.





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

APD 4008 Range Selection Table

See table below to select I/O ranges for your application.

It is generally easier to select ranges before installation.

See white model/serial number label for module information, options, or if a custom range was specified.

The module side label lists common ranges. Use the table below for a complete selection. Consult factory for non-standard or special ranges.

Switch C controls input offset and switch D controls output offset.

Switch E is for voltage or current output selection.

For ranges that fall between the listed ranges use the next highest setting and trim the output signal with the zero and span potentiometers.

Output	0-1 V	0-2 V	0-4 V	1-5 V	0-5 V	0-8 V	2-10 V	0-10 V	±5 V	± 10 V	0-2 mA	0-4 mA	0-8 mA	2-10 mA	0-10 mA	0-16 mA	4-20 mA	0-20 mA
Switches	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE	BCDE
Input																		
0-10%	100V	108V	101V	106V	109V	102V	107V	103V	104V	105V	100I	108I	101I	106I	109I	102I	107I	103I
10-20%	110V	118V	111V	116V	119V	112V	117V	113V	114V	115V	110I	118I	111I	116I	119I	112I	117I	113I
20-30%	120V	128V	121V	126V	129V	122V	127V	123V	124V	125V	120I	128I	121I	126I	129I	122I	127I	123I
30-40%	130V	138V	131V	136V	139V	132V	137V	133V	134V	135V	130I	138I	131I	136I	139I	132I	137I	133I
40-50%	140V	148V	141V	146V	149V	142V	147V	143V	144V	145V	140I	148I	141I	146I	149I	142I	147I	143I
50-60%	150V	158V	151V	156V	159V	152V	157V	153V	154V	155V	150I	158I	151I	156I	159I	152I	157I	153I
60-70%	160V	168V	161V	166V	169V	162V	167V	163V	164V	165V	160I	168I	161I	166I	169I	162I	167I	163I
70-80%	170V	178V	171V	176V	179V	172V	177V	173V	174V	175V	170I	178I	171I	176I	179I	172I	177I	173I
80-90%	180V	188V	181V	186V	189V	182V	187V	183V	184V	185V	180I	188I	181I	186I	189I	182I	187I	183I
90-100%	190V	198V	191V	196V	199V	192V	197V	193V	194V	195V	190I	198I	191I	196I	199I	192I	197I	193I
0-20%	200V	208V	201V	206V	209V	202V	207V	203V	204V	205V	200I	208I	201I	206I	209I	202I	207I	203I
10-30%	210V	218V	211V	216V	219V	212V	217V	213V	214V	215V	210I	218I	211I	216I	219I	212I	217I	213I
20-40%	220V	228V	221V	226V	229V	222V	227V	223V	224V	225V	220I	228I	221I	226I	229I	222I	227I	223I
30-50%	230V	238V	231V	236V	239V	232V	237V	233V	234V	235V	230I	238I	231I	236I	239I	232I	237I	233I
40-60%	240V	248V	241V	246V	249V	242V	247V	243V	244V	245V	240I	248I	241I	246I	249I	242I	247I	243I
50-70%	250V	258V	251V	256V	259V	252V	257V	253V	254V	255V	250I	258I	251I	256I	259I	252I	257I	253I
60-80%	260V	268V	261V	266V	269V	262V	267V	263V	264V	265V	260I	268I	261I	266I	269I	262I	267I	263I
70-90%	270V	278V	271V	276V	279V	272V	277V	273V	274V	275V	270I	278I	271I	276I	279I	272I	277I	273I
80-100%	280V	288V	281V	286V	289V	282V	287V	283V	284V	285V	280I	288I	281I	286I	289I	282I	287I	283I
0-30%	300V	308V	301V	306V	309V	302V	307V	303V	304V	305V	300I	308I	301I	306I	309I	302I	307I	303I
10-40%	310V	318V	311V	316V	319V	312V	317V	313V	314V	315V	310I	318I	311I	316I	319I	312I	317I	313I
20-50%	320V	328V	321V	326V	329V	322V	327V	323V	324V	325V	320I	328I	321I	326I	329I	322I	327I	323I
30-60%	330V	338V	331V	336V	339V	332V	337V	333V	334V	335V	330I	338I	331I	336I	339I	332I	337I	333I
40-70%	340V	348V	341V	346V	349V	342V	347V	343V	344V	345V	340I	348I	341I	346I	349I	342I	347I	343I
50-80%	350V	358V	351V	356V	359V	352V	357V	353V	354V	355V	350I	358I	351I	356I	359I	352I	357I	353I
60-90%	360V	368V	361V	366V	369V	362V	367V	363V	364V	365V	360I	368I	361I	366I	369I	362I	367I	363I
70-100%	370V	378V	371V	376V	379V	372V	377V	373V	374V	375V	370I	378I	371I	376I	379I	372I	377I	373I
0-40%	400V	408V	401V	406V	409V	402V	407V	403V	404V	405V	400I	408I	401I	406I	409I	402I	407I	403I
10-50%	410V	418V	411V	416V	419V	412V	417V	413V	414V	415V	410I	418I	411I	416I	419I	412I	417I	413I
20-60%	420V	428V	421V	426V	429V	422V	427V	423V	424V	425V	420I	428I	421I	426I	429I	422I	427I	423I
30-70%	430V	438V	431V	436V	439V	432V	437V	433V	434V	435V	430I	438I	431I	436I	439I	432I	437I	433I
40-80%	440V	448V	441V	446V	449V	442V	447V	443V	444V	445V	440I	448I	441I	446I	449I	442I	447I	443I
50-90%	450V	458V	451V	456V	459V	452V	457V	453V	454V	455V	450I	458I	451I	456I	459I	452I	457I	453I
60-100%	460V	468V	461V	466V	469V	462V	467V	463V	464V	465V	460I	468I	461I	466I	469I	462I	467I	463I
0-50%	500V	508V	501V	506V	509V	502V	507V	503V	504V	505V	500I	508I	501I	506I	409I	502I	507I	503I
10-60%	510V	518V	511V	516V	519V	512V	517V	513V	514V	515V	510I	518I	511I	516I	519I	512I	517I	513I
20-70%	520V	528V	521V	526V	529V	522V	527V	523V	524V	525V	520I	528I	521I	526I	529I	522I	527I	523I
30-80%	530V	538V	531V	536V	539V	532V	537V	533V	534V	535V	530I	538I	531I	536I	539I	532I	537I	533I
40-90%	540V	548V	541V	546V	549V	542V	547V	543V	544V	545V	540I	548I	541I	546I	549I	542I	547I	543I
50-100%	550V	558V	551V	556V	559V	552V	557V	553V	554V	555V	550I	558I	551I	556I	559I	552I	557I	553I
0-60%	600V	608V	601V	606V	609V	602V	607V	603V	604V	605V	600I	608I	601I	606I	609I	602I	607I	603I
10-70%	610V	618V	611V	616V	619V	612V	617V	613V	614V	615V	610I	618I	611I	616I	619I	612I	617I	613I
20-80%	620V	628V	621V	626V	629V	622V	627V	623V	624V	625V	620I	628I	621I	626I	629I	622I	627I	623I
30-90%	630V	638V	631V	636V	639V	632V	637V	633V	634V	635V	630I	638I	631I	636I	639I	632I	637I	633I
40-100%	640V	648V	641V	646V	649V	642V	647V	643V	644V	645V	640I	648I	641I	646I	649I	642I	647I	643I
0-70%	700V	708V	701V	706V	709V	702V	707V	703V	704V	705V	700I	708I	701I	706I	709I	702I	707I	703I
10-80%	710V	718V	711V	716V	719V	712V	717V	713V	714V	715V	710I	718I	711I	716I	719I	712I	717I	713I
20-90%	720V	728V	721V	726V	729V	722V	727V	723V	724V	725V	720I	728I	721I	726I	729I	722I	727I	723I
30-100%	730V	738V	731V	736V	739V	732V	737V	733V	734V	735V	730I	738I	731I	736I	739I	732I	737I	733I
0-80%	800V	808V	801V	806V	809V	802V	807V	803V	804V	805V	800I	808I	801I	806I	809I	802I	807I	803I
10-90%	810V	818V	811V	816V	819V	812V	817V	813V	814V	815V	810I	818I	811I	816I	819I	812I	817I	813I
20-100%	820V	828V	821V	826V	829V	822V	827V	823V	824V	825V	820I	828I	821I	826I	829I	822I	827I	823I
0-90%	900V	908V	901V	906V	909V	902V	907V	903V	904V	905V	900I	908I	901I	906I	909I	902I	907I	903I
10-100%	910V	918V	911V	916V	919V	912V	917V	913V	914V	915V	910I	918I	911I	916I	919I	912I	917I	913I
0-100%	000V	008V	001V	006V	009V	002V	007V	003V	004V	005V	000I	008I	001I	006I	009I	002I	007I	003I

Modifications and Specials

Consult factory for availability of modifications or products for custom applications. Allow a 2-4 week lead time for modified products. Minimum quantities and non-refundable engineering charges may apply.

Return Policy and Authorization

Before returning any product, please obtain a Return Materials Authorization number (RMA#) by calling Customer Service at 800-942-0315 or following instructions for service at www.api-usa.com. Include the RMA# and information regarding the reason for the return with the returned product.

Shipping costs for returns must be prepaid by the customer. For your protection, items must be carefully packed to prevent damage in shipment and insured against possible damage or loss. API will not be responsible for damage resulting from careless or insufficient packing or loss in transit.

Repairs

An RMA# must be obtained before any product can be returned. API will evaluate in-warranty products at no charge. API will evaluate out of warranty products for a nominal charge.

If API determines that the returned product is under warranty, it will repair the product or warranted parts thereof at no charge, or if unrepairable, replace it with the same or functionally equivalent product whenever possible.

API will return the warrantied product at its expense via a shipping method (carrier to be at sole discretion of API) equal to or faster than the method used by the customer.

Products or parts thereof not covered by warranty will be repaired or replaced at customer expense upon customer authorization. API will return the repaired product at customer expense via a shipping method (carrier to be at sole discretion of API) equal to or faster than the method used by the customer.

Cancellation and Restocking

A 20% restocking fee will be assessed on any cancelled order that has shipped or any product returned for credit. An RMA# must be obtained by the original purchaser before any product can be returned.

Only new unused products less than 6 months old may be returned. Installed, used, damaged, modified or customized products can not be returned for credit. API reserves the right to examine all returned products and determine type an amount of credit to be issued.

Warranty

Products manufactured or sold by Absolute Process Instruments Inc. (API) are warranted to be free from significant deviations in material and workmanship for the time period from date of purchase according to the product category below. During this time, and within the boundaries set forth in this warranty statement, API will, at its sole discretion, correct the product problem or replace the product.

API signal conditioners, alarms, transmitters:
Lifetime under terms stated herein.

This warranty shall not apply to product problems resulting from improper application, installation, incorrect wiring, operation outside of product specifications, abuse, misuse, unauthorized modification, accidents, power surges, power disruptions, power outages, static electricity, improper voltages or currents, inadequate site maintenance or preparation, acts of God, weather and its effects, lightning, floods, fire, earthquake, war, riots, military action, etc.

API products are not for use for, with, or in any medical devices or applications including, but not limited to, patient care, life support systems or medical research. API assumes no responsibility or liability for any loss or damages resulting from use of a API product in a medical or life support application. API products are not for use for, with, or in any hazardous environments.

This warranty is in lieu of all other warranties, expressed or implied, including but not limited to any implied warranty of merchantability, fitness, or adequacy for any particular purpose or use. API shall not be liable for any special, incidental, or consequential damages, whether in contract, tort, or otherwise. In no event shall API be liable for direct, indirect, special, incidental or consequential damages (including loss of profits or loss of time) resulting from the performance of an API product. In all cases, API liability will be limited to the original cost of the product in question.

API reserves the right to make improvements in design, construction, and appearance of products without notice. API may at its sole discretion discontinue support, warranty, or repair of products which it deems are obsolete or for which repair parts are no longer available.

No employee or agent of API has the authority to modify the terms of this warranty in any manner whatsoever without the express written permission of API.