

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

Quick Link: api-usa.com/4008

- 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

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

Common Mode Rejection

120 dB minimum

LoopTracker

Variable brightness LEDs indicate I/O level and status

DC 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 Logic

Normal

Output Calibration

Multi-turn zero and span potentiometers
 ±15% of span adjustment range typical

Output Loop Power Supply

20 VDC nominal, regulated, 25 mADC, <10 mVRMS max. ripple
 May be selectively wired for sinking or sourcing mA output

Output Test

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

Output Ripple and Noise

Less than 10 mVRMS

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
 1 millisecond typical with DF option

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



Applications Link
api-usa.com/apps

Free Factory I/O Setup!



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

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

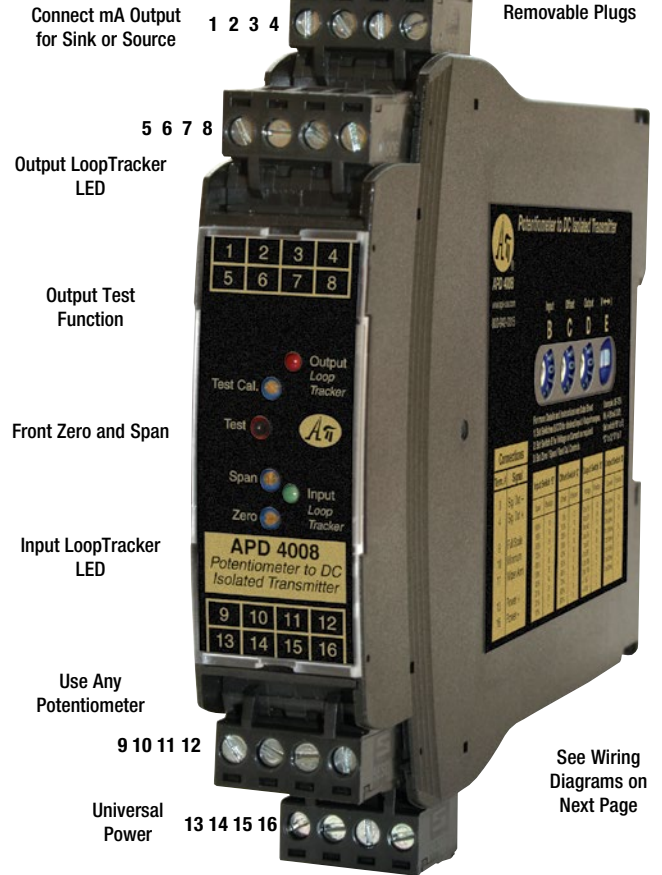
| Model | Input | Output | Power |
|------------|--|--|------------------------------------|
| APD 4008 | Field configurable—specify range if factory is to set switches | Field configurable—specify range if factory is to set switches | 85-265 VAC, 50/60 Hz or 60-300 VDC |
| APD 4008 D | | | 9-30 VDC or 10-32 VAC |

Options—add to end of model number

- DF** Fast response time, consult factory. DF option will cause output noise levels to be greater than standard specifications.
- U** Conformal coating for moisture resistance

Accessory—order as separate line item

API BP4 Spare 4-terminal plug, black



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

Range Selection

See model/serial number label for 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. Switch **D** controls output offset.

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

Electrical Connections

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

Input

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 |

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 or if it must be powered by the APD module.

Use a multi-meter to check for voltage at your device input terminals. Typical voltage may be in the range of 9 to 24 VDC. In this case, wire the device to module terminals 2 and 3.

| Type of Device for Output | - Terminal | + Terminal |
|--|------------|----------------------------------|
| Measuring/recording device accepts a voltage input. | 3 (-) | 4 (+) switch E set to "V" |
| 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" |
| Device accepts a mA (current) input and provides power to the current loop. | 2 (-) | 3 (+) switch E set to "I" |

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

Calibration

Front-mounted Zero and Span potentiometers are used to calibrate the output to compensate for load and lead variations.

Note: Perform the following calibration procedure any time switch settings are changed.

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 a minimum input to the module.
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. For example: 4 mA for a 4-20 mA output or -10 V for a ±10V output.
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.

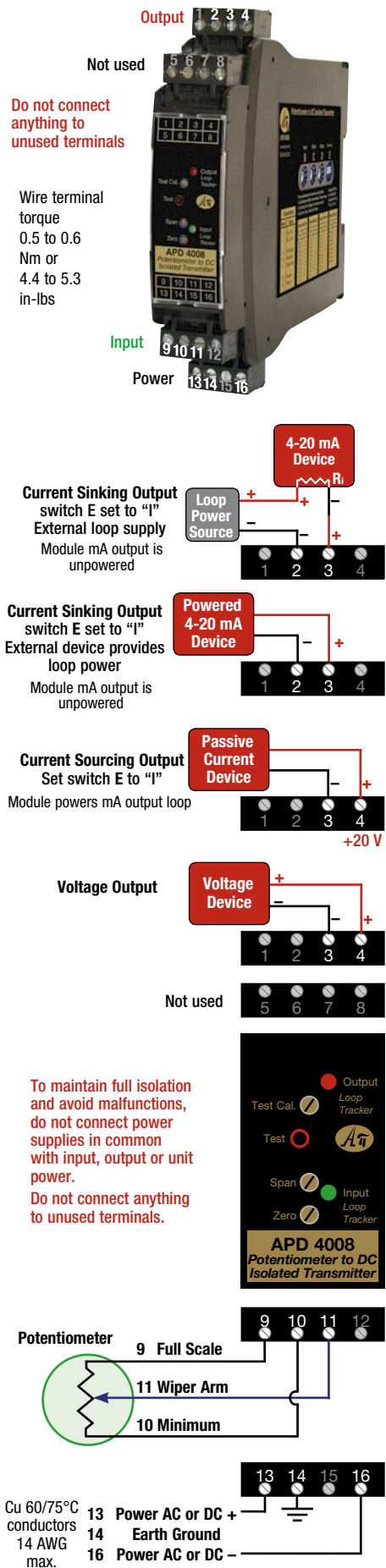
The resulting potentiometer wiper voltage is amplified and passed through an optical coupler to the output stage where it is scaled to the desired output range.

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.



APD 4008 Range Selection Table

The module side label lists common ranges. Use the table below for a complete selection of I/O ranges for your application. See the model/serial number label for module information, options, or if a custom range was specified.

Switch B controls the percent of potentiometer range to use.
 Switch C controls the percent of input offset.
 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.

It is generally easier to select ranges before installation.

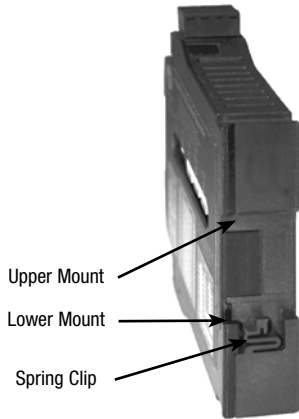
| Output | 0-1 V | 0-2 V | 0-4 V | 1-5 V | 0-5 V | 0-8 V | 2-10 V | 0-10 V | ±5 V | ± 10 V | 0-2 mA | 0-4 mA | 0-8 mA | 2-10 mA | 0-10 mA | 0-16 mA | 4-20 mA | 0-20 mA |
|----------|-------|-------|-------|-------|-------|-------|--------|--------|------|--------|--------|--------|--------|---------|---------|---------|---------|---------|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

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.

Precautions

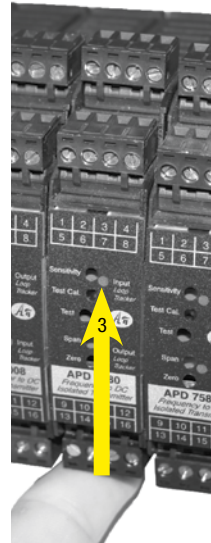
WARNING! Avoid shock hazards! Turn signal input, output, and power off before connecting or disconnecting wiring, or removing or installing module.



Installation



1. Tilt front of module downward and position against DIN rail.
2. Clip Lower Mount to bottom edge of DIN rail.

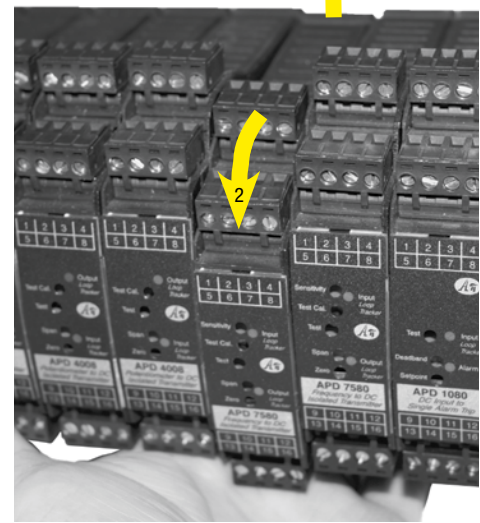



3. Push front of module upward until Upper Mount snaps into place.

Removal

Avoid shock hazards! Turn signal input, output, and power off before removing module.

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






Potentiometer to DC Isolated Transmitter

APD 4008
www.api-usa.com
800-942-0315


Input

B




Offset

C




Output

D



Output

E



V ← I

For more Details and Instructions see Data Sheet

1. Set Switches B/C/D for desired Input / Output ranges.
2. Set Switch E for Voltage or Current as required.
3. Set Zero / Span / Test Cal. Controls

Connections

| Term. # | Signal |
|---------|------------|
| 3 | Sig. Out - |
| 4 | Sig. Out + |
| 9 | Full Scale |
| 10 | Minimum |
| 11 | Wiper Arm |
| 13 | Power + |
| 16 | Power - |

| Input Switch 'B' | | Offset Switch 'C' | | Output Switch 'D' | | Output Switch 'D' | |
|------------------|----------|-------------------|----------|-------------------|----------|-------------------|----------|
| Span | Position | Offset | Position | Voltage | Position | Current | Position |
| 100% | 0 | 0% | 0 | 0 to 1V | 0 | 0 to 2mA | 0 |
| 80% | 9 | 10% | 1 | 0 to 2V | 8 | 0 to 4mA | 8 |
| 60% | 8 | 20% | 2 | 0 to 4V | 1 | 0 to 8mA | 1 |
| 40% | 7 | 30% | 3 | 0 to 5V | 9 | 0 to 10mA | 9 |
| 20% | 6 | 40% | 4 | 0 to 10V | 6 | 0 to 20mA | 6 |
| 10% | 5 | 50% | 5 | 0 to 8V | 2 | 0 to 16mA | 2 |
| | 4 | 60% | 6 | 0 to 10V | 3 | 0 to 20mA | 3 |
| | 3 | 70% | 7 | 2 to 10V | 7 | 4 to 20mA | 7 |
| | 2 | 80% | 8 | +/- 5V | 4 | | |
| | 1 | 90% | 9 | +/- 10V | 5 | | |

Example: 25-75% IN, 4-20mA OUT:
Set switch "B" to 5;
"C" to 2; "D" to 7