DMD4008, DMD4008-DC Potentiometer To DC Isolated Signal Conditioners

User's Guide

M-5246/1114

Model	Module Power
DMD4008	85-265 VAC, 50/60 Hz or 60-300 VDC
DMD4008-DC	9-30 VDC or 10-32 VAC

Description

The DMD4008 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 DMD4008 will accept any potentiometer with a value of 0-100 Ω through 0-1 MΩ without recalibration and without affecting accuracy. A stable 1 VDC source excites the potentiometer. The voltage division ratio is measured using the three input connections. This measurement method allows the use of almost any potentiometer without the need for calibration.

The DMD4008 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. Zero and span potentiometers are provided to fine-tune the output signal.

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

Sinking/sourcing versatility allows the DMD4008 to produce a powered or unpowered mA output allowing it to work with unpowered or powered mA devices respectively.

The DMD4008 has a 20 VDC loop excitation supply available for mA outputs. This power supply can be used to power a passive mA device. If the mA device receiving the output signal already provides loop power, the DMD4008 output can be wired as a passive output.

LED Indicators

Two LEDs (green for input, red for output) 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 output test button provides 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.

Potentiometer Input Ranges

Minimum: 0-100 Ω
Maximum: 0-1 MΩ

Field selectable switch settings for percent of range and offset
Input span: 10-100% of potentiometer range
Input offset: 0-90% in 10% increments

Input Excitation

Stabilized 1 VDC

Input Measurement Method

Voltage division ratio
3 wire connection required

Input Impedance

10 MΩ minimum

LED Indicators

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 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

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

85-265 VAC, 50/60 Hz or 60-300 VDC, 2 W maximum
DC version: 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

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 DMD4008 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 diagrams for terminal designations and wiring examples.

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

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

DMD4008:	85-265 VAC, 50/60 Hz or 60-300 VDC
DMD4008-DC:	9-30 VDC or 10-32 VAC 50/60 Hz

Signal Input Terminals

The potentiometer must be connected to all three signal input terminals as shown. The DMD4008 utilizes a stable 1 VDC source to excite the potentiometer.

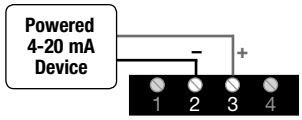
Potentiometer Input	Terminal
Full scale or high side of potentiometer	**9** (+1 VDC)
Zero or low end of potentiometer	**10 (–)**
Potentiometer wiper arm	**11**

Signal Output Terminals

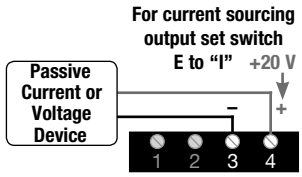
Polarity must be observed for output wiring connections. If the output does not function, check switch settings and wiring polarity.

If your device requires a current input, determine if it provides power to the current loop or if it must be powered by the module. Use a multi-meter to check for voltage at the input terminals of your device. Typical voltage may be in the range of 9 to 24 VDC. In this case, wire the device to module terminals 2 and 3.

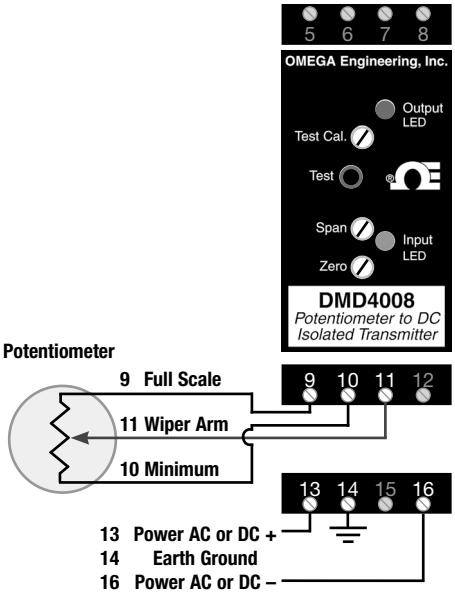
Type of Device for Output	– Terminal	+ Terminal
Measuring/recording device accepts a voltage input.	**3 (–)**	**4** (+) switch E set to "V"
Measuring/recording device accepts a mA (current) input and is unpowered or passive. Module provides the loop power.	**3 (–)**	**4** (+20 V) switch E set to "I"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



Current Sinking Output



Voltage or Current Sourcing Output



Mounting

The housing clips to a standard 35 mm DIN rail. The housing is IP40 rated and should be mounted inside a panel or enclosure.

Precautions

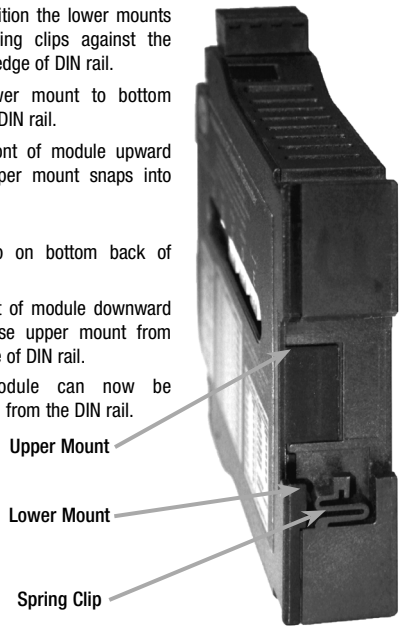
WARNING! Avoid shock hazards! Turn signal input, output, and power off before connecting or disconnecting wiring, or removing or installing module.

Installation

1. Tilt front of module downward and position the lower mounts and spring clips against the bottom edge of 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 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.



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 DMD4008 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 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 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.

DMD4008 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.

It is generally easier to select ranges before installation.

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

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 / 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	409I	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

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If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

PATENT NOTICE: U. S. Pat. No. 6,074,089; 5,465,838 / Canada 2,228,333; 2,116,055 / UK GB 2,321,712 / Holland 1008153 / Israel 123052 / France 2 762 908 / EPO 0614194. Other patents pending.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:
1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR NON-WARRANTY REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:
1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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