DMD4059
DMD4059-DC
Strain Gauge to DC Isolated Transmitter
M-5000/0219

Model	Power
DMD4059	85-265 VAC, 50/60 Hz or 60-300 VDC
DMD4059-DC	9-30 VDC or 10-32 VAC

Description
The DMD4059 accepts an input from one to four strain gauges, bridge sensors, load cells, or pressure transducers. It filters, amplifies, and converts the resulting millivolt signal into the selected DC voltage or current output that is linearly related to the input.

The full 3-way (input, output, power) isolation makes this module useful for ground loop elimination and signal isolation.

The adjustable excitation power supply generates a stable source of voltage to drive from one to four 350 Ω (or greater) devices. Sense lead circuitry is included to cancel the effects of leadwire resistance.

Input, output, excitation and zero offset (up to ±100% of span) are field configurable. Non-interactive zero and span simplifies calibration.

A 20 VDC loop excitation supply for the output can be selectively wired to power passive mA devices.

A green input LED and a red output LED vary in intensity with changes in the process input and output signals.

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.

Strain Gauge Input Ranges
100 Ω to 10,000 Ω bridges at 10 VDC
Up to four 350 Ω bridges at 10 VDC

Minimum:	0 to 5 mV range	0.5 mV/V sensitivity
Maximum:	0 to 400 mV range	40 mV/V sensitivity

Millivolt output range is determined by the sensor sensitivity (mV/V) and the excitation voltage:
mV/V sensitivity X excitation voltage = total mV range

Input Impedance
200 kΩ typical

Common Mode Rejection
100 dB minimum

Calibration Resistor Options
M01 option: Switch with calibration resistor inside module. Specify resistor value.
M02 option: Switch for external (load cell) calibration resistor.

Excitation Voltage

Switch Selectable:	0-10 VDC in 1 V increments
Maximum Output:	10 VDC maximum at 120 mA
Drive Capability:	Up to four 350 Ω bridges at 10 VDC
Fine Adjustment:	±5% via multi-turn potentiometer
Stability:	±0.01% per °C

Sense Lead Compensation
Better than ±0.01% per 1 Ω change in leadwire resistance
Maximum leadwire resistance: 10 Ω with 350 Ω at 10 VDC

LoopTracker
Variable brightness LEDs for input/output loop level and status

DC Output Ranges

Voltage (10 mA max.):	0-1 VDC	to	0-10 VDC
Bipolar Voltage (±10 mA max.):	±5 VDC	or	±10 VDC
Current:	0-2 mADC	to	0-20 mADC

Compliance, drive at 20 mA: 20 V, 1000 Ω drive
Current output can be selectively wired for sink or source

Output Calibration
Multi-turn zero and span potentiometers
±15% of span adjustment range typical
Zero offset switch: ±100% of span in 15% increments

Output Test
Sets output to test level when pressed
Adjustable 0-100% of span
Not available with M01 or M02 options

Output Ripple and Noise
Less than 10 mVRMS ripple and noise

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 (14.2 Hz)
DF option: 10 millisecond (100 Hz) response time typical (output noise will exceed specifications)
Contact factory for custom response times

Isolation
1200 VRMS min.
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

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

Power

Standard:	85-265 VAC, 50/60 Hz or 60-300 VDC
D option:	9-30 VDC (either polarity) or 10-32 VAC
Power:	2 to 5 Watts depending on number of load cells

OMEGA™
User's Guide

Range Selection

Rotary switches and a slide switches on the side of the module are used to select input and output ranges to match your application.

Switch A: Excitation voltage
Switch B: Input range
Switch C: Input offset (see table on next page)
Switch D: Output range
Switch E : Set to "V" for voltage output or
Set to "I" for current output

It is generally easier to select ranges before installing the module on the DIN rail. The tables below list available settings, ranges, and offsets. The module side label lists common ranges.

Determine how much output in millivolts the load cell will produce at full load. Multiply the manufacturer's mV/V sensitivity specification by the applied excitation voltage.

For example, a load cell rated for 3 mV/V sensitivity using 10 VDC excitation will produce an output of 0 to 30 mV for load variations from 0 to 100%.

3 mV/V sensitivity X 10 VDC excitation = 30 mV range

Excitation Voltage Setup

Refer to the sensor manufacturer's recommendations to determine what excitation voltage to use.

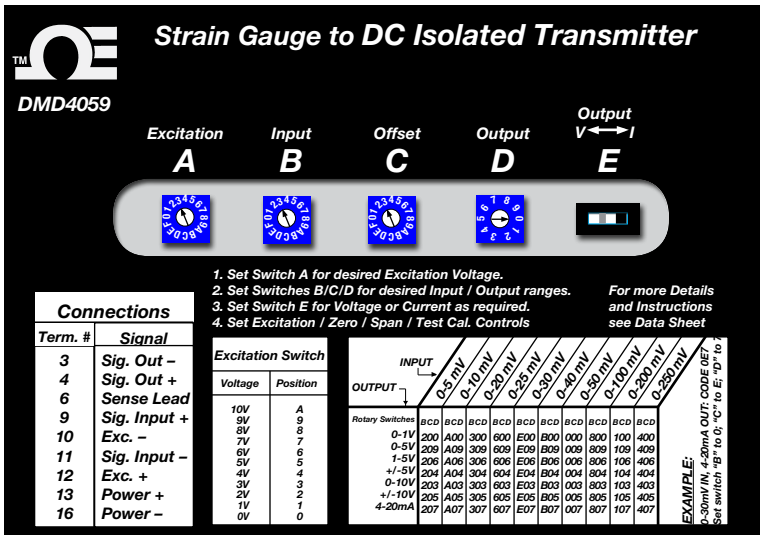
Set Excitation rotary switch A to desired excitation voltage.

After installation the excitation fine adjust potentiometer may be used to precisely trim this voltage, if desired.

Excitation	Switch A
10 V	A
9 V	9
8 V	8
7 V	7
6 V	6
5 V	5
4 V	4
3 V	3
2 V	2
1 V	1
0 V	0

I/O Range Selection B, C, D, E

1. From the table below, find the rotary switch combination that matches your I/O ranges and set rotary switches B, C, and D.
2. Set switch E to "V" for voltage output or "I" for current output.
3. For ranges that fall between the listed ranges use the next highest setting and trim the output signal with the zero and span potentiometers as described in the Calibration section.



Using Offset Switch C

Offset switch C allows canceling or taring of non-zero deadweights or other sensor offsets such as:

- Compensate for tare weights or scale deadweight to get zero output when a load is on the platform.
- Compensate for low-output sensors (e.g., less than 1 mV/V) that may have large zero offsets. Switch C can realign the zero control so it has enough range to produce the desired zero output.
- Raising the offset to allow calibration of bipolar sensors such as ±10 mV.
- Lowering the offset to compensate for elevated input ranges such as 10-20 mV.

1. Switch C does not interact with any other switch and is the only switch needed to correct zero offsets. Its only purpose is to adjust or cancel effects of the low end of the input range not corresponding nominally to 0 mV. Setting this switch to "0" results in no offset.
2. To RAISE the output zero, rotate switch C from "1" thru "7", until the Zero control can be set for your application.
3. To LOWER the output zero, rotate switch C from "9" thru "F", until the Zero control can be set for your application.
4. After all switches are set, repeat the calibration procedure.

Offset % of Span	Switch C
105%	7
90%	6
75%	5
60%	4
45%	3
30%	2
15%	1
0%	0
–15%	9
–30%	A
–45%	B
–60%	C
–75%	D
–90%	E
–105%	F

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
0-5 mV	200V	208V	201V	206V	209V	202V	207V	203V	204V	205V	200I	208I	201I	206I	209I	202I	207I	203I
0-10 mV	A00V	A08V	A01V	A06V	A09V	A02V	A07V	A03V	A04V	A05V	A00I	A08I	A01I	A06I	A09I	A02I	A07I	A03I
0-20 mV	300V	308V	301V	306V	309V	302V	307V	303V	304V	305V	300I	308I	301I	306I	309I	302I	307I	303I
0-25 mV	600V	608V	601V	606V	609V	602V	607V	603V	604V	605V	600I	608I	601I	606I	609I	602I	607I	603I
0-30 mV	E00V	E08V	E01V	E06V	E09V	E02V	E07V	E03V	E04V	E05V	E00I	E08I	E01I	E06I	E09I	E02I	E07I	E03I
0-40 mV	B00V	B08V	B01V	B06V	B09V	B02V	B07V	B03V	B04V	B05V	B00I	B08I	B01I	B06I	B09I	B02I	B07I	B03I
0-50 mV	000V	008V	001V	006V	009V	002V	007V	003V	004V	005V	000I	008I	001I	006I	009I	002I	007I	003I
0-100 mV	800V	808V	801V	806V	809V	802V	807V	803V	804V	805V	800I	808I	801I	806I	809I	802I	807I	803I
0-120 mV	F00V	F08V	F01V	F06V	F09V	F02V	F07V	F03V	F04V	F05V	F00I	F08I	F01I	F06I	F09I	F02I	F07I	F03I
0-200 mV	100V	108V	101V	106V	109V	102V	107V	103V	104V	105V	100I	108I	101I	106I	109I	102I	107I	103I
0-250 mV	400V	408V	401V	406V	409V	402V	407V	403V	404V	405V	400I	408I	401I	406I	409I	402I	407I	403I
0-300 mV	C00V	C08V	C01V	C06V	C09V	C02V	C07V	C03V	C04V	C05V	C00I	C08I	C01I	C06I	C09I	C02I	C07I	C03I
0-400 mV	900V	908V	901V	906V	909V	902V	907V	903V	904V	905V	900I	908I	901I	906I	909I	902I	907I	903I

Electrical Connections

Check white model/serial number label for module operating voltage to make sure it matches available power.

WARNING! All wiring must be performed by a qualified electrician or instrumentation engineer. See diagram at right for terminal designations and wiring examples.

Avoid shock hazards! Turn signal input, output, and power off before connecting or disconnecting wiring. Connect I/O wiring before power wiring.

Module Power Terminals

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.

Signal Input Terminals

Connect up to 4 strain gauges or load cells. See manufacturer's specifications for wiring designations and wire color-coding. Polarity must be observed when connecting inputs.

CAUTION: Never short the excitation leads together. This will cause internal damage to the module.

Some bridges may have one or two sense leads. See manufacturer's specifications. Sense leads allow the DMD4059 to compensate for leadwire resistance effects. Observe polarity when connecting sense leads.

If no sense lead is used, jumper sense (+) terminal 6 and excitation (+) 12.

Calibration should be done after all connections are made.

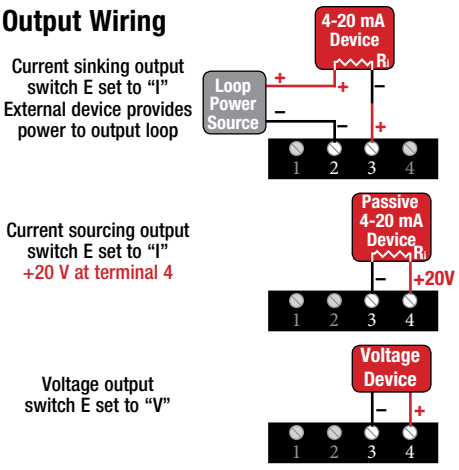
Signal Output Terminals

Polarity must be observed when connecting the signal output.

The DMD4059 output can be wired to provide either a sinking or sourcing mA output. If your device accepts a current input, determine if it provides power to the current loop or if it must be powered by the DMD4059 module.

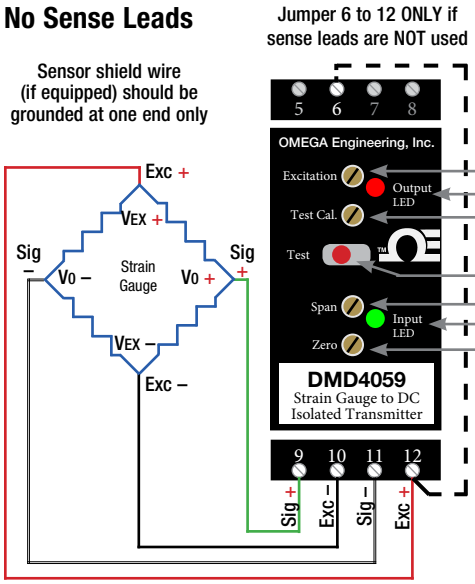
Use a multi-meter to check for voltage at your device's input terminals. Typical voltage may be 9-24 VDC. See the wiring diagram for the appropriate connections.

Output Wiring



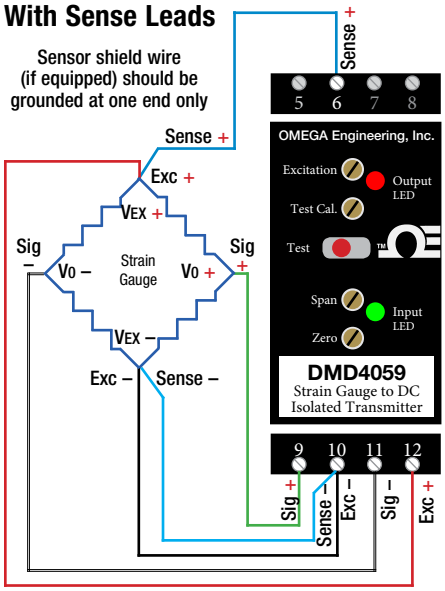
Device Connected to Output	Terminal	Terminal	Switch E
Voltage input	3 (–)	4 (+)	V
Passive mA (current) input. Module provides loop power	3 (–)	4 (+20 V)	I
mA (current) input device that provides loop power.	2 (–)	3 (+)	I

No Sense Leads

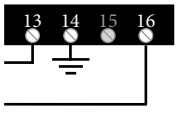


Excitation Voltage Trim
Variable Brightness Output Indicator
Output Test Level Adjust
Push to Test Output
Output Span Calibration
Variable Brightness Input Indicator
Output Zero Calibration

With Sense Leads



Module Power



Calibration

The Zero, Span, and Excitation potentiometers are used to calibrate the output.

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

This calibration procedure does not account for offsets or tare weights. If your system has an offset, tare weight or deadweight, refer to the "Using Offset Switch C" procedure.

To achieve optimum results, the system should be calibrated using an accurate bridge simulator, pressure calibrator, or calibration weights depending on the application.

1. Apply power to the module and allow a minimum 20 minute warm up time.
2. Using an accurate voltmeter across terminals 10 and 12, adjust the excitation voltage potentiometer for the exact voltage desired.
3. Provide an input to the module equal to zero or the minimum input required for the application (for example, 4 mA for a 4-20 mA output or –10 V with a ±10V output).
4. Using an accurate measurement device for the module output, adjust the Zero potentiometer for the exact minimum output signal desired. The Zero control should only be adjusted when the input signal is at its minimum.
5. Set the input at maximum, and 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.
6. Repeat the zero and span calibration for maximum accuracy.

Output Test Function

When the test button is depressed it will drive the output 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.

Installation Precautions

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

Mounting to a DIN Rail

The housing clips to a standard 35 mm DIN rail. The housing is IP40 rated and requires a protective panel or enclosure.

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.

Operation

Strain gauges and load cells are normally passive devices that are commonly referred to as "bridges" due to their four-resistor Wheatstone bridge configuration. These sensors require a precise excitation source to produce an output that is directly proportional to the load, pressure that is applied to the sensor.

The exact output of the sensor (measured in millivolts) is determined by the sensitivity of the sensor (mV/V) and the excitation voltage applied.

An additional input, the sense lead, monitors the voltage drop in the sensor leads and automatically compensates the excitation voltage at the module in order to maintain a constant excitation voltage at the sensor.

The DMD4059 provides the excitation voltage to the sensors and receives the resulting millivolt signal in return. This input signal is filtered and amplified, then offset, if required, and passed to the output stage. Depending on the output configuration selected, a DC voltage or current output is generated.

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.

Diagnostic Voltage Measurements

Using a meter with at least 10 megaohm input impedance, measure the voltage coming from the strain gauge at the locations shown. Sensitivity is measured in mV/V.

Positive Meter Lead	Negative Meter Lead	Meter Reading No pressure/load	Meter Reading Full pressure/load
+ Exc.	– Exc.	Excitation Voltage	Excitation Voltage
+ Sig.	– Exc.	+ ½ Excitation Voltage	½ Excitation Voltage + (½ x Excitation Voltage x Sensitivity)
– Sig.	– Exc.	+ ½ Excitation Voltage	½ Excitation Voltage – (½ x Excitation Voltage x Sensitivity)
+ Sig.	– Sig.	Zero Volts	Excitation Voltage x Sensitivity

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

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 in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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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.

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.

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