



PRODUCT OVERVIEW

The DMR35-DCA3 panel meter performs precision measurements of DC current supporting full-scale ranges 5A and 500A when used with a suitable [external shunt resistor](#). The 3-1/2 digit numeric display supports precision measurement, and a fast-responding 21 segment bargraph tracks quickly-changing measured values.

Rear-accessible DIP switches are provided for the selection of measurement range and display brightness.

The meter is powered from an external 9-32VDC power supply and typically requires only 37 mA when operated at 12V. The measurement inputs provide +/-48V of common-mode input range, simplifying the meter's use in a wide range of applications. The rugged polycarbonate housing is mountable in a round hole using supplied screws, and is designed as a mechanical drop-in replacement for many commonly available analog movement meters.

These meters are ideal for use in laboratory instrumentation, factory automation, and other applications requiring precise DC current monitoring.

Features

- Bright, easily readable LED display
- Up to 3-1/2 digit measurements
- Bar-graph display scale
- 0.8 % measurement accuracy
- Works with industry-standard external 50 millivolt-output shunt resistors
- Selectable current measurement ranges
- Unipolar/ Bipolar measurement options
- User-adjustable display brightness
- Mechanical drop-in replacement for common analog-movement meters
- Operates from 9 to 32 VDC
- Low current consumption, 37 mA typical at 12VDC
- RoHS Compliant
- Two year warranty

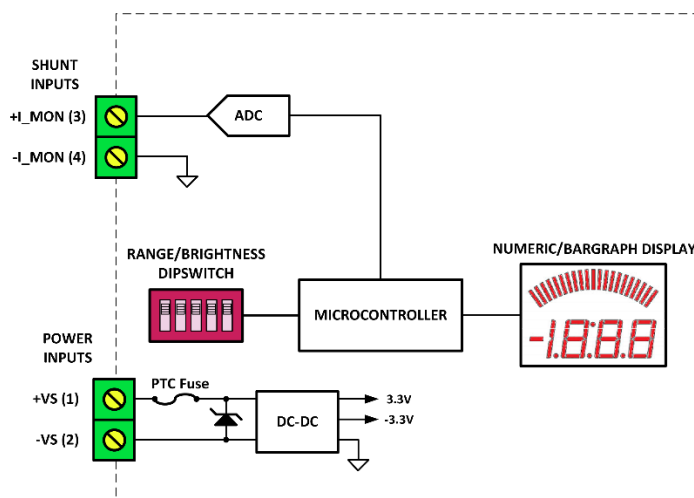
ORDERING INFORMATION:

MODEL NUMBER	DESCRIPTION
DMR35-DCA3-DC1-R	DC External Shunt Ammeter, 5-500A ranges, 9-32VDC powered, red display

External Shunt Resistors (not provided with meter)

Murata Model #	Full-scale Amps	Nominal resistance (mΩ at 25°C)
3020-01097-0	5A	10
3020-01107-0	20A	2.5
3020-01096-0	50A	1
3020-01099-0	100A	0.5
3020-01100-0	150A	0.33
3020-01101-0	200A	0.25
3020-01103-0	500A	0.1

SIMPLIFIED BLOCK DIAGRAM



For full details go to
www.murata-ps.com/rohs

SPECIFICATIONS:

Measurement Performance	Min	Typ.	Max	Units
Measurement Ranges	0-5, 0-10, 0-20, 0-50, 0-100, 0-150, 0-200, 0-500			A
Full-scale Shunt Input voltage	50			mV
Accuracy (25 °C)			0.8% Reading + 2 counts	
Temperature Stability		0.01		%F.S. /°C
Absolute Maximum Input Voltage (+I_MON to – I_MON, applied for 1 minute max.) ⁽¹⁾	-20		20	V
Absolute Maximum voltage differential (either +I_IN or –I_IN to –VS) ⁽¹⁾	-48		+48	V

Note Exceeding Absolute Maximum ratings may result in permanent damage to the meter.

Power Supply Characteristics	Min	Typ.	Max	Units
Operating Supply Voltage	9		32	V
Absolute Maximum Supply Voltage	-1		34	V
Operating Supply Current				
12V supply		37		mA
24V supply		25		mA

Display & User Interface

Display Type & Size	3-1/2 digit 7-segment, 11.4mm (0.45 in.) high 21 segment curved bar-graph			
Display Color	Red (625nm)			
Decimal Point Selection	Automatic			
Out-of-range Indication	Flashing display			
Measurement Range Selection	Dipswitch selectable (8 ranges)			
Display Intensity Control	Dipswitch selectable (4 ranges)			

Terminal Blocks

Wire Size	14-24 AWG
Insulation Strip Length	6mm (0.24 in.)
Screw Tightening Torque	0.4 N-m (3.5 lb.-in)

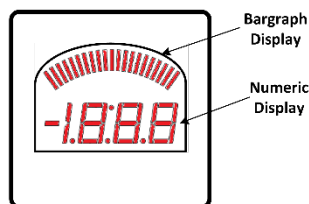
Mechanical/Environmental

Parameter	Min	Typ.	Max	Units
Operating Temperature	0		50	°C
Storage Temperature	-40		70	°C
Humidity (non-condensing)	0		85	%RH
Sealing (front face, when installed with included gasket)	Splash and dust resistant			
Mounting screws (4 included)	#4-20 0.5" thread forming			
Screw Tightening Torque	9 in-lb (1 N-m)			
Panel thickness when used with included mounting screws	0.062 in. (1.6mm)		0.25 in. (6.3mm)	
Dimensions	See Mechanical specifications figure for details			
Weight	2.3 (65)			oz. (g)

OPERATION:
Measurement Type and Capabilities

The DMR35-DCA3 digital ammeter employs a precision ADC and a low-power microcontroller to measure DC current when used with an external, user-supplied shunt resistor. The shunt resistor develops a small voltage in response to measured current. The DMR35-DCA3 works with industry-standard shunt resistors that provide 50mV of output voltage at their full-scale current rating. For example, a 100A shunt resistor with 0.5milliohms of resistance will develop 50mV across it when the full-scale input current of 100A is applied. This meter's measurement system supports a common-mode input voltage range of up to +/-48V with respect to the power supply return (-VS connection), simplifying high-side, low-side, and negative rail current measurements.

FRONT PANEL & FRONT PANEL LAYOUT AND FUNCTION

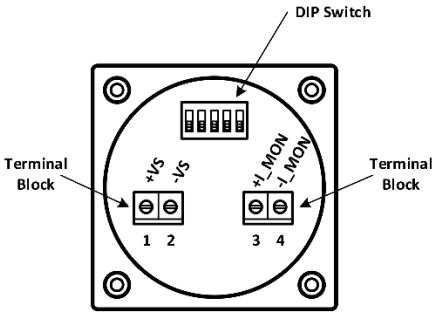


Bar-graph Display: The 21 segment bar-graph display responds quickly and smoothly like an analog meter movement to aid in reading rapidly changing measurements.

Numeric Display: The 3-1/2 digit display provides precise measurements for steady-state and slowly changing measurement values.

REAR PANEL LAYOUT AND SCREW TERMINAL CONNECTIONS

Four screw terminals are provided for power and measurement connections, as well as a 5-position DIP switch for meter configuration, as described below.

Rear Layout DM35-DCA1	Terminal #	Name	Function
	1	+VS	Power supply input terminals (9-32 VDC)
	2	-VS	
	3	+I_MON	Shunt resistor measurement input terminals
	4	-I_MON	
DIP Switch: Five individual switches support display intensity settings (SW1-SW2) and measurement range selection (SW3-SW5)			
Note: It is important to tighten all screw-terminals to their torque specifications. Proper tightening will help ensure reliable operation. Applications subject to vibration should use stranded wire.			

POWER SUPPLY CONNECTIONS

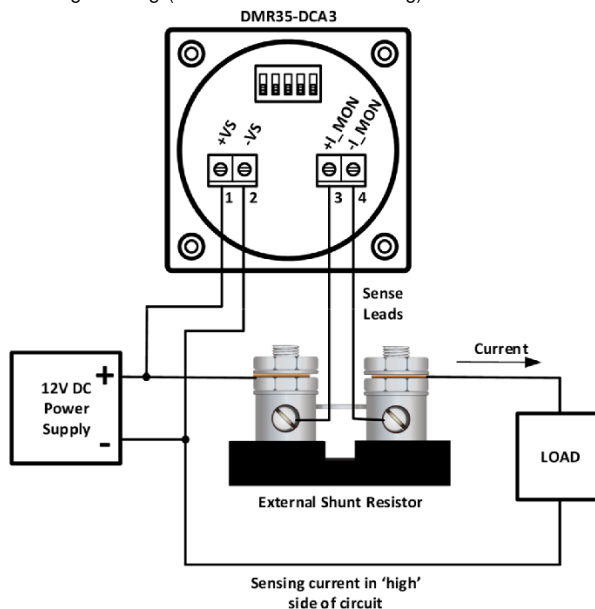
The meter is powered through the +VS and -VS terminals and requires a DC power supply which may range from 9VDC to 32VDC. This supply is electrically isolated from the meter's measurement electronics, so that the meter's measurement input terminals (+I_MON, -I_MON) do not need to be connected to the meter's power return terminal (-VS), and may vary as much as +/-48V from this connection. Please note that the meter's isolation barrier is intended only to simplify measurements, and not for safety purposes – the maximum voltage between the power supply terminals (+VS or -VS) and the measurement input terminals (+I_MON, -I_MON) must be limited to +/-48VDC. The DMR35-DCA3 incorporates protection against momentary applications of both overvoltage and reverse polarity to the power supply (+VS, -VS) terminals. Depending on regulatory and application requirements it may also be necessary for the user to add external fusing.

MEASUREMENT INPUTS

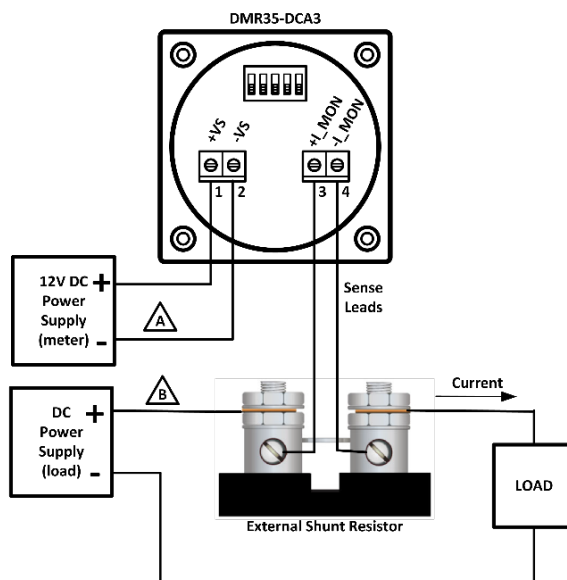
The DMR35-DCA3 does not directly perform current measurements, but measures a small (0-50mV) voltage signal developed when current is passed through an external shunt resistor. This shunt resistor must be inserted in the line in which current is to be measured. The shunt resistor's sense leads are then connected to the meter's +I_MON and -I_MON terminals, as shown in the connection examples described below. Unlike many panel meters, the DMR35-DCA3's measurement terminals are electrically isolated from the power supply terminals, supporting current measurements in which the shunt resistor's potential may be up to +/-48V different than the negative power supply terminal (-VS).

CONNECTION EXAMPLES

The schematic below shows how the DMR35-DCA3 can be used to perform a 'high-side' current measurement, where the associated shunt resistor is inserted into the load's positive leg. In this example, the meter is powered from the same power source powering the load, and the meter's current sensing terminals (+I_MON, -I_MON) are at a potential of 12 volts higher than the meter's negative power terminal (-VS). The meter can also just as easily be used to measure current in the load's negative leg ('low-side' current sensing).



It is also possible to use the meter to monitor voltage in a circuit that is independent of the meter's power supply circuit, as shown in the schematic below. When used in this way, the meter's current measuring terminals may electrically float with respect to its power supply terminals, as long as the voltage difference between the two terminal pairs remains within $\pm 48V$ of each other.



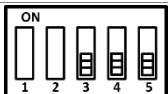
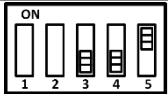
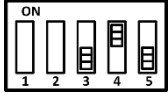
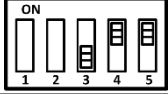
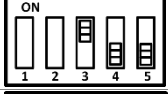
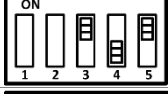
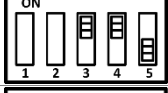
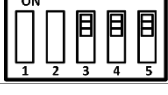
Note: The voltage between point A and point B must be within $\pm 48V$

METER CONFIGURATION

Meter Range Settings

DMR35 meter configuration is controlled through a 5-position DIP switch (SW1-SW5) on the rear of the meter. The individual switches are labelled 1 through 5 on the unit, and the ON position of the switches is also labelled. These switches are used to select both the meter's measurement range and the display intensity (brightness).

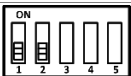
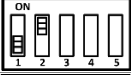
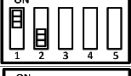
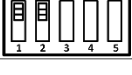
Switches SW3 through SW5 select the meter's measurement range, as shown in the table below. Suitable Murata shunt resistor models are shown for each supported measurement range.

Switch Setting				Range	Recommended Shunt Resistor	
SW 3	SW4	SW5	DIP switch		Resistance	Murata Model Number
OFF	OFF	OFF		0-5 A	10 mΩ	3020-01097-0
OFF	OFF	ON		0-10 A	5 mΩ	-
OFF	ON	OFF		0-20 A	2.5 mΩ	3020-01098-0
OFF	ON	ON		0-50 A	1 mΩ	3020-01096-0
ON	OFF	OFF		0-100 A	0.5 mΩ	3020-01099-0
ON	OFF	ON		0-150 A	0.33 mΩ	3020-01100-0
ON	ON	OFF		0-200 A	0.25 mΩ	3020-01101-0
ON	ON	ON		0-500A	0.10 mΩ	3020-01103-0

The DMR35-DCA3 performs unipolar measurements only, meaning that it will only read out positive values of current. Negative input values will result in an underflow condition of a flashing zero reading. Positive input values exceeding the maximum range will result in a flashing overflow condition. The bargraph will indicate a measurement of zero or less by illuminating the leftmost LED, and increasingly positive input values will illuminate the bargraph to the rightmost LED until all LEDs are illuminated at positive full-scale.

DISPLAY INTENSITY SETTINGS

Set the display intensity by setting switches SW1 and SW2 as shown:

SW1	SW2	Dipswitch	Display Intensity
OFF	OFF		Low
OFF	ON		Medium
ON	OFF		High
ON	ON		High ²

³ Provides only slightly higher intensity than 'High' setting

TECHNICAL NOTES



1. Calibration

The DMR35 is calibrated at the factory at manufacture. There are no user or field-adjustable calibration features.

2. Wiring

Power supply and input wiring must be rated for the electrical and environmental conditions under which the meter will be operated. They must also comply with any regulatory or application-mandated requirements pertaining to the user's installation. The terminal blocks can accommodate wire gauges ranging from #14 to #24. Wiring Insulation should be stripped to the proper length as described in Terminal Block specifications table (pg. 2), and wires must be inserted into the terminal block openings such that the screw terminal does not pinch any insulation. It is important to tighten all screw-terminals to their torque specification, which also may be found in the Terminal Block specifications table. Proper tightening will help ensure reliable operation. Applications subject to vibration should use stranded wire. After final assembly, inspect all terminal block connections for shorts between adjacent conductors; this step is especially important when using stranded wire.

3. Protection and Fusing

DMR35 meters' power supply leads (+VS, -VS) are protected against momentary overvoltage and reverse polarity conditions. Input terminals +I_MON and -I_MON are protected against noise and brief transients. Protection, however, is not provided against sustained conditions exceeding the limits listed in the Performance & Functional Specifications Table. External fusing must be supplied by the user in accordance to applicable safety and regulatory requirements for the system in which the DMR35 is installed.

4. Noisy Power Supplies

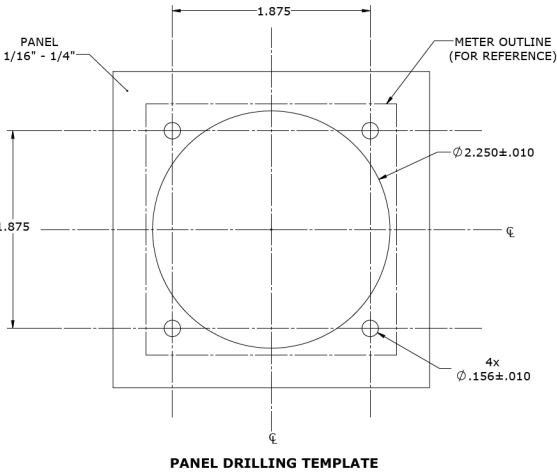
Some power supplies contain high-frequency switching devices that may conduct and/or radiate significant noise onto the low-level signal developed across the measurement inputs. Even though the DMR35 incorporates built-in input filtering, some portion of this noise may be amplified and subsequently measured by its sensitive input circuitry. Limiting runs of wire to less than 3 meters (10 feet) is strongly recommended. Also, in systems with noisy power supplies, connecting an external, non-polarized capacitor across the +VS and -VS inputs can help reduce measurement errors. In certain situations, the use of twisted pair or shield wiring may be required.

5. Self-Diagnostics

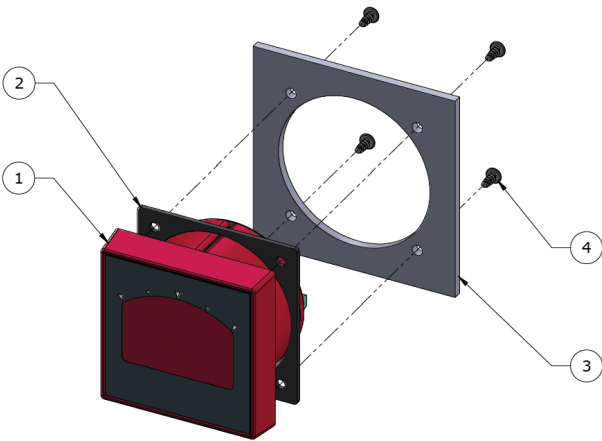
On power-on the meter performs a self-test and checks the integrity of calibration data stored in internal non-volatile memory. If the factory calibration data has been corrupted, the meter will display 'CAL' on power-on and approximately once a minute thereafter to indicate that the meter is relying on default calibration factors and that displayed measurements may have more than the datasheet-specified amount of error. If the meter detects other internal fault conditions, it will attempt to reset itself. Repeated restarts, which appear in the form of a highly intermittent display, are indicative of a hardware fault that cannot be cleared through a reset operation, in which case the meter should no longer be used.

PANEL INSTALLATION

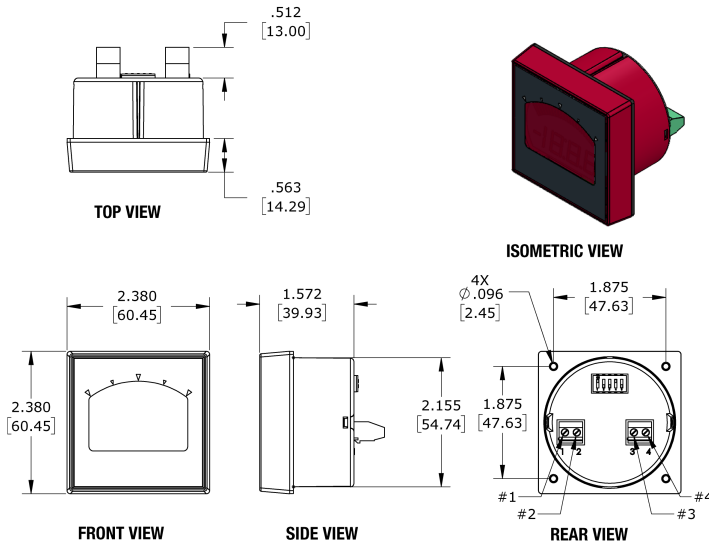
Panel Drill Template



Panel Mounting



MECHANICAL SPECIFICATIONS



DIMENSIONS ARE IN INCHES [mm]

TOLERANCES:
2 PLACE $\pm .01$ ANGLES: $\pm 0.5^\circ$
3 PLACE $\pm .005$

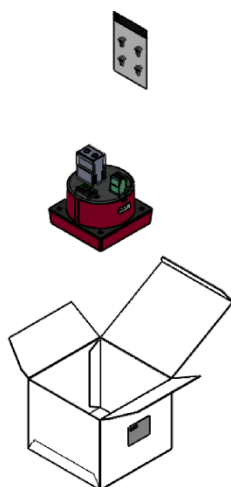
COMPONENTS SHOWN ARE FOR REFERENCE ONLY

MATERIAL:
HOUSING: POLYCARBONATE
GASKET: EPDM RUBBER

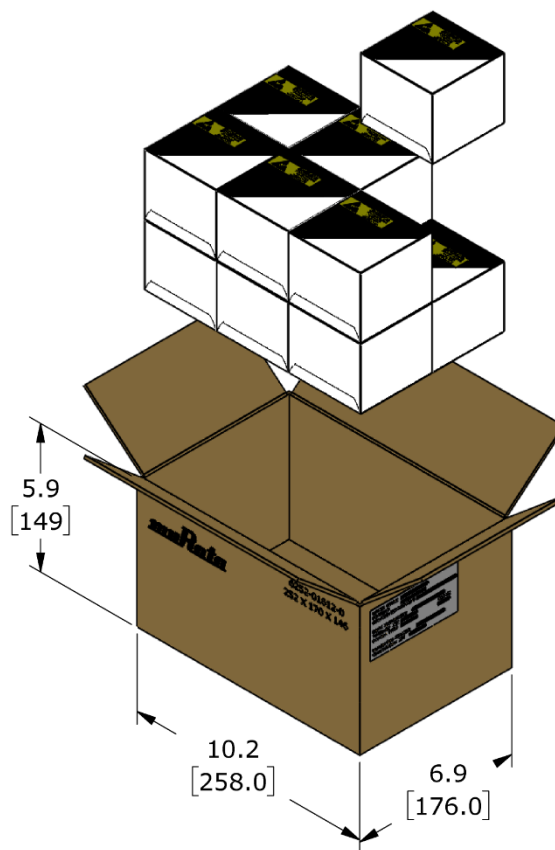


STANDARD PACKAGING

INDIVIDUAL PACKAGING (SHOWN FOR REFERENCE ONLY)



MOQ PACKAGING (12 UP)



DIMENSIONS ARE IN INCHES [mm]

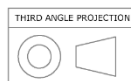
TOLERANCES:

2 PLACE $\pm .01$

ANGLES: $\pm 0.5^\circ$

3 PLACE $\pm .005$

COMPONENTS SHOWN ARE FOR REFERENCE ONLY.



SCALE: 1:12

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ISO 9001 and 14001 REGISTERED



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Refer to: <https://www.murata-ps.com/requirements/>

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