Mercury Displacement Relay - MDR Series

35A & 60A - Up to 3PST - N. O. or N.C. Contacts

LISTED
E52197

The **35** & **60** Amp Series products are **M**ercury **D**isplacement **R**elays - **MDR** for short. Hermetically sealed in welded stainless steel tubes containing triple distilled liquid mercury assure contact surfaces are freshly replenished with every contact movement. Provides protection from arcing and hazards from switching heavy loads.

- Mercury is self-renewing, cannot pit, weld, disintegrate or oxidize.
- Excellent for switching Resistive and Tungsten loads. They can also withstand high surges as well.
- Contact resistance is among the lowest available for any electromechanical relay.
- The MDR series offers superior long life performance.
- Products are available in 1, 2 or 3 poles rated at 35 or 60 Amps.
- Contacts can be Normally Open "A" or Normally Closed "B". They can also be mixed on the same 2 or 3 pole relays.
- Wire Terminated Tubes (instead of Terminals) are also available. Contact us for more info.
- DIN Rail Adapters also available. 1-pole =16-MDRDIN-1, for 2 or 3-pole = 16-MDRDIN-2/3

GENERAL SPECIFICATIONS (@ 25° C)

Contacts:	**35A**	**60A**
Contact Configuration	Up to 3PST	Up to 3PST
Contact Material	Liquid Mercury	Liquid Mercury
Contact Rating		
120 / 240VAC Resistive	35 Amp	60 Amp
28VDC Resistive	35 Amp	60 Amp
Motor 120VAC 1 Phase	5Hp	5Hp
Motor 240VAC 1 Phase	5Hp	10Hp
Contact Resistance, Initial	50 milliohms max @ 6VDC	50 milliohms max @ 6VDC
Coil:		
Coils Available	AC and DC	AC and DC
Nominal Coil Power	7 to 28VA 3 to 9W	7 to 28VA 3 to 9W
Input Voltage Tolerance - AC	85% to 110% of nominal	85% to 110% of nominal
Input Voltage Tolerance - DC	80% to 110% of nominal	80% to 110% of nominal
Drop-out voltge	10% of nominal	10% of nominal
Duty	Continuous	Continuous
Timing:		
Operate Time (max)	50ms	50ms
Release Time (max)	80ms	80ms
Dielectric Strength:		
Across Open Contacts	2650 VRMS	2650 VRMS
Between Mutally Insulated Points	2650 VRMS	2650 VRMS
Insulation Resistance	1000 megohms @ 500VAC	1000 megohms @ 500VAC
Temperature:		
Operating	-34 to 74°C (-30 to 165°F)	-34 to 74°C (-30 to 165°F)
Storage	-40 to 105°C (-40 to 221°F)	-40 to 105°C (-40 to 221°F)
Life Expectancy:		
Electrical (full load operations)	250,000	250,000
Mechanical (no load operations)	5,000,000	5,000,000
Miscellaneous:		
Mounting Position	Vertical within 10 degrees	Vertical within 10 degrees
Enclosure	Hermetically Sealed	Hermetically Sealed
Weight	Varies	Varies
Recom'd Min. Wire Size for rated load	#6 Copper	#4 Copper
Recom'd Min. Torque on Pwr. Terminals	36 in./lbs	50in./lbs

*Material safety data sheet available on request
*Dispose of properly

MANUFACTURED IN THE USA
Using an Imported subassembly

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Ordering Code M35 A 120VAC

Series
M35 Series = 35 Amp
M60 Series = 60 Amp

Contact Arrangement
A (1 N.O. tube)
AA (2 N.O. tube)
A AA (3 N.O. tube)
B (1 N.C. tube)
BB (2 N.C. tube)
BBB (3 N.C. tube)
(Mixed Combinations of A & B Tubes are available)

Coil Voltage
AC:12, 24, 120, 240 (Add VAC)
DC: 12, 24, 115-125, 250 (Add VDC)

CAUTION: Overheating of power terminals may occur if wires are not tightened to minimum torque values. This can result in catastrophic failure of the relay tube.

35A - Min. #6 Copper, 36 in./lbs 60A - Min. #4 Copper, 50 in./lbs.

CONTACTOR RATINGS FOR M35A - M35B

VOLTAGE	PHASE	HP		Motor / Induct. AMPS		RESISTIVE AMPS	TUNGSTEN AMPS
		1Ø	3Ø	1Ø	3Ø		
120VAC	1Ø 3Ø	3*	5*	34	30	35*	35*
240VAC	1Ø 3Ø	5*	7.5*	28	19	35*	17
480VAC	1Ø 3Ø	5*	10*	14	14	35*	9
600VAC	1Ø 3Ø	5*	10*	11.2	11	25 **	7
24VDC	DC	1/2		27		35*	35*
48VDC	DC	1/2		13.5		35*	35*
125VDC	DC	1/2		5.2		16*	16*
250VDC	DC	1/2		2.6		12*	12*

* UL and CSA Listed ** CSA only

CONTACTOR RATINGS FOR M60A - M60B

VOLTAGE	PHASE	HP		Motor / Induct. AMPS		RESISTIVE AMPS	TUNGSTEN	
		1Ø	3Ø	1Ø	3Ø		AMPS "A" (N.O.)	AMPS "B" (N.C.)
120VAC	1Ø 3Ø	3*	5*	34	30	60*	60*	45*
240VAC	1Ø 3Ø	5*	10*	28	28	60*	30	22.5
480VAC	1Ø 3Ø	7.5*	15*	21	21	60*	15	11.2
600VAC	1Ø 3Ø	7.5*	15*	16	17	50 **	12	9
24VDC	DC	3/4		39		60*	50*	50*
48VDC	DC	3/4		19.5		60*	50*	50*
125VDC	DC	3/4		7.4		40*	40*	40*
250VDC	DC	3/4		3.7		20*	20*	20*

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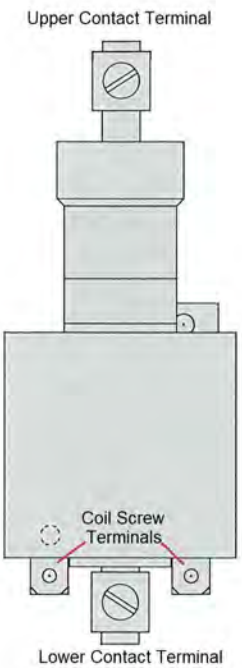
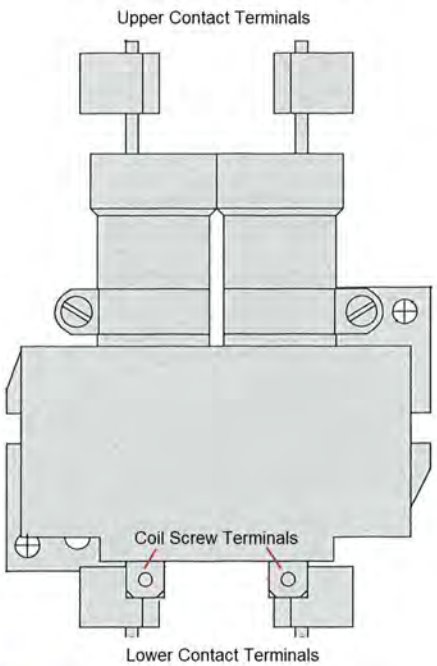
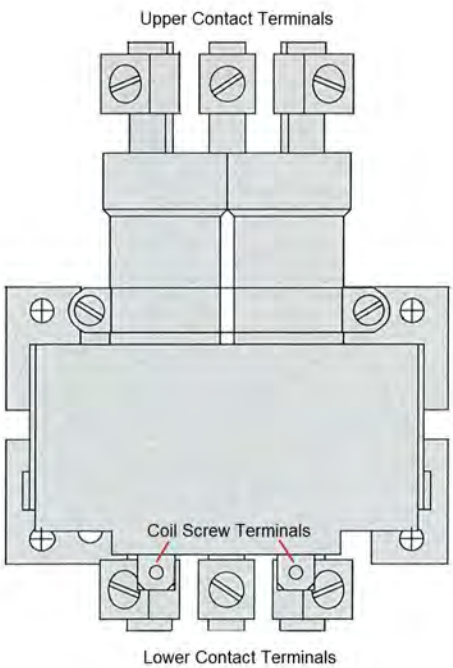
CAUTION: Overheating of power terminals may occur if wires are not tightened to minimum torque values. This can result in catastrophic failure of the relay tube.

35 & 60 Series Wiring

Not polarity sensitive







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Max Outline Dimensions

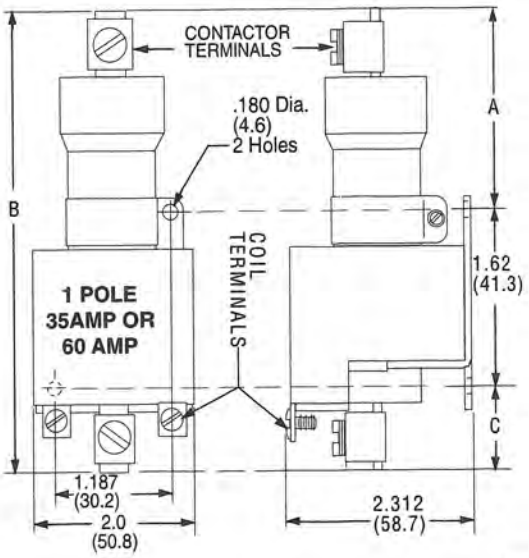
Dimensions shown in Inches and (millimeters)

***Note: SPST-NC** (Form B) –
The **Normally Closed Contact** style tube is positioned lower in the coil so the "Dimension A" in the chart is lower, but the overall height of the relay is remains the same.

Note: If mixed A & B tubes are used on the same relay, that will increase overall height of the relay.

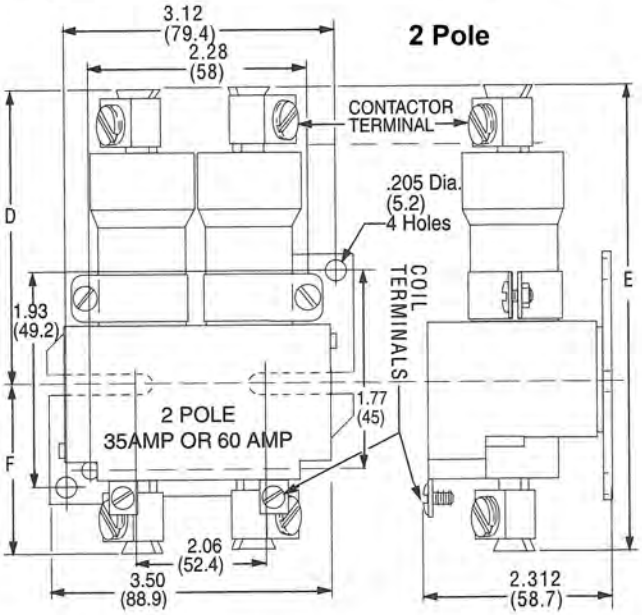
Outer and Mounting Dimensions		M60A-	M60B-	M35A-	M35B-
1 POLE	A	2.375 Max. (60.3)	1.50Max. * (38.1)	2.312 Max. (58.7)	1.375 Max. (34.9)
	B	5.06 Max. (128.52)	5.062 Max. (128.52)	4.875 Max. (123.8)	4.875 Max. (123.8)
	C	1.06 Max. (27)	1.937 Max. (49.2)	0.937 Max. (23.8)	1.875 Max. (47.6)
2 POLE	D	3.250 Max. (82.6)	2.281Max. (57.9)	3.187 Max. (81.0)	2.218 Max. (56.3)
	E	5.062 Max. (128.52)	5.062 Max. (128.52)	4.875 Max. (123.8)	4.875 Max. (123.8)
	F	1.812 Max. (46.0)	2.781 Max. (70.6)	1.687 Max. (42.9)	2.656 Max. (57.4)
3 POLE	G	3.250 Max. (82.6)	2.281 Max. (57.9)	3.187 Max. (81.0)	2.218 Max. (56.3)
	H	5.062 Max. (128.52)	5.062 Max. (128.52)	4.875 Max. (123.8)	4.875 Max. (123.8)
	J	1.812 Max. (46)	2.781 Max. (70.6)	1.687Max. (42.9)	2.656 Max. (67.4)

1 Pole



UP

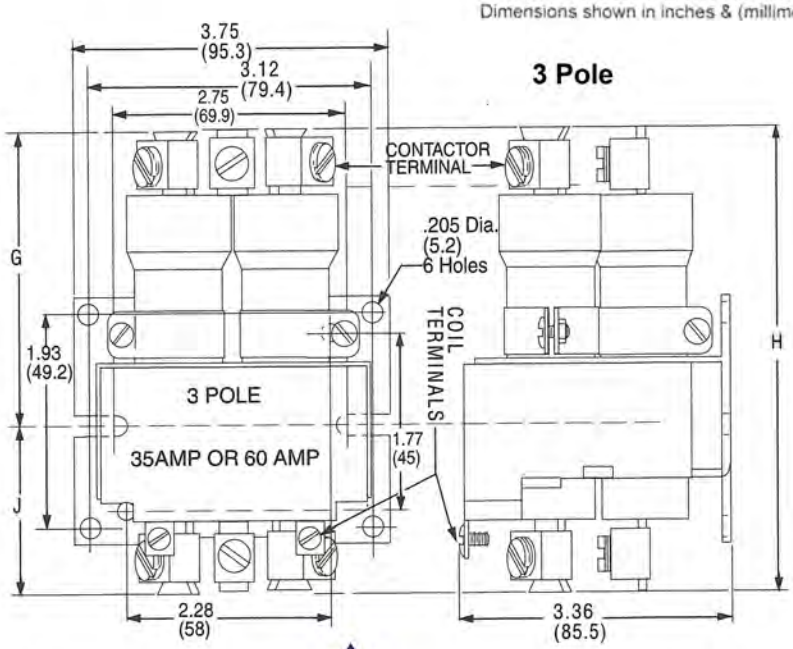
2 Pole



Max Outline Dimensions

Dimensions shown in inches & (millimeters)

3 Pole

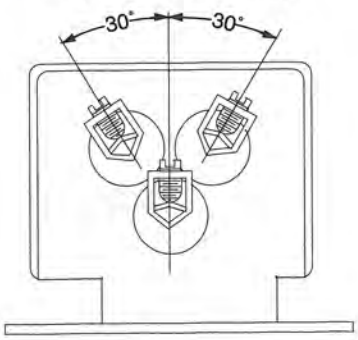


UP

***Normally closed tubes (B style) sit lower in coil assemblies**

3 Pole Top View

Angles for Reference only



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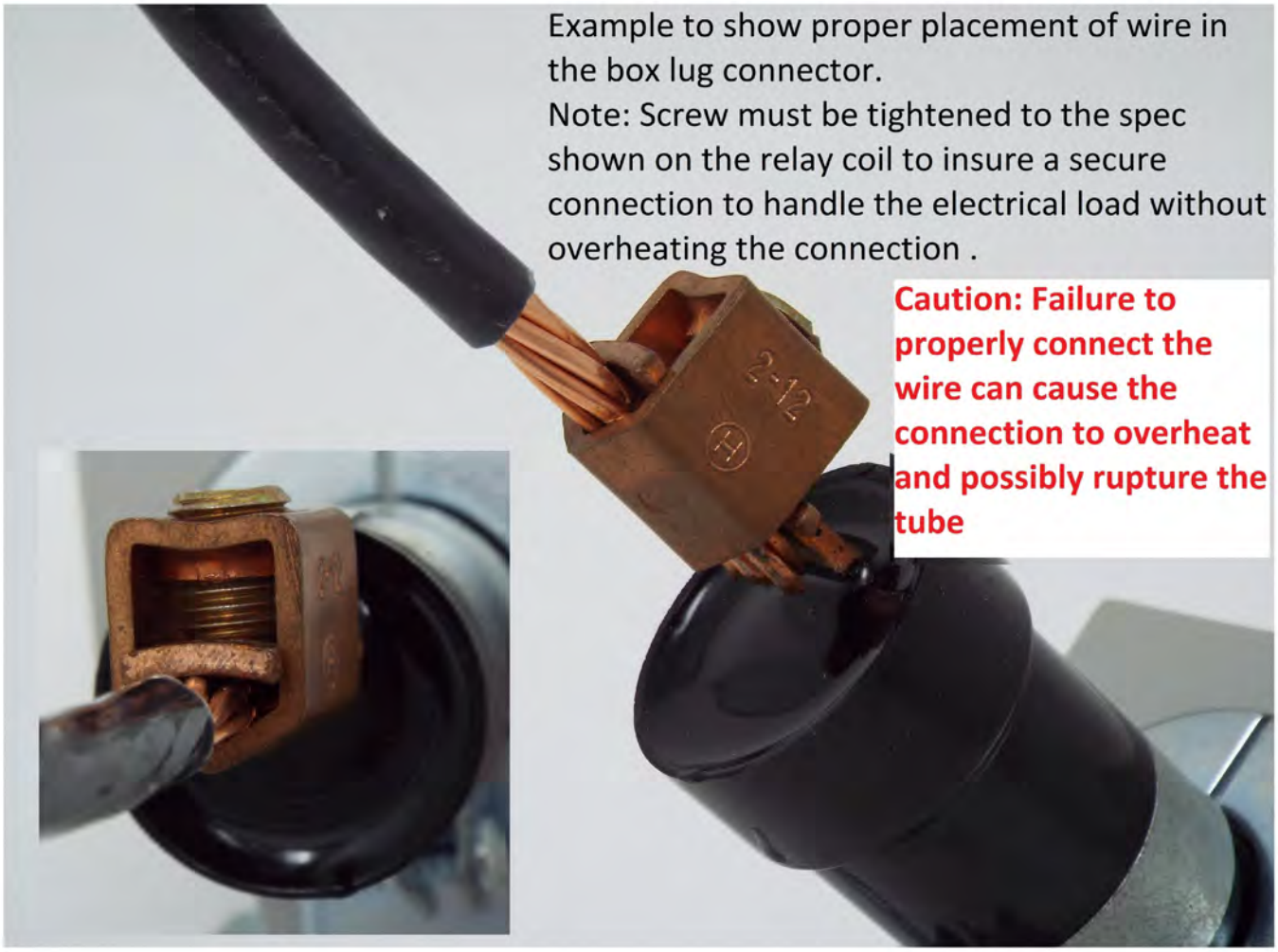
35 Amp Series

60 Amp Series

Important Wiring Note:



Example to show proper placement of wire in the box lug connector.

Note: Screw must be tightened to the spec shown on the relay coil to insure a secure connection to handle the electrical load without overheating the connection .

Caution: Failure to properly connect the wire can cause the connection to overheat and possibly rupture the tube

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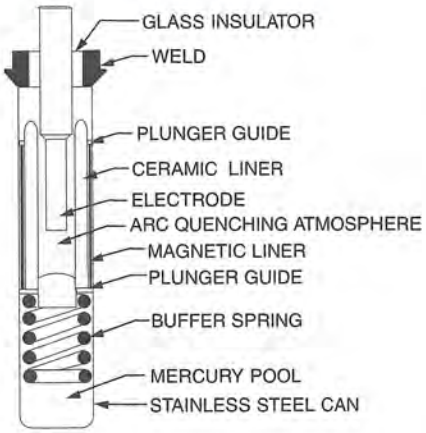
Application Data

MERCURY DISPLACEMENT TUBE



PRINCIPLE OF OPERATION

The sectional view shows our normally open style Mercury Displacement tube with the plunger assembly floating on the mercury pool.
When the coil power is off, the mercury level is below the electrode tip. No electrical path exists between the electrode and mercury pool.
When coil power is applied, the plunger is drawn down into the mercury by the pull of the magnetic field. This action raises the mercury level, so it covers the end of the electrode closing the circuit.
When coil power is turned off, the buoyant force of the mercury causes the plunger assemble to rise, dropping the mercury level, and breaking the circuit.

APPLICATION DATA

Mercury Displacement relays are ideal for adverse environments-

....Where high inrushes are encountered
....Where hermetically sealed contact operation is required because of corrosive, dirty, or moist ambient conditions.
....Where use does not permit contact maintenance.
....Where reduced noise levels are required.
....where minimum weight and size are desired.

DESIGN FEATURES

Liquid Mercury Contact - provides a new contact surface with every actuation. Mercury is self-renewing and does not pit, weld, disintegrate or oxidize.
Hermetic sealing - provides internal and external protection from arcing.
Inert Gas atmosphere - contactor tube is evacuated, then pressurized with a combination of gases which extinguish arcing and contribute to long life. The pressurized gases provide for a high dielectric withstanding voltage between contact surfaces.
Low Contact Resistance - Large electrode and mercury volume creates low contact resistance and provides high inrush current capability.
Quiet Operation - Switch clacking normally associated with conventional hard contactors, is eliminated with mercury displacement tubes and the buffer spring assembly.

APPLICATION OF "M" SERIES VS "ML" SERIES

The series "ML" is physically the same as the "M" series except for the type of gases used in the contactor tubes. The "ML" series was developed for use with resistive and tungsten loads on AC power ONLY. The "ML" series will give much greater life than the "M" series for these types of loads and is intended for high activation use, such as molding machines or ovens.
The "ML" series, however is not intended for use with motor loads on AC power, or for resistive, tungsten, or motor loads on DC power. The "M" series, which is our universal series is rated to be used on all types of loads resistive, tungsten, and motor for both AC and DC power

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