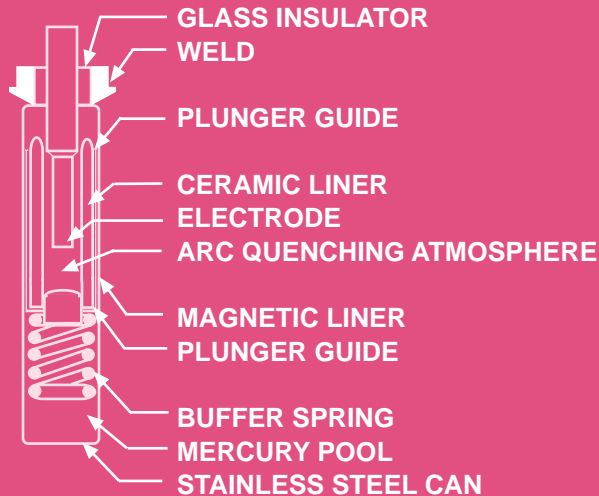


# APPLICATION DATA

## 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 assembly 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

Mercury Displacement Relays provide a perpetually self-renewing contact to assure maximum contact life and minimum contact resistance. Conventional contactors are destroyed by pitting and welding under high load conditions. MDR's have a single moving part that floats free on a pool of mercury. There are no hinges, pivots, pins or mechanical linkage to wear out or break. The result is a life expectancy which exceeds other types of comparable size contactors handling the same loads and duty cycle.

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.

## RECOMMENDED FUSE PROTECTION

MDR's are capable of accepting high inrush currents however, short circuit currents can damage the contactor. Fast acting fuses should be used in-line with the contactor load to protect against short circuit fault current. UL class J and class RK-1 fuses are recommended.

**1, 2 & 3 POLES, 35, 60 AMPS  
& 1 POLE 100 AMPS**

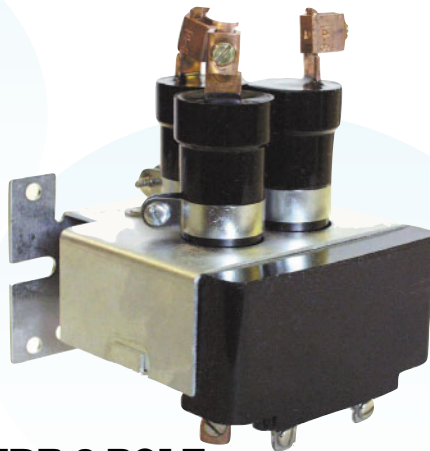
**MDR'S ARE IDEAL FOR SWITCHING  
RESISTIVE, TUNGSTEN,  
AND MOTOR LOADS FOR BOTH  
AC AND DC APPLICATIONS.**



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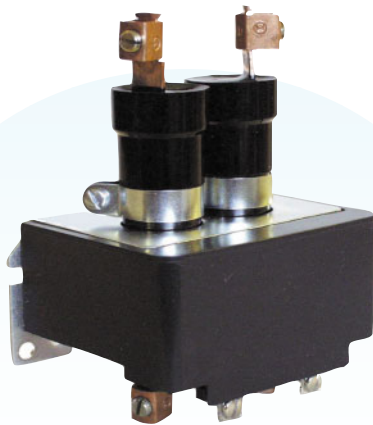


**MDR 1 POLE**  
35 & 60 AMPS

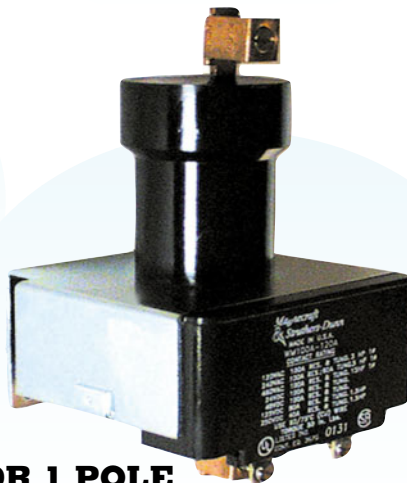


**MDR 3 POLE**  
35 & 60 AMPS

**HERMETICALLY SEALED  
STAINLESS STEEL TUBES**  
*Every contactor tube is hermetically sealed for maximum life. The MDR provides protection to the user from arcing and other hazards of switching heavy loads with exposed contacts.*



**MDR 2 POLE**  
35 & 60 AMPS



**MDR 1 POLE**  
100 AMPS

**DISPOSAL OF TUBES THAT ARE  
NO LONGER OPERABLE**

Magnecraft, at no charge, will accept and properly dispose of mercury tubes which are no longer operable.

All you need to do is prepay the freight.

Return the tube(s) to:

**Magnecraft & Struthers-Dunn**  
Attn: Manufacturing Manager  
MDR Recycling  
700 Orange Street  
Darlington, SC 29532-3793

**GENERAL SPECIFICATIONS**

**COIL**

Frequency of Operation: 60 per minute max  
80% of nominal voltage, typ  
Pull-in voltage: AC & DC coils  
Dropout voltage: 78% of nominal voltage, typical AC coils  
65% of nominal voltage, typical DC coils

**CONTACTS**

Material: Mercury.  
Contact resistance: 0.002 ohm M60 & M100  
0.003 ohm M30 & M30

**TIMING**

Operate: 50 milliseconds typical  
Dropout: 80 milliseconds typical

**DIELECTRIC STRENGTH**

Across open Contact: 2650 V rms

**TEMPERATURE**

Operating: - 35°C to + 60°C Under continuous load

**LIFE EXPECTANCY**

Electrical: 100,000 operations  
@ rated resistive load.  
Mechanical: 5,000,000 operations @ no load

**MISCELLANEOUS**

Insulation Material: Class B - 130°C  
Load Terminals: M35 pressure connectors for AWG 6-14 wire;  
M60 pressure connectors for AWG 2-12 wire;  
M100 pPressure connectors for AWG 1-8 wire  
Mounting: Vertical ±10°C  
Options: Combination of SPST-NO & SPST-NC contact configurations. Available. Other coil voltages available. Time delay module offered consult factory for details



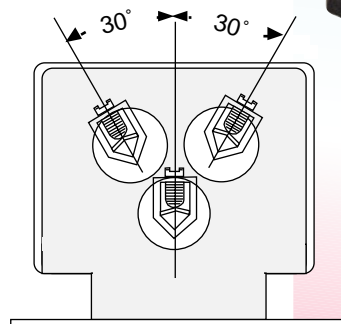
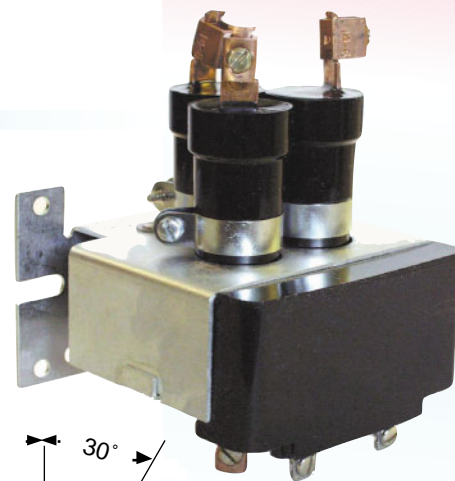
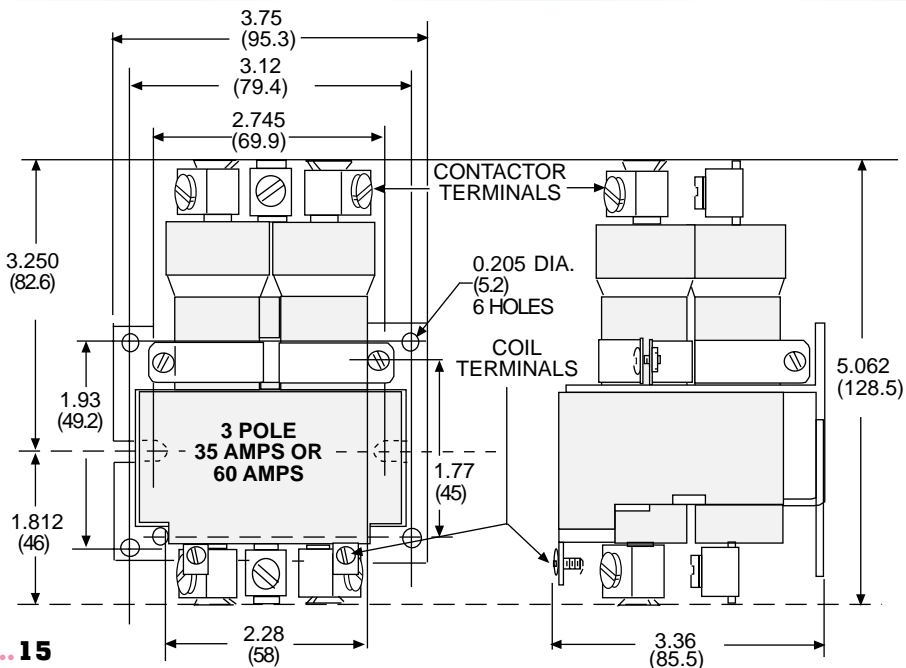
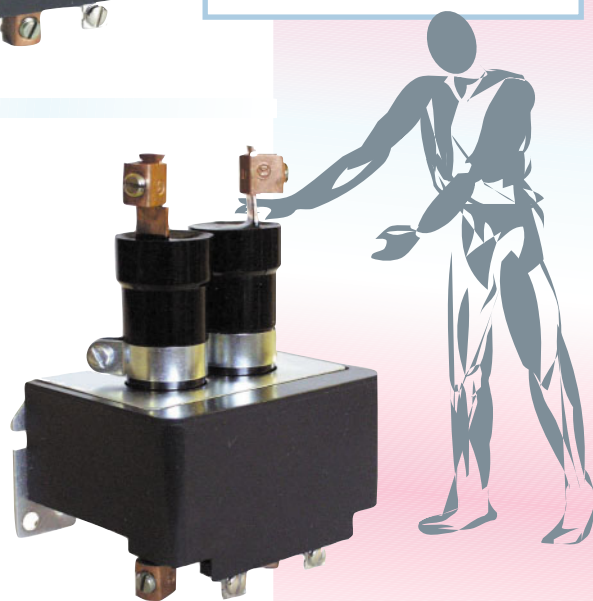
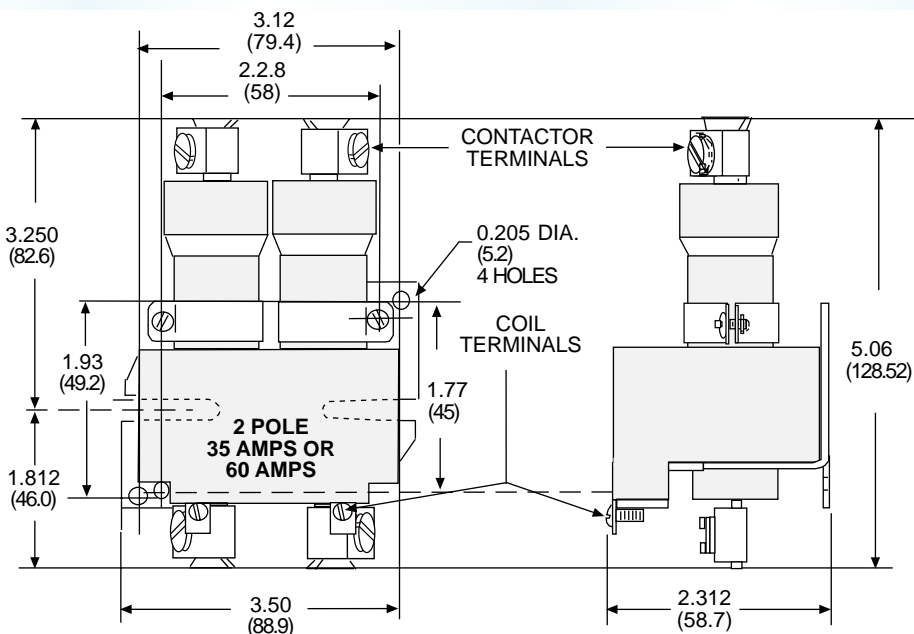
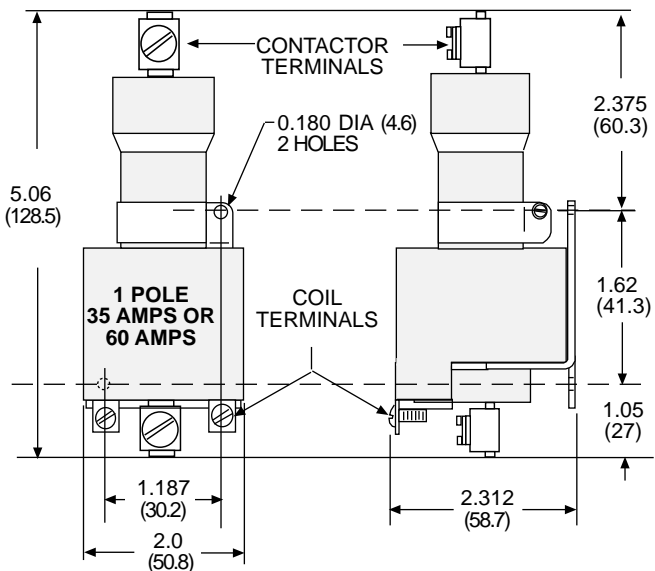
1, 2 & 3 POLES, 35 & 60 AMPS

**OUTLINE DIMENSIONS**  
DIMENSIONS SHOWN IN INCHES & (MILLIMETERS).



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**NOTE:**  
THE OUTLINES FOR THE N.C. VERSIONS ARE NOT SHOWN. THE TUBE IS POSITIONED APPROXIMATELY 0.43 INCHES (11 MM) LOWER IN THE COIL. THE OVERALL HEIGHT IS THE SAME AS THE N.O. VERSION.



1, 2 & 3 POLES, 35 AMPS

## UL CONTACT RATINGS TABLE FOR M35A-M35B

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

\* UL and CSA Listed  
SEE MDR GENERAL SPECIFICATIONS AND DIMENSIONS.

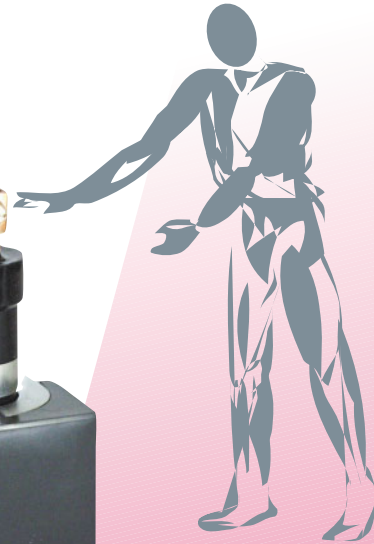


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## UL CONTACT RATINGS TABLE FOR ML35A-ML35B

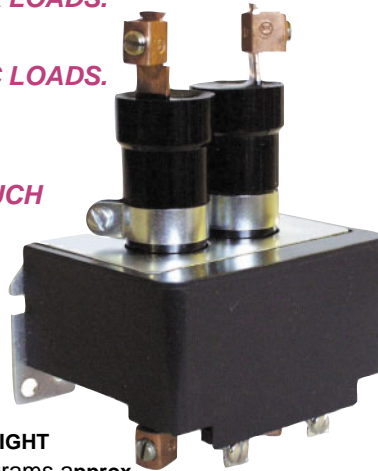
VOLTAGE	RESISTIVE AMPS	TUNGSTEN AMPS
120VAC	35*	35*
240 VAC	35*	17
480VAC	35*	9
600VAC	35*	7

\* UL and CSA Listed



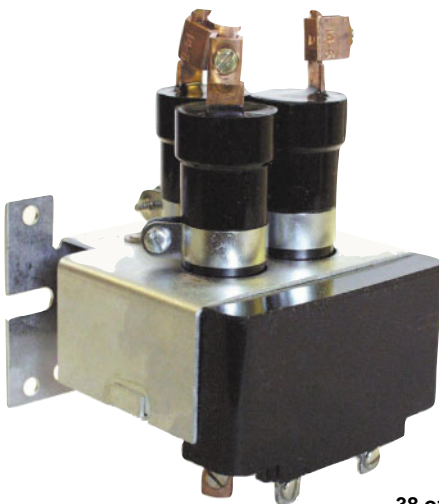
**CLASS WM35**  
SWITCHES RESISTIVE,  
TUNGSTEN, AND MOTOR LOADS.  
HIGH INRUSH CAPACITY.  
RECOMMENDED FOR DC LOADS.

**CLASS WML35**  
RECOMMENDED FOR MUCH  
LONGER LIFE WHEN  
SWITCHING AC  
RESISTIVE AND  
TUNGSTEN LOADS.



WEIGHT  
26 oz, 738 grams approx

WEIGHT  
13 oz, 370 grams approx



WEIGHT  
38 oz, 1078 grams approx

↑  
UP  
RECOMMENDED  
MOUNTING  
POSITION ±10°

### COIL MEASURED @ 25°C

STANDARD PART NUMBERS	NOMINAL INPUT VOLTAGE	NOMINAL RESISTANCE (OHMS)	NOMINAL COIL CURRENT
<b>1 POLE NORMALLY OPEN CONTACT</b>			
WM35A-120A	120 VAC	700 Ω	0.058 AMP
WM35A-240A	240 VAC, 60Hz/ 220 VAC, 50Hz	2,800 Ω	0.029 AMP
WM35A-24D	24 VDC	186 Ω	0.120 AMP
<b>2 POLE NORMALLY OPEN CONTACT</b>			
WM35AA-120A	120 VAC	218 Ω	0.135 AMP
WM35AA-240A	240 VAC, 60Hz/ 220 VAC, 50Hz	1,200 Ω	0.063 AMP
WM35AA-24D	24 VDC	98 Ω	0.232 AMP
<b>3 POLE NORMALLY OPEN CONTACT</b>			
WM35AAA-120A	120 VAC	111 Ω	0.220 AMP
WM35AAA-240A	240 VAC, 60Hz/ 220 VAC, 50Hz	430 Ω	0.117 AMP
WM35AAA-24D	24 VDC	63 Ω	0.375 AMP
<b>1 POLE NORMALLY CLOSED CONTACT</b>			
WM35B-120A	120 VAC	460 Ω	0.115 AMP
<b>ML SERIES 1 POLE NORMALLY OPEN CONTACT</b>			
WML35A-120A	120 VAC	700 Ω	0.058 AMP
WML35A-240A	240 VAC, 60Hz/ 220 VAC, 50Hz	2,800 Ω	0.029 AMP
<b>ML SERIES 2 POLE NORMALLY OPEN CONTACT</b>			
WML35AA-120A	120 VAC	218 Ω	0.135 AMP
WML35AA-240A	240 VAC, 60Hz/ 220 VAC, 50Hz	1,200 Ω	0.063 AMP
<b>ML SERIES 3 POLE NORMALLY OPEN CONTACT</b>			
WML35AAA-120A	120 VAC	111 Ω	0.220 AMP
WML35AAA-240A	240 VAC, 60Hz/ 220 VAC, 50Hz	430 Ω	0.117 AMP

OTHER COIL VOLTAGES AVAILABLE, CONSULT FACTORY FOR DETAILS

1, 2 & 3 POLES, 60 AMPS

## UL CONTACT RATINGS TABLE FOR M60A-M60B

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

\* UL and CSA Listed    \*\* 3 POLE 40 AMPS PER POLE  
SEE MDR GENERAL SPECIFICATIONS AND DIMENSIONS.



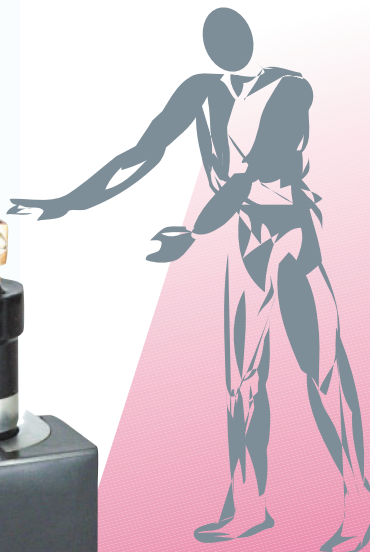
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## UL CONTACT RATINGS TABLE FOR ML60A-60B

VOLTAGE	RESISTIVE AMPS	TUNGSTEN	
		AMPS "A" (N.O.)	AMPS "B" (N.C.)
120VAC	60*	60*	45*
240VAC	60*	30	22.5
480VAC	60*	15	11.2
600VAC	50**	12	9

\* UL and CSA Listed    \*\* 3 POLE 40 AMPS PER POLE

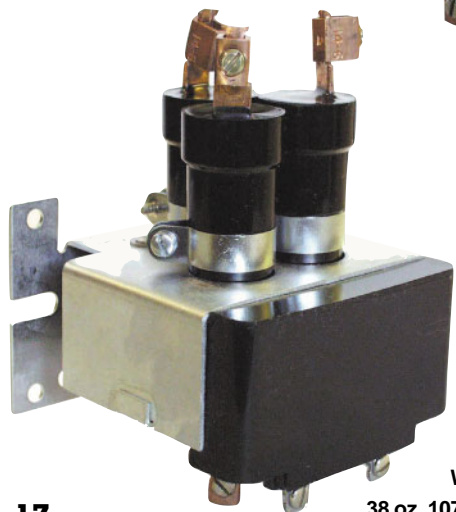
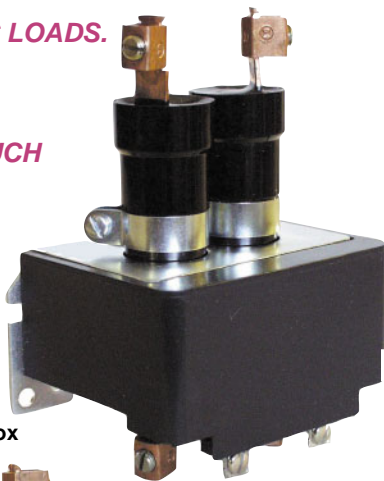


**CLASS WM60**  
SWITCHES RESISTIVE,  
TUNGSTEN, AND MOTOR LOADS  
HIGH INRUSH CAPACITY.  
RECOMMENDED FOR DC LOADS.

WEIGHT  
13 oz, 370 grams approx

**CLASS WML60**  
RECOMMENDED FOR MUCH  
LONGER LIFE WHEN  
SWITCHING AC  
RESISTIVE AND  
TUNGSTEN LOADS.

WEIGHT  
26 oz, 738 grams approx



UP  
↑  
RECOMMENDED  
MOUNTING  
POSITION ±10

WEIGHT  
38 oz, 1078 grams approx

### COIL MEASURED @ 25°C

STANDARD PART NUMBERS	NOMINAL INPUT VOLTAGE	NOMINAL RESISTANCE (OHMS)	NOMINAL COIL CURRENT
<b>1 POLE NORMALLY OPEN CONTACT</b>			
WM60A-120A	120 VAC	700 Ω	0.058 AMP
WM60A-240A	240 VAC,60Hz/ 220 VAC,50Hz	2.800 Ω	0.029 AMP
WM60A-24D	24 VDC	186 Ω	0.120 AMP
<b>2 POLE NORMALLY OPEN CONTACT</b>			
WM60AA-120A	120 VAC	218 Ω	0.135 AMP
WM60AA-240A	240 VAC,60Hz/ 220 VAC,50Hz	1,200 Ω	0.063AMP
WM60AA-24D	24 VDC	98 Ω	0.232 AMP
<b>3 POLE NORMALLY OPEN CONTACT</b>			
WM60AAA-120A	120 VAC	111 Ω	0.220 AMP
WM60AAA-240A	240 VAC,60Hz/ 220 VAC,50Hz	430 Ω	0.117 AMP
WM60AAA-24D	24 VDC	63 Ω	0.375 AMP
<b>1 POLE NORMALLY CLOSED CONTACT</b>			
WM60B-120A	120 VAC	460 Ω	0.115 AMP
<b>ML SERIES 1 POLE NORMALLY OPEN CONTACT</b>			
WML60A-120A	120 VAC	700 Ω	0.058 AMP
WML60A-240A	240 VAC,60Hz/ 220 VAC,50Hz	2.800 Ω	0.029 AMP
<b>ML SERIES 2 POLE NORMALLY OPEN CONTACT</b>			
WML60AA-120A	120 VAC	218 Ω	0.135 AMP
WML60AA-240A	240 VAC,60Hz/ 220 VAC,50Hz	1,200 Ω	0.063AMP
<b>ML SERIES 3 POLE NORMALLY OPEN CONTACT</b>			
WML60AAA-120A	120 VAC	111 Ω	0.220 AMP
WML60AAA-240A	240 VAC,60Hz/ 220 VAC,50Hz	430 Ω	0.117 AMP

OTHER COIL VOLTAGES AVAILABLE, CONSULT FACTORY FOR DETAILS

## UL CONTACT RATINGS TABLE

VOLTAGE	RESISTIVE AMPS	TUNGSTEN AMPS	HORSEPOWER SINGLE PHASE
120VAC	100	100*	3
240VAC	100	60	5
480VAC	100	30*	15
600VAC	80*	24*	10*
24VDC	100	100	1.5*
48VDC	100	100	1.5*
125VDC	80	80	1.5*
250VDC	40	40	1.5*

\*NON UL RATING

**CLASS WM100**  
**CAPABLE OF SWITCHING 100 AMP**  
**LOADS UP TO 480 VAC / 48 VDC**

## GENERAL SPECIFICATIONS

### COIL

Frequency of Operation: 60 per minute max  
 Pull-in voltage: 80% of nominal voltage, typ. AC & DC coils  
 Dropout voltage: 78% of nominal voltage, typ. AC coils  
 65% of nominal voltage, typ. DC coils

### CONTACTS

Material: Mercury  
 Contact resistance: 2 milliohm typical

### TIMING

Operate: 50 milliseconds typical  
 Dropout: 100 milliseconds typical

### DIELECTRIC STRENGTH

Across open Contact: 2650 V rms

### TEMPERATURE

Operating: - 35°C to + 60°C under continuous load

### LIFE EXPECTANCY

Electrical: 100,000 operations @ rated resistive load  
 Mechanical: 5,000,000 operations @ no load

### MISCELLANEOUS

Insulation Material: Class B - 130°C.  
 Connections: Pressure connectors for #1-8 AWG wire  
 Options: Other coil voltages available consult factory for details  
 Weight: 15.9 oz. 450 grams approx.

## 1 POLE 100 AMPS

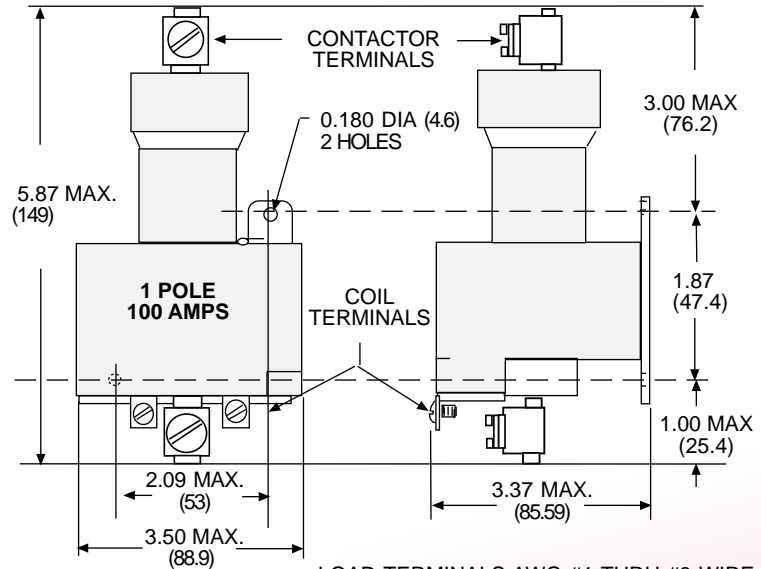


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### OUTLINE DIMENSIONS

DIMENSIONS SHOWN IN INCHES & (MILLIMETERS).

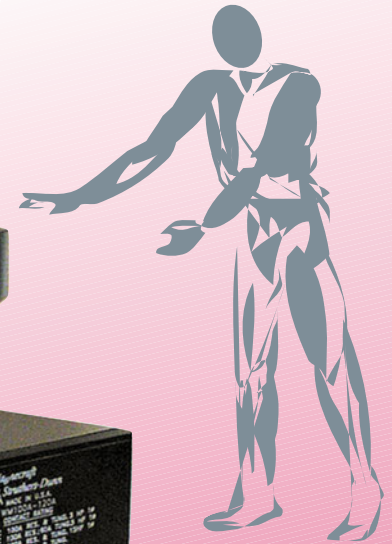
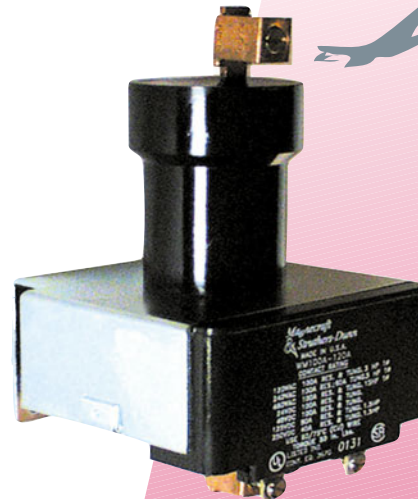


LOAD TERMINALS AWG #1 THRU #8 WIRE

**UP**



VERTICAL MOUNTING  
 RECOMMENDED ±10°



### COIL MEASURED @ 25°C

STANDARD PART NUMBERS	NOMINAL INPUT VOLTAGE	NOMINAL RESISTANCE (OHMS)	NOMINAL COIL CURRENT
<b>AC OPERATED NORMALLY OPEN CONTACT</b>			
WM100A-120A	120 VAC	73.5 Ω	0.225 AMP
WM100A-240A	240 VAC, 60Hz/ 220 VAC, 50Hz	300 Ω	0.138 AMP
WM100A-24D	24 VDC	53 Ω	0.380 AMP