

Contactors may be one of the most critical components found in HVAC and Refrigeration applications. Contactors are expected to handle the heavy inductive motor starting loads of compressors, fan motors, pump motors and a host of other motors. Contactors are also tasked with switching resistive loads in electric heat applications.



A.R.I. (Air-conditioning and Refrigeration Institute) created the 780 standard for contactors and set a requirement of 200,000 electrical life cycles. A.R.I. established some very difficult test parameters manufacturers had to test to for acceptance.

The basic 1 pole contactor with shunt (1.5 pole) or 2 pole contactor used in a residential HVAC compressor application needs to switch single phase power of 208-230 Volts with a load rating of 25 to 40 amps. Think about the number of times this has to happen in a typical year – especially in a Heat Pump or Geothermal unit that runs year round? What number do you think is reasonable for a typical season? Start doing the math and you will be amazed. For a typical cooling system, estimates for annual cycles may experience run as high as 4,000 cycles annually. If you are looking at a heat pump then you can easily double that number.

Contactors replacement is fairly straightforward. We only need to know a few pieces of information.

- Amperage rating
- Number of poles
- Coil voltage
- Auxiliary switch configuration

A few contactor manufacturers offer replacement coils. The real benefit to having replacement coils is so you can carry several different voltage replacement coils on a truck without having to stock a contactor for every voltage. This can get you out of a bind during an after hours service call.

If the contactor uses an auxiliary switch you need to make sure you match the existing switch ratings and use one of the manufacturers switches designed for the contactor. Auxiliary switches are specific to a manufacturer and not typically interchangeable.

The requirements we place on contactors become even more demanding with 3 Pole contactors.

Three pole contactors have to handle more complex and demanding loads;

- 3 phase power
- Amperage ratings from 40 through 90 amps
- Voltages up to 480V
- Horse Power Ratings from 7.5 up to 50 H.P.

When a contactor starts a compressor motor (Inductive Load) it can see amperages in excess of 150% of the rated motor amps. Once the motor starts it will typically settle to or below the rated amps.

Selecting a good contactor can be confusing and you shouldn't make the mistake of just shopping price because not all contactors are created equally.

- Look for a contactor that uses copper and brass components in the electrical path. This will minimize resistance and heat, allowing the contactor to run cooler and provide a longer service life. If the manufacturer skimped on materials and used steel that should be a good indication that they have also taken other shortcuts in design and materials.
- Contacts – make sure you pick a contactor with Silver Cadmium Oxide contacts. These offer the best service life for HVAC applications. Some manufacturers have opted to use a cheaper Silver Tin Oxide Contact which has a reduced service life.
- Enclosed body – eliminates dirt and insects contaminating the contacts.
- Enclosed coil – this helps eliminate dirt and insect intrusion into the coil and key components. This will also extend the life of the contactor.
- Arch window lugs can also help when using a number of wires per pole.

Think about what a contactor does and the expectations we place on them to perform year after year, we really don't have much room for error. Selecting a contactor that uses inferior components will leave you with problems and customer call-backs especially when you warranty repairs.



# MARS 780 Definite Purpose Contactors

MARS SERIES **614**



## MARS 780 - 3 Pole Contactors

MARS 780 - 3 pole contactors are designed for demanding applications. The enclosed body design provides quiet operation and improved durability by reducing the intrusion of dust and dirt. Side attachment rails for auxiliary switches (30-60 amp contactors) allow attachment of MARS 780 or Furnas auxiliary switches. Silver-cadmium oxide contacts provide increased contact life when switching inductive loads.

### Features:

- Large arch window box lugs
- SEMS screws or box lugs available on 30 amp contactors
- Recessed push to test button (not on 75 and 90 amp contactors)
- Enclosed body design
- Accepts MARS 780 and Furnas auxiliary switches
- Use standard MARS 780 replacement coils
- Dual QC coil terminals plus screw terminal for easy termination and jumper arrangements
- Coils - class F insulation • 600 volt rating • Foot print compatible

### 3 Pole 30 - 90 Amp

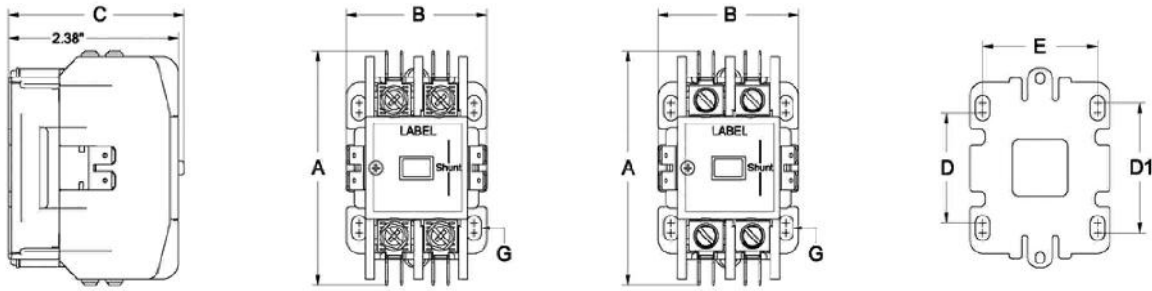
*\* For 25 Amp Contactors - Use 30 Amp in Place of 25Amp*

MARS No.	Furnas No.	FLA	Locked Rotor Amps			Non Inductive Amps	Coil Volts	Horsepower				Termination
			240V	480V	600V			1 PH	3 PH			
									240V	240V	480V	
61430*	42BF35AJ	30	180	150	120	40	24	3 HP	7.5 HP	10 HP	15 HP	Screw Type
61431*	42BF35AF						120					
61432*	42BF35AG						208-240					
61433*	42BF35AL						277					
61434*	42BF35AH						480					
61750	-	30	180	150	120	40	24	3 HP	7.5 HP	10 HP	15 HP	Box Lug
61751	-						120					
61752	-						208-240					
61753	-						277					
61754	-						480					
61445	42CF35AJ	40	240	200	160	50	24	5 HP	10 HP	15 HP	20 HP	Box Lug
61446	42CF35AF						120					
61447	42CF35AG						208-240					
61448	42CF35AL						277					
61449	42CF35AH						480					
61460	42DF35AJ	50	300	250	200	63	24	5 HP	15 HP	20 HP	25 HP	Box Lug
61461	42DF35AF						120					
61462	42DF35AG						208-240					
61463	42DF35AL						277					
61464	42DF35AH						480					
61470	42EF35AJ	60	360	300	240	75	24	7.5 HP	20 HP	25 HP	30 HP	Box Lug
61471	42EF35AF						120					
61472	42EF35AG						208-240					
61473	42EF35AL						277					
61474	42EF35AH						480					
61480	42FE35AJ106	75	450	375	300	94	24	15 HP	25 HP	40 HP	40 HP	Box Lug
61481	42FE35AF106						120					
61482	42FE35AG106						208-240					
61483	42FE35AL106						277					
61484	42FE35AH106						480					
61490	42GE35AJ106	90	540	450	360	120	24	15 HP	30 HP	50 HP	50 HP	Box Lug
61491	42GE35AF106						120					
61492	42GE35AG106						208-240					
61493	42GE35AL106						277					
61494	42GE35AH106						480					

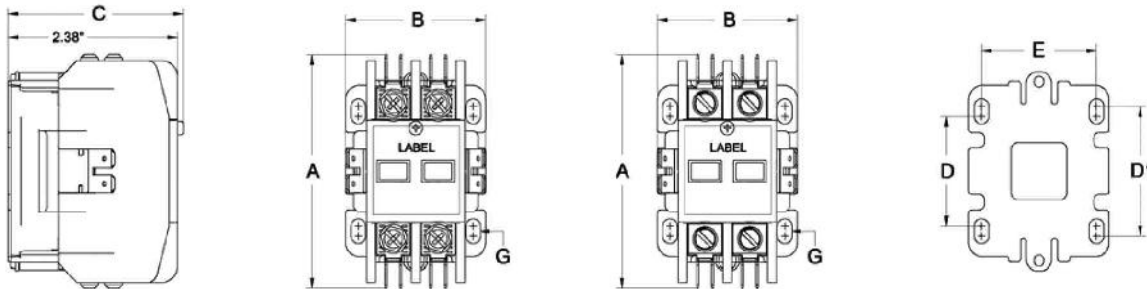
# MARS 780 Definite Purpose Contactors

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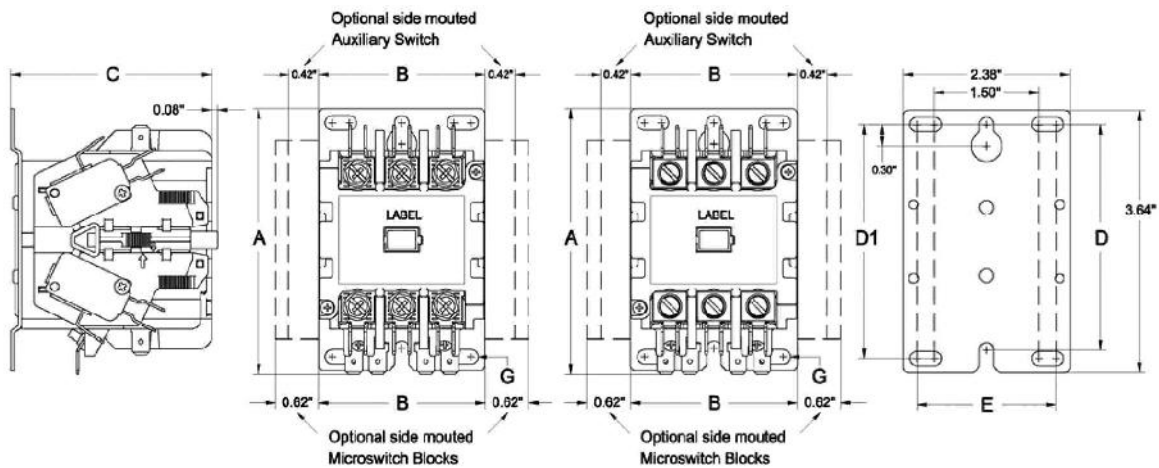
## 30-40A 1 Pole with Shunt



## 30-40A 2 Pole



## 30-40A 2\* Pole & 3 Pole



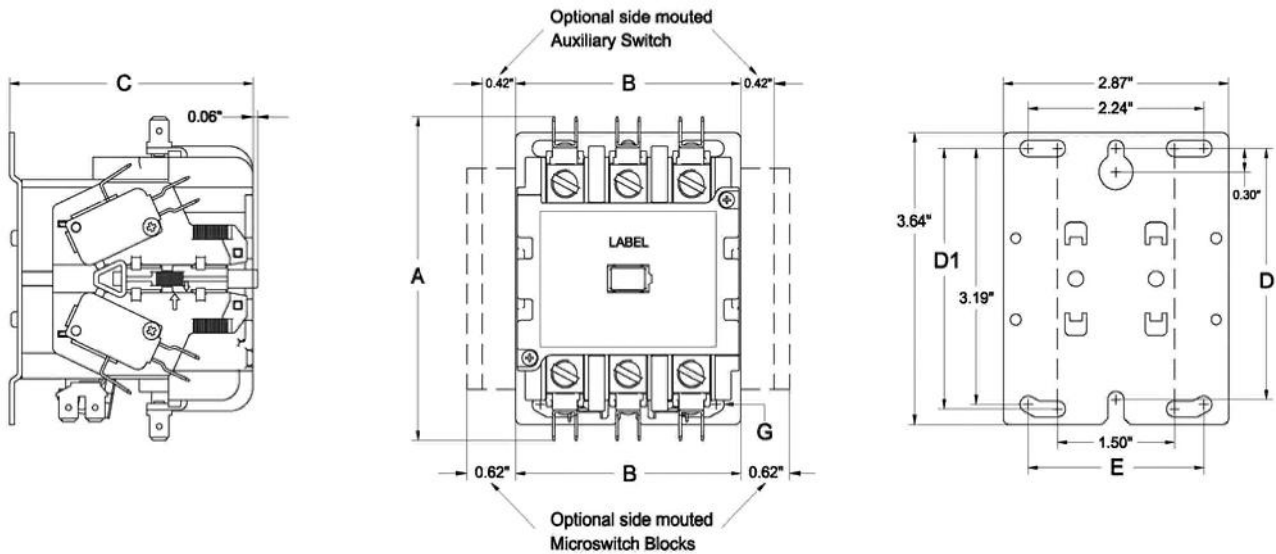
Note - 2\* Pole is a 3 pole body with center contacts removed.

MARS No.	FLA	Poles	A	B	C	D	D1	E	Mtg Screw G	Max Wire Size
61320-61324	30	1	3.19	1.97	2.46	1.5	1.77	1.61	10	8
61720-61724 61730-61734	30-40	1	3.19	1.97	2.46	1.5	1.77	1.61	10	4
61345-61349	30	2	3.19	1.97	2.46	1.5	1.77	1.61	10	8
61745-61749 61755-61759	30-40	2	3.19	1.97	2.46	1.5	1.77	1.61	10	4
61430-61434	30	3	3.69	2.38	2.87	3.13	3.25	1.98	10	8
61750-61754 61445-61449	30-40	3	3.69	2.38	2.87	3.13	3.25	1.98	10	4
61425-61428 61440-61443	30-40	2(at 3P)	3.69	2.38	2.87	3.13	3.25	1.98	10	4

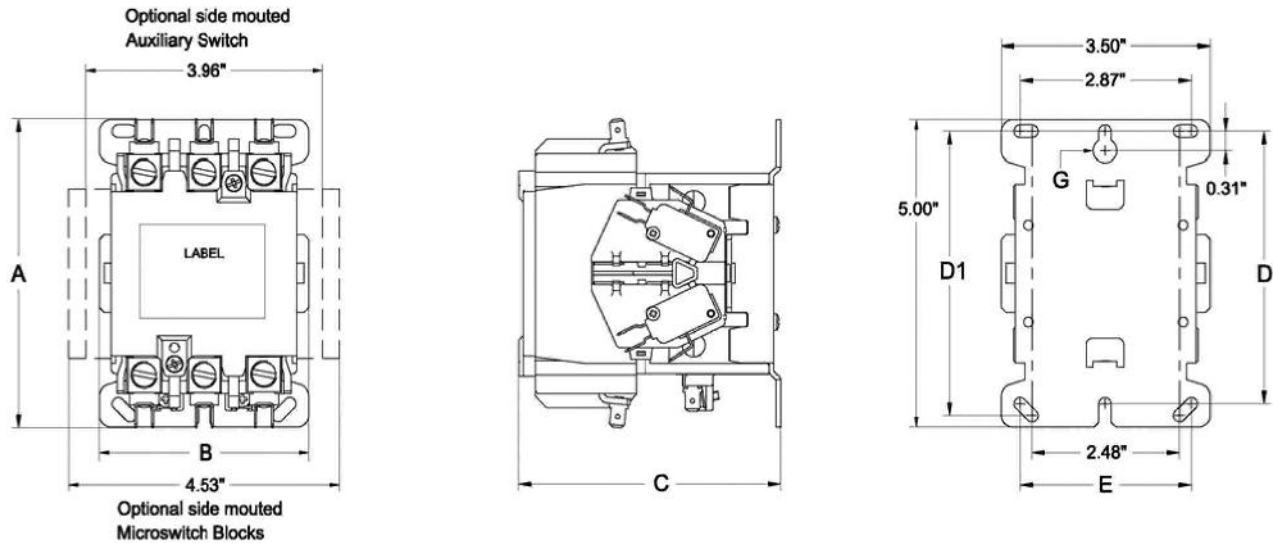
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## 50-60A 3 Pole



## 75-90A 3 Pole



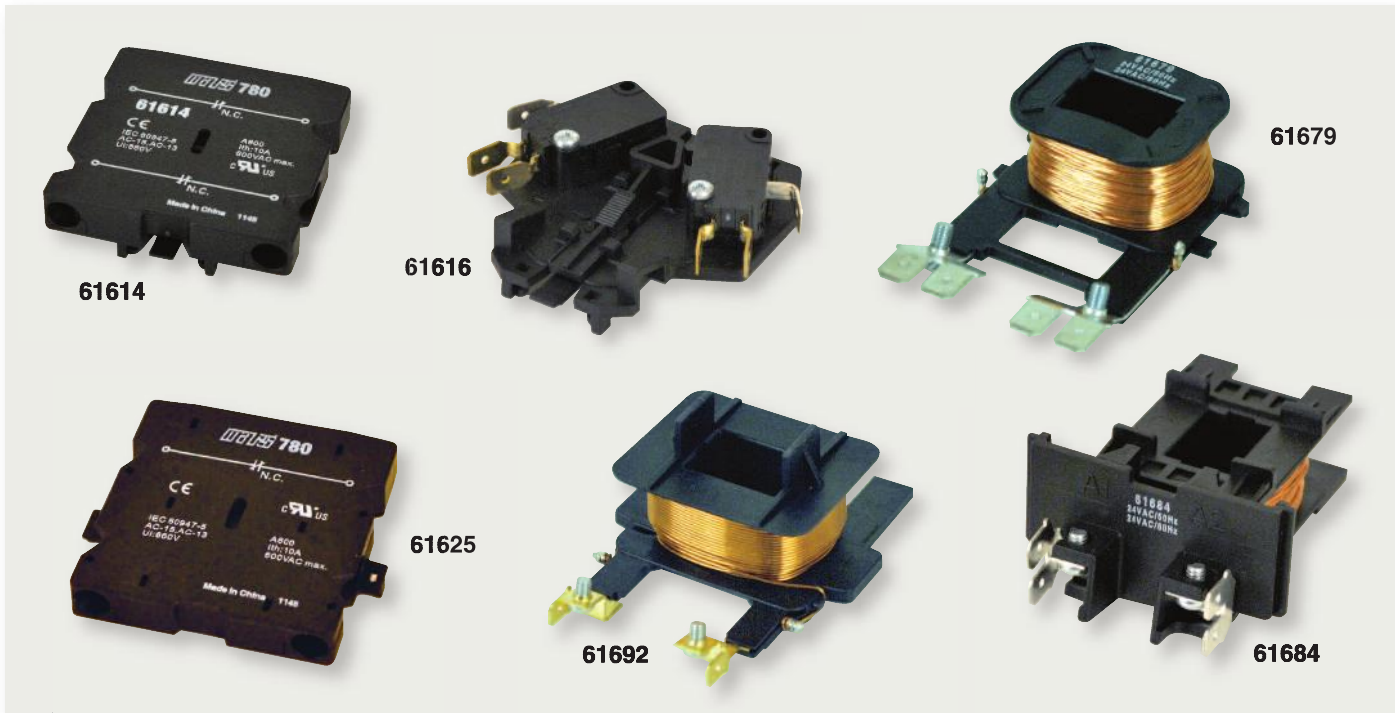
MARS No.	FLA	Poles	A	B	C	D	D1	E	Mtg Screw G	Max Wire Size
61460-61464 61470-61474	50-60	3	4.04	2.87	3.11	3.13	3.25	2.24	10	2
61480-61484 61490-61494	75-90	3	5.02	3.5	4.39	4.43	4.63	2.87	10	1/10

# MARS 780 Definite Purpose Contactors

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## Renewal Parts and Accessories

- Snap on Side Mounted Auxiliary Switches
- Replacement Coils



## Auxiliary Switches

MARS No.	Furnas No.	Description	Contactor F.L.A.	Used On
61610	49ACRO	1 NO	30 - 60	61320-61324
61611	49ACRC	1 NC		61720-61724
61612	49ACR6	1 NO- 1 NC		61730-61734
61613	49ACR7	2 NO		61345-61349
61614	49ACR8	2 NC		61745-61749
61615	49D36098001	SPDT		61755-61759
61616	49D36098003	DPDT		61430-61434
61623	-	SPDT		61750-61754
61624	-	1 NO		61445-61449
61625	-	1 NC		61425-61428
			75-90	61440-61443
				61460-61464
				61470-61474

## MARS 780 Replacement Coils

MARS No.	Furnas No.	Contactor Size	Coil Voltage
61679	-	3 Pole 30-40 Amp	24V
61680	-		120V
61681	-		208-240 V
61682	-		277V
61683	-		480 V
61684	-	3 Pole 50-60 Amp	24V
61685	-		120V
61687	-		208-240 V
61690	-		277V
61691	-		480 V
61692	-		3 Pole 75-90 Amp
61693	-	120V	
61694	-	208-240 V	
61695	-	277V	
61696	-	480 V	



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## Tech Tips for Definite Purpose Contactors

Problem with This	Do This
<b>Buzzing/Chattering*</b>	<ul style="list-style-type: none"> <li>➤ Confirm the correct voltage is being applied to the coil</li> <li>➤ Ensure there is no debris caught between the magnet &amp; armature</li> <li>➤ Ensure the VA rating on the control transformer is the OE VA rating</li> </ul>
<b>Humming</b>	<ul style="list-style-type: none"> <li>➤ Some humming is a result of the 60Hz of AC circuits and is normal</li> <li>➤ Minimize humming by cleaning the magnet &amp; armature pole faces with a dry swab; choose contactors made from non-dusting thermoplastic (MARS 780)</li> </ul>
<b>Not Pulling In</b>	<ul style="list-style-type: none"> <li>➤ Confirm the correct voltage is present and being applied to the coil</li> <li>➤ Disconnect and check the resistance of the coil;                             <ul style="list-style-type: none"> <li>– Infinite resistance ( ) is an open coil (bad coil)</li> <li>– Any other resistance is likely a good coil</li> </ul> </li> </ul>
<b>Coil Swollen/Melted</b>	<ul style="list-style-type: none"> <li>➤ Confirm control circuit voltage to coil; low voltage / voltage-drop likely</li> <li>➤ Check control circuit transformer; bad or incorrect transformer VA</li> </ul>
<b>Terminal Overheated/Burned</b>	<ul style="list-style-type: none"> <li>➤ Torque the power terminals to the rated value on the nameplate                             <ul style="list-style-type: none"> <li>– Under torqued (loose) connections can overheat/burn/melt</li> <li>– Over torqued connections can break and overheat/burn/melt</li> </ul> </li> </ul>
<b>Entire (single) Power Pole Burned</b>	<ul style="list-style-type: none"> <li>➤ Check other components in power circuit; over amp draw</li> <li>➤ Check moveable contact for restriction or significant debris</li> <li>➤ Ensure both Line &amp; Load side terminals are correctly torqued</li> </ul>
<b>All Power Poles Burned</b>	<ul style="list-style-type: none"> <li>➤ Check control circuit for loose connection; contactor is chattering/arcng</li> <li>➤ Check load for excessive amp draw</li> <li>➤ Check for swollen coil that prohibits complete contact closure; if swollen check for low control circuit voltage on the coil</li> </ul>
<b>Contact Points Stuck</b>	<ul style="list-style-type: none"> <li>➤ Contacts weld when contactor chatters (rapid on/off) due to loose connection on coil or within the control circuit; check connections including thermostat relay output</li> <li>➤ Bright 'blotchy' spots on silver contacts indicate welding has occurred</li> </ul>

\* Contact chatter is the rapid on/off cycling of the contactor. This causes excessive arcing which generates high enough heat to liquify the silver contacts causing them to stick together.