

User's Manual for
The StacoVAR ML

**POWER FACTOR CORRECTION
MOTOR LOAD (ML)
FIXED CAPACITOR**



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CAUTION!

THE FOLLOWING OPERATIONS MUST BE PERFORMED BEFORE ACCESSING THE INSIDE OF THE EQUIPMENT:

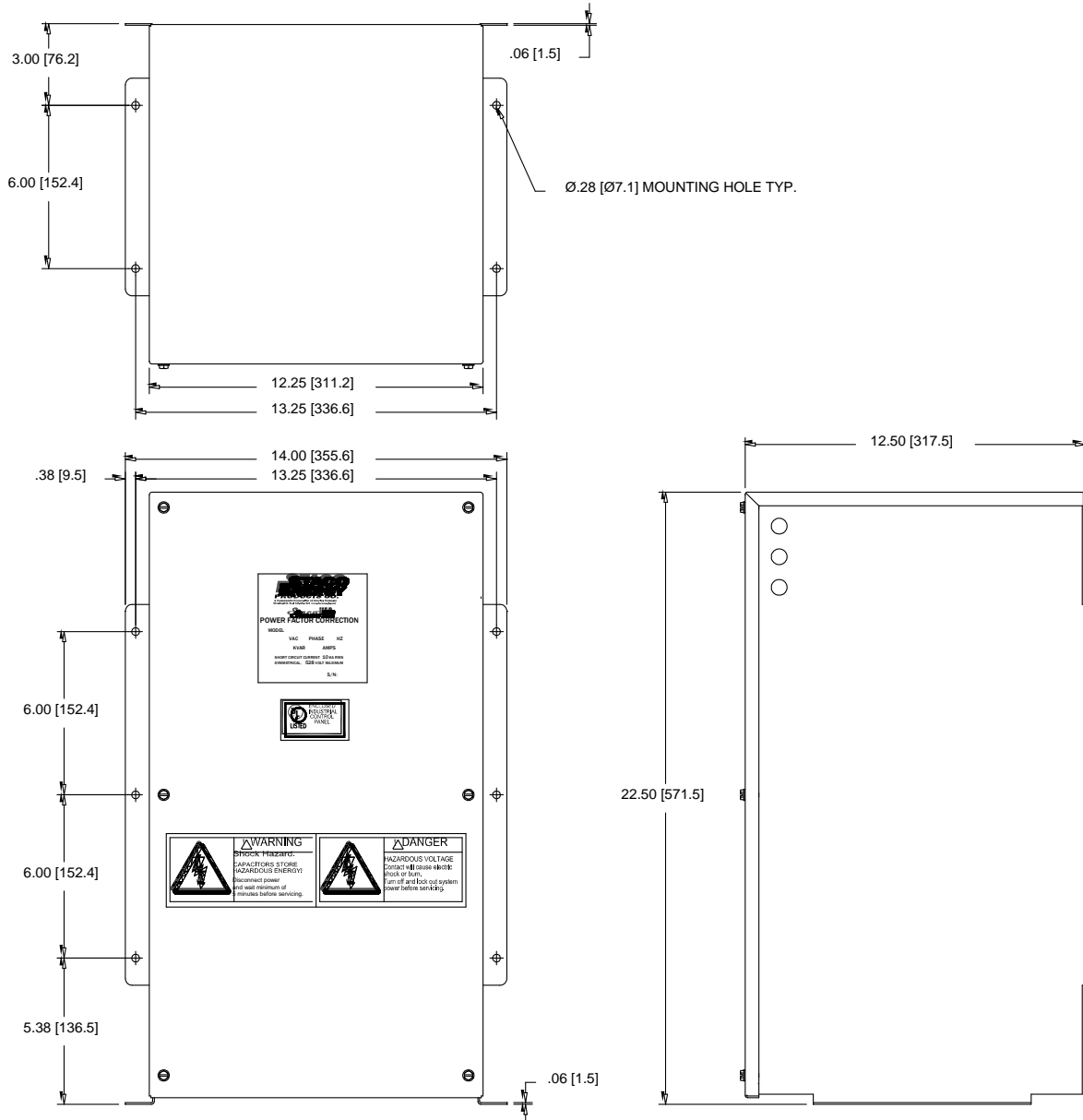
1. DISCONNECT THE POWER SUPPLY.
2. WAIT AT LEAST FIVE (5) MINUTES FOR DISCHARGING CAPACITORS. CONFIRM BY USE OF A VOLTMETER FOR BOTH AC AND DC.
3. THEN SHORT CIRCUIT AND EARTH ALL OF THE CAPACITORS.

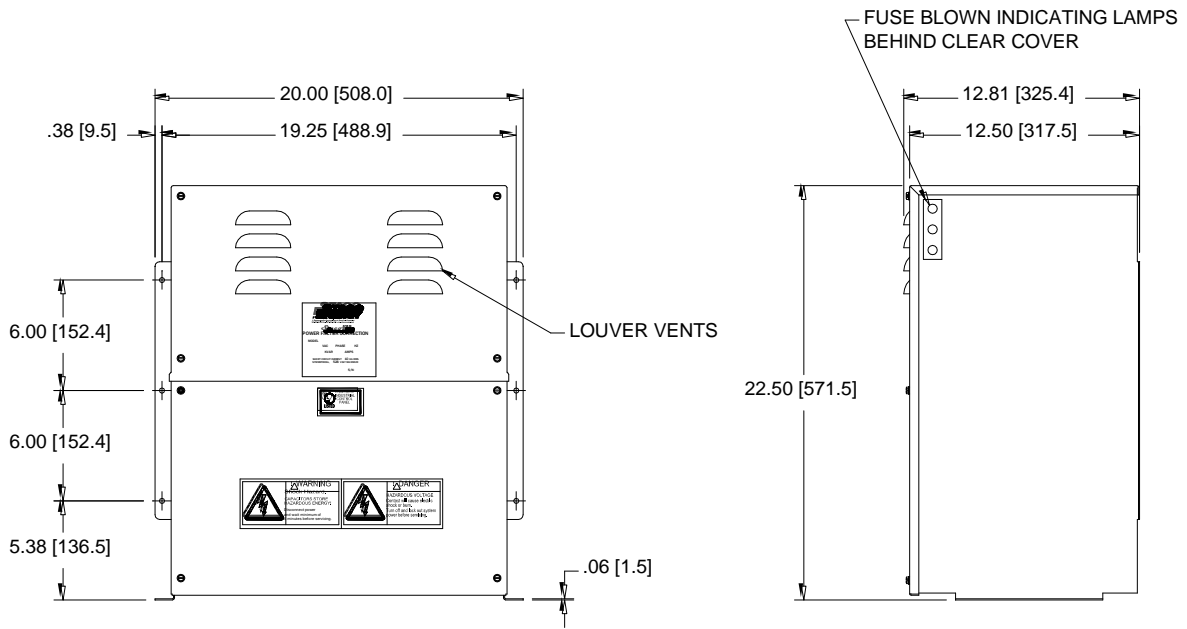
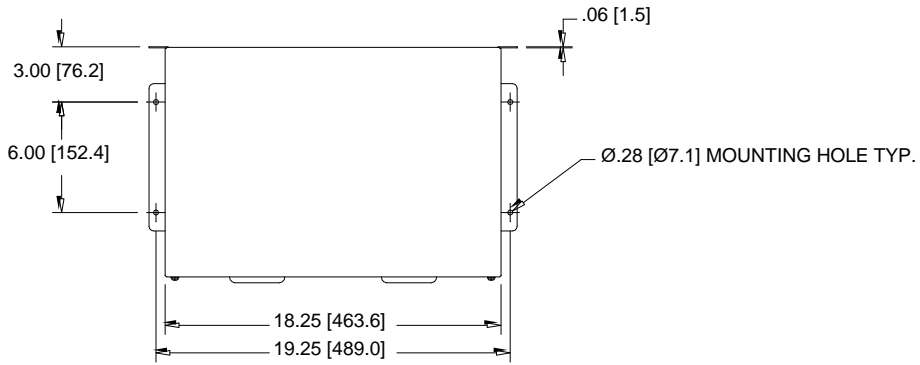
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DESCRIPTION

The StacoVAR ML is designed to be used in low voltage (240-600vac), 3-phase, 60 Hz networks; options include fuses and blown fuse indication.





Voltage	KVAR Range	Capacitors	Enclosure Size	Dimensions (HxWxD, inches)
240 480 600	2-50 2-125 2.5-125	1-5	U	22.50 x 14.00 x 12.5
240 480 600	60-100 150-300 150-300	6-10	V	22.50 x 20.00 x 12.81

COMPONENTS

MODULE ASSEMBLY (ENCLOSURE)

StacoVAR ML capacitors are housed in either a 14 or 16 gauge metal enclosure, painted ANSI 61 gray. All units include either a stud or terminal type power line connection and allow for quick, simple installation.

CAPACITORS

Capacitors are three phase, metallized polypropylene, or vegetable oil impregnation, which are self-healing to prevent permanent dielectric breakdown. Each capacitor is designed for long life and operation for a wide temperature range and is contained in a steel "can".

Pressure sensitive circuit interruption is incorporated within the capacitor to safely remove the unit from service under heavy fault conditions, while maintaining case integrity (10k available fault current rating with or without fuses). External discharge resistors allow voltage to be reduced to 50 volts or less in one minute. Resistors are sized for long life and continuous operation, at maximum rated temperature.

FUSES/BLOWN FUSE INDICATION (OPTIONAL)

Options include current limiting fuses rated for 100kaic, 200kaic, for over-current protection, and blown fuse indication lights (three fuses and three neon lights). Where over-current protection is required, applicable NEC codes should be followed for proper equipment installation.

INSTALLATION

Correct installation is required for proper performance and function of the equipment. Physical inspection of equipment for damage is recommended, prior to any installation. Indoor storage for indoor and outdoor rated equipment should be in a clean, dry environment.

A cautionary note, placement of the assembly shall be at a level and solid location, for correction operation. The unit can be either wall or floor mounted with cable entrance at top or side. Equipment should be placed in a well-ventilated environment and air must be able to circulate freely.

National Electrical Code (NEC), electric utility company, local area or service provider codes shall be adhered to during the installation. Electrical connections shall also be in compliance with required codes.

Installer/Contractor shall inspect and verify proper alignment, anchorage and grounding, proper connections and tightness of connections, prior to any start-up functions.

Appropriate personnel shall start-up and operate equipment upon installation approval.

AMBIENT TEMPERATURES (SEE TABLE 1)

In every capacitor installation, there are two very important ambient temperatures: Location Ambient Temperature and Operating Ambient Temperature.

Location Ambient Temperature is the temperature of the location before capacitors are installed or with the capacitors installed, but not operating (not energized). This is the temperature of the surrounding air in the room, vault, sub-station, or enclosure where capacitors will be operating.

Operating Ambient Temperature is the temperature of the surrounding air during capacitor operation (capacitors energized). If there is a question as to the temperature at the location during operation, it is suggested that temperature measurements be taken in accordance with the following NEMA instructions:

- A. Units shall be in operation continuously for at least 24 hours before temperature is measured.
- B. The Operating Ambient Temperature shall be determined by taking the average of the readings of three thermometers placed as follows:
 - One thermometer level with top of units.
 - One thermometer 12 inches above bottom of units.
 - One thermometer midway between the two above positions.

All three thermometers shall be placed 12 inches away (horizontally) from units.

Maximum ambient temperatures are as follows:

TABLE 1		
Capacitor Installation	Suggested Location Ambient Temperature ¹	Maximum Operating Ambient Temperature¹
Single Unit	40°C (104°F)	46°C (115°F)
Single Row of Units	35°C (95°F)	40°C (104°F)
Multiple Rows Of Tiers	30°C (86°F)	35°C (95°F)

Since excessive heating may be cause of capacitor failure, care must be used in selecting installation location. Forced air cooling may be required in certain locations.

If the maximum operating ambient temperatures are exceeded, units must be disconnected from the a-c line. Telephone your sales representative at once for advice on corrective action which may be required.

OPERATION VOLTAGE

Check the capacitor nameplate to make certain that the capacitor voltage rating is suitable for operation at the supply (line) voltage. Capacitors are capable of operation at maximum of 110 percent of nameplate rated voltage.

CONNECTION TO THE MAINS

Power Connections: L1, L2, L3 and PE

Connect L1, L2 and L3 terminals of either terminal block or fuse holder provided inside the enclosure to the network using 75°C minimum copper leads of the proper gauge. Connect an appropriate ground lead to the ground lug provided inside the enclosure.

The National Electrical Code, Article 460, governs the installation of capacitors. Staco Energy Products Power Factor Correction Fixed Bank capacitors meet all of the requirements of the code relative to discharge resistors and over-current protection.

¹ Temperatures with unrestricted ventilation

When applying capacitors to motor circuits, capacitors should usually be connected on the load side of the motor starter. In such installations, it may be desirable to change the overload protector size by the amount of the current reduction attendant with capacitor installed at Location 1.

CAUTION

When applying capacitors to motors which are subject to plugging, jogging, reversing, open transition compound starting (or on many multi-step or multi-speed motors), it is strongly recommended that the capacitor be connected between the motor starter and the disconnect at Location 3. This will result in the capacitor being energized even though the motor is not operating. The disconnect provides the appropriate means for the required removal capability per the Code (if it is not serving a branch circuit).

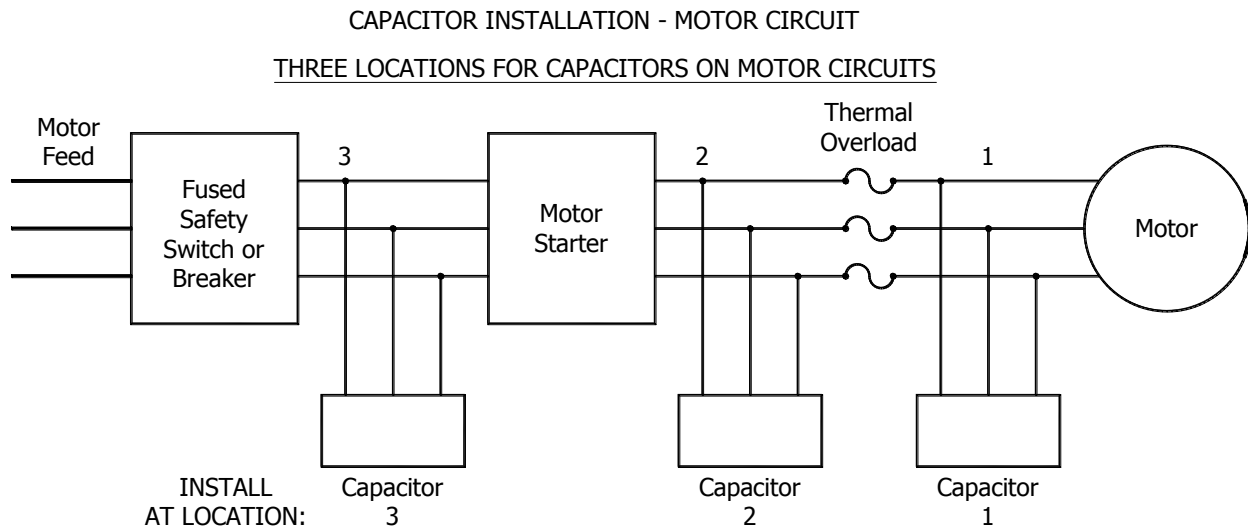


Figure 2

- A. Install at Location 1**
Motor side of thermal overload protectors when new motor installation is made and overloads can be sized in accordance with reduced current draw or on existing motors when change of thermal overload is not required.

- B. Install at Location 2**
Between the starter and thermal overloads on existing motor applications when overload rating is higher than permitted by code [NEC 430-32(a)].

C. Install at Location 3

On the line side of the starter, when separate disconnect means exist. This is a required location when motors are to be jogged, plugged or reversed, for multi-speed motors, for all starters having open transition and for starters that in any way disconnects the capacitor momentarily during the cycle and then reconnects the unit.

MAINTENANCE

MAINTENANCE PROGRAM

Every Six (6) Months

- Examine outside of enclosure for damage, objects obstructing access and/or ventilation flow.
- Disconnect circuit breaker (or switch) from external feeder, or circuit breaker.
- Allow capacitors to discharge for at least five (5) minutes before performing maintenance.
- Visually inspect power factor correction capacitors and resistors. Broken or burned resistors need replacement. Check capacitors for any swelling.
- Visually inspect fuses to see if blown, replace as necessary, note operation of lights.
- Inspect all connections, tighten as required.
- Clean inside area of any dirt and debris.
- Maintenance should be performed on StacoVAR equipment, along with panel board, switchboard, switch gear, motor control centers and other electrical power distribution equipment for optimum and efficient operation.
- Spare parts required. Consult factor for caps, fuses, and lights.

Recommended Wire Sizes and Fuses for 3-Phase, 60 Hz Capacitors.

240 VAC kVAR	Current Ratings		Wire Size	480vac Kvar	Current Ratings		Wire Size
	Actual Amps	Fuse Amps			Actual Amps	Fuse Amps	
2	4.81	10	14	2	2.41	5	14
2.5	6.01	10	14	5	6.01	10	14
4	9.62	15	14	7.5	9.02	15	14
5	12.03	20	14	10	12.03	20	14
7.5	18.04	30	12	12.5	15.04	25	14
10	24.06	40	10	15	18.04	30	12
12.5	30.07	50	8	20	24.06	40	10
15	36.09	63	8	25	30.07	50	8
20	48.11	80	6	30	36.09	63	8
25	60.14	100	4	35	42.10	80	6
30	72.17	125	3	40	48.11	80	6
40	96.23	160	1	45	54.13	100	4
50	120.28	200	2/0	50	60.14	100	4
60	144.34	250	3/0	60	72.17	125	3
75	180.43	315	250M	75	90.21	160	1
100	240.57	400	400M	80	96.23	160	1
				100	120.28	200	2/0
				125	150.36	250	3/0
				150	180.43	315	250M
				175	210.50	350	300M
				200	240.57	400	400M
600 VAC kVAR	Current Ratings		Wire Size				
Actual Amps	Fuse Amps						
2.5	2.41	5	14				
5	4.81	10	14				
7.5	7.22	15	14				
10	9.62	20	14				
12.5	12.03	20	14				
15	14.43	25	14				
20	19.25	40	10				
25	24.06	40	10				
30	28.87	50	8				
35	33.68	63	8				
40	38.49	80	6				
45	43.30	80	6				
50	48.11	80	6				
60	57.74	100	4				
75	72.17	125	3				
100	96.23	160	1				
125	120.28	200	2/0				
150	144.34	250	3/0				
175	168.40	315	250M				
200	192.46	350	300M				

Wire sizes based on NEC at 135% rated current using 90°C rated wire.

