

PhaseMAXX – The industrial mark of excellence

**PhaseMAXX**®

An Electram Product

*Installation And Operation Instructions For  
PhaseMAXX - T Series Triple Rated Rotary Converter*

230/460v



C UL

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## Installation

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*Note: Installation and termination of any Electram Rotary Phase Converter should only be performed by a qualified electrician or electrical mechanic in accordance with manufacturers instructions, and local electrical codes. Failure to follow these directions will immediately result in a voided warranty.*

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*1.1 - The rotary generator supplied with this unit is for the purpose of power conversion only, and is not intended for drive use.*

*1.2 - The rotary should be installed close to the control panel whenever possible. Placing a rubber mat or similar sheet under the rotary generator is recommended, as this will greatly reduce idle rotary noise levels.*

*1.3 - Where the converter is a two stage rotary generator system complete with metal skid set, place the supplied Anti-Vibration (3" x 3" rubber) pads under the skid set in positions shown on the accompanying mechanical drawing - eg: drawing File: FRAME\*\*.MEC. Slide the Anti-Vibration pads under both lengths of the skid after the two rotary generators have been bolted to the skid, and after the complete assembly has been moved to its desired position.*

*1.4 - It is recommended that the distribution transformer carry a KVA rating at least equal to the Horsepower rating of the largest motor in operation on the system. Consult the utility supplier in your area for local guidelines.*

*1.5 - The rotary generator is rated for either 230 or 460 volt input. For either 230 or 460 volt operation, refer to the Rotary Connection Charts on page 10. The rotary generator rotation can be CW or CCW.*

*1.6 - Note: All connection charts indicate values for both 230 and 460 volt converters. Converter systems are supplied for the specified voltage at time of order, and cannot be operated on any other voltage. Check converter nameplate for proper voltage before installation.*

*1.7 - Warning! - Do not attempt to connect any three phase transformer to the converter output terminals, Damage to both the converter and transformer can occur with the removal of system load unless a suitable contactor is used to interrupt transformer input.*

*1.8 - Rotary contactor terminals #63 and #64 must be connected to load control circuits to prevent single phase operation of three phase motors. See Connection Diagram on page 7.*

## *Installation*

*1.9 - Installation of the converter control panel should be done reasonably close to the main service entrance, as overly long raceways may produce a serious voltage drop affecting proper phase converter operation.*

*1.10 - A knockout cutter or similar device is required for mounting of conduit or cables to the converter control panel.*

*1.11 - Rotary generator connection - The rotary generator should be connected to the overload relay terminals T1, T2, and T3, using the wire size outlined in the Rotary Generator Chart on page 9.*

*1.12 - Larger converters require the use of dual, parallel connected rotary generators for reduced starting current inrush. Each generator should be connected to separate overload relay terminals T1, T2, T3, using the wire size outlined in the Rotary Generator Chart on page 9.*

*1.13 - The overload protection inside the converter panel is for the rotary generator only, and is generally preset by the manufacturer. Converter overload relays must be set to match the (F.L.A.) of the connected rotary generator as indicated on the nameplate of each rotary generator. Motor starters with overload protection are essential for all loads connected to Electram Phase Converters or utility services.*

*1.14 - Ground lugs are provided at the top of the converter control panel.*

*1.15 - Warning! - Always make sure capacitors in control panel are fully discharged before making any connection attempt. Although all Electram converters are equipped with discharge resistors or discharge coil, wait 2 minutes after removing power, then short main terminals L2 and T3 to ensure capacitor discharge before handling.*

*1.16 - Input voltage should be within 240v and 220v for 230v systems, and within 480v and 440v for 460v systems.*

*1.17 - For voltage variation of 5% or more from the converter rating, consult the manufacturer.*

*1.18 - For all 1 phase and 3 phase wiring, see Connection Diagram on page 7. All wire and protection device sizes can be calculated using specific Converter Charts.*

*1.19 - NEMA 1 (Type N1) converters should be installed in a relatively dry and clean location. NEMA 3 (Type N3) converters are suitable for indoor or outdoor environments.*

*1.20 - The converter must be installed in a location consistent with the NEMA (Type N1, N3) rating of the converter, and be installed in an area where ambient air temperature remains within (-10C to +40C). Adequate ventilation must be provided.*

*1.20 - Load control circuits must be connected to L1 and L2 only. Any attempt to use T3 for control can result in damage to control equipment.*

## Operation

2.1 - *Caution!* - *The phase converter must always be started before energizing any load motor, and similarly, should be the last item shut off.*

2.2 - *Control systems are available from Electram for automatic starting of converter and loads consecutively.*

2.3 - *This converter has the capability of supplying power to single or multiple motor applications, provided that the largest motor does not exceed the (Largest HP) rating of the converter, and provided the total load is within (Maximum HP) ratings as indicated on the converter nameplate.*

2.5 - *This converter can operate one (1) of the (Largest HP) motors, plus smaller motors to the (Maximum HP) load rating.*

2.6 - *This PhaseMAXX converter can also be used for resistive loads. The KVA capability for resistive loads is  $1.3 \times$  (Largest HP) rating.*

2.7 - *When first starting the converter, no-load voltages between L2 and T3 will be approximately 10% higher than 1 phase input voltage. Similarly, the no-load voltage between L1 and T3 will also be higher. This constitutes normal converter operation. As load is added on, the voltage imbalance will proportionately decrease.*

2.8 - *The motor amperages may be unbalanced when operated from a converter. This unbalance will vary according to total converter load. Currents on individual motors can be closely balanced when the converter is operating with a substantial load. Amperage in any line must not exceed the motor nameplate rating for motors having a 1.0 service factor. Motors with a 1.15 service factor can operate with amperage in any line at 15% over nameplate rating.*

2.9 - *To reverse rotation of any three phase motor, interchange any two lines at the motor terminals.*

## Operation

2.10 - Idle voltage level can be set close to the 1 phase input voltage with the addition of a Voltage Level System option, if very small loads (typically below 25% of the (Largest HP) rating of the converter), are to be operated individually for long time periods. This same system can be installed for electronic control boards that require all 3 phases for control operation.

VLS Option
<p>2.10.1 - The Voltage Level System relay (LR1) operates when the voltage level rises above or below adjustable points, and provides better efficiency of the converter and motors.</p> <p>2.10.2 - The factory preset values for relay LR1 are Hysteresis(%) set at 10, and Un(%)AC set at 110.</p> <p>2.10.3 - With minimal or unloaded converter operation, the LR1 output relay is energized, opening contactor LC1. During the start cycle of larger motors, Contactor LC1 may close and then reopen after the motor start cycle is complete. Alternatively, once the start cycle of a large motor is complete, relay LR1 may stay energized (depending on the voltage threshold), maintaining contactor LC1 closed until the total converter load has been reduced.</p> <p>2.10.4 - If contactor LC1 "chatters" or repeatedly cycles open and closed in quick succession during any loaded or unloaded cycle of the converter's operation, adjust the Hysteresis(%) dial to a progressively higher value (eg: 11, 12, 13, 14, 15) until relay LR1 and contactor LC1 become stabilized.</p>

2.11 - Whenever single phase loads (control circuits or otherwise) are to be connected to the converter, care must be taken to ensure their connection across L1 & L2 only. The voltage between T3 and any other line is unstable at startup of converter or load, and may be higher than 1 phase input voltage - especially under converter no-load (idle) conditions. Any control circuit connection to T3 can cause excessive magnetic contactor chatter, total drop out of control, or damage to control equipment.

2.12 - Before connecting any control circuits that utilize all 3 phases ( such as phase loss or phase rotation meters), consultation with Electram is advised.

2.13 - Optional Voltage Level Systems can be used to effectively regulate voltage imbalances, allowing voltage sensitive devices to function normally.

## Operation

2.14 - *Most applications have a diversity factor where not all of the motors are fully loaded or in operation all at the same time. Consideration should be given to this diversity factor for proper Phase Converter selection. Where the manufactured phase voltage has dropped below 10% of the 1 phase input voltage, the installation of voltage level capacitors may be required.*

2.15 - *Where converters use two parallel connected rotary generators for reduced current inrush, timer T1 should be adjusted to start the second rotary just after the first rotary generator has reached its full speed.*

2.16 - *Warning! - Unauthorized service or tampering with internal components of either the control panel or the rotary generator, may result in electrical shock from electrolytic capacitors, even though power has been completely disconnected.*

2.17 – *Note: Leave at least ten (10) seconds between the converter's consecutive STOP and START cycles. Attempting to re-start the converter while the rotary generator(s) are still coasting from the previous STOP cycle may cause a start sequence failure.*



## Wire Sizing Schedule #3

3.1 - Feeder overcurrent protection device size can be determined by multiplying the three phase current of the largest motor x (175% for Main Breaker or 150% for Main Time Delay Fuse) x 1.73, and adding (the total three phase amperage of additional three phase loads x 1.73), plus (the amperage of any single phase loads). The calculated size of feeder overcurrent protection must not be less than the (Maximum Running Amps) shown in the Converter Line Chart below x (200% for Main Breaker or 170% for Main Time Delay Fuse).

3.2 - The minimum allowable ampacity of single phase feeder can be calculated by multiplying (the three phase current of the largest motor x 1.73) x 125% and adding (the total three phase amperage of additional three phase loads x 1.73), plus (the idle current of the Rotary Converter shown in the Converter Idle Current Chart on page 9), plus (the amperage of any single phase loads). The calculated minimum allowable ampacity of single phase feeder must not be less than the (Min. Allowable Ampacity of Conductor) shown in the Converter Line Chart below.

3.3 - Important! - All conductors must be sized to prevent a voltage drop not exceeding three (3) percent from the source of supply to the converter and from converter to motor loads. This will ensure proper starting and operation of motors.

3.4 - The minimum recommended wire and protective device size between the 3 pole splitter and Electram Rotary Converter terminals **L1** and **L2 Only**, can be calculated using the Converter Line Chart below.

### Converter Line Chart

Conductors and Overcurrent Protection From The 3 Pole Splitter To Converter Terminals <b>L1</b> and <b>L2 Only</b> .						
	Maximum Running Amps		Disconnect "R" Type "D" Fuse		Min. Allowable Ampacity of Conductor.	
Model	230v	460v	230v	460v	230v	460v
PhaseMAXX - 75T	273A	137A	400A	200A	342A	171A
PhaseMAXX - 50T	192A	96A	300A	150A	240A	120A
PhaseMAXX - 40T	156A	78A	250A	125A	195A	98A
PhaseMAXX - 30T	118A	59A	200A	100A	148A	74A
PhaseMAXX - 25T	96A	48A	175A	90A	120A	60A
PhaseMAXX - 20T	78A	39A	150A	70A	98A	49A
PhaseMAXX - 15T	59A	29A	100A	50A	74A	37A
PhaseMAXX - 10T	43A	22A	70A	35A	54A	27A
PhaseMAXX - 7T	30A	15A	60A	30A	38A	19A
PhaseMAXX - 5T	22A	11A	40A	20A	28A	15A
PhaseMAXX - 3T	17A	9A	30A	20A	22A	15A

## Wire Sizing Schedule #3

3.5 - The wire size between the 3 phase splitter and converter terminal T3 must be at least the same size as that calculated for the total 3 phase output load.

EG: A #2 conductor is calculated to be sufficient for the total 3 phase load. A #2 conductor must also be used between the 3 phase splitter and Converter terminal T3.

3.6 - The wire size required for the Rotary Generator can be calculated using the values in the Rotary Generator Chart below.

### Rotary Generator Chart

Model	Maximum Running Amps		Min. Allowable Ampacity of Conductor.	
	230v	460v	230v	460v
PhaseMAXX - 75T *	187A	94A	234A	118A
PhaseMAXX - 50T *	125A	63A	157A	80A
PhaseMAXX - 40T *	100A	50A	125A	63A
PhaseMAXX - 30T *	80A	40A	100A	50A
PhaseMAXX - 25T *	65A	33A	83A	43A
PhaseMAXX - 20T *	54A	27A	68A	35A
PhaseMAXX - 15T *	40A	20A	50A	25A
PhaseMAXX - 10T	54A	27A	68A	35A
PhaseMAXX - 7T	40A	20A	50A	25A
PhaseMAXX - 5T	26A	13A	33A	17A
PhaseMAXX - 3T	20A	10A	25A	15A

\* (These models use 2 parallel rotary generators)

### Converter Idle Current Chart

Model	230v	460v
PhaseMAXX - 75T	50.0A	25.0A
PhaseMAXX - 50T	32.0A	16.0A
PhaseMAXX - 40T	27.0A	13.5A
PhaseMAXX - 30T	23.0A	11.5A
PhaseMAXX - 25T	18.0A	9.0A
PhaseMAXX - 20T	16.0A	8.0A
PhaseMAXX - 15T	11.0A	5.5A
PhaseMAXX - 10T	7.5A	3.8A
PhaseMAXX - 7T	7.0A	3.5A
PhaseMAXX - 5T	5.0A	2.5A
PhaseMAXX - 3T	4.0A	2.0A



## Wire Sizing Schedule #3

3.7 - The connection diagram for the Rotary Generator is shown in the Rotary Connection Charts below.

### Rotary Connection Chart (9 lead dual voltage)

Voltage	To overload T1	To overload T2	To overload T3	Join & Insulate
230v	T1 T7	T2 T8	T3 T9	(T4, T5, T6)
460v	T1	T2	T3	(T4, T7) (T5, T8) (T6, T9)

### Rotary Connection Chart (12 lead dual voltage)

Voltage	To overload T1	To overload T2	To overload T3	Join & Insulate
230v	T1, T6 T7, T12	T2, T4 T8, T10	T3, T5 T9, T11	
460v	T1, T12	T2, T10	T3, T11	(T4, T7) (T5, T8) (T6, T9)

3.8 - Voltage drop caused by long raceways may be critical in the startup of larger motors, particularly those motors with a substantial starting load. Whenever long runs are encountered, wire sizes must be studied carefully. The single phase transformer and single phase wiring must be large enough to prevent more than a 5% voltage drop during any motor start cycle.

# Service Guidelines

## Lubrication Procedure

4.1 - The Rotary generators for smaller converters, (typically 3T and 5T) are supplied with sealed bearings, and do not have grease fittings. These products are factory lubricated to operate for long periods under normal service conditions without re-lubrication.

4.2 - For all other rotary converters, lubricate the rotary generators according to the following chart. Use high quality ball bearing, medium consistency polyurea grease such as Mobil Polyrex EM. Do not use any silicone based grease in rotary generator bearings.

4.3 - If the rotary generator is equipped with lubrication fittings and grease drain plugs, remove the drain plugs. Clean the rotary generator fitting tips and the grease gun tip. Apply new grease until old grease starts to be expelled from the drain plug. It is normal to apply up to 70 pumps or more from the grease gun until some of the old grease is expelled. Operate the rotary generator for 20 minutes before replacing the plugs.

	Relubrication Intervals Chart		
<i>Hours of service per year</i>	<i>Models</i>		
<i>5000</i>	<i>All</i>		<i>1 Year</i>
<i>Continuous applications</i>	<i>All</i>		<i>9 Months</i>
<i>Seasonal service (where idle for 6 months or more)</i>	<i>All</i>		<i>Beginning of season</i>

4.4 – Caution: Keep grease clean. Lubricate the rotary generators at a standstill.

4.5 – Occasionally, even a new PhaseMAXX product can have a bearing with a slight noise. While all PhaseMAXX converters are factory tested, bearing noise can be attributed to several factors (including an item left for a prolonged time without being placed in operation). Where a converter bearing is believed to have an uncommon noise, the re-lubrication procedure should be completed at the converter's installation site prior to consulting Electram.

## Service Guidelines

*4.6 - Periodically inspect the terminal connections of all wiring, ensuring these are tight.*

*4.7 - Inspect all Start (Black) capacitors for external signs of stress. Each Start (Black) capacitor has a small round material expulsion window (approx 3/8 inch) at the connection end. If this window is outwardly curved or ruptured, replace all Start capacitors. Always replace all start capacitors if any single capacitor shows signs of stress. Failure to install the correct value and specific type of Start capacitors may result in severe damage to converter components. Start capacitors are non-PCB electrolyte filled.*

*4.8 - Inspect all Run (Silver) capacitors. If any of the Run capacitors are outwardly bulged or disfigured in any way, replace the individual capacitor. Run capacitors are metal encased, non-PCB oil filled, designed for industrial applications. Inspect the area around each Run (Silver) capacitor bank shelf for signs of oil leakage. If oil is detected, consult Electram for possible causes, and correction. If any Run capacitors require replacement, ensure that the replacement capacitor is complete with porcelain type resistor (specific value) if the damaged capacitor contained this item connected across its terminals.*

*4.9 - Note: Ensure the integrity of your Rotary Phase Converter. All replacement components should only be provided by Electram Rotary Equipment Ltd., 18112 - 107<sup>th</sup> Avenue, Edmonton, Alberta, T5S 1K5, (780) 451-0418.*

## Warranty

5.1 - *Electram Rotary Equipment Ltd., warrant's each of its products to be free from defects in materials or workmanship when operated under normal working conditions and in accordance with manufacturer's installation and operating instructions, for a period of twelve months from the date of purchase. This warranty shall be in lieu of any other warranty expressed or implied, including but not limited to any implied warranty of merchant ability or fitness for a particular purpose.*

5.2 - *Electram Rotary Equipment Ltd., shall not be responsible for removal, installation, or any other incidental or consequential damages arising from, or caused by the use of any of its products.*

5.3 - *Electram's liability under this warranty shall be solely limited to the replacement or repair of its defective product within the warranty period, and shall not be liable under any circumstances for any damages including but not limited to personal injury or labor costs. Under no circumstances will Electram be responsible for any repairs made by anyone other than the factory or authorized repair depot, unless such repairs have been authorized in writing by Electram Rotary Equipment Ltd.*

5.4 - *Remedy for warranty shall include one of the following:*

*Where the complete converter is returned to Electram (5.4.1)*

*5.4.1 - Electram will repair or replace, at its sole discretion, any component that has been found to be defective by the manufacturer, and is within the warranty period, provided that the complete converter is shipped with factory authorization, freight prepaid, to the nearest Electram factory outlet or authorized service facility. Upon completion of warranty repairs, Electram, or its authorized service center will return the converter freight prepaid, using Standard Ground delivery service as selected by Electram.*

*Where the converter remains installed on site, and where one or more components are determined to be faulty (5.4.2 – 5.4.3)*

*5.4.2 – Where any component is determined by Electram to be faulty within the warranty period, and where such a component is provided for under the terms of warranty, the replacement component will be shipped freight prepaid, using Standard Ground delivery services as selected by Electram Rotary Equipment Ltd.*

*5.4.3 – Any faulty or damaged component that has been replaced under the terms of warranty, must be returned to Electram Rotary Equipment Ltd. within 15 days, freight prepaid, in order to validate the warranty.*

*5.5 – Where any warranty converter or component is requested by the recipient with delivery service other than Standard Ground, the product will be shipped freight collect only.*