



# USER MANUAL

AR LOW VOLTAGE 208-240V

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# WARNING + SAFETY INFORMATION

► **DANGER: HIGH VOLTAGE** Electric shock could result in death or injury. Please consult qualified personnel for installation.

► **DANGER: RISK OF ELECTRIC SHOCK** After disconnecting the phase converter from the power source, wait 30 minutes before servicing.

This manual is to serve the purpose of providing recommendations for proper performance but is not to supersede or replace local or national electric codes. Installation should be done by a licensed electrician who is familiar with phase converter installations.

## WARNING! READ BEFORE STARTING CONVERTER!

If this phase converter does not start in less than 2 seconds, TURN IT OFF and verify the following listed below.

1. If you have 480v or any voltage other than **208-240v**, do not install this unit and call American Rotary.
2. Make sure the wire size meets or exceeds our minimum recommended size.
3. All loads, INCLUDING TRANSFORMERS, must be DISCONNECTED before starting the phase converter each time. American Rotary offers a variety of manual and automatic disconnect options. Please visit [AmericanRotary.com](http://AmericanRotary.com) or call 1-888-743-6832 for assistance.

If your converter still takes more than 2 seconds to start, call our Toll-Free Technical support line 1-888-743-6832. You will be asked to verify conditions 1 and 2 above are met. Failing to meet these two conditions account for 99% of starting problems and can result in damage to the starting capacitors.

This converter is much quieter than an off the shelf three phase motor. If for any reason it does not sound like it is running smoothly, TURN IT OFF and call American Rotary Technical support. (Please note that there is a break-in period of 100 hours.)

4. Make sure the electric generator/idler is mounted on the provided rubber isolation mounting feet. DO NOT BOLT THE IDLER MOTOR DOWN! This can cause bearing failure.

5. Make sure the idler generator is wired properly.

See section 3.2 on page 10-11 for proper wire instructions.

Do not ground any of these connections! Use the supplied bolts and make sure all connections are insulated. **DO NOT USE WIRE NUTS.**

Failure to wire the idler motor properly will void warranty!

6. Make sure the Phase Converter Panel, the electric generator/idler and your equipment is grounded!
7. This phase converter does NOT disconnect the single-phase power as it passes through the unit, so the single-phase legs remain energized even when the rotary phase converter is off. In addition to installing a single-phase breaker in front of the phase converter, you need to be aware that the single-phase power DOES flow through the phase converter whether the unit is on or off.
8. Before connecting the load, verify proper function of phase converter. This will ensure the protection of the phase converter and your equipment.



**WARNING:** This product can expose you to chemicals including Trichloroethylene, which is known to the State of California to cause cancer, and MethylPyrrolidone, which is known to the State of California to cause birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

# OVERVIEW + THANK YOU

Thank you and congratulations on your purchase of a state-of-the-art American Rotary phase converter. We appreciate the trust you have placed in American Rotary through the purchase of this phase converter. We strive to bring innovation and peace of mind to all of our clients through creating quality three phase power products that you can depend on.

## OUR MISSION

Our mission is to provide quality power solutions that support our customer's growth and help them to realize their dreams!

## KEY FEATURES AND CONSIDERATIONS:

- Current limiting soft starting electric generator (also referred to as the idler) made exclusively by Baldor.
- Built-in starter with power guard restart protection.
- Virtually zero harmonic content.
- Industrial Control Circuit - The single-phase power remains on even when the rotary phase converter is off, allowing you to activate any single-phase control circuits or other single-phase features on your three-phase equipment. (Custom options are available if all three lines need to be disconnected).
- Convenient terminal blocks for easy connections.
- True soft start electric generator which allows for a lower inrush current, more precise voltage balance and a smooth true three phase sinewave.
- American Rotary is a 508A registered panel builder.
- Built in power factor correction.
- Loads can be located a large distance from the converter by simply upsizing the wire.
- American Rotary phase converters should be wired by an experienced and qualified electrician into a single-phase circuit with proper breaker protection.
- American Rotary phase converters can run any type of load, resistive, inductive, multiple motor, and in any combination and or number.
- Best warranty in the industry.

# WARRANTY

## AMERICAN ROTARY ADVANTAGE



### PANEL WARRANTY

All American Rotary, rotary phase converter control panels are warranted against defects in material and workmanship for a lifetime (excludes DIY panels see DIY panel manual for more information). American Rotary will repair or replace (at our option), at no charge, any part(s) found to be faulty during the warranty period specified. The control panel warranty repairs must be performed by/at American Rotary's facility.

### ELECTRIC GENERATOR/IDLER WARRANTY:

The Idler/Generator is covered by Baldor's two-year warranty. Baldor Idler repairs or replacements must be performed by/at a Baldor Authorized Service Center. Baldor Idler repairs or replacements must also be pre-authorized in writing by American Rotary. The warranty inspection report as well as the specification tags from the generator will need to be provided before replacement can be authorized.

### OBLIGATIONS OF THE ORIGINAL OWNER

Transportation of control panels to American Rotary is the responsibility of the original purchaser. Return transportation is provided by American Rotary when the control panel is "in-warranty."

American Rotary will not accept Baldor idler returns or repairs sent to American Rotary. All Baldor issues are handled by Baldor Authorized Service Centers.

### EXCLUSIONS OF THE WARRANTY

This warranty does not cover any of the following: accident, misuse, fire, flood, and other acts of God, acts of terrorism, nor any contingencies beyond the control of American Rotary, including but not limited to water damage, incorrect line voltage, improper installation, installation where this unit will not meet local electrical codes, missing or altered serial numbers, and service performed by an unauthorized facility. American Rotary is not liable for any labor or inspection cost incurred in the field unless authorized by American Rotary's warranty department prior to any inspection/service. American Rotary's liability for any damages caused in association with the use of American Rotary's equipment shall be limited to the repair or replacement only of the American Rotary's equipment. No person, agent, distributor, dealer, or company is authorized to modify, alter, or change the design of this merchandise without express written approval of American Rotary.

Liability Limitation: In no event shall American Rotary be liable or responsible for consequential, incidental or special damages resulting from or related in any manner to any American Rotary product, third party installation(s), manufactured or distributed, or parts thereof. A licensed electrician must perform all installations. Not all American Rotary phase converters are UL listed. This is an option the customer must specify and additional charges will apply. American Rotary is not responsible for meeting, complying with or insuring installation inspections. American Rotary does not accept returns on units that have been installed or energized.

### DISCLAIMER OF IMPLIED WARRANTIES

OTHER THAN THE EXPRESS WARRANTY ABOVE, AMERICAN ROTARY MAKES NO OTHER WARRANTIES AND DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NONINFRINGEMENT.

## NOTE

Installations must comply with all national and local electrical code requirements and must be installed by a qualified licensed electrician. Customer is responsible for making sure this phase converter can pass inspection where installed. *Warranty is non-transferable and will remain with original purchaser/end user.*

# PRODUCT RETURN POLICY

This policy covers the return of American Rotary products (excluding Warranty returns, which are covered by a separate policy). Under this policy, original Purchaser may return product to American Rotary, with its PRIOR APPROVAL\*, for credit under the following terms and conditions:

## VALID RETURNS

The unit must have been purchased within thirty (30) days from the American Rotary corporate sales team or one of its corporate run ecommerce stores to be eligible for direct return (see below as some restrictions may apply) and cannot have been installed or energized. If purchase was made through a third party such as an American Rotary OEM Re-seller or Premium Re-seller please contact them directly. Any product whose carton has been opened (seal broken), installed, or has been marked on in any way is not considered suitable for resale, and will not be accepted for credit. Special order units are not returnable.

## OFF THE SHELF STOCK UNITS AND MODIFIED STOCK UNITS

Units that are defined as off the shelf stock are units such as NON-MODIFIED AR, AD, ADX, and DIY stock panels. These units are subject to a 25% restocking fee and the return MUST be initiated within 30 days of the purchase. Customers must return the product to the American Rotary warehouse\*\*, freight prepaid. The product carton should be packed in the same condition as it was shipped, with adequate protection from damage (We highly recommend that customers take photos of the return as American Rotary is not responsible for shipping damage and such damage will be deducted from the refund). Upon receipt, the product will be inspected, tested, and evaluated. If the product is found not to be in "as-new" re-sellable condition, the customer will be notified and will be offered the option of having the product returned to them, freight collect.

Units defined as modified are units which have been modified or upgraded from the original stock condition by American Rotary. Examples include, but are not limited to: factory installed accessory upgrades such as: timer kits, wireless remotes, installed breakers, receptacles, etc. Modified units are subject to a 25% restocking fee and all other terms to be deemed a valid return must be met.

## SPECIAL ORDER/CUSTOM MADE UNITS

Special order or custom-made units are defined as any unit that the customer has requested a special design or variation of the original product. These are any units that need to be specially made for the customer or a product that is not kept in stock on the shelf at American Rotary warehouses. Examples include, but are not limited, to white labeled products for OEM's, the AMP, AI Industrial, AUL, TEFC, Special Nema Enclosures or any other "customized" unit. These units have been specially designed and crafted and will not be able to be returned for any reason.

## REFURBISHED/SCRATCH AND DENT UNITS

These units have been discounted due to flaws in craftsmanship or handling damage and are not returnable. Each unit has been tested and inspected to ensure proper mechanical and electrical functionality.

## PRODUCT MUST BE IN ITS ORIGINAL UNOPENED, UNMARKED CARTON

Any product whose carton has been opened (seal broken), installed, or has been marked on in any way is not considered suitable for resale, and will not be accepted for credit.

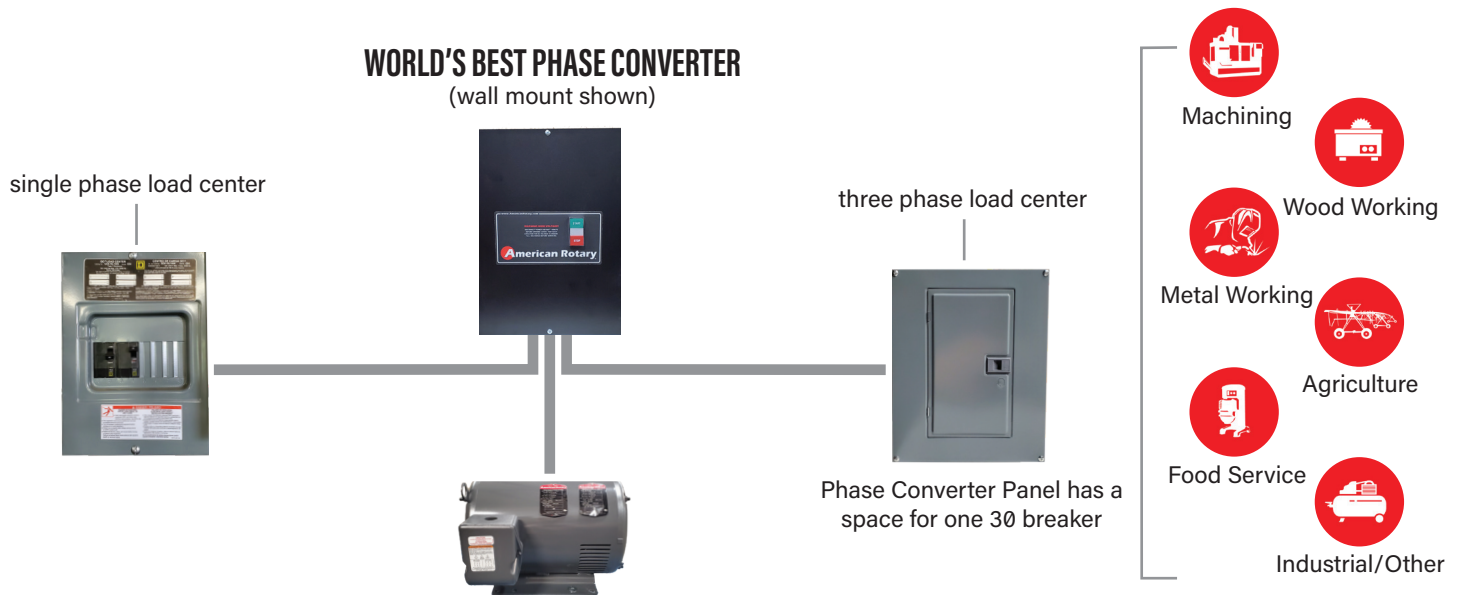
\*PRIOR APPROVAL: Contact American Rotary Return Merchandise Authorization Team to obtain the proper authorization and instructions for your return. Returns must be received within 10 days of an issued RMA.

\*\*Valid Returns must have been purchased from the American Rotary corporate sales team or one of its corporate run ecommerce stores to be eligible for direct return. If purchase was made through a third party such as an American Rotary OEM Re-seller or Premium Re-seller please contact them directly.



# 1.0 INTRODUCTION

American Rotary specializes in converting single-phase electrical power to three-phase electrical power. The diagram below provides a very simple view of the layout. Your installation may vary depending on your situation. Please consult with a licensed electrician or American Rotary Engineers if you need assistance determining what you will need for a proper installation.



It is recommended that a three-phase breaker be installed on the line between the converter control panel and the three-phase equipment. In cases where multiple pieces of equipment are being run off of a single converter a three-phase breaker panel/load center should be installed to ensure that all circuits are isolated. This is recommended to protect each piece of equipment and the wire that feeds that equipment.

The two single-phase lines pass through the phase converter and are used to manufacture the 3rd line that completes the three phases. The output voltage will always be close to the input voltage. If a completely different voltage is needed, then a transformer will be necessary.

The three-phase output is delta configured. This means that voltage measurements between phases will be similar to input voltages. Voltages should only be measured line to line. Do not measure voltages line to ground. Most machinery requires a delta three phase voltage and this third line voltage to ground should not affect operation. If a piece of equipment requires wye voltage and a neutral connection, the output of the phase converter must be ran through a delta-wye transformer to create the neutral. The phase converter must be started before the transformer if connected electrically. This is done with a safety disconnect switch or a custom automated disconnect. American Rotary offers a wide variety of transformers and disconnect options.

## 2.0 INSTALLATION GUIDELINES (CONTROL PANEL + IDLER)

The installation of the phase converter may vary from set-up to set-up, by the location it is being installed, variances in code requirements, and based on the application being used. The following is an overview only with basic connections of the single-phase utility power to the idler and the connections from the electric generator/idler to the American Rotary phase converter panel. Please consult a licensed electrician to ensure proper installation is completed.

### 2.1 ENVIRONMENTAL CONSIDERATIONS

The unit should be installed in a location free from the following:

- Excessive dirt
- Corrosive gases or liquids
- Excessive vibration
- Airborne particles (particularly metal particles)
- Ambient temperatures exceeding 50°C
- High humidity

American Rotary offers both wall mount and idler mount control panel locations. In either case, to minimize heat and vibration in the control panel, be sure to use proper isolation mounts on the generator/idler. The idler can be mounted in an elevated location to help reduce the introduction of dust and foreign contaminants into the windings. All idlers need to be protected from dust buildup on the outside of the motor as this can lead to overheating.

### 2.2 PRE-INSTALLATION

Installation should be done by a licensed electrician who is familiar with phase converter installations.

### 2.3 PACKING LIST

Before attempting to install the phase converter, ensure the following items are identified in the packaging:

1. American Rotary Phase Converter Panel
2. Electric Generator (also referred to as the idler)
3. Hardware Pack
  - Isolation mounting feet
  - Idler wire connection bolts and nuts (DO NOT USE WIRE NUTS)
4. Any additional accessories you may have ordered

### 2.4 PRE-INSTALLATION CHECKLIST

- ☐ Verify that your incoming utility voltage is between 208-240 volts. This manual covers the installation and proper wiring for the listed voltages only. If you have 480v incoming power do not install this unit and call American Rotary.
- ☐ Re-verify load requirements (i.e. HP, Amps, KW, KVA)
- ☐ Re-verify that the converter has been properly sized
- ☐ Re-verify incoming single-phase power is adequate
- ☐ Confirm proper conductor size (wire). See wire size chart on page 15
- ☐ Confirm proper overload protection (breaker). See breaker sizing on page 17
- ☐ Confirm all inline incoming power is disconnected
- ☐ Ensure you have all the tools required for the install (i.e. safety glasses, electric hot gloves, wrenches, screwdrivers, electrical tape, hammer, punch, crimpers, ring terminals, multi-meter, etc.)



## 3.0 PHYSICAL INSTALLATION

American Rotary phase converter units come standard in NEMA Type 1 indoor rated enclosures and are meant to be installed indoors only. NEMA Type 3R rainproof enclosures are available with the American Rotary AI Industrial series converters and other Nema rated enclosures are available by special order if needed. If the idler/generator is to be located outdoors, you should consider the American Rotary AI series or a special order TEFC generator/idler as an option. The control panels should be mounted securely. The electric generator/idler should be mounted on a clean flat surface using the provided rubber isolation mounting feet (bolt-down feet and insulators are available at an additional cost).

### 3.1 MOUNTING CONTROL PANEL

(for idler mount panels please see the separate Options and Accessories Manual).

#### STEP 1

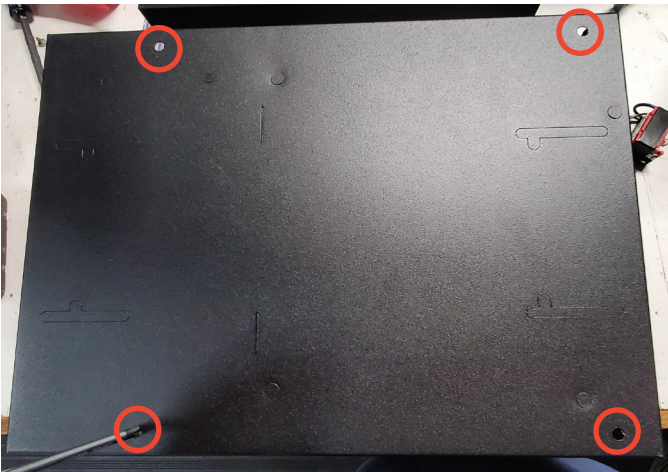
Determine the location where you will be mounting the panel to the wall.

#### STEP 2

Remove panel cover by removing the six (6) screws located on the front and the side of the panel.

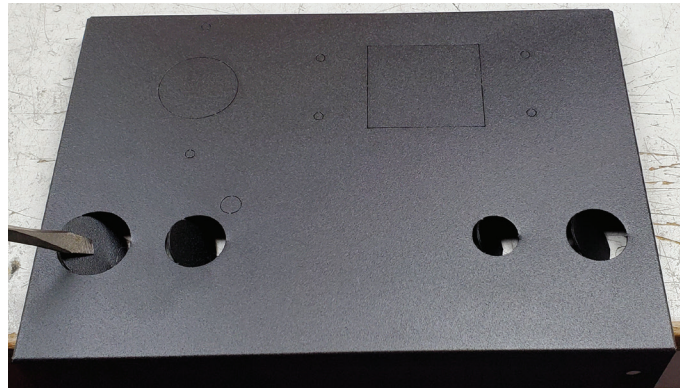
#### STEP 3

Remove screw knockouts from the back of the panel (be careful not to allow any metal to fall into the inside of the panel as this may lead to severe damage to the unit). See picture below.



#### STEP 4

Remove the conduit knockouts you will be using from the converter panel (panel can be mounted to have the knockouts accessible from the top or the bottom for ease of installation simply by turning the front cover around when re-attaching it).



#### STEP 5

If a panel mount breaker or flush mount receptacle is being installed, please reference the provided Options and Accessories Manual at this time. If not, please move on to step 6.

#### STEP 6

Mark the wall you will be mounting the panel and install your mounting hardware (NOT INCLUDED).

#### STEP 7

Attach panel to the wall by using the screw knockouts removed in Step 3.

## 3.2 CONNECTING CONTROL PANEL TO IDLER

(for minimum wire size recommendations see page 15)

### STEP 1

Feed wires through knockouts in converter panel and use wire clamps or compression connectors to secure wires in panel. It is recommended to use different color wires and to label the wires for each connection to ensure the proper tracing and connections downstream of the converter.

### NOTE

The following applies to steps 2-5 (**DO NOT USE WIRE NUTS FOR ANY IDLER CONNECTIONS AND DO NOT GROUND ANY OF THE IDLER CONNECTIONS**).

### STEP 2

Locate the (A) terminal. Connect one wire to this single barrel lug. This wire should connect to wires 1 and 7 inside the idler junction box using ring terminals bolts and nuts. (See fig 3.2.1 & 3.2.2 on pg 11)

### STEP 3

Locate the (B) terminal. Connect one wire to this single barrel lug. This wire should connect to wires 2 and 8 inside the idler junction box using ring terminals bolts and nuts. (See fig 3.2.1 & 3.2.2 on pg 11)

### STEP 4

Locate the (C) terminal. Connect one wire to this double barrel lug. This wire should connect to wires 3 and 9 inside the idler junction box using ring terminals bolts and nuts. ((See fig 3.2.1 & 3.2.2 on pg 11)

### STEP 5

Inside the idler junction box you will find 3 remaining wires marked 4,5, and 6. These wires should be bolted together. (See fig. 3.2.2 on pg. 11.)

### STEP 6

Connect ground lines to proper ground screws. (See fig. 3.2.3 on pg. 11.)

### STEP 7

Insulate all connections made in the idler junction box using rubber mastic tape, heat shrink tubing, or standard electrical tape.

## NOTE

The diagram below shows the single-phase input L1 and L2, the three-phase output T1, T2, and T3, and the idler connections for the rotary phase converter A, B, and C. Make sure to go off of wire numbers and not wire color as those may vary.

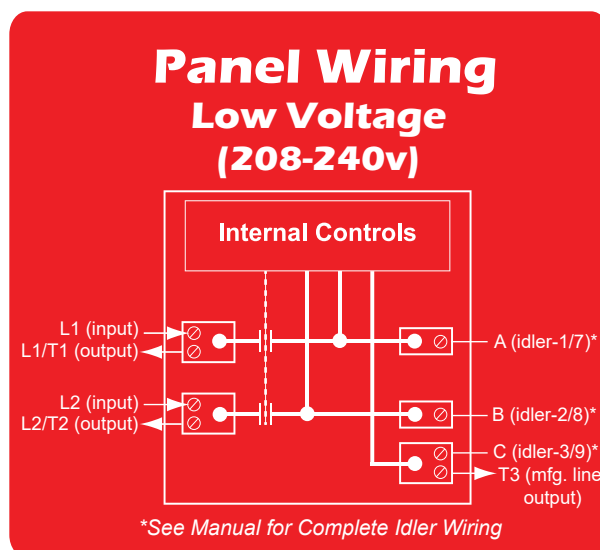


Figure 3.2.1 (\*Lug diagram may be different on larger units)

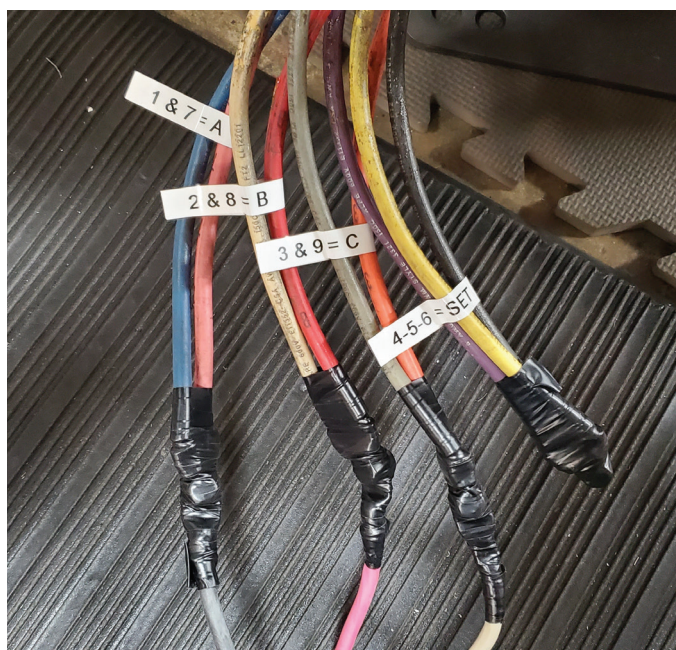


Figure 3.2.2

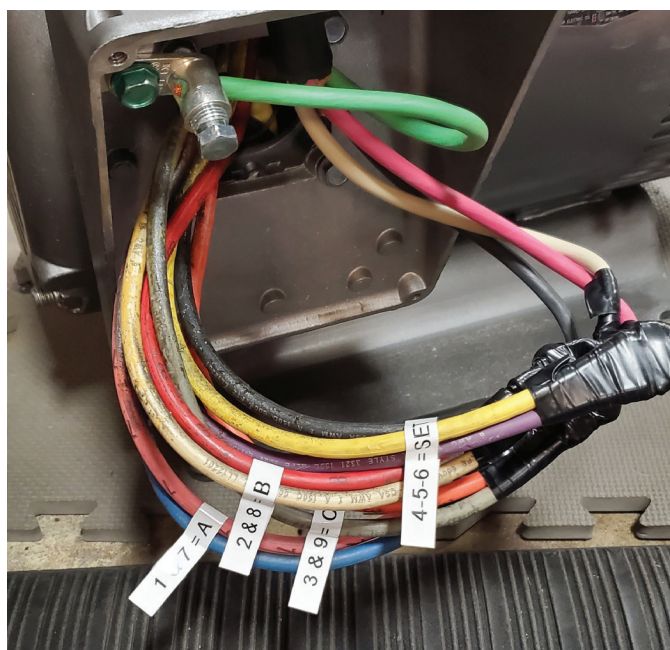


Figure 3.2.3



### 3.3 CONNECTING SINGLE PHASE POWER TO CONVERTER PANEL

(for minimum wire and breaker size recommendations see pages 15-17)

#### STEP 1

Make sure your power is disconnected. Failure to do so may result in electrical shock or even death.

#### STEP 2

Install single-phase wires in the phase converter panel by running the wires through the knockouts removed in earlier steps and secure to panel using wire clamps or compression connectors.

#### STEP 3

Connect wires to L1/L2 lugs and connect ground wire to the ground lug. (See fig. 3.2.1 on pg 11.)

#### STEP 4

Verify again that power is off and then proceed to connect the other end of the wires to your single-phase breaker in your single-phase panel.

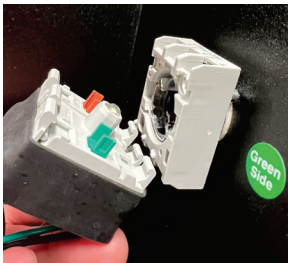
## NOTE

Do not turn on the power yet...we are not done.

### 3.4 CONNECTING START/STOP SWITCH TO CONVERTER PANEL COVER

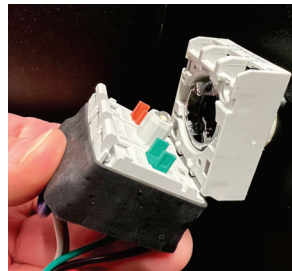
Remove the switch assembly from the bubble wrap. The switch assembly is already pre-wired into the phase converter panel.

Although it appears the switch can be installed either direction, it can not! The switch will break if installed in the wrong direction.



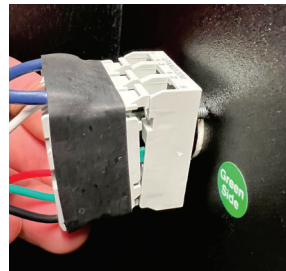
#### STEP 1

Make sure the green contact plunger matches up with the "Green Side" sticker.



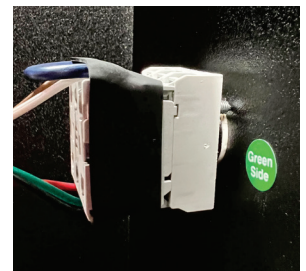
#### STEP 2

Position the bottom hooks into the slots of the plastic mounting adapter.



#### STEP 3

Rotate the switch assembly upward making sure the top locking tabs line up with each one of their grooves.



#### STEP 4

Push evenly on the back of the switch assembly until all 3 contact blocks snap into place.

## 4.0 TESTING CONVERTER BEFORE CONNECTING LOAD

When testing the converter without the load attached and running please keep in mind that the voltage readings may be higher than expected. This is completely normal. When you connect the load and have it running the voltages will even out and come into tolerance. Please follow the steps below for testing the converter before hooking up any load(s).

### STEP 1

Temporarily attach the front of the panel using two screws.

### STEP 2

Turn on your single-phase power to the phase converter. The converter should not turn on at this point. If the converter turns on as soon as the single-phase power is turned on, immediately disconnect the power and review the installation instructions or see the troubleshooting section of this manual on pages 20-21.

### STEP 3

Press the start button to start the converter. Once you verify the converter has started you may remove the screws that you replaced in the panel in step 1 and proceed to check your voltages (you may want to have a second person assist you as it is easier if someone holds the panel cover as it will be attached by wires). Voltages should be checked from phase to phase as this is an open Delta system. Example: You will need to measure the line voltage across T1 – T2, T1 – T3, and T2 – T3. You may find that one leg is reading higher than the other, but remember that this is normal, and it will settle in once a load is applied. Your voltages should be fairly close to your single-phase input voltage.

\*It is recommended to record these voltages in the Notes section on page 24-25.

### STEP 4

Now you can turn off the converter using the stop button, disconnect the power and wait 3 minutes.

### STEP 5

Verify the power is off. Connect three-phase load(s) i.e. three-phase breaker panel, equipment, disconnects, transformers, etc. These will be wired into T1, T2, and T3.

## 5.0 WIRING CONSIDERATIONS

### 5.1 GENERAL WIRING CONSIDERATIONS

American Rotary recommends that a qualified electrician should do all wiring and make all the connections. It is important to have adequate single-phase electrical service. The actual single-phase current that will flow through the converter is approximately 1.73 times the three-phase current. The National Electric Code requires 2.5 times the three-phase load current to allow for starting current and a margin of safety. This is a good conservative calculation to determine your single-phase branch circuit wire size and breaker size. The power needed to run the phase converter is very small and is negligible in figuring out the power required. The power required is calculated based on the load(s) only. Please see the list below for additional considerations when wiring the converter and your equipment.

- American Rotary recommends the use of copper wire. If you choose to use aluminum wire make sure it is upsized properly, as it does not carry the same rating as copper.
- Follow all local, state and national electric codes (NEC) which may supersede American Rotary recommendations. NEC wire chart is located on page 16.
- Increase wire size one size for every 50 feet of run and round up.
- American Rotary highly recommends surge protection to be installed on the single-phase and three-phase side to prevent damage downstream in case of a power surge caused by lightning strikes, brown outs, etc. American Rotary has affordable options for this in stock.
- T3 is the manufactured line; DO NOT use T3 for any single-phase loads such as start circuits, controls, etc. Run all control voltage and equipment controls from lines L1/T1 and L2/T2. Terminals A and B are for the idler only.
- Always make sure that the rotary phase converter starts before external load(s) are applied. This includes transformers that are connected downstream of the converter. American Rotary offers a number of automatic and manual disconnect solutions to ensure all loads are disconnected before attempting to start the converter. Failure to do so can result in serious damage to the converter and your equipment, this will also void your warranty.
- DO NOT assume that a breaker box neutral is a ground. Be sure to ground all equipment including breaker boxes, phase converter control panel and idler, disconnect switches, transformers, loads etc.
- Wire can never be sized too large, but too small of wire can impede performance and even keep the converter from starting properly.



## 5.2 FOR 208V - 240V

For all voltages: Conductors recommended are based off minimum single-phase breaker which is sized based on largest starting load. For combined HP's greater than 50% of maximum total HP listed in the table below, consult NEC and local codes for conductor sizing. The below charts do not replace or supersede any requirements by local, state, or national electric codes.

					MINIMUM RECOMMENDED WIRE SIZE
MODEL	KW	LARGEST LOAD FOR OPTIMAL PERFORMANCE HP	MAX TOTAL LOAD RUNNING HP	1-PHASE INPUT	3-PHASE OUTPUT (IDLER + LOAD)
AR 5	3.7	2.5	5	12	12
AR 10	7.5	5	10	10	12
AR 15	11	7.5	15	8	12
AR 20	15	10	20	6	10
AR 30	22	15	30	3	8

## 5.3 NEC WIRE RECOMMENDATIONS

The following wire recommendations are using copper wire as a conductor.

WIRE SIZE (AWG OR KCMIL)	AMPERAGE RATING (90°C/194°F)
12	30
10	40
8	55
6	75
4	95
3	115
2	130
1	145
1/O	170
2/O	195
3/O	225
4/O	260
250	290

\*reference table 310.16 NEC 2020

### ADDITIONAL WIRING NOTES

It is important to have adequate single-phase electrical service. The actual single-phase current that will flow through the converter is approximately 1.73 times the three-phase current. The National Electric Code requires 2.5 times the three-phase load current to allow for starting current and a margin of safety. This is a good conservative calculation to determine your single-phase branch circuit wire size and breaker size.

The power needed to run the phase converter is very small and is negligible in figuring out the power required. The power required is calculated based on the load only.

Wire can never be sized too large, but too small of wire can impede performance and even keep the converter from starting properly. Increase wire size one size for every 50 feet of run and round up.

## 6.0 CIRCUIT BREAKER CONSIDERATIONS

### FOR 208V - 240V

For all voltages: Breakers recommended are based off of the largest single load that is able to be started. Always consult NEC and local codes for breaker sizing. The below chart does not replace or supersede any requirements by local, state, or national electric codes.

MODEL	KW	MIN 1-PHASE BREAKER SIZE (AMPS)
AR 5	3.7	20
AR 10	7.5	40
AR 15	11	50
AR 20	15	60
AR 30	22	100

# 7.0 OPERATION + MAINTENANCE

## 7.1 STARTING + STOPPING

American Rotary phase converters are started and stopped with a mechanical push button. As with most electrical equipment, frequent stops and starts are harder on the rotary phase converter than steady operation. The rotary phase converter is extremely low cost to operate at idle (with no three-phase load), and this is preferable to a high level of stopping and starting. If your load situation dictates that the rotary phase converter must be started and stopped frequently, call us about our Phase Monitor and Timer Kit for optimum product operation.

## 7.2 CHECKING VOLTAGES

Measuring voltage is the easiest way to test to see if the phase converter is working properly. To get the most accurate measurement, the three-phase load should be running when you are checking the voltage.

### VOLTAGE MEASUREMENTS:

Measure L1/T1 to L2/T2	This is your single-phase voltage as supplied from the utility. To get the most accurate voltage measurement, make sure that the converter is on and the load is applied.
Measure L1/T1 to T3	This is the voltage between the manufactured line (T3) and one of the single phase lines. This voltage should be up to 5% higher than the T1 to T2 single-phase voltage.
Measure L2/T2 to T3	This voltage is the least important. It should also be within 5%. This voltage will drop down into spec. when a load is applied.

Do not measure line to ground. Voltages will vary widely when doing this.

## 7.3 GENERAL MAINTENANCE

The rotary phase converter may operate continuously with or without a load. The converter will run cool and quiet in the no load condition because the voltages are well balanced.

1. Never start the converter with a load applied (including transformers).
2. The converter should start within a second or two. Wait to start loads (including transformers) until the converter reaches full speed. A timer circuit can be used to automatically start loads after the converter reaches full speed.

### 7.3.1 MAINTENANCE

**Warning:** Ensure the power is disconnected and wait 30 minutes before inspecting the phase converter. Failure to disconnect the power can result in electric shock which may cause serious injury or death.

Please check the following annually:

- 1) Keep dust and moisture away from the control panel and the idler. Keep dust from accumulating in the motor. Dust can be blown out using compressed air. Keep dust from accumulating on the surface of a TEFC idler as this prohibits proper cooling.
- 2) Please check all lugs and make sure nuts are torqued down. The nut on the lugs per studs should be torqued down to 87 in/lbs using a calibrated torque wrench.
- 3) Check all connections to capacitors to make sure nothing is loose and all terminals are fully on the capacitors.
- 4) Check all input and output connections and make sure the lugs are tightened and secure.
- 5) Check all connections to the idler and make sure all electrical tape is secure.

All connections should be done with wire bolts and nuts. Insulate all connections made in the idler junction box using rubber mastic tape, heat shrink tubing, or standard electrical tape.

### 7.3.2 LUBRICATION

American Rotary phase converter idlers/generators are custom made and come with pre-packed bearings using the lubricant specifically designed for this idler. Exxon Polyrex EM or Peerless LLG Grease are high temperature bearing grease or equivalent polyurea lubricant is recommended for the Baldor Idlers and can be purchased through American Rotary.

DO NOT use Lithium based lubricants. These may cause premature bearing failure and will void the warranty.

Be careful not to force so much grease into the bearings that the excess finds its way into the windings of the idler. Some idlers have sealed bearings and will never require greasing even though they contain grease fittings (applies to all 5, 10 and 15 sizes). For all other units use the following rule of thumb for scheduled maintenance:

#### NOTE

Any idler manufactured after 3/1/24 will not contain grease zerks and does not require lubrication.

## LUBRICATION PROCESS:

1. Locate the grease inlet, clean the area and replace the pipe plug with a grease fitting.
2. Locate and remove the grease drain plug, if provided. This is located on the end bell, 180 degrees below the grease inlet.
3. Add the recommended volume of the recommended grease.
4. Replace the grease inlet plug and run the motor for 15 minutes.
5. Replace the drain plug.

GREASING AMOUNTS PER HP SIZE OF THE PHASE CONVERTER IDLER				
HP	BEARING SIZE	WEIGHT IN GREASE TO ADD OZ (GRAMS)	VOLUME OF GREASE TO BE ADDED	
			IN <sup>3</sup>	TEASPOON
5-15	No Greasing Required - Unit is equipped with sealed bearing.			
20-25	6208	0.19 (5.0)	0.3	1.0
30	6309	0.47 (12.5)	0.7	2.5
40-75	6311	0.61 (17)	1.2	3.9

*\*\*These values are based off of Standard Severity of Service of 8 hours a day in a clean environment not exceeding 40 degrees Celsius. If being used in a different environment or if the unit is in storage for an extended amount of time before or during usage, please see the attached ABB Installation and Maintenance schedule and reference the bearing size for proper greasing amounts.\*\**



## 8.0 TROUBLESHOOTING

### 1. MY THREE-PHASE LOAD DOES NOT SEEM TO HAVE ENOUGH POWER TO START.

- Check to make sure your converter is turned on.
- Check to make sure your converter is big enough. If not, a second converter of equal size can be installed in parallel to your converter to double its size. Ask us about our Autolink.
- Make sure your wire is big enough. Use the minimum wire size suggested on page 15. Go up at least one size for every 50 feet of run. Wire may need to be upsized for hard loads.
- Verify connections in the phase converter panel and Idler/generator.
- You may need a larger single-phase service. Everything may be big enough on your end, but sometimes the power company's transformer is not big enough to handle the full load plus other loads on your grid. Call your power company or electrician for service.

### 2. MY MACHINE DOES NOT START WHEN I TURN ON THE CONVERTER.

- The Start/Stop buttons on the converter are designed to only start your converter and not your loads. If your load does not have its own motor starter, American Rotary has a full line of motor starters available.

### 3. MY MACHINE STARTS RIGHT AWAY WHEN I TURN ON MY CONVERTER.

- You have your load improperly connected inside the converter panel. Reference wiring instructions on pages 10-13.

### 4. MY START/STOP SWITCH IS REVERSED SO WHEN I TURN IT OFF IT IS ON AND VICE VERSA.

- The switch has been installed on your panel improperly. Reference attaching Start/Stop switch section on page 12.

### 5. MY CONVERTER STARTS AS SOON AS I APPLY POWER TO IT.

- The idler generator is improperly connected inside the converter panel. Reference wiring instructions on pages 10 and 11.

### 6. CONVERTER DOES NOT START, OR IT MAKES A GROWLING SOUND.

- Verify you have single phase power between L1 and L2 feeding the converter. You should see between 208v-240v when measuring line to line.
- Check your idler and panel wiring connections.
- Make sure your wire is big enough. Use the minimum wire size suggested on page 15. Go up at least one size for every 50 feet of run. Wire may need to be upsized for hard loads.
- Check to make sure the idler is hooked up for its rated voltage. If it is 208-240 volts, make sure lines 4, 5 and 6 are electrically tied together, insulated, and not grounded. For complete steps on Idler Wiring, please reference pages 10-11.

### 7. A CAPACITOR FAILED OR IS LEAKING.

- A start capacitor may fail as a result of too frequent starts or having a load on when starting. Make sure all loads are disconnected when starting, including transformers.
- An overload such as too heavy of a load for the converter can cause the start and run capacitors to fail.
- A power surge such as a lightning strike or a brown-out can cause the capacitors to fail. A surge suppressor may be needed and can be found on the American Rotary website or by calling its sales office.

## **8. THE IDLER IS VERY HOT.**

- The Baldor idlers are rated up to 150° C. It may be normal for them to run hot. High current on one or more lines may also cause them to run hot. A good voltage balance means a good current balance.

## **9. MY THREE-PHASE LOAD HAS CONTACTORS THAT ARE CLICKING, LIGHTS THAT ARE FLICKERING OR IT KICKS OUT AS SOON AS IT STARTS.**

- All controls should be run from T1 and T2 (the single-phase lines). These lines do not fluctuate voltage as much as T1 to T3 or T2 to T3. If your machine does not have these clearly marked, reference your equipments installation manual or contact the equipment manufacture for technical support to ensure proper identification of the phase wiring.

## **10. MY VOLTAGE IS TOO HIGH OR TOO LOW.**

- The voltage that the phase converter will produce is based off the incoming single-phase voltage. The phase converter will use your voltage measured leg to leg on single phase as a baseline for balancing the voltage. Leg to leg voltage may vary by about 5% while under load. The phase converter does not transform the voltage up or down. If you need to raise or lower your voltage, a transformer may need to be added. Please contact American Rotary for assistance.

## **11. MY BREAKER IS POPPING.**

- Check to make sure the idler is hooked up for its rated voltage. If it is 208-240 volts, make sure lines 4, 5 and 6 are bolted together, insulated, and not grounded.
- Popping or blowing breakers might mean that there is a short from improper wiring installation. There may be grounding connected somewhere that should not be. Check the phase converter and the idler for both of these potential problems.
- Your breaker may be undersized. Check sizing requirements for your current setup. If further assistance is needed in sizing, contact American Rotary.
- Make sure your wire is big enough. Use the minimum wire size suggested on page 15. Step-up at least one size for every 50 feet of run. Wire may need to be upsized for hard loads.

## **12. MY VOLTAGE IS NOT BALANCED.**

- Do not measure line to ground. T3, the manufactured line, references a floating ground. The output of a phase converter is a Delta three phase voltage. If a neutral or 120 volts to ground is needed from all three lines, a Delta-Wye transformer is needed. American Rotary stocks the correct transformers for this.
- Make sure to check the voltage under load as it will be more balanced at that time.

## 9.0 IMPORTANT TERMS

### TRANSFORMER

A piece of electrical equipment that is used to increase or decrease electrical voltage.

### DISCONNECT

A mechanical switch that is used to break a connection between an electrical wire or line to provide isolation from the power source to a device.

### CIRCUIT BREAKER

Commonly referred to as a breaker, is an automatically operated electrical switch which will protect an electrical circuit from damage caused by excess current generally caused by an overload or short circuit on the line. Breakers are available in different sizes all based on the applications.

### LOAD CENTER

A panel that is used to house multiple breakers which will also serve the purpose of providing power distribution and isolation for the machine loads.

### ELECTRIC GENERATOR/IDLER

The rotary portion of the phase converter that is custom designed to produce the manufactured leg of a three-phase system that is powered from a single-phase system.

### CONTROL PANEL

The main panel as part of the three-phase converter. This is where all of the electrical connections are made, where the phase converter is turned on and off, and the panel that houses the start and run circuits for the phase converter.

### CAPACITOR

Stores electrical energy to assist with start loads and voltage balancing. An American Rotary phase converter will have two sets of capacitors, each serving a separate purpose. You will have start capacitors and run capacitors. Start capacitors are only engaged during the starting of the converter and during the start-up of the load whereas the run capacitors are engaged at all times when the converter is running.

### CONTACTOR

An electrically controlled or magnetically controlled switch used to engage an electrical circuit. This is used simply to complete an electrical connection and should not be considered a disconnect.

### GROUND

Provides an alternate route for electrical current to flow back to ground or Earth in the event of a problem in the wiring system.

### DELTA POWER

In simple terms in reference to a three-phase system, it would be a four-wire system (three hot wires and a ground). With a delta system, the power is connected in a triangle. When measuring a delta system leg to ground you will end up with a high leg. Delta systems should always be measured leg to leg when checking for voltage balance as you will get similar readings leg to leg.

## **WYE POWER**

In simple terms in reference to a three-phase system, it would be a five-wire system (three hot wires, a neutral wire, and a ground wire). A wye connection utilizes a star connection. Measuring voltage on a wye system will give you around 120v to ground on all three hot legs or between 208-240v when measuring between hot legs.

## **NEMA TYPE 1**

This is an indoor rated enclosure that is providing protection to the equipment inside from typical indoor contaminants such as dirt or other solid falling objects.

## **NEMA TYPE 3R**

This is an outdoor rated enclosure that is providing protection to the equipment inside from falling rain, sleet, snow and external ice formation. With an American Rotary Type 3R enclosure, the access door is also equipped with a gasket for an extra layer of protection.

## **TEFC**

Stands for Totally Enclosed Fan Cooled. This is a type of electric generator enclosure that does not allow outside air to circulate through the interior of the generator. Instead, it uses an externally mounted fan that blows air over the frame to cool it. With this enclosure, you can mount the electric generator/idler outdoor without the need for an additional enclosure around it.

## **IDLER JUNCTION BOX**

Also referred to as the J-Box. This is the box on the side or top of the electric generator/idler where the wire connection points are made. The junction box has a knockout where you can run the wires through and secure using a wire clamp or compression connectors. The front of the junction box will open to allow the wire connections to be made.

## **INSULATING WIRE CONNECTIONS**

This is the process of covering any wire connection points that are typically using metal with a non-conductive material. This process typically utilizes the use of rubber mastic tape, heat shrink tubing, or standard electrical tape.

## **CURRENT**

The rate of which electricity travels through a set point.

## **REGENERATIVE CURRENT**

Extra current or ghost current that is created when there are motors on a system. They can add current back into the line which can cause an amp meter to give an inaccurate reading and read higher than the actual amount of current being utilized.

## 10.0 NOTES

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## 10.0 NOTES

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