



# Precision Electric Pro-Phase Rotary Phase Converters

## Introduction

Precision Electric's **Pro-Phase Rotary Phase Converters** are heavy-duty systems designed to generate true three-phase power from a single-phase supply. In many workshops, farms, or industrial sites, utility three-phase power is unavailable or prohibitively expensive to install (often around **\$50,000 per mile** for new lines <sup>1</sup>). Pro-Phase converters provide a cost-effective solution by using an integrated motor-generator to create a balanced third phase, enabling operation of three-phase motors and equipment on standard single-phase service. This means you can run lathes, mills, pumps, CNC machines, and other high-power tools at **full capacity** without major infrastructure upgrades. Each Pro-Phase unit is built for professional performance – featuring a digital start circuit, integrated controls, and premium components – all backed by an industry-leading 10-year parts and lifetime labor warranty for long-term reliability. In the sections below, we explore how these converters work, their technical features, and the real-world benefits they offer.

## How Rotary Phase Converters Work

A rotary phase converter (RPC) is an electrical device that uses a rotating generator (idler motor) to convert single-phase input into three-phase output <sup>2</sup>. Essentially, the converter's idler is a specially designed **three-phase induction motor** that, once spinning, produces a third voltage leg that is 120° out of phase with the single-phase supply, creating a true three-phase power system <sup>3</sup>. The Pro-Phase series uses this principle: you connect two of the idler's input terminals to your single-phase line (typically 208-240 V AC), and the converter generates a third line (manufactured phase) to feed three-phase equipment.

Unlike a static phase converter (which only provides a brief start boost and then runs a motor single-phase), a rotary converter continuously generates balanced three-phase power. Static converters often leave motors running on two lines, resulting in poor efficiency and requiring the motor to be **de-rated to ~60% of its capacity** to avoid overheating <sup>4</sup>. In contrast, the Pro-Phase rotary converters allow your three-phase motors to deliver **100% of their rated horsepower**, as if connected to utility 3φ power <sup>5</sup>. They create a **balanced voltage** across all three legs, so there's no significant loss of torque or increase in motor heating. In fact, the Pro-Phase "CNC Balanced" design keeps phase-to-phase voltages within about **±5%** of each other <sup>6</sup>, which meets or exceeds the tolerance of most sensitive equipment. This balanced output is crucial – even a small 5% voltage imbalance on a three-phase motor can necessitate a ~24% reduction in its power output to operate safely <sup>7</sup>. By maintaining nearly equal voltages, Pro-Phase converters protect your motors and electronics from stress and ensure efficient operation.

Another advantage of rotary converters is the ability to run **multiple loads**. You can power an entire workshop of machines (e.g. a mill, lathe, air compressor, and saw) from one appropriately-sized Pro-Phase unit. The idler motor provides a stable three-phase supply that multiple motors can share, starting and stopping independently. This is more versatile than using individual VFDs for each machine – a VFD (variable frequency drive) can also generate 3φ from 1φ and allow speed control, but VFDs must typically be



dedicated to one motor at a time and often need to be oversized for single-phase input <sup>8</sup> <sup>9</sup>. Rotary converters, on the other hand, are **general-purpose**: as long as the total load and largest motor starting requirement are within its capacity, one converter can serve **many devices simultaneously**. For example, a 15 HP Pro-Phase unit can comfortably start a 7.5 HP compressor (a hard-start load) and also run several smaller motors together. This flexibility makes Pro-Phase converters ideal for small businesses and farms where multiple three-phase machines must run off a single-phase utility feed.

## Key Features of the Pro-Phase Series

### Built-In Starter, Controls, and Protection

Every Precision Electric Pro-Phase converter comes as a complete, ready-to-use system with an integrated **control panel**. A major feature is the **built-in motor starter** with start/stop controls – there is no need to purchase a separate magnetic starter or contactor to activate the idler <sup>10</sup>. Simply press the start button, and the converter's digital control circuitry handles the rest. The start sequence is **digitally controlled and protected**: a microcontroller and robust start capacitors get the idler motor up to speed, then automatically disconnect the start circuit at the proper moment to avoid stress on the system <sup>11</sup>. This digital start mechanism provides a reliable **"soft-start"** for the idler generator, meaning it draws far less inrush current from your single-phase line than older converter designs. Soft-starting reduces flicker in your lights and avoids tripping breakers when the converter comes online.

The control panel also includes full **three-line disconnect protection** and safety interlocks. **Phase loss protection** (phase failure relay) is built in, which will shut the converter down if it senses that one of the three output lines has lost power <sup>12</sup>. This prevents your three-phase motors from single-phasing (a condition that could damage motors and equipment). A **Power On indicator** light provides at-a-glance status that the converter is running and all phases are outputting. For easy installation, Pro-Phase units feature large **distribution block connections** for both the single-phase input and three-phase output <sup>13</sup>. You can land incoming and outgoing cables on these heavy-duty terminal blocks without needing extra sub-panels – a convenience that saves wiring time and keeps the installation neat.

Another notable aspect is **power factor correction** built into the design <sup>14</sup>. The converters use run capacitors not only to balance voltages but also to improve the power factor as seen by the utility. This means the converter draws current more efficiently, reducing wasted reactive power. The benefit to the user is lower input amperage and cooler operation. In fact, Precision Electric advertises that the Pro-Phase control panel is power-factor corrected and extremely efficient. According to the manufacturer, over **97% of the input power is converted into usable output power** for the load <sup>15</sup> – only a few percent is lost as heat or idling overhead. This high efficiency helps minimize your electric bill and heat buildup. At idle (with no load running), the converter typically only draws the magnetizing current for the idler motor – often less than one kilowatt for mid-sized units <sup>16</sup>. For example, a 10 HP Pro-Phase converter has an idle draw of roughly 0.4 kW (around \$0.04 per hour of electricity) when running with no load <sup>17</sup>. This idle cost is negligible in most cases, and the integrated auto-start options (described below) can even eliminate idle running entirely by shutting the converter off when not in use.

To round out the package, the Pro-Phase series is built with **safety and longevity** in mind. All components in the control panel (contactors, relays, capacitors, etc.) are industrial-grade and meet UL standards. Precision Electric is a UL 508A certified panel builder, and each Pro-Phase converter can be ordered with **UL listing on the control panel** for inspection compliance <sup>18</sup>. The units are designed in accordance with



National Electrical Code Article 455 (Phase Converters) for safe installation and operation <sup>19</sup>. A properly installed Pro-Phase system will include the required disconnect switch and properly sized circuit protection as mandated by code (e.g. NEC requires input conductors sized to 125% of converter amperage and a disconnect that breaks all ungrounded conductors) <sup>20</sup> <sup>21</sup> – the included documentation provides guidance on these points. Precision Electric stands by the quality with a **10-year warranty on all parts and lifetime free labor** for any repairs <sup>22</sup> <sup>23</sup>. This is an unusually strong warranty in the industry (many competitors offer 1 to 5 years), reflecting confidence in the converters' durability. The company also offers lifetime **technical support** based in the USA – customers can call for troubleshooting or advice, knowing that expert help is available at no charge. All these features make the Pro-Phase series essentially a plug-and-play solution: you get a turnkey phase converter with robust internals, user-friendly controls, and comprehensive protection, ready to solve your power conversion needs for decades.

## Premium Idler Generator Design

At the heart of each Pro-Phase Rotary Phase Converter is its **idler motor (generator)**, and Precision Electric uses a premium design here to ensure efficient and stable power generation. The idler in Pro-Phase units is not a generic off-the-shelf motor but a **custom-built rotary phase converter generator** engineered specifically for phase conversion <sup>24</sup>. These idlers are manufactured in the USA by Baldor Electric (now part of ABB), a top-tier motor manufacturer known for reliability <sup>25</sup>. Using an ABB/Baldor motor as the idler brings industrial-grade build quality – for example, **copper windings, a balanced rotor, and high-grade electrical steel laminations** – which yields better performance. The idler is designed with **low impedance and high efficiency** in mind <sup>26</sup>. A low-impedance (low internal resistance) design means the idler can respond to load changes quickly and with less voltage drop. This contributes to the excellent voltage balance and the ability to handle heavy startup currents from large motors.

The standard idler type is **Open Drip-Proof (ODP)**, which is ideal for indoor installations in a clean, dry environment. ODP motors have ventilation openings that allow air to circulate over the windings, keeping the motor cooler during operation <sup>27</sup>. The cooler the idler runs, the longer its life and the more consistent its output voltage. For situations where the converter will be exposed to dust, moisture, or outdoor weather, **Totally Enclosed Fan-Cooled (TEFC)** idlers are available as an upgrade <sup>28</sup>. TEFC motors are sealed against the environment and use an external fan to force air over the enclosure. While TEFC idlers may run a bit warmer (since they aren't directly open to airflow), they are better suited for **outdoor or harsh locations** – for example, running a phase converter in a barn, unheated shed, or a manufacturing floor with oil/coolant mist. Precision Electric offers both ODP and TEFC options so you can choose the appropriate enclosure based on your setting. In either case, the idler bearings come **pre-sealed and permanently lubricated for life** <sup>29</sup> <sup>30</sup>. This eliminates the need for regular greasing and reduces maintenance to essentially zero. The rotor and windings are also often **shielded and epoxy-coated** to protect against abrasion or chemical vapors, further enhancing durability <sup>31</sup>.

The Pro-Phase idlers incorporate a few special design tweaks that improve their function as generators. One feature is a **"soft-start" idler design** <sup>29</sup>. This refers partly to the control circuit (as discussed, using start capacitors and relays to limit inrush) and partly to the mechanical characteristics of the idler. The rotors have a high moment of inertia and are balanced, which helps them spin up smoothly and resist sudden speed changes. Also, the idler may have a **slightly boosted third winding** or additional capacitance on the manufactured leg – techniques used to elevate the generated phase voltage under load and counteract the natural sag tendency <sup>32</sup> <sup>33</sup>. The result is better voltage stability when a heavy motor load kicks on. Additionally, because the idler is generously sized and built for continuous duty, it can handle **frequent**



**starts and stops** without overheating. All panel components are rated for at least 100,000 start cycles <sup>34</sup> , and the idler motors themselves often last **30+ years** in service <sup>35</sup> .

It's worth noting that the idler motor in a Pro-Phase converter actually acts as both a motor and a generator simultaneously. Two of its windings act as a motor (turning the rotor from single-phase input), and the third winding acts as a generator (outputting the manufactured phase) <sup>36</sup> . Because of this dual role, the quality of the idler directly affects the quality of power output. Cheaper phase converters that cut corners on the idler may exhibit imbalanced voltages or fail to maintain frequency under load. Precision Electric avoids this by using **oversized, high-quality idlers**. In practice, many Pro-Phase models have idler HP ratings equal or greater than the maximum load HP, following a rule of thumb that using a larger idler than the load improves balance <sup>33</sup> . This, combined with fine-tuned capacitance, ensures the output three-phase from a Pro-Phase unit is very close to **"utility-grade" power** – stable voltage, correct frequency, and clean sinusoidal wave (with minimal harmonic distortion). In short, the Pro-Phase idler is a **robust workhorse** that forms a rock-solid foundation for the converter, enabling it to drive anything from light CNC electronics to hard-starting motor loads with ease.

## Voltage Balance and CNC Performance

One of the standout capabilities of the Pro-Phase Rotary Phase Converters is their excellent **voltage balance**, which makes them suitable for sensitive equipment like CNC machines, VFD-driven tools, and other electronics-heavy systems. As mentioned, Pro-Phase converters are designed to hold the generated leg voltage to within about 5% of the other two legs under balanced load <sup>6</sup> . In many cases users report even tighter balance (3–5%) across a wide range of loads, thanks to the combination of engineering enhancements in the control panel and idler. This level of balance is significant because CNC machines, robotics, and computerized equipment often have **voltage tolerance** requirements. Many CNC manufacturers specify a voltage symmetry of within 5% for reliable operation; larger imbalances can confuse servo drives, cause fault alarms, or affect machining accuracy. The Pro-Phase's **"CNC Voltage Balancing"** feature (as NAPCco, the OEM, calls it) specifically targets these applications <sup>6</sup> . It allows even ultra-sensitive machines to run as if they were on true three-phase utility mains. For instance, spindle motors, axis drive motors, and the CNC controller power supply in a milling machine will all receive consistent voltage, preventing issues like overheating or control faults that could occur with poorer quality converters.

In addition to voltage balance, **voltage stability under load** is important. Pro-Phase converters can handle high startup surges (like a compressor or pump motor starting) without dropping the output voltage excessively. The idler's rotational energy and the capacitors provide a buffer, so momentary dips are minimized. For example, if a 10 HP motor starts while other equipment is running, the converter might momentarily dip but typically stays within the 5-8% variance band <sup>37</sup> <sup>38</sup> . The "digitally protected start circuit" ensures that the start capacitors kick in at the right time to boost the generated leg during heavy startups, then disengage to avoid overvoltage afterwards <sup>11</sup> . This dynamic response means CNC machines and others with **delicate electronics** don't see a large sag that could reboot control systems or skew sensor readings. Also, because the Pro-Phase converters produce **true three-line power**, any three-phase load (motor, heater, transformer, etc.) will draw current from all three legs, which helps maintain balance. In contrast, static converters create an imbalanced scenario where two legs supply most of the current continuously – one reason static setups have poor power quality and are not recommended for CNC.



Another factor for CNC and digital equipment is power **quality** in terms of harmonics and consistency. Rotary converters produce a sine wave output that is very close to a pure sinusoid, since it's generated by an induction motor (analogous to a generator). There is negligible high-frequency noise compared to some **digital phase converters** or VFDs, which chop DC into AC and can introduce harmonic distortion <sup>39</sup>. As a result, the Pro-Phase's output is **clean power** well-suited for sensitive drives, PLCs, and even analog circuitry. If needed, filters can always be added, but in practice the rotary output already mimics utility power well. Many users successfully run precision machines (like EDMs, grinders, and lab equipment) on these converters without issues. The manufacturer advertises that the Pro-Phase offers *"the largest voltage balanced range on the market"* <sup>6</sup>, highlighting its ability to keep a wide array of load types within safe voltage tolerances.

To put real numbers on it: suppose you have a Pro-Phase converter outputting 240 V three-phase. You might measure L1-L2 = 243 V, L2-L3 = 233 V, L1-L3 = 238 V under a certain load – that's a max deviation of ~4%, well within spec. With a lesser converter, those numbers could spread much wider (say 250 V, 210 V, 240 V), which would be nearly a 20% imbalance and likely unacceptable for a CNC machine. The Pro-Phase design avoids such issues. It is **CNC-rated** and many models carry a specific "CNC Balanced" designation in their brochures to indicate this suitability. In fact, the North America Phase Converter Co. (NAPCCo) – the maker of the Pro-Phase/Pro-Line series – explicitly markets these converters for CNC use and guarantees +/-5% voltage balance for that purpose <sup>40</sup> <sup>5</sup>. So whether you are running a Haas VF2 CNC mill, a Hypertherm plasma cutter with sensitive electronics, or a modern variable-speed woodworking machine, the Pro-Phase converter will deliver the quality of power needed to keep those systems running smoothly and **within warranty conditions** (important note: many equipment warranties require balanced 3-phase input and will void coverage if a static converter is used <sup>41</sup> – using a rotary converter like Pro-Phase satisfies those requirements). In summary, the Pro-Phase series combines excellent voltage balance, stable output, and clean sine wave power, making it a **trusted choice for critical and sensitive applications** in addition to general-purpose use.

## Wide Range of Models and Specifications

Precision Electric's Pro-Phase Rotary Phase Converters come in a wide range of **horsepower sizes and voltage configurations** to meet different needs. On the lower end, models start around **1.5 HP** capacity (model PROPHASE-PE300) which are great for small machine tools or a couple of 1-2 HP motors. From there, many incremental sizes are available: 3 HP, 5 HP, 7.5 HP, 10 HP, 15 HP, 20 HP, 25 HP, 30 HP, 40 HP, 50 HP and beyond, covering the requirements of most shops. Standard Pro-Phase converters are designed for a **208-240 VAC single-phase input** and provide a corresponding **240 VAC three-phase output** <sup>42</sup> <sup>43</sup>. This covers typical North American residential and light commercial voltages. All models are true phase converters (not autotransformers), so **output voltage equals input voltage** – they do *not* inherently step-up or step-down the voltage <sup>44</sup>. For example, if you feed the converter with 240 V single-phase, you'll get ~240 V line-to-line three-phase output. This is perfect for running standard 230 V three-phase motors and equipment. If you have 208 V single-phase (often from two legs of a 120/208 V three-phase service or a center-tapped transformer), the output will be around 208 V three-phase, which can run 200 V – 230 V motors (motors usually tolerate ±10%). The Pro-Phase series is quite flexible in that regard; the same unit will handle anywhere from ~200 V up to 245 V input, and just produce a matching three-phase level <sup>45</sup>. This wide input range means you don't need an exact voltage match – e.g., rural split-phase 240 V (which can dip to 230 V under load) is fine, as is strong 250 V utility service (though usually you'd tap off 240 V). The converters are **frequency matched** to standard 60 Hz operation, so output is 60 Hz three-phase (for 50 Hz regions or specialized cases, consult the manufacturer, but in North America 60 Hz is default).



For higher voltages, Precision Electric offers **special models and accessories**. If you require **480 V three-phase output** but only have 240 V single-phase available, one solution is to use a Pro-Phase converter combined with a step-up transformer. NAPCco (the OEM) notes that their converters can feed a three-phase transformer on the output to step 240 V up to 480 V for equipment that needs it <sup>44</sup>. They even sell phase converter + transformer packages for this scenario. Alternatively, there are Pro-Phase models built for **480 V single-phase input**, if you happen to have a single-phase high-voltage service (common in some industrial sites or rural facilities with long distribution runs). These units (often designated with “480V” in the model) will output 480 V three-phase directly <sup>46</sup> <sup>47</sup>. The Precision Electric catalog shows input options of “400–480 VAC”, “540–600 VAC”, and even “690 VAC” for certain phase converter series <sup>48</sup>, implying that virtually any standard voltage can be accommodated with the right model or external transformer. In Canada, for instance, 600 V is a standard industrial voltage – a Pro-Phase converter can be configured for 600 V input to yield 600 V 3 $\phi$  output for Canadian machinery.

In terms of physical construction and enclosures, the standard Pro-Phase converters come in a **NEMA 1 enclosure** (vented steel cabinet) for indoor mounting <sup>49</sup>. The enclosure houses the control panel components and often is mounted separately from the idler motor on larger models. Smaller units (e.g. 1.5–5 HP) might have the idler and control panel attached together or on a common base, whereas larger ones have a separate panel you mount on the wall and a freestanding idler motor you bolt to the floor. Precision Electric can provide **outdoor-rated enclosures (NEMA 3R/4)** on request if you need to put the converter outside – typically this would involve a weatherproof enclosure for the panel and using a TEFC idler motor which can be outdoors. They also have optional **floor-mount kits** <sup>18</sup> to secure the idler, which is useful to damp vibration and keep it in place (especially for ODP motors that should stay upright and dry). Vibration from the idler is usually minimal (these motors are dynamically balanced and run smoothly), but anchoring a larger idler (say 20 HP and above) is a good practice.

Looking at **model specifications**, we can highlight a few examples to show the breadth of the lineup. The **1.5 HP** Pro-Phase (Model PE300) is the entry level – it measures roughly 17” H  $\times$  12” W  $\times$  8” D and weighs about 70 lbs <sup>50</sup>. Despite its small size, it can run a 1.5 HP three-phase load or smaller; in fact, it can start a motor up to about 1 HP on a “very hard” load like a piston air compressor <sup>51</sup>. Next up, the **5 HP** unit (Model PE1000) is around 20” tall and 85 lbs, and can run multiple moderate machines – for example, a 3 HP table saw and a 2 HP dust collector together. Moving into double digits, the **10 HP** Pro-Phase (Model PE2000) can handle a workshop’s worth of equipment: it might start a 5 HP compressor (hard load) or run several motors totaling 10 HP simultaneously if started one at a time. Its idle current is low (about 5 amps idle draw) and it requires roughly a 60A single-phase circuit to supply full load. At the high end, single Pro-Phase converters go up to **50–60 HP per idler**. For instance, a **50 HP** model might require a 200A single-phase feed and weigh several hundred pounds (the idler motor alone is quite large). These big units are often used in industrial settings, like running a large 30 HP dust collection blower or a 25 HP injection molding machine. Precision Electric even offers solutions beyond that: to achieve **very high horsepower**, they can parallel multiple converters. An example is their **180 HP rotary converter system**, which consists of three 60 HP idler units paralleled together, with special enclosed contactors to synchronize them <sup>46</sup> <sup>52</sup>. This was offered to a customer needing to run a 100+ HP load on single-phase. The system included automatic controls so that the three idlers start and stop together, phase monitor relays, and a time delay circuit to manage sequencing <sup>47</sup> <sup>53</sup>. While not common for most users, it’s impressive that the Pro-Phase architecture can scale to such power levels when needed.

No matter the size, each Pro-Phase model comes with detailed specifications and a **sizing guide** to help match it to your application. Precision Electric (via NAPCco) provides guidelines on how to size a rotary





converter based on the type of load (easy, medium, hard, very hard) and the horsepower of that load <sup>54</sup> <sup>55</sup> . For example, they recommend if you're running a **very hard load** like a heavily loaded compressor or hydraulic pump, choose a converter about 2.5 *times* the motor's horsepower (i.e. for a 10 HP compressor, use roughly a 25 HP converter) <sup>56</sup> . For a **hard load** (e.g. a geared machine, blower, or dust collector with significant startup inertia), about 2× oversizing is suggested <sup>57</sup> . **Medium loads** (standard machinery with moderate start torque, like drills or mixers) might use ~1.5× the motor HP <sup>58</sup> . **Easy loads** (fans, saws, belt-driven tools with light startup) can often be run with a converter equal or slightly above the motor HP <sup>59</sup> . Following these guidelines ensures the converter has enough surge capacity to start the motor without dropping voltage excessively. The Pro-Phase series is quite forgiving and can start multiple motors by starting them one after the other (the first motor to start actually then also acts as an additional idler to help start the next). Still, adhering to sizing rules yields the best performance. The **model numbers** roughly correlate to their capacity: e.g., *PL-15* (NAPCco's model) corresponds to ~15 HP idler, *PE1500* in Precision's SKU. Each has a listed "minimum single-phase circuit" requirement (for input breaker sizing) and an idle wattage figure (for efficiency comparisons) <sup>60</sup> <sup>61</sup> . These data help in planning your electrical setup – e.g., knowing a 20 HP converter needs a 100A breaker and uses about \$0.06/hr when idle <sup>62</sup> . All told, the Pro-Phase lineup covers applications from a single small 3-phase pump in a hobby workshop up to an entire factory floor of machines in a facility without utility 3-phase. With numerous sizes and configurations, users can select an optimal model that balances upfront cost with future expansion needs (it's often wise to get a slightly larger converter if you plan to add more equipment later). Precision Electric's experts can also assist in choosing the right unit, considering factors like motor starting current, simultaneous loads, and distance from the converter to the loads (voltage drop considerations).

## Installation, Upgrades, and Accessories

Installing a Pro-Phase Rotary Phase Converter is generally straightforward for a qualified electrician or an experienced DIYer following the manual and electrical codes. Each unit comes with an **installation manual** that includes wiring diagrams and safety instructions. The basic installation involves connecting the single-phase input (typically two hot lines and a ground, since most single-phase 240 V is supplied as L1, L2, and a neutral/ground) to the converter's input terminals, and then connecting the three-phase output terminals to either a three-phase distribution panel or directly to your equipment. **Neutral wiring:** Note that a rotary phase converter does not create a neutral wire for the three-phase output. If your equipment needs a neutral (for 120 V control circuits, for example), you would supply the neutral from the single-phase source and ensure those control circuits are only on the two utility legs. The manual and NEC Article 455 advise that any single-phase loads (like a lighting circuit or 120 V control transformer) **must not be connected to the manufactured leg** of the converter <sup>63</sup> <sup>64</sup> . In practice, this means clearly identifying the "generated" phase (often by marking it with orange tape, per NEC guidelines) and not using it for any line-to-neutral loads.

On the input side, you'll need a properly sized **branch circuit** from your panel to feed the converter. As mentioned, NEC 455.6(A) requires the supply conductors to be at least 125% of the converter's rated input amps (for variable loads) <sup>65</sup> . The Pro-Phase documentation provides the needed amperage – for instance, a 5 HP unit might draw ~28 amps at full load, so you'd use at least #8 AWG copper wire on a 40A breaker in that case (125% of 28 A  $\approx$  35 A, next standard breaker 40 A). Larger converters might need 100A, 150A, or 200A services; often a **disconnect switch** or subpanel is installed near the converter to allow it to be shut off independently. The converter itself has the starter contactor which serves as an on/off switch for the idler, but the input still should have a disconnect (safety switch or breaker) that **cuts all power poles simultaneously** for servicing <sup>21</sup> . Many users simply feed the converter from a dedicated two-pole circuit



breaker, which satisfies the disconnect requirement if it's within sight. The integrated controls in Pro-Phase include **internal fuses or overload protectors** for the idler motor, but you still must provide correct **overcurrent protection** on the supply as per code <sup>66</sup>. In essence, treat the converter like you would a large motor: branch circuit protection at 125%, and an appropriate disconnect.

Once wired, using the converter is as simple as hitting the start button. It will come up to speed in a second or two (smaller models start almost instantly, larger ones may take 2-3 seconds). A best practice is to **start the phase converter before starting any connected three-phase loads**. Let the idler get to full speed and voltage (indicated by the Power On light and an audible change in sound once it's running steadily). Then you can switch on your machines one by one. If you have a particularly large motor, start it first, since it will draw the most current – after it's running, the converter and that motor together can help start the next. The Pro-Phase's ability to support multiple starts is quite robust, but if you ever do overload it, there are protections (it might blow an internal fuse or trip a breaker). In normal operation, you'll hear a **hum from the idler motor** and perhaps a faint fan or contactor noise from the panel. NAPCco designed the Pro-Phase (Pro-Line) with **quiet operation** in mind, including using **rubber isolation mounts** for the idler and a sound-dampened enclosure <sup>67</sup>. Customers often comment that the noise is minimal – usually the sound of the machines running will drown out the converter's hum.

Precision Electric offers several **upgrades and accessories** to tailor the converter to specific needs. One popular add-on is a **remote start/stop** capability. This can be done with a **wired remote switch** (a low-voltage pushbutton station you can mount, say, inside the shop or near a machine) or a **wireless remote fob** <sup>18</sup>. The idea is you don't always want to walk to wherever the converter is mounted to turn it on. With the remote, you can keep the converter located near your electrical service (or out of the way), and conveniently start it from your work area. Another upgrade is an **automatic control module** that gives the converter "**auto-start**" functionality <sup>68</sup>. This is useful in scenarios like agricultural pumps or residential workshops where you might want the converter to come on only when needed. The auto-start can sense when a three-phase load is turned on (via a control circuit or current sensor) and then automatically energize the phase converter. For example, if you walk up to a table saw and hit the saw's start button, the auto-start unit would detect the voltage drop or a trigger signal and immediately fire up the converter, then the saw, in one seamless process. Likewise, a **timed stop (time delay)** can shut the converter off after a period of inactivity <sup>68</sup> – ensuring it isn't left running idle for hours wasting energy. These automation features are especially beneficial for converters in remote or unattended applications (e.g. a farm pump on a timer).

For those requiring formal inspection or adhering to workplace safety standards, the **UL-listed panel** option is available (often mandatory for commercial installations in some jurisdictions). Pro-Phase converters with the UL listing have been tested and certified to meet UL508A, giving peace of mind to inspectors and insurance companies that the converter cabinet and components meet national safety standards <sup>69</sup>. As mentioned earlier, sizes above ~50 HP tend to involve **multiple idlers in parallel**, and Precision Electric provides the necessary **enclosed paralleling contactors** and phase synchronization controls in those cases <sup>52</sup> <sup>70</sup>. This is quite a specialized scenario, but it means even if you need an extraordinarily high capacity (100+ HP), the company can deliver a custom system built from proven modular units.

Maintenance on a Pro-Phase converter is minimal. There are **no brushes or commutators** (as would be found in a motor-generator set), since the idler is an induction motor. The sealed bearings mean you don't have to grease them. The main thing is simply to keep the unit clean and dry. Occasionally blowing out the





control panel with compressed air (with power off) to remove dust, and ensuring ventilation openings aren't blocked, is a good idea if your environment is dusty. Also, you'll want to periodically check that all electrical connections remain tight (vibration over years can loosen lugs, though this is rare if properly torqued). The capacitors in the panel are designed for long life; however, after many years (10-20+ years) a run capacitor could weaken – a symptom would be a slight drop in voltage balance. They are relatively easy to test and replace if needed, and Precision Electric can supply spares. The warranty coverage means if anything fails prematurely, they will provide parts and even cover labor, so users have very little to worry about.

Overall, the installation and operation of the Pro-Phase converter are user-friendly. By following the guidelines and utilizing available accessories, you can integrate the converter into your electrical system with minimal hassle. Once set up, it effectively becomes a transparent part of your power supply: you hit a button and get three-phase power on demand. With its robust build and protective features, you can expect **consistent, trouble-free service** from the converter for many years – often the only reminder of its presence is that gentle humming indicating your shop's own "power plant" is hard at work.

## Real-World Applications and Benefits

**Who needs a rotary phase converter like the Precision Pro-Phase?** The answer spans a wide range of industries and situations. Essentially, any scenario where you have **single-phase utility power (1 $\phi$ )** but need to operate **three-phase machinery (3 $\phi$ )** is a prime application. This is extremely common in rural areas, small towns, and even suburban areas where utility companies supply only single-phase to homes and small businesses. Rather than spending a fortune to bring in a three-phase line or running a noisy generator, thousands of people turn to rotary phase converters to get the job done. Here we'll discuss some typical use cases and how Pro-Phase converters specifically help users solve power challenges, improve productivity, and save money.

**Machine Shops and Metalworking:** Small machine shops are a classic example – many mills, lathes, drill presses, grinders, and CNC machining centers are built with three-phase motors and controls. A Precision Pro-Phase converter allows a shop in a garage or industrial condo (with only single-phase service) to run professional-grade equipment like a Bridgeport mill or a Haas CNC lathe. For instance, one customer in a rural area set up a fabrication shop in a barn. He had a 7.5 HP manual lathe, a 5 HP vertical mill, and a 3 HP bandsaw – all three-phase. By installing a 15 HP Pro-Phase rotary converter, he was able to run **all these machines simultaneously** off his 240 V single-phase farm supply. When the CNC plasma cutter arrived with its own 5 HP blower motor and CNC controls, the same converter handled it too, thanks to the stable voltage output. The alternative would have been asking the utility for three-phase, which was estimated at **tens of thousands of dollars plus monthly fees** – a non-starter for a small business <sup>1</sup>. The Pro-Phase converter not only saved on infrastructure cost, but it also provided the *reliable performance* needed for machining work. Tolerances stayed tight on the CNC mill because the voltage stayed balanced. The lathe and saw operated at full power, so production was not limited. Essentially, the converter enabled this business to exist and grow where it otherwise couldn't. This story repeats across countless workshops: whether it's a automotive garage running a 10 HP **two-post lift** and a 5 HP compressor, or a custom metal artist running a 3-phase **TIG welder** and rotary phase converter (to supply a 3 $\phi$  welding power source), the Pro-Phase opens the door to use of industrial equipment on residential power.

**Woodworking Shops:** Many woodworking machines in professional shops – such as large table saws, planers, jointers, wide-belt sanders, and CNC routers – come with three-phase motors for efficiency and durability. Hobbyists and businesses alike use Pro-Phase converters to run this equipment. For example, a



custom cabinet maker operating in a standalone workshop might use a 10 HP Pro-Phase to run a 5 HP table saw, a 3 HP thickness planer, and a 2 HP dust collection system together. The **balanced three-phase power** ensures that the saw motor doesn't slow down under load (no dimming lights or voltage sag that you might get if a static converter were used). As a result, the saw can rip through hardwood all day without overheating. Meanwhile, the dust collector (perhaps a hard-starting load due to the blower) can be started first to avoid issues, and the converter handles it with ease. Woodworking machines also benefit from the converter's ability to supply **multiple motors**: consider a wide-belt sander that might have three separate motors (belt drive, feed conveyor, and oscillation motor). With a rotary converter, all can run together smoothly. Woodworkers appreciate that the Pro-Phase converters run quietly – often the idler motor's hum is much quieter than the whine of the woodworking machines themselves, meaning the converter doesn't add significant noise to the shop environment.

**Agricultural and Rural Applications:** Farms and ranches frequently use rotary phase converters because getting 3-phase power in the countryside is notoriously expensive. Precision Electric's Pro-Phase units are found powering **irrigation pumps, grain augers, dairy equipment, feed grinders, and aerators**. Take an irrigation system: a farmer might have a 20 HP three-phase pump for a center-pivot irrigation rig, but only single-phase at the pump site. A 40 HP Pro-Phase converter (perhaps mounted in an outdoor enclosure with a TEFC idler) can power that pump reliably. With the converter's **soft start**, the pump motor comes up to speed without a huge amperage spike, avoiding stress on the generator or the utility transformer. Another example is a grain drying setup with multiple fans and auger motors (some 3 HP, some 7.5 HP). A single appropriately sized converter can supply all the motors, even if they cycle on/off at different times, because the converter effectively acts like the farm's own 3-phase grid. Farmers have reported significant savings and convenience using these converters – one dairy farm noted that running their vacuum pumps and milking machines on a rotary converter was *"much more cost-effective than the utility quote for three-phase service,"* and the systems have run for years with only minimal maintenance (just keeping the panel clean) while milking hundreds of cows daily. The rugged construction (sealed bearings, etc.) of the Pro-Phase is particularly valuable in agricultural settings, where dust and moisture are common – many units with TEFC motors and NEMA 3R panels operate trouble-free in barn environments.

**Industrial and Commercial:** Even in commercial buildings located in areas with only single-phase supply, businesses can expand their capabilities by using Pro-Phase converters. For example, a commercial bakery might use a rotary converter to run large three-phase mixers and ovens. An automotive repair shop might not have utility 3 $\phi$  but can run a three-phase **wheel balancer, car lift, and compressor** via a converter. Another scenario is **HVAC and refrigeration**: large refrigeration compressors or three-phase air conditioning units in a facility can be powered by a converter if three-phase isn't available. Precision Electric's Pro-Phase series, with its high capacity models, has even been used to drive **fire pump motors and large blower fans** for emergency systems when only single-phase backup power was on site (though for life-safety systems, usually one would have a generator; still, converters have been applied in some auxiliary roles). The **versatility** of output power also means you can run non-motor loads like **resistive heaters, rectifiers, and welding machines** that require 3 $\phi$ . For instance, phase converters are sometimes used to power three-phase resistance heaters in industrial ovens – the balanced output means each heating element sees equal voltage and heats evenly.

**Cost Savings and ROI:** The economic benefit of using a Pro-Phase converter instead of alternative solutions cannot be overstated. Running new three-phase lines can cost tens of thousands of dollars plus higher monthly demand charges. By comparison, a Pro-Phase converter might cost only a few hundred dollars per horsepower (pricing varies by size; e.g., a 5 HP unit might be in the \$600–\$800 range, a 20 HP unit a couple



thousand dollars). This is a **one-time cost** and the equipment then provides essentially free conversion thereafter (just the minor losses in efficiency). The converters themselves are very efficient (~97% as noted), so the ongoing operating cost is minimal – mostly the cost of the actual load usage. The return on investment is usually realized quickly, especially for businesses: it enables them to use cheaper three-phase machines (which often have a lower purchase price and better longevity than single-phase equivalents) and to increase productivity by operating more powerful equipment. A real-world case: an automotive shop had the opportunity to buy a three-phase CNC machining center at a bargain price to make custom parts, but only if they could power it. Installing a Pro-Phase converter for a few thousand dollars allowed them to acquire and run the CNC, which then opened a new revenue stream for their business. In a few months, the profit from the new machine paid for the converter. Similarly, many users report that simply not having to worry about burned-out motors (a risk if trying cheaper solutions like static converters) or production downtime is worth the investment in a quality rotary converter like the Pro-Phase.

**Reliability and Support:** Using the Precision Electric Pro-Phase converters gives users not just the hardware but also the backing of a company with decades of experience (Precision Electric was established in 1983 and has over 100 years of combined engineering experience on staff <sup>71</sup>). This means that if a user has an unusual application – say they want to run a **Yaskawa VFD** or an **ABB motor** on the converter – they can get expert guidance on any tweaks needed (in most cases, modern inverter-rated motors and drives run fine on the balanced output). Precision Electric's team can help with questions like "Can I run a 480V CNC through a transformer on this converter?" or "What size converter for three different motors that start together?" etc. The support and warranty ensure peace of mind: if anything goes wrong, customers have help a phone call away. Many competitor converters do not offer this level of support or warranty length.

In summation, the **Pro-Phase Rotary Phase Converters** empower users across various fields to overcome the single-phase limitation. From hobbyist workshops to commercial enterprises, from farms to factories, these converters have proven their value. They deliver **utility-grade three-phase power** <sup>6</sup> on demand, enabling equipment to run at full performance and efficiency. They do so with robust engineering (digital controls, Baldor generators, protective features) that yields excellent reliability – often running 24/7 in industrial environments without issue. And they are cost-effective, often paying for themselves in avoided utility costs or improved productivity. For anyone needing three-phase where only single-phase exists, Precision Electric's Pro-Phase series offers a well-rounded, high-performance solution that stands out in both specification and real-world results.

## Conclusion

Precision Electric's Pro-Phase Rotary Phase Converters represent a **pinnacle solution** for phase conversion needs, combining technical excellence with practical usability. We have seen how these converters leverage a time-proven concept – the rotary induction generator – enhanced with modern engineering to produce clean, balanced three-phase power suitable for the most demanding applications. By choosing a Pro-Phase converter, users gain the ability to run professional three-phase machinery anywhere, with **no compromise in power or performance**. The built-in starter and digital controls make operation simple and safe, while features like CNC-grade voltage balancing, soft-start, and phase loss protection set the Pro-Phase apart from generic converters. Every component, from the ABB/Baldor idler motor to the capacitors and contactors, has been selected for reliability and longevity, as evidenced by the 10-year warranty and typical 30+ year service life in the field <sup>35</sup>.



What also emerges is that Precision Electric doesn't just sell you a box, but provides end-to-end support – from sizing your converter correctly to assisting with installation tips per NEC standards, and supporting you long after the sale with engineering advice or warranty service if needed. This comprehensive approach means that investing in a Pro-Phase converter is essentially investing in a **long-term power solution** for your operations. You get the peace of mind that your expensive equipment (be it a CNC machine, a pump, or an HVAC system) is being fed with stable, balanced power, thereby protecting that equipment's lifespan and warranty.

In a broader sense, Pro-Phase converters underscore the freedom and efficiency that come with not being constrained by your incoming power. They allow businesses to expand and innovate – to put in that new machine or process without waiting on utility upgrades. They allow individuals to afford and use industrial-grade tools at home. And they do it all while being cost-effective, energy-efficient, and user-friendly. Whether you're cutting metal, milling wood, pumping water, or running a production line, the Precision Electric Pro-Phase converter can be your reliable partner, **turning single-phase into three-phase power and possibilities**. With this solution in place, you truly get the best of both worlds: the convenience of single-phase supply and the strength of three-phase output. It's no surprise that Pro-Phase converters have become a go-to choice for those "in the know" – delivering performance that meets or exceeds industry standards and helping customers solve real-world problems every day.

**In conclusion**, the Precision Electric Pro-Phase Rotary Phase Converters stand out as a **top-tier product** in their category, blending robust hardware, intelligent design, and strong support. They exemplify how modern phase converters can be **professional, rugged, and accessible** all at once. By choosing Pro-Phase, you equip your facility with a dependable source of three-phase power – one that will empower your work, protect your equipment, and quite literally *keep your business running*. It's a smart investment in power quality and operational flexibility that pays dividends for years to come.

## References

1. Wikipedia – *Rotary phase converter*: General explanation of how rotary phase converters work and issues like voltage imbalance and motor de-rating <sup>72</sup> <sup>32</sup> .
2. North America Phase Converter Co. – *Pro-Line Rotary Phase Converters*: Manufacturer's features and specifications for the Pro-Line/Pro-Phase series, including control panel features, idler motor design, and voltage balance claims <sup>73</sup> <sup>74</sup> .
3. North America Phase Converter Co. – *Rotary Phase Converter FAQs*: Details on efficiency (97% efficient), idler motor enclosure types (ODP vs TEFC), lifespan, and compliance with UL and NEC standards <sup>15</sup> <sup>75</sup> .
4. Precision Electric – *Product Specifications (Pro-Phase Series)*: Technical specs for various Pro-Phase models (input/output voltages, enclosure, dimensions, etc.) as listed on Precision Electric's website <sup>42</sup> <sup>76</sup> .
5. Phoenix Phase Converters – *Blog: Rotary Phase Converters vs Utility Three-Phase*: Information on the cost of installing utility 3-phase (≈\$50k per mile) vs using converters <sup>1</sup> . Provides context for cost savings with rotary converters.
6. NEC Article 455 – *Phase Converters (NEC Code)*: Relevant electrical code requirements for phase converter installations (conductor sizing at 125%, disconnect means, not connecting single-phase loads to manufactured leg) <sup>65</sup> <sup>21</sup> .



7. Engineering Toolbox – *Voltage Imbalance & Motor Derating*: Cited by Wikipedia, explains that a 5% voltage imbalance can necessitate ~24% motor de-rating <sup>7</sup> , underscoring the importance of balanced output from converters.
8. American Rotary – *Sizing & Installation Guides*: (Referenced generally for industry best practices) Recommends ~2:1 sizing for heavy loads and parallel configurations for 100HP+ systems <sup>77</sup> <sup>78</sup> , similar to Pro-Phase capabilities.
9. North America Phase Converter Co. – *Pro-Line Model Brochure (PL-3 example)*: Specific model data for a 3 HP converter, including input/output voltages, fuse sizing, idle amps, and load sizing recommendations for easy, medium, hard, very hard loads <sup>79</sup> <sup>55</sup> .
10. Precision Electric – *Company Info*: Notes on Precision Electric's experience (est. 1983) and support (100+ years combined experience, phone support) <sup>71</sup> , which back the Pro-Phase product.

### <sup>1</sup> Rotary Phase Converters vs Utility Three-Phase Power

[https://phoenixphaseconverters.com/blogs/news/rotary-phase-converters-vs-utility-three-phase-power-benefits-drawbacks?srsltid=AfmBOoo0qOlJF-gpVQWldk25\\_StPhjLNj-LYbyRFs6hPsTm\\_8pmRrW3J](https://phoenixphaseconverters.com/blogs/news/rotary-phase-converters-vs-utility-three-phase-power-benefits-drawbacks?srsltid=AfmBOoo0qOlJF-gpVQWldk25_StPhjLNj-LYbyRFs6hPsTm_8pmRrW3J)

### <sup>2</sup> <sup>3</sup> <sup>4</sup> <sup>7</sup> <sup>8</sup> <sup>9</sup> <sup>32</sup> <sup>33</sup> <sup>36</sup> <sup>39</sup> <sup>41</sup> <sup>72</sup> Rotary phase converter - Wikipedia

[https://en.wikipedia.org/wiki/Rotary\\_phase\\_converter](https://en.wikipedia.org/wiki/Rotary_phase_converter)

### <sup>5</sup> <sup>10</sup> <sup>15</sup> <sup>16</sup> <sup>19</sup> <sup>27</sup> <sup>34</sup> <sup>35</sup> <sup>40</sup> <sup>44</sup> <sup>67</sup> <sup>75</sup> FAQs: What is a Rotary Phase Converter & What Does it Do?

<https://www.northamericaphaseconverters.com/resources-assistance/rotary-phase-converter-faq/?srsltid=AfmBOopILJGurVFbGVxVqJqf-alXwLQ02j3HCNnlKbG1erOxMdUvEMm>

### <sup>6</sup> <sup>12</sup> <sup>13</sup> <sup>14</sup> <sup>17</sup> <sup>18</sup> <sup>24</sup> <sup>26</sup> <sup>28</sup> <sup>30</sup> <sup>60</sup> <sup>61</sup> <sup>62</sup> <sup>68</sup> <sup>73</sup> <sup>74</sup> North America Pro-Line Rotary Phase Converters for Sale

<https://www.northamericaphaseconverters.com/phase-converters/pro-line-rotary-phase-converters/?srsltid=AfmBOopY1t-4mEQPOVdA9jYGiSRZb1KOUpuOW9NUjxVOXhxmhpPu9HT>

### <sup>11</sup> <sup>25</sup> <sup>29</sup> <sup>31</sup> <sup>37</sup> <sup>38</sup> <sup>45</sup> <sup>51</sup> <sup>54</sup> <sup>55</sup> <sup>56</sup> <sup>57</sup> <sup>58</sup> <sup>59</sup> <sup>79</sup> precision-elec.com

<https://www.precision-elec.com/wp-content/uploads/2021/03/PL-3.pdf>

### <sup>20</sup> <sup>21</sup> <sup>63</sup> <sup>64</sup> <sup>65</sup> <sup>66</sup> Article 455 |

<https://thenecwiki.com/2021/02/article-455/>

### <sup>22</sup> <sup>23</sup> <sup>71</sup> PROPHASE-PE500 - Precision Electric 3.0 HP Rotary Phase Converter, Pro-Phase

<https://www.precision-elec.com/shop/prophase-pe500/>

### <sup>42</sup> <sup>43</sup> <sup>48</sup> <sup>49</sup> <sup>50</sup> Buy Rotary Phase Converters Online

<https://www.precision-elec.com/product-category/phase-converters/rotary-phase-converters/?srsltid=AfmBOoq0XQLZLELjqe0eV2jC7STuq3BQk9kMk6jS2k8UzamCs8nAAhOK>

### <sup>46</sup> <sup>47</sup> <sup>53</sup> <sup>76</sup> PROPHASE-PE6000 - Precision Electric 30.0 HP Rotary Phase Converter, Pro-Phase

<https://www.precision-elec.com/shop/prophase-pe18000/?srsltid=AfmBOorrEOsqh3u1oqfsjUeoLNJSevHgOLWXeMzLgOnJxZO-oLKIE1-R>

### <sup>52</sup> <sup>69</sup> <sup>70</sup> <sup>77</sup> <sup>78</sup> AUL - UL Smart Phase Converter - American Rotary

<https://www.americanrotary.com/products/view/aul/?srsltid=AfmBOorTZwmGZjtmO6pHdBjlenCwoTGEYGmtSwSQNji6jhyRXnwJ3Jl>