



PHILADELPHIA GEAR

POWER SYSTEMS BY TIMKEN



Timken Power Systems
New & Replacement Gearboxes



Location. Location. Location.

Our commitment to quality is demonstrated by the fact that each one of our sites has been independently audited and ISO certified. This multi-site quality strategy comes with a degree of risk – after all, if one site fails an audit, the whole organization’s certification is placed in jeopardy.

Still, we have taken this approach to quality, which is unique in our industry, so that customers are assured that their mission critical equipment is in good hands anywhere within our network.

Philadelphia Gear’s Quality Management System is designed to provide consistently high levels of service to our customers, and is compliant with the quality system models of ANSI/ISO/ASQ Q9001.

Simply put, our unwavering goal is to measure customer satisfaction the way our customers define it – by delivering *100% TSB: 100% on-Time, 100% on-Spec, and 100% on-Budget.*

ISO 9001
Quality Certified

Local Service. National Support. Global Expertise.



Philadelphia Gear® brand enclosed drives are the product of over 125 years of innovative design engineering and manufacturing excellence. Our brands, which include WesTech, Western Gear, DeLaval Steam Turbine, Standard Machine, and Hamilton Gear have set the standard for endurance, quality, and customer satisfaction for more than a century.

However, all gear drives reach a point where they need to be replaced or upgraded due to changes in manufacturing needs, process improvements or technological advances. Our mission is to ensure that our customers always have state-of-the-art gear drive technology at their disposal to help prevent unplanned downtime.

Our gearbox configurations are as flexible and comprehensive as your application, and are designed to offer a wide array of size and footprint variations. We can create any possible gear arrangement necessary to satisfy customer requirements: from parallel shaft, to right angle, to double helical, to planetary/epicyclic, to bevel helical, and so on. There is virtually no gear related problem you'll run into that we haven't seen – and solved – before.

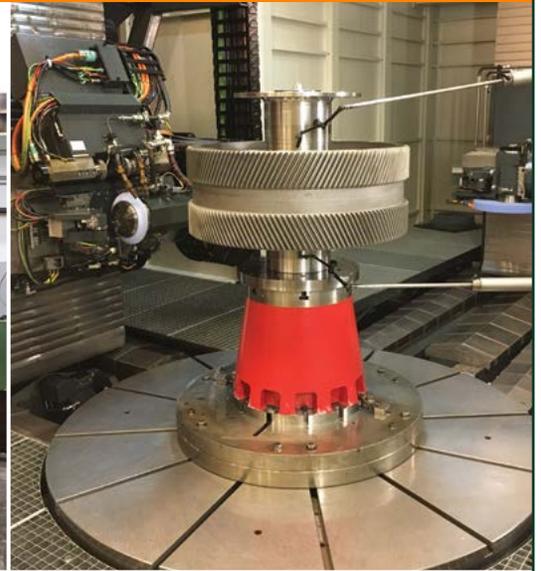
Now as part of Timken Power Systems, Philadelphia Gear and its family of brands have never been in a better position to serve demanding industrial markets throughout an increasingly competitive world.

Designed Solutions for Gearbox Applications

- Conveyors
- Cooling Towers
- Test Stands
- Kilns
- Extruders
- Crushers
- Generators
- Accessory Drives
- Load Boxes
- Pulverizers
- Fans
- Basic Oxygen Furnaces
- Low Speed Pumps
- High Speed Pumps
- Wind Turbines
- Air Preheaters
- Atomizers
- Ball Mills
- Swing Bridges
- Hydroelectric Turbines
- Draw Benches
- Pinion Stands
- Compressors
- Marine Propulsion



World-Class Design Means World-Class Performance



Philadelphia Gear and Timken Power Systems' products are designed to help our customers reduce and eliminate unplanned downtime. Believing that being close to our customers is critical to understanding their applications more thoroughly, we have strategically located our Regional Service and Manufacturing Centers so that they are close to the industries they serve.

Each regional facility has its own engineering and manufacturing capabilities, but is also backed by the central engineering and technical center located in King of Prussia, Pennsylvania. Additionally, and unique in the gear industry, each location has immediate Internet access to a vast digital library of intellectual property.

With over 4-million pages of drawings, bills of materials and other engineering documents available 24/7, each plant is able to instantaneously access more than a 125 years' worth of technical information. This applies to the entire Timken Power Systems family of gear brands including not only Philadelphia Gear, but Western Gear, WesTech Gear, DeLaval Steam Turbine, Hamilton Gear, and much of the GE marine gear product line as well.

Equipment Investment Delivers Reliability to End-Users

We understand the pressure our customers are under to do more with less, and that it has never been more important to make sure their equipment is available to run at optimal levels. By continually investing in the latest manufacturing, checking and testing equipment, the Philadelphia Gear network of manufacturing centers, representing nearly 1,000,000 square feet of space, makes us one of the most well-equipped suppliers of enclosed gear drives in the world.





Plant Infrastructure

- 70-ton lifting capacity
- Certified welders and non-destructive testing
- EPA approved painting and cleaning facilities with waste water recovery system
- Plant flows maximized to increase production efficiency and throughput
- Ergonomically designed work cells
- Bearing induction heaters to 10"
- Gear cable induction heating system to any size
- All sites independently ISO certified

Gear Manufacturing Capabilities

- Form grinding up to 4 meters
- Gear checking to 4 meters
- Horizontal and vertical 5-axis machining centers
- AGMA quality ratings of 8-15, depending on the application
- CNC gear hobbing to 1.8 meters
- Gear shaving to 90"
- Multiple roll stands to check gear contacts up to 100" center distances, and to simulate housing parallelism
- Gear balancing to 30,000 lbs.
- Gear shaping to 36"
- Isolated assembly areas

Gearbox and Component Test Capabilities

- Magnetic Particle Inspections (MPI) after case hardening and grinding
- Laser alignment on all test stands
- Faro arms for housing and component inspections
- Various test stands capable of achieving full load simulations to 60,000 HP
- Compliant with API testing standards as required
- 2500 HP cooling towers

General Machining Capabilities

- Horizontal boring mill tables up to 98" L x 48" W
- Vertical turning lathes to 42" D
- 300-ton press
- Key seating to 1.5" W x 15" L
- Shaft turning to 40" D x 16' L
- I.D. grinding to 22" D
- O.D. grinding to 40" D x 100" L
- Turning shafts to 56" D x 120" L
- Jig mill capabilities for housings and components
- Surface grinding to 42" D
- 8' arm drill press



Philadelphia Gear Brand Low Speed Gearboxes

There is not a low speed industrial gearbox application for which Philadelphia Gear has not designed and manufactured a solution. Throughout its storied history the company has made some of the highest torque gear drives ever conceived. From its revolutionary design work on vertical roller mill pulverizer gearboxes, to double reduction cooling tower drives used in harsh or corrosive environments, to load sharing conveyor drives, if you have the need, we have the answer.

No one understands the critical nature of this equipment better than Philadelphia Gear. That's why our extraordinary record of operating for millions of hours, combined with low maintenance costs and high availability rates, is second to none.

From the outset, Philadelphia Gear worked as the Original Equipment Manufacturer designer of record for many of the finest OEMs in the world including: ABB, B&W, Combustion Engineering, Cooper, Dresser, Elliott, Foster Wheeler, GE, Praxair, Rolls-Royce, Solar, as well as many government agencies including the Army Corps of Engineers, NASA, and the US Navy and Coast Guard, among many others.

No Time for Downtime

A recent survey of industrial plant maintenance managers revealed that 85% identified gear drives as being "very critical" to their operations. It is precisely that criticality that we understand best. Philadelphia Gear is a team of highly focused specialists, dedicated to helping the end-users of gear drives get the most out of their mission critical equipment.

The five key promises we make to the end-user community:

1. Purpose design gearboxes to get the job done right
2. Minimize production time through lean manufacturing
3. Maximize life cycle value with products that last
4. Support customer with field service experts available 24/7
5. Stay close to the customer through a robust network of sites





Before We Ship

It's one thing to describe your scope of work to a customer. It's something else to provide ISO documentation of the procedures and back it with a 5-year warranty. Every housing and every element that is going to be put into a Philadelphia brand gearbox undergoes a thorough inspection, measurement and checking process, and it is all documented through an exhaustive paper trail.

To deliver world-class products that deliver world-class performance you have to start at the very beginning; you have to start with the material you use to create the gearbox in the first place.

There is a variety of Philadelphia Gear material specifications that vary by application and industry. But regardless of their end-use, all materials are certified to our current standard, vacuum degassed, and ultrasonically tested to ensure material quality. Additionally, in order to assure uniform properties, special attention is given to all materials that have undergone heat treating and forming processes during manufacturing. Finally, cleanliness and mechanical testing requirements are carefully chosen and implemented based on each customer's application.

Characteristics of Philadelphia Gear Brand Gearboxes

- High quality, heavy-duty gearbox housings
- Heat-treated alloy steel shaft surfaces, precision ground to mate with gears, bearings and seal journals
- Horizontally or vertically offset parallel shaft configurations
- Single, double, triple, quadruple or quintuple reductions
- Bevel, bevel-helical or bevel-planetary arrangements
- Single helical, double helical, worm and herringbone gearing arrangements depending on application needs
- Chain driven turning gear systems when necessary
- Splash or force-fed lubrication systems, motor driven oil pumps, immersion heaters or oil coolers
- Other special features may include double extended shafts, built-in power take-offs and/or multiple bevel inputs to accommodate auxiliary machines, special exterior paints, anti-corrosive hardware, etc.



Philadelphia Gear Brand High Speed Gearboxes



High speed gearbox applications are demanding. It is only with the utmost dedication to design and manufacturing best practices that the kind of speeds that are required by the power generation, gas and oil exploration, refining, and pipeline/pumping industries, among others, can be achieved.

To further complicate matters, these units are often placed in some of the harshest operating environments in the world. Whether your application is offshore in the North Sea or the Gulf of Mexico, or land-based on the frozen north slope of Alaska or the sun-baked Sahara desert, Philadelphia Gear high-speed drives have an unparalleled record of long-term reliability.

As a founding member of the American Gear Manufacturer's Association (AGMA), as well as a current member and technical contributor to the American Petroleum Institute (API), Philadelphia Gear is uniquely positioned to serve the worldwide high speed gearbox market with products that are engineered for the toughest applications.

Greater Reliability Demanded by Higher Throughputs

Plant trends are clear – do more with less. This means that rotating machinery in process industries is running harder, faster, and is challenged to transmit more power than ever before. Advanced gear design and manufacturing capabilities developed at Philadelphia Gear, plus extensive operational field experience, make it possible for us to meet these exacting requirements.

Philadelphia Gear's long history in serving this market is evidenced by the fact that we have units successfully operating in the field that are rated up to 80,000 HP, have shaft speeds as high as 70,000 RPM, and pitch line velocities sometimes exceeding 35,000 feet per minute. Taken together, we offer a perfect blend of world-class engineering, long-term reliability and highly competitive initial cost.



Features You Need, Benefits You'll See

It all comes down to performance. All the features and benefits in the world don't mean a thing if a unit doesn't run reliably. For 125 years we've made gearboxes with one goal in mind: to provide the highest possible levels of uptime, all the time.

- Housings – Rugged design adds strength and rigidity, helping to maintain precise alignment of gears and bearings. Custom cast or fabricated housings available.
- Bearings – Split, steel-backed, Babbitt-lined precision journal bearings with thrust faces engineered to account for axial loads.
- Shafts – Machined from heat-treated, high quality alloy steel. Oversized to maintain gear alignment and protect from overload.
- Gears – Designed, manufactured and assembled with state-of-the-art technology; through-hardened, or case carburized steel forgings; precision hobbled and ground for accuracy and superior finish.
- Pinions – Integral with shafts, precision hobbled and ground in either case carburized or through-hardened versions per specifications.
- Seals – Aluminum labyrinth seals to prevent shaft leaks at extreme temperatures.
- Efficiency – Over 98% running at full capacity.
- Dynamically Balanced – Assures all rotating elements run smoothly at high speed.
- API / Instrumentation – Built to API standards as required, with a wide range of instrumentation options that satisfy any application requirements.

Testing in the Shop Achieves Optimal Performance in the Field

Full-speed tests of high speed drives under variable conditions, together with the use of sophisticated instrumentation to analyze vibration, sound levels, lubrication and gear mesh frequencies is a standard operating procedure at Philadelphia Gear. Shaft vibrations are monitored on both "X" and "Y" axes to ensure reliability and acceptable levels of sound, oil and bearing temperatures, and gear tooth patterns are thoroughly checked and documented.

By testing our gearboxes at field operating speeds our customers have the peace of mind in knowing their Philadelphia brand gearboxes will do what they are supposed to do once they are installed, a promise that is backed by one of the best warranty programs in industry: 5-years, regardless of how demanding the application or operating environment.

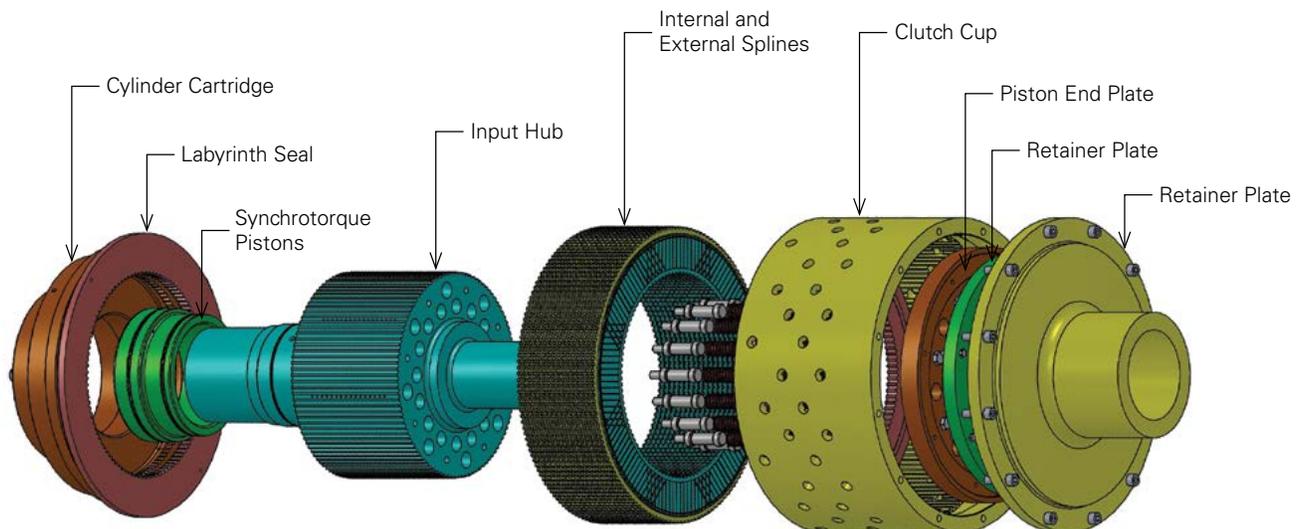


100% Lock-up. 0% Fixed-slip Losses.

Philadelphia Gear's Synchrotorque® line of hydroviscous clutches operates on the principle of shearing an oil film to transmit torque. This hydroviscous effect transmits torque in proportion to a variable clamping force. For unrestrained loads, the higher the clamping force, the faster the output speed. The input drive plates function as the driver. The output friction discs are faced with a suitably grooved resilient material and act as a driven member.

Precisely controlled clamping pressure between input drive plates and output friction discs allows virtually infinite speed control right up to 100% of input speed. This simple phenomenon, based on established hydrodynamic bearing principles, is the basis for controlled torque transmission in the Synchrotorque line of hydroviscous clutches.

- Works for 100 HP to 20,000 HP applications
- Range of sizes for a variety of mounting configurations
- Appropriate for adverse environments
- Output speed equals 100% of input speed
- No fixed-slip losses
- Can transmit torque in either direction
- Can remain running while disconnected from load
- Maximizes torque transfer in compact space
- Protects drivetrain from excessive loads with automatic torque limiting feature
- Clutch can be integrated with gearbox in one housing; unique Gear-Pak® solution simplifies alignment, reduces number of components, improves efficiency in smaller footprint, and has lower initial cost



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You've Got Enough to Worry About

Cross gearboxes off your list. Philadelphia Gear is proud to offer one of the most comprehensive warranty programs in the industry for its full line of enclosed drives. We believe that world-class gear drives should be backed by a truly world-class warranty.

That is why our commitment to our customers and the trouble-free operation of the equipment we design and manufacture is backed for a full five years. This best-in-industry warranty gives Philadelphia Gear customers the peace of mind that comes with knowing that their gearbox has been engineered by people who hate downtime as much as they do.



**PHILADELPHIA
GEAR**

POWER SYSTEMS BY TIMKEN

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Military Marine
Mining
Municipalities
Nuclear
Offshore Exploration
Oil and Gas
Power Generation
Pulp and Paper
Refining
Steel and Metals
Transportation
Water Management
Wind



TIMKEN

The Timken team applies their know-how to improve the reliability and performance of machinery in diverse markets worldwide. The company designs, makes and markets high-performance mechanical components, including bearings, gears, belts, chain and related mechanical power transmission products and services.

Stronger. Commitment. Stronger. Value. Stronger. Worldwide. Stronger. Together. | Stronger. By Design.

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