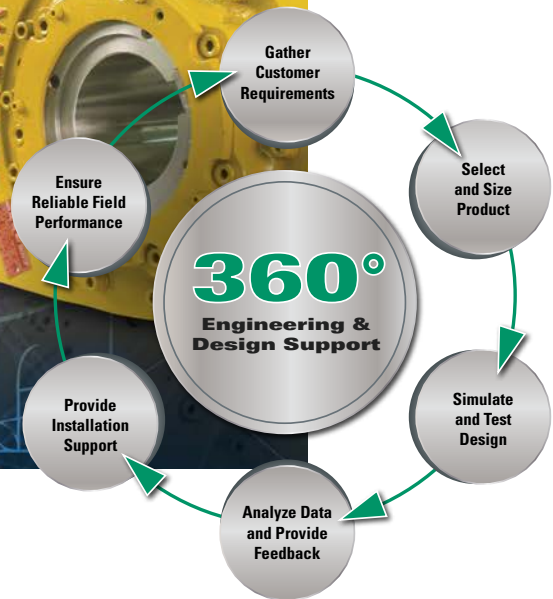


Heavy Duty & Overrunning Clutch Brake Group Engineering Capabilities

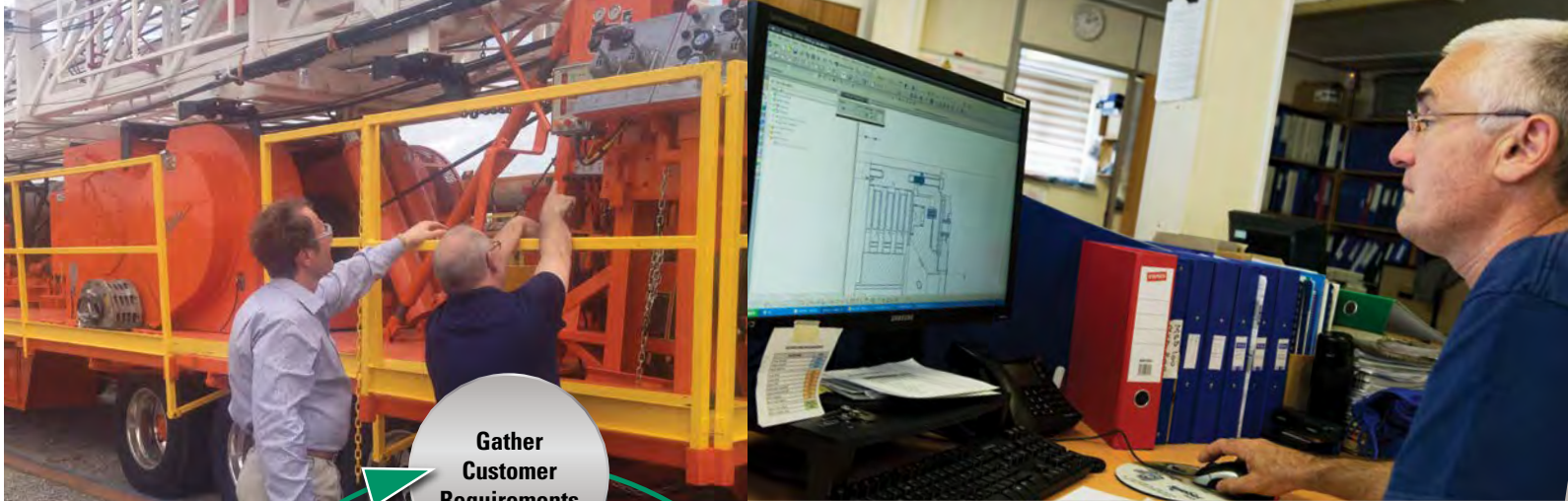


Altra[®]
Industrial Motion

Formsprag Clutch • Industrial Clutch • Marland Clutch
Stieber • Stromag • Svendborg Brakes • Wilflex • Wichita Clutch

Our approach

We offer the industry's most comprehensive design, engineering and testing support... available around the world.



The well recognized brands of Altra Industrial Motion's Heavy Duty & Overrunning Clutch Brake Group (HDOCB) are multinational designers and producers of advanced pneumatic, hydraulic mechanical and electromechanical power transmission solutions.

360° Engineering & Design Support

Over our many decades of experience, we have developed a comprehensive 360° approach to providing our customers with an unmatched level of design, engineering and testing support.

Customer Requirements

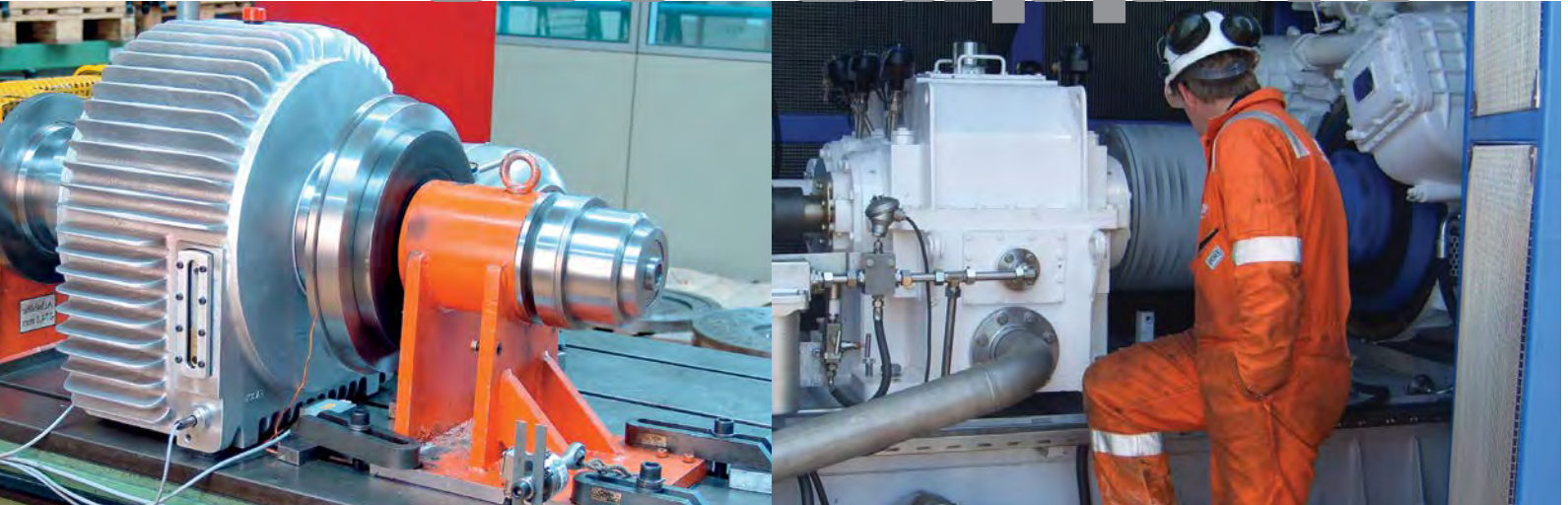
It all begins with obtaining and understanding our customer's expectations. This can happen in a number of ways including the use of online data forms, customer conferences or on-site visits.

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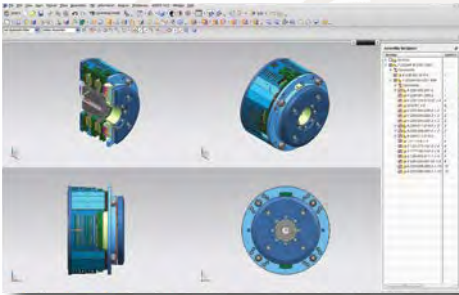


360° Support



Product Selection and Sizing

Once armed with the application parameters, the process of determining specific product solution meets the customer's performance requirements can begin, including custom designs.



Design Simulation and Testing

The most advanced engineering tools available are utilized for product design and testing. To meet customer demand, we continue to expand their global in-house testing capabilities, which are among the most extensive in the industry.

Data Analysis and Sharing

Utilizing electronic data acquisition, our engineering teams work closely with our customers to analyze all test results. In some cases, we can securely share real time test results directly with our customers. This open, collaborative approach allows for all parties to be aware of actual performance characteristics prior to field installation.

Installation Support

Our engineering teams are strategically located around the world to provide comprehensive customer support, ensuring efficient and successful product mounting and installation.

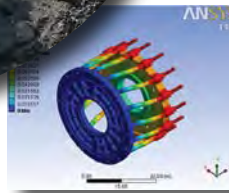
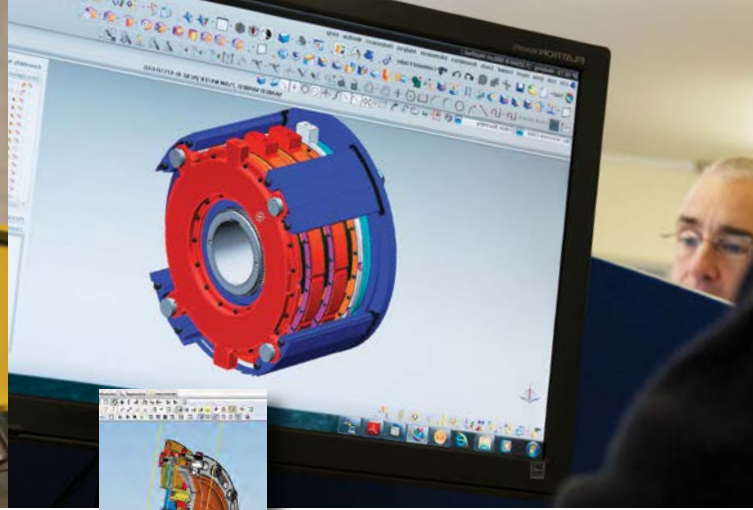
Field Performance Check

Our engineers are available to conduct remote or on-site field evaluations to help customers obtain optimum performance from our products.



Engineering Design

Market-focused engineering teams provide innovative solutions designed for years of reliable performance.



Engineering Tools and Systems

- ANSYS FEA
- Teamcenter PLM
- NX CAD & Solidworks
- Labview DAQ
- CREO Parametric

Industries Served

- Metals
- Energy, Oil & Gas
- Mining
- Marine
- Elevators
- Material Handling
- Packaging Machinery
- Renewable Energy
- Aerospace & Defence

Leading through design innovation

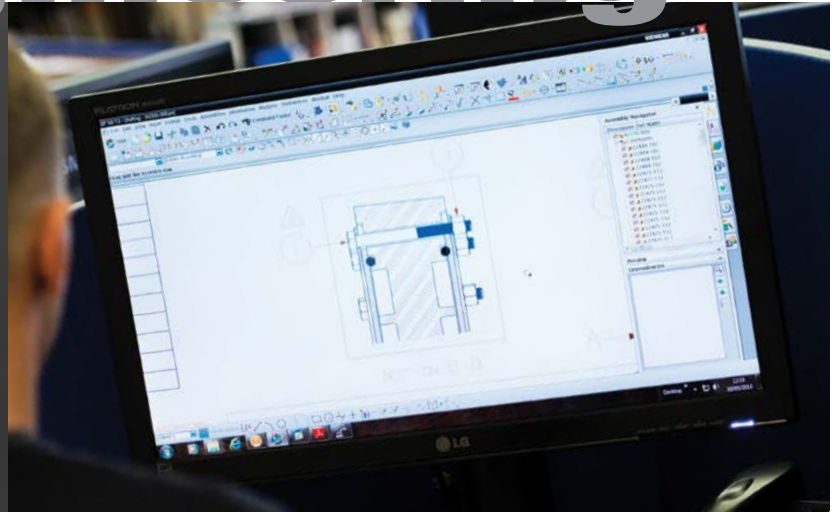
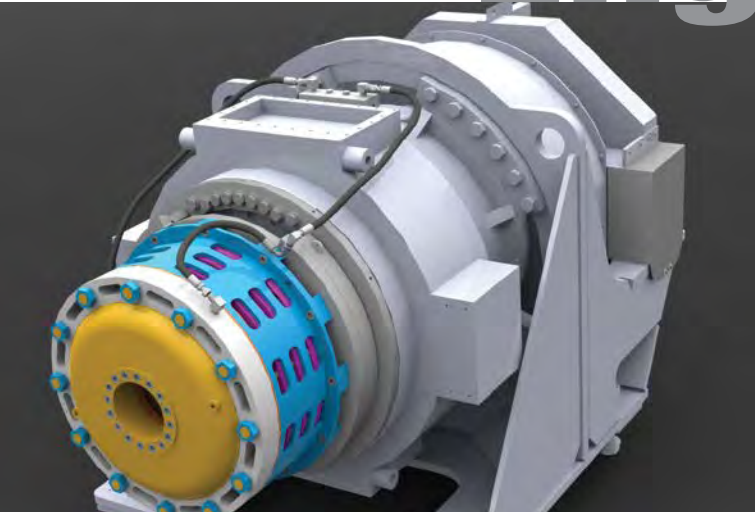
We employ a flexible approach to problem solving, enabling our engineering teams to provide application and design support from concept to completion. Our extensive expertise spans a wide range of applications from offshore mooring winches, mining ball mills and conveyor backstops to high rise elevators, metal mill coilers and high speed turbine engine starters.

Wichita Clutch, Industrial Clutch, Twiflex Limited, Formsprag Clutch, Marland Clutch and Stieber Clutch are recognized around the world as leaders in clutch/brake design technology. Recent achievements include:

- Utilized the latest technologies and state-of-the-art materials to develop revolutionary, corrosion-resistant composite water jackets for water-cooled clutches and brakes.
- Designed and manufactured the world's largest mine conveyor backstop with a torque capacity up to 1,200,000 ft.lb. and bore sizes up to 23 inches.



Engineering



Custom solutions are our standard

While our wide array of standard products will meet most customer performance requirements, many customers come to us when they need a clutch or brake to function in a different way which cannot be achieved with available standard industry offerings.

Customers have come to rely on our application-based design expertise to develop innovative brake and clutch solutions that will meet or exceed their field performance expectations. Some recent examples include:

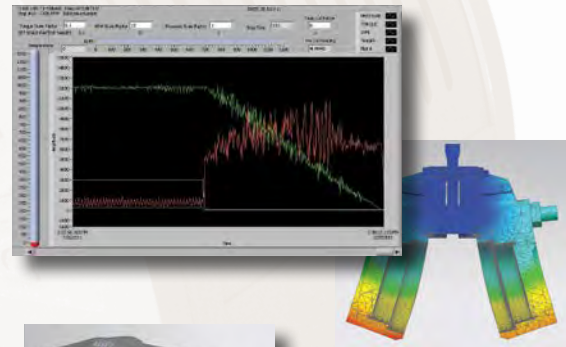
- Brake modified to withstand corrosive sea spray and direct sea water splash for mooring winches
- Custom wet brake for world's largest tidal turbine
- Load-sharing, high-speed backstopping clutch for inclined conveyors
- Brake with economical dual-actuator for drilling rig drawworks
- Custom floating design caliper brakes
- Modified standard vent clutch for marine-duty on large sand dredge
- Bi-directional backstopping clutch for critical valves on aircraft carriers
- Grinding mill caliper brake with parked-off feature for safer field service

Other typical modifications include:

- Calipers with varying braking force, monitoring switches, paint finish, environmental protection, pad material and disc thickness.
- Clutches and brakes with extended size capacity, unique mounting designs, low temp capability, special paint and logos.

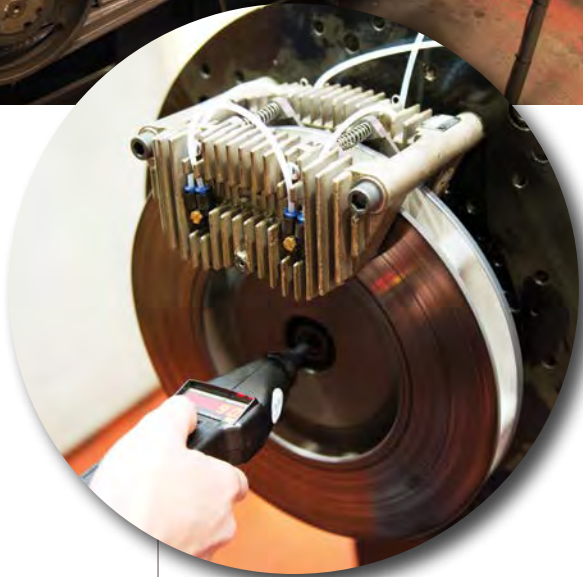
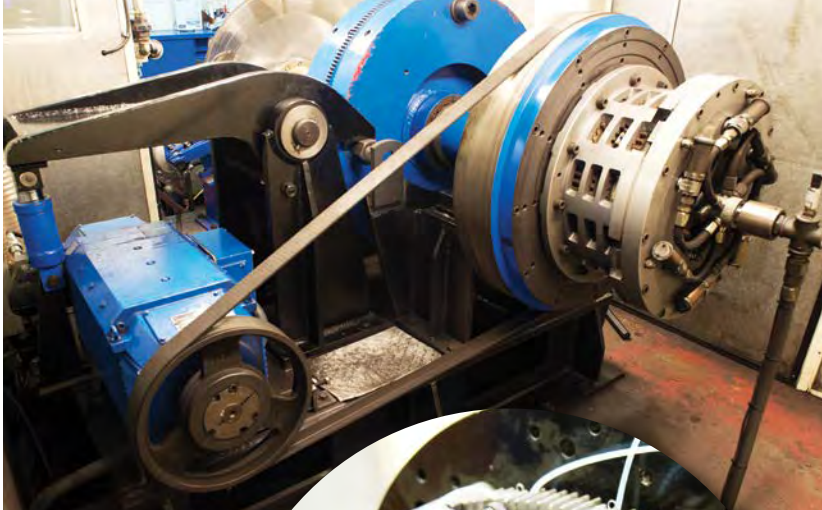
Advanced engineering capability

Our global teams utilize the most advanced engineering tools available including NX CAD & Solidworks, Teamcenter PLM, ANSYS Finite Element Analysis and CREO Parametric.



Advanced Testing

Our broad in-house testing capability allows for shortened product development cycles.



Each brand has the capability to rapidly produce prototype units for test and evaluation by customers, or by using our own in-house, full scale testing equipment to simulate the operating conditions of a specific client-defined application. In combination with electronic data acquisition, we can accelerate the design, testing and verification processes in order to meet the demands of shortened product development cycles.

Test Capabilities

- Constant Tension
- E-Stop
- Dynamic Braking
- Start/Stop
- Wet Clutch/Brake Cycling
- Variable Drive Cycling
- Static Torque
- Inertia Stop
- Centrifugal Throwout Speed



Temperature and Immersion Testing

Our clutches and brakes are required to perform in some of the most extreme conditions around the world. Our sophisticated, custom-designed climate control chamber lets us subject our brakes to temperatures from -75 to 180°C at 10-95% rh. Our new immersion stand will allow us to test the performance of our products underwater.

Wired for Success

The majority of our test stands are wired into one central control lab where we utilize sophisticated data acquisition software to run multiple test protocols simultaneously.



Testing



The largest rig in the industry

To meet growing customer demand, Wichita Clutch recently invested in a new, large capacity test stand. The rig is comprised of state-of-the-art VACON variable frequency drives that operate two motor/gearbox drivetrains allowing for coordinated simultaneous testing of two clutch/brakes at 1,500HP each or a single clutch/brake at 3000HP. No other clutch/brake manufacturer has a test stand this large that can accurately simulate customer usage.

The new test stand was recently used to burnish the brakes for a customer who was installing them in an offshore application. The customer received the brakes, installed them, and was up and running much faster than previously would have been possible.



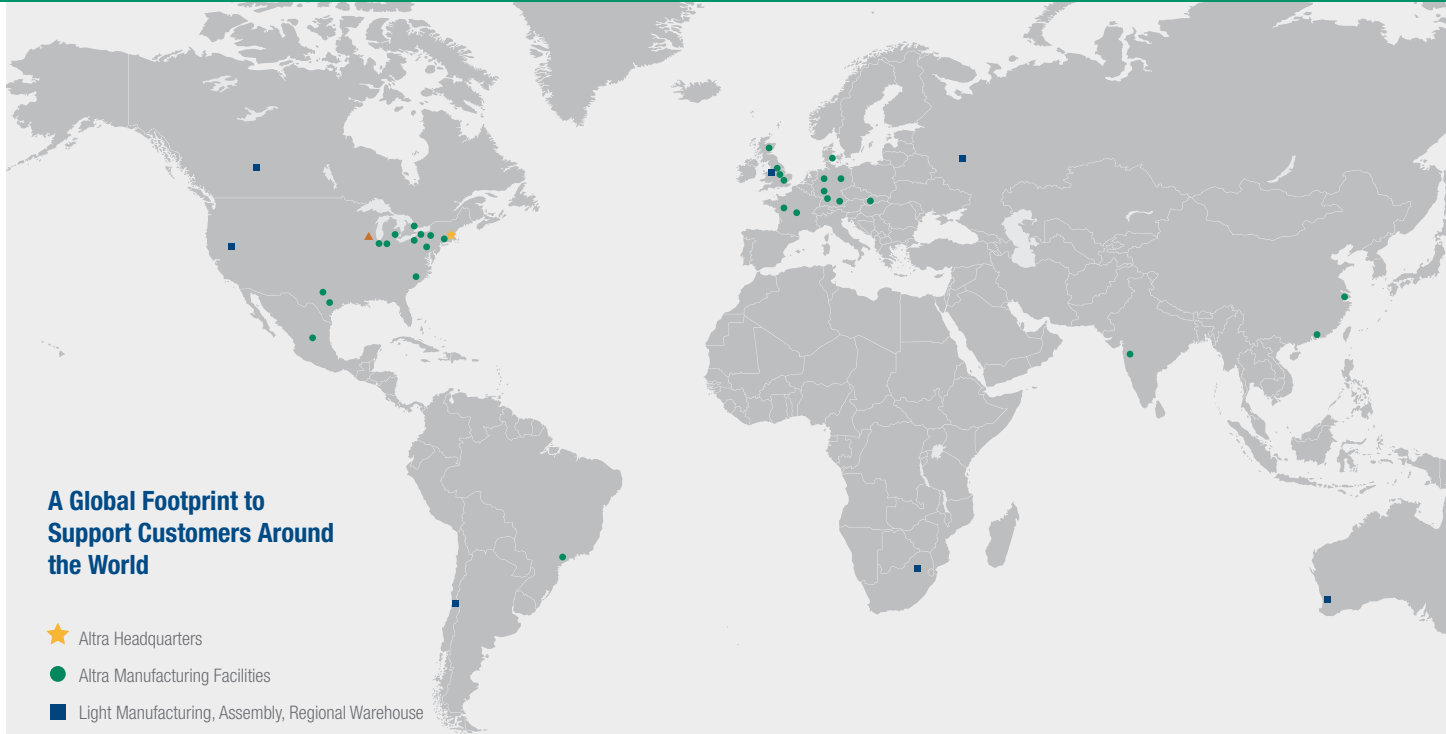
Ensuring Long Lasting Performance

A fatigue test room at our Twiflex facility allows us to test caliper brakes up to 2,000,000 cycles at 280 bar, 2 kW dissipation on four modular stations. This enables us to provide accurate thruster performance and friction material wear data which minimizes the risks of downtime.

In-House Testing Apparatus

- Constant Tension Braking - 3000 HP total (2 at 1500HP), 10K ft.lb. torque
- High Energy Braking - Up to 6000 ft.lb., 1200 RPM
- Dynamic Brake/Clutch (in-line mounted) - 85 Kw motor, 1835 RPM
- Start/Stop Cycling (flywheel mounted) - 350 CPM, 900 RPM
- Wet Clutch/Brake Cycling (flywheel mounted) - Up to 1600 ft.lb., 1000 RPM
- (2) Constant Tension Braking - 14 Kw, 380 RPM
- Static Torque - 100,000 Nm
- Inertia Stop - Max.: 1000 RPM, 1.6 Mj, 50 kNm





A Global Footprint to Support Customers Around the World

- ★ Altra Headquarters
- Altra Manufacturing Facilities
- Light Manufacturing, Assembly, Regional Warehouse
- ▲ Altra Shared Services and ECB Technology Center

The Brands of Altra Industrial Motion

Couplings

Ameridrives
www.ameridrives.com

Bibby Turboflex
www.bibbyturboflex.com

Guardian Couplings
www.guardiancouplings.com

Huco
www.huco.com

Lamiflex Couplings
www.lamiflexcouplings.com

Stromag
www.stromag.com

TB Wood's
www.tbwoods.com

Geared Cam Limit Switches

Stromag
www.stromag.com

Electric Clutches & Brakes

Inertia Dynamics
www.idicb.com

Matrix
www.matrix-international.com

Stromag
www.stromag.com

Warner Electric
www.warnerelectric.com

Linear Products

Warner Linear
www.warnerlinear.com

Engineered Bearing Assemblies

Kilian
www.kilianbearings.com

Heavy Duty Clutches & Brakes

Industrial Clutch
www.indclutch.com

Twiflex
www.twiflex.com

Stromag
www.stromag.com

Svendborg Brakes
www.svendborg-brakes.com

Wichita Clutch
www.wichitaclutch.com

Belted Drives

TB Wood's
www.tbwoods.com

Gearing

Bauer Gear Motor
www.bauergears.com

Boston Gear
www.bostongear.com

Delroyd Worm Gear
www.delroyd.com

Nuttall Gear
www.nuttallgear.com

Overrunning Clutches

Formsprag Clutch
www.formsprag.com

Marland Clutch
www.marland.com

Stieber
www.stieberclutch.com