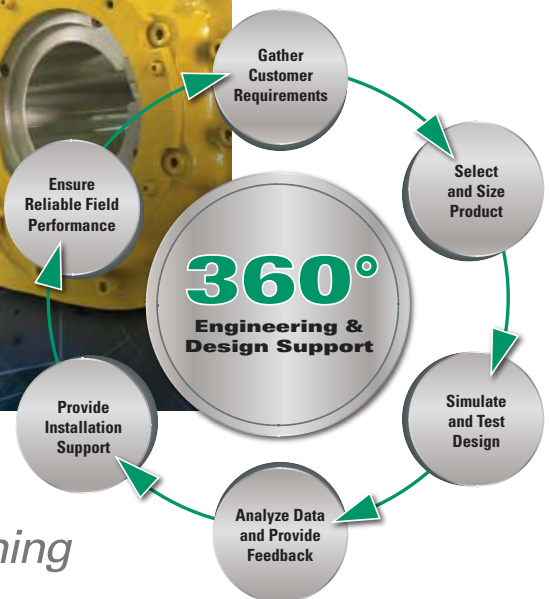


Heavy Duty & Overrunning Clutch Brake Group Engineering Capabilities

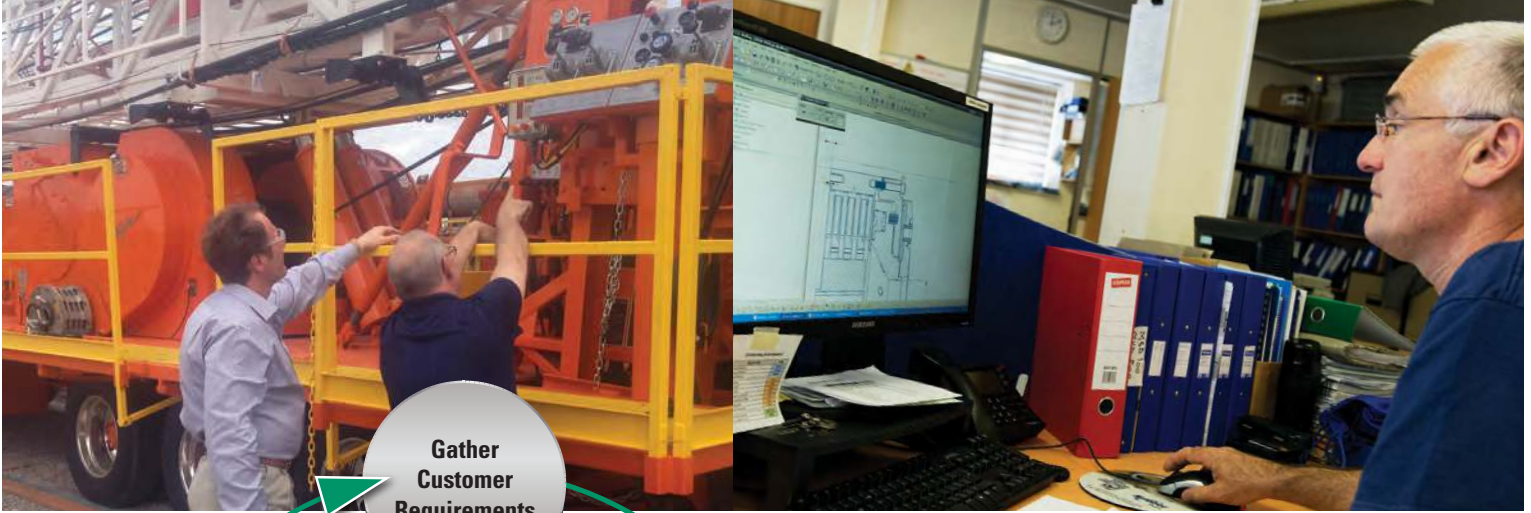


Heavy Duty & Overrunning Clutch Brake Group

Wichita Clutch • Industrial Clutch • Twiflex Limited
Formsprag Clutch • Marland Clutch • Stieber 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.

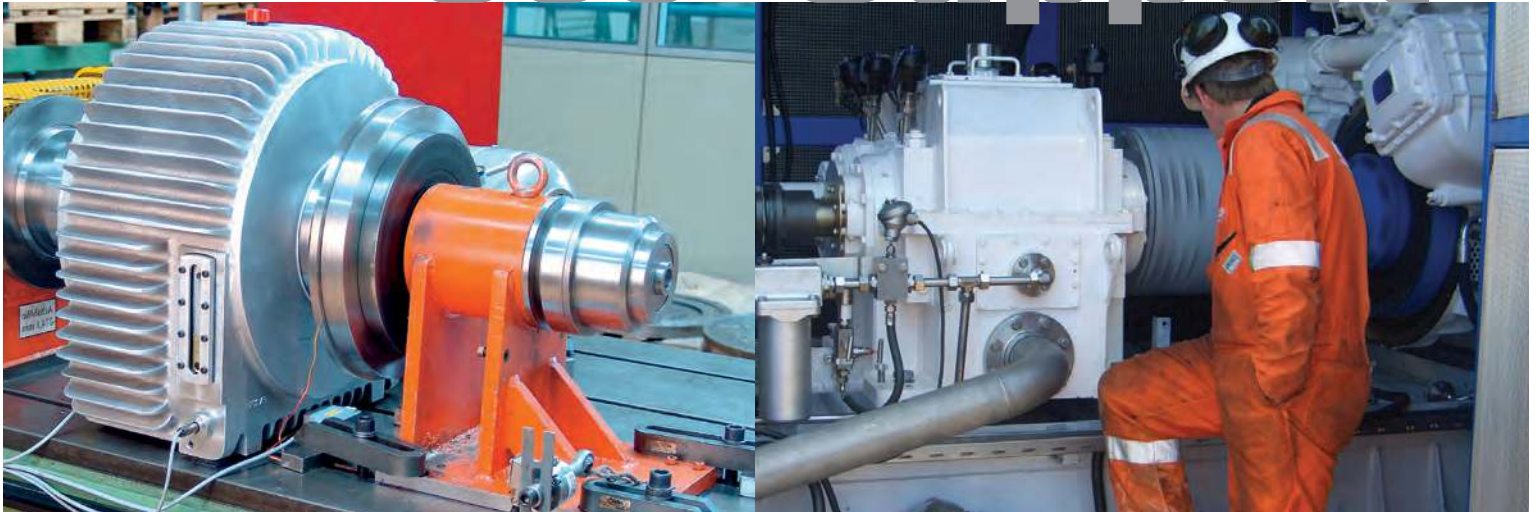


**Heavy Duty & Overrunning
Clutch Brake Group**

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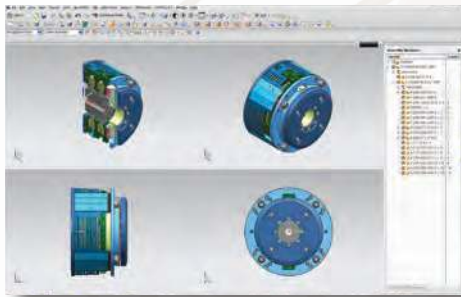


360° Support



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.

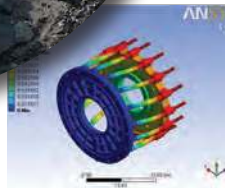
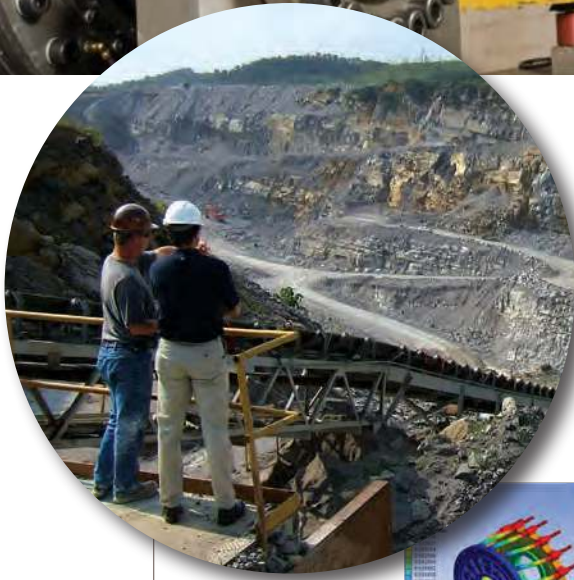
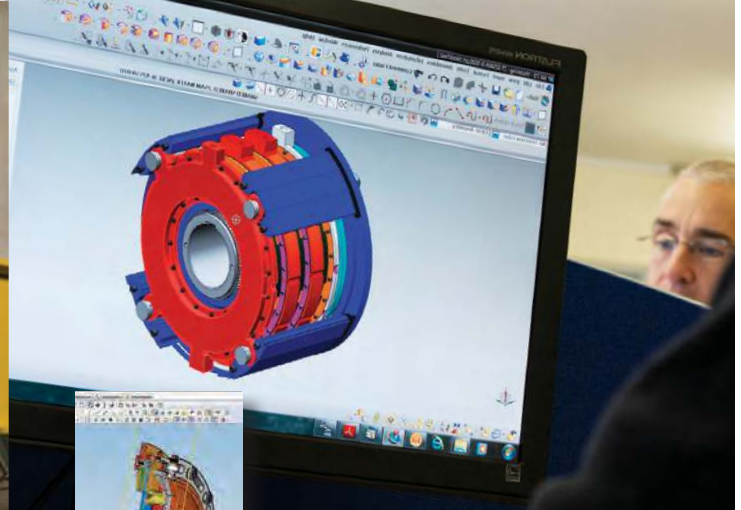
Field Performance Check

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

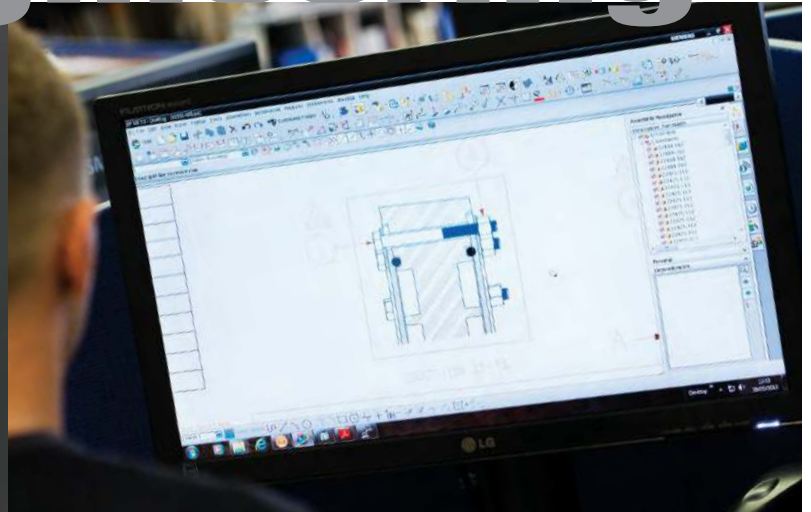
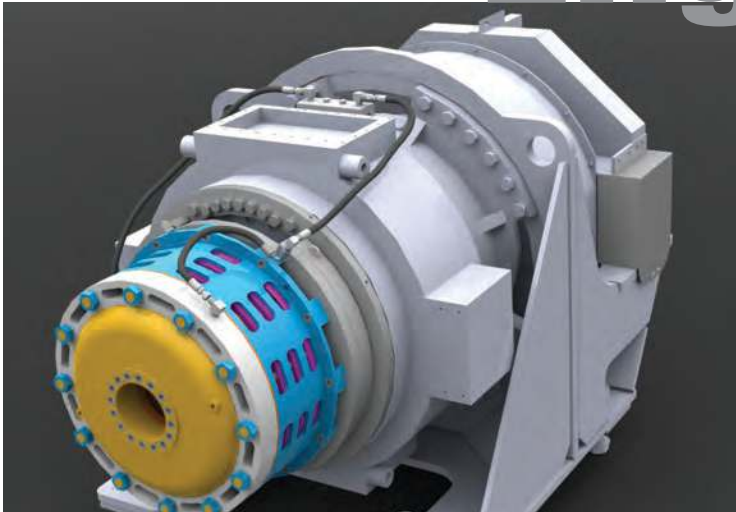
We employ a flexible approach to problem solving, enabling our engineering teams to provide application and design support from concept to completion. Our extensive expertise spans a wide range of applications from offshore mooring winches, mining ball mills and conveyor backstops to high rise elevators,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

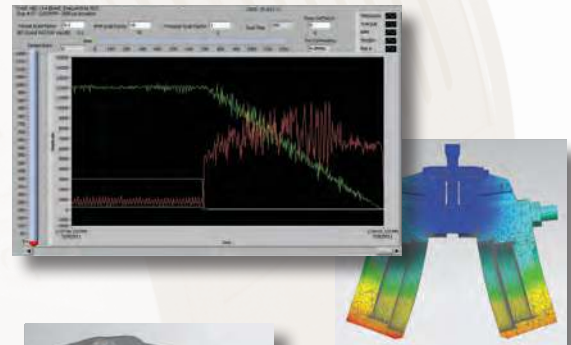
- Brake modified to withstand corrosive sea spray and direct sea water splash for mooring winches
- Custom wet brake for world's largest tidal turbine
- Load-sharing, high-speed backstopping clutch for inclined conveyors
- Brake with economical dual-actuator for drilling rig drawworks
- Custom floating 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.

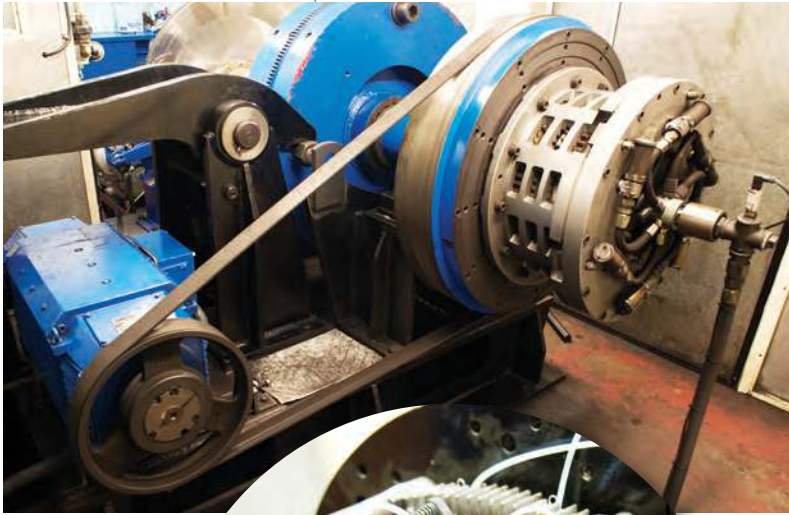
Advanced engineering capability

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.

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.

Test Capabilities

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



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.

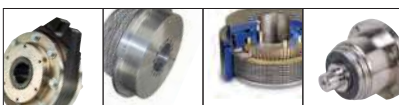
The new test stand was recently used to burnish the brakes for a customer who was installing them in an offshore application. The customer received the brakes, installed them, and was up and running much faster than previously would have been possible.

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



<p>Electromagnetic Clutches and Brakes</p> <p>Warner Electric <i>Electromagnetic Clutches and Brakes</i> New Hartford, CT - USA 1-800-825-6544 <i>For application assistance: 1-800-825-9050</i></p> <p>St Barthelemy d'Anjou, France +33 (0) 2 41 21 24 24</p> <p><i>Precision Electric Coils and Electromagnetic Clutches and Brakes</i> Columbia City, IN - USA 1-260-244-6183</p> <p>Matrix International <i>Electromagnetic Clutches and Brakes, Pressure Operated Clutches and Brakes</i> Brechin, Scotland +44 (0) 1356 602000 New Hartford, CT - USA 1-800-825-6544</p> <p>Inertia Dynamics <i>Spring Set Brakes; Power On and Wrap Spring Clutch/Brakes</i> New Hartford, CT - USA 1-800-800-6445</p>	<p>Couplings</p> <p>Ameridrives Couplings <i>Mill Spindles, Ameriflex, Ameridisc</i> Erie, PA - USA 1-814-480-5000</p> <p><i>Gear Couplings</i> San Marcos, TX - USA 1-800-458-0887</p> <p>Bibby Turboflex <i>Disc, Gear, Grid Couplings, Overload Clutches</i> Dewsbury, England +44 (0) 1924 460801 Boksburg, South Africa +27 11 918 4270</p> <p>TB Wood's <i>Elastomeric Couplings</i> Chambersburg, PA - USA 1-888-829-6637 – Press #5 <i>For application assistance: 1-888-829-6637 – Press #7</i></p> <p><i>General Purpose Disc Couplings</i> San Marcos, TX - USA 1-888-449-9439</p> <p>Ameridrives Power Transmission <i>Universal Joints, Drive Shafts, Mill Gear Couplings</i> Green Bay, WI - USA 1-920-593-2444</p> <p>Huco Dynatork <i>Precision Couplings and Air Motors</i> Hertford, England +44 (0) 1992 501900 Chambersburg, PA - USA 1-888-829-6637</p> <p>Lamiflex Couplings <i>Flexible Couplings, Bearing Isolators, and Coupling Guards</i> São Paulo, SP - Brasil +55-11-5679-6533</p>	<p>Heavy Duty Clutches and Brakes</p> <p>Wichita Clutch <i>Pneumatic Clutches and Brakes</i> Wichita Falls, TX - USA 1-800-964-3262 Bedford, England +44 (0) 1234 350311</p> <p>Twiflex Limited <i>Caliper Brakes and Thrusters</i> Twickenham, England +44 (0) 20 8894 1161</p> <p>Industrial Clutch <i>Pneumatic and Oil Immersed Clutches and Brakes</i> Waukesha, WI - USA 1-262-547-3357</p> <p>Gearing</p> <p>Boston Gear <i>Enclosed and Open Gearing, Electrical and Mechanical P.T. Components</i> Charlotte, NC - USA 1-800-825-6544 <i>For application assistance: 1-800-816-5608</i></p> <p>Bauer Gear Motor <i>Gearred Motors</i> Esslingen, Germany +49 (711) 3518 0 Somerset, NJ - USA 1-732-469-8770</p> <p>Nuttall Gear and Delroyd Worm Gear <i>Worm Gear and Helical Speed Reducers</i> Niagara Falls, NY - USA 1-716-298-4100</p>	<p>Overrunning Clutches</p> <p>Formsprag Clutch <i>Overrunning Clutches and Holdbacks</i> Warren, MI - USA 1-800-348-0881 – Press #1 <i>For application assistance: 1-800-348-0881 – Press #2</i></p> <p>Marland Clutch <i>Roller Ramp and Sprag Type Overrunning Clutches and Backstops</i> South Beloit, IL - USA 1-800-216-3515</p> <p>Stieber Clutch <i>Overrunning Clutches and Holdbacks</i> Heidelberg, Germany +49 (0) 6221 30 47 0</p> <p>Belted Drives and Sheaves</p> <p>TB Wood's <i>Belted Drives</i> Chambersburg, PA - USA 1-888-829-6637 – Press #5 <i>For application assistance: 1-888-829-6637 – Press #7</i></p> <p>Engineered Bearing Assemblies</p> <p>Kilian Manufacturing <i>Engineered Bearing Assemblies</i> Syracuse, NY - USA 1-315-432-0700</p> <p>For information concerning our sales offices in Asia Pacific check our website www.altramotion.com.cn</p>
<p>Linear Products</p> <p>Warner Linear <i>Linear Actuators</i> Belvidere, IL - USA 1-800-825-6544 <i>For application assistance: 1-800-825-9050</i></p> <p>St Barthelemy d'Anjou, France +33 (0) 2 41 21 24 24</p>			



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