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and

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2017 p|46



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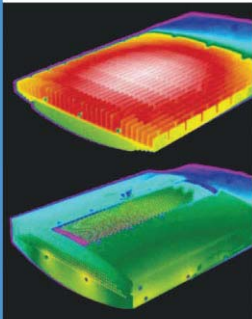
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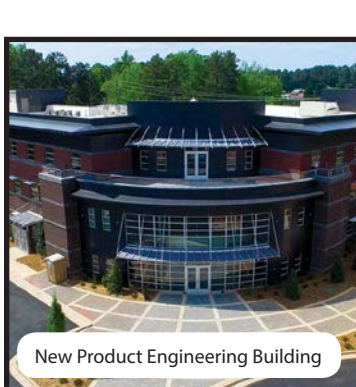


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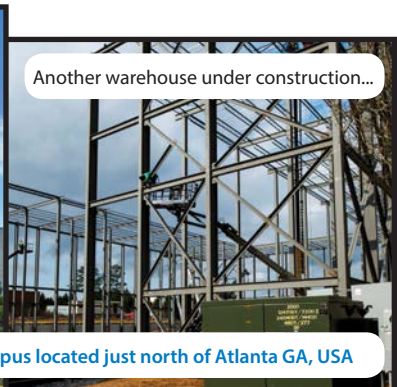


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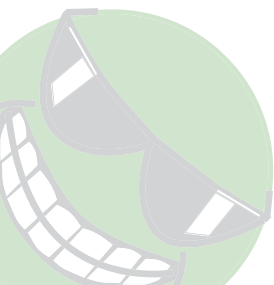


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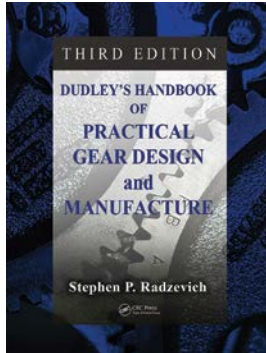
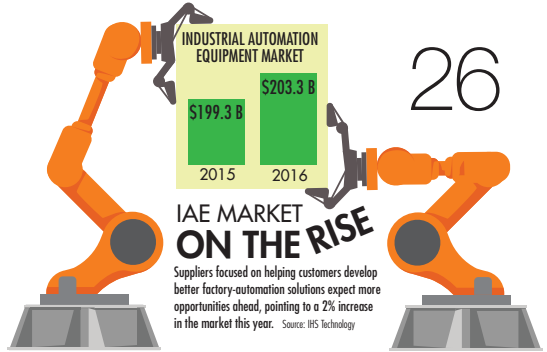
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 Paid subscriptions include issues 1-12. Rates: U.S.: \$139/year; \$199/two years. Canada/Mexico: \$159/year; \$239/two years; All other countries: \$199/year; \$299/two years. Cost for back issues are U.S. \$10.00 per copy plus tax, Canada \$15.00 per issue plus tax, and Int'l \$20.00 per issue. OEM Handbook and Supplier Directory, \$50.00 plus tax. Prepaid subscription: Penton Media (Machine Design), P.O. Box 2100, Skokie IL 60076-7800. Periodicals postage paid at Kansas City, MO and additional mailing offices.

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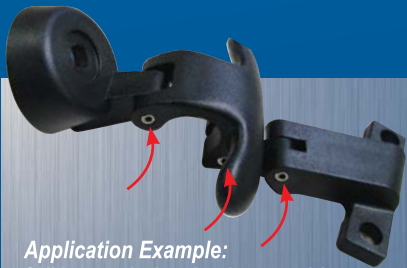
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Editorial

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The Top 8 Predictions for IoT in 2017

Brian Buntz, content director at Penton's IoT Institute, interviewed several industry leaders to get an idea of where the Internet of Things (IoT) is headed in 2017. Here are his top eight predictions.

- 1. IoT Gets Smarter.** Although the Industrial Iot (IIoT) is more advanced than the consumer side of IoT, applications for both tend to use unimpressive, relatively "dumb" computing power. That will change in the upcoming year as companies start using high-power computing in their applications.
- 2. Data Collection Moves to the Cloud.** Data collection will move to the cloud, and it probably won't be based on SQL. There could be purpose-built collection services with the major goals being the use of AI to recognize individuals' speech and improve machine operations.
- 3. Recruiting IoT Employees Will Remain a Challenge.** Companies launching IoT projects face a tough time in recruiting talent. It remains a challenge to find enough workers to secure the Internet of Things, and 45% of IoT companies struggle to find security professionals. And 30% report having difficulty finding digital marketers.
- 4. Companies Will Develop Common-Sense IoT Products.** Companies are learning that just because something can be hooked into the internet doesn't mean someone will buy it. They will have to learn how to be more adept in explaining to consumers how their connected products can improve their lives.
- 5. The IoT Market Will Expand Despite Security Risks.** Some IoT companies will be reckless when it comes to security, particularly with consumer products. More companies, however, will understand that security needs to be built into products. Still, there will be more IoT security threats and actions, but the IoT will plow on, especially on the industrial side.
- 6. Winning IoT Products Will Include Services.** In the past, most machine builders simply sold products. With the IIoT, they will sell machines-as-a-service.
- 7. Startups Will Gain Ground.** Startups are better positioned than large conglomerates to better understand what the IoT can do for consumers. They will leverage this agility and insight to grab a large share of the IoT market.
- 8. Standards Remain Up in the Air.** In the IoT, no one is responsible for the cost savings consumers and businesses would get with standards, and companies are more concerned with protecting market share than pushing for a universal set of standards.

For more insights into the IoT and Buntz's predictions, check out his column and other content at Penton's Internet of Things Institute (www.ioti.com).

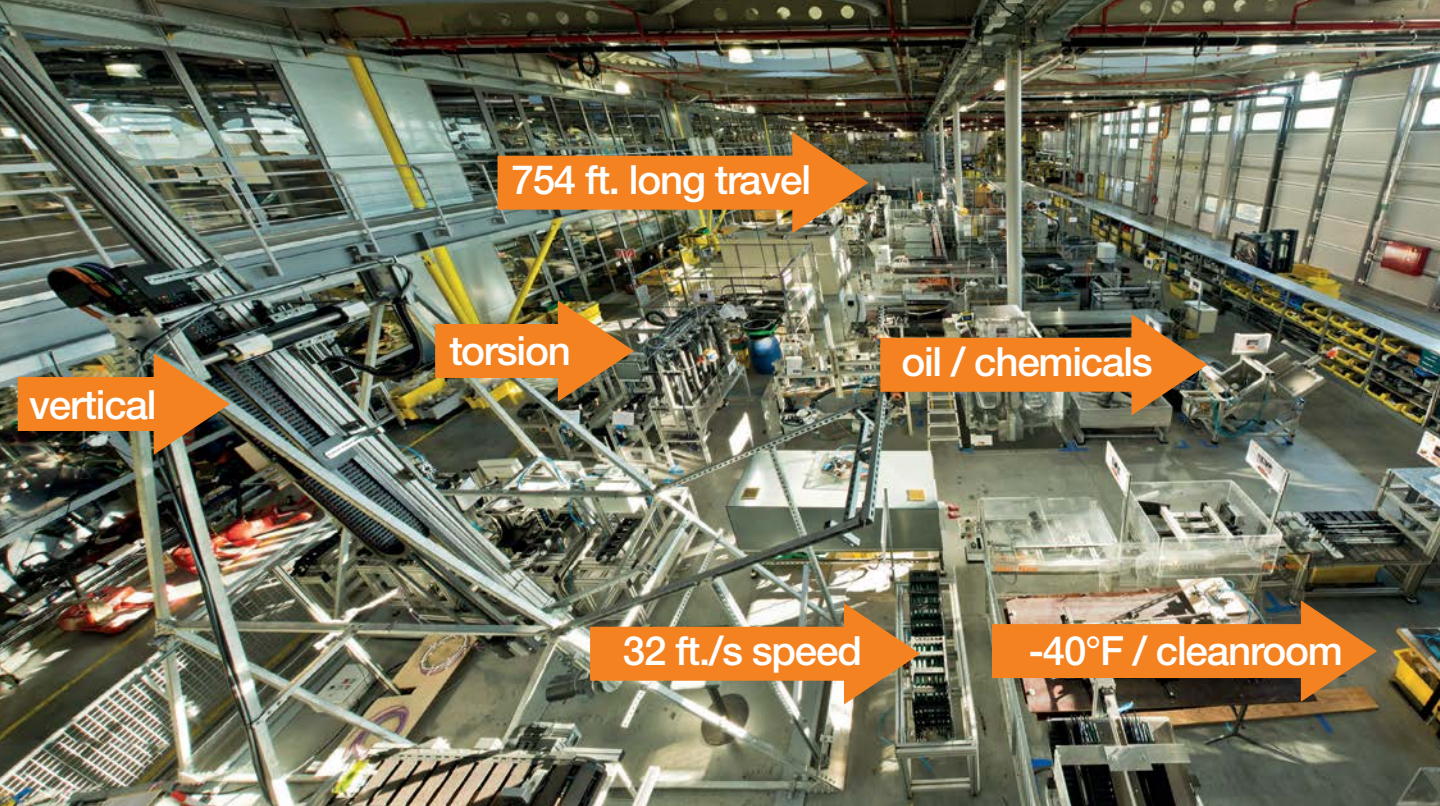
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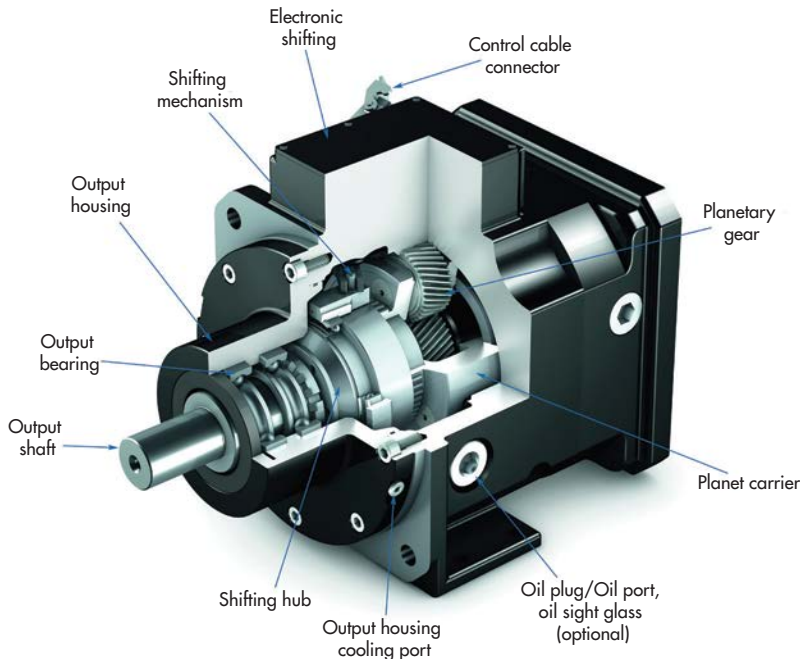
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The gear box is also easy to install. The motor shaft slides into the input coupling and is bolted to the gear box; the coupling is then properly torqued. The motor is available with either shafted or flanged outputs, and each comes with a short, medium, or long output. This lets users customize the gear box to their specific applications.

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News

Trump's Policies on Science and Engineering: HURTFUL OR HELPFUL?

The science and engineering policies of President-elect Donald Trump are still in the developing stages. During the campaign, very few discussions centered on the future of science and engineering. The most talked-about topics were manufacturing at home and overseas, NASA's efforts into deep space exploration, and the investment into the nation's crumbling infrastructure. A report from the Information Technology and Innovation Foundation (ITIF) compiled the current viewpoints on such topics by examining the President-elect's statements, policy positions, and strategies as listed on his campaign site.

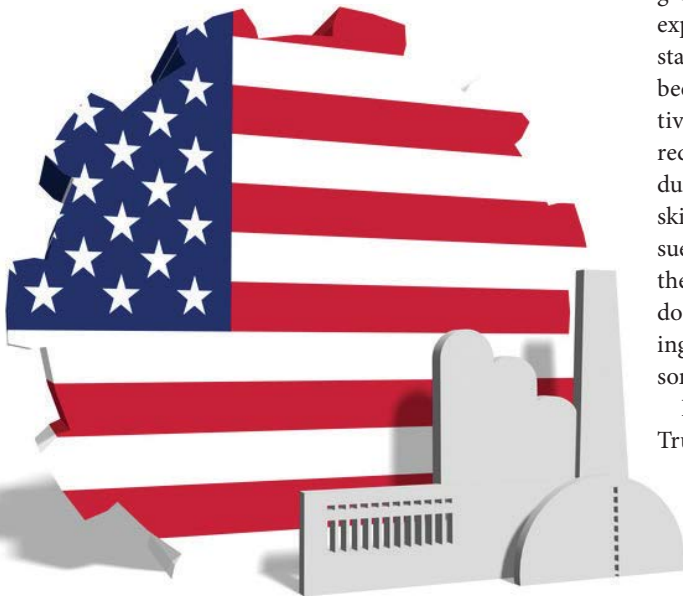
ENGINEERING WORK FORCE

President-elect Donald Trump has stressed during his campaign the need for increasing manufacturing in the United States. Hand in hand with the increase of manufacturing is the

need to increase the engineering labor force in the country. Trump has stated his opposition to H-1B visas, which allow the use of foreign labor. He proposes requiring companies to hire from an unemployed labor pool and raise wage requirements for H-1B workers. Several studies have shown that the labor pool for skilled workers is low. As we have reported in our Salary & Career Report (<http://machinedesign.com/datasheet/download-2016-annual-salary-career-report-pdf>), the average age of skilled laborers is around 56-58 years old, and the United States will face a labor shortage of 3.5 million workers in the years leading up to 2025. It is predicted that 2 million of those jobs will most likely go unfilled due to the skills gap. To increase the pool of skilled laborers, the U.S. needs a stronger focus on STEM education.

According to the ITIF report, Trump's position on STEM support is to tie student-loan decisions to job prospects after graduation, which would promote STEM majors with high expected wages. The ITIF report states that, "One of the long-standing strengths of the U.S. national innovation system has been its ability to use scientific and technological talent effectively, regardless of its source. The global talent imperative requires that the U.S. implement policies that will both produce a domestic workforce equipped with globally demanded skills and be open to skilled foreign workers who wish to pursue their talents in the environment of economic opportunity the country affords. The U.S. needs to bring a much-needed dose of innovation to STEM education policy, including moving from the current 'some STEM for all' to an 'all STEM for some' approach."

In terms of bring more jobs to engineering, President-elect Trump plans to privatize infrastructure. Instead of relying on government funding to develop our nation's crumbling infrastructure, Trump plans to stimulate \$1 trillion in private-sector infrastructure spending with \$140 billion in tax credits for companies willing to take on the



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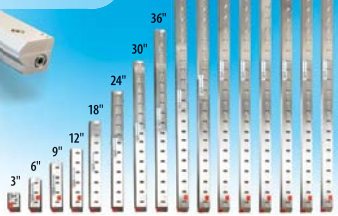


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task. Wired.com reported that the current cost to repair the failing bridges, tunnels, roadways, and rails is astronomically high: The American Society of Civil Engineers scored the U.S. infrastructure at a D+ and estimates the country would need to invest \$3.6 trillion to repair a majority of it by 2020. Josh Bivens, research and policy director of the Economic Policy Institute, states that by investing \$18 billion a year into roads, bridges, and waterways, one could see a potential \$29 billion jump in GDP and more than 200,000 jobs. The problem will be getting private companies willing to invest in infrastructure plans. Since the return on investment is little to none, many private companies will not jump at the chance to participate in the work. Privatizing the work could also lead to private asset holders with too much power over future investment decisions. Without investing federal funding, it is hard to say if the private sector will be enough to support the plan.

MANUFACTURING AT HOME AND ABROAD

Trump has stated that he will have companies that manufacture their products in China, such as Apple, start production in the United States. He also would place a 45% tax on all imports from China and 35% on all imports from Mexico. The problem with this solution is the potential to make U.S. products very expensive. For example, according to CNET,

the estimated cost of U.S.-manufactured iPhones would start at \$1,300 at minimum wage and with an equal work force. This would put Apple and other U.S.-based companies that rely on foreign production and parts at a disadvantage against foreign-based production companies like Samsung. Trump plans to repatriate profits by offering a one-time tax rate incentive of 10% to bring business back to U.S. from overseas. This could appeal to manufacturing and offshore pharmaceutical companies, but U.S. manufacturing needs to be prepared for such an undertaking.

The solution to increase U.S. manufacturing has been automation. The investment into automation for the last few years has seen an increase in manufacturing, creating jobs and boosting the economy. According to a report from Ball State University, production in the U.S. has grown by 17.6% in the last decade, nearly 2.2% per year since 2006. As reported by Fortune.com, the bulk of this increase is due to automation as 88% of work has been fulfilled by automated systems and robotic systems.

As an example of this growth in automation, “Manufacturing USA” is a network of nine regional centers focused on technology challenges, including areas such as 3D printing and photonics. Each center is funded by government, private, and university agencies to help small firms scale up and com-

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SCIENCE PROGRESS: CLIMATE CHANGE, LIFE SCIENCES, AND NASA

A number of scientists have expressed their concerns for research budgets under a Trump presidency. Federal funding is a necessity for many to continue their research into subjects like climate change, life sciences including diseases and drug treatments, and space exploration efforts.

Regarding climate change, Trump has stated his intentions to pull out of the Paris climate deal. The deal has yet to be ratified by the Senate. The plan pledges to contribute \$800 million annually to the United Nations Framework Convention on Climate Change. If Trump does decide to dissolve the U.S. involvement in the agreement, there is no legal penalty in doing so. According to a report on PBS NewsHour, other countries like China will most likely continue with the Paris climate deal. Estimates suggest that the pollution in China leads to 1.2 million premature deaths per year, causing damages that equal 10% to 13% of their GDP. There are also hints that the Clean Power Plan currently being stayed by the Supreme Court will be revoked. The administrative action to impose limits on CO2 emission from new and existing power

plants is now being litigated in the U.S. Court of Appeals. But it has been reported that the decline of coal is being driven more by cost than the initiative to lower CO2 emissions.

Meanwhile, according to Politico.com, last year, two-thirds of all new U.S. power was generated by wind and solar and a majority of the rest came from natural gas. This is likely due to dramatic price drop in wind and solar prices and that gas prices have continued to stay at low prices. National Mining Association vice president Luke Popovich states that the regulations placed on mercury, ozone, soot, and other coal-fired pollutants have hurt the coal business, which has seen 68,000 lost jobs. He looks forward to the next administration because he believes it will bring less regulation and let the coal industry to compete more fairly. However, most experts agree that the return of coal mining as an industry leader is unlikely.

As far as NASA is concerned, Trump wants to push research into deep space exploration rather than the low atmosphere studies. Trump is pushing for more public and private partnerships to be the foundation of space efforts to help drive man-piloted missions. His stances on life sciences, just like the research done at the National Institute of Health, are not concrete yet and time will tell how the research in those sectors will be affected. ■

—Carlos Gonzalez

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REPAIR CAFES Inspire Hand-On Learning, Reduce Waste, and Strengthen Community Bonds

TOSS IT? NO WAY! Repair Café (<https://repaircafe.org>) is a non-profit organization that aims to inspire sustainability at the local level by encouraging people to organize Repair Café events in their area. In more than 29 countries, over 1,150 cafes offer free services to residents that want to fix their

broken belongings, including electronics, bicycles, clothing, and housekeeping devices. This not only reduces waste in landfills, but builds a healthy sense of community that allows participants to learn new skills, build their resourcefulness, and make new friends.

The first Repair Café was started in 2009 in Amsterdam by Martine Postma. While Europe has the most Repair Cafes, more and more are being created in the U.S. and worldwide. This month, Repair Café started a partnership with online parts store, eSpares, to offer a 10% discount on spare parts for cafes in English, French, German and Spanish speaking countries.

To encourage new launches across the world, Repair Café offers a starter pack, which includes a manual with the plans for organizing Repair Cafes from the ground up. The content is based on tactics used by Café founders in the past, and discusses ways to find local repair experts, book locations for events, determine which tools to supply, and find funding. The starter pack also guarantees that the organization will contact other interested parties in the area so that communities can work together to curate events. It will also advertise the initiative through the Repair Café network. Donations to support local groups and to fund missions abroad can be submitted through the Repair Café's website for any specified area.

The workshops rely on specialists and residents to volunteer their time and skills so they can fix gadgets that fit their skill sets and available resources. A Youtube video (<https://youtu.be/gVJU1ydAUIQ>) shows scenes from a Repair Café in the Netherlands. In the video, people talk about the benefits of helping others fix things. While some volunteers like working with their hands and sharing the methods of their craft, others find value in fixing old devices that hold sentiment by the user, such as an old flashlight that belonged to a woman's father. ■

—Leah Scully

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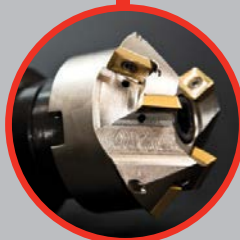
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SIEMENS ACQUIRES MENTOR GRAPHICS for \$4.5 Billion

GERMAN ENGINEERING-SOLUTIONS COMPANY Siemens announced its biggest deal with an industrial software company since 2007 with the purchase of Mentor Graphics. Based in Colorado, Mentor Graphics creates software that aids in the design and simulation of semiconductor chips used in

automotive, aerospace, and other industries. It has 5,700 employees and expects to gain \$1.22 billion in revenue for the year.

The purchase was settled at \$4.5 billion. Siemens offered \$37.25 per share to Mentor Graphics shareholders, which added a 21% premium to its closing price through cash reserves. The acquisition is scheduled to close in the second quarter of next year.

Siemens expects the acquisition will help broaden its solutions for “smart” manufacturing and automation. By offering Mentor Graphics’ software to manufacturers, it expects to become a key player in creating automated-car technologies and other technologies that are expected to see growth within the next 20 years.

Acquisitions over the past nine years have helped Siemens to strengthen its automated and software-based design solutions. In 2007, it bought UGS for \$3.5 billion, and earlier this year, it bought CD-adapco for nearly \$1 billion. Both of these companies are U.S. industrial design software companies that serve aerospace and automotive industries, and have helped to advance Siemens’ digital factory division as a major source of growth and profitability.

Siemens software executive Chuck Grindstaff predicts that Siemens will benefit most from Mentor Graphics’ experience in mechatronics design software, according to *The Financial Times*. “Mechatronics” is defined as the integration of electronics with mechanical parts like actuators or transducers, on any scale. Guillermo Peigneux Lojo, an analyst at UBS, predicts that Siemens will benefit mostly from Mentor Graphics’ automobile products and services. ■

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The Making of a Movement

Maker Faire Co-founder Sherry Huss explains how it all started, and where it's heading next.

Interview by JEFF KERNS

Maker Faire is a large movement that started over 10 years ago with Dale Dougherty and Sherry Huss. While this movement might be inspiration for kids, at this year's New York City event, the median age of attendees was 40. This event has branded itself in many ways to build bridges and collaborate across disciplines to unite technologies and different creative mediums that inspire conversations that may have not have happened otherwise. This blending of people is imperative to the faire's message. Furthermore, the founders saw the need for human interaction and value in meeting face-to-face to create lasting memories and relationships that continue to expand the faire that has become a movement. *Machine Design* was fortunate



enough to talk with co-founder Sherry Huss about how this whole crazy show got started.

What is your background?

I have a business degree from Ohio State University, but my entry into the career world was through book publishing. I worked in sales with a textbook publisher. From there I went into software publishing. This is was a time where it was a lot of Lotus 123. Eventually I started with Ziff-Davis that was, an electronic publisher, where things started to gel for me. Being on the consumer side of different types of communities, I was responsible for figuring out how to pull together these commu-

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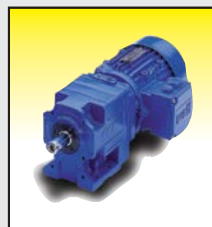
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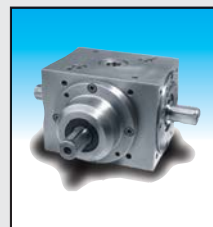
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nities for different audiences. Then, about 20 years ago, I segued into events where I launched JavaOne in 1996.

Where did the Maker Movement start?

I was always in the technology side, the developer side, and this is where I met Dale Dougherty—the other co-founder of Maker Faire. At that time, Dale had come up with Web 2.0 as the next generation of the web around 2001 or 2002. An inter-

esting note is that Web 2.0 was declared the millionth word in the English dictionary. He was also launching a series of books called “Hacks.” This is when he found a particular group of people. They would often buy a product, then “hack” it to suit their needs.

This group of people tended to be engineers. However, even if there they was engineer, they often were managers, or project managers. While they took their careers seriously, they

weren’t “Making” on the job. This would lead these engineers to have a basement or garage where they would be able to scratch their creative, “Maker” itch.

This is where Dale first put a name to the group, and called them Makers. This didn’t require you to be an engineer, or have a degree, just that you are passionate about it. “Making” started in the tech world. However, as we started putting together an event, we realized Making transcended all disciplines. This led Dale to publish the *Make* magazine in 2005. It was predominantly men in the engineering trade, but it was open for anyone with that creative passionate spirit.

How did the first Maker Faire happen?

I saw Dale had posted, “How to Build a Geeked-Up Haunted House” on the website and said, “let’s build one.” As we put the event together, we talked about what a real-time event to celebrate Makers would look like. This was when Dale had the idea for Maker Faire and in fall 2005 to spring 2006, our first Maker Faire was born.

How do you manage to make such a diverse group feel welcome?

Welcoming diversity was the plan all along and some of the ideas were meant to transcend age, gender, and cultures. In 2006 there were a lot of Indy craft groups that were starting, so we started working with Bazaar Bizarre to curate craft faire areas that were handmade. Then we started aggregating that with other communities. Some communities we already knew, such as rocket makers, small engine building clubs, etc. and then we reached out to other communities we weren’t as familiar with. we simply asked if they wanted to join us and gave them a

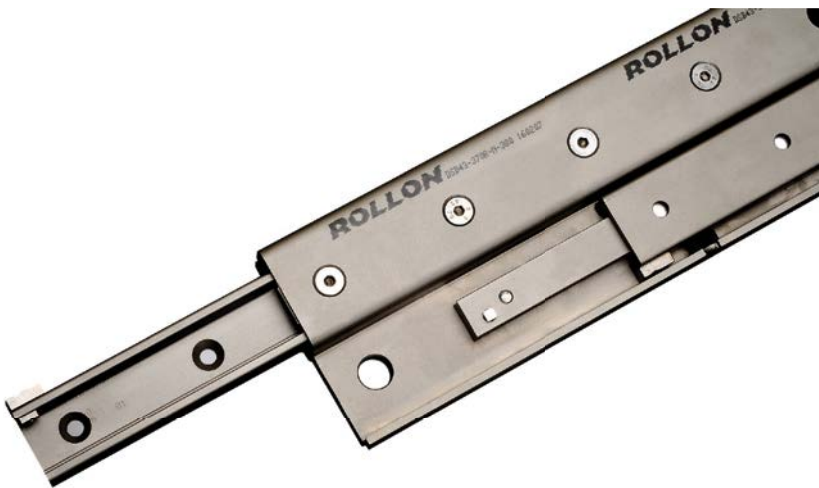


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space to collaborate with the other communities.

One of our visions was to curate a collaborative group. Early on, we noticed the robot group would only talk to the robot group as an example. However, value was to get these group together and start collaborating. We didn't know if it was going to work, but we rented a fair ground to find out. Just like any state or county fair, we were just trying to bring together a community to celebrate and share.

This year, I think we'll be shy of 200 fairs around the world. Maker Faires are in about 35 other countries and have about 1.5 million attendees. It was surprising that we didn't really have an issue with getting attendees or Makers to show up. We had a harder time to find sponsors. This led us to pull back in 2009. However, we still had many people that were asking for us to bring a faire to their area. This led to the idea to create a licensing model to bring interdisciplinary, hands-on, family friendly activities to all the areas.

Are Makers starting companies, or just tinkering?

All of the above. This has become such a large community with such a wide scope, it's hard to highlight any one thing. We do have Zero to Maker, which might be someone new or young. They might not know how to make, but they just want to get involved. Then we have Maker to Maker, which are Makers that are less interested in making money and just enjoy making. Maker to Market are Makers that are looking to take something to market. We see a lot of them networking, looking for investors, and using crowd sourcing.

What do you think were the factors that lead to the success of this movement?

Looking back, it really gained momentum about 2009, which was during the recession. People were looking for employment or other options. Also, I feel parents are increasingly frustrated with the education system, so as we got momentum I think parents saw this as a way to educate their kids in a positive, exciting way. Another big component was hosting a live event that

was face-to-face. You can communicate online, and over the phone, but an event like this gets people together, which forms an experience or relationship we haven't found a way to digitize yet. So the timing, face-to-face interaction, and inclusive nature with the recession and current state of education were all factors.

What have you done to help the current problems in education?

Our model is similar to a school science fair, so we have generated



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the School Maker Faire. It's essentially a Maker Faire in a box. What might be more interesting for our brand is that we don't have a winner. We aren't targeting the few over-achievers. While over-achievers are more than welcome, they will most likely show up on their own. We are trying to get everyone, especially the non-traditional thinking students. Maker Faire isn't to highlight the few but empower the community.

Dale also started a non-profit—makered.org—that helps empower teachers and communities to facilitate meaningful making and learning experiences with youth. I think it is interesting to note that none of this is to generate curriculum. We feel that you don't tell a gardener how to plan seeds; they just need a plot of land. A big part of our work is to help find space for Makers. However, these are just a few things associated with this movement. We work with FIRST Robotics Competition, and there is even a camp. Google helped launch a Maker Camp, 2017 will be our sixth year, and the list goes on.

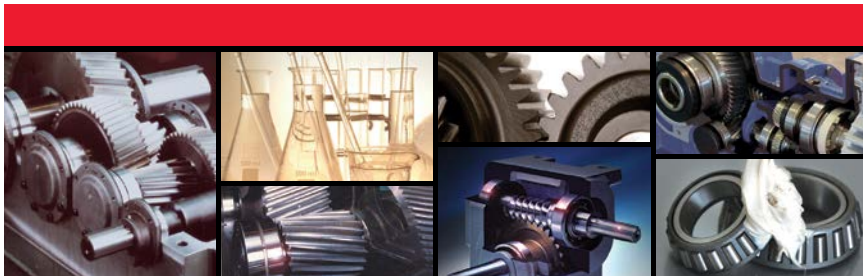
Where do you see this movement heading?

We seem to have gotten away from some simple things. Making food became commercial and automated. This seems to have led to a community that doesn't understand where food comes from or how to cook. We cut home economics, now something as simple as feeding kids or teaching them to cook seems difficult. Now we see programs such as The Green Bronx Machine, an inner-city program that has students growing their own vegetables.

We cut shop and now no one fixes things—granted, it might be more difficult to repair some things. However, this has led to a community of fixers, websites, Maker Spaces, Hacker Space, and more. Even YouTube channels like Jimmy Diresta that show how to build and fix things are gaining in popularity.

Overall, I see this moving toward a more communal type of living and work. Kids are dropping out of school because they are bored and don't feel they are learning anything. Then they find one of these communities and suddenly they want to learn more and thrive because the support and excitement of hands-on or applied learning.

We need to support people's creative knowledge and motivate them. In order to recognize this, you need a community to support you. Communal works does not mute individuality; it can support and promote it. **md**



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What's the Difference Between Industrial Robots?

As the world of robots expands in the industrial space, it's prudent to get to up to speed on the multiple types available and their capabilities.

In today's industrial automation field, robots handle difficult, dangerous, and repeated tasks. These jobs include the lifting of heavy objects, pick and placing of parts, assembly of compo-

nents, or assisting manual labor in sorting products. Robots can be grouped into several categories depending on their movement, degrees of freedom, axes of rotation, and function.

This chart lists all of the different types of robots available today. (Image courtesy of Robot Park)

All Types of Robots by Locomotion

STATIONARY ROBOTS	Cartesian Robots	Cylindrical	Spherical	SCARA	Articulated	Parallel
	Single Wheel	2 Wheeled	3 Wheeled	4 Wheeled	6 Wheeled	Tracked Robots
	One Leg	Bipedal	Tripedal	Quadrupedal	Hexapod	Many Legs
	SWIMMING ROBOTS	FLYING ROBOTS	Robotic Balls	SWARM ROBOTS	MODULAR ROBOTS	
	MICRO Robots	NANO Robots	SOFT ROBOTS	SNAKE Robots	CRAWLER Robots	HYBRID Robots

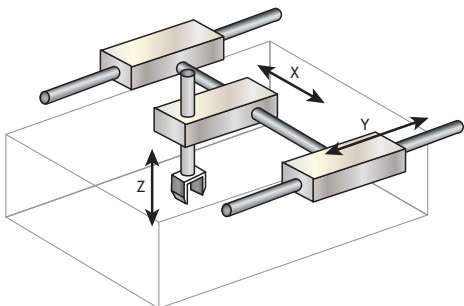
STATIONARY ROBOTS

Stationary robots are those that perform their task without changing positions. The term “stationary” is more associated with the base of the robot and not the whole robot. The robot moves above the base to perform the desired operation. These robots manipulate their environment by controlling the position and orientation of an end-effector. End-effectors could be a drilling, welding, or gripper device.

Stationary robots break down into different groups:

Cartesian/Gantry Robots

Cartesian, or gantry, robots (also known as rectilinear robots) have three linear joints that use the Cartesian coordinate system. They operate within the x-, y-, and z-axis by using linear guide rails. These guide rails help translate the end-effector into the correct position by moving the end-effector along the rail in the corresponding axis. These robots are typically used for pick-and-place work, application of sealant, assembly operations, or handling machine tools and arc welding.



A Cartesian robot operates in the x-, y-, and z-axes to reach its end position.

Cylindrical Robots

A cylindrical robot has at least one rotary joint at the base and at least one prismatic joint to connect the links. Along the joint axis, the rotary joint uses a rotational motion; along the prismatic joint, it moves in a linear motion. Their

(Continued on page 121)

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In the Industrial IoT, Data Drives the Trends

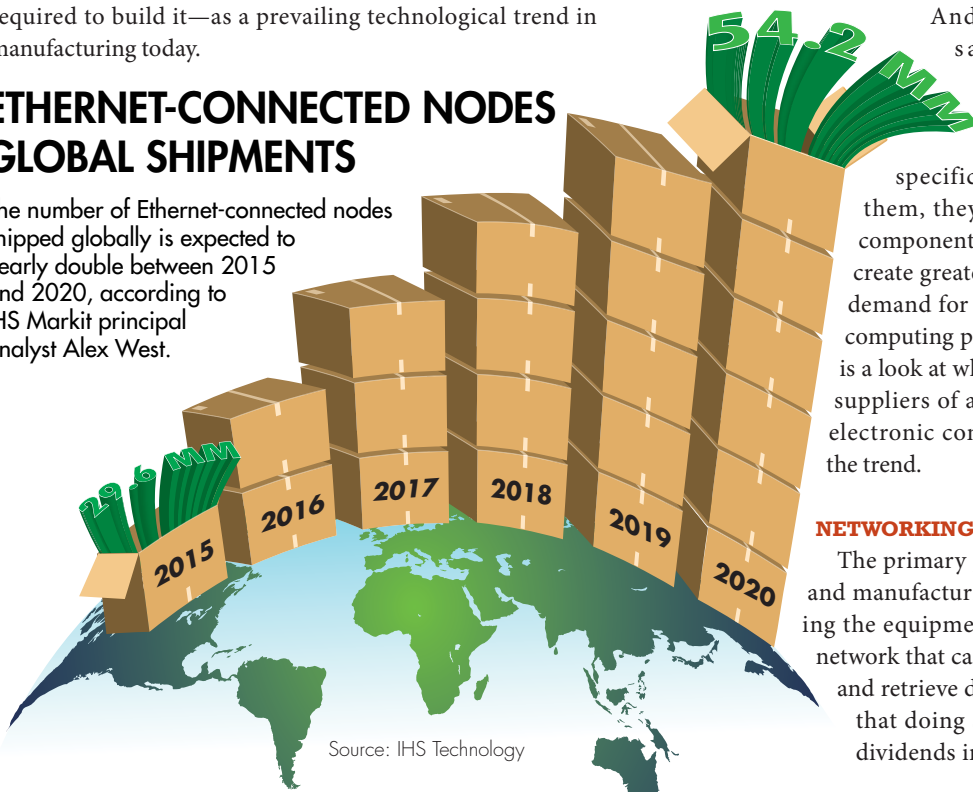
Data, networking, and edge computing are at the heart of the components trends rippling through the IIoT.

Demand for networking, “edge-computing” solutions, and an overall drive to glean more—and better—data from industrial equipment and systems is creating new opportunities throughout the supply channel, especially for suppliers of electronic components and related systems. As the smart-factory movement and the Industrial Internet of Things (IIoT) take hold, suppliers point to growing demand for more complex equipment and machinery—and the electronic components required to build it—as a prevailing technological trend in manufacturing today.

“The IoT really is [about] connectivity from what’s on the plant floor to how you get data outside the plant floor—or from the outside in—quicker, faster, to make easier decisions,” says Dan Shaughnessy, director of product sales for Kaman Automation, which provides industrial solutions to original equipment manufacturers (OEMs), industrial production plants, and infrastructure facilities. “It’s about improving predictive and preventive maintenance [for example]. And it all comes down to data.”

ETHERNET-CONNECTED NODES GLOBAL SHIPMENTS

The number of Ethernet-connected nodes shipped globally is expected to nearly double between 2015 and 2020, according to IHS Markit principal analyst Alex West.



And although Shaughnessy says many industrial customers are still trying to “figure out” what the IoT—or, more specifically, the IIoT—means to them, they seek advice on the best components and equipment that will create greater connectivity, leading to demand for sensing, networking, and computing products and systems. Here is a look at what Shaughnessy and other suppliers of automation solutions and electronic components say are driving the trend.

NETWORKING SOLUTIONS

The primary goal for myriad industrial and manufacturing customers is connecting the equipment on the plant floor to a network that can monitor, measure, store, and retrieve data. Shaughnessy explains that doing so helps companies yield dividends in the form of better infor-

“The IoT really is [about] connectivity from what’s on the plant floor to how you get data outside the plant floor—or from the outside in—quicker, faster, to make easier decisions.” — Dan Shaughnessy, director of product sales, Kaman Automation

mation to make predictive maintenance decisions, repair or replace decisions, and so forth.

For many customers, the first step is ensuring that every piece of equipment on the plant floor has an Ethernet connection and can push or pull data from the system via software. The various protocols for doing so fluctuate from customer to customer—and even within plants—which is why the networking aspect of automation often plays the largest role in a job today.

“We spend a lot of time with customers on the networking side of things, talking about how much bandwidth they need, and how to segment networks,” says Shaughnessy. “We also talk about remote connectivity and how you safely get into your systems from the outside. The next big portion [of this] is how you house the data you want to mine from these elements.”

These are issues that continue to evolve, notes Alex West, a principal analyst with research firm IHS Markit, echoing Shaughnessy’s point about the growth in Ethernet technology,

in particular. West says the number of Ethernet-connected nodes shipped globally is expected to nearly double between 2015 and 2020—from 29.6 million to 54.2 million—continuing a trend that has been developing over the last 10 years. Compared to traditional fieldbus technology, Ethernet devices can be IP-addressable, the technology offers higher bandwidth, and can be more seamlessly integrated throughout an organization, making it “the networking solution of choice” when it comes to enabling IIoT solutions, adds West.

“Increasingly, there’s a transition to using Ethernet,” he explains. “Fieldbus is still growing, but at a far slower rate.”

A similar story unfolds when it comes to data storage, particularly as it relates to the cloud. Shaughnessy says more and more customers are looking at cloud-based solutions for data storage—particularly smaller and midsized companies that can’t afford the cost of complex IT structures. West notes that companies large and small are still divided when it comes to the cloud:

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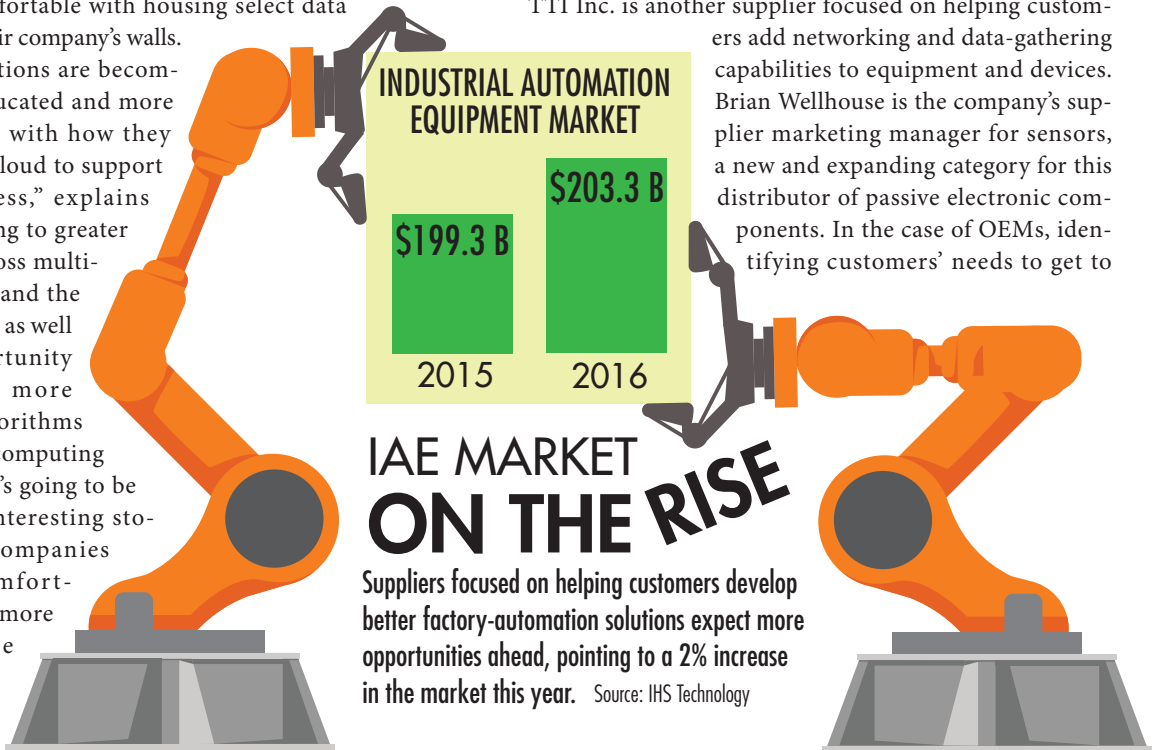
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Many are still concerned about data security, while some have become comfortable with housing select data outside of their company's walls.

"Organizations are becoming more educated and more comfortable with how they can use the cloud to support their business," explains West, pointing to greater visibility across multiple facilities and the supply chain, as well as the opportunity to leverage more complex algorithms and greater computing power. "That's going to be one of the interesting stories—how companies become comfortable placing more data on the cloud in the future."

HOMING IN ON COMPONENTS

TTI Inc. is another supplier focused on helping customers add networking and data-gathering capabilities to equipment and devices. Brian Wellhouse is the company's supplier marketing manager for sensors, a new and expanding category for this distributor of passive electronic components. In the case of OEMs, identifying customers' needs to get to



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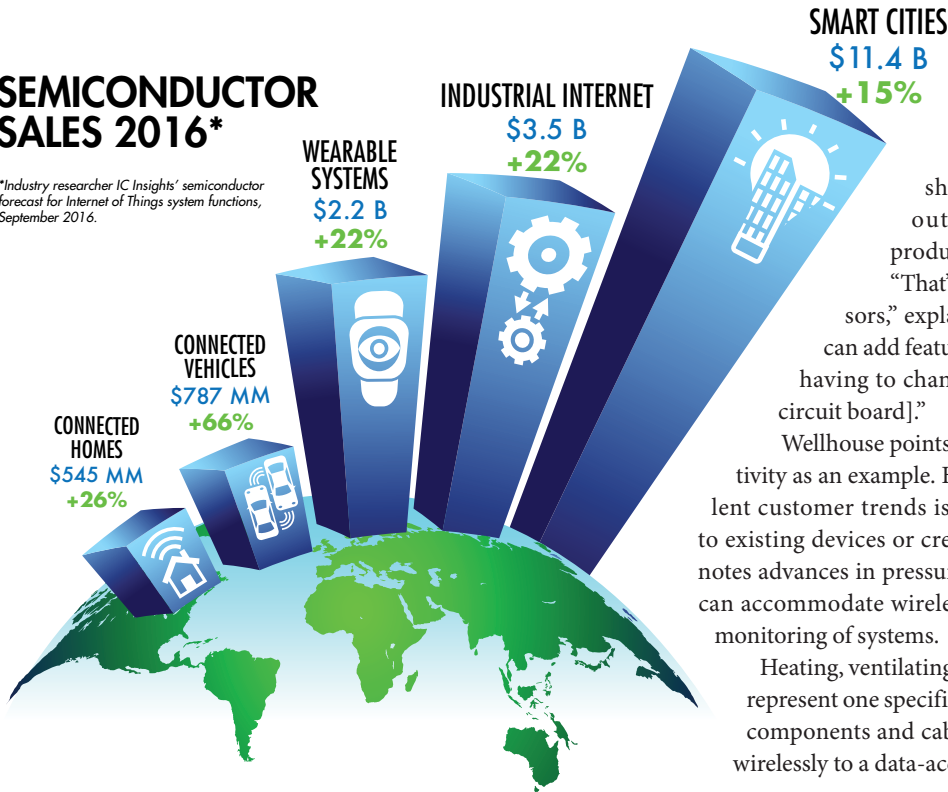


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SEMICONDUCTOR SALES 2016*

*Industry researcher IC Insights' semiconductor forecast for Internet of Things system functions, September 2016.



market faster, with less downtime and while creating a more efficient product, is paramount—especially when you can show them how to do so without completely redesigning a product or piece of equipment..

“That’s how we’ve really led with sensors,” explains Wellhouse. “[Customers] can add features to their old device without having to change a majority of the [printed circuit board].”

Wellhouse points to growth in wireless connectivity as an example. He says one of the most prevalent customer trends is to add networking and data to existing devices or create new sensor networks. He notes advances in pressure transducer technology that can accommodate wireless modules, enabling remote monitoring of systems.

Heating, ventilating, and air conditioning systems represent one specific case. By removing additional components and cabling, data can be transmitted wirelessly to a data-acquisition system. For instance,

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incorporating connectors with Bluetooth technology eliminates the need to source the cable that would typically transmit data from the system.

Whether developing wired or wireless solutions, however, suppliers emphasize the importance of gathering intelligence in today's factory environment. And they also point to the opportunities available across the growing industrial automation equipment market—valued at \$199.3 billion in 2015 and expected to hit \$203.2 billion this year, according to IHS Markit.

“The fact is, if your device or piece of equipment on the floor is standalone, you'll never get anything out of it at all,” says Kaman's Shaughnessy. “Every device that you're going to put somewhere—every device that will have the ability to gather intelligence—needs to be on a backbone of some type that allows it to produce data or have data pulled out of it.”

SENSORS AND REMOTE CONNECTIVITY

Because efficiency is a top concern in the industrial market, it also is a driving force behind the growth of the Industrial IoT. In a 2016 report, “Smart Technologies Impacting Industrial Market Dynamics,” IHS researcher Bill Morelli explained it this way: “In the industrial market, many of the strategies for more efficient manufacturing and commerce include demand for remote communications, monitoring, and control. This trend is driving the growth of integrated intelligence, sensor networks, asset tracking, internet connectivity, M2M communications, and energy measurement and management.”

Remote system monitoring is an important step in that direction—and a factor driving advances in sensor technology at the component level. TTI's Wellhouse suggests combination sen-

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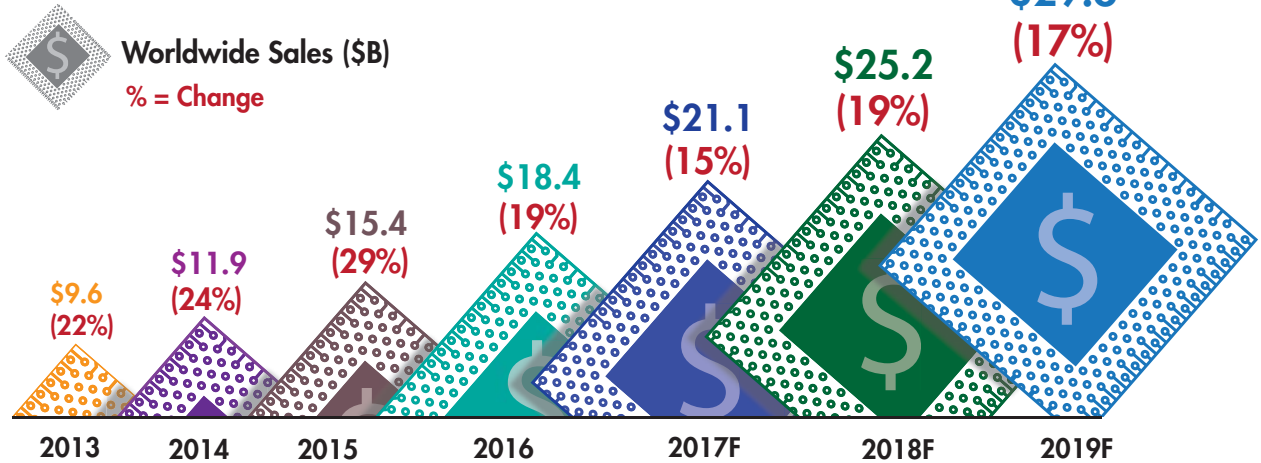
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Source: IC Insights

sors—or “sensor fusion”—as a key industry trend. Customers are demanding a wider range of functions out of their sensors. One example, he says, are sensors that once gauged only temperature but can now sense humidity output as well—at a good price point. Street lighting is another example; customers are

adding sensors to lighting that not only measure energy use, but count cars and gather other traffic-flow information. The drive is toward fewer components that gather more data.

As a distributor, one of the greatest challenges faced by TTI involves educating customers on the wide range of solutions available to achieve a particular result, adds Wellhouse. He says as many as four to five different technologies can do the same thing, at widely varying price ranges.

“Much of our work has been educating engineers on different technologies and solutions based on the sensing need they have for the application,” explains Wellhouse. “We’re supporting design and making sure engineers are aware that there are multiple solutions for a single problem.”

Aiden Mitchell, vice president of IoT sales for Arrow Electronics, agrees and emphasizes growing demand for sensing at the “edge”—that is, embedding more sensors at the device level. This underscores the growing importance of data, says Mitchell, noting that ubiquitous sensing is giving customers the real-time execution they need to generate new and better information to improve operations.

“In components, the biggest opportunity is at the edge. On the sensor side, we’re seeing sensor unit growth and low-power wireless as the two fastest growing technology areas. That growth is only matched by embedded computer solutions—board-level and box-level solutions,” he explains. “More and more, the value is shifting to the data. Companies run on data either because that’s what’s going to drive their efficiency, or maybe because it’s going to drive their new revenue model. Either way, it’s all about the data.”

EDGE COMPUTING TAKES HOLD

Like the IoT itself, trends surrounding IoT component technology are also connected. Mitchell’s point about putting

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“Edge computing allows you to manage some portion of the workload so you don’t have to stream that information back up to the cloud 24/7.” — Eric Williams, Avnet

more sensing technologies at the “edge” of a process is part of a separate trend toward “edge computing.” Both Arrow and electronic components distributor Avnet Inc. say that trend is beginning to drive growth in the segment and has considerable long-term potential.

Essentially, edge computing pushes computing technology away from centralized networks and toward the source of data by using a variety of devices—laptops, tablets, cell phones, and sensors, to name a few. Avnet’s Eric Williams describes it as “pushing the processing mode out to the edge.” And he says it’s all about data and efficiency.


“Edge computing allows you to manage some portion of the workload so you don’t have to stream that information back up to the cloud 24/7,” explains Williams. “Suppliers and customers are looking for edge-based solutions—to create processing at the edge.”

Once again, lighting is a prime example. In the case of street lighting, an edge-based solution tracks information at the lighting source and sends back only necessary data, such as when a particular lumen level is reached that indicates the need for service. The end result is more focused data generation that allows organizations—businesses, municipalities, and others—to make better decisions.

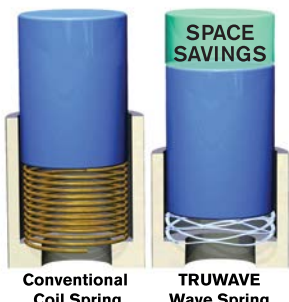
“Components and hardware are still vital, but it’s all about what you need [in order] to generate data,” adds Mitchell. “It’s about sensing embedded in that edge device. Then it’s about the mobilized, embedded compute options...all of this allows you to predict a lot more accurately what’s going to occur.”

GROWTH AHEAD

However you look at it, the IIoT is ripe for growth. Recent industry data predicting sales growth in semiconductors for IoT-related systems bears this out. Industry researcher IC Insights said this fall that IoT semiconductor sales will rise 19% this year to \$18.4 billion—with industrial internet applications rising 22% to \$3.5 billion. Connected cars, homes, wearables, and smart cities also will drive that growth.

“It’s a really fun and interesting time in the industry,” says Mitchell. “There are still challenges in many other markets. But one thing is for sure: We’re seeing IoT really drive growth.” 

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How to Make Pressure Switches That Last

The author offers simple design principles for pressure switches on off-highway operating conditions.

Commodity pressure switches fail all the time. And in nonessential fluid control applications, those failures may not amount to much more than the switch's replacement cost. However, in the fluid control systems used in off-highway equipment, failure really is not an option. These applications require accurate, reliable pressure switching under harsh operating conditions.

Raising the stakes even further, pressure switches help govern truly critical machine subsystems. They are used to monitor fluid in braking, steering, transmission, suspension, and track-tensioning systems in all types of equipment—from civilian earth movers, mobile cranes, and mining machines to off-road military vehicles. On these machines, operator safety subsystems also rely on accurate, failure-proof pressure switching. Likewise, hydraulic auxiliary systems—such as buckets and backhoes—need pressure switching to run. In all of these applications, the wrong pressure switch can cause

catastrophic damage or even endanger human life.

So what makes a good pressure switch for these failure-intolerant off-highway applications? First, the switch has to meet the basic application requirements related to pressure, accuracy, size, mounting requirements, and communications. Second, and equally important, the switch has to be rugged.

The notion of “rugged” can be somewhat subjective, and many vendors claim to have ruggedized switches. Rugged is defined as a stable switching response and long lifecycle in the face of seven failure modes—pressure spikes, leaks, temperature extremes, moisture, chemical exposure, vibration, and shock loads. These switches will address all but the most extreme conditions (see “Extreme Ingress Protection” on page 123).

Switches that can withstand all these seven life-ending failure modes have three design principles in common. They tend to have a piston rather than diaphragm design. They have

carefully designed pressure-management features and seals. And they use materials and construction methods that mitigate chemical and moisture exposures as well as thermal expansion mismatches. Here is a closer look at these design principles.

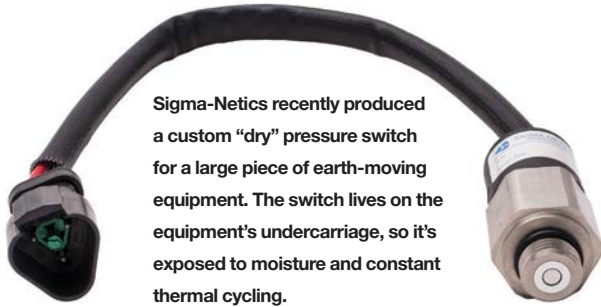
CHOOSE PISTON-ACTUATED SWITCHES

Modern pressure switches for off-highway applications, in general, fall into one of two broad categories.

Electromechanical switches include designs in which an internal piston, diaphragm, or both move in response to external pressure changes. This movement trips a snap-acting switching element at a pre-set pressure level, opening or closing an electrical circuit. When we refer to piston-actuation, we



Off-highway equipment applications require accurate, reliable pressure switching under harsh operating conditions.



Sigma-Netics recently produced a custom "dry" pressure switch for a large piece of earth-moving equipment. The switch lives on the equipment's undercarriage, so it's exposed to moisture and constant thermal cycling.

mean that a relatively large-diameter sealed piston and actuator operate the switching element directly—without the need for a diaphragm.

Solid-state switches rely on some type of strain gauge to sense the pressure changes and electronic circuitry to initiate the switching response.

All these types of pressure switches have advantages—as long as you use them in the right applications. For example, a simple diaphragm switch may offer a theoretical lifecycle or unit-cost advantage over a piston-actuated design, but the diaphragm switch may not be able to withstand the pressure spikes and environmental conditions found in a heavy equipment application. Likewise, a solid-state switch may initially seem to offer better accuracy or lifecycle than a piston switch, but these data sheet advantages can disappear in an application that experiences extreme pressure spikes or electromag-

netic interference (EMI). Solid state switches also require a more complex electrical infrastructure than their mechanical counterparts, which can drive cost.

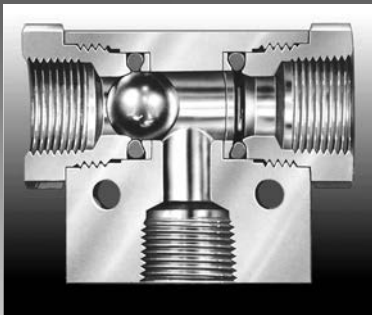
When it comes to operating in extreme environments, the piston-actuated designs have a number of compelling advantages over other types of pressure switches—even those with comparable or even better data sheet specifications. Well-designed piston switches offer accuracies as well as ± 1 to 2 percent with a narrow dead-band, and they can last for up to 1 million cycles. What makes the piston-actuated pressure switch unique, however, is that it does not lose its accuracy or fail early when exposed to harsh operating conditions.

Just how harsh? Rugged pressure switches need to survive thermal cycling from -65°F to 250°F . They have to tolerate shock and vibration loads corresponding to peak accelerations as high as 50 G. They require ingress protection up to IP 67, which keeps out moisture and particulate. They have to tolerate a broad range of fuels and corrosive chemicals. And most challenging of all, they have to survive pressure spikes as aggressive as 1 million psi/second.

MANAGE PRESSURE SPIKES

Another key differentiator between pressure-switch designs relates to how they measure overpressure conditions. Many

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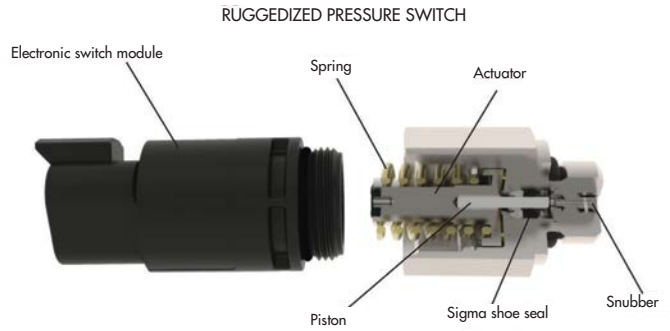
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ruggedized switches can withstand high pressures by design. Modern designed pressure switches, for example, have proof pressures as high as 12,000 psig and maximum operating pressures up to 7,500 psig. But it is not the steady state pressure that causes a well-designed and properly-specified switch to fail. It is the rise rate of pressure spikes.

Pressure spikes have many causes, ranging from pump ripple to fast valve actuation to control mishaps. And these spikes can reach a surprisingly high rate. We have seen heavy equipment applications that have experienced spikes as high as 1 million psi/second. Pressure spikes this high place enormous stresses on every switch component and represent the most catastrophic failure mode for heavy-duty pressure switches.

Protecting switches from pressure spikes partially comes down to designing robust switch housings, seals, pistons, and actuators. Beefing up the switch components, however, will only get you so far given the magnitude of forces from a 1 million psi/second pressure spike.

At these pressure rates, a ruggedized switch also needs to incorporate design features that keep damaging spikes from ever reaching the pressure switch's internal electrical switching element. One design approach is to use mechanical features or devices that reduce the size of the orifice into the switch's pressure chamber, choking off the flow into the switch.



Protecting switches from pressure spikes partially comes down to designing robust switch housings, seals, pistons, and actuators. A ruggedized switch also needs to incorporate design features that keep damaging spikes from ever reaching the pressure switch's internal electrical switching element.

These fluid flow restrictors, called snubbers, can protect against pressure spikes, but they create a design challenge: For high-pressure systems, the ratio of piston area to the orifice through the snubber has to be very high or else the snubber will not provide the desired protection against pressure spikes. In small-diameter pistons, however, this ratio will result in orifice sizes too small to manufacture, much less allow unimpeded fluid flow into the switch and can easily clog as a result of the particulate contamination in the media. An example would be the use of a snubber design whose internal design features restrict fluid flow while preserving a relatively large, clog-resistant orifice. This design provides fluid flow equivalent to a smaller orifice that meets the very high piston-to-orifice ratio.

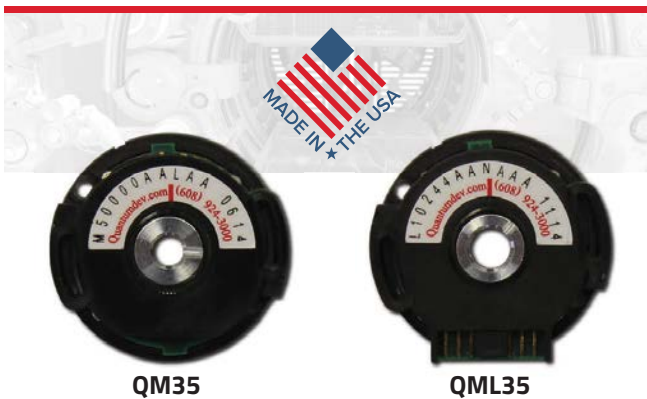
Further improvements could be made by using an elastomeric switch actuator between the top of the piston and the switch. The elastomer functions as a mallet to soften any pressure-driven blows to the electrical switching element.

Early switch designs used a metal actuator, but we found that the mallet approach can significantly extend switch life in applications with low set point pressures and high line pressures. In these cases, the mallet complements the snubber—by further mitigating the effect of the piston as it impacts the electrical switching element at a high velocity. The mallet softens these blows, protecting the switching element from early stress-fatigue failures.

PAY ATTENTION TO PISTON SIZE

Creating a switch that delivers both accuracy and reliability under harsh conditions starts with the proper design of the piston itself, particularly its size.

With piston-based pressure switches, the cross-sectional area of the piston helps determine both accuracy and repeatability. In general, you want a large piston size relative to the

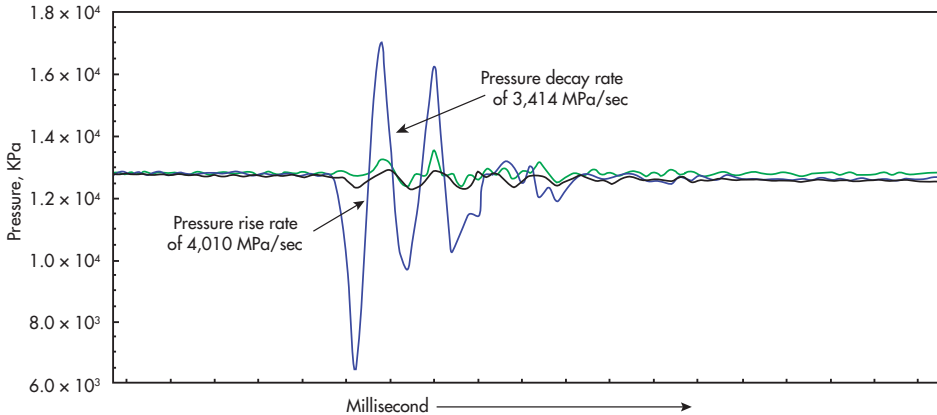


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Severe pressure spikes are the leading killer of switches.

overall size of the switch and strength of the various switch materials. Pistons with a large cross-sectional area are inherently more sensitive to small changes in applied pressure.

Larger pistons also help improve the switch's hysteresis. Also known as the Delta-P value, hysteresis is the percent difference between the switch's actuation pressure and the pressure at which it returns to its original state. Because the force developed from an applied pressure rises exponentially with piston surface area while friction forces from the seals exhibit only a linear increase, large pistons lessen the friction component of hysteresis. Put differently, contribution of friction forces to the system decreases in relative terms as piston size grows. In a related benefit, reducing friction from the switch's dynamic surfaces also improves overall repeatability and the longevity. Keep in mind that piston size is only one part of the hysteresis equation. Many other factors come into play, too, including the design and materials of all mechanical components as well as the mechanical characteristics of the electrical switching element.

Designing a switch with a large piston may sound cut and dry, but it does present some design challenges. Size constraints within the switch package place some obvious limits on piston size, but the more challenging issue involves striking a balance between the size of the piston and a calibrated spring that helps control the piston's response to applied pressure. The spring needs to be compact, given the size of the piston and the overall switch package. Yet the spring also has response and energy-storage requirements that either increase its size or result in very high design stresses.

Striking a good balance between the size of the piston and the spring is one of the overlooked design differentiators that sets apart a good ruggedized pressure switch from a bad one.

STOP THE LEAKS

Leaks from the switch's pressure chamber into its electrical cavity are another common failure mode that can be eliminated through careful design. In piston-based switches,

leaks usually develop around the dynamic piston seals. And that is no surprise since many switches use elastomer o-rings to create a seal around the moving piston.

At high pressures and cycle counts, however, the issue with o-rings is not so much whether they will leak, but when they will leak. Excessively high pressures will deform elastomer o-rings to the point that they allow fluid to pass by. This

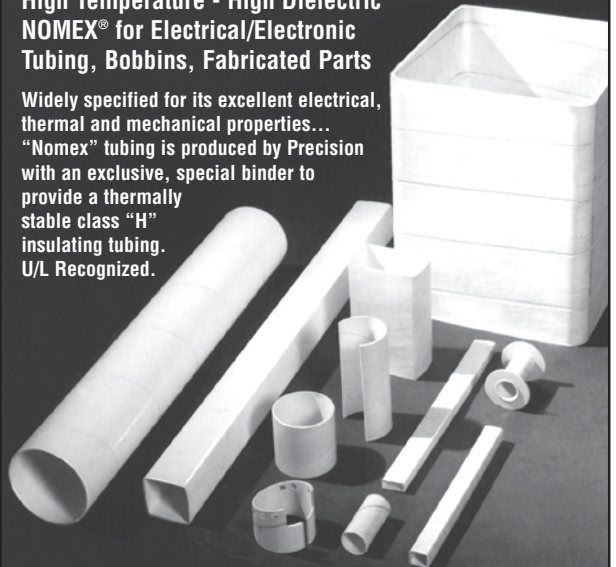
problem tends to worsen over time as the elastomer o-ring wears. Furthermore, nibbling of the o-ring may begin to occur with each pressure spike, which can ultimately result in a seal breach. The problems with simple o-rings forced designers to take a different approach toward sealing by using a rigid fluoropolymer seal in conjunction with an o-ring. With its low coefficient of friction and rigidity, the fluoropolymer seal avoids the deformation and wear problems associated with traditional elastomeric o-ring seals even at very high pressures of 30,000 psig.

(Continued on page 123)

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Here's a look at the structural adhesives engineers should know about before making design decisions.



Structural adhesives can join parts without interfering or detracting from their finish or aesthetics like welding or mechanical fasteners.

There are several reasons why structural adhesives are chosen for a wide variety of assembly operations. Unlike mechanical fasteners, they don't damage substrates by needing drilled holes, and there's no heat distortion (a risk with welding). They can also join dissimilar materials without galvanic corrosion, work with different geometries, and don't concentrate stress at a few localized spots, thus increasing fatigue resistance. And after the joining processes, structural adhesives don't require refinishing steps or leave protrusions, so they are aesthetically more pleasing.

Compared to other types of adhesives, structural adhesives have the highest load-bearing capabilities; boast excellent

environmental and chemical resistance, with no solvent emissions to deal with; and come with a range of cure times and properties. They cure in an irreversible process which helps provide excellent temperature and solvent resistance. They also do not need access to air to dry or cure, nor moisture like one-part silicone and polyurethane sealants.

In fact, structural adhesives have such a wide range of characteristics that engineers may have difficulty selecting which structural adhesive to use. Compared to other adhesives, however, structural adhesives are less intuitive to use and their performance is widely affected by processing decisions. Here are some tips on choosing structural adhesives and how to handle processing decisions.

SELECTING A STRUCTURAL ADHESIVE

Talking with suppliers' technical engineers or outside consultants can provide insights regarding structural adhesives. However, in many cases, preliminary decisions are made before talking with others, or else applications are too sensitive to discuss with outsiders. In these cases, there are a few general principles for choosing structural adhesives.

The first is that structural adhesives should be chosen based on the application's performance and processing requirements. Once these are known, the next step is choosing the adhesive which most economically meets those requirements.

Here are some of the application requirements that should be considered:

Operational conditions

Temperature: How hot or cold?

Humidity: Will the joint be exposed to rain or saltwater?

UV exposure: Will the joint be exposed to the sun, and can UV radiation penetrate the substrates and reach the adhesive?

Chemical resistance

What fluids—such as motor oil, gasoline, diesel fluid, and jet fuel—will come in contact with the joint?

Will the joint be cleaned frequently with detergents, which are weak acids and bases?

Will any specialized chemicals come in contact with the joint? And will contact be continual (such as in a filter) or only occasional?

Cleanliness and environmental issues

Do any regulations come into play regarding toxicity or disposal? Will the adhesive be used in food packaging or a medical device?

Is the part being bonded sensitive to outgassing, ionics, or corrosion like electronics and optics are?

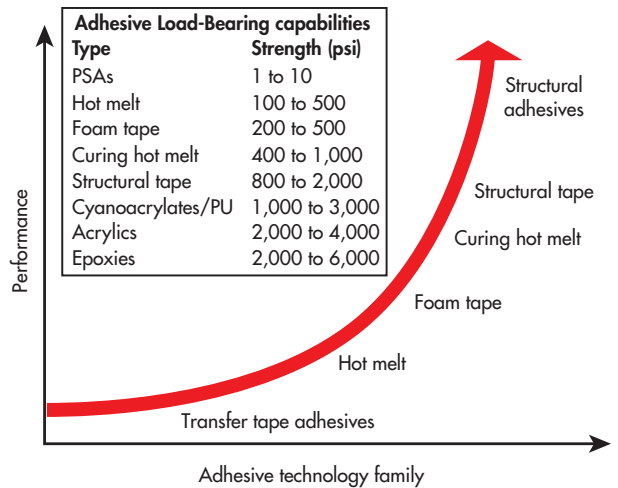
Mechanical challenges

Will the bonded part be subject to high impact or vibrational forces? How high are the stresses on the bondline? And what types are they?



It takes a well-designed adhesive such as 3M's Scotch Weld Acrylic Structural Adhesive DP8010 Blue to bond materials to low-surface-energy plastics like HDPE. The one-part epoxy comes in different sized packages so users can make the most of its 10-minute work life.

Adhesive Technologies Continuum



Adhesives vary significantly in their load-bearing capabilities (strength), with epoxy adhesives generally being the strongest. This chart deals only with load-bearing capabilities.

The general answers to these will help determine which type of structural adhesive should be considered. Specific answers will help focus on which specific products should be chosen based on manufacturers' data sheets and application test results.

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Regardless of how structural adhesives are chosen, they should be tested before any final decision is made.

TYPES OF STRUCTURAL ADHESIVES

Structural adhesives, which are categorized by their chemistries, are routinely capable of overlap shear strengths of more than 1,000 psi when bonding metal in room-temperature testing. Although there are hybrids, structural adhesives are most commonly based on epoxy, acrylic, urethane, or cyanoacrylate chemistries.

Each adhesive type can be tailored to some extent. For example, adding thickeners will increase viscosity, while adding diluents decreases viscosity. Toughening agents can be added to increase fatigue resistance. But adhesive types can be roughly compared based on the general properties inherent in each one's chemistry. Still, engineers should closely review specific properties for adhesives they are interested in.

Acrylics provide the highest bonding strength on plastics, and may also provide good bonds to metals (including many oily metals). However, they tend to have lower vibration/impact resistance than epoxies, resulting both in lower fatigue resistance and lower performance at temperature extremes.

Cyanoacrylates provide good shear strength on many plastics and rubbers, although primers may be required, but are rigid and show low resistance to peel and impact.

Comparing Structural Adhesives

Property	Epoxies	Acrylics	Urethanes	Cyanoacrylates
Overlap shear (metals)	Good	Fair to good	Fair	Fair to good
Overlap shear (plastics)	Fair	Good	Fair	Good
Shear (oily metals)	Poor	Good	Poor	Poor
Peel strength	Good	Poor	Fair	Poor
Impact resistance and toughness	Poor to good	Poor to fair	Fair	Poor
Flexibility	Poor to good	Poor	Good	Poor
Temperature resistance range	Good	Fair	Poor	Poor to fair
Solvent resistance	Good	Poor	Poor	Poor to fair

Urethanes are quite flexible but generally have lower strength, especially at higher temperatures. They bond well to plastics, woods, and metals, and are generally lower-priced than other types of structural adhesives.

Epoxies come in the widest range of properties and have the best overall bond strength on metals. Standard five-minute rigid epoxies tend to be brittle and are best suited to applications with relatively low stress and no impacts. Flexible epoxies have higher peel strengths and can better withstand impacts, and are good choices for parts which may need to require some flex and bend. Toughened epoxies incorporate elastomeric regions which absorb impact, so they provide the highest shear, peel, impact, vibration, and fatigue resistance. This makes them well suited for demanding applications. In general, however, using epoxies requires that oils be rigorously removed from metal joint surfaces. There are some exceptions to this rule, such as one-part heat cure epoxies.

Based on these generalities, engineers looking to bond ABS to stainless steel for a part that will see moderate environmental stress—such as operational temperatures from -20°F to 150°F, but little vibration or impact—would likely choose an epoxy or acrylic. Add vibration or impact to the criteria, and the choices would tip towards flexible or toughened epoxies or toughened acrylics.

Engineers seeking to bond wood to plastic for outdoor use where changes in the weather could cause significant movement of the substrate would consider urethanes for their flexibility. If more strength is needed, a flexible epoxy could serve the purpose.

Bonding low-surface-energy plastics, such as HDPE, to itself or to another plastic would require a specialty acrylic to avoid costly and time-consuming surface modification procedures. In some cases, ultimate strength or performance in a property category may not be required. This means engineers may be able to trade off performance for handling and processing capabilities.

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HANDLING AND PROCESSING CONSIDERATIONS

Once the adhesive choice has been narrowed down based on performance criteria, handling and processing considerations come into play. These run the gamut from storage conditions and shelf life to the convenience of assembly processes.

When discussing handling and processing considerations, it is necessary to distinguish between one-part and two-part epoxies, as they are handled and processed differently. One-part epoxies have the curative and base pre-mixed, thus eliminating the need to measure and mix the parts. But one-part epoxies do have more involved shelf life issues, such as premature aging and cold-temperature storage requirements. They also require curing at 250° to 350°F. Thus, in contrast to two-part epoxies, one-part epoxies require careful handling but are relatively easy to dispense. In addition, one-part epoxies generally provide the highest shear strengths on metal and the best resistance to high temperature and solvents.



Some two-part epoxies, such as 3M's Scotch Weld DP100 Plus, can be applied using a two-cartridge dispenser. It ensures the two parts are mixed and dispensed in the proper ratio.

Cyanoacrylates are often chosen for production convenience, as they do not require mixing and have a long pot lives (time they can spend open prior to bonding). But once bonded parts are mated using cyanoacrylates, they cannot be repositioned. These really are "instant adhesives," which increases the risk of accidental skin bonding. And they have a strong odor. Cyanoacrylates also carry the risk of "blooming," a cosmetically unappealing rainbow or whitish haze surrounding the bond line. Blooming is really the volatilized monomer condensing on the part. There are some cyanoacrylates that minimized blooming.

Two-part epoxies, acrylics, and urethanes are stable at room temperature prior to mixing. Room-temperature storage is longest for two-part epoxies and shortest for urethanes (which are moisture-sensitive) and acrylates (which can be temperature-sensitive).

Two-part structural adhesives require some time for the cure to start after the adhesive is mixed and the surfaces to be bonded are mated. This allows for positioning, but also requires that parts be held in place until some level of cure has been reached. This period of time is known by several terms, including set time, fixture time, green strength, and time to handling strength. Adhesive manufacturers may define it differently so engineers should carefully read the datasheet to determine each adhesive's characteristics.

Typically, two-part adhesives can be supplied in bulk, such as five-gallon pails or 55-gallon drums, and used with a meter/mixer. They may also come packaged in hand-dispensable cartridges. These cartridges feature side-by-side cylinders appropriately sized to provide the right mix ratio and are mated with disposable static-mix nozzles that ensure proper mixing. A variety of hand-held applicators are available, as well. Two-part adhesives may also come in small cans or tubes which require manual measuring and mixing.

Adhesives that cure by chemical reaction, including all two-part adhesives, have curing times that are temperature-

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Handling and Processing Comparison of Structural Adhesives

Property	One-part epoxies	Two-part epoxies	Acrylics	Urethanes	Cyanoacrylates
Storage requirements	Poor	Good	Fair	Fair	Fair
Shelf life	Poor	Good	Fair	Poor	Good
Measuring/mixing required	Good	Poor	Poor	Poor	Good
Room temperature curing	Poor	Good	Good	Good	Good
Pot life	Good	Good	Fair	Fair	Good
Repositioning before set	Good	Good	Fair	Fair	Poor
Set time/Handling strength	Fair	Fair	Good	Good	Good
Full cure time	Good	Poor	Fair	Fair	Good
Viscosity range	Fair	Good	Fair	Good	Fair
Odor	Good	Good	Poor	Good	Fair
Potential health issues	Fair	Fair	Poor	Poor	Fair

dependent. They cure quicker in warmer temperatures, but they will also have shorter pot lives, open times, and times to handling strength. At cooler temperatures, curing is slower and the times are extended. Thus, when using adhesives in non-temperature controlled environments, designers must consider the temperature difference between the use environment and the standard "room temperature" of 70° to 75°F generally used by manufacturers to report pot lives and times to handling strength.

As a rough rule of thumb, if using the adhesive outside on a hot summer day, the open time might be as little as half what is reported on the datasheet and on a cool spring or fall day with temperatures in the low 50s, these times might be doubled. An approximate estimate says that for a 10°C warmer cure environment, the adhesive will have half the open time. Conversely, for a 10°C cooler environment, the open time will be doubled. So extra care might be needed to complete the bonding step quickly on hot days, or extra fixture times may be needed in cool environments.

A corollary is that two-part structural adhesives can have cure times deliberately accelerated by applying heat. Options typically include ovens and radiant heat sources. Data sheets and other information from manufacturers can help engineers determine possible cure schedules.

In addition to varying cure times, adhesives also tend to thin in warmer environments and will thicken in cooler environments. In general, then, application temperatures of 60° to 80°F and a minimum application temperature around 40°F are recommended for two-part adhesives.

Viscosity can also be chosen to match preferences. In general, the viscosity range is widest for two-part epoxies and urethanes where products can range from thin to heavy pastes. Non-sag adhesives may be formulated to be shear-thinning, which lets them be dispensed relatively easily but not to run or sag after dispensing.

Although structural adhesives typically don't contain solvents, they may contain volatile organic chemical components or other components that can emit an odor or lead to skin or respiratory irritation. Users are cautioned to review the safety data sheets before using any adhesive.

When choosing which adhesives to screen, first consider end-user requirements. Next, read up on the various types and consult with adhesive suppliers. Finally, consider the process requirements to eliminate most of the choices. This will leave a relatively small set of adhesives with favorable performance and processing characteristics.

For a final selection, however, conduct testing and validation. Typically, peel tests and overlap shear tests of some sort are done to determine the strength of the adhesive on particular substrates or under specific environmental conditions. The exact details of the test should be based on the particular project. Don't rely solely on the information in manufacturers' technical data sheets. Good adhesive suppliers are willing to work with users in defining and assisting in these decisions, including some type of material testing.

However, the most carefully chosen adhesive may not work well in the application if the bonding surfaces are not properly prepared or the joint is poorly designed. This is another area where engineers will benefit from early discussions with their adhesive suppliers. **md**

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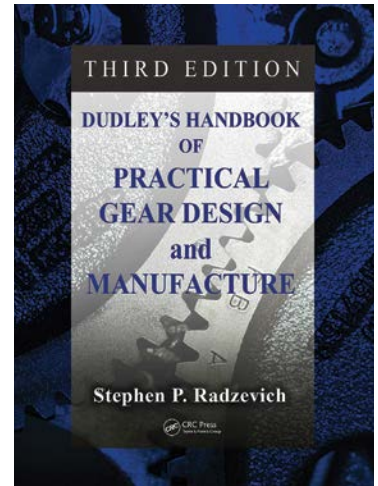
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Learning Gear Essentials with *Dudley's Handbook*



The 3rd Edition of *Dudley's Handbook of Practical Gear Design and Manufacture* by Stephen P. Radzevich is a complete resource of real-world gear engineering, and includes modeling, analysis, and failure theory.

Author and professor Steve Radzevich discusses the third revision to *Dudley's Handbook of Practical Gear Design and Manufacture*, and the essentials that all gear designers should know.

Dudley's *Handbook of Practical Gear Design and Manufacture* lays out the essentials of gear design, with topics including key gear terminology, the fundamental equations in their design, the tools to build them, the software to analyze them, and even how to predict their failures. The most common gear types include spur gears, helical gears, internal gears, and bevel gears. Throughout this article we will show the basic equations used for each gear to determine the circular pitch, pitch angles, and pitch diameters.

Machine Design had the opportunity to speak with author and professor Steve Radzevich to discuss the most recent revision of the book.

Please tell me a little about yourself and your background.

I am a professor of mechanical engineering and a professor of manufacturing engineering. I received my Master's in science in 1976, Ph.D. in 1982, and my doctorate in science (engineering) in 1991, all in mechanical engineering. I have extensive industrial experience in gear design and manufacture. I have also developed numerous software packages dealing with computer-aided design (CAD) and computer-aided machining (CAM) of precise gear finishing for a variety of industrial sponsors.

My main research interest is the kinematic geometry of part surface generation, with a particular focus on precision gear design, high-power-density gear trains; torque share in multi-flow gear trains; design of special-purpose gear cutting/

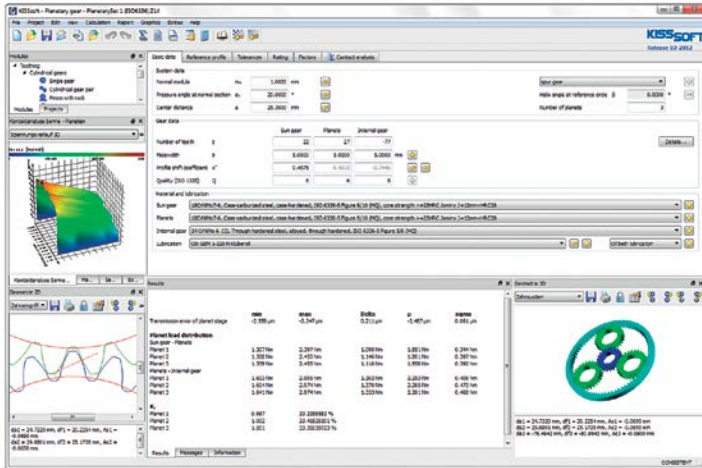
finishing tools; and design and machine (finish) of precision gears for low-noise and noiseless transmissions of cars, light trucks, and so on. I have spent over 40 years developing software, hardware, and other processes for gear design and optimization. Besides my work for industry, I train engineering students at universities and gear engineers in companies.

I have authored and coauthored over 30 monographs, handbooks, and textbooks. I have also authored and coauthored over 600 scientific papers, and hold over 250 patents on inventions in the field (USA, Japan, Russia, Europe, Canada, Soviet Union, South Korea, Mexico, and others).

This is the third edition of the book. What is the history of the book and what is the main purpose?

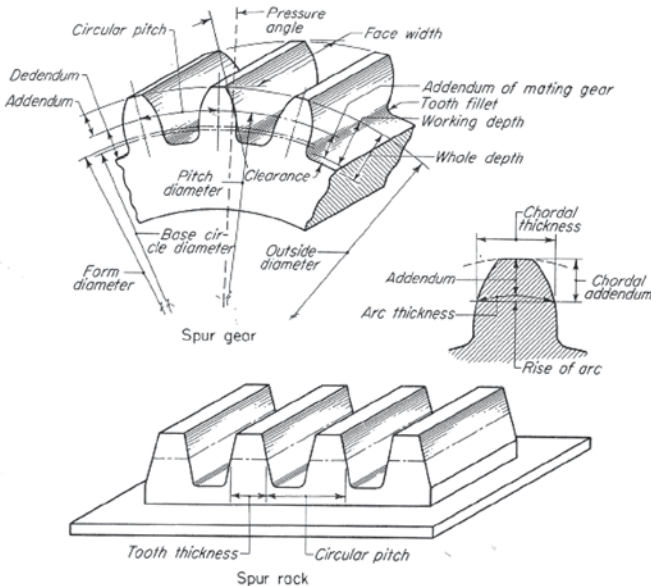
The book originated from the original 1954 book *Practical Gear Design* by D.W. Dudley and published by the McGraw-Hill Book Company. However, D.W. Dudley's 1954 book is not the first edition of the *Dudley's Handbook of Practical Gear Design and Manufacture*.

In 1984, McGraw-Hill Book Company, based on the ideas and instructions from D.W. Dudley, published the 1st Edition of the *Handbook* also by D.W. Dudley. I took over on the 2nd edition of the *Handbook*, and it was revised and updated in 2012 by CRC Press. CRC Press published the current 3rd Edition of the *Handbook* (revised and updated) in 2016. The main purpose of the book has always been to provide gear engineers with an advanced source of comprehensive information on gear design, gear production, and gear application.



Gear engineers often turn to commercial software like KISSsoft to design gears.

SPUR GEARS



Spur-gear and rack terminology: Spur gears, which are the most common type of gear used, have their teeth on the outside of a cylinder. The teeth are parallel to the axis of the cylinder.

$$\text{Module} = \frac{25.400}{\text{diametral pitch}}$$

$$\text{Circular pitch} = \pi \div \text{diametral pitch}$$

$$\text{Pitch diameter} = \text{number of teeth} \div \text{diametral pitch}$$

$$\text{Center distance} = \frac{\text{pinion pitch diameter} \div \text{gear pitch diameter}}{2}$$

$$\text{Pitch diameter (operating) of pinion} = \frac{2 \times \text{operating center distance}}{\text{ratio} + 1}$$

$$\text{where Gear (tooth) ratio} = \frac{\text{number of gear teeth}}{\text{number of pinion teeth}}$$

What are the essential types of gears used in the industry today?

All of the gears used in the industry nowadays fall into one of three principal types of gearing:

1. Those that operate on **parallel axes** of rotation of a gear and a mating pinion (external and internal gearings)—spur and helical gears, double-helical and herring-bone gears, Novikov gears, epi-cycloidal gears, etc.
2. Those that operate on **intersected axes** of rotation of a gear and a mating pinion (external and internal gearings)—straight bevel gears, skew bevel gears, spiral bevel gears, face gear drives, and so forth.
3. Those that operate on **crossed axes** of rotation of a gear and a mating pinion (external and internal gearings)—hypoid gears, spiroid gears, worm gearings, and others of the same design.

Gearings of numerous special designs are also used in specific applications.

When designing gears, what are the essential terms and nomenclature that one should know?

Prior to beginning designing gears, it is a *must* to understand how gearings operate—that is, how the gear and the pinion tooth flanks are engaged in mesh, and how they are able to transmit a rotation smoothly (with a constant angular velocity ratio). This problem, which (from the first glimpse) looks like a simple one, is not correctly understood by the most of gear experts—both from industry as well as from academia.

A few of the essential terms include:

- **Gear ratio:** The number of teeth on the gear divided by the number of teeth on its mating pinion.
- **Operating pitch diameters:** The pitch diameters determined from the number of teeth and the center distance at which gears operate.
- **Base pitch:** The circular pitch in the plane of rotation at the base circle.
- **Pitch cones:** The imaginary surface forming a plane (pitch plane) or a cylinder (pitch cylinder).
- **Center distance:** Equal to the sum of the pitch diameter of the pinion and the pitch diameter divided by two.
- **Circular pitch:** The circular distance from a point on one gear tooth to a like point on the next tooth, taken along the pitch circle. Two gears must have the same circular pitch to mesh with each other. As they mesh, their circles will be tangent to one another.
- **Diametral pitch (or module):** A measure of tooth size in the English system. In units, it is the number of teeth per inch of pitch diameter. An increase in tooth size decreases the diametral pitch. Diametral pitches usually range from 25 to 1.

- **Profile angle (pressure angle):** The slope of the gear tooth at the pitch-circle position. If the pressure angle is 0 deg., the tooth is parallel to the axis of the gear—and is really a spur-gear tooth.
- **Helix angle:** The inclination of the tooth in a lengthwise direction. For example, if the helix angle is 0 deg., the tooth is parallel to the axis of the gear—and is really a spur-gear tooth.

What tools are at an engineer's disposal to design gears?

Finite element analysis (FEA) is widely used by gear engineers, mainly for the purpose of verifying bending and contact strength of gear teeth, deflections of the gear teeth under the operating load, and so forth. Again, the commercial software KISSsoft is used to design gear pairs. To design gearboxes (including bearings, shafts, gear housings, etc.), corresponding ROMAX software is commonly used.

What are typical failures are seen in gears today?

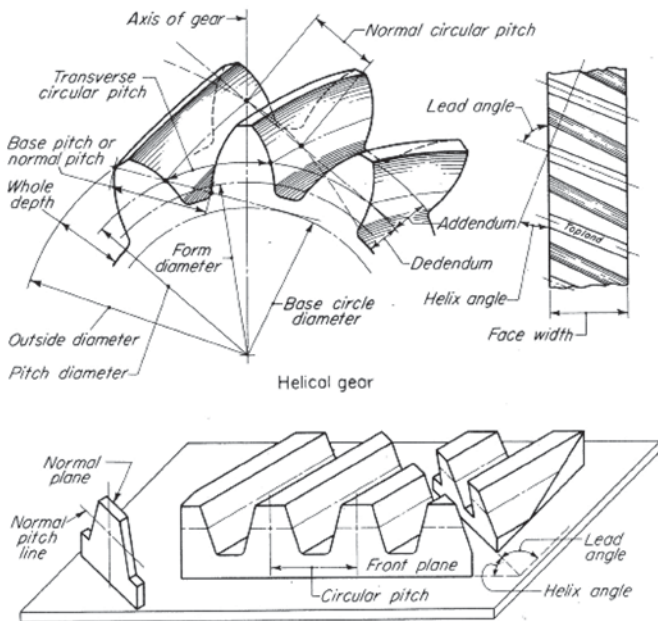
The typical failures seen in today's gears are due to:

- Insufficient strength (either bending strength or contact strength) causes failure of the gear teeth.
- Poor gear design, along with manufacturing errors, can cause improper load share between two (or more) pairs of the gear teeth, resulting in gear-tooth failure.
- When a gear base pitch (and a mating pinion base pitch) is not equal to the operating base pitch of the gear pair, excessive vibration generation and noise excitation are observed (both can result in a low lifetime of the gearing, as well as in gear failure).

Many of the gear failure modes can be prevented if the gears are (in respective order of the above list) properly designed, properly manufactured, and properly assembled in the gear housing.

(Continued on page 120)

HELICAL GEARS



Helical-gear and rack terminology: Helical teeth cut on a spiral that wraps around a cylinder. They progressively enter the meshing zone and in turn have a smoother action than spur gear teeth. They also tend to be quieter.

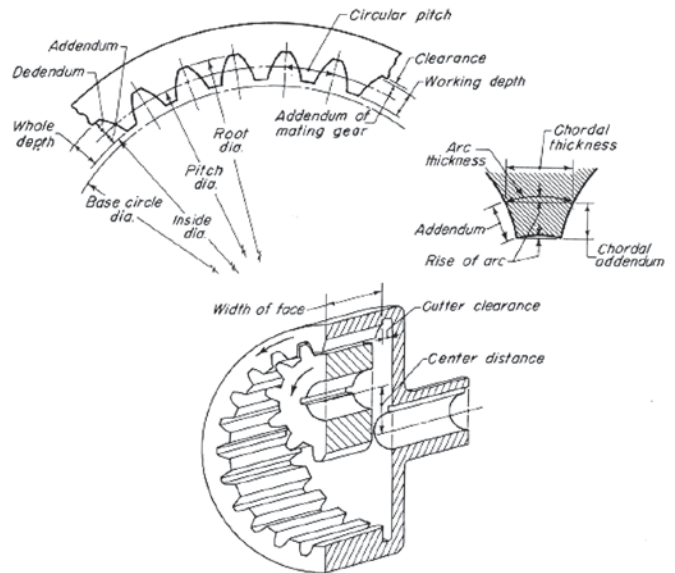
Normal circular pitch = circular pitch × cosine helix angle

Normal module = transverse module × cosine helix angle

Normal diametral pitch = transverse diametral pitch × cosine helix angle

Axial pitch = circular pitch ÷ tangent helix angle
= normal circular pitch ÷ sine helix angle

INTERNAL GEARS



Internal-gear and rack terminology: Internal gears have their teeth on the inside of a cylinder. The teeth may be made either spur or helical. Internal gears are generally more efficient due to the fact that the sliding velocity along the profile is lower than that of a similar external set.

$$\text{Center distance} = \frac{\text{pitch diameter of gear} - \text{pitch diameter of pinion}}{2}$$

$$\text{Pitch diameter (operating) of pinion} = \frac{2 \times \text{operating center distance}}{\text{ratio} - 1}$$

$$\text{Pitch diameter (operating) of gear} = \frac{2 \times \text{operating center distance} \times \text{ratio}}{\text{ratio} - 1}$$

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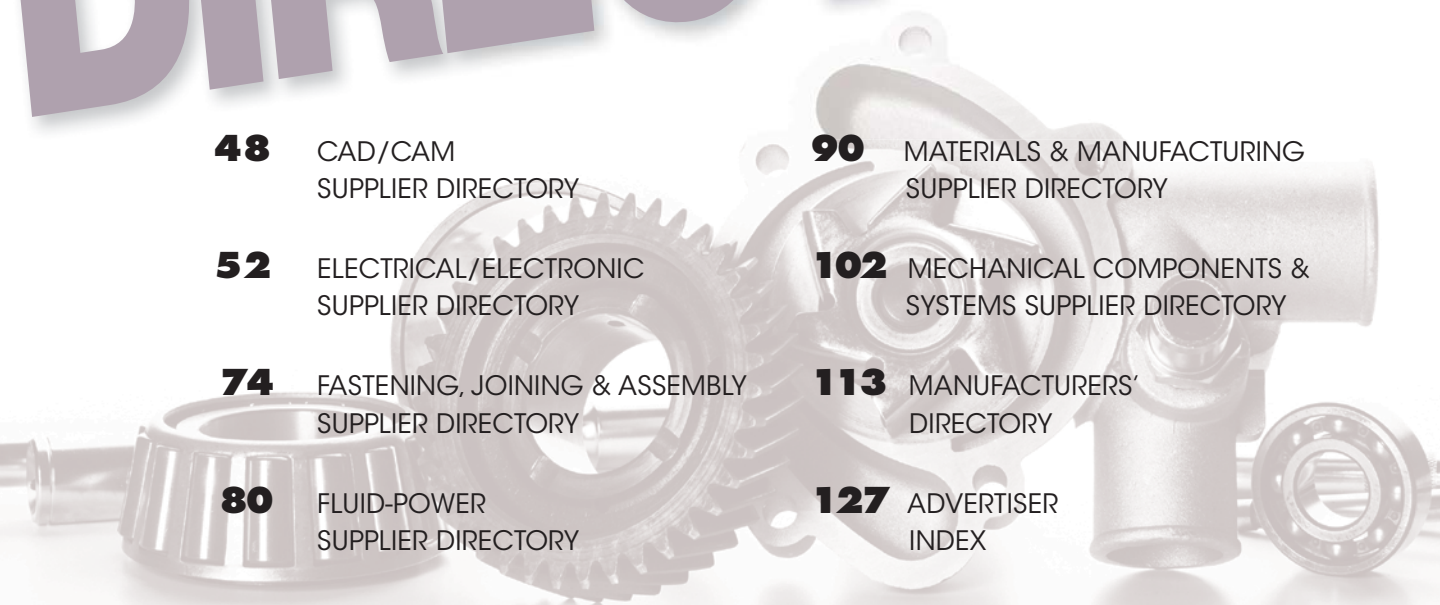
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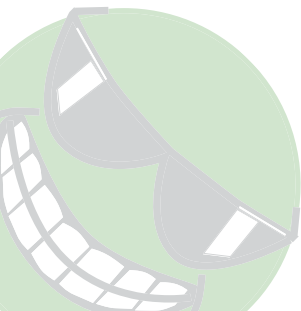
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Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Servometer, Cedar Grove, NJ

SKF USA Inc, Lansdale, PA

TLX Technologies LLC, Pewaukee, WI

Ultra Motion LLC, Cutchogue, NY

Velmex, Inc., Bloomfield, NY

ACTUATORS, ROLLER-SCREW LINEAR SERVO

Aerotech Inc, Pittsburgh, PA

BellowsTech LLC, Ormond Beach, FL

Digi-Key Corp, Thief River Falls, MN

Exlar Corp, Chanhassen, MN

Festo Corp, Hauppauge, NY

Haydon Kerk Motion Solutions Inc, Waterbury, CT

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SKF USA Inc, Lansdale, PA

Ultra Motion LLC, Cutchogue, NY

Velmex, Inc., Bloomfield, NY

ACTUATORS, VOICE-COIL

Digi-Key Corp, Thief River Falls, MN

Enfield Technologies, Trumbull, CT

ADAPTERS, WALL

Digi-Key Corp, Thief River Falls, MN

AMPLIFIERS

Aerotech Inc, Pittsburgh, PA

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Baumer Ltd, Southington, CT

Digi-Key Corp, Thief River Falls, MN

ElectroCraft, Dover, NH

Exlar Corp, Chanhassen, MN

HBM Inc, Marlborough, MA

Performance Motion Devices, Boxborough, MA

Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

ANGLE-MEASUREMENT SYSTEMS

AMETEK, Clawson, MI

Digi-Key Corp, Thief River Falls, MN

Microstrain Inc, Williston, VT

MTI Instruments Inc, Albany, NY

Trans-Tek Inc, Ellington, CT

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Digi-Key Corp, Thief River Falls, MN

Floyd Bell Inc, Worthington, OH

BACKLIGHTING

Digi-Key Corp, Thief River Falls, MN

Mitsubishi International Corp, New York, NY

BATTERIES

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Belt Technologies Inc, Agawam, MA

Dexmet Corp, Wallinton, CT

Digi-Key Corp, Thief River Falls, MN

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

Ocean Server Technology, Fall River, MA

Tadiran Inc, Port Washington, NY

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

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Digi-Key Corp, Thief River Falls, MN

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Tadiran Inc, Port Washington, NY

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Digi-Key Corp, Thief River Falls, MN

GripNail - Industrial Metal Fasteners, East Providence, RI

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BATTERY, HOLDERS

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BLOWERS

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AMETEK Precision Motion Control, Kent, OH

Digi-Key Corp, Thief River Falls, MN

ebm-papst Inc, Farmington, CT

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Beckhoff Automation LLC, Savage, MN

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

Nippon Pulse America Inc, Radford, VA

Opto 22, Temecula, CA

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Beckhoff Automation LLC, Savage, MN

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Digi-Key Corp, Thief River Falls, MN

Floyd Bell Inc, Worthington, OH

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CARD CAGES

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New Berlin, WI 53151, 262-786-1500, 800-298-2066,
FAX: 262-786-3280, sales@dynatect.com,
www.Dynatect.com — See Ad Index

GripNail - Industrial Metal Fasteners, East Providence, RI

igus Inc, PO Box 14349, East Providence, RI 02914,
401-438-2200, 800-521-2747, FAX: 401-438-7270,
cdennen@igus.com, www.igus.com — See Ad Index

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932,
973-660-9700, ldonovovan@lappusa.com,
www.lappusa.com

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Omega Engineering, Stamford, CT

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National Instruments, Austin, TX

CHIPS, MICROCOMPUTER

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IDEC Corp, Sunnyvale, CA

Omega Engineering, Stamford, CT

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COILS

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Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

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Omega Engineering, Stamford, CT

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Digi-Key Corp, Thief River Falls, MN

Omega Engineering, Stamford, CT

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Omega Engineering, Stamford, CT

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Omega Engineering, Stamford, CT

Performance Motion Devices, Boxborough, MA

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Festo Corp, Hauppauge, NY

Omega Engineering, Stamford, CT

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Omega Engineering, Stamford, CT

COMPUTERS, OEM-BOARD ROM

Omega Engineering, Stamford, CT

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www.lappusa.com

New England Wire Technologies, Lisbon, NH

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Servometer, Cedar Grove, NJ

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Alden Products Co, Brockton, MA

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Altech Corp, 35 Royal Rd, Flemington, NJ 08822, 908-806-9400, FAX: 908-806-9490, mario@altech.com, www.altechcorp.com — See Ad Index

AMETEK, Rosemead, CA

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Beckhoff Automation LLC, Savage, MN
Belt Technologies Inc, Agawam, MA
Digi-Key Corp, Thief River Falls, MN

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonvovan@lappusa.com, www.lappusa.com

Omega Engineering, Stamford, CT
Roxtec Inc, Tulsa, OK

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, info@sabcable.com, www.sabcable.com — See Ad Index

Tech-Etch Inc, Plymouth, MA
Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT
US Digital, Vancouver, WA

CONNECTORS, COMBINATION, POWER/SIGNAL

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Alden Products Co, Brockton, MA

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Belt Technologies Inc, Agawam, MA
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Lemo USA Inc, Rohnert Park, CA
Omega Engineering, Stamford, CT

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Digi-Key Corp, Thief River Falls, MN

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonvovan@lappusa.com, www.lappusa.com

Omega Engineering, Stamford, CT
PAVE Technology Co Inc, Dayton, OH

CONNECTORS, HIGH-DENSITY

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Alden Products Co, Brockton, MA

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Omega Engineering, Stamford, CT
Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

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Alden Products Co, Brockton, MA

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Belt Technologies Inc, Agawam, MA
Digi-Key Corp, Thief River Falls, MN

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

Omega Engineering, Stamford, CT
Servometer, Cedar Grove, NJ
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CONNECTORS, POWER

Alden Products Co, Brockton, MA

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Electrotech Sales Group LLC, Colmar, PA

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonvovan@lappusa.com, www.lappusa.com

Omega Engineering, Stamford, CT

CONTACTS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

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Belt Technologies Inc, Agawam, MA

Braxton Mfg Co Inc, Watertown, CT
Digi-Key Corp, Thief River Falls, MN

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonvovan@lappusa.com, www.lappusa.com

Servometer, Cedar Grove, NJ
Tech-Etch Inc, Plymouth, MA

CONTROLLER, POWER

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Digi-Key Corp, Thief River Falls, MN
Omega Engineering, Stamford, CT
Watlow, St Louis, MO
Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

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Allegro MicroSystems Inc, Worcester, MA
AMK Drives and Controls Inc, 5631 S Laburnum Ave, Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339, info@amkdrives.com, www.amkdrives.com
Applied Motion Products, Watsonville, CA
Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

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B&R Industrial Automation Corp, Roswell, GA
ElectroCraft, Dover, NH
Elmo Motion Control, Nashua, NH
Enfield Technologies, Trumbull, CT
Festo Corp, Hauppauge, NY
Galil Motion Control, Rocklin, CA

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonvovan@lappusa.com, www.lappusa.com

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Lenze Americas, Uxbridge, MA
LIKA Electronics SRL, Carre' (VI) - Italia
maxon precision motors, inc, Fall River, MA
MICROMO, Clearwater, FL

Midwest Motion Products, 1000 Industries Circle, Howard Lake, MN 55349, 320-490-7060, FAX: 480-247-4096, sales@midwestmotion.com, www.midwestmotion.com

NORD Gear Corp, Waunakee, WI
Omega Engineering, Stamford, CT
Performance Motion Devices, Boxborough, MA

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

Schneider Electric Motion USA, Marlborough, CT
Ultra Motion LLC, Cutchogue, NY
Velmex, Inc., Bloomfield, NY
Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

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Allegro Microsystems Inc, Worcester, MA

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info@amkdrives.com, www.amkdrives.com**

Applied Motion Products, Watsonville, CA

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Elmo Motion Control, Nashua, NH

Galil Motion Control, Rocklin, CA

maxon precision motors, inc, Fall River, MA

MICROMO, Clearwater, FL

Nanotec Electronic US Inc, Stoneham, MA

Omega Engineering, Stamford, CT

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Galil Motion Control, Rocklin, CA

Lenze Americas, Uxbridge, MA

maxon precision motors, inc, Fall River, MA

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Nanotec Electronic US Inc, Stoneham, MA

Omega Engineering, Stamford, CT

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Galil Motion Control, Rocklin, CA

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Velmex, Inc., Bloomfield, NY

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Watlow, St Louis, MO

HEATING ELEMENTS

Belt Technologies Inc, Agawam, MA

Dalton Electric Heating Co Inc, Ipswich, MA

Dexmet Corp, Wallinton, CT

Hotwatt Inc, Danvers, MA

Minco Products Inc, Minneapolis, MN

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT
Watlow, St Louis, MO

ICS (INTEGRATED CIRCUITS)

Allegro MicroSystems Inc, Worcester, MA

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Nippon Pulse America Inc, Radford, VA

IMAGING SYSTEMS, INFRARED

Belt Technologies Inc, Agawam, MA

INCLINOMETERS

BEI Sensors, Goleta, CA

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

Microstrain Inc, Williston, VT

US Digital, Vancouver, WA

INSTRUMENTS, WEATHER

Belt Technologies Inc, Agawam, MA

Bristol Instruments, Boston, MA

Omega Engineering, Stamford, CT

INSULATION MATERIALS, ELECTRICAL

Precision Paper Tube Co, 1033 S Noel Ave, Wheeling, IL 60090, 847-537-4250, FAX: 847-537-5777, sales@pptube.com, www.pptube.com — See Ad Index

INSULATION, SHIELDING

Roxtec Inc, Tulsa, OK

INTERFACES, MAN-MACHINE

Belt Technologies Inc, Agawam, MA

B&R Industrial Automation Corp, Roswell, GA

US Digital, Vancouver, WA

INTERFACES, OPERATOR

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Festo Corp, Hauppauge, NY

INVERTERS, POWER

Absopulse Electronics Ltd, 110 Walgreen Rd, Ottawa, ON K0A 1L0, 613-836-3511, FAX: 613-836-7488, absopulse@absopulse.com, www.absopulse.com

HBM Inc, Marlborough, MA

JOYSTICKS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Clawson, MI

EAO Switch Corp, Milford, CT

HAWE Hydraulics, Charlotte, NC

JR Merritt Controls Inc, Stratford, CT

KEYBOARDS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

KEYPADS, MEMBRANE

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

The Bergquist Co, 18930 W 78th St, Chanhassen, MN 55317, 952-835-2322, 800-347-4572, FAX: 952-835-0430, webmaster@bergquistcompany.com, www.bergquistcompany.com

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

KNOBS, ALUMINUM

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

PIC Design, Middlebury, CT

KNOBS, PHENOLIC

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Carr Lane Mfg Co, St Louis, MO

Digi-Key Corp, Thief River Falls, MN

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

LAMPS, DIAGNOSTIC

Floyd Bell Inc, Worthington, OH

LAMPS, FLASHLIGHT

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

LASERS

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

LCDS (LIQUID-CRYSTAL DISPLAYS)

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

LEDS (LIGHT-EMITTING DIODES)

Allegro MicroSystems Inc, Worcester, MA

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Grand Junction, CO

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

Floyd Bell Inc, Worthington, OH

LEDS, ALPHANUMERIC

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

LENSES

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

Tri Town Plastics Inc, Deep River, CT

LIGHT SOURCES

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Xenon Corp, Wilmington, MA

LIGHT, INDICATOR

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Floyd Bell Inc, Worthington, OH

IDEC Corp, Sunnyvale, CA

Mitsubishi International Corp, New York, NY

Solico-Mec Inc, Hartford, CT

Wilbrecht LEDCO Inc, St Paul, MN

LUBRICANTS FOR CONNECTORS

Nye Lubricants, Fairhaven, MA

LUBRICANTS FOR SWITCHES

Nye Lubricants, Fairhaven, MA

LVDTs (LINEAR VARIABLE-DIFFERENTIAL TRANSFORMERS)

Digi-Key Corp, Thief River Falls, MN

Kavlico Corp, Moorpark, CA

Trans-Tek Inc, Ellington, CT

MAGNETS

Digi-Key Corp, Thief River Falls, MN

MAGNETS, CERAMIC & ALNICO

Digi-Key Corp, Thief River Falls, MN

MAGNETS, RARE-EARTH

Digi-Key Corp, Thief River Falls, MN

MARKERS, WIRE

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Omegadyne Inc, Sunbury, OH

MEMORY DEVICES, ROM, PROM, EPROM

Digi-Key Corp, Thief River Falls, MN

METERS, PANEL

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Grand Junction, CO

Bristol Instruments, Boston, MA

Digi-Key Corp, Thief River Falls, MN

ENM Company, 5617 Northwest Hwy, Chicago, IL 60646, 773-775-8400, 888-372-0465, FAX: 773-775-5968, customerservice@enmco.com, www.enmco.com

Omega Engineering, Stamford, CT

MICROPROCESSORS & MICROCONTROLLERS

AMETEK, Clawson, MI

Digi-Key Corp, Thief River Falls, MN

Enfield Technologies, Trumbull, CT

Festo Corp, Hauppauge, NY

Nvidia, Santa Clara, CA

Omega Engineering, Stamford, CT

MICROPROCESSORS, CUSTOMIZED CONTROLS

AMETEK, Clawson, MI

Nvidia, Santa Clara, CA

Omega Engineering, Stamford, CT

MODULES, CIRCUIT, ANALOG

AMETEK, Clawson, MI

Bristol Instruments, Boston, MA

Digi-Key Corp, Thief River Falls, MN

Omega Engineering, Stamford, CT

Opto 22, Temecula, CA

MODULES, CIRCUIT, DIGITAL

AMETEK, Clawson, MI

Bristol Instruments, Boston, MA

Digi-Key Corp, Thief River Falls, MN

Omega Engineering, Stamford, CT

Opto 22, Temecula, CA

MODULES, INTERFACE

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Altech Corp, 35 Royal Rd, Flemington, NJ 08822, 908-806-9400, FAX: 908-806-9490, mario@altech.com, www.altechcorp.com — See Ad Index

AMETEK, Clawson, MI

AMETEK, Grand Junction, CO

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Festo Corp, Hauppauge, NY

Omega Engineering, Stamford, CT

Opto 22, Temecula, CA

MONITORS, VIBRATION

Microstrain Inc, Williston, VT

Omega Engineering, Stamford, CT

Trans-Tek Inc, Ellington, CT

MOTION ANALYZERS, HIGH-SPEED DIGITAL

AMETEK, Clawson, MI

Omega Engineering, Stamford, CT

MOTION-CONTROL DEVICES, ELECTRICAL

Aerotech Inc, Pittsburgh, PA

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Clawson, MI

AMK Drives and Controls Inc, 5631 S Laburnum Ave, Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339, info@amkdrives.com, www.amkdrives.com

Applied Motion Products, Watonsville, CA

Beckhoff Automation LLC, Savage, MN

Bison Gear & Engineering Corp, St Charles, IL

B&R Industrial Automation Corp, Roswell, GA

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

Celera Motion, Bedford, MA

Clippard Instrument Laboratory Inc, 7390 Colerain Ave, Cincinnati, OH 45239, 513-521-4261, 877-245-6247, FAX: 513-521-4464, sales@clippard.com, www.clippard.com — See Ad Index

Delta Computer Systems, Battle Ground, WA

ElectroCraft, Dover, NH

Elmo Motion Control, Nashua, NH

Enfield Technologies, Trumbull, CT

Festo Corp, Hauppauge, NY

Galil Motion Control, Rocklin, CA

Haydon Kerk Motion Solutions Inc, Waterbury, CT

Infranor Inc, Wilmington, MA

Lenze Americas, Uxbridge, MA

maxon precision motors, inc, Fall River, MA

MICROMO, Clearwater, FL

National Instruments, Austin, TX

Nippon Pulse America Inc, Radford, VA

Omega Engineering, Stamford, CT

Onvio LLC, Salem, NH

Performance Motion Devices, Boxborough, MA

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, info@sabcable.com, www.sabcable.com — See Ad Index

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

Schneider Electric Motion USA, Marlborough, CT

Servometer, Cedar Grove, NJ

Trans-Tek Inc, Ellington, CT

US Digital, Vancouver, WA

Velmex, Inc., Bloomfield, NY

Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

MOTION-CONTROL DEVICES, MECHANICAL

Aerotech Inc, Pittsburgh, PA

AMETEK, Clawson, MI

AMETEK Precision Motion Control, Kent, OH

Applied Motion Products, Watonsville, CA

Bison Gear & Engineering Corp, St Charles, IL

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

**Dynatec Manufacturing Inc, 2300 S Calhoun Rd,
New Berlin, WI 53151, 262-786-1500, 800-298-2066,
FAX: 262-786-3280, sales@dynatec.com,
www.dynatec.com — See Ad Index**

ElectroCraft, Dover, NH
Elmo Motion Control, Nashua, NH
Exlar Corp, Chanhassen, MN
Galil Motion Control, Rocklin, CA

IKO Intl Inc, Parsippany, NJ
Infranor Inc, Wilmington, MA
maxon precision motors, inc, Fall River, MA
Nanotec Electronic US Inc, Stoneham, MA
Omega Engineering, Stamford, CT

Onvio LLC, Salem, NH
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

**Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index**

**Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com**

Schneider Electric Motion USA, Marlborough, CT
Servometer, Cedar Grove, NJ
Steinmeyer Inc, Burlington, MA
Trans-Tek Inc, Ellington, CT
US Digital, Vancouver, WA
Velmex, Inc., Bloomfield, NY

MOTION-CONTROL SYSTEMS

Aerotech Inc, Pittsburg, IA
AMETEK, Clawson, MI

**AMK Drives and Controls Inc, 5631 S Laburnum Ave,
Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339,
info@amkdrives.com, www.amkdrives.com**

Applied Motion Products, Watsonville, CA
Beckhoff Automation LLC, Savage, MN

**Clippard Instrument Laboratory Inc, 7390 Colerain Ave,
Cincinnati, OH 45239, 513-521-4261, 877-245-6247,
FAX: 513-521-4464, sales@clippard.com,
www.clippard.com — See Ad Index**

Delta Computer Systems, Battle Ground, WA
Elmo Motion Control, Nashua, NH
Enfield Technologies, Trumbull, CT
Festo Corp, Hauppauge, NY
Galil Motion Control, Rocklin, CA
Haydon Kerk Motion Solutions Inc, Waterbury, CT
IKO Intl Inc, Parsippany, NJ
Infranor Inc, Wilmington, MA
Leeson Electric Motors, Grafton, WI
LIKA Electronics SRL, Carre' (VI) - Italia
maxon precision motors, inc, Fall River, MA
MICROMO, Clearwater, FL
Nanotec Electronic US Inc, Stoneham, MA
O'Keefe Controls Co, Trumbull, CT
Omega Engineering, Stamford, CT
OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH
Performance Motion Devices, Boxborough, MA
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

**Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index**

**Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com**

Schneider Electric Motion USA, Marlborough, CT
Steinmeyer Inc, Burlington, MA
Ultra Motion LLC, Cutchogue, NY
Velmex, Inc., Bloomfield, NY
Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

MOTOR/PART SETS, UNIVERSAL

Groschopp Inc, Sioux Center, IA
Infranor Inc, Wilmington, MA
Omega Engineering, Stamford, CT

MOTORS, BRUSHLESS

Aerotech Inc, Pittsburg, IA
**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

AMETEK Precision Motion Control, Kent, OH

**AMK Drives and Controls Inc, 5631 S Laburnum Ave,
Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339,
info@amkdrives.com, www.amkdrives.com**

Applied Motion Products, Watsonville, CA

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
tgable@automationdirect.com,
www.automationdirect.com — See Ad Index**

Beckhoff Automation LLC, Savage, MN
ebm-papst Inc, Farmington, CT
ElectroCraft, Dover, NH

**ENM Company, 5617 Northwest Hwy, Chicago, IL 60646,
773-775-8400, 888-372-0465, FAX: 773-775-5968,
customerservice@enmco.com, www.enmco.com**

Exlar Corp, Chanhassen, MN
Groschopp Inc, Sioux Center, IA
Infranor Inc, Wilmington, MA
Leeson Electric Motors, Grafton, WI
maxon precision motors, inc, Fall River, MA
MICROMO, Clearwater, FL
Moog Components Group, Blacksburg, VA
Nanotec Electronic US Inc, Stoneham, MA
Nippon Pulse America Inc, Radford, VA
Omega Engineering, Stamford, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Pittman Motors, Harleysville, PA

**Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index**

Schneider Electric Motion USA, Marlborough, CT
SEW-Eurodrive Inc, Lyman, SC
Watson-Marlow Pumps Group, Wilmington, MA
Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

MOTORS, BRUSH-TYPE

Aerotech Inc, Pittsburg, IA
AMETEK Precision Motion Control, Kent, OH
Bison Gear & Engineering Corp, St Charles, IL
ElectroCraft, Dover, NH

**ENM Company, 5617 Northwest Hwy, Chicago, IL 60646,
773-775-8400, 888-372-0465, FAX: 773-775-5968,
customerservice@enmco.com, www.enmco.com**

Groschopp Inc, Sioux Center, IA
Infranor Inc, Wilmington, MA
Leeson Electric Motors, Grafton, WI
maxon precision motors, inc, Fall River, MA
MICROMO, Clearwater, FL

**Midwest Motion Products, 1000 Industries Circle,
Howard Lake, MN 55349, 320-490-7060
FAX: 480-247-4096, sales@midwestmotion.com,
www.midwestmotion.com**

Moog Components Group, Blacksburg, VA
Nanotec Electronic US Inc, Stoneham, MA
Omega Engineering, Stamford, CT
Pittman Motors, Harleysville, PA

MOTORS, DEFINITE-PURPOSE

Leeson Electric Motors, Grafton, WI
NORD Gear Corp, Waunakee, WI
Omega Engineering, Stamford, CT
SEW-Eurodrive Inc, Lyman, SC

MOTORS, FRACTIONAL-HORSEPOWER

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

AMETEK Precision Motion Control, Kent, OH

**AMK Drives and Controls Inc, 5631 S Laburnum Ave,
Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339,
info@amkdrives.com, www.amkdrives.com**

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
tgable@automationdirect.com,
www.automationdirect.com — See Ad Index**

Bison Gear & Engineering Corp, St Charles, IL
ElectroCraft, Dover, NH
Groschopp Inc, Sioux Center, IA
Haydon Kerk Motion Solutions Inc, Waterbury, CT
Leeson Electric Motors, Grafton, WI
maxon precision motors, inc, Fall River, MA

**Midwest Motion Products, 1000 Industries Circle,
Howard Lake, MN 55349, 320-490-7060
FAX: 480-247-4096, sales@midwestmotion.com,
www.midwestmotion.com**

2017 ELECTRICAL/ELECTRONIC SUPPLIER DIRECTORY

Moog Components Group, Blacksburg, VA
Nippon Pulse America Inc, Radford, VA
NORD Gear Corp, Waunakee, WI
Omega Engineering, Stamford, CT
SEW-Eurodrive Inc, Lyman, SC
Watson-Marlow Pumps Group, Wilmington, MA
Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

MOTORS, FRAMELESS

ElectroCraft, Dover, NH
Infranor Inc, Wilmington, MA
Omega Engineering, Stamford, CT

MOTORS, INTEGRAL-HORSEPOWER

AMETEK Precision Motion Control, Kent, OH
Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Bison Gear & Engineering Corp, St Charles, IL
Leeson Electric Motors, Grafton, WI
maxon precision motors, inc, Fall River, MA
NORD Gear Corp, Waunakee, WI
Omega Engineering, Stamford, CT
SEW-Eurodrive Inc, Lyman, SC

MOTORS, LINEAR

Aerotech Inc, Pittsburgh, PA
Beckhoff Automation LLC, Savage, MN
ElectroCraft, Dover, NH
Haydon Kerk Motion Solutions Inc, Waterbury, CT
Moog Components Group, Blacksburg, VA
Nanotec Electronic US Inc, Stoneham, MA
Nippon Pulse America Inc, Radford, VA
Omega Engineering, Stamford, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Rockwell Automation Inc, Milwaukee, WI

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schneider Electric Motion USA, Marlborough, CT
SEW-Eurodrive Inc, Lyman, SC
Siemens Process Industries & Drives, Alpharetta, GA
Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

MOTORS, PIEZO

Omega Engineering, Stamford, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

MOTORS, SPECIAL-PURPOSE

AMETEK Precision Motion Control, Kent, OH
Beckhoff Automation LLC, Savage, MN
Bison Gear & Engineering Corp, St Charles, IL
Digi-Key Corp, Thief River Falls, MN
Haydon Kerk Motion Solutions Inc, Waterbury, CT
Infranor Inc, Wilmington, MA

Leeson Electric Motors, Grafton, WI
MICROMO, Clearwater, FL
Nippon Pulse America Inc, Radford, VA
Omega Engineering, Stamford, CT
Pittman Motors, Harleysville, PA

MOTORS, STEPPING

Aerotech Inc, Pittsburgh, PA
Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK Precision Motion Control, Kent, OH
Applied Motion Products, Watsonville, CA

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Beckhoff Automation LLC, Savage, MN
Belt Technologies Inc, Agawam, MA
Digi-Key Corp, Thief River Falls, MN
ElectroCraft, Dover, NH
Haydon Kerk Motion Solutions Inc, Waterbury, CT
MICROMO, Clearwater, FL
Nanotec Electronic US Inc, Stoneham, MA
Nippon Pulse America Inc, Radford, VA
Omega Engineering, Stamford, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Schneider Electric Motion USA, Marlborough, CT

MOTORS, SUBFRACTIONAL-HORSEPOWER

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA
Bison Gear & Engineering Corp, St Charles, IL
ElectroCraft, Dover, NH
Haydon Kerk Motion Solutions Inc, Waterbury, CT
Infranor Inc, Wilmington, MA
Leeson Electric Motors, Grafton, WI
maxon precision motors, inc, Fall River, MA
NORD Gear Corp, Waunakee, WI
Omega Engineering, Stamford, CT

MOTORS, SYNCHRONOUS

Aerotech Inc, Pittsburgh, PA
Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK Precision Motion Control, Kent, OH
AMK Drives and Controls Inc, 5631 S Laburnum Ave, Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339, info@amkdrives.com, www.amkdrives.com

ElectroCraft, Dover, NH
Groschopp Inc, Sioux Center, IA
Infranor Inc, Wilmington, MA

Leeson Electric Motors, Grafton, WI
Omega Engineering, Stamford, CT
SEW-Eurodrive Inc, Lyman, SC

MOTORS, UNIVERSAL

AMETEK Precision Motion Control, Kent, OH
Bison Gear & Engineering Corp, St Charles, IL
Groschopp Inc, Sioux Center, IA
Omega Engineering, Stamford, CT

MOTORS, UNIVERSAL, OPEN-FRAME

Aerotech Inc, Pittsburgh, PA
Groschopp Inc, Sioux Center, IA
Infranor Inc, Wilmington, MA
Omega Engineering, Stamford, CT

MOVS (METAL-OXIDE VARISTORS)

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

OPERATOR I/O

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN
Omega Engineering, Stamford, CT
Opto 22, Temecula, CA
Rockwell Automation Inc, Milwaukee, WI
Siemens Process Industries & Drives, Alpharetta, GA
Unitronics Inc, Quincy, MA

OPTIC FIBER, BACKLIGHTING

Belt Technologies Inc, Agawam, MA
Mitsubishi International Corp, New York, NY

OPTIC FIBER, DATA-TRANSFER

Beckhoff Automation LLC, Savage, MN
Belt Technologies Inc, Agawam, MA
Digi-Key Corp, Thief River Falls, MN
Mitsubishi International Corp, New York, NY

OPTIC FIBER, DEVICES

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Beckhoff Automation LLC, Savage, MN
Belt Technologies Inc, Agawam, MA
Digi-Key Corp, Thief River Falls, MN
Moog Components Group, Blacksburg, VA
MTI Instruments Inc, Albany, NY

OPTICAL MATERIALS, OTHER

Belt Technologies Inc, Agawam, MA
Nusil Technology, Carpinteria, CA

OPTICS, FIBER

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Baumer Ltd, Southington, CT

Beckhoff Automation LLC, Savage, MN

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonvovan@lappusa.com, www.lappusa.com

Mitsubishi International Corp, New York, NY

MTI Instruments Inc, Albany, NY

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

OPTOELECTRONIC DEVICES

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

Festo Corp, Hauppauge, NY

Gems Sensors & Controls, Plainville, CT

Opto 22, Temecula, CA

PANELS, CONTROL

AMETEK, Grand Junction, CO

Belt Technologies Inc, Agawam, MA

B&R Industrial Automation Corp, Roswell, GA

EAO Switch Corp, Milford, CT

Electrotech Sales Group LLC, Colmar, PA

Festo Corp, Hauppauge, NY

Hoffman, Anoka, MN

Omega Engineering, Stamford, CT

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, info@sabcable.com, www.sabcable.com — See Ad Index

Unitronics Inc, Quincy, MA

Watlow, St Louis, MO

Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

PHOTOCELLS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

PIEZOMOTORS

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

PLOTTERS

Belt Technologies Inc, Agawam, MA

PLUGS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonvovan@lappusa.com, www.lappusa.com

Roxtec Inc, Tulsa, OK

POLARIZERS

Belt Technologies Inc, Agawam, MA

POTENTIOMETERS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

BEI Sensors, Goleta, CA

Digi-Key Corp, Thief River Falls, MN

Elmo Motion Control, Nashua, NH

Omega Engineering, Stamford, CT

POWER ABSORBERS

Digi-Key Corp, Thief River Falls, MN

POWER SUPPLIES, MODULAR

Absopulse Electronics Ltd, 110 Walgreen Rd, Ottawa, ON KOA 1L0, 613-836-3511, FAX: 613-836-7488, absopulse@absopulse.com, www.absopulse.com

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Applied Motion Products, Watsonville, CA

Digi-Key Corp, Thief River Falls, MN

Enfield Technologies, Trumbull, CT

Murata Power Solutions, Mansfield, MA

Ocean Server Technology, Fall River, MA

TDK-Lambda Americas, San Diego, CA

Ultra Motion LLC, Cutchogue, NY

POWER SUPPLIES, MOUNTED

Absopulse Electronics Ltd, 110 Walgreen Rd, Ottawa, ON KOA 1L0, 613-836-3511, FAX: 613-836-7488, absopulse@absopulse.com, www.absopulse.com

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Electrotech Sales Group LLC, Colmar, PA

Enfield Technologies, Trumbull, CT

IDEC Corp, Sunnyvale, CA

Murata Power Solutions, Mansfield, MA

POWER SUPPLIES, UNINTERRUPTIBLE

Absopulse Electronics Ltd, 110 Walgreen Rd, Ottawa, ON KOA 1L0, 613-836-3511, FAX: 613-836-7488, absopulse@absopulse.com, www.absopulse.com

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Ocean Server Technology, Fall River, MA

PRISMS

Belt Technologies Inc, Agawam, MA

PROTECTIVE DEVICES

AMETEK, Clawson, MI

Digi-Key Corp, Thief River Falls, MN

Dynatect Manufacturing Inc, 2300 S Calhoun Rd, New Berlin, WI 53151, 262-786-1500, 800-298-2066, FAX: 262-786-3280, sales@dynatect.com, www.Dynatect.com — See Ad Index

Electro Static Technology, Mechanic Falls, ME

PROTECTORS, CURRENT

Digi-Key Corp, Thief River Falls, MN

Electro Static Technology, Mechanic Falls, ME

PROTECTORS, TEMPERATURE-RESPONSIVE

AMETEK, Clawson, MI

PROTECTORS, VOLTAGE-RESPONSIVE

Digi-Key Corp, Thief River Falls, MN

PURGE/PRESSURIZATION SYSTEMS

Hoffman, Anoka, MN

RECEPTACLES

Advanced Interconnections Corp, West Warwick, RI

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kcc@keyelco.com, www.keyelco.com

RECTIFIERS

Absopulse Electronics Ltd, 110 Walgreen Rd, Ottawa, ON KOA 1L0, 613-836-3511, FAX: 613-836-7488, absopulse@absopulse.com, www.absopulse.com

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Mayr Corporation, Waldwick, NJ

REED DEVICES

Digi-Key Corp, Thief River Falls, MN

Madison Co, Branford, CT

Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

REFLECTORS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Belt Technologies Inc, Agawam, MA

REGULATORS, VOLTAGE

Advanced Control Technology Inc, Shakopee, MN

Allegro Microsystems Inc, Worcester, MA

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

RELAYS

Advanced Control Technology Inc, Shakopee, MN

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Altech Corp, 35 Royal Rd, Flemington, NJ 08822, 908-806-9400, FAX: 908-806-9490, mario@altech.com, www.altechcorp.com — See Ad Index

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Electrotech Sales Group LLC, Colmar, PA

Gems Sensors & Controls, Plainville, CT

IDEC Corp, Sunnyvale, CA

Madison Co, Branford, CT

Omega Engineering, Stamford, CT

Opto 22, Temecula, CA

Watlow, St Louis, MO

Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

RELAYS, METER

Advanced Control Technology Inc, Shakopee, MN

Digi-Key Corp, Thief River Falls, MN

Omega Engineering, Stamford, CT

RELAYS, TIME-DELAY

Advanced Control Technology Inc, Shakopee, MN

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, West Chicago, IL

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Omega Engineering, Stamford, CT

RESISTORS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Wilbrecht LEDCO Inc, St Paul, MN

RESOLVERS

AMETEK, Clawson, MI

Baumer Ltd, Southington, CT

Digi-Key Corp, Thief River Falls, MN

Elmo Motion Control, Nashua, NH

Infranor Inc, Wilmington, MA

maxon precision motors, inc, Fall River, MA

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, info@sabcable.com, www.sabcable.com — See Ad Index

RETAINERS, COIN-CELL

Belt Technologies Inc, Agawam, MA

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

SAFETY BARRIERS, INTRINSIC

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Gems Sensors & Controls, Plainville, CT

SCRs (SILICON-CONTROLLED RECTIFIERS)

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Watlow, St Louis, MO

SENSORS

Adsens Technology, La Puente, CA

Advanced Control Technology Inc, Shakopee, MN

Allegro Microsystems Inc, Worcester, MA

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Altech Corp, 35 Royal Rd, Flemington, NJ 08822, 908-806-9400, FAX: 908-806-9490, mario@altech.com, www.altechcorp.com — See Ad Index

AMETEK, Clawson, MI

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Balluff Inc, Florence, KY

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Baumer Ltd, Southington, CT

BEI Sensors, Goleta, CA

Celera Motion, Bedford, MA

Cognex Corp, Natick, MA

Digi-Key Corp, Thief River Falls, MN

Elmo Motion Control, Nashua, NH

Festo Corp, Hauppauge, NY

Gems Sensors & Controls, Plainville, CT

HBM Inc, Marlborough, MA

Industrial Encoder Corp, St. Catharines, ON

Kavlico Corp, Moorpark, CA

Madison Co, Branford, CT

Microstrain Inc, Williston, VT

MTI Instruments Inc, Albany, NY

O'Keefe Controls Co, Trumbull, CT

Omegadyne Inc, Sunbury, OH

Omega Engineering, Stamford, CT

Opto 22, Temecula, CA

Pepperl+Fuchs Inc, Twinsburg, OH

Rockwell Automation Inc, Milwaukee, WI

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, info@sabcable.com, www.sabcable.com — See Ad Index

Siemens Process Industries & Drives, Alpharetta, GA

Tekscan Inc, South Boston, MA

Thomas Products Ltd, Southington, CT

Trans-Tek Inc, Ellington, CT

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

Watlow, St Louis, MO

SENSORS, LASER

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Balluff Inc, Florence, KY

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Belt Technologies Inc, Agawam, MA
 Digi-Key Corp, Thief River Falls, MN
 MTI Instruments Inc, Albany, NY
 Omega Engineering, Stamford, CT
 Opto 22, Temecula, CA

SENSORS, OPTICAL

Belt Technologies Inc, Agawam, MA
 HBM Inc, Marlborough, MA
 LIKA Electronics SRL, Carre' (VI) - Italia

maxon precision motors, inc, Fall River, MA
 Omega Engineering, Stamford, CT
 US Digital, Vancouver, WA

SENSORS, POSITION

Adsens Technology, La Puente, CA
 Allegro MicroSystems Inc, Worcester, MA

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

AMETEK, Clawson, MI

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
 tgable@automationdirect.com,
 www.automationdirect.com — See Ad Index**

Balluff Inc, Florence, KY

**Banner Engineering Corp, 9714 10th Ave N,
 Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR,
 FAX: 763-544-3213, sensors@bannerengineering.com,
 www.bannerengineering.com — See Ad Index**

Baumer Ltd, Southington, CT
 BEI Sensors, Goleta, CA
 Belt Technologies Inc, Agawam, MA
 Celera Motion, Bedford, MA

**Clippard Instrument Laboratory Inc, 7390 Colerain Ave,
 Cincinnati, OH 45239, 513-521-4261, 877-245-6247,
 FAX: 513-521-4464, sales@clippard.com,
 www.clippard.com — See Ad Index**

Cognex Corp, Natick, MA
 Digi-Key Corp, Thief River Falls, MN
 Elmo Motion Control, Nashua, NH
 Festo Corp, Hauppauge, NY
 Kavlico Corp, Moorpark, CA
 LIKA Electronics SRL, Carre' (VI) - Italia
 Madison Co, Branford, CT
 maxon precision motors, inc, Fall River, MA
 Microstrain Inc, Williston, VT
 Moog Components Group, Blacksburg, VA
 Novotechnik, Southborough, MA
 Omega Engineering, Stamford, CT
 Opto 22, Temecula, CA

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
 Trans-Tek Inc, Ellington, CT
 US Digital, Vancouver, WA
 ZF Electronics, Pleasant Prairie, WI

SENSORS, PRESSURE

Advanced Control Technology Inc, Shakopee, MN

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

AMETEK, Grand Junction, CO

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
 tgable@automationdirect.com,
 www.automationdirect.com — See Ad Index**

Baumer Ltd, Southington, CT
 Digi-Key Corp, Thief River Falls, MN
 Festo Corp, Hauppauge, NY
 Gems Sensors & Controls, Plainville, CT
 HBM Inc, Marlborough, MA
 Kavlico Corp, Moorpark, CA
 Omegadyne Inc, Sunbury, OH
 Omega Engineering, Stamford, CT
 Opto 22, Temecula, CA
 Pepperl+Fuchs Inc, Twinsburg, OH
 Servometer, Cedar Grove, NJ
 Tekscan Inc, South Boston, MA

SENSORS, RADAR

Omega Engineering, Stamford, CT

SENSORS, TEMPERATURE

Advanced Control Technology Inc, Shakopee, MN

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

AMETEK, Clawson, MI

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
 tgable@automationdirect.com,
 www.automationdirect.com — See Ad Index**

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 FAX: 763-544-3213, sensors@bannerengineering.com,
 www.bannerengineering.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN
 Exergen Corp, Watertown, MA
 Gems Sensors & Controls, Plainville, CT
 Madison Co, Branford, CT
 Microstrain Inc, Williston, VT
 Minco Products Inc, Minneapolis, MN
 National Instruments, Austin, TX
 Opto 22, Temecula, CA
 Servometer, Cedar Grove, NJ
 Watlow, St Louis, MO

SERVOAMPLIFIERS

Aerotech Inc, Pittsburgh, PA

**AMK Drives and Controls Inc, 5631 S Laburnum Ave,
 Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339,
 info@amkdrives.com, www.amkdrives.com**

Applied Motion Products, Watsonville, CA
 Beckhoff Automation LLC, Savage, MN
 ElectroCraft, Dover, NH
 Elmo Motion Control, Nashua, NH
 Exlar Corp, Chanhassen, MN
 Galil Motion Control, Rocklin, CA
 Performance Motion Devices, Boxborough, MA
 Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

SERVOMETERS

Belt Technologies Inc, Agawam, MA
 Lenze Americas, Uxbridge, MA
 Nanotec Electronic US Inc, Stoneham, MA

SERVOMOTORS

Aerotech Inc, Pittsburgh, PA

**AMK Drives and Controls Inc, 5631 S Laburnum Ave,
 Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339,
 info@amkdrives.com, www.amkdrives.com**

Applied Motion Products, Watsonville, CA

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
 tgable@automationdirect.com,
 www.automationdirect.com — See Ad Index**

Beckhoff Automation LLC, Savage, MN

ElectroCraft, Dover, NH
 Elmo Motion Control, Nashua, NH
 Exlar Corp, Chanhassen, MN
 Galil Motion Control, Rocklin, CA
 Groschopp Inc, Sioux Center, IA
 Leeson Electric Motors, Grafton, WI
 maxon precision motors, inc, Fall River, MA
**Midwest Motion Products, 1000 Industries Circle,
 Howard Lake, MN 55349, 320-490-7060
 FAX: 480-247-4096, sales@midwestmotion.com,
 www.midwestmotion.com**

Nanotec Electronic US Inc, Stoneham, MA
 Nippon Pulse America Inc, Radford, VA

**SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004,
 866-722-2974, FAX: 973-276-1515, info@sabcable.com,
 www.sabcable.com — See Ad Index**

SEW-Eurodrive Inc, Lyman, SC
 Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

SERVO SYSTEMS

Aerotech Inc, Pittsburgh, PA

**AMK Drives and Controls Inc, 5631 S Laburnum Ave,
 Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339,
 info@amkdrives.com, www.amkdrives.com**

Applied Motion Products, Watsonville, CA
 Elmo Motion Control, Nashua, NH
 Enfield Technologies, Trumbull, CT
 Festo Corp, Hauppauge, NY
 Galil Motion Control, Rocklin, CA
 The Oilgear Co, Milwaukee, WI
 Onvio LLC, Salem, NH
 Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

SHIELDING, EMI/RFI

Bal Seal Engineering Inc, Foothill Ranch, CA
Dexmet Corp, Wallinton, CT
Hoffman, Anoka, MN

**LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932,
973-660-9700, ldonvovan@lappusa.com,
www.lappusa.com**

Rortec Inc, Tulsa, OK

Servometer, Cedar Grove, NJ

Tech-Etch Inc, Plymouth, MA

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

SLEEVING, ELECTRICAL-INSULATING

**Precision Paper Tube Co, 1033 S Noel Ave, Wheeling, IL
60090, 847-537-4250, FAX: 847-537-5777,
sales@pptube.com, www.pptube.com — See Ad Index**

SLIP RINGS

Moog Components Group, Blacksburg, VA

SOCKETS

Advanced Interconnections Corp, West Warwick, RI

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN

**Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY
11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040,
kec@keyelco.com, www.keyelco.com**

SOLENOIDS

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

Belt Technologies Inc, Agawam, MA

Festo Corp, Hauppauge, NY

Moog Components Group, Blacksburg, VA

SKF USA Inc, Lansdale, PA

TLX Technologies LLC, Pewaukee, WI

SPACERS

Digi-Key Corp, Thief River Falls, MN

**Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY
11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040,
kec@keyelco.com, www.keyelco.com**

OndrivesUS.com, Freeport, NY

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

SPEAKERS

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN

STAND-OFFS

Digi-Key Corp, Thief River Falls, MN

GripNail - Industrial Metal Fasteners, East Providence, RI

**Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY
11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040,
kec@keyelco.com, www.keyelco.com**

STARTERS, ELECTROMAGNETIC

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
tgable@automationdirect.com,
www.automationdirect.com — See Ad Index**

Electrotech Sales Group LLC, Colmar, PA

STARTERS, MANUAL

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
tgable@automationdirect.com,
www.automationdirect.com — See Ad Index**

STARTERS, SOLID-STATE

Rockwell Automation Inc, Milwaukee, WI

Siemens Process Industries & Drives, Alpharetta, GA

SUPPRESSORS, NOISE

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

AMETEK, Clawson, MI

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

SWITCHES, CAM

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

AMETEK, Clawson, MI

Belt Technologies Inc, Agawam, MA

Omega Engineering, Stamford, CT

SWITCHES, DIFFERENTIAL-PRESSURE

Digi-Key Corp, Thief River Falls, MN

Festo Corp, Hauppauge, NY

Omegadyne Inc, Sunbury, OH

Omega Engineering, Stamford, CT

Orange Research Inc, Milford, CT

Servometer, Cedar Grove, NJ

SWITCHES, HIGH-PERFORMANCE

Advanced Control Technology Inc, Shakopee, MN

AMETEK, Clawson, MI

Digi-Key Corp, Thief River Falls, MN

Haydon Kerk Motion Solutions Inc, Waterbury, CT

Linemaster Switch Corp, Woodstock, CT

Omega Engineering, Stamford, CT

ZF Electronics, Pleasant Prairie, WI

SWITCHES, ILLUMINATED & NONILLUMINATED

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

IDEC Corp, Sunnyvale, CA

Omega Engineering, Stamford, CT

Solico-Mec Inc, Hartford, CT

ZF Electronics, Pleasant Prairie, WI

SWITCHES, KEYBOARD

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Linemaster Switch Corp, Woodstock, CT

Omega Engineering, Stamford, CT

ZF Electronics, Pleasant Prairie, WI

SWITCHES, KEYLOCK

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
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Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Omega Engineering, Stamford, CT

SWITCHES, LEVER

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Festo Corp, Hauppauge, NY

Omega Engineering, Stamford, CT

ZF Electronics, Pleasant Prairie, WI

SWITCHES, LIMIT

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
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www.thinkallied.com — See Ad Index**

AMETEK, Clawson, MI

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
tgable@automationdirect.com,
www.automationdirect.com — See Ad Index**

Baumer Ltd, Southington, CT

Digi-Key Corp, Thief River Falls, MN

Festo Corp, Hauppauge, NY

Omega Engineering, Stamford, CT

Pepperl+Fuchs Inc, Twinsburg, OH

Rockwell Automation Inc, Milwaukee, WI
 Siemens Process Industries & Drives, Alpharetta, GA
 Tekscan Inc, South Boston, MA
 Wilbrecht LEDCO Inc, St Paul, MN
 Yaskawa America Inc / Drives & Motion Division, Waukegan, IL
 ZF Electronics, Pleasant Prairie, WI

SWITCHES, LIQUID-LEVEL

Advanced Control Technology Inc, Shakopee, MN
 AMETEK, Clawson, MI

**Banner Engineering Corp, 9714 10th Ave N,
 Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR,
 FAX: 763-544-3213, sensors@bannerengineering.com,
 www.bannerengineering.com — See Ad Index**

Baumer Ltd, Southington, CT
 Belt Technologies Inc, Agawam, MA
 Digi-Key Corp, Thief River Falls, MN
 Gems Sensors & Controls, Plainville, CT
 Madison Co, Branford, CT
 Omegadyne Inc, Sunbury, OH
 Omega Engineering, Stamford, CT
 Thomas Products Ltd, Southington, CT

SWITCHES, MANUAL (DIP)

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

AMETEK, Clawson, MI
 Digi-Key Corp, Thief River Falls, MN
 EAO Switch Corp, Milford, CT
 Omega Engineering, Stamford, CT

SWITCHES, MEMBRANE-TOUCH

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

**The Bergquist Co, 18930 W 78th St, Chanhassen, MN 55317,
 952-835-2322, 800-347-4572,
 FAX: 952-835-0430, webmaster@bergquistcompany.com,
 www.bergquistcompany.com**

EAO Switch Corp, Milford, CT
 Linemaster Switch Corp, Woodstock, CT
 Omega Engineering, Stamford, CT

SWITCHES, MINIATURE & SUBMINIATURE

Advanced Control Technology Inc, Shakopee, MN

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

**Banner Engineering Corp, 9714 10th Ave N,
 Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR,
 FAX: 763-544-3213, sensors@bannerengineering.com,
 www.bannerengineering.com — See Ad Index**

Baumer Ltd, Southington, CT
 Belt Technologies Inc, Agawam, MA

**Clippard Instrument Laboratory Inc, 7390 Colerain Ave,
 Cincinnati, OH 45239, 513-521-4261, 877-245-6247,
 FAX: 513-521-4464, sales@clippard.com,
 www.clippard.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN
 EAO Switch Corp, Milford, CT
 IDEC Corp, Sunnyvale, CA
 Madison Co, Branford, CT
 Omega Engineering, Stamford, CT
 Solico-Mec Inc, Hartford, CT
 Wilbrecht LEDCO Inc, St Paul, MN
 ZF Electronics, Pleasant Prairie, WI

SWITCHES, PHOTOELECTRIC

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
 tgable@automationdirect.com,
 www.automationdirect.com — See Ad Index**

**Banner Engineering Corp, 9714 10th Ave N,
 Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR,
 FAX: 763-544-3213, sensors@bannerengineering.com,
 www.bannerengineering.com — See Ad Index**

Baumer Ltd, Southington, CT
 Festo Corp, Hauppauge, NY
 Omega Engineering, Stamford, CT
 Pepperl+Fuchs Inc, Twinsburg, OH

SWITCHES, PRESSURE OR FLOW-OPERATED

Adsens Technology, La Puente, CA

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN
 Festo Corp, Hauppauge, NY
 Gems Sensors & Controls, Plainville, CT
 MICO Inc, North Mankato, MN
 O'Keefe Controls Co, Trumbull, CT
 Omegadyne Inc, Sunbury, OH
 Omega Engineering, Stamford, CT
 Orange Research Inc, Milford, CT
 Pepperl+Fuchs Inc, Twinsburg, OH
 Tekscan Inc, South Boston, MA

SWITCHES, PROGRAMMABLE

Allegro Microsystems Inc, Worcester, MA
 AMETEK, Clawson, MI
 Linemaster Switch Corp, Woodstock, CT
 Omega Engineering, Stamford, CT

SWITCHES, PROXIMITY

Adsens Technology, La Puente, CA
 Advanced Control Technology Inc, Shakopee, MN
 Allegro Microsystems Inc, Worcester, MA

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
 tgable@automationdirect.com,
 www.automationdirect.com — See Ad Index**

Balluff Inc, Florence, KY

**Banner Engineering Corp, 9714 10th Ave N,
 Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR,
 FAX: 763-544-3213, sensors@bannerengineering.com,
 www.bannerengineering.com — See Ad Index**

Baumer Ltd, Southington, CT
 Digi-Key Corp, Thief River Falls, MN

Festo Corp, Hauppauge, NY
 Gems Sensors & Controls, Plainville, CT
 Madison Co, Branford, CT

Omega Engineering, Stamford, CT
 Pepperl+Fuchs Inc, Twinsburg, OH
 Rockwell Automation Inc, Milwaukee, WI
 Siemens Process Industries & Drives, Alpharetta, GA
 Yaskawa America Inc / Drives & Motion Division, Waukegan, IL
 ZF Electronics, Pleasant Prairie, WI

SWITCHES, PUSHBUTTON

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
 tgable@automationdirect.com,
 www.automationdirect.com — See Ad Index**

**Banner Engineering Corp, 9714 10th Ave N,
 Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR,
 FAX: 763-544-3213, sensors@bannerengineering.com,
 www.bannerengineering.com — See Ad Index**

**Clippard Instrument Laboratory Inc, 7390 Colerain Ave,
 Cincinnati, OH 45239, 513-521-4261, 877-245-6247,
 FAX: 513-521-4464, sales@clippard.com,
 www.clippard.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN
 EAO Switch Corp, Milford, CT
 Festo Corp, Hauppauge, NY
 IDEC Corp, Sunnyvale, CA
 Linemaster Switch Corp, Woodstock, CT
 Omega Engineering, Stamford, CT

Rockwell Automation Inc, Milwaukee, WI
 Siemens Process Industries & Drives, Alpharetta, GA
 Solico-Mec Inc, Hartford, CT
 Yaskawa America Inc / Drives & Motion Division, Waukegan, IL
 ZF Electronics, Pleasant Prairie, WI

SWITCHES, ROCKER

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
 Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
 FAX: 817-595-6444, quotes@alliedelec.com,
 www.thinkallied.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN
Linemaster Switch Corp, Woodstock, CT
Omega Engineering, Stamford, CT
ZF Electronics, Pleasant Prairie, WI

SWITCHES, ROTARY

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Altech Corp, 35 Royal Rd, Flemington, NJ 08822, 908-806-9400, FAX: 908-806-9490, mario@altech.com, www.altechcorp.com — See Ad Index

AMETEK, Clawson, MI

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Omega Engineering, Stamford, CT

SWITCHES, SAFETY INTERLOCK

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

IDEC Corp, Sunnyvale, CA

Omega Engineering, Stamford, CT

Wilbrecht LEDCO Inc, St Paul, MN

SWITCHES, SEALING BOOTS

Digi-Key Corp, Thief River Falls, MN

Lauren Mfg, New Philadelphia, OH

Omega Engineering, Stamford, CT

SWITCHES, SNAP-ACTION

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Clawson, MI

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Linemaster Switch Corp, Woodstock, CT

Omega Engineering, Stamford, CT

Wilbrecht LEDCO Inc, St Paul, MN

ZF Electronics, Pleasant Prairie, WI

SWITCHES, SUMP-PUMP

Omega Engineering, Stamford, CT

SWITCHES, TEMPERATURE

Advanced Control Technology Inc, Shakopee, MN

Digi-Key Corp, Thief River Falls, MN

Exergen Corp, Watertown, MA

Madison Co, Branford, CT

Omega Engineering, Stamford, CT

Servometer, Cedar Grove, NJ

SWITCHES, THERMALLY OPERATED (THERMAL-CUTOFF, THERMOSTAT)

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Omega Engineering, Stamford, CT

SWITCHES, TOGGLE

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Clippard Instrument Laboratory Inc, 7390 Colerain Ave, Cincinnati, OH 45239, 513-521-4261, 877-245-6247, FAX: 513-521-4464, sales@clippard.com, www.clippard.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

EAO Switch Corp, Milford, CT

Festo Corp, Hauppauge, NY

Omega Engineering, Stamford, CT

Solico-Mec Inc, Hartford, CT

SWITCHES, TOOL-HANDLE

Omega Engineering, Stamford, CT

SWITCHES, ULTRASONIC

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Baumer Ltd, Southington, CT

Gems Sensors & Controls, Plainville, CT

Madison Co, Branford, CT

Omega Engineering, Stamford, CT

Pepperl+Fuchs Inc, Twinsburg, OH

SWITCHES, VACUUM

Adsens Technology, La Puente, CA

Festo Corp, Hauppauge, NY

Omegadyne Inc, Sunbury, OH

Omega Engineering, Stamford, CT

TACHOMETERS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Grand Junction, CO

Baumer Ltd, Southington, CT

Belt Technologies Inc, Agawam, MA

Elmo Motion Control, Nashua, NH

Industrial Encoder Corp, St. Catharines, ON

Infranor Inc, Wilmington, MA

maxon precision motors, inc, Fall River, MA

TERMINALS, SCREW

Advanced Interconnections Corp, West Warwick, RI

AMETEK, Rosemead, CA

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Belt Technologies Inc, Agawam, MA

Digi-Key Corp, Thief River Falls, MN

Electrotech Sales Group LLC, Colmar, PA

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

ZF Electronics, Pleasant Prairie, WI

TERMINALS, WIRE

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Rosemead, CA

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY 11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040, kec@keyelco.com, www.keyelco.com

TESTERS, CIRCUIT

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

TESTERS, MICRO-TORQUE

Belt Technologies Inc, Agawam, MA

THERMISTORS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

AMETEK, Clawson, MI

Digi-Key Corp, Thief River Falls, MN

Watlow, St Louis, MO

THYRISTORS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Digi-Key Corp, Thief River Falls, MN

TIMERS

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

AMETEK, West Chicago, IL

AMETEK, Clawson, MI

Baumer Ltd, Southington, CT

Digi-Key Corp, Thief River Falls, MN

**ENM Company, 5617 Northwest Hwy, Chicago, IL 60646,
773-775-8400, 888-372-0465, FAX: 773-775-5968,
customerservice@enmco.com, www.enmco.com**

Festo Corp, Hauppauge, NY

TIMERS, PROGRAMMABLE

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

AMETEK, West Chicago, IL

Baumer Ltd, Southington, CT

Digi-Key Corp, Thief River Falls, MN

O'Keefe Controls Co, Trumbull, CT

Watlow, St Louis, MO

TOUCHSCREENS

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
tgable@automationdirect.com,
www.automationdirect.com — See Ad Index**

Beckhoff Automation LLC, Savage, MN

**The Bergquist Co, 18930 W 78th St, Chanhassen, MN 55317,
952-835-2322, 800-347-4572,
FAX: 952-835-0430, webmaster@bergquistcompany.com,
www.bergquistcompany.com**

Digi-Key Corp, Thief River Falls, MN

IDEC Corp, Sunnyvale, CA

TRACKBALLS

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
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www.thinkallied.com — See Ad Index**

Belt Technologies Inc, Agawam, MA

TRANSDUCERS

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
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www.thinkallied.com — See Ad Index**

AMETEK, Clawson, MI

AMETEK, Grand Junction, CO

**Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA
30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876,
tgable@automationdirect.com,
www.automationdirect.com — See Ad Index**

Digi-Key Corp, Thief River Falls, MN

Festo Corp, Hauppauge, NY

HBM Inc, Marlborough, MA

Kavlico Corp, Moorpark, CA

Minco Products Inc, Minneapolis, MN

Omegadyne Inc, Sunbury, OH

Omega Engineering, Stamford, CT

Pepperl+Fuchs Inc, Twinsburg, OH

Tekscan Inc, South Boston, MA

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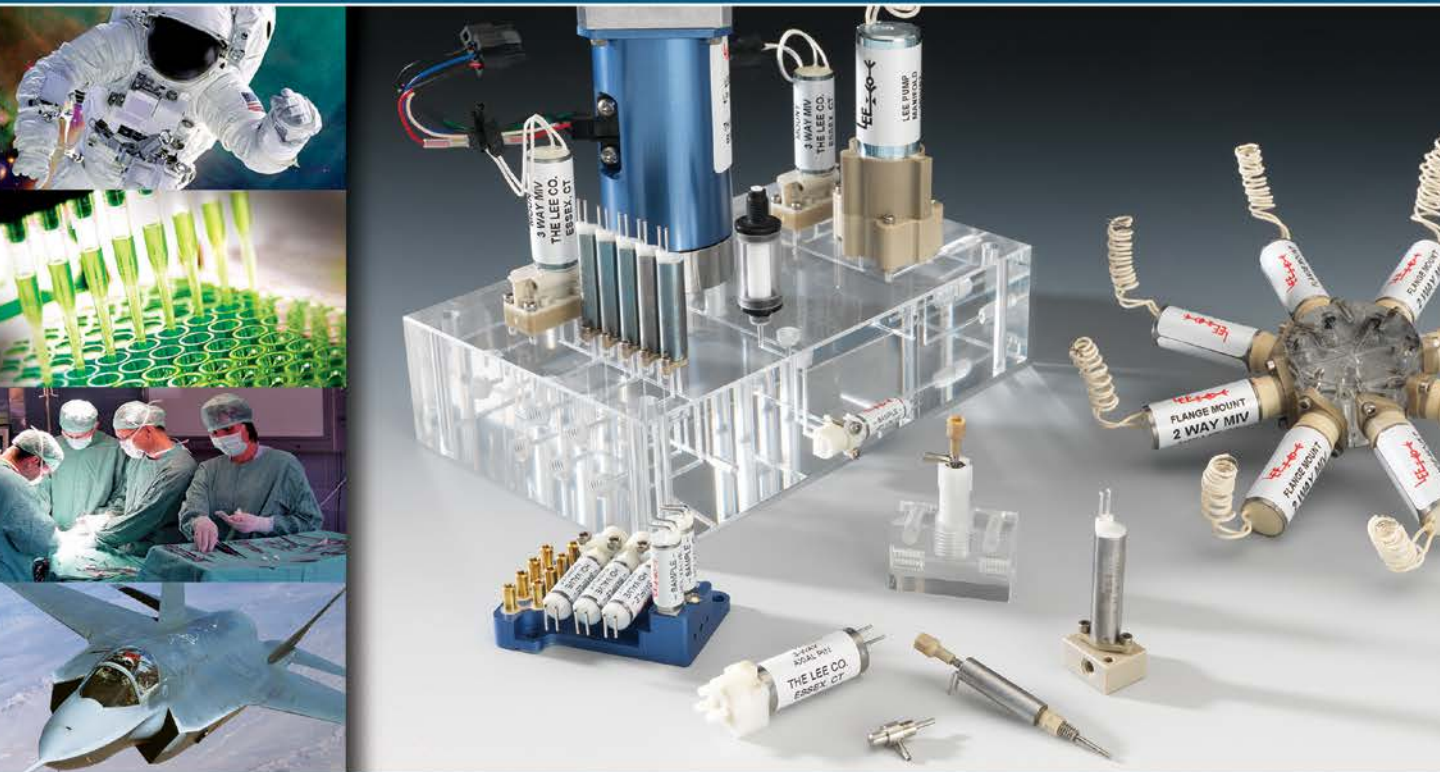
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SWITCHES, TEMPERATURE

Advanced Control Technology Inc, Shakopee, MN
AMETEK, Clawson, MI
Madison Co, Branford, CT
O'Keefe Controls Co, Trumbull, CT
Servometer, Cedar Grove, NJ

SYSTEMS, OTHER

Festo Corp, Hauppauge, NY

TABLES, ROTARY-INDEXING, PNEUMATIC

AMETEK, Clawson, MI
Festo Corp, Hauppauge, NY

TANKS, AIR/OIL

Belt Technologies Inc, Agawam, MA
Fabco-Air Inc, Gainesville, FL

TEST EQUIPMENT

Belt Technologies Inc, Agawam, MA
Exair Corp, Cincinnati, OH
HBM Inc, Marlborough, MA
National Instruments, Austin, TX

TIMERS, PNEUMATIC

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA
Festo Corp, Hauppauge, NY

TOOLS, PNEUMATIC/HYDRAULIC

Belt Technologies Inc, Agawam, MA
Beswick Engineering Co Inc, Greenland, NH
Carr Lane Mfg Co, St Louis, MO
GripNail - Industrial Metal Fasteners, East Providence, RI

TRANSDUCERS, HYDRAULIC

Belt Technologies Inc, Agawam, MA
Gems Sensors & Controls, Plainville, CT
Novoteknik, Southborough, MA

TRANSDUCERS, PNEUMATIC

ControlAir Inc, Amherst, NH
 Festo Corp, Hauppauge, NY
 Gems Sensors & Controls, Plainville, CT
 Novotechnik, Southborough, MA
 Omegadyne Inc, Sunbury, OH

TUBING, PRESSURE

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Festo Corp, Hauppauge, NY
 Greene Rubber Co, Woburn, MA

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Deublin Co, Waukegan, IL

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BellowsTech LLC, Ormond Beach, FL
 Beswick Engineering Co Inc, Greenland, NH
 Festo Corp, Hauppauge, NY
 KNF Neuberger Inc, Trenton, NJ

VALVE BLOCKS

Omega Engineering, Stamford, CT

VALVES, CHECK

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 Festo Corp, Hauppauge, NY
 Humphrey Products, Kalamazoo, MI

Keppner Products Co, 995 N Ellsworth Ave, Villa Park, IL 60181, 630-279-1550, FAX: 630-279-9669, wkokum@keppner.com — See Ad Index

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O'Keefe Controls Co, Trumbull, CT
 Omega Engineering, Stamford, CT
 SFC KOENIG, North Haven, CT

VALVES, DIRECTIONAL-CONTROL

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 860-399-628, 800-LEE-PLUG, Fax: 860-399-2270, kingsburyj@theleeco.com, www.theleeco.com

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 The Oilgear Co, Milwaukee, WI
 Omega Engineering, Stamford, CT
 Peter Paul Electronics Co Inc, New Britain, CT

VALVES, FLOW-CONTROL

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Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, tgable@automationdirect.com, www.automationdirect.com — See Ad Index

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 Omega Engineering, Stamford, CT
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 Servometer, Cedar Grove, NJ

TLX Technologies LLC, Pewaukee, WI

VALVES, FLUID-POWER

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Omega Engineering, Stamford, CT

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VALVES, OTHER

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VALVES, PINCH

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KNF Neuberger Inc, Trenton, NJ

MICO Inc, North Mankato, MN

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Omega Engineering, Stamford, CT

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VALVES, SERVO

Enfield Technologies, Trumbull, CT

Omega Engineering, Stamford, CT

VALVES, SOLENOID

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VENTS, BREATHER

Adsens Technology, La Puente, CA

VENTURIES

Belt Technologies Inc, Agawam, MA

Exair Corp, Cincinnati, OH

Festo Corp, Hauppauge, NY

WATER HYDRAULICS, COMPONENTS & SYSTEMS

AMETEK, Clawson, MI

Belt Technologies Inc, Agawam, MA

Gems Sensors & Controls, Plainville, CT

Minnesota Rubber and Plastics,
Minneapolis, MN

The Oilgear Co, Milwaukee, WI

MATERIALS & MANUFACTURING PROCESSES

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Ceramics, Glass, Carbon, & Mica

ALUMINA, HIGH-DENSITY

Astro Met Inc, Cincinnati, OH
Ceramco Inc, Center Conway, NH

CERAMICS

Astro Met Inc, Cincinnati, OH
Belt Technologies Inc, Agawam, MA

CERAMICS, COMPOSITES-GRAPHITE

Belt Technologies Inc, Agawam, MA

CERAMICS, CONDUCTIVE

Belt Technologies Inc, Agawam, MA

CERAMICS, ZIRCON

Belt Technologies Inc, Agawam, MA

FIBERS, OPTIC

**Banner Engineering Corp, 9714 10th Ave N,
Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR,
FAX: 763-544-3213, sensors@bannerengineering.com,
www.bannerengineering.com — See Ad Index**

Belt Technologies Inc, Agawam, MA
Mitsubishi International Corp, New York, NY

GLASS BEADS & SPHERES

Belt Technologies Inc, Agawam, MA

GLASS CERAMICS

Astro Met Inc, Cincinnati, OH
Belt Technologies Inc, Agawam, MA

INDUSTRIAL GLASS

Belt Technologies Inc, Agawam, MA

MATERIALS, INSULATING

Astro Met Inc, Cincinnati, OH
Belt Technologies Inc, Agawam, MA
Ceramco Inc, Center Conway, NH
Fabrico, Kennesaw, GA

MATERIALS, REFRACTORY

Astro Met Inc, Cincinnati, OH
Belt Technologies Inc, Agawam, MA
Ceramco Inc, Center Conway, NH

MICA & MICA PRODUCTS

Belt Technologies Inc, Agawam, MA

MULLITE

Ceramco Inc, Center Conway, NH

PARTIALLY STABILIZED ZIRCONIA

Astro Met Inc, Cincinnati, OH

POLYCRYSTALLINE

Astro Met Inc, Cincinnati, OH

REFRACTORY CERAMIC OXIDES

Astro Met Inc, Cincinnati, OH
Belt Technologies Inc, Agawam, MA

SAPPHIRE

Bird Precision, Waltham, MA

SUPERCONDUCTORS

Belt Technologies Inc, Agawam, MA

TETRAGONAL

Astro Met Inc, Cincinnati, OH

TETRAGONAL-ZIRCONIA POLYCRYSTALS

Astro Met Inc, Cincinnati, OH
Ceramco Inc, Center Conway, NH

ZIRCONIA POLYCRYSTALS

Astro Met Inc, Cincinnati, OH

ZIRCONIA-TOUGHENED ALUMINA

Astro Met Inc, Cincinnati, OH

Composite Materials

ALUMINUM MATRIX

Belt Technologies Inc, Agawam, MA

CERAMIC MATRIX

Belt Technologies Inc, Agawam, MA

CHEMICALS

Belt Technologies Inc, Agawam, MA
Miller-Stephenson Chemical Co Inc, Danbury, CT

CLAD METALS

AMETEK, Eighty Four, PA

COMPOSITES

Belt Technologies Inc, Agawam, MA
Dexmet Corp, Wallinton, CT

**Intech Corp, 250 Herbert Ave, Closter, NJ 07624,
201-767-8066, FAX: 201-767-7797,
info@intechpower.com, www.intechpower.com
— See Ad Index**

Lauren Mfg, New Philadelphia, OH
Tri-Star Plastics Corp, Shrewsbury, MA

CONDUCTIVE COMPOSITES

Belt Technologies Inc, Agawam, MA

CONDUCTIVE MATERIALS

Belt Technologies Inc, Agawam, MA

GRAPHITE & CARBON/CARBON COMPOSITES

Tri-Star Plastics Corp, Shrewsbury, MA

INJECTION-MOLDABLE COMPOUNDS

Lauren Mfg, New Philadelphia, OH

MATERIALS, COMPOSITE METAL/PLASTIC

GGB Bearing Technology, Thorofare, NJ

**Intech Corp, 250 Herbert Ave, Closter, NJ 07624,
201-767-8066, FAX: 201-767-7797,
info@intechpower.com, www.intechpower.com
— See Ad Index**

Tri-Star Plastics Corp, Shrewsbury, MA

METAL, CARBON OR GRAPHITE-REINFORCED

Belt Technologies Inc, Agawam, MA
FineLine Prototyping Inc, Raleigh, NC

PLASTIC LAMINATES, THERMOPLASTIC

Belt Technologies Inc, Agawam, MA
FineLine Prototyping Inc, Raleigh, NC

REINFORCED PLASTICS

Belt Technologies Inc, Agawam, MA

Fabrication, Testing, & Evaluation Equipment & Services

AUTOMATED MATERIALS TESTING SYSTEMS

AMETEK, Clawson, MI
Belt Technologies Inc, Agawam, MA

CASTING, MACHINES

Belt Technologies Inc, Agawam, MA

COMPOSITE-CUTTING MACHINERY

Belt Technologies Inc, Agawam, MA

COMPOSITE-FABRICATION SERVICES

Belt Technologies Inc, Agawam, MA

COMPOSITE-MANUFACTURING MACHINERY

Belt Technologies Inc, Agawam, MA

COMPOSITE-MOLDING EQUIPMENT

Belt Technologies Inc, Agawam, MA

COOLING EQUIPMENT

Belt Technologies Inc, Agawam, MA
Exair Corp, Cincinnati, OH

DIMENSIONAL MEASUREMENT & GAGING

Baumer Ltd, Southington, CT
Belt Technologies Inc, Agawam, MA
Mahr Federal Inc, Providence, RI
Trans-Tek Inc, Ellington, CT

ELECTRICAL TESTING

HBM Inc, Marlborough, MA
TUV SUD America, Peabody, MA

FINITE-ELEMENT-ANALYSIS PROGRAMS/SOFTWARE

Greene Rubber Co, Woburn, MA
HBM Inc, Marlborough, MA

FORMING EQUIPMENT

AMETEK, Clawson, MI
Belt Technologies Inc, Agawam, MA

GUNS, COLD-AIR

Exair Corp, Cincinnati, OH

HAND TOOLS

**Allied Electronics Inc, 7151 Jack Newell Blvd S,
Fort Worth, TX 76118, 817-595-3500, 800-433-5700,
FAX: 817-595-6444, quotes@alliedelec.com,
www.thinkallied.com — See Ad Index**

Mahr Federal Inc, Providence, RI
 Nordson EFD, East Providence, RI

HEATING EQUIPMENT

Belt Technologies Inc, Agawam, MA
 Instron, Norwood, MA

INJECTION MOLDS

Advanced Control Technology Inc, Shakopee, MN
 Belt Technologies Inc, Agawam, MA

Craftech Inc, 8 Dock St, PO Box 636, Hudson, NY 12534, 518-828-5001, 800-833-5130, FAX: 518-828-9468, info@craftechind.com, www.craftechind.com — See Ad Index

Greene Rubber Co, Woburn, MA

Proto Labs Inc, 5540 Pioneer Creek Dr, Maple Plain, MN 55359, 877-479-3680, FAX: 763-479-2679, customerservice@protolabs.com, www.protolabs.com — See Ad Index

Tri Town Plastics Inc, Deep River, CT

LABORATORY EQUIPMENT & SUPPLIES

Aerotech Inc, Pittsburgh, PA
 HBM Inc, Marlborough, MA
 National Instruments, Austin, TX

MACHINE TOOLS

Belt Technologies Inc, Agawam, MA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

MTI Instruments Inc, Albany, NY
 SETCO Sales Co, Cincinnati, OH

MACHINERY, CUSTOM-BUILT

Aerotech Inc, Pittsburgh, PA
 AMETEK, Clawson, MI
 Belt Technologies Inc, Agawam, MA
 HBM Inc, Marlborough, MA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

mk North America, 105 Highland Park Dr
 Bloomfield, CT 06002 US, 860-769-5500
 Fax: 860-769-5505, info@mknorthamerica.com,
 www.mknorthamerica.com

Omega Engineering, Stamford, CT
 SETCO Sales Co, Cincinnati, OH
 TUV SUD America, Peabody, MA

Visumatic Industrial Products, 856 Porter Pl, Lexington, KY 40508, 859-255-7907, FAX: 859-255-7909, sales@visumatic.com, www.visumatic.com — See Ad Index

MACHINERY, PRODUCTION

AMETEK, Clawson, MI
 Belt Technologies Inc, Agawam, MA
 HBM Inc, Marlborough, MA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

mk North America, 105 Highland Park Dr Bloomfield, CT 06002 US, 860-769-5500 Fax: 860-769-5505, info@mknorthamerica.com, www.mknorthamerica.com

MTI Instruments Inc, Albany, NY
 Omega Engineering, Stamford, CT

Visumatic Industrial Products, 856 Porter Pl, Lexington, KY 40508, 859-255-7907, FAX: 859-255-7909, sales@visumatic.com, www.visumatic.com — See Ad Index

MACHINERY, SURFACE-FINISHING

Belt Technologies Inc, Agawam, MA
 Nordson EFD, East Providence, RI
 Omega Engineering, Stamford, CT

MACHINES, PLANT-EQUIPMENT

HBM Inc, Marlborough, MA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

Omega Engineering, Stamford, CT

MEDICAL DEVICES, MIS

Belt Technologies Inc, Agawam, MA
 FineLine Prototyping Inc, Raleigh, NC

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

Linemaster Switch Corp, Woodstock, CT

Proto Labs Inc, 5540 Pioneer Creek Dr, Maple Plain, MN 55359, 877-479-3680, FAX: 763-479-2679, customerservice@protolabs.com, www.protolabs.com — See Ad Index

MIXING EQUIPMENT

Belt Technologies Inc, Agawam, MA

MOTOR-TESTING EQUIPMENT

HBM Inc, Marlborough, MA

NOZZLES

Exair Corp, Cincinnati, OH

PACKAGING EQUIPMENT

Aerotech Inc, Pittsburgh, PA
 AMETEK, Clawson, MI
 Belt Technologies Inc, Agawam, MA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

Nordson EFD, East Providence, RI

PARTICLE-SIZE ANALYZERS & STANDARDS

Belt Technologies Inc, Agawam, MA

PLANT EQUIPMENT

Beckhoff Automation LLC, Savage, MN
 Belt Technologies Inc, Agawam, MA

PRESSES

AMETEK, Clawson, MI
 Fabco-Air Inc, Gainesville, FL

PRINTERS, BAR-CODE LABEL

Belt Technologies Inc, Agawam, MA

PROCESS MONITORING, MEASUREMENT & CONTROL

AMETEK, Clawson, MI
 Beckhoff Automation LLC, Savage, MN
 HBM Inc, Marlborough, MA
 National Instruments, Austin, TX
 Watlow, St Louis, MO

PROTOTYPING SYSTEMS, RAPID

Belt Technologies Inc, Agawam, MA
 Fabrico, Kennesaw, GA

SERVICES, ELECTRONIC & FABRICATING

Belt Technologies Inc, Agawam, MA

TENSILE TESTING MACHINES

AMETEK, Clawson, MI
 Ametek Test & Calibration Instruments, Largo, FL
 Belt Technologies Inc, Agawam, MA
 Instron, Norwood, MA
 MTI Instruments Inc, Albany, NY

ULTRASONIC TESTING

Belt Technologies Inc, Agawam, MA
 Exair Corp, Cincinnati, OH

X-RAY TESTING EQUIPMENT & SUPPLIES

Belt Technologies Inc, Agawam, MA

Fibers, Wood, Paper, & Cork

FIBERS, METALS

Mott Corporation, Farmington, CT

NONWOVENS

Belt Technologies Inc, Agawam, MA
 Dexmet Corp, Wallinton, CT

PAPERS, INDUSTRIAL

Belt Technologies Inc, Agawam, MA

POLYETHYLENE

Belt Technologies Inc, Agawam, MA
 Dexmet Corp, Wallinton, CT

Finishes & Coatings

ANODIZING

Belt Technologies Inc, Agawam, MA
 Boyd Coatings Research Co Inc, Hudson, MA
 FineLine Prototyping Inc, Raleigh, NC

ANODIZING, HARD-COAT

Belt Technologies Inc, Agawam, MA
 Boyd Coatings Research Co Inc, Hudson, MA

CERAMIC HARD-FACING

Astro Met Inc, Cincinnati, OH
 Belt Technologies Inc, Agawam, MA
 Devcon, Danvers, MA

2017 MATERIALS SUPPLIER DIRECTORY

CHEMICAL COATINGS

Belt Technologies Inc, Agawam, MA
Miller-Stephenson Chemical Co Inc, Danbury, CT
Tri-Star Plastics Corp, Shrewsbury, MA

CHEMICAL-CONVERSION COATINGS

Belt Technologies Inc, Agawam, MA

CHEMICAL-IMMERSION COATINGS

Belt Technologies Inc, Agawam, MA
Devcon, Danvers, MA

CHEMICAL-RESISTANT CONCRETE

Belt Technologies Inc, Agawam, MA
Devcon, Danvers, MA

CLEANING, CHEMICAL

Belt Technologies Inc, Agawam, MA
Branson Ultrasonics Corp, Danbury, CT
Miller-Stephenson Chemical Co Inc, Danbury, CT

CLEANING, SOLVENT

Belt Technologies Inc, Agawam, MA
Branson Ultrasonics Corp, Danbury, CT
FineLine Prototyping Inc, Raleigh, NC
Miller-Stephenson Chemical Co Inc, Danbury, CT

COATINGS, NOT ELSEWHERE CLASSIFIED

Belt Technologies Inc, Agawam, MA
Boyd Coatings Research Co Inc, Hudson, MA
Devcon, Danvers, MA
FineLine Prototyping Inc, Raleigh, NC

COATINGS, TEFLON

Belt Technologies Inc, Agawam, MA
Boyd Coatings Research Co Inc, Hudson, MA
Donwell Co, Manchester, CT
Tri-Star Plastics Corp, Shrewsbury, MA

CONDUCTIVE & EMI/RFI-SHIELDED COATINGS

Miller-Stephenson Chemical Co Inc, Danbury, CT
Nusil Technology, Carpinteria, CA

CONFORMAL COATINGS

Dymax Corp, Torrington, CT
Miller-Stephenson Chemical Co Inc, Danbury, CT
Nusil Technology, Carpinteria, CA

ELASTOMER, OTHER

Lauren Mfg, New Philadelphia, OH

ELASTOMERIC COATINGS

Devcon, Danvers, MA
Nusil Technology, Carpinteria, CA

ELECTROCHEMICAL COATINGS

Servometer, Cedar Grove, NJ

ELECTRODEPOSITED COATINGS

Servometer, Cedar Grove, NJ
Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

ENCAPSULANTS

Devcon, Danvers, MA
Dymax Corp, Torrington, CT
Nusil Technology, Carpinteria, CA

HEAT-RESISTANT COATINGS

Devcon, Danvers, MA
Donwell Co, Manchester, CT
Omega Engineering, Stamford, CT

HOT-DIP COATINGS

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

IN-MOLD COATINGS

Devcon, Danvers, MA

LUBRICANTS & ADDITIVES

Nusil Technology, Carpinteria, CA
Nye Lubricants, Fairhaven, MA

METALLIC COATINGS

Servometer, Cedar Grove, NJ

METAL-SPRAY COATINGS

Nordson EFD, East Providence, RI

ORGANIC COATINGS

Belt Technologies Inc, Agawam, MA

PAINTING

Boyd Coatings Research Co Inc, Hudson, MA

PLASMA-SPRAY COATINGS

Belt Technologies Inc, Agawam, MA

PLASTIC COATINGS

Boyd Coatings Research Co Inc, Hudson, MA

POWDER COATINGS

Boyd Coatings Research Co Inc, Hudson, MA

RUBBER COATINGS

Devcon, Danvers, MA

SEALANTS

Devcon, Danvers, MA
Dymax Corp, Torrington, CT
Nusil Technology, Carpinteria, CA

SEALANTS FOR POROUS-METAL CASTINGS

Devcon, Danvers, MA

SURFACE CLEANING & PREPARATION

Boyd Coatings Research Co Inc, Hudson, MA
Miller-Stephenson Chemical Co Inc, Danbury, CT

SURFACE TREATING

Belt Technologies Inc, Agawam, MA
Donwell Co, Manchester, CT

VAPOR-DEPOSITED COATINGS

Belt Technologies Inc, Agawam, MA

Irons & Steels

ALLOY STEEL

Eagle Stainless Tube & Fabrication Inc, Franklin, MA

ALLOY STEEL, WIRE

AMETEK, Eighty Four, PA

EXPANSION ALLOYS, FERROUS

Dexmet Corp, Wallinton, CT

GLASS-TO-METAL-SEALING ALLOYS, FERROUS

GripNail - Industrial Metal Fasteners, East Providence, RI

HIGH-STRENGTH STEEL

Belt Technologies Inc, Agawam, MA
Eagle Stainless Tube & Fabrication Inc, Franklin, MA

HIGH-TEMPERATURE STEEL

BellowsTech LLC, Ormond Beach, FL
Belt Technologies Inc, Agawam, MA
Eagle Stainless Tube & Fabrication Inc, Franklin, MA

IRON-BASE SUPERALLOYS, CAST

Belt Technologies Inc, Agawam, MA

MAGNET STEELS

Belt Technologies Inc, Agawam, MA

MASTER ALLOYS

FineLine Prototyping Inc, Raleigh, NC

METALS, POWDERED

AMETEK, Eighty Four, PA
Belt Technologies Inc, Agawam, MA
FineLine Prototyping Inc, Raleigh, NC

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

METALS, REFRACTORY, FERROUS

Belt Technologies Inc, Agawam, MA

POWDER-METAL PARTS

FineLine Prototyping Inc, Raleigh, NC

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

POWDERS, IRON

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

POWDERS, STAINLESS-STEEL

AMETEK, Eighty Four, PA
Belt Technologies Inc, Agawam, MA

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

STAINLESS STEEL

AMETEK, Eighty Four, PA
 BellowsTech LLC, Ormond Beach, FL
 Belt Technologies Inc, Agawam, MA
 Eagle Stainless Tube & Fabrication Inc, Franklin, MA
 Omega Engineering, Stamford, CT

STAINLESS STEEL, AUSTENITIC, COLD-ROLLED

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

STAINLESS STEEL, FERRITIC, COLD-ROLLED

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

STAINLESS STEEL, MARTENSITIC, COLD-ROLLED

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

STAINLESS STEEL, SHEET

Belt Technologies Inc, Agawam, MA

STAINLESS STEEL, SPECIALTY, COLD-ROLLED

Ulbrich Stainless Steels & Special Metals Inc, North Haven, CT

STEELS, ALLOY

Omega Engineering, Stamford, CT

TOOL & DIE STEEL

Belt Technologies Inc, Agawam, MA

ULTRAHIGH-STRENGTH STEEL

Belt Technologies Inc, Agawam, MA

Joining & Sealing

ADHESION PROMOTERS

Devcon, Danvers, MA

ADHESIVES

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA
 Devcon, Danvers, MA
 Dymax Corp, Torrington, CT
 Fabrico, Kennesaw, GA
 Miller-Stephenson Chemical Co Inc, Danbury, CT
 Nusil Technology, Carpinteria, CA

ADHESIVES, ANAEROBIC

Belt Technologies Inc, Agawam, MA
 Devcon, Danvers, MA
 Dymax Corp, Torrington, CT
 Fabrico, Kennesaw, GA

ADHESIVES, CYANOACRYLATE

Devcon, Danvers, MA
 Dymax Corp, Torrington, CT
 Fabrico, Kennesaw, GA

ADHESIVES, ELASTOMERIC

Devcon, Danvers, MA

ADHESIVES, PRESSURE-SENSITIVE

Belt Technologies Inc, Agawam, MA
 Devcon, Danvers, MA
 Fabrico, Kennesaw, GA
 Nusil Technology, Carpinteria, CA

ADHESIVES, RESIN BLENDS

Belt Technologies Inc, Agawam, MA
 Devcon, Danvers, MA

ADHESIVES, SPECIAL-PURPOSE

Belt Technologies Inc, Agawam, MA
 Devcon, Danvers, MA
 Dymax Corp, Torrington, CT

ADHESIVES, THERMOPLASTIC

Devcon, Danvers, MA
 Fabrico, Kennesaw, GA

ADHESIVES, THERMOSETTING

Belt Technologies Inc, Agawam, MA
 Devcon, Danvers, MA
 Dymax Corp, Torrington, CT
 Fabrico, Kennesaw, GA
 Nusil Technology, Carpinteria, CA

ADHESIVES, ULTRAVIOLET-CURED

Devcon, Danvers, MA
 Dymax Corp, Torrington, CT

FILM ADHESIVE, EPOXY

Fabrico, Kennesaw, GA

MECHANICAL FASTENERS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Roxtec Inc, Tulsa, OK
 Smalley Steel Ring Co, Lake Zurich, IL
SPIROL, 30 Rock Ave, Danielson, CT 06239, 860-774-8571, FAX: 860-774-2048, info@spirol.com, www.spirol.com — See Ad Index

METAL JOINING, NOT ELSEWHERE CLASSIFIED

Belt Technologies Inc, Agawam, MA
 Branson Ultrasonics Corp, Danbury, CT
 Devcon, Danvers, MA
 Fabco-Air Inc, Gainesville, FL
 GripNail - Industrial Metal Fasteners, East Providence, RI
 Senior Aerospace, Sharon, MA
 Smalley Steel Ring Co, Lake Zurich, IL

SEALING, HERMETIC

BellowsTech LLC, Ormond Beach, FL
 Belt Technologies Inc, Agawam, MA

Lauren Mfg, New Philadelphia, OH
 PMI Industries LLC, Rochester, NY

SOLDER METALS

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA

TAPE, PRESSURE-SENSITIVE

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, quotes@alliedelec.com, www.thinkallied.com — See Ad Index

Belt Technologies Inc, Agawam, MA
 Fabrico, Kennesaw, GA
 Garland Mfg Co, Saco, ME

WELDING EQUIPMENT, MACHINES

Belt Technologies Inc, Agawam, MA
 PMI Industries LLC, Rochester, NY

WELDING EQUIPMENT, MACHINES FOR PLASTIC

Belt Technologies Inc, Agawam, MA
 Branson Ultrasonics Corp, Danbury, CT
 Fluid Metering Inc, Syosset, NY
 PMI Industries LLC, Rochester, NY

WELDING FILLER METALS, WIRE, ELECTRODES, POWDERS, CONSUMABLES

Belt Technologies Inc, Agawam, MA

WELDING, ULTRASONIC

Branson Ultrasonics Corp, Danbury, CT
 PMI Industries LLC, Rochester, NY

Laboratory, Field, or Other Services

DIMENSIONAL MEASUREMENT & GAGING

Mahr Federal Inc, Providence, RI
 PMI Industries LLC, Rochester, NY
 Trans-Tek Inc, Ellington, CT

ENVIRONMENTAL TESTING

Omega Engineering, Stamford, CT
 TUV SUD America, Peabody, MA

FAILURE ANALYSIS

Instron, Norwood, MA
 PMI Industries LLC, Rochester, NY

FRICTION & WEAR TESTING

Instron, Norwood, MA
 PMI Industries LLC, Rochester, NY

NONDESTRUCTIVE TESTING OF PHYSICAL & MECHANICAL PROPERTIES

Instron, Norwood, MA

2017 MATERIALS SUPPLIER DIRECTORY

PHYSICAL & MECHANICAL PROPERTY TESTING

Instron, Norwood, MA
TUV SUD America, Peabody, MA

PROCESS MONITORING, MEASUREMENT & CONTROL

National Instruments, Austin, TX
Watlow, St Louis, MO

SERVICES, CUSTOM-ENGINEERING & DESIGN

Festo Corp, Hauppauge, NY
HBM Inc, Marlborough, MA
Lauren Mfg, New Philadelphia, OH
PMI Industries LLC, Rochester, NY
SETCO Sales Co, Cincinnati, OH

Nonferrous Metals

ALUMINUM

FineLine Prototyping Inc, Raleigh, NC
Omega Engineering, Stamford, CT
PMI Industries LLC, Rochester, NY
Sapa Industrial Extrusions, Cressona, PA

ALUMINUM & ITS ALLOYS, CAST

**Alumacast, 3200 E Pershing, Appleton, WI 54911,
www.alumacast.com — See Ad Index**

ALUMINUM & ITS ALLOYS, WROUGHT

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New England Wire Technologies, Lisbon, NH

Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622, 714-562-0500, 888-874-6565, FAX: 714-562-0600, info@trimlok.com, www.trimlok.com — See Ad Index

Watson-Marlow Pumps Group, Wilmington, MA

TUBING, POLYCARBONATE

Greene Rubber Co, Woburn, MA

Lauren Mfg, New Philadelphia, OH

New England Wire Technologies, Lisbon, NH

TUBING, POLYETHYLENE

Festo Corp, Hauppauge, NY

Lauren Mfg, New Philadelphia, OH

New England Wire Technologies, Lisbon, NH

TUBING, PTFE

Fluoron Inc, Elkton, MD

Greene Rubber Co, Woburn, MA

Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622, 714-562-0500, 888-874-6565, FAX: 714-562-0600, info@trimlok.com, www.trimlok.com — See Ad Index

Tri-Star Plastics Corp, Shrewsbury, MA

TUBING, RUBBER

Greene Rubber Co, Woburn, MA

Lauren Mfg, New Philadelphia, OH

New England Wire Technologies, Lisbon, NH

Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622, 714-562-0500, 888-874-6565, FAX: 714-562-0600, info@trimlok.com, www.trimlok.com — See Ad Index

TUBING, STAINLESS

AMETEK, Clawson, MI

BellowsTech LLC, Ormond Beach, FL

Braxton Mfg Co Inc, Watertown, CT

TUBING, STRIPED

Lauren Mfg, New Philadelphia, OH

New England Wire Technologies, Lisbon, NH

TUBULAR PARTS, FABRICATED

Braxton Mfg Co Inc, Watertown, CT

Precision Paper Tube Co, 1033 S Noel Ave, Wheeling, IL 60090, 847-537-4250, FAX: 847-537-5777, sales@pptube.com, www.pptube.com — See Ad Index

Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622, 714-562-0500, 888-874-6565, FAX: 714-562-0600, info@trimlok.com, www.trimlok.com — See Ad Index

WIRE PARTS

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, info@sabcable.com, www.sabcable.com — See Ad Index

Plastics

ABS ALLOYS

PMI Industries LLC, Rochester, NY

ACETAL (AC) HOMO AND/OR COPOLYMER

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

ACRYLICS

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

ACRYLONITRILE-BUTADIENE-STYRENE (ABS)

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

ACRYLONITRILE-STYRENE-ACRYLIC (ASA)

Lauren Mfg, New Philadelphia, OH

ADDITIVES, PLASTIC

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

ANTIOXIDANTS

Lauren Mfg, New Philadelphia, OH

ANTISTATIC AGENTS

Miller-Stephenson Chemical Co Inc, Danbury, CT

CHLORINATED POLYETHYLENE (CPE)

Lauren Mfg, New Philadelphia, OH

COATINGS, PLASTIC

PMI Industries LLC, Rochester, NY

COLORANTS

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

EPOXY (EP)

Miller-Stephenson Chemical Co Inc, Danbury, CT

FILLERS

Dexmet Corp, Wallinton, CT

FLUOROCARBON, ETHYLENE-CHLOROTRIFLUOROETHYLENE (ECTFE)

Tri-Star Plastics Corp, Shrewsbury, MA

FLUOROCARBON, ETHYLENE-TETRAFLUOROETHYLENE (ETFE)

Tri-Star Plastics Corp, Shrewsbury, MA

FLUOROCARBON, FLUORINATED-ETHYLENE-PROPYLENE (FEP)

Fluoron Inc, Elkton, MD

Tri-Star Plastics Corp, Shrewsbury, MA

FLUOROCARBON, PERFLUOROALKOXY (PFA)

Fluoron Inc, Elkton, MD

Tri-Star Plastics Corp, Shrewsbury, MA

FLUOROCARBON, POLYTETRAFLUOROETHYLENE (PTFE)

Fluoron Inc, Elkton, MD

Miller-Stephenson Chemical Co Inc, Danbury, CT

Tri-Star Plastics Corp, Shrewsbury, MA

FLUOROCARBON, POLYVINYL-FLUORIDE (PVF)

Tri-Star Plastics Corp, Shrewsbury, MA

FLUOROCARBON, POLYVINYLIDENE-FLUORIDE (PVDF)

Tri-Star Plastics Corp, Shrewsbury, MA

LIQUID-CRYSTAL POLYMER (LCP)

PMI Industries LLC, Rochester, NY

NYLON

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

NYLON 11, 12

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com

— See Ad Index

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

NYLON 6

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

NYLON 6/6

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

NYLON, NOT ELSEWHERE CLASSIFIED

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com

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PLASTICS, COMPOUNDED

Lauren Mfg, New Philadelphia, OH

Minnesota Rubber and Plastics, Minneapolis, MN

PLASTICS, CUSTOM-COMPOUNDED

Lauren Mfg, New Philadelphia, OH

Minnesota Rubber and Plastics, Minneapolis, MN

PLASTICS, ELASTOMERIC

Lauren Mfg, New Philadelphia, OH

PLASTICS, LAMINATED

Lauren Mfg, New Philadelphia, OH

Tri-Star Plastics Corp, Shrewsbury, MA

PLASTICS, NOT ELSEWHERE CLASSIFIED

Garland Mfg Co, Saco, ME

Lauren Mfg, New Philadelphia, OH

POLYAMIDE-IMIDE (PAI)

Tri-Star Plastics Corp, Shrewsbury, MA

POLYCARBONATE (PC)

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

POLYESTER, THERMOPLASTIC (PBT)

PMI Industries LLC, Rochester, NY

POLYESTER, THERMOPLASTIC (PET)

PMI Industries LLC, Rochester, NY

Precision Paper Tube Co, 1033 S Noel Ave, Wheeling, IL 60090, 847-537-4250, FAX: 847-537-5777, sales@pptube.com, www.pptube.com — See Ad Index

POLYETHER SULFONE (PES)

Tri-Star Plastics Corp, Shrewsbury, MA

POLYETHERETHERKETONE (PEEK)

PMI Industries LLC, Rochester, NY

POLYETHERIMIDE (PEI)

Tri-Star Plastics Corp, Shrewsbury, MA

POLYETHERKETONE (PEK)

Tri-Star Plastics Corp, Shrewsbury, MA

POLYETHYLENE, HIGH-DENSITY (HDPE)

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

POLYETHYLENE, LOW-DENSITY (LDPE)

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

POLYETHYLENE, ULTRAHIGH-MOLECULAR-WEIGHT (UHMW)

Fluoron Inc, Elkton, MD

Garland Mfg Co, Saco, ME

POLYETHYLENES & COPOLYMERS

Garland Mfg Co, Saco, ME

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

POLYIMIDE (PI)

Tri-Star Plastics Corp, Shrewsbury, MA

POLYIMIDE FILM

Precision Paper Tube Co, 1033 S Noel Ave, Wheeling, IL 60090, 847-537-4250, FAX: 847-537-5777, sales@pptube.com, www.pptube.com — See Ad Index

POLYPROPYLENE (PP)

Garland Mfg Co, Saco, ME

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

POLYSTYRENE (PS)

PMI Industries LLC, Rochester, NY

POLYSTYRENE, HIGH-IMPACT (HIPS)

Lauren Mfg, New Philadelphia, OH

PMI Industries LLC, Rochester, NY

POLYSULFONE (PSO)

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

POLYTETRAFLUOROETHYLENE (PTFE)

PMI Industries LLC, Rochester, NY

Tri-Star Plastics Corp, Shrewsbury, MA

POLYURETHANE, RIM

Lauren Mfg, New Philadelphia, OH

POLYVINYLCHLORIDE (PVC)

Lauren Mfg, New Philadelphia, OH

SILICONE

Devcon, Danvers, MA

Lauren Mfg, New Philadelphia, OH

Nusil Technology, Carpinteria, CA

SILICONES, FLEXIBLE

Devcon, Danvers, MA

Lauren Mfg, New Philadelphia, OH

Nusil Technology, Carpinteria, CA

THERMOPLASTICS

Lauren Mfg, New Philadelphia, OH

Rubbers & Elastomers

CHLOROPRENE (NEOPRENE; CR)

Lauren Mfg, New Philadelphia, OH

CONDUCTIVE ELASTOMERS

Greene Rubber Co, Woburn, MA

Nusil Technology, Carpinteria, CA

ELASTOMERS, OTHER

Devcon, Danvers, MA

Lauren Mfg, New Philadelphia, OH

Nusil Technology, Carpinteria, CA

**Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622,
714-562-0500, 888-874-6565, FAX: 714-562-0600,
info@trimlok.com, www.trimlok.com**
— See Ad Index

ETHYLENE-PROPYLENE (EPM)

Greene Rubber Co, Woburn, MA

ETHYLENE-PROPYLENE-DIENE (EPDM)

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

**Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622,
714-562-0500, 888-874-6565, FAX: 714-562-0600,
info@trimlok.com, www.trimlok.com** — See Ad Index

FLUOROCARBON (CRM, FPM, FKM)

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

FLUOROSILICONE (FVMQ)

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH
Nusil Technology, Carpinteria, CA

HYDROGENATED NITRILE (ACRYLONITRILE-BUTADIENE, HNBR)

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

INHERENTLY FLAME RETARDANT (AU)

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

ISOPRENE-NATURAL (NR)

Greene Rubber Co, Woburn, MA

ISOPRENE-SYNTHETIC (IR)

Greene Rubber Co, Woburn, MA

NITRILE

(ACRYLONITRILE-BUTADIENE; NBR)

Greene Rubber Co, Woburn, MA

NITRILE RUBBER, HYDROGENATED (HNBR)

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

PERFLUOROELASTOMERS

Greene Rubber Co, Woburn, MA

POLYACRYLATE (ACM, ANM)

Greene Rubber Co, Woburn, MA

POLYAMIDE THERMOPLASTIC ELASTOMERS

Greene Rubber Co, Woburn, MA
PMI Industries LLC, Rochester, NY

POLYURETHANE

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH
PMI Industries LLC, Rochester, NY

**Pyramid Inc, 522 N 9th Ave E, Newton, IA 50208,
641-792-2405, FAX: 641-792-2478,
sales@pyramidbelts.com, www.pyramidbelts.com**
— See Ad Index

**SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004,
866-722-2974, FAX: 973-276-1515, info@sabcable.com,
www.sabcable.com** — See Ad Index

RUBBER COATINGS

Devcon, Danvers, MA

RUBBER, HARD

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

RUBBER, NATURAL

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

RUBBER, NOT ELSEWHERE CLASSIFIED

Devcon, Danvers, MA
Lauren Mfg, New Philadelphia, OH

RUBBER, SYNTHETIC

Lauren Mfg, New Philadelphia, OH

**Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622,
714-562-0500, 888-874-6565, FAX: 714-562-0600,
info@trimlok.com, www.trimlok.com** — See Ad Index

SILICONE (MQ, PMQ, VMQ, PVMQ)

Devcon, Danvers, MA
Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH
Nusil Technology, Carpinteria, CA

**Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622,
714-562-0500, 888-874-6565, FAX: 714-562-0600,
info@trimlok.com, www.trimlok.com**
— See Ad Index

SILICONES, FLEXIBLE

Devcon, Danvers, MA
Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH
Nusil Technology, Carpinteria, CA

**Trim-Lok Inc, 6855 Hermosa Cir,
Buena Park, CA 90622, 714-562-0500,
888-874-6565, FAX: 714-562-0600,
info@trimlok.com, www.trimlok.com**
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STYRENIC- THERMOPLASTIC ELASTOMERS

Devcon, Danvers, MA

THERMOPLASTIC ELASTOMERS, NOT ELSEWHERE CLASSIFIED

Devcon, Danvers, MA
Lauren Mfg, New Philadelphia, OH

THERMOPLASTIC ELASTOMERS, NYLON

Lauren Mfg, New Philadelphia, OH
PMI Industries LLC, Rochester, NY

THERMOPLASTIC ELASTOMERS, POLYESTER

PMI Industries LLC, Rochester, NY

THERMOPLASTIC ELASTOMERS, STYRENIC

Devcon, Danvers, MA

THERMOPLASTIC ELASTOMERS, URETHANE

Devcon, Danvers, MA
Greene Rubber Co, Woburn, MA
PMI Industries LLC, Rochester, NY

THERMOPLASTICS

Devcon, Danvers, MA
Lauren Mfg, New Philadelphia, OH
PMI Industries LLC, Rochester, NY

**Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622,
714-562-0500, 888-874-6565, FAX: 714-562-0600,
info@trimlok.com, www.trimlok.com**
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THERMOSET ELASTOMERS, NOT ELSEWHERE CLASSIFIED

Devcon, Danvers, MA
Lauren Mfg, New Philadelphia, OH

URETHANE (AU, EU)

Devcon, Danvers, MA

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ABSORBERS, SHOCK & VIBRATION

Airpot Corp, Norwalk, CT
SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
 Festo Corp, Hauppauge, NY
 Lauren Mfg, New Philadelphia, OH
 OndrivesUS.com, Freeport, NY
 Ringfeder Power Transmission Corp, Westwood, NJ

ACTUATORS

Aerotech Inc, Pittsburgh, PA
 Amacoil Inc, Aston, PA
 AMK Drives and Controls Inc, Richmond, VA
 BellowsTech LLC, Ormond Beach, FL
Carlyle Johnson Machine Co, 291 Boston Turnpike,
 Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645,
 maxitorq@cjmco.com, www.cjmco.com — See Ad Index
SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index

Exlar Corp, Chanhassen, MN
 Fabco-Air Inc, Gainesville, FL
 Harmonic Drive LLC, Peabody, MA
 LINAK US, Louisville, KY
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT
 Primatics Inc, Tangent, OR
Rollon Corp, 30 Wilson Dr, Sparta, NJ 07871, 877-976-5566,
 FAX: 973-300-9030, r.wood@rolloncorp.com,
 www.rollon.com

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index
Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
 781-271-0140, 800-854-6333, FAX: 781-932-4127,
 info-usa@schneeberger.com, www.schneeberger.com

Servometer , Cedar Grove, NJ
 SKF USA Inc, Lansdale, PA
 Ultra Motion LLC, Cutchogue, NY
 Velmex, Inc., Bloomfield, NY

ADAPTERS, LOAD

ENM Company, 5617 Northwest Hwy, Chicago, IL 60646,
 773-775-8400, 888-372-0465, FAX: 773-775-5968,
 customerservice@enmco.com, www.enmco.com
 Zero-Max Inc, Plymouth, MN

BALLS, METAL (FERROUS & NONFERROUS)

Carr Lane Mfg Co, St Louis, MO
SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
 New England Miniature Ball Corp, Norfolk, CT
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT

BALLS, MINIATURE

SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
 New England Miniature Ball Corp, Norfolk, CT
 Nordex Inc, Brookfield, CT
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT

BALLS, PRECISION

SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
 New England Miniature Ball Corp, Norfolk, CT
 Nordex Inc, Brookfield, CT
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT

BALLSCREWS

SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
Dynatec Manufacturing Inc, 2300 S Calhoun Rd,
 New Berlin, WI 53151, 262-786-1500, 800-298-2066,
 FAX: 262-786-3280, sales@dynatec.com,
 www.Dynatec.com — See Ad Index

Steinmeyer Inc, Burlington, MA

BEARINGS, BALL

SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
 New England Miniature Ball Corp, Norfolk, CT
 New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA
 Nordex Inc, Brookfield, CT
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT
 RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

Schaeffler Group USA Inc, Danbury, CT
 SKF USA Inc, Lansdale, PA
 SKF USA Inc, Kulpsville, PA

BEARINGS, BALL-RETAINER

SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
 Mahr Federal Inc, Providence, RI
 New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

BEARINGS, BALL-SPLINE

SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
 GTC Falcon Inc, Plymouth, MA
 IKO Intl Inc, Parsippany, NJ
Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

BEARINGS, CERAMIC

Astro Met Inc, Cincinnati, OH
 New England Miniature Ball Corp, Norfolk, CT
 New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA
 Nordex Inc, Brookfield, CT
 PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

SKF USA Inc, Lansdale, PA
 SKF USA Inc, Kulpsville, PA

BEARINGS, CROSSED-ROLLER

IKO Intl Inc, Parsippany, NJ
 Nordex Inc, Brookfield, CT
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT
Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
 781-271-0140, 800-854-6333, FAX: 781-932-4127,
 info-usa@schneeberger.com, www.schneeberger.com

BEARINGS, GRAPHITE

New England Miniature Ball Corp, Norfolk, CT
 SKF USA Inc, Lansdale, PA

BEARINGS, LINEAR

SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index
igus Inc, PO Box 14349, East Providence, RI 02914,
 401-438-2200, 800-521-2747, FAX: 401-438-7270,
 cdennen@igus.com, www.igus.com — See Ad Index

IKO Intl Inc, Parsippany, NJ
 Nordex Inc, Brookfield, CT
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT
Rollon Corp, 30 Wilson Dr, Sparta, NJ 07871, 877-976-5566,
 FAX: 973-300-9030, r.wood@rolloncorp.com,
 www.rollon.com

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

Schaeffler Group USA Inc, Danbury, CT
 SKF USA Inc, Lansdale, PA
 SKF USA Inc, Kulpsville, PA

BEARINGS, LINEAR-ROTARY

igus Inc, PO Box 14349, East Providence, RI 02914,
 401-438-2200, 800-521-2747, FAX: 401-438-7270,
 cdennen@igus.com, www.igus.com
 — See Ad Index

Mahr Federal Inc, Providence, RI
 Nordex Inc, Brookfield, CT
 OndrivesUS.com, Freeport, NY
 PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
 Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
 walter.newton@schaeffler.com, www.schaeffler.com
 — See Ad Index

SKF USA Inc, Kulpsville, PA

BEARINGS, MINIATURE

Bird Precision, Waltham, MA
SDP/SI Stock Drive Products/Sterling Instrument,
 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
 800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
 sdp-sisupport@sdp-si.com — See Ad Index

2017 MECHANICAL SUPPLIER DIRECTORY

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

IKO Intl Inc, Parsippany, NJ

New England Miniature Ball Corp, Norfolk, CT

New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

BEARINGS, NEEDLE

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

IKO Intl Inc, Parsippany, NJ

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schaeffler Group USA Inc, Danbury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

BEARINGS, NOT ELSEWHERE CLASSIFIED

Amacoil Inc, Aston, PA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

New England Miniature Ball Corp, Norfolk, CT

New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

PIC Design, Middlebury, CT

RBC Bearings, Oxford, CT

Rollon Corp, 30 Wilson Dr, Sparta, NJ 07871, 877-976-5566, FAX: 973-300-9030, r.wood@rolloncorp.com, www.rollon.com

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

SKF USA Inc, Kulpville, PA

Smalley Steel Ring Co, Lake Zurich, IL

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

BEARINGS, PILLOW-BLOCK

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schaeffler Group USA Inc, Danbury, CT

SKF USA Inc, Lansdale, PA

SKF USA Inc, Kulpville, PA

BEARINGS, PLAIN

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Garland Mfg Co, Saco, ME

GGB Bearing Technology, Thorofare, NJ

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

SKF USA Inc, Lansdale, PA

SKF USA Inc, Kulpville, PA

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

Tri-Star Plastics Corp, Shrewsbury, MA

BEARINGS, PLASTIC

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY

BEARINGS, ROD-END

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

IKO Intl Inc, Parsippany, NJ

New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

BEARINGS, ROLLER

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

IKO Intl Inc, Parsippany, NJ

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schaeffler Group USA Inc, Danbury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

SKF USA Inc, Lansdale, PA

SKF USA Inc, Kulpville, PA

BEARINGS, SPHERICAL

Bird Precision, Waltham, MA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

IKO Intl Inc, Parsippany, NJ

New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schaeffler Group USA Inc, Danbury, CT

SKF USA Inc, Lansdale, PA

SKF USA Inc, Kulpville, PA

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

Tri-Star Plastics Corp, Shrewsbury, MA

BEARINGS, THIN-SECTION

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

New Hampshire Ball Bearings Inc (NHBB), Chatsworth, CA

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

SKF USA Inc, Kulpville, PA

BEARINGS, THRUST

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

GGB Bearing Technology, Thorofare, NJ

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schaeffler Group USA Inc, Danbury, CT

SKF USA Inc, Lansdale, PA

2017 MECHANICAL SUPPLIER DIRECTORY

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

Tri-Star Plastics Corp, Shrewsbury, MA

BEARINGS, TURNTABLE

IKO Intl Inc, Parsippany, NJ
OndrivesUS.com, Freeport, NY
RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

BELTS, CONVEYOR

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Domer Mfg Corp, Hartland, WI

BELTS, METAL

Belt Technologies Inc, Agawam, MA

BELTS, NOT ELSEWHERE CLASSIFIED

Belt Technologies Inc, Agawam, MA
IKO Intl Inc, Parsippany, NJ
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

BELTS, STAINLESS

Belt Technologies Inc, Agawam, MA

BELTS, TIMING

Amacoil Inc, Aston, PA
Belt Technologies Inc, Agawam, MA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

BELTS, WOVEN ENDLESS FLAT

Belt Technologies Inc, Agawam, MA

BLOWERS

AMETEK Precision Motion Control, Kent, OH
ebm-papst Inc, Farmington, CT

BRAKES

AMETEK, Clawson, MI

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Mayr Corporation, Waldwick, NJ
MICO Inc, North Mankato, MN
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT

BRAKES, AIR-ACTUATED

AMETEK, Clawson, MI

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

Mach III Clutch Inc, Walton, KY

BRAKES, ELECTROMECHANICAL

AMETEK, Clawson, MI

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Lenze Americas, Uxbridge, MA
Mayr Corporation, Waldwick, NJ
MICO Inc, North Mankato, MN
Miki Pulley, Plymouth, MN
Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT
Reell Precision Mfg Inc, 1259 Willow Lake Blvd, Saint Paul, MN 55110, 651-486-3323, info@reell.com, www.reell.com — See Ad Index

BRAKES, HYSTERESIS

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY
Pelican Products Inc, Torrance, CA

BRAKES, LINEAR-GUIDE

Mayr Corporation, Waldwick, NJ
OndrivesUS.com, Freeport, NY
Pelican Products Inc, Torrance, CA

BRAKES, MAGNETIC-PARTICLE

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Miki Pulley, Plymouth, MN
OndrivesUS.com, Freeport, NY

BRUSHES, CUSTOM

Electro Static Technology, Mechanic Falls, ME
Miki Pulley, Plymouth, MN

BUSHINGS

Carr Lane Mfg Co, St Louis, MO

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

GGB Bearing Technology, Thorofare, NJ
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

SPIROL, 30 Rock Ave, Danielson, CT 06239, 860-774-8571, FAX: 860-774-2048, info@spirof.com, www.spirol.com — See Ad Index

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

Tri-Star Plastics Corp, Shrewsbury, MA

CABLE ASSEMBLIES, MECHANICAL

AMETEK, Clawson, MI

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

Linemaster Switch Corp, Woodstock, CT

Pivot Point Inc, Hustisford, WI
Roxtec Inc, Tulsa, OK

CABLE CONTROLS

Linemaster Switch Corp, Woodstock, CT

CAM FOLLOWERS

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT
RBC Bearings, Oxford, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

CAMS

AMETEK, Clawson, MI

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

OndrivesUS.com, Freeport, NY

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

CARRIERS, CABLE & HOSE

AMETEK, Clawson, MI

Dynatect Manufacturing Inc, 2300 S Calhoun Rd, New Berlin, WI 53151, 262-786-1500, 800-298-2066, FAX: 262-786-3280, sales@dynatect.com, www.Dynatect.com — See Ad Index

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

CELLS, LOAD, MECHANICAL

HBM Inc, Marlborough, MA

CHAINS, CONVEYOR

Domer Mfg Corp, Hartland, WI
LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932, 973-660-9700, ldonovan@lappusa.com, www.lappusa.com

CHAINS, TRANSMISSION

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

CLAMPS, LINEAR-GUIDE

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

CLUTCHES

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Dynatect Manufacturing Inc, 2300 S Calhoun Rd, New Berlin, WI 53151, 262-786-1500, 800-298-2066, FAX: 262-786-3280, sales@dynatect.com, www.Dynatect.com — See Ad Index

Mach III Clutch Inc, Walton, KY

Mayr Corporation, Waldwick, NJ

Miki Pulley, Plymouth, MN

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

Pelican Products Inc, Torrance, CA

PIC Design, Middlebury, CT

Reell Precision Mfg Inc, 1259 Willow Lake Blvd, Saint Paul, MN 55110, 651-486-3323, info@reell.com, www.reell.com — See Ad Index

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

CLUTCHES, AIR-ACTUATED

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

Dynatect Manufacturing Inc, 2300 S Calhoun Rd, New Berlin, WI 53151, 262-786-1500, 800-298-2066, FAX: 262-786-3280, sales@dynatect.com, www.Dynatect.com — See Ad Index

Mach III Clutch Inc, Walton, KY

OndrivesUS.com, Freeport, NY

CLUTCHES, ELECTROMECHANICAL

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Mayr Corporation, Waldwick, NJ

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH

PIC Design, Middlebury, CT

Reell Precision Mfg Inc, 1259 Willow Lake Blvd, Saint Paul, MN 55110, 651-486-3323, info@reell.com, www.reell.com — See Ad Index

CLUTCHES, HYSTERESIS

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY

CLUTCHES, VISCOUS-TORQUE-CONVERTER

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, maxitorq@cjmco.com, www.cjmco.com — See Ad Index

OndrivesUS.com, Freeport, NY

COLLARS

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Ruland Manufacturing Co Inc, Marlborough, MA

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com — See Ad Index

Whittet-Higgins Co, Central Falls, RI

COLLARS, SHAFT

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Ruland Manufacturing Co Inc, Marlborough, MA

Whittet-Higgins Co, Central Falls, RI

CONVEYOR COMPONENTS

Belt Technologies Inc, Agawam, MA

Bison Gear & Engineering Corp, St Charles, IL

Dorner Mfg Corp, Hartland, WI

Garland Mfg Co, Saco, ME

CONVEYOR SCREWS

Belt Technologies Inc, Agawam, MA

CONVEYORS, ROLLER

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Dorner Mfg Corp, Hartland, WI

Pyramid Inc, 522 N 9th Ave E, Newton, IA 50208, 641-792-2405, FAX: 641-792-2478, sales@pyramidbelts.com, www.pyramidbelts.com — See Ad Index

COUNTERS & TIMERS, MECHANICAL

Baumer Ltd, Southington, CT

COUPLINGS, FLEXIBLE

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

GTC Falcon Inc, Plymouth, MA

Helical Products Co Inc, Santa Maria, CA

Mayr Corporation, Waldwick, NJ

Miki Pulley, Plymouth, MN

NBK America LLC, 421 Feheley Drive, Suite B, King of Prussia, PA 19406-2658, 484-685-7500, FAX: 484-685-7600, info.us@nbk1560.com, www.nbk1560.com

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Ringfeder Power Transmission Corp, Westwood, NJ

Ruland Manufacturing Co Inc, Marlborough, MA

Servometer, Cedar Grove, NJ

US Digital, Vancouver, WA

Zero-Max Inc, Plymouth, MN

COUPLINGS, FLUID

Carr Lane Mfg Co, St Louis, MO

Festo Corp, Hauppauge, NY

Ringfeder Power Transmission Corp, Westwood, NJ

COUPLINGS, RIGID

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Greene Rubber Co, Woburn, MA

Mayr Corporation, Waldwick, NJ

Miki Pulley, Plymouth, MN

NBK America LLC, 421 Feheley Drive, Suite B, King of Prussia, PA 19406-2658, 484-685-7500, FAX: 484-685-7600, info.us@nbk1560.com, www.nbk1560.com

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Ringfeder Power Transmission Corp, Westwood, NJ

Ruland Manufacturing Co Inc, Marlborough, MA

Zero-Max Inc, Plymouth, MN

COUPLINGS, SHAFT, FLEXIBLE

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

GTC Falcon Inc, Plymouth, MA

Helical Products Co Inc, Santa Maria, CA

Mayr Corporation, Waldwick, NJ

Miki Pulley, Plymouth, MN

NBK America LLC, 421 Feheley Drive, Suite B, King of Prussia, PA 19406-2658, 484-685-7500, FAX: 484-685-7600, info.us@nbk1560.com, www.nbk1560.com

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Ringfeder Power Transmission Corp, Westwood, NJ

Ruland Manufacturing Co Inc, Marlborough, MA

Servometer, Cedar Grove, NJ

Zero-Max Inc, Plymouth, MN

COUPLINGS, UNIVERSAL-JOINT

BellowsTech LLC, Ormond Beach, FL

Clippard Instrument Laboratory Inc, 7390 Colerain Ave, Cincinnati, OH 45239, 513-521-4261, 877-245-6247, FAX: 513-521-4464, sales@clippard.com, www.clippard.com — See Ad Index

Curtis Universal Joint Co, Springfield, MA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

GTC Falcon Inc, Plymouth, MA

Helical Products Co Inc, Santa Maria, CA

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Ringfeder Power Transmission Corp, Westwood, NJ

Servometer, Cedar Grove, NJ

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

CRANKS

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

DAMPERS

BellowsTech LLC, Ormond Beach, FL

Lauren Mfg, New Philadelphia, OH

Servometer, Cedar Grove, NJ

DAMPERS, SHOCK & VIBRATION

Airpot Corp, Norwalk, CT

BellowsTech LLC, Ormond Beach, FL

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

2017 MECHANICAL SUPPLIER DIRECTORY

Festo Corp, Hauppauge, NY
Lauren Mfg, New Philadelphia, OH
Ringfeder Power Transmission Corp, Westwood, NJ
Roxtec Inc, Tulsa, OK
Servometer, Cedar Grove, NJ

DIE-CUT PARTS

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH

DIFFERENTIALS

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Harmonic Drive LLC, Peabody, MA
OndrivesUS.com, Freeport, NY

DIMENSIONAL MEASUREMENT

AMETEK, Clawson, MI
Trans-Tek Inc, Ellington, CT

DRIVES & TRANSMISSIONS, ADJUSTABLE-SPEED, BELT

Amacoil Inc, Aston, PA

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Miki Pulley, Plymouth, MN
NORD Gear Corp, Waunakee, WI
OndrivesUS.com, Freeport, NY

DRIVES & TRANSMISSIONS, ADJUSTABLE- SPEED, CHAIN

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932,
973-660-9700, ldonovan@lappusa.com,
www.lappusa.com

DRIVES & TRANSMISSIONS, ADJUSTABLE- SPEED, FRICTION

Amacoil Inc, Aston, PA

Carlyle Johnson Machine Co, 291 Boston Turnpike,
Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645,
maxitorq@cjmco.com, www.cjmco.com — See Ad Index

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108,
630-980-1133, FAX: 630-980-1232, info@diequa.com,
www.diequa.com — See Ad Index

NORD Gear Corp, Waunakee, WI

DRIVES & TRANSMISSIONS, ADJUSTABLE-SPEED, GEAR-DIFFERENTIAL

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

DRIVES & TRANSMISSIONS, ADJUSTABLE- SPEED, NOT ELSEWHERE CLASSIFIED

Amacoil Inc, Aston, PA

Bison Gear & Engineering Corp, St Charles, IL

Carlyle Johnson Machine Co, 291 Boston Turnpike,
Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645,
maxitorq@cjmco.com, www.cjmco.com — See Ad Index

NORD Gear Corp, Waunakee, WI
Onvio LLC, Salem, NH
Zero-Max Inc, Plymouth, MN

DRIVES & TRANSMISSIONS, ADJUSTABLE- SPEED, VARIABLE-STROKE

Amacoil Inc, Aston, PA

DRIVES & TRANSMISSIONS, CONSTANT- SPEED, BELT

Amacoil Inc, Aston, PA

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932,
973-660-9700, ldonovan@lappusa.com,
www.lappusa.com

OndrivesUS.com, Freeport, NY

DRIVES & TRANSMISSIONS, CONSTANT- SPEED, CHAIN

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY

DRIVES & TRANSMISSIONS, CONSTANT- SPEED, GEAR

Bison Gear & Engineering Corp, St Charles, IL

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108,
630-980-1133, FAX: 630-980-1232, info@diequa.com,
www.diequa.com — See Ad Index

Harmonic Drive LLC, Peabody, MA

NORD Gear Corp, Waunakee, WI

OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH

SEW-Eurodrive Inc, Lyman, SC

DRIVES & TRANSMISSIONS, CONSTANT- SPEED, REVERSING

Amacoil Inc, Aston, PA

Carlyle Johnson Machine Co, 291 Boston Turnpike,
Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645,
maxitorq@cjmco.com, www.cjmco.com — See Ad Index

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

NORD Gear Corp, Waunakee, WI

OndrivesUS.com, Freeport, NY

DRIVES, INDEXING

Aerotech Inc, Pittsburgh, PA

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

ENGRAVING TABLES/SYSTEMS

Belt Technologies Inc, Agawam, MA

FANS

AMETEK Precision Motion Control, Kent, OH

ebm-papst Inc, Farmington, CT

FEET, LEVELING

Belt Technologies Inc, Agawam, MA

Carr Lane Mfg Co, St Louis, MO

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

PIC Design, Middlebury, CT

GASKETS

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Greene Rubber Co, Woburn, MA

Lauren Mfg, New Philadelphia, OH

GEAR & PINION RACKS

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850,
FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

GEARING, LARGE GROUND-TOOTH

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850,
FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

GEARS, CYCLOIDAL

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Onvio LLC, Salem, NH

GEARS, GROUND-TOOTH

SDP/SI Stock Drive Products/Sterling Instrument,
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800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850,
FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865,
814-894-2461, 800-458-6079, FAX: 814-894-5272,
sales@symmco.com, www.symmco.com — See Ad Index

GEARS, HARMONIC

Harmonic Drive LLC, Peabody, MA

2017 MECHANICAL SUPPLIER DIRECTORY

GEARS, HELICAL

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
Onvio LLC, Salem, NH
PIC Design, Middlebury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, METRIC

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, NOISE-REDUCING

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Electro Static Technology, Mechanic Falls, ME

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, NONCIRCULAR

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

GEARS, NONLUBRICATED

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

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KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

GEARS, NOT ELSEWHERE CLASSIFIED

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, PLANETARY

Applied Motion Products, Watsonville, CA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Harmonic Drive LLC, Peabody, MA

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

maxon precision motors, inc, Fall River, MA
OndrivesUS.com, Freeport, NY
Onvio LLC, Salem, NH

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, PRECISION

Applied Motion Products, Watsonville, CA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Harmonic Drive LLC, Peabody, MA

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

maxon precision motors, inc, Fall River, MA
Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH

PIC Design, Middlebury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, RIGHT-ANGLE-DRIVE

Applied Motion Products, Watsonville, CA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

Harmonic Drive LLC, Peabody, MA

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

maxon precision motors, inc, Fall River, MA

MITRPAK Power Transmission Products, Uxbridge, MA

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
Onvio LLC, Salem, NH

PIC Design, Middlebury, CT

Zero-Max Inc, Plymouth, MN

GEARS, SPIRAL-BEVEL

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
Onvio LLC, Salem, NH

PIC Design, Middlebury, CT

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, SPUR

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850, FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

maxon precision motors, inc, Fall River, MA

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

GEARS, WITH PLASTIC OR METAL HUB

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

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201-767-8066, FAX: 201-767-7797,
info@intechpower.com, www.intechpower.com
— See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850,
FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865,
814-894-2461, 800-458-6079, FAX: 814-894-5272,
sales@symmco.com, www.symmco.com — See Ad Index

GEARS, WORM

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624,
201-767-8066, FAX: 201-767-7797,
info@intechpower.com, www.intechpower.com
— See Ad Index

KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850,
FAX: 516-248-4385, info@khkgears.us, www.khkgears.us

maxon precision motors, inc, Fall River, MA
Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865,
814-894-2461, 800-458-6079, FAX: 814-894-5272,
sales@symmco.com, www.symmco.com — See Ad Index

GUIDES, LINEAR

igus Inc, PO Box 14349, East Providence, RI 02914,
401-438-2200, 800-521-2747, FAX: 401-438-7270,
cdennen@igus.com, www.igus.com — See Ad Index

Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

SETCO Sales Co, Cincinnati, OH

GUIDEWAYS

Garland Mfg Co, Saco, ME
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

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HUBS

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sdp-sisupport@sdp-si.com — See Ad Index

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PIC Design, Middlebury, CT

IDLERS

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sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

INDEXING & POSITIONING TABLES

Aerotech Inc, Pittsburgh, PA
Festo Corp, Hauppauge, NY

IKO Intl Inc, Parsippany, NJ
Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

SETCO Sales Co, Cincinnati, OH

Velmex, Inc., Bloomfield, NY

ISOLATORS

Lauren Mfg, New Philadelphia, OH

JACKS

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108,
630-980-1133, FAX: 630-980-1232, info@diequa.com,
www.diequa.com — See Ad Index

JOINTS, UNIVERSAL

BellowsTech LLC, Ormond Beach, FL

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

GTC Falcon Inc, Plymouth, MA
Helical Products Co Inc, Santa Maria, CA

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Servometer, Cedar Grove, NJ

KNOBS, CLAMPING

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

LEADSCREWS

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

Universal Thread Grinding Co, Fairfield, CT

LINK BELTS

PIC Design, Middlebury, CT

LUBRICANTS

Lubriplate Lubricants Company, Newark, NJ
Miller-Stephenson Chemical Co Inc, Danbury, CT
Nye Lubricants, Fairhaven, MA
SKF USA Inc, Lansdale, PA

LUBRICANTS FOR BEARINGS

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

GGB Bearing Technology, Thorofare, NJ

Lubriplate Lubricants Company, Newark, NJ

Nordex Inc, Brookfield, CT

Nye Lubricants, Fairhaven, MA

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index

SKF USA Inc, Lansdale, PA

LUBRICANTS FOR GEARS

Lubriplate Lubricants Company, Newark, NJ
Nye Lubricants, Fairhaven, MA

LUBRICANTS, SYNTHETICS

Lubriplate Lubricants Company, Newark, NJ
Nye Lubricants, Fairhaven, MA

LUBRICATING SYSTEMS

Fluid Metering Inc, Syosset, NY
Nordson EFD, East Providence, RI
SKF USA Inc, Lansdale, PA
SKF USA Inc, Kulpville, PA

MACHINE BASES

Carr Lane Mfg Co, St Louis, MO

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

SETCO Sales Co, Cincinnati, OH

MACHINES, CALIBRATING

Belt Technologies Inc, Agawam, MA

MANIPULATORS

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Ultra Motion LLC, Cutchogue, NY

MECHANISMS, INDEXING

Aerotech Inc, Pittsburgh, PA
Belt Technologies Inc, Agawam, MA
Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
Onvio LLC, Salem, NH
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Velmex, Inc., Bloomfield, NY

MECHANISMS, INTERMITTENT-MOTION

Aerotech Inc, Pittsburgh, PA
AMETEK, Clawson, MI
Belt Technologies Inc, Agawam, MA
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Onvio LLC, Salem, NH
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Reell Precision Mfg Inc, 1259 Willow Lake Blvd,
Saint Paul, MN 55110, 651-486-3323, info@reell.com,
www.reell.com — See Ad Index

MECHANISMS, PERIODIC-MOTION

Aerotech Inc, Pittsburgh, PA
PIC Design, Middlebury, CT

MECHANISMS, THREE-DIMENSIONAL

Aerotech Inc, Pittsburgh, PA
Belt Technologies Inc, Agawam, MA

MEMBERS, TELESCOPING

GTC Falcon Inc, Plymouth, MA

MODULAR, ALUMINUM-PROFILE CONSTRUCTION SYSTEM

PIC Design, Middlebury, CT

MOTION CONVERTERS

Exlar Corp, Chanhassen, MN

MOTORS, SPRING

AMETEK, Feasterville, PA
Smalley Steel Ring Co, Lake Zurich, IL

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MOUNTING HARDWARE

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Keystone Electronics Corp, Astoria, NY
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT

NOISE-CONTROL MATERIALS

Electro Static Technology, Mechanic Falls, ME

POSITIONING SYSTEMS

Aerotech Inc, Pittsburgh, PA
AMETEK, Clawson, MI
Belt Technologies Inc, Agawam, MA
IKO Intl Inc, Parsippany, NJ
maxon precision motors, inc, Fall River, MA
Nordex Inc, Brookfield, CT
Onvio LLC, Salem, NH
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Primatics Inc, Tangent, OR
Ultra Motion LLC, Cutchogue, NY
Velmex, Inc., Bloomfield, NY

POWER SOURCE, SOLAR

Belt Technologies Inc, Agawam, MA

PULLEYS

Belt Technologies Inc, Agawam, MA
SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624,
201-767-8066, FAX: 201-767-7797,
info@intechpower.com, www.intechpower.com
— See Ad Index

NBK America LLC, 421 Feheley Drive, Suite B,
King of Prussia, PA 19406-2658, 484-685-7500,
FAX: 484-685-7600, info.us@nbk1560.com,
www.nbk1560.com

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
Onvio LLC, Salem, NH
PIC Design, Middlebury, CT
Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865,
814-894-2461, 800-458-6079, FAX: 814-894-5272,
sales@symmco.com, www.symmco.com — See Ad Index

RATCHETS

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY

REELS

AMETEK, Feasterville, PA
AMETEK, Sellersville, PA
SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

ROBOTS

Aerotech Inc, Pittsburgh, PA
Belt Technologies Inc, Agawam, MA

Nordson EFD, East Providence, RI
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004,
866-722-2974, FAX: 973-276-1515, info@sabcable.com,
www.sabcable.com — See Ad Index

Visumatic Industrial Products, 856 Porter Pl, Lexington,
KY 40508, 859-255-7907, FAX: 859-255-7909, sales@visumatic.com,
www.visumatic.com — See Ad Index

ROTARY, AIR-BEARING

Aerotech Inc, Pittsburgh, PA
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Primatics Inc, Tangent, OR

SAFETY DEVICES

AMETEK, Clawson, MI
Banner Engineering Corp, 9714 10th Ave N, Minneapolis,
MN 55441, 763-544-3164, 888-3-SENSOR, FAX:
763-544-3213, sensors@bannerengineering.com, www.bannerengineering.com — See Ad Index

Belt Technologies Inc, Agawam, MA
Dynatec Manufacturing Inc, 2300 S Calhoun Rd,
New Berlin, WI 53151, 262-786-1500, 800-298-2066,
FAX: 262-786-3280, sales@dynatec.com,
www.dynatec.com — See Ad Index

SCREWS, BALL

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index
Dynatec Manufacturing Inc, 2300 S Calhoun Rd,
New Berlin, WI 53151, 262-786-1500, 800-298-2066,
FAX: 262-786-3280, sales@dynatec.com,
www.dynatec.com — See Ad Index

Haydon Kerk Motion Solutions Inc, Waterbury, CT
IKO Intl Inc, Parsippany, NJ
maxon precision motors, inc, Fall River, MA
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com

SKF USA Inc, Lansdale, PA
Steinmeyer Inc, Burlington, MA

SCREWS, ROLLER

Exlar Corp, Chanhassen, MN
Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
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SKF USA Inc, Lansdale, PA

SHAFTS, FLEXIBLE

BellowsTech LLC, Ormond Beach, FL
SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
Servometer, Cedar Grove, NJ

SHAFTS, NOT ELSEWHERE CLASSIFIED

Amacoil Inc, Aston, PA
Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

Schaeffler Group USA Inc, 308 Springhill Farm Rd,
Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599,
walter.newton@schaeffler.com, www.schaeffler.com
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SHEAVES

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sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624,
201-767-8066, FAX: 201-767-7797,
info@intechpower.com, www.intechpower.com
— See Ad Index

SHIMS

SDP/SI Stock Drive Products/Sterling Instrument,
2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300,
800-345-1144, FAX: 516-326-8827, www.sdp-si.com,
sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT
Rotor Clip Company Inc, 187 Davidson St,
Somerset, NJ 08873, 732-469-7333, FAX: 732-469-7898,
sales@rotorclip.com, www.rotorclip.com
— See Ad Index

Smalley Steel Ring Co, Lake Zurich, IL
SPIROL, 30 Rock Ave, Danielson, CT 06239, 860-774-8571,
FAX: 860-774-2048, info@spirol.com, www.spirol.com
— See Ad Index

SLIDE GUIDES

Festo Corp, Hauppauge, NY
Garland Mfg Co, Saco, ME
IKO Intl Inc, Parsippany, NJ
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com
SETCO Sales Co, Cincinnati, OH

SLIDE UNITS

Festo Corp, Hauppauge, NY
IKO Intl Inc, Parsippany, NJ
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Rollon Corp, 30 Wilson Dr, Sparta, NJ 07871, 877-976-5566,
FAX: 973-300-9030, r.wood@rolloncorp.com,
www.rollon.com

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801,
781-271-0140, 800-854-6333, FAX: 781-932-4127,
info-usa@schneeberger.com, www.schneeberger.com
SETCO Sales Co, Cincinnati, OH

SLIDES & WAYS

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PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
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info-usa@schneeberger.com, www.schneeberger.com
SETCO Sales Co, Cincinnati, OH

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SLIDES, AIR-BEARING

Aerotech Inc, Pittsburgh, PA

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

SLIDES, ANTI-FRICTION

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Garland Mfg Co, Saco, ME

IKO Intl Inc, Parsippany, NJ

PIC Design, Middlebury, CT

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

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SETCO Sales Co, Cincinnati, OH

SLIDES, BELT-DRIVE

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PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

Rollon Corp, 30 Wilson Dr, Sparta, NJ 07871, 877-976-5566, FAX: 973-300-9030, r.wood@rolloncorp.com, www.rollon.com

SETCO Sales Co, Cincinnati, OH

Velmex, Inc., Bloomfield, NY

SLIDES, BUSH

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

SLIDES, CROSSED-ROLLER

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IKO Intl Inc, Parsippany, NJ

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

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SETCO Sales Co, Cincinnati, OH

SLIDES, LINEAR-MOTION

Aerotech Inc, Pittsburgh, PA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

IKO Intl Inc, Parsippany, NJ

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com — See Ad Index

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

Rollon Corp, 30 Wilson Dr, Sparta, NJ 07871, 877-976-5566, FAX: 973-300-9030, r.wood@rolloncorp.com, www.rollon.com

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

SETCO Sales Co, Cincinnati, OH

SKF USA Inc, Lansdale, PA

Yaskawa America Inc / Drives & Motion Division, Waukegan, IL

SLIDES, SHAFT

GTC Falcon Inc, Plymouth, MA

PIC Design, Middlebury, CT

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com — See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

SNUBBERS

Greene Rubber Co, Woburn, MA

O'Keefe Controls Co, Trumbull, CT

SPEED REDUCERS

Bison Gear & Engineering Corp, St Charles, IL

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

Groschopp Inc, Sioux Center, IA

Harmonic Drive LLC, Peabody, MA

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

SPEED REDUCERS, CYCLOIDAL

Onvio LLC, Salem, NH

SPEED REDUCERS, HELICAL

Bison Gear & Engineering Corp, St Charles, IL

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH

PIC Design, Middlebury, CT

SEW-Eurodrive Inc, Lyman, SC

SPEED REDUCERS, PLANETARY

Applied Motion Products, Watsonville, CA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

Groschopp Inc, Sioux Center, IA

Harmonic Drive LLC, Peabody, MA

OndrivesUS.com, Freeport, NY

Onvio LLC, Salem, NH

SEW-Eurodrive Inc, Lyman, SC

SPEED REDUCERS, WORM-GEAR

Bison Gear & Engineering Corp, St Charles, IL

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

Groschopp Inc, Sioux Center, IA

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

SPINDLES

Aerotech Inc, Pittsburgh, PA

igus Inc, PO Box 14349, East Providence, RI 02914, 401-438-2200, 800-521-2747, FAX: 401-438-7270, cdennen@igus.com, www.igus.com — See Ad Index

SETCO Sales Co, Cincinnati, OH

SPINDLES, AIR-BEARING

Aerotech Inc, Pittsburgh, PA

PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

SETCO Sales Co, Cincinnati, OH

SPLINES

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Nordex Inc, Brookfield, CT

SPRINGS, "MACHINE"

AMETEK, Sellersville, PA

Helical Products Co Inc, Santa Maria, CA

Lee Spring, Brooklyn, NY

Smalley Steel Ring Co, Lake Zurich, IL

SPRINGS, COMPRESSION

AMETEK, Sellersville, PA

Century Spring Corp, Los Angeles, CA

Helical Products Co Inc, Santa Maria, CA

Lee Spring, Brooklyn, NY

Nordex Inc, Brookfield, CT

OndrivesUS.com, Freeport, NY

PIC Design, Middlebury, CT

Rotor Clip Company Inc, 187 Davidson Ave, Somerset, NJ 08873, 732-469-7333, FAX: 732-469-7898, sales@rotorclip.com, www.rotorclip.com — See Ad Index

Smalley Steel Ring Co, Lake Zurich, IL

SPRINGS, DIE

Century Spring Corp, Los Angeles, CA

Lee Spring, Brooklyn, NY

SPRINGS, DISC

Century Spring Corp, Los Angeles, CA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Lee Spring, Brooklyn, NY

Nordex Inc, Brookfield, CT

PIC Design, Middlebury, CT

Smalley Steel Ring Co, Lake Zurich, IL

SPRINGS, EXTENSION

AMETEK, Sellersville, PA

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

2017 MECHANICAL SUPPLIER DIRECTORY

Helical Products Co Inc, Santa Maria, CA
Lee Spring, Brooklyn, NY
Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT
Ringfeder Power Transmission Corp, Westwood, NJ

SPRINGS, LEAF, LONG-TAPER

Smalley Steel Ring Co, Lake Zurich, IL

SPRINGS, NOT ELSEWHERE CLASSIFIED

AMETEK, Sellersville, PA
Bal Seal Engineering Inc, Foothill Ranch, CA
Century Spring Corp, Los Angeles, CA
Lee Spring, Brooklyn, NY
Ringfeder Power Transmission Corp, Westwood, NJ

Rotor Clip Company Inc, 187 Davidson Ave, Somerset, NJ 08873, 732-469-7333, FAX: 732-469-7898, sales@rotorclip.com, www.rotorclip.com
— See Ad Index

Smalley Steel Ring Co, Lake Zurich, IL

SPRINGS, STOCK

AMETEK, Sellersville, PA
Lee Spring, Brooklyn, NY
PIC Design, Middlebury, CT
Smalley Steel Ring Co, Lake Zurich, IL

SPRINGS, TORSION

AMETEK, Sellersville, PA
Century Spring Corp, Los Angeles, CA
SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Helical Products Co Inc, Santa Maria, CA
Lee Spring, Brooklyn, NY

SPRINGS, WIRE

Lee Spring, Brooklyn, NY
PIC Design, Middlebury, CT
Smalley Steel Ring Co, Lake Zurich, IL

SPROCKETS

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Intech Corp, 250 Herbert Ave, Closter, NJ 07624, 201-767-8066, FAX: 201-767-7797, info@intechpower.com, www.intechpower.com
— See Ad Index

Nordex Inc, Brookfield, CT
OndrivesUS.com, Freeport, NY
Onvio LLC, Salem, NH
PIC Design, Middlebury, CT

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com
— See Ad Index

Subassemblies, machine & instrument

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

HBM Inc, Marlborough, MA
Nordex Inc, Brookfield, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, info@sabcable.com, www.sabcable.com — See Ad Index

TABLES, XY

Aerotech Inc, Pittsburgh, PA
Nordex Inc, Brookfield, CT
Nordson EFD, East Providence, RI
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

SETCO Sales Co, Cincinnati, OH
SKF USA Inc, Lansdale, PA
Steinmeyer Inc, Burlington, MA
Velmex, Inc., Bloomfield, NY

TABLES, XYZ

Aerotech Inc, Pittsburgh, PA
Nordex Inc, Brookfield, CT
Nordson EFD, East Providence, RI
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Primatics Inc, Tangent, OR
Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

SETCO Sales Co, Cincinnati, OH
SKF USA Inc, Lansdale, PA
Steinmeyer Inc, Burlington, MA
Velmex, Inc., Bloomfield, NY

TENSIONERS

AMETEK, Clawson, MI
SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

TENSIONERS, BOLT/STUD

PIC Design, Middlebury, CT

TENSIONERS, CHAIN & BELT

AMETEK, Clawson, MI
Belt Technologies Inc, Agawam, MA
SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT

TORQUE CONVERTERS

OndrivesUS.com, Freeport, NY

TORQUE LIMITERS

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, info@diequa.com, www.diequa.com — See Ad Index

Mach III Clutch Inc, Walton, KY
Mayr Corporation, Waldwick, NJ
OndrivesUS.com, Freeport, NY
PIC Design, Middlebury, CT
Ringfeder Power Transmission Corp, Westwood, NJ

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, sales@symmco.com, www.symmco.com — See Ad Index

Zero-Max Inc, Plymouth, MN

TORQUE MONITORS

GTC Falcon Inc, Plymouth, MA

TRIPODS

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index

VIBRATION ISOLATORS

BellowsTech LLC, Ormond Beach, FL
SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY, 516-328-3300, 800-345-1144, FAX: 516-326-8827, www.sdp-si.com, sdp-sisupport@sdp-si.com — See Ad Index

Greene Rubber Co, Woburn, MA
Lauren Mfg, New Philadelphia, OH
Servometer, Cedar Grove, NJ

VIBRATORY FEEDERS

Festo Corp, Hauppauge, NY
SPIROL, 30 Rock Ave, Danielson, CT 06239, 860-774-8571, FAX: 860-774-2048, info@spiro.com, www.spiro.com
— See Ad Index

Visumatic Industrial Products, 856 Porter Pl, Lexington, KY 40508, 859-255-7907, FAX: 859-255-7909, sales@visumatic.com, www.visumatic.com — See Ad Index

VISES

Carr Lane Mfg Co, St Louis, MO

WORKSTATIONS

Belt Technologies Inc, Agawam, MA

XY STAGES, AIR-BEARING

Aerotech Inc, Pittsburgh, PA
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Primatics Inc, Tangent, OR
Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index

XY STAGES, CROSSED-ROLLER

Aerotech Inc, Pittsburgh, PA
IKO Intl Inc, Parsippany, NJ
Nordex Inc, Brookfield, CT
PIC Design, Middlebury, CT
PI (Physik Instrumente) LP / Motion Positioning, Auburn, MA
Primatics Inc, Tangent, OR
Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, walter.newton@schaeffler.com, www.schaeffler.com
— See Ad Index

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, info-usa@schneeberger.com, www.schneeberger.com

A

Absopulse Electronics Ltd, 110 Walgreen Rd, Ottawa, ON KOA 1L0, 613-836-3511, FAX: 613-836-7488, Email: absopulse@absopulse.com, Web: www.absopulse.com

Adsens Technology, 18310 Bedford Cir, La Puente, CA 91744, 626-854-2774, 800-641-9026, FAX: 626-854-2776, Email: acheng@adsens.net, Web: www.adsens.net

Advanced Machine & Engineering Co, 2500 Latham St, Rockford, IL 61103, 800-225-4263, Email: info@ame.com, Web: www.ame.com

Advanced Control Technology Inc, 7050 E County Rd 101, Shakopee, MN 55379, 952-882-0000, 877-800-8820, FAX: 952-890-3644, Email: sales@actsensors.com, Web: www.actsensors.com

Trade Names: ACT, -ACT Company

Advanced Interconnections Corp, 5 Energy Way, West Warwick, RI 02893, 401-823-5200, 800-424-9850, FAX: 401-823-8723, Email: info@advanced.com, Web: www.advanced.com

Trade Names: B2B SMT Connectors, -EMC Terminals and Test Jacks, -Flip-Top, BGA Test Sockets, -Mezza-pede SMT Connectors, -Peel-A-Way Removable Terminal Carriers, -SocketPac Power Converter Sockets

Aerotech Inc, 101 Zeta Dr, Pittsburgh, PA 15238, 412-963-7470, FAX: 412-963-7459, Email: sales@aerotech.com, Web: www.aerotech.com

Trade Names: ACCUDEX, -Ensemble, -FiberAlign, -FiberMax, -LaserTurn, -LENSGEN, -Ndrive, -Npaq, -Soloist, -UNIDEX

Airpot Corp, 35 Lois St, Norwalk, CT 06851, 800-848-7681, FAX: 203-849-0539, Email: mag@airpot.com, Web: www.airpot.com

Alden Products Co, 117 N Main St, Brockton, MA 02301-3908, 508-427-7000, FAX: 508-583-0164, Web: www.aldenproducts.com

Allegro MicroSystems Inc, 115 Northeast Cutoff, Worcester, MA 01606, 508-853-5000, FAX: 508-853-7895, Email: kanderson@allegromicro.com, Web: www.allegromicro.com

Allied Electronics Inc, 7151 Jack Newell Blvd S, Fort Worth, TX 76118, 817-595-3500, 800-433-5700, FAX: 817-595-6444, Email: quotes@alliedelec.com, Web: www.thinkallied.com

Altech Corp, 35 Royal Rd, Flemington, NJ 08822, 908-806-9400, FAX: 908-806-9490, Email: mario@altech.com, Web: www.altechcorp.com

Alturair, 9175 Lavell St, La Mesa, CA 91941, 619-449-1570, Email: info@alturair.com, Web: www.alturair.com

Alumacast, 3200 E Pershing, Appleton, WI 54911, Web: www.alumacast.com

Amacoil Inc, 2100 Bridgewater Rd, Aston, PA 19014, 610-485-8300, 800-252-2645, FAX: 610-485-2357, Email: amacoil@amacoil.com, Web: www.amacoil.com

Trade Names: Amacoil, -EasyLock, -Uhing

AMETEK, 900 Clymer Ave, Sellersville, PA 18960, 215-257-6531, FAX: 215-257-0934, Web: www.ametekhunterspring.com

AMETEK, 1725 Western Dr, West Chicago, IL 60185, 630-231-5900, 800-323-2593, FAX: 630-231-1377, Web: www.nationalcontrols.com

AMETEK, 820 Penna Blvd, Feasterville, PA 19053, 215-355-6900, Web: www.ametekhunterspring.com

AMETEK, 1080 N Crooks Rd, Clawson, MI 48017, 248-435-0700, 800-635-0289, FAX: 248-435-8120, Email: gemco@ametek.com, Web: www.ametekapt.com

AMETEK Precision Motion Control, 100 East Erie St, Kent, OH 44240, 330-673-3452, FAX: 330-677-3306, Email: info@ametekind.com, Web: www.ametektip.com

AMETEK Technical & Industrial, 110 East Erie St, Kent, OH 44240, Web: www.ametekdfs.com

AMETEK, 455 Corporate Blvd, Newark, DE 19702, 302-995-0400, 800-441-7777, FAX: 302-456-4444, Email: info.haveg@ametek.com, Web: www.ametekfpp.com

AMETEK, 287 27 Rd, Grand Junction, CO 81503, 970-242-8863, FAX: 970-245-6267, Web: www.ametekdixson.com

AMETEK, 4232 Temple City Blvd, Rosemead, CA 91770, 626-443-8933, FAX: 626-575-2437, Web: www.hcindustries.com

AMETEK Inc, 1100 Cassatt Rd, PO Box 1764, Berwyn, PA 19312, 610-647-2121, FAX: 215-323-9337

AMETEK, Rte 519, Eighty Four, PA 15330, 724-225-8400, FAX: 724-225-6622, Web: www.ametekmetals.com

Ametek Test & Calibration Instruments, 8600 Somers Dr, Largo, FL 33773, 727-536-7831, 800-527-9999, FAX: 910-668-3746, Email: rich.brown@ametek.com, Web: chatillon.com



AMK Drives and Controls Inc, 5631 S Laburnum Ave, Richmond, VA 23231, 804-222-0323, FAX: 804-222-0339, Email: info@amkdrives.com, Web: www.amkdrives.com

Trade Names: AMKAMAC, -AMKASmart, -AMKASYN, -DYNASYN

Analog Devices, One Technology Way, Norwood, MA 02062, 800-262-5643, Email: robert.berube@analog.com, patrick.kusior@analog.com, Web: www.analog.com

Applied Motion Products, 404 Westridge Dr, Watsonville, CA 95076, 831-761-6555, 800-525-1609, Email: sales@applied-motion.com, Web: www.applied-motion.com

Astro Met Inc, 9974 Springfield Pike, Cincinnati, OH 45215, 513-772-1242, 800-706-8849, FAX: 513-772-9080, Email: fgorman@astromet.com, Web: www.astromet.com

Trade Names: Amalox 68, -Amalox 87, -Amzirox 86, -Macor, -ZTA-96

Automationdirect.com, 3505 Hutchinson Rd, Cumming, GA 30040, 770-889-2858, 800-633-0405, FAX: 770-889-7876, Email: tgable@automationdirect.com, Web: www.automationdirect.com

B

Balluff Inc, 8125 Holton Dr, Florence, KY 41042, 859-727-2200, 800-543-8390, FAX: 859-727-4823, Email: balluff@balluff.com, Web: www.balluff.com

Bal Seal Engineering Inc, 19650 Pauling, Foothill Ranch, CA 92610, 949-460-2100, 800-366-1006, FAX: 949-460-2300, Email: mhalloran@balseal.com, Web: www.balseal.com

Trade Names: Bal Conn Electrical Contact, -Bal Contact, Electrical Contact, -Bal Seal Spring-Energized Seal, -Bal Spring, Canted Coil Spring, -Enduris, Ultra-High Pressure Seal, -Enforcer, High Force Canted Coil Spring, -LKS High PV Seal, -SYGNUS Implantable Contact System

Banner Engineering Corp, 9714 10th Ave N, Minneapolis, MN 55441, 763-544-3164, 888-3-SENSOR, FAX: 763-544-3213, Email: sensors@bannerengineering.com, Web: www.bannerengineering.com

Baumer Ltd, 122 Spring St, Ste C6, Southington, CT 06489, 860-621-2121, 800-937-9336, FAX: 860-628-6280, Email: sales.us@baumer.com, Web: www.baumer.com

Beckhoff Automation LLC, 13130 Dakota Ave, Savage, MN 55378, 952-890-0000, 877-TWINCAT, FAX: 952-890-2888, Email: beckhoff.usa@beckhoff.com, Web: www.beckhoffautomation.com

Trade Names: EtherCAT, -eXtended Automation (XA), -eXtended Transport System (XTS), -eXtreme Fast Control (XFC), -Scientific Automation, -TwinCAT, -TwinSAFE

BEI Sensors, 7230 Hollister Ave, Goleta, CA 93117, 805-968-0782, 800-350-2727, FAX: 805-968-3154, Email: contact@beisensors.com, Web: www.beisensors.com

BellowTech LLC, 1289 N Highway 1, Ste 1, Ormond Beach, FL 32174, 386-615-7530, FAX: 386-615-7973, Email: bellows@bellowstech.com, Web: www.bellowstech.com

Belt Technologies Inc, 11 Bowles Rd, Agawam, MA 01001, 413-786-9922, FAX: 413-789-2786, Email: iamaya@belttechnologies.com, Web: www.belttechnologies.com

The Bergquist Co, 18930 W 78th St, Chanhassen, MN 55317, 952-835-2322, 800-347-4572, FAX: 952-835-0430, Email: webmaster@bergquistcompany.com, Web: www.bergquistcompany.com

Beswick Engineering Co Inc, 284 Ocean Rd, Greenland, NH 03840, 603-433-1188, 800-354-5014, FAX: 603-433-1188, Email: mj@beswick.com, Web: www.beswick.com

Bird Precision, One Spruce St, Waltham, MA 02454, 800-454-7369, Email: sales@birdprecision.com, Web: www.birdprecision.com

Bison Gear & Engineering Corp, 3850 Ohio Ave, St Charles, IL 60174, FAX: 630-377-6777, Web: www.bisongear.com

Boker's Inc, 3104 Snelling Ave, Minneapolis, MN 55406, 612-729-9365, 800-927-4377, FAX: 612-729-8910, Web: www.bokers.com

Boyd Coatings Research Co Inc, 51 Parmenter Rd, Hudson, MA 01749, 978-562-7561, 800-258-0110, FAX: 978-562-9622, Email: info@boydcoatings.com, Web: www.boydcoatings.com

Branson Ultrasonics Corp, 41 Eagle Rd, PO Box 1961, Danbury, CT 06813, 203-796-0400, 888-282-5646, FAX: 203-796-9838, Email: info@bransonultrasonics.com, Web: www.bransonultrasonics.com

Braxton Mfg Co Inc, 858 Echo Lake Rd, Watertown, CT 06795, 860-274-6781, FAX: 860-274-9195, Email: sales@braxtonmfg.com, Web: www.braxtonmfg.com

B&R Industrial Automation Corp, 1250 Northmeadow Pkwy, Roswell, GA 30076, 770-772-0400, 800-752-2637, FAX: 770-772-0243, Email: office.us@br-automation.com, Web: www.br-automation.com

C

Carlyle Johnson Machine Co, 291 Boston Turnpike, Bolton, CT 06043, 860-643-1531, FAX: 860-646-2645, Email: maxitorq@cjmco.com, Web: www.cjmco.com

Carr Lane Mfg Co, 4200 Carr Lane Ct, PO Box 191970, St Louis, MO 63119, 314-647-6200, FAX: 314-647-5736, Email: info@carrlane.com, Web: www.carrlane.com

Trade Names: **CL5 Carr Lock Tiny Vise**

Carter Mfg Co, 1725 Airpark Dr, Grand Haven, MI 49417, 616-842-8760, Web: www.carterbearings.com

Celera Motion, 125 Middlesex Tpk, Bedford, MA 01730, 781-266-5700, FAX: 781-266-5112, Web: www.celeramotion.com

Century Spring Corp, 222 E 16th St, Los Angeles, CA 90015, 800-237-5225, Email: info@centuryspring.com, Web: www.centuryspring.com

Ceramco Inc, 1467 E Main St, Center Conway, NH 03813-0300, 603-447-2090, FAX: 603-447-3906, Email: info@ceramcoceramics.com, Web: www.ceramcoceramics.com

Cicoil Flexible Flat Cable, 24960 Avenue Tibbitts, Valencia, CA 91355, 661-295-1295, FAX: 661-295-0813, Web: www.cicoil.com

Trade Names: **Flexrail Stripmount**

Clippard Instrument Laboratory Inc, 7390 Colerain Ave, Cincinnati, OH 45239, 513-521-4261, 877-245-6247, FAX: 513-521-4464, Email: sales@clippard.com, Web: www.clippard.com

Trade Names: **Maximatic, -Minimatic**

Custom Machine & Tool Co., 301 Winter Street, Hanover, MA 02339, 781-924-1003, FAX: 781-924-5154, Email: cstevens@cmtco.com, Web: cmtco.com

Cognex Corp, 1 Vision Dr, Natick, MA 01760, 508-650-3000, 800-677-2646, FAX: 508-650-3344, Email: ron.pulicari@cognex.com, Web: www.cognex.com

COMSOL Inc, 1 New England Executive Park, Ste 350, Burlington, MA 01803, 781-273-3322, FAX: 781-273-6603, Email: info@comsol.com

Continental Hydraulics, 5505 W 123rd St, Savage, MN 55378, 952-895-6400, FAX: 952-895-6444, Web: www.continentalhydraulics.com

ControlAir Inc, 8 Columbia Dr, Amherst, NH 03061, 603-886-9400, FAX: 603-889-1844, Email: sales@controlair.com, Web: www.controlair.com

Craftech Inc, 8 Dock St, PO Box 636, Hudson, NY 12534, 518-828-5001, 800-833-5130, FAX: 518-828-9468, Email: info@craftechind.com, Web: www.craftechind.com

Curtis Universal Joint Co, 4 Bernie Ave, Springfield, MA 01107, 413-737-0281, 800-466-2144, FAX: 413-737-8430, Email: richk@curtisuniversal.com, Web: www.curtisuniversal.com

D

Dalton Electric Heating Co Inc, 28 Hayward St, Ipswich, MA 01938, 978-356-9844, FAX: 978-356-9846, Email: dalton@daltonelectric.com, Web: www.daltonelectric.com

Delta Computer Systems, 1818 SE 17th St, Battle Ground, WA 98604, 360-254-8688, FAX: 360-254-5435, Email: technicalsales@deltamotion.com, Web: www.deltamotion.com

Design 2 Part, PO Box 7193, Prospect, CT 06712, 203-758-6663, 800-225-4535, FAX: 203-758-6664, Email: info@jobshop.com, Web: www.design2part.com

SDP/SI Stock Drive Products/Sterling Instrument, 2101 Jericho Turnpike, New Hyde Park, NY 11010, 516-328-3300, 800-345-1144, FAX: 516-326-8827, Email: sdp-sisupport@sdp-si.com, Web: www.sdp-si.com

Deublin Co, 2050 Norman Dr W, Waukegan, IL 60085, 847-689-8600, FAX: 847-689-8690, Web: www.deublin.com

Devcon, 30 Endicott St, Danvers, MA 01923, 978-777-1100, 800-933-8266, FAX: 978-774-0516, Email: oeminfo@devcon.com, Web: www.devcon.com

Dexmet Corp, 22 Barnes Industrial Rd S, Wallinton, CT 06492, 203-294-4440, FAX: 203-294-7899, Email: e.toro@dexmet.com, Web: www.dexmet.com

Diequa Corp, 180 Covington Dr, Bloomingdale, IL 60108, 630-980-1133, FAX: 630-980-1232, Email: info@diequa.com, Web: www.diequa.com

Trade Names: **DYNABOX, -GIRARD, -PLANETDRIVE, -PLANETROLL, -SERVOFOX, -TANDLER, -VARVEL, -WATDRIVE, -ZIMM**

Digi-Key Corp, 701 Brooks Ave S, Thief River Falls, MN 56701, 218-681-6674, 800-344-4539, FAX: 218-681-3380, Email: sales@digikey.com, Web: www.digikey.com

Donwell Co, 130 Sheldon Road, PO Box 906, Manchester, CT 06042, 860-649-5374, 800-864-2702, FAX: 860-647-0074, Email: donwell@donwell.com, Web: www.donwell.com

Dorner Mfg Corp, 975 Cottonwood Ave, PO Box 20, Hartland, WI 53029, 262-367-7600, 800-397-8664, FAX: 800-369-2440, Email: info@dorner.com, Web: www.dorner.com

Duff-Norton, Box 7010, Charlotte, NC 28241, 800-477-5002, Email: sales@duffnorton.com, Web: www.duffnorton.com

Dura-Belt, 3119 Scioto Darby Exec Ct, Hilliard, OH 43026, 614-777-0295, 800-770-2358, Email: info@durabelt.com, Web: www.durabelt.com

Dymax Corp, 318 Industrial Ln, Torrington, CT 06790, 860-482-1010, 877-396-2988, FAX: 860-496-0608, Email: info@dymax.com, Web: www.dymax.com

Dynatect Manufacturing Inc, 2300 S Calhoun Rd, New Berlin, WI 53151, 262-786-1500, 800-298-2066, FAX: 262-786-3280, Email: sales@dynatect.com, Web: www.Dynatect.com

Trade Names: **Dynatect LSI, -Dynatect Ro-Lab, -Gortite, -Gortrac, -Polyclutch**

E

Eagle Stainless Tube & Fabrication Inc, 10 Discovery Way, Franklin, MA 02038, 508-528-8650, 800-528-8650, FAX: 508-520-1954, Email: info@eagletube.com, Web: www.eagletube.com

EA0 Switch Corp, 98 Washington St, Milford, CT 06460, 203-877-4577, FAX: 203-877-3694, Email: sales@eaoswitch.com, Web: www.eaoswitch.com

ebm-papst Inc, 100 Hyde Rd, Farmington, CT 06034, 860-674-1515, FAX: 860-674-8536, Email: sales@us.ebmpapst.com, phil.hartman@us.ebmpapst.com, kyle.wills@us.ebmpapst.com, Web: www.ebmpapst.us

ElectroCraft, 1 Progress Dr, Dover, NH 03920, 603-742-3330, Email: rkerber@electrocrafter.com, Web: www.electrocrafter.com

Electro Static Technology, 31 Winterbrook Rd, Mechanic Falls, ME 04256, 207-998-5140, 866-738-1857, FAX: 207-998-5143, Email: sales@est-static.com, Web: www.est-static.com

Electrotech Sales Group LLC, 151 Discovery Dr #112, Colmar, PA 18915, 215-997-8855, FAX: 215-822-7632, Email: sales@esgllc-usa.com, Web: www.esgllc-usa.com

Elmo Motion Control, 42 Technology Way, PO Box 49103, Nashua, NH 03060, 603-821-9979, FAX: 603-821-9943, Email: jmclaughlin@elmo.com, Web: www.elmomc.com

Encoder Products, PO Box 249, Sagle, ID 83860, 208-263-8541, Email: steved@encoder.com, Web: www.encoder.com

Enfield Technologies, 35 Nutmeg Dr, Trumbull, CT 06611, 203-375-3100, 800-504-3334, Email: info@enfieldtech.com, Web: www.enfieldtech.com

ENM Company, 5617 Northwest Hwy, Chicago, IL 60646, 773-775-8400, 888-372-0465, FAX: 773-775-5968, Email: customerservice@enmco.com, Web: www.enmco.com

Trade Names: **Counting Instruments, -Electrical Electronic, -ENM Counting Devices, -ENM Counting Instruments, -Medical Devices**

EPSON America Inc, 3840 Kilroy Airport Way, Long Beach, CA 90806, 562-981-3840, Web: www.epson.com

Exair Corp, 11510 Goldcoast Dr, Cincinnati, OH 45249, 513-671-3322, 800-903-9247, FAX: 513-671-3363, Email: techhelp@exair.com, Web: www.exair.com

Exergen Corp, 400 Pleasant St, Watertown, MA 02472,
617-923-9900, 800-422-3006, FAX: 617-923-9911,
Email: rharris@exergen.com, Web: www.exergen.com

Exlar Corp, 1470 Lake Dr W, Chanhassen, MN 55317,
952-368-3434, FAX: 952-368-4877, Email: bgallea@exlar.com,
Web: www.exlar.com

F

Fabco-Air Inc, 3716 NE 49th Ave, Gainesville, FL 32609,
352-373-3578, FAX: 352-375-8024,
Email: Bill_Schmidt@fabco-air.com,
Web: www.fabco-air.com

Trade Names: Dial-A-Stroke, •Hi-Power, •Longstroke,
•Mini-Pancake, •Multi-Power, •Pancake, •Pro-Coat,
•The Pancake Line

Fabrico, 4175 Royal Dr, Ste 800, Kennesaw, GA 30144,
800-351-8273, FAX: 678-202-2702, Email: info@fabrico.com,
Web: www.fabrico.com

Farm Design Inc, 12 Silver Lake Rd, Hollis, NH 03049,
603-465-9800, Email: info@farmpd.com,
Web: www.farmpd.com

Festo Corp, 395 Moreland Rd, PO Box 18023, Hauppauge, NY
11788, 631-435-0800, 800-99-FESTO, FAX: 631-435-8026,
Email: customer.service@us.festo.com, Web: www.festo.com/us

FineLine Prototyping Inc, 9310 Focal Point, Ste 100,
Raleigh, NC 27617, 919-781-7702, FAX: 919-781-7612,
Email: sales@finelineprototyping.com,
Web: www.finelineprototyping.com

Trade Names: DMLS, •Selective Laser Sintering, •Stereolithography

Firestone Specialty Products, 641 Ohio St, Terre Haute, IN 47807,
866-367-3531, Web: www.firestoneip.com

Floyd Bell Inc, 720 Dearborn Park Ln, Worthington, OH
43085-5703-20, 614-294-4000, 888-356-9323,
FAX: 614-291-0823, Email: mkent@floydbell.com,
Web: www.floydbell.com

Fluid Metering Inc, 5 Aerial Way, Ste 500, Syosset, NY 11791,
516-922-6050, 800-223-3388, FAX: 516-624-8261,
Email: pumps@fmipump.com, Web: www.fmipump.com

Trade Names: CeramPump, •Radio:Matic, •Smooth-Flo

Fluoron Inc, 505 Blue Ball Rd, Ste 120A, Elkton, MD 21921,
410-392-0220, Email: sales@fluoron.com,
Web: www.fluoron.com

Trade Names: Fluoro-Coat 200, •Fluoro-Coat X-550, •Fluoro-Safe,
•Fluoro-Shrink P, •Fluoro-Stat 102, •Fluoro-Tac

G

Galil Motion Control, 3750 Atherton Rd, Rocklin, CA 95765,
916-626-0101, 800-377-6329, FAX: 916-626-0102,
Email: galil@galilmc.com, Web: www.galilmc.com

Garland Mfg Co, 55 Industrial Park Rd, PO Box 538, Saco, ME 04072,
207-283-3693, 800-727-1900, FAX: 207-283-4834,
Email: dgarland@garlandmfg.com,
Web: www.garlandmfg.com

Gems Sensors & Controls, 1 Cowles Rd, Plainville, CT 06062,
860-747-3000, 800-378-1600, FAX: 860-747-4244, Email:
tomilyn.doyle@gemssensors.com, Web: www.gemssensors.com

Trade Names: Diptape, •Psibar, •Rotor Flow, •Safe-Pak, •SureSite,
•Turbo Flow, •Warrick

GGB Bearing Technology, 700 Mid Atlantic Pkwy, Thorofare, NJ
08086, 856-848-3200, FAX: 856-848-5115,
Email: marketing@ggbbearings.com,
Web: www.ggbbearings.com

GMN USA, 1784 New Britain Ave, Farmington, CT 06032,
800-686-1679, Email: info@gmnuma.com,
Web: www.gmnuma.com

Greene Rubber Co, 20 Cross St, Woburn, MA 01801, 781-937-9909,
800-354-1954, FAX: 781-937-9739,
Email: bponn@greenerubber.com,
Web: www.greenerubber.com

GripNail - Industrial Metal Fasteners, 97 Dexter Rd, East
Providence, RI 02914, 401-431-1791, 800-474-7624,
FAX: 401-438-8520, Email: info@gripnail.com,
Web: www.gripnail.com

Trade Names: DriveTacks, •GripNails, •GripNailers-Automatic
Fastening Center, •MetalTacks, •PowerPinner Welders,
•PowerPoint Weld Pins, •PunchPins, •SnapStik Insulation
Hangers, •SnapStik Spindle Anchors, •TackMounts

Groschopp Inc, 420 15th St NE, Sioux Center, IA 51250,
712-722-4135, 800-829-4135, FAX: 712-722-1445, Email:
brendab@groschopp.com, Web: www.groschopp.com

GTC Falcon Inc, 118 Long Pond Rd, Plymouth, MA 02360,
508-746-0200, 888-309-0646, FAX: 508-746-6494,
Email: jrleto@aol.com, Web: www.gtcfalcon.com

H

Harmonic Drive LLC, 247 Lynnfield St, Peabody, MA 01960,
978-532-1800, 800-921-3332, Email: marketing@
harmonicdrive.net, Web: www.harmonicdrive.net

HAWE Hydraulics, 9009 K Perimeter Woods Dr, Charlotte, NC
28216, 704-509-1599, FAX: 704-509-6302, Email: sales@
hawe hydraulics.com, Web: www.haweusa.com

Haydon Kerk Motion Solutions Inc, 1500 Meriden Rd, Waterbury,
CT 06705, 203-756-7441, 800-243-2715, FAX: 203-756-8724,
Email: marcia.colucci@ametek.com,
Web: www.haydonkerk.com

HBM Inc, 19 Bartlett St, Marlborough, MA 01752, 800-578-4260,
FAX: 508-485-7480, Email: info@usa.hbm.com,
Web: www.hbm.com

Helical Products Co Inc, PO Box 1069, Santa Maria, CA 93456,
805-928-3851, 888-211-9589, FAX: 805-928-2369,
Email: sales@heli-cal.com, Web: www.heli-cal.com

Henkel Corporation, 18930 W 78th St, Chanhassen, MN 55317,
952-835-2322, 800-347-4572, FAX: 952-835-0430,
Email: janna.watzke@henkel.com,
Web: www.bergquistcompany.com

Trade Names: Loctite

**Hiwin Corp, 1400 Madeline Ln, Elgin, IL 60124,
847-827-2270, 877-804-4946, FAX: 847-827-2291,
Email: info@hiwin.com, Web: www.hiwin.com**

Hoffman, 2100 Hoffman Way, Anoka, MN 55303, 763-421-2240,
FAX: 763-422-2178, Web: www.hoffmanonline.com

Honeywell Inc, 1985 Douglas Dr N, Golden Valley, MN 55422,
763-954-4570

Hotwatt Inc, 128 Maple St, Danvers, MA 01923, 978-777-0070,
FAX: 978-774-2409, Email: jim@hotwatt.com,
Web: www.hotwatt.com

Trade Names: GLASROPE, •SUPERWATT

Humphrey Products, 5070 E'N' Ave, PO Box 2008, Kalamazoo,
MI 49003, 269-381-5500, 800-477-8707, FAX: 269-381-4113,
Email: websales@humphrey-products.com,
Web: www.humphrey-products.com

I

IDEC Corp, 1175 Elko Dr, Sunnyvale, CA 94089, 408-747-0550,
800-262-4332, FAX: 408-745-5258,
Email: opencontact@idec.com, Web: www.idec.com/usa

**igus Inc, PO Box 14349, East Providence, RI 02914,
401-438-2200, 800-521-2747, FAX: 401-438-7270,
Email: cdennen@igus.com, Web: www.igus.com**

Trade Names: igus Inc

IKO Intl Inc, 91 Walsh Dr, Parsippany, NJ 07054, 973-402-0254,
800-922-0337, FAX: 973-402-0441, Email: jlongo@ikonet.co.jp,
Web: www.ikont.com

Industrial Encoder Corp, 22 Commerce Pl, St. Catharines, ON L2S
0B3, 905-984-3256, 888-277-6205, FAX: 905-984-5017,
Email: info@globalencoder.ca, Web: www.globalencoder.ca

Infranor Inc, 299 Ballardvale St, Ste 4, Wilmington, MA 01887,
978-988-9002, 800-237-3786, FAX: 978-988-9112,
Email: info@infranorusa.com, Web: www.infranorusa.com

Trade Names: AC Servo Drive, •Brushless Servo Motor, •Motors,
•Pancake Motor, •Servo Drive, •Servo Motor, •Slotless Brushless
Servo Motor, •Slotless Servo Motor

Instron, 825 University Ave, Norwood, MA 02062, 781-575-5000,
800-564-8378, FAX: 781-575-5751, Email: carly_kinch@instron.
com, Web: www.instron.com

**Intech Corp, 250 Herbert Ave, Closter, NJ 07624,
201-767-8066, FAX: 201-767-7797, Email: info@
intechpower.com, Web: www.intechpower.com**

**International Fluid Power Exposition, 1300 E 9th Street,
Suite 2400, Milwaukee, WI 53214 US, 414-274-0693,
800-867-6060, Email: info@ifpe.com,
Web: www.ifpe.com**

Iwaki America Inc, 5 Boynton Rd, Holliston, MA 01746,
508-429-1440, FAX: 508-429-1386,
Email: info@iwakiamerica.com, Web: www.iwakiamerica.com

J

The Job Shop Company, 16 Waterbury Rd, PO Box 7193,
Prospect, CT 06712, 203-758-6663, FAX: 203-758-6883,
Email: eich@d2p.com

JR Merritt Controls Inc, 55 Sperry Ave, Stratford, CT 06615,
203-381-0100, 800-333-5762, FAX: 203-381-0400,
Email: info@jrmerritt.com,
Web: www.jrmerritt.com

K

Kaman Industrial Technologies, 1 Vision Way, Bloomfield, CT
06002, 860-687-5000, Email: Dave.Mayer@kaman.com,
Web: www.KamanACE.com

Kavlico Corp, 14501 Princeton Ave, Moorpark, CA 93021,
805-523-2000, FAX: 805-523-7125, Email: sales@kavlico.com,
Web: www.kavlico.com

**Kepler Products Co, 995 N Ellsworth Ave, Villa Park,
IL 60181, 630-279-1550, FAX: 630-279-9669, Email:
wkukum@kepler.com**

Ketterer, 1010 Randolph St, Thomasville, NC 27360, 336-472-5300,
Email: heath@ketterer.us.com, Web: www.ketterer.us



**Keystone Electronics Corp, 31-07 20th Rd, Astoria, NY
11105, 718-956-8900, 800-221-5510, FAX: 718-956-9040,
Email: kec@keyelco.com, Web: www.keyelco.com**

**KHK USA Inc, 259 Elm Pl, Mineola, NY 11501, 516-248-3850,
FAX: 516-248-4385, Email: info@khkgears.us,
Web: www.khkgears.us**

KNF Neuberger Inc, 2 Black Forest Rd, Trenton, NJ 08691,
609-890-8600, Email: knfusa@knf.com, Web: www.knf.com/usa

Kubotek USA Inc, 2 Mount Royal Ave, Ste 500, Marlborough, MA
01752, 508-229-2020, 800-372-3872, FAX: 508-229-2121,
Email: jagoglia@kubotek3d.com, Web: www.kubotekusa.com

Kurt Mfg, 302 Jeffers Ave, Lyman, NE 69352, 308-787-0127,
866-257-7995, FAX: 308-787-1281, Email: kurthyd@aol.com,
Web: www.kurthydraulics.com

L

**LAPP Group, 29 Hanover Rd, Florham Park, NJ 07932,
973-660-9700, Email: ldonvovan@lappusa.com,
Web: www.lappusa.com**

**Trade Names: ETHERLINE, • EPIC, • FLEXIMARK, • HITRONIC • LAPP
Group, • LAPP USA, • LFLEX, • SILVYN, • SKINTOP, • UNITRONIC**

Lauren Mfg, 2228 Reiser Ave SE, New Philadelphia, OH 44663,
800-683-0676, FAX: 330-339-1515,
Email: solutions@lauren.com, Web: www.lauren.com

The Lee Company, 2 Pettipaug Rd, PO Box 424, Westbrook, CT
06498, 860-399-6281, 800-LEE-PLUG, FAX: 860-399-2270,
Email: kingsburyj@theleeco.com, Web: www.theleeco.com

Leeson Electric Motors, 2100 Washington St, PO Box 241, Grafton,
WI 53080, 262-377-8810, FAX: 262-377-9025, Email: leeson@
leeson.com, Web: www.leeson.com

Lee Spring, 140 58th St, #3C, Brooklyn, NY 11220, 718-236-2222,
888-777-4647, FAX: 888-426-6655, Email: sales@leespring.com,
Web: www.leespring.com

Lemo USA Inc, PO Box 2408, Rohnert Park, CA 94928,
707-578-8811, 800-444-5366, FAX: 707-206-3774,
Email: info@lemousa.com, Web: www.lemo.com

Lenze Americas, 630 Douglas St, Uxbridge, MA 01569,
508-278-9100, 800-217-9100, FAX: 508-278-7873,
Email: marketing@lenzeamericas.com,
Web: www.lenze.com

**Trade Names: AC Tech, •Drive Solution Designer,
•Easy Explorer, •INTORO, •L-force Automation,
•L-force Engineer, •PositionServo, •SimpleServo,
•SMVector**

LIKA Electronics SRL, LIKA Electronics SRL, Carre' (VI) - Italia
FAX: +39 (0)445806699, Web: www.lika.biz

LINAK US, 2200 Stanley Gault Pkwy, Louisville, KY 40223,
502-253-5595, Email: meaton@linak-us.com,
Web: www.linak-us.com

Linemaster Switch Corp, 29 Plaine Hill Rd, PO Box 238, Woodstock,
CT 06281, 860-974-1000, FAX: 860-974-9100,
Email: info@linemaster.com, Web: www.linemaster.com

Linmot, 204 E Morrissey Dr, Elkhorn, WI 53121, 262-743-2555,
Web: www.linmot.com

Lubriplate Lubricants Company, 129 Lockwood St, Newark, NJ
07105, 800-733-4755, FAX: 800-347-5329,
Email: info@lubriplate.com, Web: www.lubriplate.com

Trade Names: Lubriplate Lubricants

M

Mach III Clutch Inc, 101 Cummings Dr, Walton, KY 41094,
859-291-0849, 866-291-0849, FAX: 859-655-8362,
Email: info@machiii.com, Web: www.machiii.com

Madison Co, 27 Business Park Dr, Branford, CT 06405,
203-488-4477, 800-466-5383, FAX: 203-481-5036,
Email: info@madisonco.com, Web: www.madisonco.com

Mahr Federal Inc, 1144 Eddy St, Providence, RI 02905,
401-784-3100, 800-343-2050, FAX: 401-784-3246,
Email: information@mahr.com, Web: www.mahr.com

**Trade Names: Digimar, •Dimensionair, •Dimentron, •MarForm,
•MarMotion, •MarShaft, •MarSurf, •Maxum, •Pocket Surf,
•Precimar**

Massa Products, 280 Lincoln St, Hingham, MA 02043,
781-749-4800

maxon precision motors, inc, 101 Waldron Rd, Fall River, MA 02720,
508-677-0520, 800-865-7540, FAX: 508-677-0530,
Email: info@maxonmotorusa.com,
Web: www.maxonmotorusa.com

Mayr Corporation, 4 North St, Waldwick, NJ 07463, 201-445-7210,
800-465-6297, FAX: 201-445-8019, Email: info@mayrcorp.com,
Web: www.mayrcorp.com

Mentor Graphics Corp/Mechanical Analysis Division, 8005
SW Boeckman Dr, Wilsonville, OR 97070, 503-685-8000,
800-547-3000, Email: design_simulation@mentor.com,
Web: go.mentor.com/mechanical-analysis

**Metal Powder Ind. Federation, 105 College Rd, Princeton,
NJ 08540-6692, 609-452-7700, FAX: 609-987-8523,
Email: jdale@mpif.org, Web: mpif.org**

MICO Inc, 1911 Lee Blvd, North Mankato, MN 56003,
507-625-6426, FAX: 507-625-3212, Email: micomail@mico.com,
Web: www.mico.com

MICROMO, 14881 Evergreen Ave, Clearwater, FL 33762,
727-572-0131, 800-807-9166, FAX: 727-573-5918,
Email: marketing@micromo.com, Web: www.micromo.com

Micronor Inc, 3483 Old Conejo Rd Ste 203, Newbury Park, CA
91320, 805-499-0114, FAX: 805-499-6585,
Email: sales@micronor.com, Web: www.micronor.com

Microstrain Inc, 459 Hurricane Ln Ste 102, Williston, VT 05495,
802-862-6629, 800-449-3878, FAX: 802-863-4093,
Email: rmcorneau@microstrain.com,
Web: www.microstrain.com

**Midwest Motion Products, 10761 Ahern Ave SE,
Watertown, MN 55388, 952-955-2626,
FAX: 480-247-4096, Email: sales@midwestmotion.com,
Web: www.midwestmotion.com**

**Trade Names: MMP - 20A Series Controls, •MMP - 25A Series
Controls, •MMP - 815 BR Servo Amplifier, •MMP - D22 Series
Motors, •MMP - D33 Series Motors, •MMP - D40 Series Motors,
•MMP - S22 Series Motors, •MMP - S27 Series Motors,
•MMP - TM3 Series Motors, •MMP - TM57 Series Motors**

Miki Pulley, 13200 Sixth Ave N, Plymouth, MN 55441,
763-546-4300, 800-533-1731, FAX: 763-546-8260,
Email: sales@mikipulley-us.com,
Web: www.mikipulley-us.com

Miller-Stephenson Chemical Co Inc, George Washington Hwy,
Danbury, CT 06810, 203-743-4447, 800-992-2424,
FAX: 203-791-8702, Email: rrwilcox@miller-stephenson.com,
Web: www.miller-stephenson.com

Minalex Corp, 25 Coddington Rd, PO Box 247,
Whitehouse Station, NJ 08889

Minco Products Inc, 7300 Commerce Ln, Minneapolis, MN 55432,
763-571-3121, FAX: 763-571-0927, Email: sales@minco.com,
Web: www.minco.com

Minnesota Rubber and Plastics, 1100 Xenium Ln N,
Minneapolis, MN 55441, 952-927-1400, FAX: 952-927-1470,
Email: webmaster@mnrubber.com, Web: www.mnrubber.com

MITRPAK Power Transmission Products, PO Box 327, Uxbridge,
MA 01569, 508-278-2422, 800-648-7725, FAX: 508-278-7863,
Email: info@mitrpak.com, Web: www.mitrpak.com

Mitsubishi International Corp, 655 Third Ave, New York, NY 10017,
212-605-2392, FAX: 212-605-1030,
Email: ken.eben@mitsubishicorp.com,
Web: www.fiberopticalpof.com

mk North America, 105-125 Highland Park Dr, Bloomfield, CT
06002, 860-769-5500, FAX: 860-769-5505,
Email: info@mknorthamerica.com,
Web: www.mknorthamerica.com

**Trade Names: CleanMove, •CleanMove Sanitary Stainless Steel
Conveyors, •VersaMove, •VersaMove Pallet Conveyor System**

Molex, 2222 Wellington Ct, Lisle, IL 60532, 630-527-5290,
Email: carol.magosky@molex.com

Moog Components Group, 1213 North Main St, Blacksburg, VA
24060, 540-552-3011, FAX: 540-557-6400,
Email: mcg@moog.com, Web: www.moog.com/components

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Motor Components LLC, 2243 Corning Rd, Elmira Heights, NY 14903, 607-737-8371, Email: p.puleo@facet-purolator.com, Web: www.facet-purolator.com

Trade Names: CUBE Solid State, •DURA-LIFT, •Facet, •Facet/Purolator, •GOLD-FLO, •POSI-FLO

Mott Corporation, 84 Spring Ln, Farmington, CT 06032, 860-747-6333, 800-289-6688, FAX: 860-747-6739, Email: quest@mottcorp.com, Web: www.mottcorp.com

MTI Instruments Inc, 325 Washington Ave Extension, Albany, NY 12205, 518-218-2550, 800-342-2203, Email: sales@mtiinstruments.com, Web: www.mtiinstruments.com

Murata Power Solutions, 11 Cabot Blvd, Mansfield, MA 02048, 508-339-3000, 800-233-2765, FAX: 508-339-6356, Email: sales@murata-ps.com, Web: www.murata-ps.com

MW Industries - Century Spring, 222 E 16th St, Los Angeles, CA 90015, 213-763-8124, FAX: 213-749-3802, Email: jteeter@mw-ind.com, Web: mw-ind.com

N

Nanotec Electronic US Inc, 38 Montvale Ave, Ste 255 C15, Stoneham, MA 02180, 781-219-3343, FAX: 781-498-1344, Email: info@us.nanotec.com, Web: www.nanotec.com

Trade Names: Plug & Drive DC Servos

National Instruments, 11500 N Mopac Expy, Austin, TX 78759, 800-531-5066, FAX: 512-683-8411, Email: info@ni.com, Web: www.ni.com

NBK America LLC, 421 Feheley Drive, Suite B, King of Prussia, PA 19406-2658, 484-685-7500, FAX: 484-685-7600, Email: info.us@nbk1560.com, Web: www.nbk1560.com

Trade Names: NBK America LLC NBK Nabeya bi-tech Kaisha

New England Miniature Ball Corp, 163 Greenwoods Rd W, PO Box 585, Norfolk, CT 06058, 860-542-5543, FAX: 860-542-5058, Email: sales@nemb.com, Web: www.nemb.com

New England Wire Technologies, 130 N Main St, Lisbon, NH 03585, 603-838-6624, FAX: 603-838-6160, Email: sales@newenglandwire.com, Web: www.newenglandwire.com

Trade Names: COLDflex, •HYflex, •NE-FI, •NEWcel, •NEWWind, •NEWtral, •NEWtuf

New Hampshire Ball Bearings Inc (NHBB), 9700 Independence Ave, Chatsworth, CA 91311, 818-993-4100, FAX: 818-407-5020, Email: info@nhbb.com, Web: www.nhbb.com

Nippon Pulse America Inc, 4 Corporate Dr, Radford, VA 24141, 540-633-1677, FAX: 540-633-1674, Email: ccummings@nipponpulse.com, Web: www.nipponpulse.com

Nordex Inc, 426 Federal Rd, Brookfield, CT 06804, 203-775-4877, 800-243-0986, FAX: 203-775-6552, Email: info@nordex.com, Web: www.nordex.com

NORD Gear Corp, 800 Nord Dr, Waunakee, WI 53597, 608-849-7300, 888-314-6673, FAX: 800-373-6673, Email: info.us@nord.com, Web: www.nord.com

Nordson EFD, 40 Catamore Blvd, East Providence, RI 02914-1206, 401-431-7000, Email: danielle.morando@nordsonefd.com, Web: www.nordsonefd.com

Novoteknik, 155 Northboro Rd, Southborough, MA 01772, 508-485-2244, 800-667-7492, FAX: 508-485-2430, Email: info@novoteknik.com, Web: www.novoteknik.com

Trade Names: Contelec, •Novostriuctive, •Novoteknik

Nusil Technology, 1050 Cindy Ln, Carpinteria, CA 93013, 805-684-8780, FAX: 805-566-9905, Email: silicone@nusil.com, Web: www.nusil.com

Nvidia, 2701 San Tomas Expwy, Santa Clara, CA 95050, 408-486-2000, FAX: 408-486-2200, Email: mhendess@nvidia.com, Web: www.nvidia.com

Nye Lubricants, 12 Howland Rd, Fairhaven, MA 02719, 508-996-6721, FAX: 508-997-5285, Email: jevans@nyelubricants.com, Web: www.smartgrease.com

O

Ocean Server Technology, 151 Martine St, Fall River, MA 02723, 508-678-0550, FAX: 508-678-0552, Email: sales@ocean-server.com, Web: www.ocean-server.com

The Oilgear Co, 2300 S 51st St, PO Box 343924, Milwaukee, WI 53219, 414-327-1700, 800-558-6636, FAX: 414-327-0532, Email: jbossard@oilgear.com, Web: www.oilgear.com

O'Keefe Controls Co, PO Box Q, Trumbull, CT 06611, 203-261-6711, 800-533-3285, FAX: 203-261-8331, Email: rokeefe@okeefecontrols.com, Web: www.okcc.com

Omegadyne Inc, 149 Stelzer Ct, Sunbury, OH 43074, 740-965-9340, 800-872-3963, FAX: 740-965-9438, Email: info@omegadyne.com, Web: www.omegadyne.com

Omega Engineering, One Omega Dr, Stamford, CT 06907, 203-359-1660, 800-848-4286, FAX: 203-359-7700, Email: info@omega.com, Web: www.omega.com

OndrivesUS.com, 216 N Main St, Freeport, NY 11520, 516-771-6777, 888-260-7466, Email: sales@ondrivesUS.com, Web: www.ondrivesUS.com

Trade Names: SERVO-BEAM, Flexible Shaft Coupling, •STEP-BEAM, Flexible Shaft Coupling

Onvio LLC, 20 Northwestern Dr, Salem, NH 03079, 603-685-0404 ext. 1105, 866-685-0404, FAX: 603-685-0405, Email: jdamico@onviollc.com, Web: www.onviollc.com

Opto 22, 43044 Business Park Dr, Temecula, CA 92590, 800-321-6786, FAX: 909-695-3095, Web: www.opto22.com

Orange Research Inc, 140 Cascade Blvd, Milford, CT 06460, 203-877-5657, 800-989-5657, FAX: 203-783-9546, Email: info@orangeresearch.com, Web: www.orangeresearch.com

P

The Paneloc Corp, 142 Brickyard Rd, Farmington, CT 06032, 860-677-6711, 800-394-6711, FAX: 860-677-8606, Email: shorner@paneloc.com, Web: www.paneloc.com

PAVE Technology Co Inc, 2751 Thunderhawk Ct, Dayton, OH 45414, 937-890-1100, FAX: 937-890-5165, Email: sales@pavetechnologyco.com, Web: www.pavetechnologyco.com

Pelican Products Inc, 23215 Early Ave, Torrance, CA 90505, 310-326-4700, 800-473-5422, FAX: 310-326-3311, Email: sales@pelican.com, Web: www.pelicanom.com

PennEngineering, 5190 Old Easton Rd, Danboro, PA 18916, 215-766-8853, 800-237-4736, FAX: 215-766-0143, Email: info@pemnet.com, Web: www.pemnet.com

Trade Names: Atlas, •MaxTite, •microPEM, •PEM, •PEMSERTER, •PennEngineering, •Plus+Tite, •SI, •SpinTite, •StickScrew

Pepperl+Fuchs Inc, 1600 Enterprise Pkwy, Twinsburg, OH 44087, 330-486-0001, FAX: 330-425-4607, Email: sales@us.pepperl-fuchs.com, Web: www.am.pepperl-fuchs.com

Performance Motion Devices, 80 Central St, Boxborough, MA 01719, 978-266-1210, Email: motion-control@pmdcorp.com, Web: www.PMDcorp.com

Trade Names: PMD

Peter Paul Electronics Co Inc, 480 John Downey Dr, New Britain, CT 06051, 860-229-4884, FAX: 860-223-1734, Email: info@peterpaul.com, Web: www.peterpaul.com

Photofabrication Engineering Inc, 500 Fortune Blvd, Milford, MA 01757, 508-478-2025, FAX: 508-478-3582, Email: rashman@photofabrication.com, Web: www.photofabrication.com

PIC Design, 86 Benson Rd, PO Box 1004, Middlebury, CT 06762, 203-758-8272, 800-243-6125, FAX: 203-758-8271, Email: info@pic-design.com, Web: www.pic-design.com

PI (Physik Instrumente) LP / Motion Positioning, 16 Albert St, Auburn, MA 01501, 508-832-3456, FAX: 508-832-0506, Email: bethp@pi-usa.us, Web: www.pi-usa.us

Trade Names: PIFOC, •PIglide, •PILine, •PImag, •Q-Motion

Pittman Motors, 343 Godshall Dr, Harleysville, PA 19438, 267-933-2105, FAX: 215-256-1338, Email: info.pittman-motors@ametec.com, Web: www.pittman-motors.com

Pivot Point Inc, PO Box 488, Hustisford, WI 53034, 920-349-3251, 800-222-2231, FAX: 920-349-3253, Email: mail@pivotpins.com, Web: www.pivotpins.com

Trade Names: Auto-Lock Safety Pull Pin, •Bow-Tie Locking Cotter, •Infinity S-Hook, •Nylon Lanyards, •Rue-Ring Locking Cotter, •SLIC Pin

PMI Industries LLC, 350 Buell Rd, Rochester, NY 14624, 585-464-8050, FAX: 585-328-6509, Email: greg.al@pmiindustries.com, Web: www.pmiindustries.com

Precision Paper Tube Co, 1033 S Noel Ave, Wheeling, IL 60090, 847-537-4250, FAX: 847-537-5777, Email: sales@pptube.com, Web: www.pptube.com

Primatics Inc, 32114 Mallard Ave, Tangent, OR 97389-0409, 541-791-9678, FAX: 541-791-9410, Email: info@primatics.com, Web: www.primatics.com

Proto Labs Inc, 5540 Pioneer Creek Dr, Maple Plain, MN 55359, 877-479-3680, FAX: 763-479-2679, Email: customerservice@protolabs.com, Web: www.protolabs.com

PTC, 140 Kendrick St, Needham, MA 02494, 781-370-5000, 888-782-3776, FAX: 781-370-6000, Email: dconnall@ptc.com, Web: www.ptc.com

Pyramid Inc, 522 N 9th Ave E, Newton, IA 50208, 641-792-2405, FAX: 641-792-2478, Email: sales@pyramidbelts.com, Web: www.pyramidbelts.com

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Quantum Devices Inc., 112 Orbison Street, Barneveld, WI 53507, 608-924-3000, FAX: 608-924-3007, Email: mgaribay@quantumdev.com, Web: quantumdev.com

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Raco Intl LP, 3350 Industrial Blvd, Bethel Park, PA 15102, 412-835-5744, 888-229-7226, FAX: 412-835-0338, Email: raco@racointernational.com, Web: www.racointernational.com

RBC Bearings, 102 Willenbrock Rd, Oxford, CT 06478, 800-390-3300, FAX: 203-267-5000, Email: info@rbcbearings.com, Web: www.rbcbearings.com

Reell Precision Mfg Inc, 1259 Willow Lake Blvd, Saint Paul, MN 55110, 651-486-3323, Email: info@reell.com, Web: www.reell.com

Trade Names: MH12 Friction Hinge, •MH14 Friction Hinge, •PH-35 Friction Hinge, •PolyTorq, •ReellTorq, •RT Series Friction Hinge, •Torque Insert, •vTilt Monitor Mount

Ringfeder Power Transmission Corp, 165 Carver Ave, Westwood, NJ 07675, 201-666-3320, 800-245-2580, FAX: 201-664-6053, Email: ross.rivard@ringfeder.com, Web: www.ringfeder.com

Rockwell Automation Inc, 1201 S Second St, Milwaukee, WI 53204-2496, 414-382-2000, 800-223-5354, FAX: 414-382-4444, Email: webmaster@rockwellautomation.com, Web: www.rockwellautomation.com

Rollon Corp, 30 Wilson Dr, Sparta, NJ 07871, 877-976-5566, FAX: 973-300-9030, Email: r.wood@rolloncorp.com, Web: www.rollon.com

Rotor Clip Company Inc, 187 Davidson Ave, Somerset, NJ 08873, 732-469-7333, FAX: 732-469-7898, Email: sales@rotorclip.com, Web: www.rotorclip.com

Roxtec Inc, 10127 E Admiral Pl, Tulsa, OK 74116, 918-254-9872, 800-520-4ROX, FAX: 918-254-2544, Email: info@us.roxtec.com, Web: www.roxtec.com

Ruland Manufacturing Co Inc, 6 Hayes Memorial Dr, Marlborough, MA 01752, 508-485-1000, 800-225-4234, FAX: 508-485-9000, Email: chris.gumas@ruland.com, Web: www.ruland.com

S

SAB North America, 344 Kaplan Dr, Fairfield, NJ 07004, 866-722-2974, FAX: 973-276-1515, Email: info@sabcable.com, Web: www.sabcable.com

Sapa Industrial Extrusions, 53 Pottsville St, Cressona, PA 17929, 800-233-3165, 800-233-3165, FAX: 800-252-4646, Web: www.sapagroup.com/industrialextrusions

Schaeffler Group USA Inc, 308 Springhill Farm Rd, Fort Mill, SC 29715, 803-548-8500, FAX: 803-548-8599, Email: walter.newton@schaeffler.com, Web: www.schaeffler.com

Schaeffler Group USA Inc, 200 Park Ave, PO Box 1933, Danbury, CT 06813-1933, 203-790-5474, 800-243-2532, FAX: 203-830-8171, Web: www.fag.com, www.fag.de/content.fag.de/en/index.jsp, www.schaeffler.us

Schneeberger Inc, 44 Sixth Rd, Woburn, MA 01801, 781-271-0140, 800-854-6333, FAX: 781-932-4127, Email: info-usa@schneeberger.com, Web: www.schneeberger.com

Trade Names: Karl Hipp GmbH, •Sferax SA

Schneider Electric Motion USA, 370 N Main St, Marlborough, CT 06447, 860-295-6102, FAX: 860-295-6107, Email: info@imshome.com, Web: www.motion.schneider-electric.com

Trade Names: hMTechnology, •Lexium MDrive, •MDrive, •MForce

Senior Aerospace, 1075 Providence Hwy, Sharon, MA 02067, 781-784-1400, 800-BELLOWS, FAX: 781-784-1405, Email: jmeyer@metalbells.com, Web: www.metalbells.com

Servometer, 501 Little Falls Rd, Cedar Grove, NJ 07009-1291, 973-785-4630, FAX: 973-785-0756, Email: info@servometer.com, Web: www.servometer.com

Trade Names: BellowsTech, •Interconnectric, •Flex-Nickel, •Servometer, •Servometric, •Servo-Flex, •Servo-Torque

SETCO Sales Co, 5880 Hillside Ave, Cincinnati, OH 45233, 513-941-5110, 800-543-0470, FAX: 513-941-6913, Email: sales@setcousa.com, Web: www.setcousa.com

SEW-Eurodrive Inc, 1295 Old Spartanburg Hwy, Lyman, SC 29365, 864-439-7537, FAX: 864-439-7830, Email: rmintz@seweurodrive.com, Web: www.seweurodrive.com

SFC KOENIG, 73 Defco Park Rd, North Haven, CT 06473, 203-245-1100, FAX: 203-245-3072, Email: info-us@sfckoenig.com, Web: www.sfckoenig.com

Trade Names: KOENIG CHECK VALVE, •KOENIG EXPANDER, •KOENIG RESTRICTOR, •SFC KOENIG

Shear-Loc, 23191 Peralta Dr, Laguna Hills, CA 92653, 949-768-8985, 800-775-5668, FAX: 949-768-8705, Email: sales@shear-loc.com, Web: www.shear-loc.com

Siemens Process Industries & Drives, 3333 Old Milton Pkwy, Alpharetta, GA 30005-4437, 770-751-2000, 800-241-4453, FAX: 678-297-8316, Email: helpline.sil@siemens.com, Web: www.usa.siemens.com/industry

Trade Names: SIMOGEAR

SKF USA Inc, 890 Forty Foot Rd, Lansdale, PA 19446, 267-436-6000, 800-440-4753, FAX: 267-436-6001, Email: skfusainfo@skf.com, Web: www.skfusa.com

SKF USA Inc, 890 Forty Foot Rd, PO Box 332, Kulpville, PA 19443, 267-436-6000, FAX: 267-436-6001, Email: skfusainfo@skf.com, Web: www.skfusa.com

Smalley Steel Ring Co, 555 Oakwood Rd, Lake Zurich, IL 60047, 847-719-5900, FAX: 847-719-5999, Email: info@smalley.com, Web: www.smalley.com

Trade Names: Constant Section Rings, •Crest-to-Crest Wave Springs, •Hoopster Retaining Rings, •Laminar Sealing Rings, •Smalley Linear Springs, •Smalley Wave Springs, •Spirolox Retaining Rings, •Wavo Springs

Solico-Mec Inc, 75 Locust St, Hartford, CT 06114, 860-527-3092, 800-275-7089, FAX: 800-275-7092, Email: bsorenson@wesgarde.com, Web: www.solico.com

SolidWorks Corp, 175 Wyman St, Waltham, MA 02451, 978-371-5000, 800-693-9000, FAX: 978-371-7303, Email: info@solidworks.com, Web: www.solidworks.com

SpaceClaim, 150 Baker Ave Ext, Concord, MA 01742

SPIROL, 30 Rock Ave, Danielson, CT 06239, 860-774-8571, FAX: 860-774-2048, Email: info@spiro.com, Web: www.spirol.com

Steinmeyer Inc, 56 Middlesex Tpke, Ste 200, Burlington, MA 01803, 781-273-6602, FAX: 781-273-6220, Email: jskaltas@steinmeyer.com, Web: www.steinmeyer.com

Symmco Inc, 40 S Park St, PO Box F, Sykesville, PA 15865, 814-894-2461, 800-458-6079, FAX: 814-894-5272, Email: sales@symmco.com, Web: www.symmco.com

T

Tadiran Inc, 2 Seaview Blvd, Port Washington, NY 11050, 516-621-4980, 800-537-1368, FAX: 516-621-4517, Web: www.tadiranbat.com

TDK-Lambda Americas, 3055 Del Sol Blvd, San Diego, CA 92154, 619-575-4400, 800-LAMBDA-4, FAX: 619-575-2245, Email: david.norton@us.tdk.lambda.com, Web: www.us.tdk-lambda.com/lp

Tech-Etch Inc, 45 Aldrin Rd, Plymouth, MA 02360, 508-747-0300, FAX: 508-746-9639, Email: sales@tech-etech.com, Web: www.tech-etech.com

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Therm-Omega, 353 Ivyland Rd, Warminster, PA 18974, 215-441-8967, Web: www.thermomegatech.com

Thomas Products Div, 1419 Illinois Ave, Sheboygan, WI 53081, 920-457-4091, 800-811-2129, FAX: 920-451-4237, Email: leads@rt pumps.com, Web: www.thomas pumps.com

Thomas Products Ltd, 987 West St, Southington, CT 06489, 860-621-9101, 800-666-9101, FAX: 860-621-1470, Email: cduksa@thomasprod.com, Web: www.thomasprod.com

TLX Technologies LLC, N27 W23727 Paul Rd, Pewaukee, WI 53072, 262-970-8660, FAX: 262-970-8665, Email: sales@tlxtech.com, Web: www.tlxtech.com

Torqmaster, 200 Harvard Ave, Stamford, CT 06902, 203-326-5945, 888-414-4643, Email: info@torqmaster.com, Web: www.torqmaster.com

Trade Names: Trade Names: Friction Hinges, Torque Hinges

Trans-Tek Inc, PO Box 338, Ellington, CT 06029, 860-872-8351, 800-828-3964, FAX: 860-872-4211, Email: nhamilton@transtekinc.com, Web: www.transtekinc.com

Trim-Lok Inc, 6855 Hermosa Cir, Buena Park, CA 90622, 714-562-0500, 888-874-6565, FAX: 714-562-0600, Email: info@trimlok.com, Web: www.trimlok.com

Tri Star Industries Inc, 101 Massirio Dr, Berlin, CT 06037, 860-828-7570, 800-882-8980, FAX: 860-828-7475, Email: sales@tristar-inserts.com, Web: www.tristar-inserts.com

Tri-Star Plastics Corp, 906 Boston Tpke, Shrewsbury, MA 01545, 508-845-1111, 800-TRI-STAR, FAX: 508-845-1200, Email: rcedrone@tstar.com, Web: www.tstar.com

Tri Town Plastics Inc, 12 Bridge St, Deep River, CT 06423, 860-526-3200, FAX: 860-526-4848, Email: tritown@ttplastics.com, Web: www.ttplastics.com

TUV SUD America, 10 Centennial Dr, Peabody, MA 01960, 978-573-2500, 800-TUV-0123, FAX: 978-977-0159, Email: casteinza@tuvam.com, Web: www.tuvamerica.com

U

Ulbrich Stainless Steels & Special Metals Inc, 153 Washington Ave, North Haven, CT 06473, 203-239-4481, 800-243-1676, FAX: 203-239-7479, Email: information@ulbrich.com, Web: www.ulbrich.com

Trade Names:

- Diversified Ulbrich Du Canada,
- Diversified Ulbrich of Canada,
- Ulbrich of California Inc,
- Ulbrich of Illinois Inc,
- Ulbrich of New England,
- Ulbrich Shaped Wire Inc,

- Ulbrich Solar Technologies Inc,
- Ulbrich Specialty Strip Mill,
- Ulbrich Specialty Wire Products,
- Ulbrino

Ultra Motion LLC, 22355 County Rd 48, Cutchogue, NY 11935, 631-298-9179, 888-321-9178, FAX: 631-298-6593, Email: sales@ultramotion.com, Web: www.ultramotion.com

Trade Names: Phase Index, -Servo Cylinder

UniMeasure, 4175 SW Research Way, Corvallis, OR 97333, 541-757-3158, 800-717-3158, FAX: 541-757-0858, Email: sales@unimeasure.com, Web: www.unimeasure.com

Unitronics Inc, 1 Batterymarch Park, Quincy, MA 02169, 617-657-6596, 866-666-6033, FAX: 617-657-6598, Email: usa.sales@unitronics.com, Web: www.unitronics.com

Universal Thread Grinding Co, 30 Chambers St, Fairfield, CT 06432, 203-336-1849, FAX: 203-366-1326

US Digital, 1400 NE 136th Ave, Vancouver, WA 98684, 360-260-2468, 800-736-0194, FAX: 360-260-2469, Email: sales@usdigital.com, Web: www.usdigital.com

V

Velmex, Inc., 7550 State Route 5 and 20, Bloomfield, NY 14469, 585-657-6151, 800-642-6446, FAX: 585-657-6153, Email: info@velmex.com, Web: www.velmex.com

Trade Names:

- UniSlide® Assemblies
- BiSlide® Assemblies - XSlide® Assemblies
- VXM™ Assemblies - VRO™ Readout

Visumatic Industrial Products, 856 Porter Pl, Lexington, KY 40508, 859-255-7907, FAX: 859-255-7909, Email: sales@visumatic.com, Web: www.visumatic.com

Vlier Products/Barry Controls, 82 South St, Hopkinton, MA 01748, 800-821-1090, Web: www.vlier.com

W

Watlow, 12001 Lackland Rd, St Louis, MO 63146, 314-878-4600, 800-WATLOW2, FAX: 877-893-1005, Email: inquiry@watlow.com, Web: www.watlow.com

Watson-Marlow Pumps Group, 37 Upton Technology Park Dr, Wilmington, MA 01887, 978-658-6168, 800-282-8823, FAX: 978-658-0041, Email: russell.merritt@wmftg.com, Web: www.wmpg.com

Whittet-Higgins Co, 33 Higginson Ave, Central Falls, RI 02863, 401-728-0700, FAX: 401-728-0703, Web: www.whittet-higgins.com

WIKA Instrument, 1000 Wiegand Blvd, Lawrenceville, GA 30043, 855-362-9452, Web: www.wika.us/mh3

Wilbrecht LEDCO Inc, 1400 Energy Park Dr #20, St Paul, MN 55108, 651-659-0919, 888-323-8751, FAX: 651-659-9204, Email: info@wilbrechtledco.com, Web: www.wilbrechtledco.com

Woodex Bearing Co, 216 Bay Point Rd, Georgetown, ME 04548, 207-371-2210, 800-526-8800, FAX: 207-371-2169, Email: sales@woodex-meco.com, Web: www.woodex-meco.com

World Encoders, 2200 N Stonington Ave Ste 240, Schaumburg, IL 60195, 847-252-7401, 800-903-9093, Email: sales@worldencoders.com, Web: www.worldencoders.com/

X

Xenon Corp, 37 Upton Dr, Wilmington, MA 01887, 978-661-9033, 800-878-3594, FAX: 978-661-9055, Email: info@xenoncorp.com, Web: www.xenoncorp.com

Y

Yaskawa America Inc / Drives & Motion Division, 2121 Norman Dr S, Waukegan, IL 60085, 847-887-7000, 800-YAS-KAWA, FAX: 847-887-7310, Email: marcom@yaskawa.com, Web: www.yaskawa.com

Trade Names:

- A1000, -iQpump, -MotionWorks, -MPiec,
- Sigma-5, -V1000, -Yaskawa Electric, -Z1000

Z

Zero-Max Inc, 13200 Sixth Ave N, Plymouth, MN 55441, 763-546-4300, 800-533-1731, FAX: 763-546-8260, Email: sales@zero-max.com, Web: www.zero-max.com

Trade Names: CD Coupling,

- Crown Gear right angle gear boxes,
- OHLA Overhung Load Adapters,
- Roh'Lix Actuators,
- ServoClass Coupling,
- Torq-Tender Overload Safety Devices,
- Zero-Max

ZF Electronics, 11200 88th Ave, Pleasant Prairie, WI 53158, 262-942-6500, Email: ryan.eder@zf.com, Web: www.cherrycorp.com


Trade Names:

- Cherry, -Cherry Energy Harvesting,
- Cherry Sensors, -Cherry Switches,
- ZF Energy Harvesting

(Continued from page 45)

Is there anything that you feel design engineers should know when working on gears?

To be concise, all novel designs of gear cutting tools, as well as all novel methods of gear machining/finishing, need to be developed in tight connection with the latest accomplishments in the theory of gearing. No perfect gears can be designed and manufactured if advances in the theory of gearing are ignored.

If the gear design is not based on the latest achievements in the scientific theory of gearing, then only approximate gears can be designed and manufactured. Approximate gears do not meet all of the requirements for today's gears: high power density, low noise excitation, etc. Furthermore, all of the efforts to increase the accuracy of approximate gears are not cost-effective. From the very beginning, gears must be designed as perfect gears, and not take the route of designing approximate gears as is often seen today. 

If the gear design is not based on the latest achievements in the scientific theory of gearing, then only approximate gears can be designed and manufactured. Approximate gears do not meet all of the requirements for today's gears: high power density, low noise excitation, etc.

STRAIGHT BEVEL GEARS

Bevel-gear and rack terminology: There are four basic types of bevel gears—straight, Zerol, spiral, and skew tooth. Bevel gears impose both thrust and radial loads in addition to the transmitted tangential forces on their support bearings. By convention, the direction of rotation of a bevel gear is viewed from the heel end of the gear looking toward the apex, whether it be clockwise or counterclockwise.

$$\tan(\text{pitch angle, pinion}) = \frac{\text{number of teeth in pinion}}{\text{number of teeth in gear}}$$

$$\tan(\text{pitch angle, gear}) = \frac{\text{number of teeth in gear}}{\text{number of teeth in pinion}}$$

When the shaft angle is less than 90°

$$\tan(\text{pitch angle, pinion}) = \frac{\sin(\text{shaft angle})}{\text{ratio} + \cos(\text{shaft angle})}$$

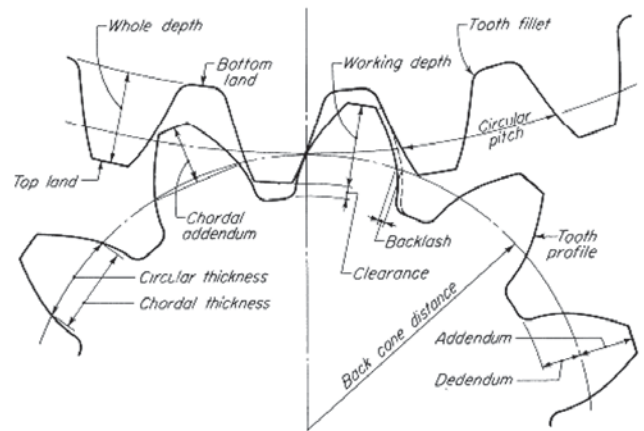
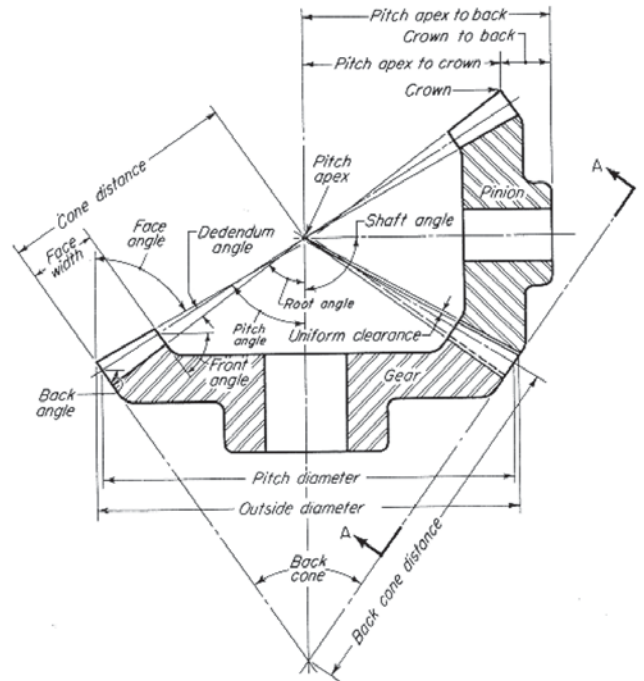
$$\tan(\text{pitch angle, gear}) = \frac{\sin(\text{shaft angle})}{\frac{1}{\text{ratio}} + \cos(\text{shaft angle})}$$

When the shaft angle is over than 90°

$$\tan(\text{pitch angle, pinion}) = \frac{\sin(180^\circ - \text{shaft angle})}{\text{ratio} - \cos(180^\circ - \text{shaft angle})}$$

$$\tan(\text{pitch angle, gear}) = \frac{\sin(180^\circ - \text{shaft angle})}{\frac{1}{\text{ratio}} - \cos(180^\circ - \text{shaft angle})}$$

In all the preceding cases,
Pitch angle, pinion + pitch angle, gear = shaft angle

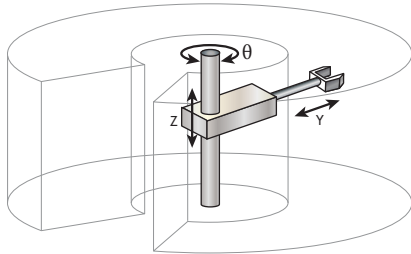


What's the Difference?

(Continued from page 25)

movements occur within a cylindrical-shaped work envelope. Cylindrical robots are used for assembly operations, handling of machine tools and die-cast machines, and spot welding.

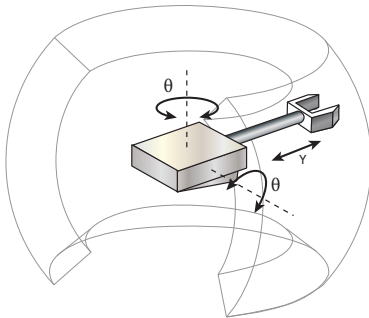
The cylindrical robot has a rotary joint along the joint axis for rotation movement and a prismatic joint for linear motion.



Spherical Robots

These are also known as polar robots. The arm is connected to the base with a twisting joint, and has a combination of two rotary joints and one linear joint. The axes of the combined joints form a polar coordinate system and operate within a spherical-shaped work envelope. These robots are used for handling of machine tools, spot welding, die casting, fettling machines, and gas and arc welding.

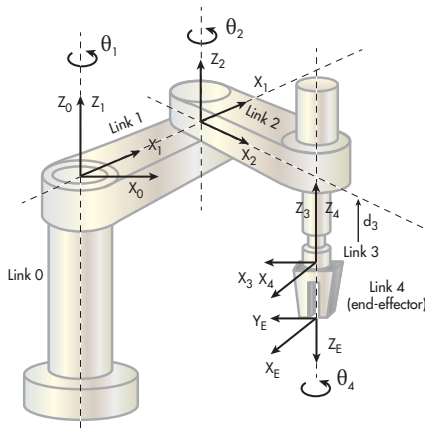
With its combined rotational joint, two rotary joints, and a linear joint, the spherical robot operates in the polar coordinate system to achieve a spherical-shaped work envelope.



SCARA Robots

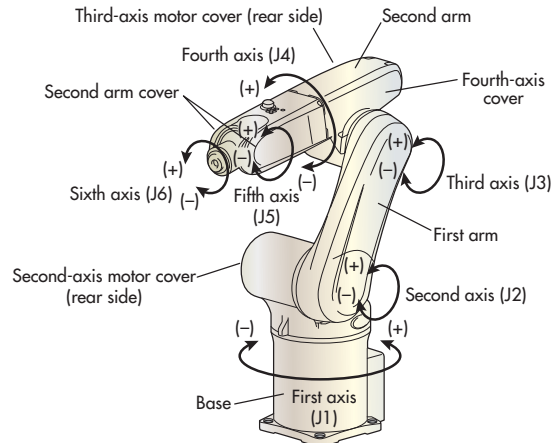
SCARA robots are primarily used for assembly applications. The compliant arm, which is cylindrical in design, is comprised of two parallel joints that provide it with compliance in one selected plane. These robots are used for pick-and-place work, application of sealant, assembly operations, and handling of machine tools.

A SCARA robot is mainly used in assembly applications due to the nature of its movement, such as jobs that require drilling or tapping assemblies.



Robotic Arms

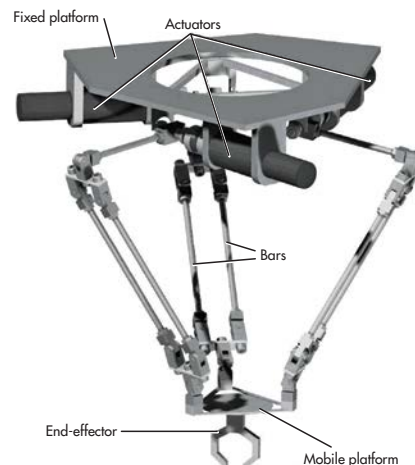
Robotic arms, or articulated robots, feature rotary joints that can range from a simple two-joint structure to a complicated structure with 10 or more joints. The arm is connected to a base that has a twisting joint. Rotary joints connect the links in the arm; each joint is a different axis and provides an additional degree of freedom. Industrial robotic arms have four or six axes. Such robots are primarily used for assembly operations, die-casting, fettling machines, gas and arc welding, and applying paint.



Robotic arms are some of the most common robots used in manufacturing today. They are essential to assembly operations that require heavy lifting or dangerous movements.

Parallel Robots

Parallel robots are also known as delta robots. They are built from jointed parallelograms connected to a common base. The parallelograms move a single end of arm tooling in a dome-shaped envelope. They are used primarily in the food, pharmaceutical, and electronic industries. The robot itself is capable of precise movement, making it ideal for pick-and-place operations.



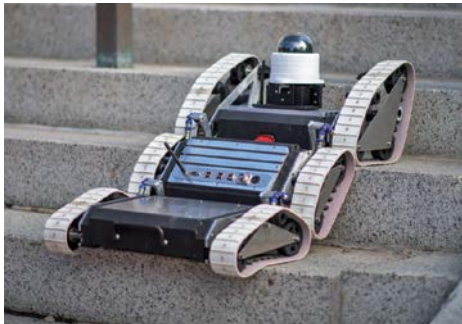
Parallel or delta robots are used often in pick-and-place operations such as drug- and food-sorting jobs.

What's the Difference?

WHEELED ROBOTS

Wheeled robots are vehicle-based and change their position with the help of a drive system or track system. Such robots are easy to construct mechanically and they have a low associated cost. Easy to move around, these robots operate in different environments and come in various forms, including single-wheel, two-wheeled, three-wheeled, four-wheeled, multi-wheeled, and tracked.

An example of a wheeled robot is the ARTI tracked robotics platform developed by Transcend Robotics. Targeted at unmanned ground vehicle operation, the design can handle a large variety of loads and scale most terrain, thanks to its patented Safeguard Joints. The joints help stabilize the platform over difficult terrain, ensuring that it is able to climb steps without flipping over. It can be used in uneven terrain, as well as to transport equipment in a warehouse or office building. The robot is customizable, meaning users can add sensors, robotic arms, or different payloads to complete a task.



The ARTI tracked robot from Transcend Robotics exemplifies how these robots can be used to navigate difficult terrain.

LEGGED ROBOTS

Legged robots are also mobile robots, but with more complicated movement. The robots feature motorized leg appendages to control their locomotion, allowing them to perform effectively on uneven ground. These robots tend to cost more, though, due to their complexity. Varieties of legged robots include one-legged, two-legged/bipedal (humanoids), three-legged/tri-pedal, four-legged/quadrupedal, six-legged (six-legged hexapod), and robots with many legs.

The DRC-Hubo robot is an example of a legged robot. It was a first-place finalist in the DARPA Robotics Challenge in 2015. Hubo was required to perform complex tasks such as driving a car, cutting holes into walls, opening doors, and negotiating difficult and uneven terrain.



DRC-Hubo won the 2015 DARPA Robotics Challenge by performing complex tasks, such as driving a car and opening doors. (Image courtesy of KAIST and Rainbow Co.)

The robot operates on two legs, but benefits from being able to utilize rollers built into the knees. This feature helped Hubo complete the required competition tasks in the shortest time.

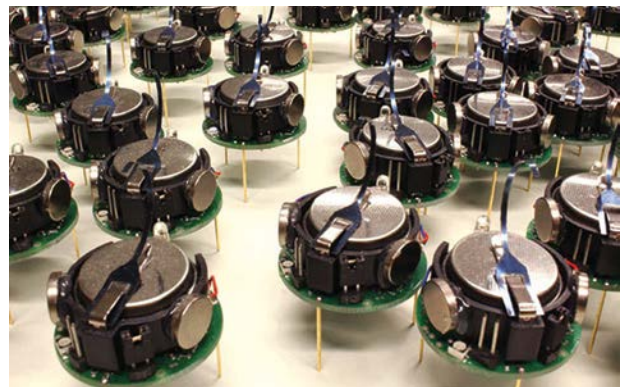
ANIMAL-BASED, SWARM, AND MODULAR ROBOTS

Several robot designs are based on animal movement. Robots that can either swim or fly are inspired by fish and birds. Robots created by Festo exemplify this trend—they help in the study of how to use nature's natural mechanics in current automation.



Festo designs these robotic animals in the hopes that animal-like movements can be replicated using modern automation practices. By taking this route, Festo is learning how to apply nature's mechanics in everyday engineering. (Image courtesy of Festo)

Swarm and modular robots are comprised of a series of robots. Swarm robots consist of multiple smaller robots that operate as cooperative modules. However, they do not create a single united robot. Modular robots also feature multiple robots and are more functional than a robotic swarm. A single module can have self-mobility and operate alone. Modular robots are useful for jobs that require significant coverage due to their versatile configurations. [md](#)



The Kilobots are a perfect example of swarm collaborative robots. They were created in the lab of Radhika Nagpal, the Fred Kavli professor of computer science at the Harvard School of Engineering and Applied Sciences (SEAS). (Image courtesy of Harvard)

(Continued from page 37)

USE THE RIGHT MATERIALS

The last element to consider in a ruggedized pressure switch relates to its construction materials. Failures related to corrosion and moisture tend to have obvious material solutions: The exteriors of most ruggedized pressure switches are constructed from 18-8 stainless steel. The exterior polymer components are made from high-performance engineering plastics, such as glass-filled polyphenylene sulfide (PPS). All the internal components—including springs, piston, and seals—will likewise be made from corrosion-resistant materials.

What is less obvious about the materials in a ruggedized pressure switch is that they need to work together as a system. Switch failures related to temperature extremes all too often occur because pressure-switch designers have not accounted for coefficient of thermal expansion (CTE) mismatches between different materials in the switch. A visual inspection of the switch will not tell you whether the switch manufacturer has managed CTE differences with enough care. But you can and should inspect the performance of the switch across its entire operating temperature range. A switch with well-chosen materials will have a relatively flat response across its temperature range. Switches with

poorly chosen materials will often have reduced accuracy or widening Delta-P values at very low or high temperatures—as thermal expansion or contraction change the movement of switch components relative to one another.

Pressure switches come in so many different forms that it is difficult to decide what type will work best in your application. But if your application involves harsh operating conditions and an intolerance of failure, the choice between switches becomes much clearer. Piston-based designs with provisions to manage high pressure spikes, leaks, severe vibration and shock, high humidity, and thermal issues will offer the best balance of accuracy and reliability in the toughest environments. **mc**



The exteriors of most ruggedized pressure switches are constructed from 18-8 stainless steel.

SEVERE PRESSURE SPIKES

PRESSURE CAN QUICKLY get out of hand in many hydraulic systems. We have seen measured pressure spikes as high as 1 million psi/second in some heavy equipment applications.

If that sounds like an unrealistic number, consider that a 5,000 psi rise in pressure over one millisecond translates to a 1 million psi/sec pressure spike. In heavy equipment applications, spikes such as these can occur if, say, an articulated loader hits the ground hard and fast.

These spikes are the leading killer of switches in our experience. But you can design a switch to tolerate extreme pressure spikes. For better switch designs, the pressure snubber and cushioned actuator can absorb the hammer blow associated with a pressure spike. We also optimize the structural integrity of all internal and housing components—in part, by picking materials with high tensile properties.

EXTREME INGRESS PROTECTION

MOST RUGGEDIZED PRESSURE switches have an ingress protection level of IP 67. And that level of protection is more than adequate for the vast majority of industrial, aerospace, and heavy equipment applications. Sometimes, though, an application will require more protection against moisture or contamination.

We often have to custom-design these switches since most off-the-shelf models do not reach IP 69 or above. For example, custom aerospace switches are available that have been hermetically sealed to 1×10^{-8} Torr cc/sec He.

Or to take another example, a custom “dry” pressure switch for a large piece of earth moving equipment. The switch lives on the equipment’s undercarriage, so it is exposed to moisture and constant thermal cycling.

To simulate this demanding end-use environment, the switch undergoes a number of aggressive tests. A “power wash test,” for example, subjects a switch heated to 120°C to repeated blasts of water at 1,000 psi. A “heated dunk test” repeatedly heats the switch to 120°C and dunks a meter deep in room temperature water. Under these conditions, a heated switch will tend to draw in the cooler water like a straw.

Surviving these tests and the end-use conditions required a custom design that goes beyond what most ruggedized switches can do. To eliminate all the leak paths that would open up as the switch thermally cycled we had to implement a number of proprietary steps related to managing the thermal expansion (CTE) of the switch, its housing, and sealing materials.

New Products

Linear Rod Actuators Mimic Hydraulic Force-Holding Specs

THE RSX hydraulic-class electric linear rod actuator can be used to replace hydraulic cylinders by meeting the need for extreme forces. Featuring a roller-screw drive, it addresses applications including pressing, punching, stamping; riveting, fastening, joining; injection molding; and sawmilling. While the initial offering, the RSX-096, is capable of 30,000 lbf, new additions to the the RSX family are capable of 50,000 lbf/222.5 kN or higher. With Type III hardcoat-anodized aluminum or zinc-plated steel construction, it includes tie-rods and an anti-rotate feature that prevents the rod from rotating without external guidance. The actuator is rated IP67 to resist water from a light washdown and dust from outdoor environments. It can also be used for cold-weather operation.

TOLOMATIC, (800) 328-2174, www.tolomatic.com



Panel-Mount Connectors Accommodate Thick Panel Boxes

THE RD24 connector with plastic hex nut reduces the need for mounting-screw holes and targets thick panel boxes. Available in 4- and 7-pin configurations, the panel-mount connectors are rated at a maximum of 16A per contact and can transfer up to 400V. These screw-terminated connectors are fitted with gold plated contacts and are designed to withstand harsh industrial environments with an IP67 rating. An added feature allows an optional protection cap lanyard to attach directly to the housing body of the connector.

BINDER USA, (805) 437-9925, www.binder-usa.com



Gearboxes Feature Compact, Versatile Design

THE COMPACT right-angle, flange-mounted WPLFE gearbox targets applications with tight space constraints and powerful torque requirements. It features lifetime lubrication and minimal installation height to install in any direction. Its standardized flange interface makes it easy to mount drive components including pulleys, belt drives, rack-and-pinion systems, linear units, and rotary tables. The large flange output-shaft diameter provides five times the torsional stiffness of an output shaft with a feather key. In addition, deep, low-friction groove ball bearings produce little heat, and ultimately improve the lifetime performance of the gearbox and drive. Their features include 94% efficiency at full load, operating temperatures from 25 to 90°C, IP54 protection, a nominal output torque of up to 260

Nm, radial force up to 3,800 N, a service life of 20,000 hours, and a wide inertia ration range.

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VERSIONS OF the Vert-X 2800 Series angular-position sensors convert measurements into an analog or digital output. With the Easy Adapt tool, users can configure any part to measure its



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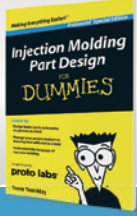
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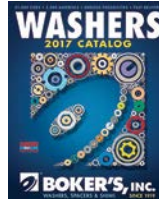
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AIRPOT CORPORATION, (800) 848-7681, www.airpot.com



Rugged Memory Cards Target Military Applications

THE SATA card (pictured) and Sentinel PC card flash memory guarantee operation in extreme environmental conditions. Both cards are hermetically sealed in stainless steel and can withstand shock, vibration, humidity, and immersion for use in military environments, fighter aircraft, helicopters, and ground army applications. They operate at temperatures ranging from -40°F to 185°F (-40 to 85°C), at altitudes up to 40,000 feet. The SATA card provides throughput of 100 megabytes per second (MB/s), capacity of up to 512 gigabytes (GB), and 3.3 VDC operation. The Sentinel PC card flash memory features throughput of 20 MB/s, a capacity of up to 32GB, and power greater than +3.3 or 5 VDC. Flash memory is configured in 512 byte erasable sectors for maximum compatibility. It weighs only 2 ounces.

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PACIFIC POWER SOURCE, (949) 251-1800, www.pacificpower.com



Compact Stepper Motor Includes Drive Box

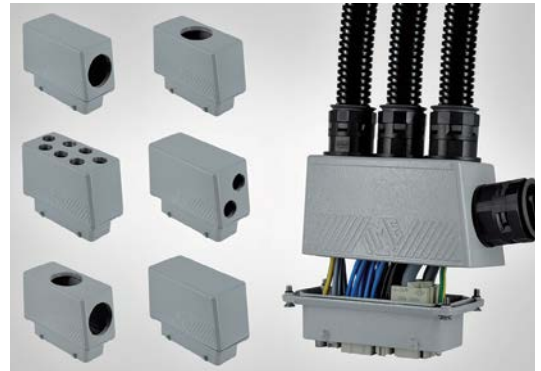
THE SWM series of integrated steppers combine a drive and motor unit into a single IP65-rated housing, eliminating wiring and saving on cost. In addition to a built-in incremental encoder, they combine a high torque NEMA 24-step motor with a 6.0 Amp/phase (peak-of-sine) drive. Both a 24- and 48-Volt DC external power supply can be connected to the rear of the motor to power the drive. They are RoHS and CE compliant, and rated IP65 for wet and dusty environments. They support M12 connectors and allow for stored programming for stand-alone operation. They are anti-resonance and torque-ripple smoothing. Communication options include RS-232, Ethernet, and EtherNet/IP, in addition to Modbus/RTU for easy communication with programmable logic computers and human machine interfaces.

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Conveyor Incorporates Mini-Buffer for Faster Container Processing

THE ADAPTA ML series of flat, multi-lane conveyor systems features first-in, first-out product flow and pressure-less accumulation with high speed capabilities. It can be used to transport non-round, odd-shaped containers, and is scalable and easy to operate. Two small AdaptA Mini-Buffer are integrated into its design to offer an innovative packaging loop that handles rounds at higher speeds with virtually no changeover. It is available in a variety of layout configurations that can be custom fit to production lines. Floor-level construction improves safety and reduces product damage when compared to vertical, spiral accumulators.

BW CONTAINER SYSTEMS, www.bwcontainersystems.com

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Design Thinking for IoT in the Product Development Process

Product development processes were not a big deal until 1983, when several noteworthy articles outlined the merits of competing based on a best-practices product development process. In 1986, Robert Cooper trademarked the Stage-Gate process, thus sparking the industry wave. Like all bodies of knowledge, time brings evolution and maturation. Some bodies take six decades to fully mature, which is also true for development processes. The surprisingly rapid arrival of the Internet of Things (IoT) and Industrial Internet of Things (IIoT) between 2015 and 2020 necessitates another incarnation of the product development process.

Since Cooper lit the torch with a basic process construct that started at approval and ended at launch, elegance has been added. The early 1990s brought in a product definition phase that was preceded by a concepting activity. The late 1990s saw improvements for technology-push products, rapid commercialization, and the formalization of portfolios at every phase of the pipeline.

The early 2000s ushered in advanced development processes and innovation skunkworks organizations that were separated from product development and added refinements for technology-push. The late 2000s integrated intellectual property (IP) to generate, protect, and monetize it through licensing and sale. In the early 2010s, we made it lean. Many are still working on IP and lean. But—never a dull moment—the IoT is arriving faster than many had imagined.

Currently, few companies have gone through their product development process from stem to stern to prepare for the IoT. Modifying business and technical processes, and using them until they become the norm, takes several years. IP is a great example of this. There is urgency, however. If predictions that there will be hundreds of billions of connected devices by 2025 are true, it would stand to reason that the companies that design “IoT-ready” products would have an advantage.

What then are the implications of IoT-ready products on the product development process? Let’s use a bit of design thinking to look for places to tailor the product development process for the IoT. Right now, the value of the product is largely about the product itself. In the future, the value of the product will also be

its information content and its ability to aggregate vertically and horizontally in the cloud. A well-designed process can go a long way to enabling “IoT capability.” My November column (<http://machinedesign.com/contributing-technical-experts/sensors-are-essential-be-iiot-and-iiot-competitive>) discussed the importance of sensors. The better the source data and the less it costs, the better the resultant value. That is a good starting point.

One of the first considerations for a new product is its portfolio fit. Does the product fit with the company’s IoT goals for the portfolio, product line, or family? Has the company established IoT goals at these levels yet? From a technical view, do architectural rules and guidelines exist for incorporating sensors, wireless, and other possible “IoT enablers” in a systematic way?

MAKING IoT-ABILITY PART OF THE PLAN

For project plans and approvals, do business plans address “IoT ability” as part of every business plan? Are there implications for bills of material, design reviews, and other structural and checklist documentation? Chip and PCB designers have been provisioning for magnetic fields, cross talk, and current surges at the micro level. In the future, fully connected products touting 100% up-time will have many of these same design considerations at the macro level—and associated safety issues.

Alpha and beta testing with customers and focus groups is sure to bring in a whole host of new types of inputs, slowing down products that are well along in development. As one nears product launch, technical literature and marketing promotional materials will have to address IoT capabilities in a consistent way. My guess is that many companies will soon develop an “IoT branding” strategy. These branding strategies will mature with time, ultimately emanating from architectural principles early-on in the process, as enabling the IoT also approaches its own day-to-day norm with product developers.

The IoT will be no different than other product development process improvements. They all had their “what does it all mean?” beginning. Companies that eagerly addressed early-market uncertainties were the first to become proficient. Other companies then copied their practices. But, the eager ones got a three- to five-year head start. **md**

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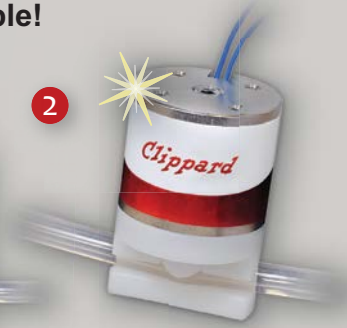
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