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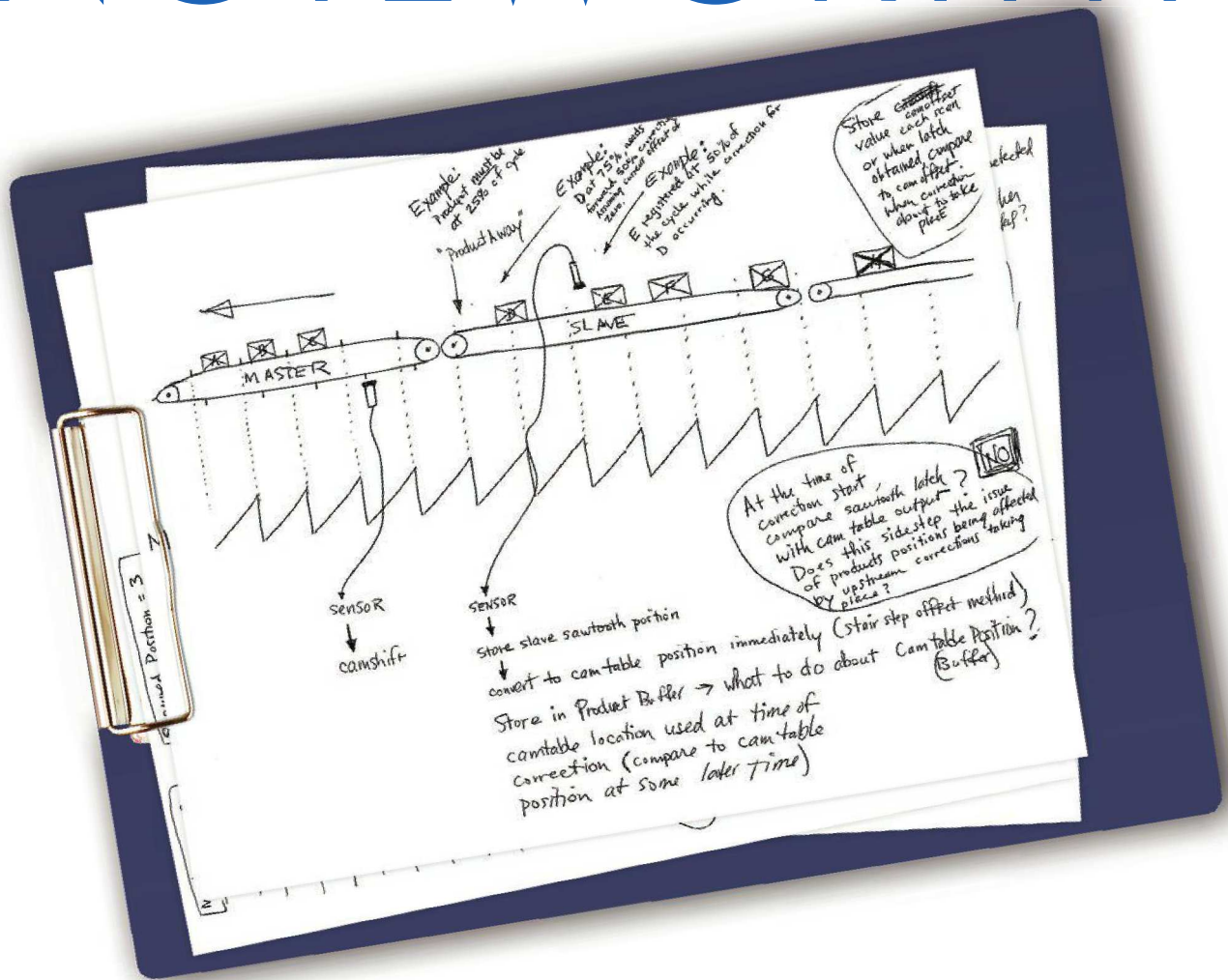
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Rescue Robots

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Photo by Mark Micire
Courtesy of Inuktun

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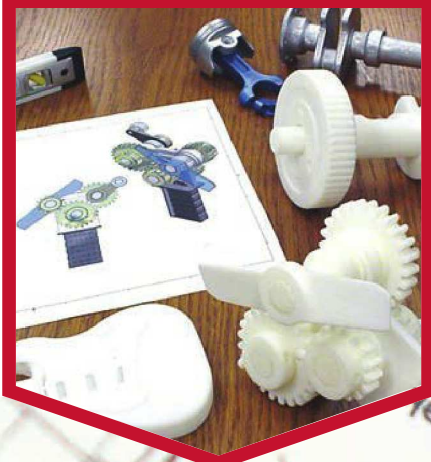
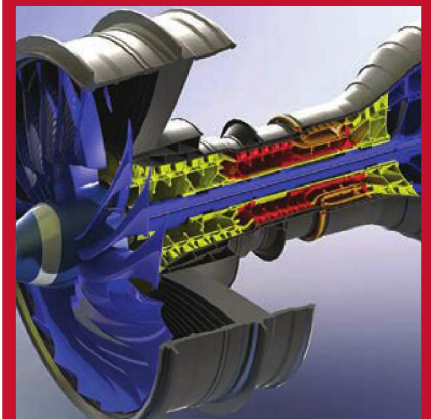


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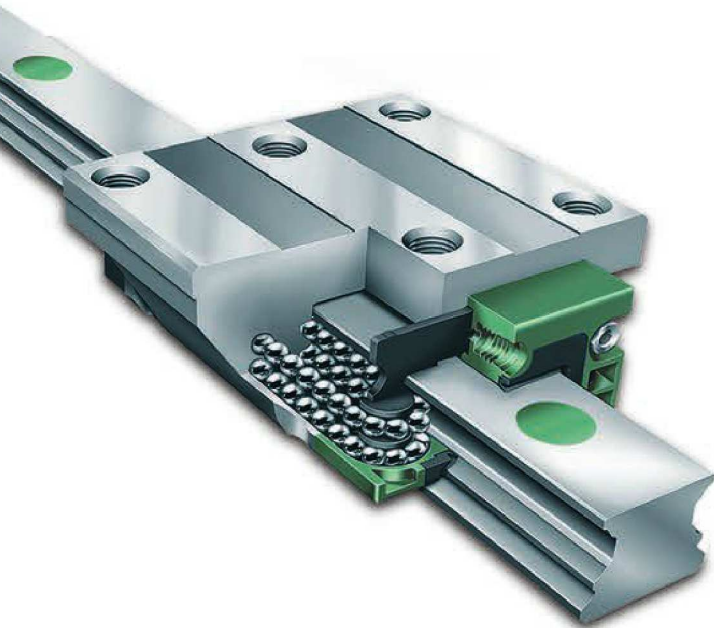
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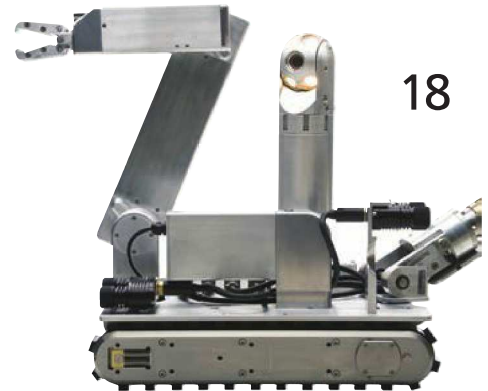
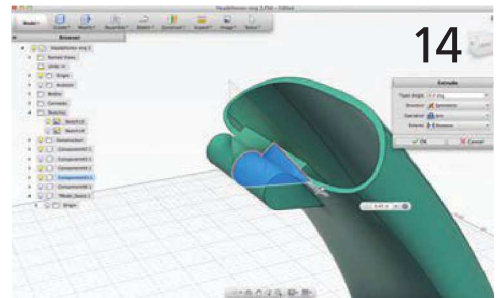
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 A key component in many linear motion applications, actuators come in a wide range of designs, sizes and configurations



Musk-Mania



In the history of comic book characters, there are only a handful who qualify as super heroes without actually having any super powers. To pull it off, they have to be ridiculously wealthy, have a penchant for the melodramatic and, of course, colorful super villains to battle.

Elon Musk, co-founder of Tesla Motors, SpaceX and SolarCity, may fall short of super hero status but that hasn't stopped the media from commonly referring to the serial entrepreneur as Tony Stark or Ironman. And given the multiple headlines about him this summer, it's not hard to see why.

At the beginning of August, Musk released plans for the Hyperloop, an underground, high-speed mag-lev transport system capable of speeds up to 700 miles per hour. Designed to whisk passengers from L.A. to San Francisco in 30 minutes, the design came complete with conceptual art ripped straight from the panels of super hero weekly.

True to form, nefarious critics dumped cold water on the idea, calling the projected \$6 billion price tag and decade-long construction timeline naïve. Even Musk says he doesn't have the time or money to do carry out the idea, but fans of the project have taken up the cause. Engineers at simulation software firm ANSYS have begun designing a virtual model to test the Hyperloop's aerodynamics, while a team at Odgen, Utah-based 3D printing start-up WhiteClouds produced a scale model of the futuristic transport in a day.

Only days earlier, Musk had drawn media attention when his space transport firm, SpaceX, successfully tested its reusable Grasshopper booster rocket, which rose up to 820 feet and over 330 feet before maneuvering to a precision landing. The plan is to develop the reusable rockets to automatically return to Earth after launch to significantly reduce the cost of space transport.

To cap things off, Musk controversially proclaimed his Model S the safest car in the world following a 5-star rating by the National Highway Traffic Safety Administration. The outspoken entrepreneur even went so far as to claim that the luxury EV had attained the highest score in the agency's history by braking its roof crush test machine.

That claim has since been denied by the NHTSA, but Musk must be doing something right. The market value of Tesla Motors briefly reached \$20 billion in August based on increased sales of the Model S. In addition, the "indestructible" EV has become the third-best selling luxury sedan in California, according to the *California Auto Outlook*.

Finally, at the end of August, Musk revealed a holographic design system that allows engineers to design things like rocket engine parts using only hand gestures and then 3D print them in titanium, a concept taken directly from the Ironman movies.

Perhaps the media attention is starting to warp Musk's ego a bit as he's seemingly courting the Tony Stark comparison himself. But, call what him what you will, it's not often that an entrepreneurial visionary with a mechanical bent like Musk has the track record and chutzpah to not only pitch seemingly far-fetched ideas but actually pull them off.

Mike McLeod



I enjoy hearing from you so please contact me at MMcLeod@design-engineering.com and your letter could be published in an upcoming issue.

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UP FRONT

OACETT elects new president

The Ontario Association of Certified Engineering Technicians and Technologists (OACETT) instated Stephen Morley, C.E.T., C.I.M. as OACETT's new president. During his presidency, Morley will lead the association through a review of its strategic plan, the organization says. Morley graduated from Centennial College's Mechanical Engineering Technology - Design program and has held a variety of engineering and business management roles, including his current position as integration manager at CSA Group.

www.oacett.org

Westport appoints president

Vancouver-based, Westport Innovations, makers of natural gas engines and vehicles, announced that former board member, Nancy Gougarty, has been appointed president and COO. According to the company, the change in roles is part of the company's shift from R&D to global commercialization. Gougarty has held leadership positions in the automotive sector, including managing director for GM's joint venture in Shanghai; director for Delphi Packard Asia Pacific; global account director General Motors, and VP for Delphi Automotive Systems, Japan and Korea.



www.westport.com

MDA to develop communications for commercial space shuttle

MacDonald, Dettwiler and Associates Ltd. has signed a US\$1.7 million contract with Sierra Nevada Corporation (SNC) to develop an engineering concept solution to provide on-board communication signal processing capabilities for its Dream Chaser crew transportation vehicle. SNC is one of only three companies funded under NASA's Commercial Crew Program aimed at developing a reusable spacecraft.

www.mdacorporation.com

Cansel buys Solid Engineering

Canadian Autodesk reseller, Cansel, has acquired Solid Engineering Solutions Inc., based in Coquitlam, B.C.. Solid Engineering Solutions Inc. is a value-added reseller of Autodesk engineering and manufacturing software.

www.cansel.ca

Canadian human-powered helicopter takes Sikorsky prize



AeroVelo's Atlas human-powered helicopter at the peak of its historic flight on June 13th, 2013. (Photo courtesy of Martin Turner – Visiblize.com)

Sikorsky Aircraft Corp. announced in July that Toronto's AeroVelo Inc. won the \$250,000 AHS Igor I. Sikorsky Human Powered Helicopter Competition, that had gone unclaimed for more than 30 years. AHS and Sikorsky Aircraft presented the award at a ceremony at the Soccer Centre in Vaughan, ON where the record-breaking flight was conducted on June 13.

The Toronto-based AeroVelo team, led by pilot and chief engineer Dr. Todd Reichert and co-chief engineer Cameron Robertson, and comprised largely of students at the University of Toronto, beat the 33-year-old challenge last month, flying its "Atlas" helicopter above 3 meters (9.8 feet) and hovering for approximately 64 seconds. Officials from the American Helicopter Society (AHS) International verified the flight data and concluded it meets all of the criteria necessary to win the competition.

AeroVelo's Atlas vehicle is the largest human-powered helicopter to have flown, and the first in Canada. With four rotors each measuring nearly 70 feet, the Atlas' airframe is constructed of light carbon tube and polymer weighing only 115 lbs, with a highly modified bicycle frame pedaled by the pilot. It first flew in August 2012.

"This is an incredible accomplishment," said Mike Hirschberg, executive director of AHS International. "For a third of a century, the AHS Sikorsky Prize has eluded the best minds and technology available. The technological and theoretical advancements achieved in pursuit of our challenge have been astounding."

www.aerovelo.com

Canadian firms least likely to adopt best innovation strategies

According to a survey conducted by the Conference Board of Canada's Centre for Business Innovation, only about one-sixth of Canadian firms adopt an innovation strategy that focuses on competing in international markets. Those firms that do expand into competitive

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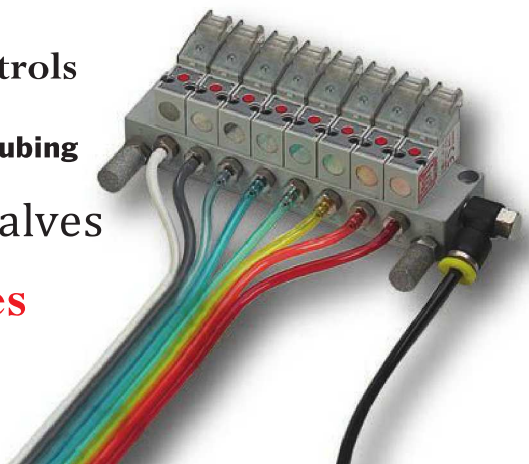
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global markets outside of North America, however, earn between 10 to 30 percent more net income than similar firms that use other approaches.

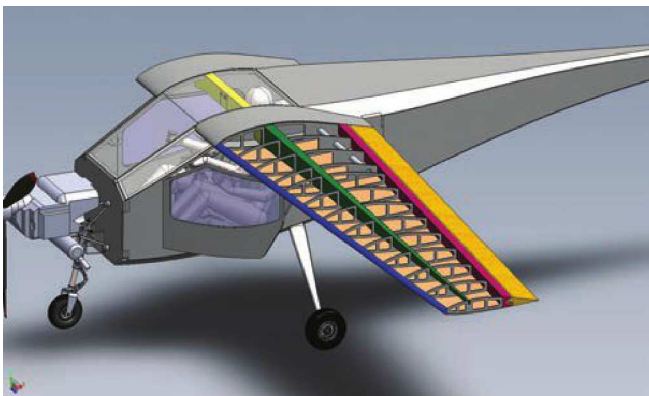
According to the 2012 report – *The State of Firm-Level Innovation in Canada* – only 14 percent of Canadian firms surveyed make territorial expansion the focus of their innovation strategies while more than half pursue a user needs-driven innovation strategy and approximately one-third adopt a technology-driven approach.

As in other studies, respondents said innovation funding presents a challenge. Cash from within an operation or from the corporate HQ is the most frequent source, followed by government funding. In addition, firms that look to expand their markets/territory make more use of internal financing and less use of government funding or private equity than do firms with user- or technology-driven innovation strategies.

“It is not clear if use of internal cash is by choice or by constraint,” said Michael Bloom, VP of Organizational Effectiveness and Learning. “In any case, it is interesting that neither private equity nor government financing is more readily available for territorial expansion, given the fact that the companies with such innovation strategies achieve higher average financial performance than other firms do.”

In addition, the survey found that the most prevalent challenges for innovation include lack of funding, organizational culture, poor innovation training, fear of risk, lack of executive focus and lack of innovation measurement. Also, the survey data suggests a strong correlation between the intensity of innovation efforts and company performance – but only if innovation activities are well managed.

www.conferenceboard.ca/cbi



Canadian open source two-seat airplane may cost only \$15,000

The idea of building your own airplane from scratch may seem like a crazy idea, but a handful of engineers (and a legion of volunteers) believe anyone with some consumer manufacturing tools, DIY skills and a taste for adventure should have the opportunity to give it a go.

Founded by Ottawa-based, former Lockheed Martin

principal engineer, John Nicol, MakerPlane is a self-stylized open source aviation organization that aims to leverage the advent of personal manufacturing equipment (e.g. CNC mills and 3D printers) plus cheap electronics (e.g. Arduino and Raspberry Pi controllers) to develop a safe and reasonably priced, two-seat, single-prop sport plane.

The ultimate goal is to make the schematics, bill of materials, assembly instructions and open source avionics software available for free. Potential “makers” would only need pony up the cost of the engine, composite build material and electronics, etc. All told, the group hopes the final price tag would amount to no more than a relatively cheap \$15,000.

According to the group, the MakerPlane 1.0 falls under the Experimental Light Sport Aircraft category and each home-built aircraft would require an FAA inspection before it would be allowed to fly. In addition, potential aviators would be required to hold a sport pilot license or better.

To help further the cause, MakerPlane launched an Indiegogo crowd-funding campaign to raise a target of \$75,000. According to the organization, the money will go toward the material and testing costs of building two prototypes (one static prototype for breaking point testing and one for test flight).

The group plans to have a flight worthy prototype in time for the 2015 AirVenture show in Oshkosh, Wisconsin with final plans, build instructions, etc. to follow shortly after.

<http://makerplane.org>

Canada just shy of top 10 on Global Innovation Index

According to the Global Innovation Index (GII) 2013 – published by Cornell University, INSEAD and the World Intellectual Property Organization (WIPO) – Canada came in at number 11, just short of the top 10 of the world’s most innovative nations. The United States rejoined the top five and the United Kingdom moved up to the third spot while Switzerland retained its place atop the rankings.

Published annually since 2007, the GII 2013 looked at 142 economies, using 84 indicators including the quality of top universities, availability of microfinance and venture capital deals. According to the report, Switzerland and Sweden’s (2) performance reflects the fact that both countries are leaders in all components of the GII, consistently ranking in the top 25.

While comparatively rich countries dominate the top ranks, the report shows that 18 emerging economies are outperforming other countries in their respective income groups, including the Republic of Moldova, China, India, Uganda, Armenia and Viet Nam. However, Latin America saw the largest improvement in GII rankings, with Costa Rica taking the lead regional position.

R&D expenditures are also on the rise, according to the report, with the top 1,000 R&D-spending companies

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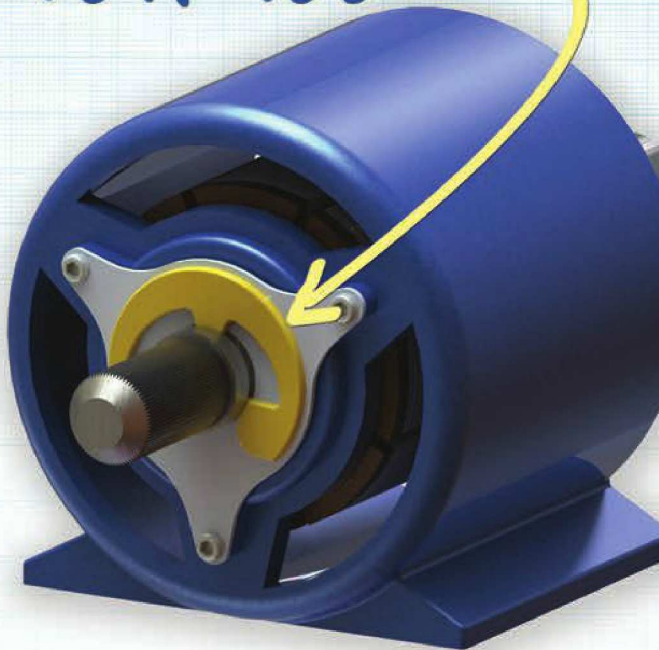
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increasing budgets in this area by between 9 and 10 percent in 2010 and 2011, with a similar pattern in 2012. In addition, the report says emerging markets have increased their R&D spending faster than high-income countries. Over the last five years, China, Argentina, Brazil, Poland, India, Russia, Turkey and South Africa have been at the forefront while countries like China have shown a marked uptick in patent filings worldwide.

In terms of its innovation strengths and weaknesses, the GII report ranked Canada high in areas such as trade and competition, business environment, venture capital deals and general infrastructure but low on national office resident trademark registrations, expenditure on education and growth rate of GDP per person engaged.

www.globalinnovationindex.org



Canadian TAPV armoured vehicles begin testing

Textron Systems Canada announced that its Marine & Land Systems division has shipped four pre-production Canadian Forces Tactical Armoured Patrol Vehicles (TAPV) to locations in the United States and Canada for testing and training.

The Textron TAPV Team, led by Textron Systems Canada, was selected in June 2012 to manufacture 500 Canadian Forces Tactical Armoured Patrol Vehicles with options for up to 100 more. The TAPV contract, with options, has a value of CAD\$603.4 million, with an additional five-year in-service support contract of CAD\$105.4 million. As prime contractor, Textron is providing overall TAPV management, acting as design authority and coordinating vehicle integration by Canadian subcontractors.

In early July, the first pre-production vehicle (PPV) was sent to Aberdeen Test Center, a U.S. Army test facility in Maryland, for qualification testing. The rest are at Rheinmetall Canada in Saint-Jean-sur-Richelieu, Quebec, where vehicle integration activities are taking place.

The company says testing and training is on schedule and full production is planned for January of 2014.

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Inside FUSION 360

An in-depth look at Autodesk's cloud-enabled, hybrid MCAD modeling software

By Ralph Grabowski

In response to the CAD industry's direct modeling mania, Autodesk first announced Inventor Fusion—a desktop installed 3D modeler that combined free-form and solid modeling in a history-free environment—as tech demo on June 24, 2009. Four years later, Autodesk similarly picked June 25 of this year to publicly announce Fusion 360, a cloud-enabled version of the original, thereby adding a modeling component its line of 360 products (including Simulation, PLM and BIM).

Fusion 360 is hybrid software in two ways. For one, it's not a pure cloud-only app running in a Web browser. Rather, the bulk of the software is still installed on a desktop computer. Some functions, however, are available only through the cloud, such as translation of foreign formats. In another sense, Fusion always operates for free, at a basic level; however, all options are available only as long as we keep paying for them.

When Autodesk introduced Fusion 360 to the media, the company said it felt in the middle of a perfect storm, created by the triad of new types of technology, new ways to access it and new demands for ways of working. And so, on the MCAD side of things, Autodesk's answer is Fusion 360. Based on the response from beta users, Autodesk is convinced that everyone will want this next generation of Fusion, because it allows us to “design faster, work anywhere and share with anyone.”

What Fusion Does and Doesn't Do

To start, Fusion 360 requires logging in to the software with a user name and password; no just launching the software with a single double-click. The advan-

tage, Autodesk says, is that the software license is not tied to a single machine or a specific serial number. In this new world, user names are tied to accounts at Autodesk, which determine whether we are allowed to log in and which functions we can access.

Once inside Fusion 360, we can use direct modeling to make and edit 3D shapes from polygons, surfaces, features, assemblies and sketched prismatics. It does not do parametrics or history trees; these will be added later.

The software uses T-Splines—technology Autodesk purchased in 2011—that's unique in how it performs sub-division modeling. Specifically, it can handle T-shaped intersections between faces with curvature continuity. It can start with curves and can match to exact curves, surfaces and meshes. This is in contrast to other 3D modelers, such as AutoCAD, which start from primitives.

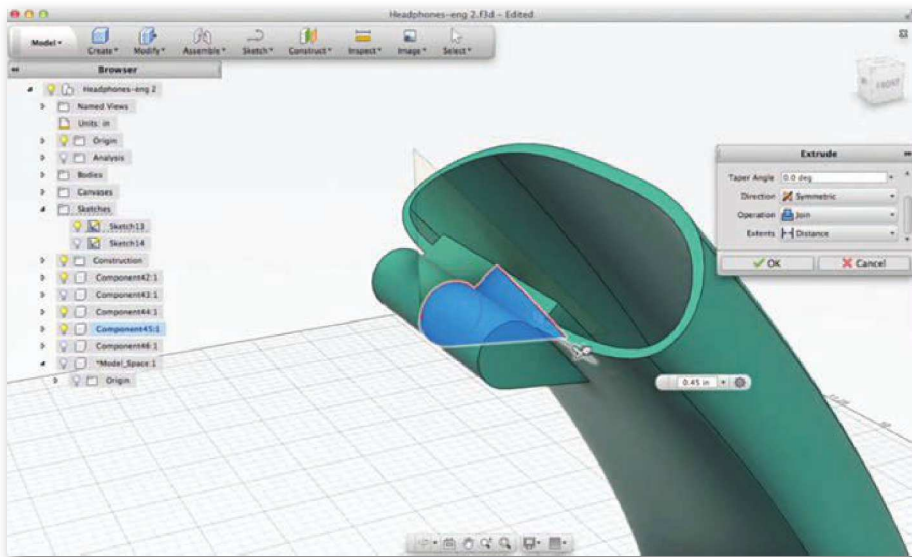
While execution of modeling commands relies on local resources, some Fusion 360 functions are available only with Internet access. For instance, it translates 3D file formats only through a cloud server. Other cloud-based functions include collaboration and named backups (a.k.a. automatic archives).

What the FAQ

To flesh out the details, representatives from Autodesk answered the following questions on the particulars of Fusion 360 at a recent company press event.

Q: What happens when a Fusion 360 subscription lapses?

Autodesk: You still can log into the site, access your data and get data out in any format. You cannot, however, author



Like the four-year-old tech preview of the same name, Autodesk's Fusion 360 performs the same push-pull modeling operations plus T-Splines-driven surface and mesh modeling.

or edit designs. You'll get a subset of the experience but you own the design data.

Q: How would one go about using Fusion 360 from any other computer: Would the desktop component have to first be installed each time I move to a different computer?

Autodesk: There is a thin client, which users can download as many times as they like, on as many machines as they need.

Q: How much will Fusion 360 cost?

Autodesk: It is free for students and certain groups of enthusiasts. On an annual plan, the cost \$25 a month [\$300 a year, actually]—less than the price of a cell phone bill. There are also monthly and quarterly plans, which we have not yet announced.

Q: Does every user need the \$25/month account?

Autodesk: Not collaborators, who can use a free 360 account. They would log in through their Web browser.

Q: Is the \$300/year for all services, or does Autodesk expect to charge more for extras in the future?

Autodesk: We will be introducing monthly, quarterly, and annual plans throughout the year. Prices will start at \$25/user per month, based on an annual

contract commitment. [No answer to my question on charging extra for extra functions.]

Q: Is there a limit to the amount of data?

Autodesk: There is no data size limit, currently.

Q: What data formats are supported?

Autodesk: Fusion 360 can import Inventor, DWG, STEP, IGES, JT, NX, CATIA V5, Pro/Engineer, SolidWorks, Parasolid and PTC's Granite. [For exports, the list is similar though shorter.]

Q: What is the future of Fusion for Mac?

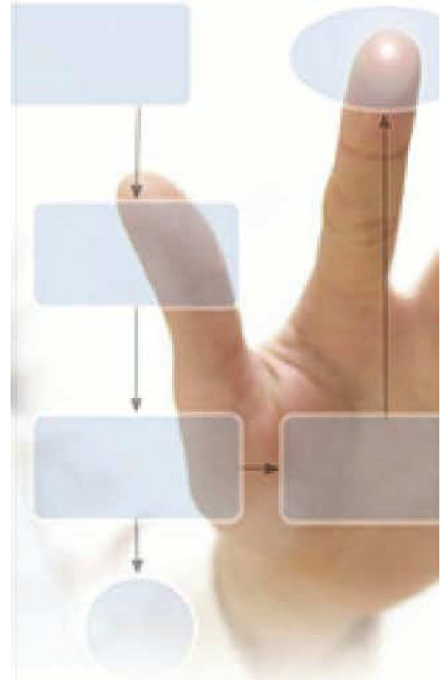
Autodesk: We're embracing the Mac, alongside other platforms. With Fusion 360, users have the ability to work on both Windows and Mac. [The demo we showed had two users working together in Fusion 360: One was running Fusion 360 on a Mac, the other Windows.]

What Ralph Thinks

Direct MCAD modeling has been around for decades, and so Fusion is nothing new. After all, AutoCAD always has been a direct modeler, and still is.

But for 3D MCAD, history-based modeling was king until SpaceClaim's 2007 launch made big vendors realize

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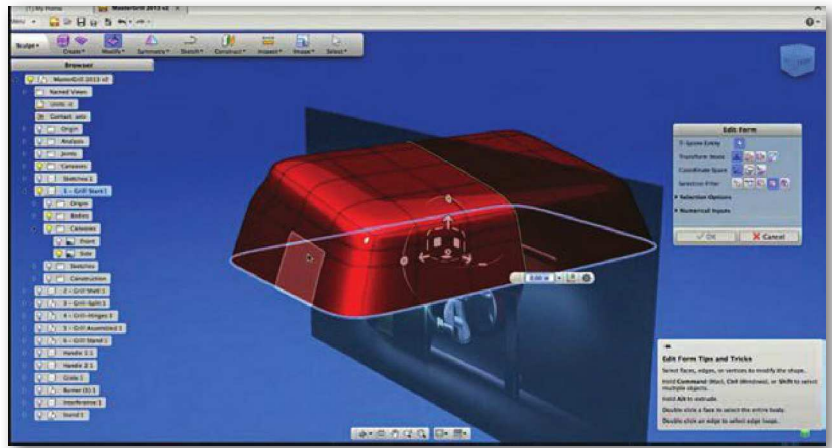
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they could slap on direct editing to give their legacy software another bullet point on the spec sheet.

For example, PTC bolted CoCreate onto Creo; Dassault forked V5 into V6; Siemens PLM synchronized ST with Solid Edge and NX technology. Even little Bricsys purchased an entire direct modeling team from LEDAS. Only SolidWorks stumbled out of the gate, and badly. (It should be noted, all of these are still works-in-progress.)

I wonder if Autodesk got a little irked. They were still in the process of beefing up Inventor to take on Catia and Pro/E, when along came direct modeling. So, they created their own direct modeler, and named it "Inventor Fusion", blending history and direct modeling. It was available free for two releases of Inventor and AutoCAD. Autodesk is always looking for ways to migrate users from slightly-cheaper AutoCAD to more-expensive Inventor and Revit.

My assumption was that Autodesk would merge Fusion into Inventor, seamlessly and eventually. This year's release of independent Fusion 360, then, is a puzzle, because (a) it is not part of Inventor; (b) it doesn't do history-based parametric modeling on its own; (c) it's a separate pay-per-use prod-



While Fusion 360 runs locally through a thin-client executable, a few of its functions, including foreign file translation, require a paid Autodesk subscription.

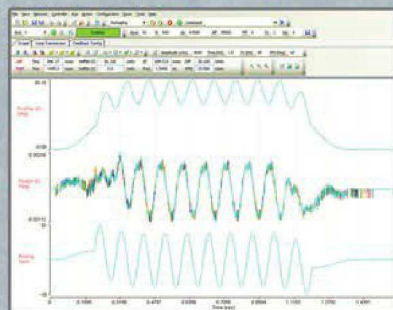
uct not included in a subscription plan. As best as I can tell, the original desktop Fusion will continue to be available free for Windows and Mac computers.

At this point, it appears that Autodesk is doing a sensible thing in providing customers with two options: Desktop Inventor and/or cloud-based Fusion 360. Large corporations will tend towards cloud-based pay-on-demand software, while SME's (small and medium enterprises) will stick to desktop perpetual licenses.

<http://autodesk.com/tryfusion360>

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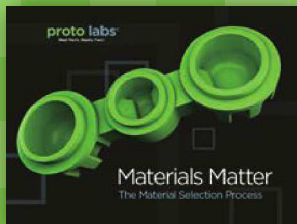
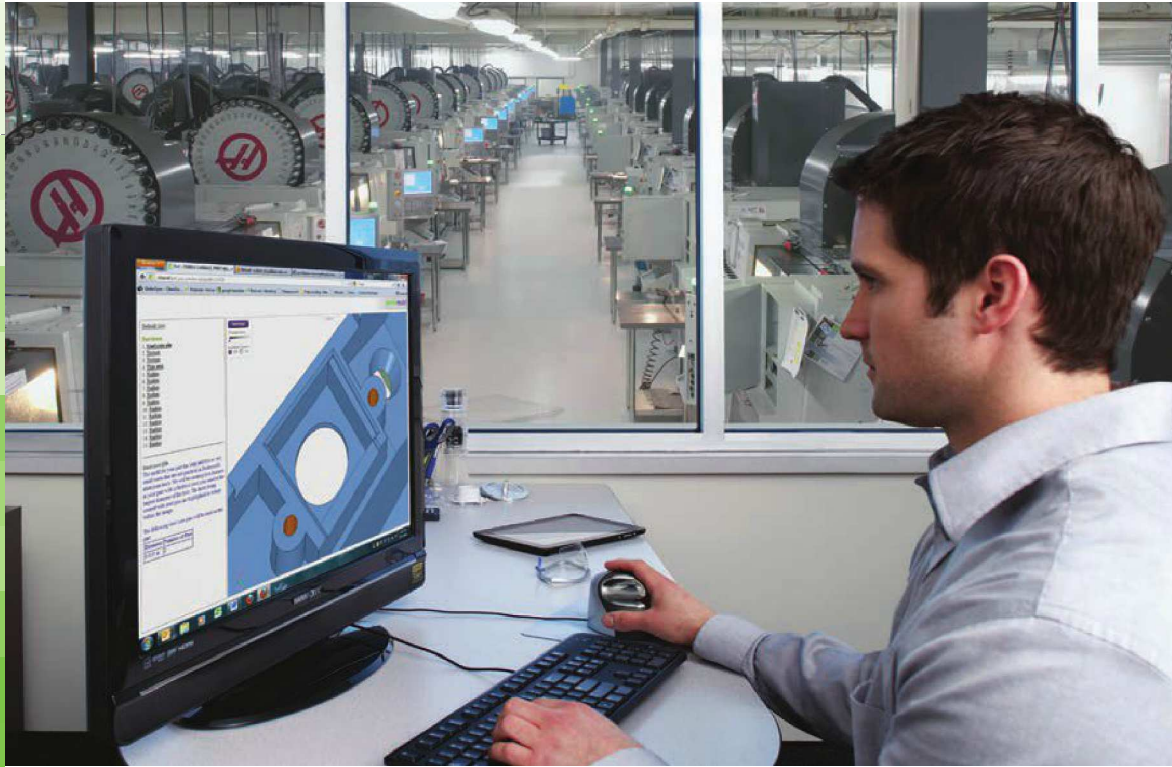


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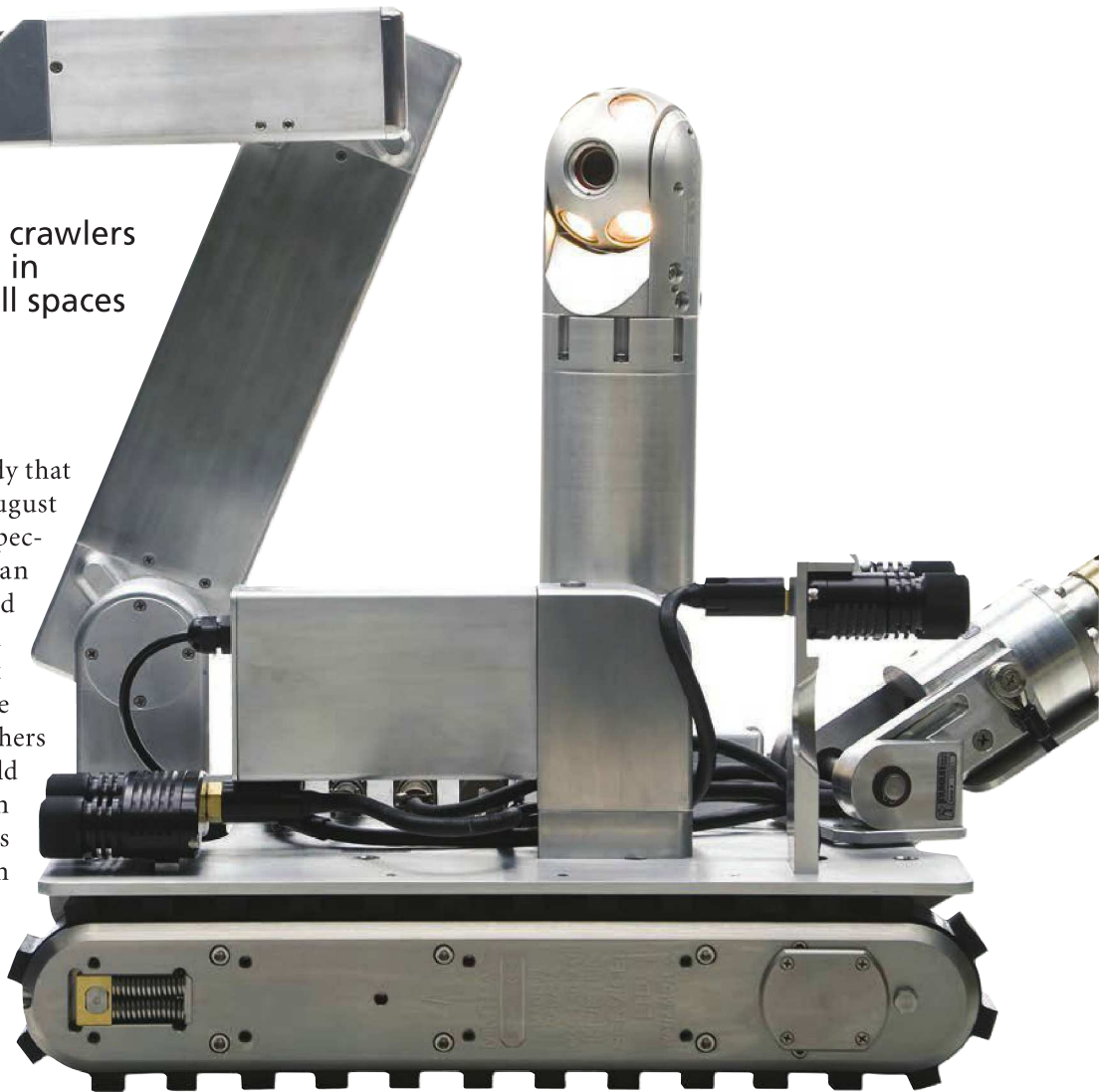
By Treena Hein

In the days following the tragedy that began in the early hours of August 6th 2007, the need for remote inspection became more apparent than ever. Six miners had been trapped in Utah's Crandall Canyon coal mine. During a rescue attempt some days later, three rescue personnel were killed and six others injured. Although the miners would never be found alive, Inuktun remote inspection robotic systems provided critical information in that lethal situation.

The tiny and rugged visual information-gathering units were also employed at Ground Zero in New York following the 9-11 attack, and now are used in search and rescue operations around the world.

Disaster reconnaissance was, however, not at all a use first envisioned by the founders of Inuktun for their crawlers. Al Robinson and Terry Knight, who both had experience in the submarine industry, started the Nanaimo, British Columbia-based company in 1989. They noticed that there was interest in remote inspection and very little in the way of solutions available. Knight eventually moved on to other things, but Robinson, a hydraulics engineer now in his 70's, still leads Inuktun's mechanical design team.

Inuktun crawlers (and other products) are now used around the world – for inspection of nuclear reactors, through pipes of every type and in underwater applications, among others. Their track mobility systems are built to tackle tough terrain. The company's smallest crawler can inspect a pipe 10 cm in diameter, and most units are water-



In addition to inspection, Inuktun's collapsible versatrax 450 features a four-function manipulator arm that unfolds for handling items and debris and a second camera for close inspection.

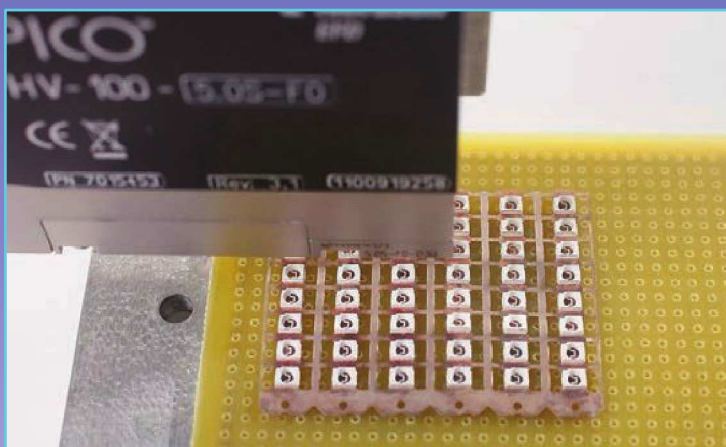
proof, with some rated to a depth of 300 meters. Some models travel at a speed of up to 10 meters per minute, and the Versatrax 300 can inspect more than 2000 meters of pipe in a single run.

Mobile Crawlers

A typical Inuktun robotic system consists of the crawler with camera and light, along with a remote controller, monitor, recording device, cable and cable reel. Wireless operation is not a development priority for the company, as the tethers ensure device retrieval and wireless signals can be dodgy in underground areas and through twisty pipes.

Adequate light is very important, says technical sales manager Jeff Christopherson, and Inuktun employs high-

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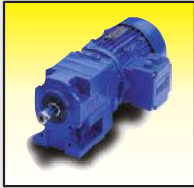
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output LEDs on all units. Besides video footage, the systems also relay camera pan and tilt position, pitch and roll, time, date and other custom messages.

One might think that reducing weight would be a big design concern in creating these little guys, but the opposite is true.

"Our crawlers have to be heavy enough to be able to pull hundreds of metres of tether," Christopherson explains, "so we added weight to them through things like making the tracks out of brass."

The custom-made tethers used by Inuktun are lightweight, but are also durable, water-resistant, easily spooled and most of all, highly friction-resistant.

All Inuktun crawlers have a modular design, and although some key components such as tracks have undergone improvements over the past two decades, the original design concepts remain intact. Other concepts came from meeting customer needs.

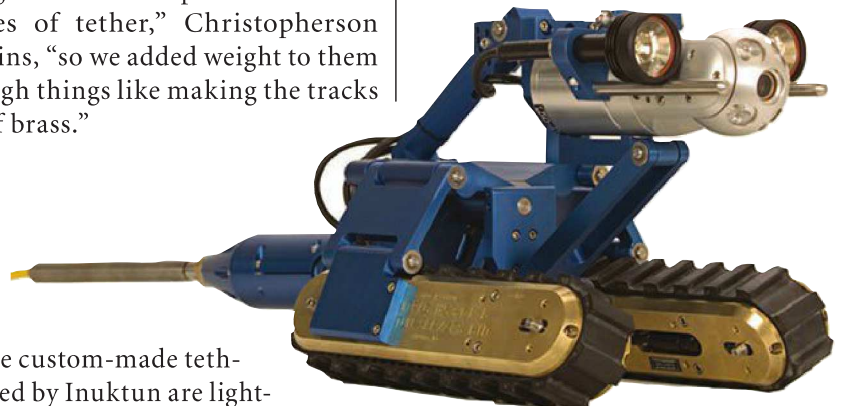
"We do offer off-the-shelf units, but the modularity and the experience of our team allows us to produce highly customized solutions," Christopherson explains. "We had a customer who needed a model that would fit into a small opening but also perform a variety of tasks, so we created a customized system which later became available as the off-the-shelf Versatrax 450."

The collapsible crawler feature with extended tracks that allow improved manoeuvrability. The main camera can be lowered for moving through tight spaces, and a four-function manipulator arm unfolds for handling items and debris. A second camera is included for close monitoring of remote handling operations.

Another model has a chassis that itself can be remotely reconfigured to allow it to fit through a very small

opening. Yet another model features magnetic tracks, allowing it to travel upside down or sideways on any vertical magnetic surface.

Jeff Stanway, a mechanical engineer who has been with Inuktun 17 years, notes that the two biggest overall design challenges have been electrical – and those challenges continue.



Inuktun's Versatrax 150 is a modular, long-range internal pipe inspection system capable of operation within pipe sizes from 6 to 12 inches in diameter.

"Visualization is the main purpose of the crawlers and getting a high-quality video feed through a long tether is a big challenge," he says.

"There are a lot of things that inject noise into the signal like the electrical power, motor commutation, and any other sensors and devices. You have to characterize the noise, identify where it's coming from and remove it through learning how to filter it out."

Getting adequate electricity to the vehicle was another main challenge.

"You can't handle resistance issues by using a larger tether because that would make it too heavy for the vehicle to pull, so we had to work out how to safely increase the voltage using DC-DC switchers," says Stanway.

Unlike Inuktun crawlers, these two design challenges aren't going anywhere, anytime soon.

"Originally, our crawlers went 1000 feet and we've moved well beyond that, but more distance is always desirable," Stanway notes. "We're always pushing the envelope."

DE

www.inuktun.com

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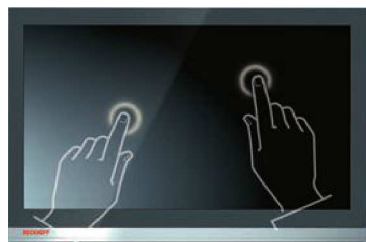


Automation

Multi-touch Panel Series

Beckhoff Automation introduced its CP2xxx and CP3xxx Control Panel and Panel PC series, that feature multi-touch technology. The aluminum and stainless steel widescreen panels are designed for use under industrial conditions and are available in various sizes and resolutions. In addition to 4:3 format display sizes, the widescreen displays are available in: 7-inch with a resolution of 800 x 480; 15.6-inch with 1366 x 768; 18.5-inch with 1366 x 768; and 24-inch with the full HD resolution of 1920 x 1080.

To ensure industrial compatibility, the multi-touch series uses Projective Capacitive Touchscreen (PCT) technology. The front of the display is a glass pane with an anti-reflection coating and operation with work gloves (e.g. latex gloves) is also possible. Five-



finger touch and automation solutions with 2-hand operation are equally possible. Familiar smartphones functions, such as zooming, scrolling, object turning, flicks, etc. are now also usable for industrial applications. A special touch controller prevents faulty operation, e.g. due to a water droplet or the ball of the hand.

In addition, the panel series is designed both for control cabinet installation and for mounting arm installation. The CP2xxx built-in Panel PC series is implemented with IP 65 protection at the front and IP 20 at the rear. The CP3xxx Control Panels for mounting arm installation feature all-round IP 65 protection. The CP29xx and CP39xx series use DVI/USB Extended Technology and can be operated up to 50m away from the Industrial PC. The CP22xx built-in devices are also available as Panel PCs with Intel Celeron Core i3, i5 or i7 processor.

www.beckhoffautomation.com

Analog I/O modules

AutomationDirect has added discrete and analog I/O modules to its CLICK PLC line. The modules include an available 24 VDC combination discrete module that includes an eight-point DC input/eight-point DC sinking or sourcing output model as well as a four-point DC input/four-point relay output model.

The available 24 VDC four-channel analog input modules with 13-bit resolution include 0-20mA current input and 0-10V voltage input versions. The line-up includes 12-bit resolution four-channel output modules in 4-20mA current and 0-10V voltage versions. Also added is a four-channel input/two-channel output module in current and voltage versions and features 13-bit resolution inputs and 12-bit resolution outputs.

Four-channel RTD and thermocouple modules with 16-bit resolution have also been added. The RTD input module accepts Pt100, Pt1000, jPT100, Cu10, Cu25, and Ni120 elements. Resistive ranges are also supported. The thermocouple input module supports J, K, E, R, S, T, B, N, and C-type thermocouples; voltage ranges are also supported.

www.automationdirect.com



Ethernet Switch

Omega's introduced its OM-ESW-100 series, a range of compact IEEE 802.3 layer two network unmanaged industrial Ethernet switches with automatic speed, duplex and cable sensing. The series features robust construction capable of withstanding environmental extremes for use in mission critical applications. The Class I, Division 2 switches feature redundant power inputs, hardened metal enclosures and 16 kV port protection. Each switch is capable of auto negotiating 10/100 Mbps and half/full duplex communications.

www.omega.com



Machine Vision

X-Ray Camera

Teledyne DALSA introduced its Remote RadEye HR camera, a compact, CMOS-based industrial X-ray camera. The sensor features more than 2 million pixels in an active area measuring 33x25mm, with a pixel spacing of just 20µm, and supports X-ray energies up to 90kVp. The camera connects via its integrated direct-USB interface and has 12 digital video outputs. The sensor body, packaged in an aluminum housing, measures 40x50x13mm and weighs less than 200g.

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Frame Grabber

BitFlow, Inc. introduced its Cyton CXP4 four-channel frame grabber based on the CoaXPress standard. The card features the Gen 2.0 x8 PCI Express bus interface and supports video capture speeds of up to 6.250 Gigabits/second (Gb/S) in applications deploying one to four CXP-6 cameras. CXP also allows control commands, triggers and power to be sent to and from cameras over the same 75 Ohm coaxial cable. The Cyton CXP4 supports simple and complicated, application-specific triggering.



The frame grabber cards can also be aggregated to support data rates up to 25 Gb/S of data.

www.bitflow.com.

Electric

Crimp Inserts

HARTING now offers size 3A crimp inserts that have a rated delivery capability of 55A at 40°C. The Han Q 3/0 and Han Q 4/0 inserts are designed to fit into any Han 3A housing –standard metal, EMC (high shielding), HPR (external power) or Han-INOX

(stainless steel). Each Han Q 3/0 module measures 42 mm², features three contacts plus a ground and can accommodate wires ranging from 8 AWG to 16 AWG. The Han Q 4/0 is a 4-pole version of the Han Q 3/0 without a ground and is intended for use in Han 3A plastic housings. Also, with their four contacts, each of these connectors can be used for two devices up to 52A and 830V.

www.harting.ca



Fluid Power



Toggle and Stem Valves

Clippard introduced its line of HV-HTV valves, available in 3-way and 4-way configurations, feature #10-32 inlet and outlet ports. They are available as toggle or stem actuated, in addition

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to cartridge styles, with flows up to 15 scfm at 100 psig. The HV-3 Series is a fully-ported 3-way valve. This can be used as a selector valve choosing between two separate pressures or fluids going to a single output. Being fully-ported, the valve also works as a diverter sending a fluid to two separate outputs. Also, the valve may be used as a Normally-Closed or Normally-Open 3-way valve. The HV-4 series is a 4-way valve that vents its exhaust ports to atmosphere and is designed for powering simple cylinder applications.

www.clippard.com

Pneumatics Tubing

AutomationDirect has expanded its pneumatic tubing line to include UV stabilized polyurethane (PUR) and PTFE styles. NITRA tubing is made from 100 percent virgin raw materials and has a hardness specification of Shore A 98. The tubing provides protection



against UV rays of the sun and ultraviolet lights used in curing processes. UV stabilized tubing is available in inch (5/32 to 1/2-inch) and metric sizes (4mm to 12mm) in 100-foot and 500-foot. NITRA PTFE tubing has a hardness

specification of Shore D 55 and is designed for high heat applications. This tubing is available in inch (1/4 to 1/2-inch) and metric sizes (4mm to 12mm) in 100-foot rolls.

www.automationdirect.com

Solenoid Valve

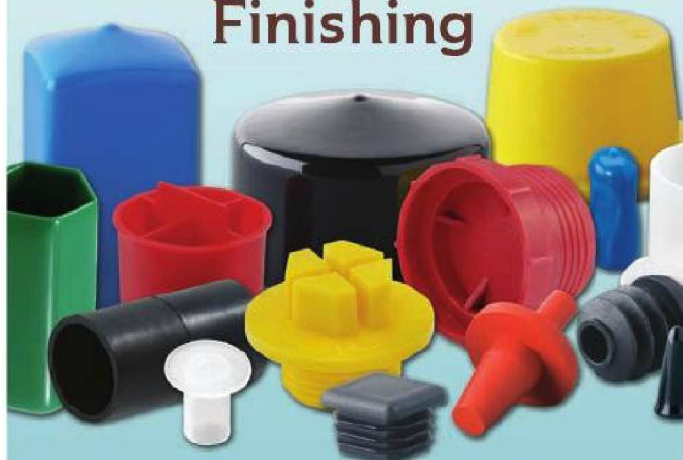
Parker Hannifin Corporation introduced its Viking Lite Valve Series, a low-cost inline solenoid valve. The valves feature Parker's Wear Compensating System (WCS), which comprises a spool seal that expands radially under pressure and doesn't require lubrication. The series operates with standard pressures of up to 145 psig and standard temperatures ranges of 14°F to 122°F (-10°C to 50°C). The Viking Lite Valve Series come in 3-way and 4-way 2-position single and double solenoid and 4-way 3-position double solenoid functions, 1/8, 1/4 or 3/8 port sizes with a standard 22-pin 3-Pin DIN solenoid connector. The valves can mount individually or collectively on an IEM bar manifold.



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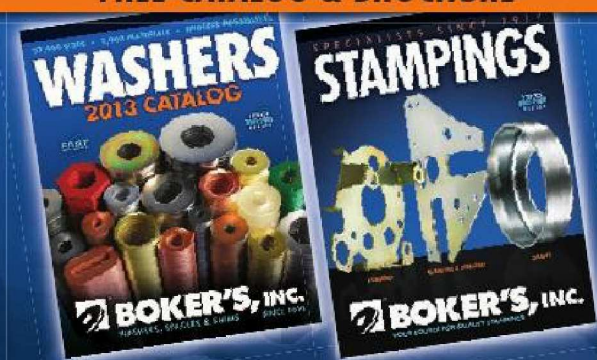
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Rigid Mounting Clamp

Stafford Manufacturing Corp. released its Staff-Mount Split Mounting Clamps, a series of heavy-duty "L" mounting clamps. The series features a perfectly flat mounting half that provides a large footprint, includes dowel holes for precise locating, and 4-hole patterns for multiple attachment options. They have eight drilled and tapped holes to let users attach the mounting half to an object. The clamps are machined from aluminum and offered in standard 2-inch and 4-inch lengths with 3/4-inch to 2-inch shaft, tube, and pipe sizes. Dowel hole locations are held to a tolerance of 0.001 inch.

www.staffordmfg.com



Conveyor Pulley

Baldor Electric Company introduced its Dodge D-LAG conveyor pulleys that feature a 100 percent vulcanized, natural rubber compound that is 73 percent more resistant to wear than standard SBR rubber. Two pulley styles are available:



D-LAG heavy-duty drum pulleys with a 10- to 24-inch diameter, and D-LAG MDX (mine duty extra) drum pulleys with a 12- to 24-inch diameter. The heavy-duty pulleys are designed with flexible end discs to eliminate weld fatigue under cyclical loads, while Dodge MDX pulleys feature an integral hub design that eliminates the welded hub.

www.baldor.com

Ball Bushing Bearings

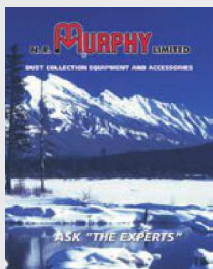
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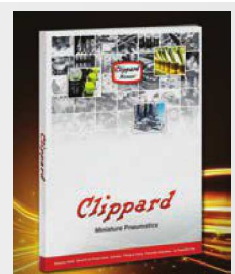
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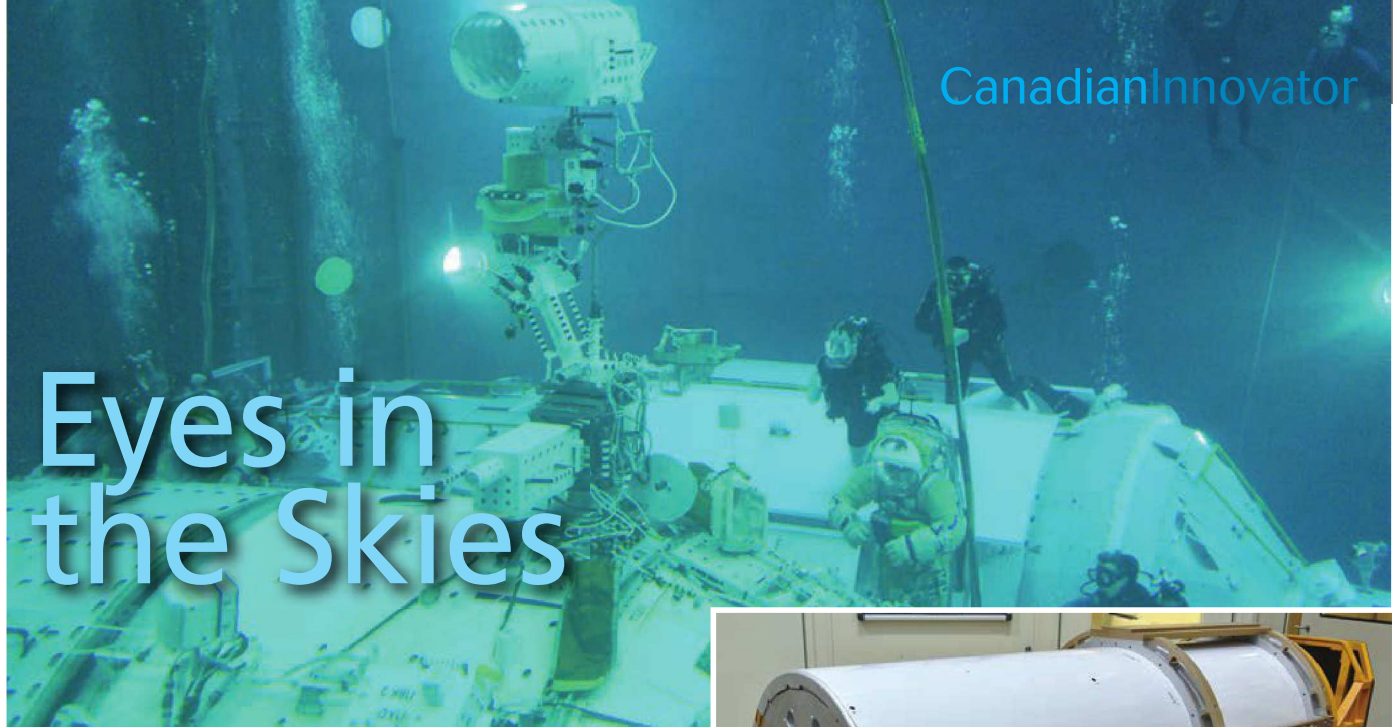
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Eyes in the Skies

Vancouver's Urthecast to bring near real-time, HD video of Earth to the Internet.

By David Godkin

Those in the business of observing Earth from space – or who simply enjoy the view – will soon have a more precise and comprehensive tool at their disposal. This November, a Russian Soyuz rocket will blast off from Kazakhstan to deliver two cameras to the International Space Station (ISS), including one that will provide the first, near real-time high-resolution video footage of the earth. Spearheaded by Vancouver-based company, Urthecast, video and still images will be down linked to customers for scientific and business purposes and made available to ordinary citizens on the Internet.

"The rich information content in this data set has all kinds of applications," says Urthecast CEO Wade Larson, "from biodiversity measurement to disaster management to increasing general public awareness. Fukushima, Tahrir Square, Hurricane Sandy; none of these had an HD video-from-space application."

Larson says Urthecast's High Resolution Camera (HRC) will be a vast improvement over "push broom" imagers in space, which are limited to collecting static images of the earth. Mounted on a swivel attached to the Russian's service module aboard the ISS, the HRC will use an array detector to capture video footage at three frames per second for a tight, 15 km square view. Passing over a city the size of Vancouver for 90 seconds will yield 270 video frames at a resolution of one meter, says Larson.

"You will not see an individual person, but you will be able to see real movement, i.e. crowds of people, cars moving, cars stopping, a golf cart moving along on the golf course. Nothing like this exists in space."

Last year, the Russian Space Agency jumped at the idea proposed by Larson and his brother Scott, also a former executive of MacDonald Dettwiler and Associates (MDA) in Richmond, B.C., to deploy the HRC aboard the space station. It also re-scheduled the launch date to dovetail with the launch



Above: Cosmonauts practice installing Urthecast's cameras on an ISS full-scale model at the Hydrolab training facility in Star City, Russia. The company's HRC camera will transmit HD video of Earth in real time.

of the Olympic Torch into space for Russia's 2014 Winter Olympic Games. Urthecast's job, meantime, has been to develop the business model needed to attract financial investment to support the program.

50-km Snapshots

Urthecast's main draw will be the HRC's video capability but some of the program's appeal will be for a second medium resolution camera (MRC) attached to the ISS in a fixed, downward position. The MRC will capture static images of a 50 km swath of the earth at a lower resolution of 5.5 metres. Larson says this will be helpful in business and science applications that require a wider view, such as agricultural monitoring.

"You don't see cars and buildings so much as you see forests and fields," he says. "Here, the applications would include things like change detection in farm crops, oil and gas spills and the monitoring of maritime traffic."

A daily list of task commands will be uploaded to the cameras in space from mission operations in Moscow, while actual manipulation of the cameras will be built into automated systems aboard the ISS. Video and MCR image data will then be down-linked to as many as eleven ground stations around the globe and delivered to licensed customers, and to a web portal for ordinary users currently under construction in San Francisco. Larson says those users will access both video and MRC imagery in much the way they do Google Earth; the difference is these will be refreshed within just a few hours of capture.

The best part, Larson adds, is that ordinary users will enjoy the “overview effect” ISS astronauts typically experience travelling 350 km above the earth’s surface.

“It’s the sense of wonder and awe that people have when they see the planet from the vantage point of space. Our vision, our ambition is, in a small way, to make that available to everyone in the world through the Internet.”

Larson says all of this has been made financially feasible because of the ISS’s comparatively low orbit. Satellites orbiting 600 to 800 km above the earth are expensive to design and build. Piggy backing onto the International Space Station, 350 km above the earth, not only provides a closer view, it keeps costs

down. The \$55 million in private funding raised so far and web advertising won’t hurt either, Larson adds, but what has really made the project viable is the “marriage” of technology to market demand.

“By ensuring very low capital cost, and creating a video product that creates a level of intimacy and viewer engagement you don’t have with still imagery, and then bringing that into the Internet age, that is where we stand out quite uniquely.”

Final integration and testing of the technology will be performed by Rutherford Appleton, a government-owned lab in England that is also building the telescopes and other optical components. Meantime, MDA has developed

real-time software to compress the high volumes of video and still image data that will be downloaded to the ground.

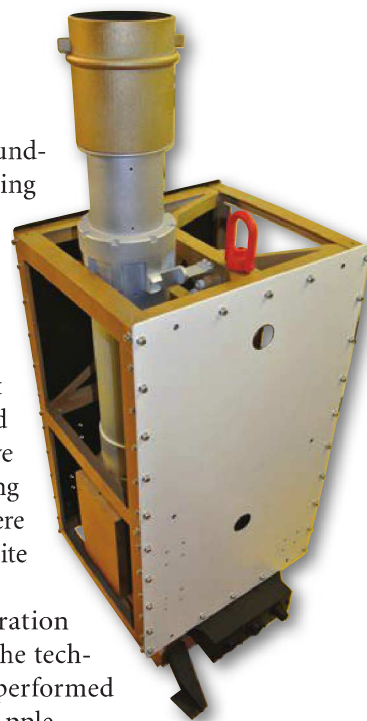
“We’re working with many high speed channels at the same time and also with two cameras at the same time,” says MDA project manager and aeronautical engineer Carlos Alonso. “It’s the first time we’ve done something like this and it’s very, very exciting.”

Exciting enough to sign a \$4.2 million contract with Urthecast to develop the back end of the cameras. For his part, Larson believes “MDA is the right partner” for a project as involved and complex as this one.

Will the HRC’s near real-time capability evolve into full real-time video? Larson thinks “there’s always going to be a slight delay.” Urthecast’s goal is to add additional cameras, sensors and ground stations as the company becomes self-sustaining, thereby “increasing throughput of the entire system.”

Both cameras will be shipped to Russia later this summer. Following the November launch, the cameras will be installed by cosmonauts to the outside of the ISS in three separate space walks. Once they have been fully calibrated and commissioned, the HRC and MRC will begin operating in the first quarter of 2014.

www.urthecast.com
www.mdacorporation.com



Urthecast’s MRC will capture static images of a 50 km swath of the earth at a resolution of 5.5 metres.

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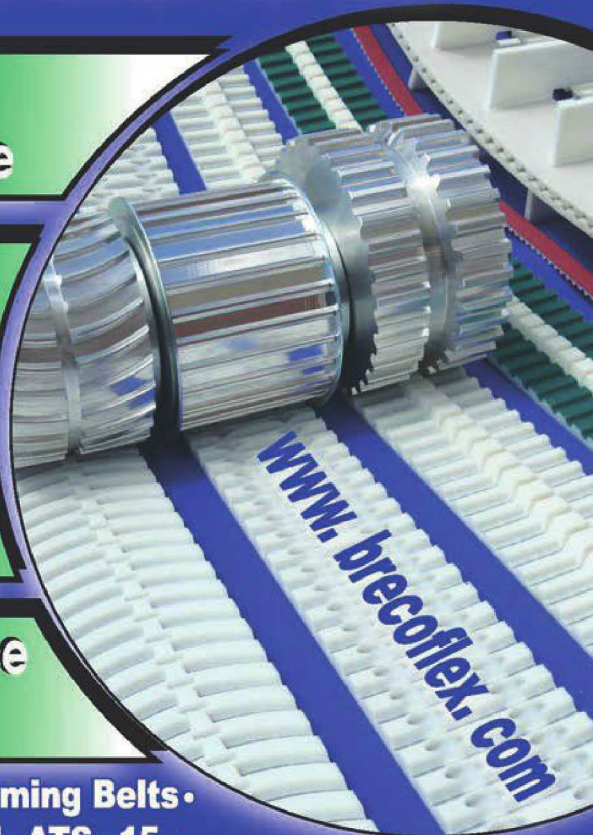
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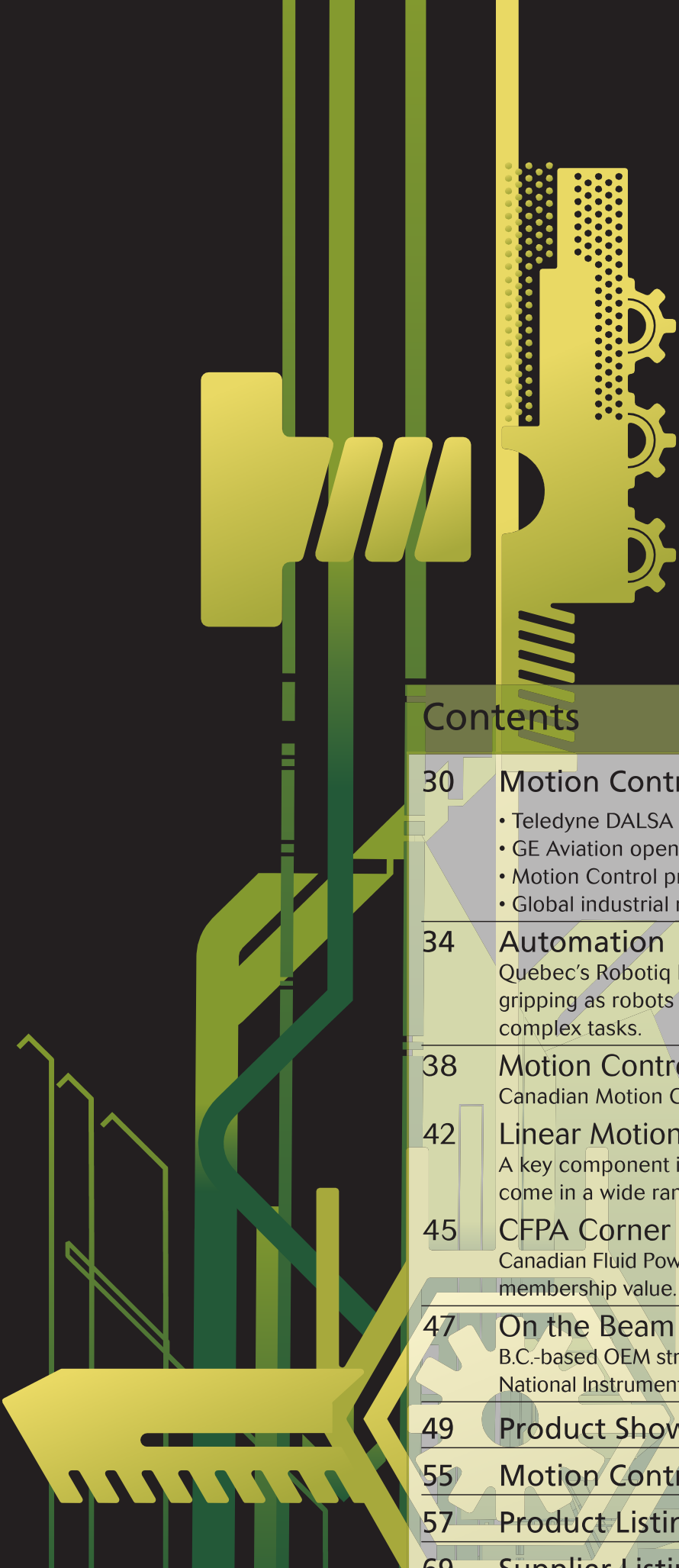
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Motion Control Buyer's Guide

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Siemens appoints new CEO for Motion Control

Robert Neuhauser has been appointed CEO of Siemens' Motion Control (MC) systems business, succeeding Uwe Frank, who is becoming CEO of Siemens' Control Products & System business in its building technologies division in Switzerland.

Frank has been CEO of MC since October of 2008, driving the company's strategic business alignment to become an innovation and technology leader supplying equipment to the global machine-building industry, the company says.

Neuhauser, who has been with Siemens since 2006, is taking up his new post on 1 July. He is currently chief operating officer of Siemens' healthcare business.

After completing a doctorate in physical chemistry, Neuhauser spent two years doing research at the Massachusetts Institute of Technology in the US. Later, he worked in the development division of the chip-maker, Infineon.

www.automation.siemens.com



Robert Neuhauser

Teledyne DALSA cameras help create Matrix-style replays

Every sports fan loves the slow-motion replay, especially following a controversial call. But what if you could pause the action, zoom in and out and even sweep around the action, Matrix-style? Waterloo, ON-based Teledyne DALSA is helping make it happen.

The Canadian machine vision equipment maker announced that it is partnering with Replay Technologies to provide its cameras and frame grabbers for deployment of Replay's freeD sports replay system at AT&T Stadium (formerly Cowboys Stadium) in Arlington, TX.

Using Dalsa's high definition cameras, Replay's freeD system works similar to creating a 3D model from 2D photos using a series of Microsoft Xbox Kinect sensors, yet on a much larger and more sophisticated scale. In addition to standard 2D video, the Dalsa cameras will also store depth data and color textures of the action from multiple angles.

The depth data from the cameras is then combined to form 3D models of the players over which the color texture pixels are applied. The resulting 3D photo-realistic renders allow replay of a touchdown reception, for instance, to be played back or reviewed from angles where there wasn't a physical camera.

At AT&T Stadium, the freeD system will use 24 Teledyne DALSA Falcon2 cameras—12 cameras positioned around each end of the field. The camera's 12 megapixel, 4K-resolution



will allow the system to capture close-ups in HD quality. According to Replay Technologies, Teledyne Dalsa's cameras and Xcelera frame grabbers were selected to deliver the speed and resolution required for this application.

The freeD system was first used in 2012 at the Players Championship PGA golf tournament and at the London 2012 Olympic Games gymnastics competition. The system is currently deployed at Yankee Stadium in New York and is a regular feature of Yankees home games broadcasted by the YES Network with an average of 30 second rendering time.

The freeD replay system was featured during NBC Sunday Night Football's broadcast of the first Dallas Cowboys NFL home game versus the New York Giants on September 8th.

www.teledynedalsa.com

www.replay-technologies.com

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GE Aviation opens Automation R&D Centre in Bromont, Que.

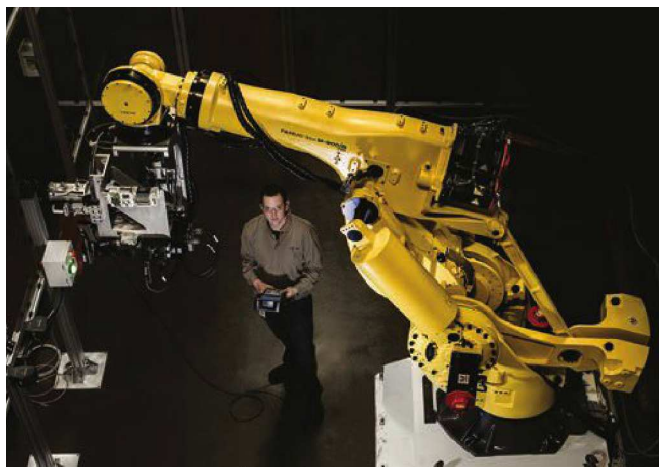
GE Aviation opened a Global Robotics, Automation and Instrumentation R&D Centre in Bromont, Quebec. According to the company, the centre will develop advanced robotic processes, software applications and intellectual property. GE Aviation Bromont manufactures aircraft engine components, including the CFM56 engines for the Boeing 737 and Airbus 320 aircraft, and GENx engines for the Boeing 787 and Boeing 747-8.

The \$61.4 million investment will create up to 60 skilled jobs and includes \$8 million from Investissement Quebec (IQ) and the Ministère des Finances et de l'Économie du Québec (MFEQ). In addition to manufacturing engine components in Bromont, GE Aviation manufactures complex engine hardware in Orillia, Ontario, and has an engine testing and research and development centre in Winnipeg.

www.geaviation.com

AV&R, IMAC to Merge

Aerospace robotics company, AV&R Vision & Robotics, and manufacturing automation and die casting equipment firm, IMAC Automation, announced the two companies are merging to become AV&R, Quebec's largest automation engineering firm. The new AV&R group now comprises more than



120 employees, including 80 engineering graduates, in its offices in Old Montreal and in Saint-Bruno.

Following the merger, AV&R will continue to serve IMAC Automation's existing customers in Quebec in their various sectors with AV&R-IMAC. AV&R Die Casting (formerly IMAC Die Casting) says it will benefit from AV&R's expertise in inspection and robotic finishing to further IMAC's Cadence 100T small aluminum parts casting product.

www.imacinc.ca

Motion Control product sales down in 2013

According to statistics released by the Motion Control Association in August, global shipments for motion control products fell by 6.8 percent in the first half of 2013. However, the industry trade group holds more optimism for the later half of the year.

"Our second quarter survey of MCA member companies revealed that only two percent of respondents believe motion control shipments will contract further over the next two quarters," said Jeff Burnstein, president of MCA. "Optimism is higher yet among MCA distributor members, of whom 80 percent believe motion control shipments will increase in the next six months."

"While shipments declined in some of the largest product categories, such as motors, there are a few categories that are doing very well this year," said Alex Shikany, MCA director of market analysis. "For instance, shipments of motion controllers are up 15 percent and



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support services are up nearly six percent through June.”

MCA summarizes market results from suppliers and distributors in quarterly tracking reports and trend analysis reports. These reports examine orders and shipments by major product category quarterly and annually with tables and color graphics. Growth rates and book to bill ratios are provided for each product category.

www.MotionControlOnline.org

Global industrial machine vision sales to hit \$2 billion by 2018

A report on machine vision (MV) technology and market trends published by french research firm, Yole Développement, says total industrial MV sales accounted for 1.2 million cameras in 2012. In addition, sales are expected to reach \$2 billion in 2018, at an 8 percent CAGR.

From an industrial perspective, the report states that, “versatile detection and inspection, and compact 3D inspection will fuel most of the machine vision industrial market’s growth over the coming five years, driven by new low-end applications.”

From a non-industrial standpoint, all identified segments are expected to sustain steady, high growth at approximately 15 percent CAGR, specifically high-end IP surveillance, license plate recognition and automotive safety sectors.

“After moderate 1 percent growth in 2012, an upturn is expected in the future, thanks to the automation trend in Asian factories, new capital expenditures in the semiconductor industry and the emergence of new low-end applications,” said Paul Danini, Technology & Market Analyst, Imaging Technologies & MEMS Devices, at Yole Développement.

“Growth in the low-end segments will be driven by strong price erosion stemming from the commoditization of machine vision subsystems.”

The company’s report notes that MV applications’ complex diversity has resulted in the emergence of a multitude of small MV camera manufacturers. Therefore the machine vision market is “very fragmented at the camera level”. On the flip side, the MV image sensor market remains concentrated due to the requirement for strong technical know-how in designing specialized sensors.

www.yole.fr

Rexroth launches fast delivery program

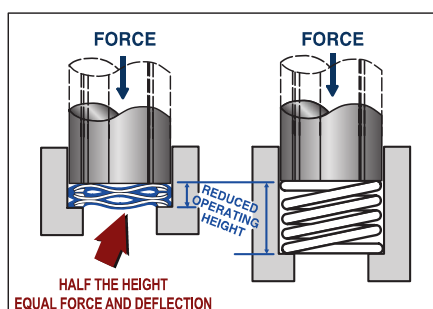
Rexroth announced a new GoTo focused delivery program for its most requested drive and control products. Delivery times vary according to specific products selected, but the company says products are shipped as quickly as 24 hours after ordering. The company’s GoTo program includes a quick-reference website, ordering details and downloadable technology-specific catalogues that identify all of the products and shipment times covered under the program.

www.boschrexroth.ca/GoTo

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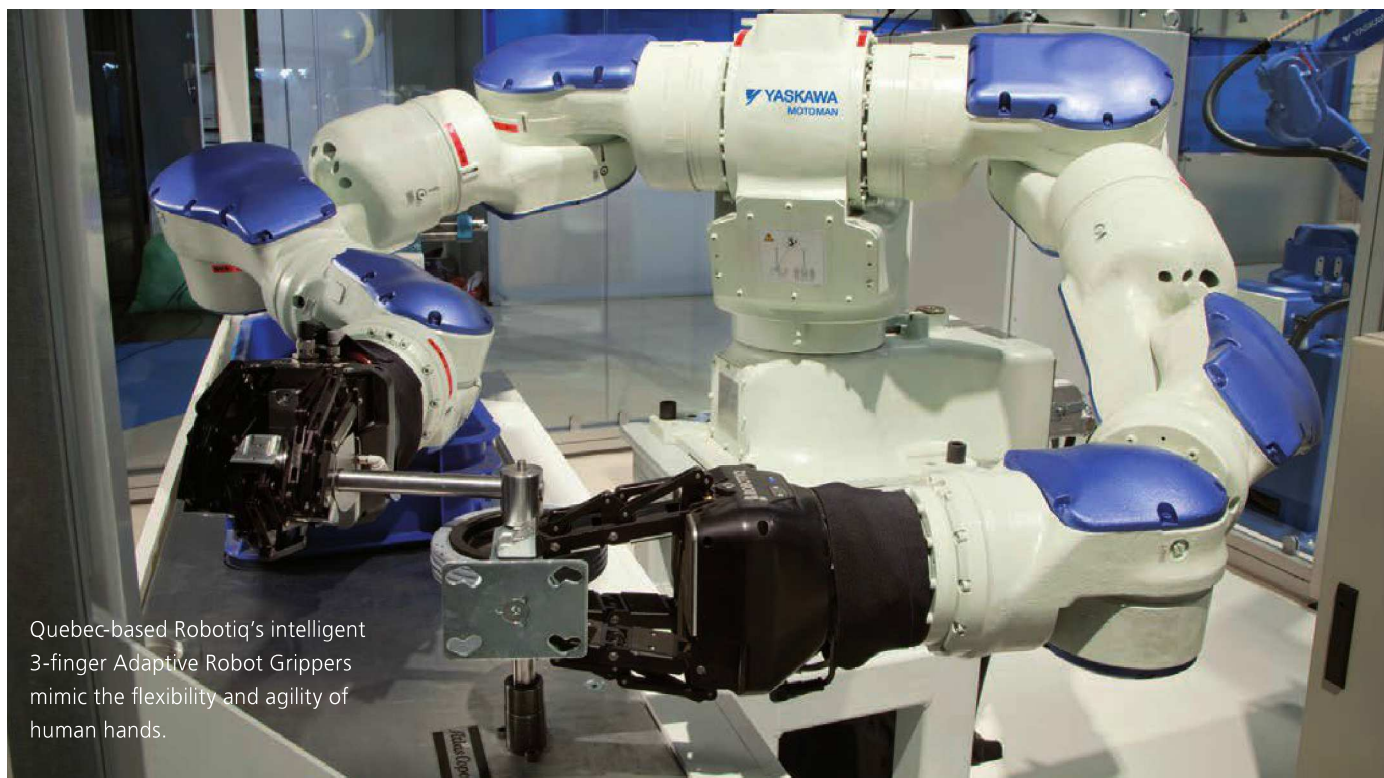


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Quebec-based Robotiq's intelligent 3-finger Adaptive Robot Grippers mimic the flexibility and agility of human hands.

Get a *Grip*

Quebec's Robotiq looks to achieve intelligent and super-agile gripping as robots are tasked to accomplish increasingly complex functions.

By Treena Hein

It may seem like a trivial thing but engineering a truly flexible and adaptable robotic end-effector is tougher than it seems. In fact, it's akin to the manufacturing robotics field's quest for the Holy Grail, says Samuel Bouchard.

"For the past two decades, robot-makers have been working hard to create efficient bin picking systems, and we are getting very close now," says the president of St-Nicolas, Quebec-based Robotiq (pronounced Ro-bah-teek). "While the automation of many different production processes has progressed quite quickly, it's still been necessary to keep people doing highly repetitive tasks such as sorting parts."

But with the progress being made with 3D vision systems, computation and flexible end-effectors, Bouchard says, "I believe highly-efficient bin sorting will soon be a reality for today's industrial production lines."

It's in those highly agile and flexible end-effectors that Robotiq specializes. Founded in 2008, the company embeds mechanical intelligence into their universal gripping devices to boost the overall efficiency of automated systems. Bouchard started the company because he saw a large gap between robotics research and the robotics industry.

"I knew the lab we were in during my grad work at Laval University had something of value for the industry," he says. "The two other Robotiq co-founders [Jean-Philippe Jobin and Vincent Duchaine] and I looked at several technologies and chose to develop better robot hand technology because we could find good applications for it, and the technology was mature."

The Robotiq team set to work to create the company's standard offerings – the Robotiq 2-Finger and 3-Finger universal electric 'Adaptive Robot Grippers' – which are able to grip objects of any shape. After the grip has occurred and a motion is executed, the devices are also able to monitor whether they still have the object.

"We tried to keep the system as simple as possible," says Bouchard. "It has to be holistic too. In order to have a good control, the mechanics, electronics and software really have to be developed together."

Robotiq Grippers employ a combination of motor current monitoring and encoder data to detect pick-up. "The Gripper respects the incremental encoder value feedback relating to opening and closing limits, and cycle time is thus reduced because it doesn't have to fully open or close," Bouchard explains. "This is much more flexible than pneumatic grippers, which operate only from fully open to fully closed and also therefore take up

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more space and have limited stroke around small parts.”

Motor current is another feedback source. By knowing it, power supplies and their related protection devices can be appropriately dimensioned. “It can be used in a qualitative way to know what final force will be applied by the fingers to the object,” Bouchard explains. The 2-Finger Gripper also has an auto-locking mechanism, so that the motor doesn’t need to apply force continuously on an object to maintain the desired final force. This is for safety reasons and to reduce the amount of power required once an item is picked up.

But although these Grippers can accomplish so much, efficient bin picking has yet to be achieved. “It’s because there are often so many geometry types on each part to consider for proper handling in an industrial setting,” Bouchard says. “Parts are also in a random and unstructured environment so vision systems have to be very precise, and the computation behind the system has to be able to make sense of all the data detected by the vision system. Then, the robot has to be equipped with effective and flexible end-effectors to be able to handle the parts in many different ways. So all three pillars have to be in place.”

He says the progress that’s been made with vision systems



Robotiq’s Adaptive Gripper is a key component of Carnegie Mellon University’s CHIMP robot, a leading entry in DARPA’s Robotics Challenge.

over the past decade has been impressive, but they still have some way to go. “Computation is an even larger challenge and remains the major issue with bin picking,” he says. “Being able to calculate 1D linear segments, 2D features or 3D scenes was feasible, but making sense of all this data is a significant task.”

Achieving a flexible end-effector has involved various approaches. “Vacuum cups are an option, but they don’t work well when parts are irregular or there’s not enough flat spots to achieve a good grip,” notes Bouchard. “Pneumatic grippers are another possibility. You can control the force of the grip by controlling the pressure, but it’s hardly programmable. There is no built-in grip detection, only limited speed control and it’s also hard to achieve low force levels.”

The development of electric grippers has opened up a new world because the speed, force and position of the fingers are all adjustable. “So our grippers give more options to the computation software by being able to pick a part from different orientations,” Bouchard notes, “but better vision and computation systems are needed to achieve highly-efficient bin sorting.”

Robotiq’s 3-Finger Gripper is heading to the next DARPA (Defense Advanced Research Project Agency) Robotics Challenge as part of the Carnegie Mellon University (CMU) entry, CHIMP. In this challenge, robots have to perform complex decision-making tasks in disaster scenarios. Bouchard says the CMU team benchmarked several robotic hands available and found that Robotiq’s was a good fit for their design approach. Being part of this competition is a great source of pride for Robotiq team. “We also believe the Challenge will provide us with great visibility and demonstrate innovative ways to use our grippers,” Bouchard says, “no matter the outcome.”

DARPA win or not, Bouchard’s enthusiasm for robotics isn’t likely to ever flag. “I like the fact that it combines many disciplines and can be applied in various industries,” he says. “We’re just scratching the surface of what robots can do.”

DE

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Motion Control Roundtable 2013

Canada's motion control leaders discuss the future of the industry.

DE: *After a couple of strong years, the motion control market looked a bit slower or flat for 2012. Is 2013 shaping up to be more of the same or better/worse?*

Joe Ottenhof – Regional Manager Canada, Beckhoff Automation: This year is shaping up to be a very good recovery year for us. In our core markets, which include machine builders and manufacturers, we are seeing dramatic growth, driven largely by motion control. We know that because our drives business in North America is up substantially year over year. It's being driven specifically by the low end—small, very compact drives—which tells us that a lot of things are moving from a mechanical to a servo-based implementation. That's driven by the fact that prices are coming down for servo and other motion technologies.

Christian Fritz – Senior Product Manager For Advanced Machine Control And Robotics, National Instruments: In 2010/2011, the motion control industry saw considerable growth from the semiconductor and solar industries but then solar fell off a cliff last year. Additionally, the economic downturn in East Asia, especially Japan, challenged the motion industry's growth goals in the last year. On the flip side, these problems are very regional or industry specific, so companies with a broad geographic reach and a diverse offering across applica-

tion areas and industries weren't affected by those swings as much. NI has a wide customer base and that helps us decouple from a lot of those swings.

Mark McCann – Lead Design Engineer, Myostat Motion Control: Since 2011, our sales have increased by 30 percent, year over year. We didn't note any slowdown. I believe part of this has to do with our core product being an integrated motor. There is still so much growth potential in the industry for integrated motors that even if there is a general slowdown, the market is large enough to absorb it. So far, 2013 has seen about another 30 percent growth for us.

Goran Tesanovic, Manager – Motion Control, Siemens Canada: The general motion control market in 2013 is a bit better than 2012. We see an increasing number of orders requiring complex, sophisticated motion solutions, which is a good sign for our customers. Being capable of solving unique and advanced motion challenges gives them the advantage needed to stay ahead of global competition. At the same time, it plays well for Siemens, in that our products and solutions are perfectly positioned for the high-end motion market. Parallel to that, we also see an increased number of orders from the simple motion market segment, thanks to numerous new products Siemens introduced targeting those motion applications. Overall, the motion control industry experienced stronger demand in 2013 from the automotive and aerospace markets.

DE: *At Hannover Messe this year, there was a fair amount of buzz about Industry 4.0. Is this still a "far off" vision of automation or are there signs it's starting to take root?*

Ottenhof – Beckhoff: Industry 4.0 is the fourth revolution of manufacturing defined by the integration of the automation and information technology worlds to form what's been called by some the "Internet of Things." The concept of flexible manufacturing has been around for a while but, in this case, we're talking about a dynamic manufacturing system that takes

[Industry 4.0] isn't about just a single system that is "smart," but an entire machine, process or plant that is continually factoring in new data.

— Joe Ottenhof, Beckhoff Automation



Joe Ottenhof

data from, not only sensors, but everything having to do with the enterprise as a whole. It is all connected through the “cloud” and “big data,” those IT buzz words we hear so much about. The idea is to have a manufacturing system that learns. Not just a single system that is “smart” but an entire machine, process or plant, that is continually factoring in new data. While the ultimate implementation is perhaps 10 years away, Industry 4.0 is an official German government high tech manufacturing strategy built on technology that’s already in place today.

Fritz – NI: Industry 4.0 is relatively new but the phenomena behind it has been around for several years now. The number of intelligent programmable systems is dramatically increasing, and that trend follows through to the factory floor. Inter-connected, embedded control and monitoring systems that are all programmable and process data from analog sensors and databases or communicate wirelessly help machine builders create smarter machines that are more autonomous than ever before. Enabling technologies that make up this trend, like cloud computing, Industrial Ethernet or advanced measurement and controls, have already been adopted by innovative machine builders over the past couple of years. So, I think it has already started, but that it’s a slow evolution rather than a revolution that happens on a particular date.

When functionality is defined in software that’s open to an end user, it’s a lot easier to build features that differentiate your machine from your competitors’.

— Christian Fritz, National Instruments



Christian Fritz

McCann—Myostat: We’re not hearing anything about it directly. That being said, some of our high-volume manufacturing clients are looking to collect more data and they are collecting data at different stages within their operations to improve their quality control process. They are also looking at being able to access this data from worldwide factories and bringing it all into their central hub, or being able to do software updates to remote machines. So, for now, it’s at the software and quality control level which is all in line with Industry 4.0.



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Tesanovic – Siemens: The Fourth Industrial Revolution (Industry 4.0) is a vision, but there are already signs it is planting real seeds. Since 2007, Siemens has invested 4 billion Euro in acquisitions with the goal to link digital product planning with physical production. The market for industrial IT and software is expanding by about 8 percent each year mostly in areas of CAx, collaborative product data management, digital manufacturing, 2D-3D process design and engineering analyses tools, MES and command and control. Siemens is already preparing ground for Industry 4.0 and its Digital Enterprise Platform.

DE: *To what extent is motion control becoming as much about the software as it is the hardware?*

Ottenhof – Beckhoff: There is still a niche where fit-for-purpose hardware motion controllers are going to be needed. However, all functionality is ultimately about software, not hardware. Software is a huge enabler for bringing down the cost of complex applications. As complexity goes up in a hardware-based motion system, the physical hardware goes up. When you're talking about software-based motion, the complexity is a function of the code you're writing. And as the power of the PC goes up, your ability to execute more code goes up but within the same footprint. For us, more and more, we see that advances in motion control will be based on the advances in software, not hardware.

Fritz – NI: Software is playing a more dominant role because one of the key things of Industry 4.0 is that these distributed systems are software programmable to the lowest level. Fixed function controllers and drives that can't be modified by a user are typically optimized for very specific purposes or are designed to be as generic as possible to cover a wide variety of applications. Using them is typically very effective, but as

As product features become more and more powerful, you need software to abstract some of the complexity.

— Mark McCann, Myostat Motion Control



Mark McCann

soon as you have to step outside their defined capabilities, it gets really challenging. And if you build a smart machine that leverages a lot of sensor data, and you try to bring those measurements back into the control loop to build a vision guided motion system or a force feedback application with a fixed personality controller or system, you just don't have the flexibility to do that. When functionality is defined in software that's open to an end user, it's a lot easier to build features that differentiate your machine from your competitors'.

McCann—Myostat: Software is becoming increasingly important. Many motion control companies have so many hardware products that it is critical to have software that can be used to integrate them seamlessly. As the communication protocols become more complex, it's not something the end user can work with directly. Even on our side, with integrated servos, software is becoming increasingly important to give access to the features within the motor. As product features become more and more powerful, you need software to abstract some of the complexity. There are a lot of manufacturers who don't have the resources to employ engineers to program the lower level of motion control. They need software to assist them with programming the servos or other devices they are using.

Tesanovic – Siemens: Real motion control is already more about software than hardware. For years, CNC controllers have been loaded with tested and proven canned functions and cycles. The same has been happening during the last 8-10 years in the motion control market. Ready-to-use software blocks and solutions incorporated in the controller offer tested, proven solutions that shorten engineering time and remove application risk. In addition, Siemens also offers mechatronics software and support to customers in virtual machine analyses, optimization and simulation.

DE: *What major challenges do you find your customers facing in Canada?*

Ottenhof – Beckhoff: The challenge faced by all of our customers and suppliers in Canada is competition from a recovering U.S. economy and, of course, from offshore. Another challenge is finding skilful people. It is amazing how hard it is to find experienced engineers with skills that will help address the competition issues. It's important that we harken back to why Industry 4.0 is important. It's one of the things that Canada, perhaps more so than the U.S., should be looking at as a means of recovering our manufacturing competitiveness. If we keep going the way we have been going, we'll definitely lose to countries that leverage the latest tools and technologies.

Fritz – NI: One of the biggest challenges our customers in Canada are facing is staying competitive as manufacturing continues to move East. To bring some of those facilities back to Canada, they need to build smarter machines that have increased throughput, flexibility and operate more autonomously to secure their business but allow the Canadian

The Fourth Industrial Revolution (Industry 4.0) is a vision, but there are already signs it is planting real seeds.

— Goran Tesanovic, Siemens Canada



Goran Tesanovic

manufacturing sector to be successful and provide jobs—all necessary components that keep an economy growing.

McCann—Myostat: One thing we hear about is the overhead involved in R&D funding. As a nation, we're up against the U.S., which has a large base to work from. It's hard to move at the speed of business when government funding takes such a long time, especially when it's a required component within your business. Also, Canada is treated as somewhat of a secondary market by the large U.S. and Asian automation suppliers, so prices tend to be higher. On the other hand, we hear about the difficulties breaking into a larger U.S. and Asian markets, as well.

Tesanovic – Siemens: On the low-end machinery side, the challenge is the fierce competition from emerging markets. On the high-end side, the challenge is the availability of experienced application engineers at the time when machine builders need them. Many OEMs are operating with only small, core engineering teams. Also, up until recently, there was an issue with national technical standards being so strict in some areas, compared to other international norms, that it became almost a barrier for our customers to implement the most advanced compact motion technology. Today, some of the challenges are already removed and certifying organizations are working diligently to remove remaining obstacles. **DE**



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Choosing the *Right* Linear Actuator

A key component in many linear motion applications, actuators come in a wide range of designs, sizes and configurations.

by Chuck Leonard, MISUMI USA

Whether they are called single-axis actuators, slides or tables, linear actuators provide precision linear motion of a load along a single axis, as part of a machine assembly, a piece of industrial equipment or a testing and inspection device.

Automotive and appliance assembly operations first used linear motion devices nearly 100 years ago, although the principles of linear motion are actually centuries old. Over the years, although the principles have remained the same, the technology has evolved, resulting in more precisely controlled motion and greater flexibility of the tools used to achieve it.

Depending on the industry and the application, various factors will determine the most suitable type of actuator to use for a particular function or operating mode. Design engineers in factory automation industries—such as automotive, appliance, packaging, medical device, semiconductor, general manufacturing and assembly—must take all kinds of different factors into account in their decision-making and actuator selection process.

The following is an overview of some of the linear actuator choices available in the marketplace today.

Simple Stage Actuator Systems: Available in electric, manual or pneumatic models, basic stage systems offer an economical choice for performing relatively simple, yet precise functions. Typical applications for easy-to-adjust hand-operated units include inspection jigs and fixtures and manual indexing tables. They can also be used to perform manual adjustments on production lines to accommodate various product sizes. Electric or pneumatically-driven modules can be used in both horizontal and vertical positions for work transfers, conveyance and other basic motion. Users can select standard or precision class units based on the application requirements.

Standard and Cover Type Single Axis and Multi-Axis Actuators: This category includes a wide array of actuator assembly designs—including compact standard and covered types; standard- and high-precision grades; motorized styles (metric and NEMA); and a range of sizes, profiles and styles



MISUMI's LX Series actuators offer a compact, low-profile linear motion platform, allowing users to configure design options to suit a host of applications.

designed and engineered to handle light, medium and heavy loads. Some actuators can be configured with standard and custom mounting brackets and angle plates to form X/Y, X/Z or X/Y/Z axes.

Such a wide range of products is not surprising, since linear actuators play a key role in many machines, work cells and factory automation system applications. Typical functions include servo-driven insertion and drilling, precision measurement, QC testing and inspection, pick-and-place tables and painting stations, to name just a few.

When high precision performance is demanded, the vendor should be able to provide actuators having calibration certification. Many suppliers also offer commonly used accessories, such as limit switches and end-of-travel switches, which allow the actuator to perform specific functions.

In selecting linear actuators from such a broad field, design engineers can narrow down their choices using the specific application requirements, such as size/weight of load to transport, length of stroke, travel speeds, accuracy demands and the ambi-

ent operating environment.

Robotic Actuators: These convenient assemblies are multi-position, programmable robotic systems which include the actuator, controller and cables in a single package. Available in a broad spectrum of models and configurations, the systems are flexible and capable of performing precise motion control. Look for rugged construction, flexibility and long service life in medium and heavy-duty applications, such as part assembly, pick-and-place, insertion, inspection, alignment and testing.

Belt Drive Actuators: Belt-drive actuators come in a wide array of lengths and offer designers an economical and versatile choice for diverse applications in many industries, including packaging, printing, machine tool, aerospace and defense, manufacturing automation, education and entertainment. Comprised of a drive system, structural beam member, guidance system and cart, belt-driven systems are designed to carry loads up to 227 kg (500 lbs.) with



MSA Series Belt Drive actuators from MISUMI can be configured to carry up to 227 kg (500 lbs) at travel speeds ranging from 1,200 to 10,000 mm per second.

travel speeds ranging from 1,200 to 10,000 mm per second and high acceleration up to

20 G's or more.

Look for rugged, precision-machined steel construction, an interior shaft for superior strength, and an ultra-tough timing belt. Models are available for light, medium and heavy loads, including large hanging loads, and offer a variety of cart design options. Also, find a supplier that can also provide replacement belt drives and accessories such as motor mounts, gearboxes and sensor kits.

Overall, the right pre-assembled linear actuators offer industrial OEMs and their design engineers a practical and cost-effective choice, typically much less expensive than custom-building in-house. Many report that purchasing configured linear actuators from a reliable supplier has saved money and also dramatically reduced design and engineering time and costs.

DE

www.misumiusa.com

Chuck Leonard is a Motions Systems Specialist at MISUMI USA, a global supplier of fixed and configurable components, including linear actuators, for use in factory automation machinery and systems.

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The New CFPA

Canadian Fluid Power Association refocuses to increase Canadian membership value.

By Alan Wheatley, CFPA Communications Chair

Over the past year, the Canadian Fluid Power Association or CFPA has been working hard to provide true value for our members and create a national identity. After a few years of dwindling membership under the economic strains of the recent recession, the CFPA has now totally refocused and repositioned its value proposition. The NFPA in the United States has been able to provide important services for their members and the CFPA is modeling ourselves in a similar fashion but keeping it uniquely Canadian in the process.

Under the guidance of the CFPA's new Manager, Trish Torrance, the following committees (Market Insight, Education, Industrial Relations, Communications) now form the pillars of the CFPA and are mandated to create value and interest for our members.

Market Insights

The Statistics Committee, chaired by John Lamb, will provide information specifically for our Canadian marketplace. It will provide quarterly reports on how the industry is doing on a national and regional scale and allow members to compare performance against those results. In addition, the CFPA Executive Report will provide our members with a "gut check" of the industry at that moment in time. It will provide aspects such as daily rate of shipments, incoming orders and sales volume. Both of these reports have been a consistent request from our members. The committee will continue to look at value-add programs to provide additional market insight to CFPA members.

Education

The Education portfolio, chaired by long-time director John Bachmann, has been the cornerstone of the CFPA since its inception and continues to increase awareness of our fluid power industry. The lack of qualified personnel in our industry is a national cause for concern and our education committee continues to strive to generate interest in our profession. Whether it is the Fluid Power Challenges in Ontario and Alberta or our participation in fluid power scholarships, this committee continues to present the fluid power industry as a viable and exciting professional opportunity.

Industrial Relations

Our Industrial Relations committee, chaired by Doug Newton, has a mandate to provide an information conduit to our members regarding fluid power industry regulations



**Canadian Fluid
Power Association**

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d'énergie des fluides**

and certifications. Allowing new or existing products to be installed in Canada can be a confusing and difficult proposition. Our Industrial Relations committee will provide some clarity to this process as well as be a sounding board for questions from our members.

Communications

The Communication committee, chaired by myself, Alan Wheatley, is responsible for media outreach. We are currently remodeling our website for easier navigation as well as insuring all information is current and relevant. Instant updates on the website from regional and national events at committee meetings will ensure that all members will be kept up to date with pertinent information. Our goal to be on Twitter and LinkedIn is currently in discussion as we see social media as an important part of keeping in touch with the new generation of fluid power professionals. Stay tuned for the new launch of www.cfpa.ca in the near future.

Membership

Our Membership committee, chaired by Rich Docherty, is responsible for recruitment of new members. Reaching out to current and potential members and requesting feedback based on current initiatives will allow the CFPA to provide the information and events that our members are demanding. Its focus is to speak to members and quantify the value they receive for their membership in the CFPA.

Regional Events

Our Regional Events committee, chaired by Chris Ballard, oversees all regional and national events for the CFPA. Recently, we held our first CFPA regional meetings (Alberta on April 15 and Montreal on June 5) to great success. We look forward to our first 2-day national AGM on September 19 and 20 in Niagara-on-the-Lake, and are confident that it will be the best CFPA event we have created. Future plans are to take the event on the road to eastern and western Canada.

The CFPA is undergoing quick and positive change with efforts to give our new and future members value for money. We are enthusiastic about the future of our association and our industry and hope you will continue to support us. Check out our new website and feel free to contact Trish at our association office if you have any comments or wish to get involved. **DE**
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On the Beam

B.C.-based OEM streamlines electron beam machine control with NI LabVIEW, PXI

By Jie Gao, Ralf Edinger, Dmitri Sandler - PAVAC Industries Inc.

PAVAC Industries Inc. is the world leader in hybrid electron beam (EB) products and services. Our core technology is a diode laser heated beam gun with high electron density generation capabilities. There are a variety of applications for this technology including electron beam welding (EBW); pulsed electron beam physical vapor deposition (PEB-PVD); and electron beam flue gas treatment (EBFGT).

System Requirements

For our system, we needed a state-of-the-art control system that fulfilled the following functions and requirements:

Vacuum sub-system: Requires both the automatic system pumping down/venting procedure for the operator and individual vacuum component control to facilitate troubleshooting and maintenance.

Motion sub-system: There are three to six (could be more) mechanical axis depending on machine configuration. All mechanical axis, as well as beam current and beam focus, are considered to be electrical axis and required to move in the same coordinate space for a welding machine. Pulsed beam on/off control is required to synchronize with certain mechanical axis positions for the PEB-PVD machine.

Beam generation sub-system: Includes both automatic and manual control of bias voltage, high voltage and laser heating. Beam current proportional-integral derivative (PID) and beam focus coil current PID control loop rates are required running at 20 to 100 ms. A minimum 100 ns pulse width for digital signal generation is required to accurately control beam energy.

Beam manipulation sub-system: Includes beam focus control and wave-



Engineers at PAVAC Industries rebuilt the company's world leading electron beam systems, standardizing on a NI-based platform.

form generation for forming beam scanning patterns in an XY plane. It requires beam waveform patterns following a mechanical axis position for certain applications.

Machine vision sub-system: Used to bring up beams, locate the welding seam, and monitor the process.

Additionally, the control system is required to behave like an operating system for the machine; accept program in text format from the user; and interpret it into the specific machine operations. For advanced machine features, the control system is also required to parse basic programming elements such as variables, if conditions, for loops, while loops and subroutine calling.

Overview of the New System

The EB Machine mainly consists of a beam gun and processing chamber. The control software adopts a client/server structure to separate the graphical user interface (GUI) from core control functions and acts as a server running in the NI real-time target PXI.

The GUI is responsible for sending the operator's request to the server and displaying and logging the machine status feedback from the server. The GUI, which communicates via TCP/IP protocol, was developed with LabVIEW and deployed on an industrial PC.



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The following programmable state machines, which were coded with LabVIEW, the LabVIEW Real-Time Module and the LabVIEW NI Softmotion Module, run in parallel and collaborate to implement PLC-type control and multi-axis motion control:

Gun state machine: Handles control logic and procedures and maintains the status of gun vacuum pumps, valves, high voltage and laser power supply.

Chamber state machine: Handles control logic and procedures and maintains the status of chamber vacuum pumps, valves, chamber doors and servo motor drives.

Motion state machine: Controls mechanical and electrical axes motion and generates beam waveform according to the operator's settings.

Main state machine: Receives operator's requests; dispatches requests to the above state machines accordingly; and interprets and executes the user input text format program.

Time-critical functions built in the NI PXI-7833R with the LabVIEW FPGA Module include the following:

- Low-level axis set-point interpolation and control signals that are essentially part of the LabVIEW NI SoftMotion
- Beam PID control loop with a customized PID algorithm
- Beam focus coil current control loop
- Digital pulse generator
- Waveform FIFO buffer

Benefits of the NI Solution

The control system of our first in-house machine was a hodge-podge. The PLC was from Siemens; the motion control was made of a commercial software package called OpenCNC and a Vigilant Motion control card; waveform generation was from an NI multifunction DAQ card; and the GUI and vision was developed with Microsoft Visual Basic.

Although this structure worked, there were several disadvantages. First, an integrator needed to handle communication between the PLC and the motion control system. In addition, at least three sets of code from different computer languages needed to be maintained. Ultimately, when the product became obsolete, we foresaw that it was going to be hard to replace it due to compatibility issues.

Consequently, we started searching for a more efficient and complete solution and found the NI PXI and LabVIEW platform to be the best candidate. Equipped with abundant device drivers and frequently used control functions, LabVIEW relieves the developer from reinventing low-level functions. It also provided basic coding functions found in the other programming environments. Additionally, the NI hardware is versatile and reliable.

Overall, we concluded that the NI solution met all of our real-time control requirements. The system is highly scalable, expandable and easy to maintain.

DE

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Concentric Reducer

Baldor Electric Company introduced its Dodge MAXUM XTR concentric reducer, which the company says offers more torque rating per case size than others on the market. It's carburized and ground gearing meets AGMA Q11 Quality standards, as well as the AGMA 2301 cleanliness specification.

The reducer also features a standard premium tandem seal system with HNBR oil seals protected by an excluder lip auxiliary seal on all shafts. In addition, the XTR's tapered and/or spherical roller bearings are designed to meet or exceed AGMA standards. MAXUM XTR concentric reducers are available in nine case sizes, with torque ratings from 29,500 in-lbs to 579,000 in-lbs torque.

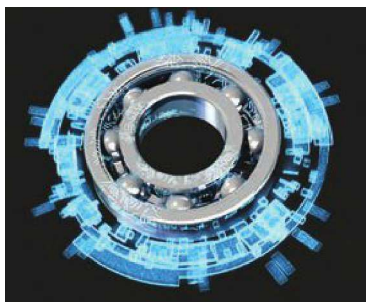
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Smart Bearings

SKF introduced SKF Insight, a "smart" technology integrated into new SKF bearings that allows them to communicate their operating conditions. According to the company, Insight technology monitors the conditions that can cause bearing damage from the first microscopic effect as it happens. Among its key features, SKF Insight includes miniaturization and packaging of sensor technologies to measure parameters such as RPM, temperature, velocity, vibration, load, lubrication and other conditions. The "smart" bearings generate their own power for operation while wireless technology packaged inside the bearing enables communication. The bearings can also form a "mesh network" to send information relevant to their condition for analysis.

www.skfusa.com



Planetary Gearhead

Maxon Motor has added two gearheads to its GP 32 line, which feature a reinforced planetary carrier, repositioned bearings and a ceramic version. Maxon's GP 32 AR and GP 32 CR gearheads position the bearings of the output stage as far apart as possible to compensate for radial forces of up to 140 N. In addition, the axles of the planet gears are securely fixed in both halves of the planetary carrier and ceramic axles can be selected to achieve maximum torque and life span. The short-term permissible torque reaches up to 1.25 Nm. The gearheads are available with output shafts in 6mm and 8mm diameters.

www.maxonmotorusa.com



Sensors

Linear Encoder

HEIDENHAIN announced its miniature incremental exposed linear encoders, the LIF400 Series, designed especially for linear motor applications.

With travel up to 1 meter, the LIF400s maintain a scale accuracy grade of $\pm 3 \mu\text{m}$ and is designed for both coarse and fine measurement applications (4 microns down to 10 nanometers of resolution). The series' grating, called SUPRADUR, offers a high tolerance to contamination due to the precisely measured layers of glass and reflective material that prevents contaminants from interfering with the light-based, non-contact scanning principle. Other features include optical limit switches and a separate homing track with an integrated reference mark.

www.heidenhain.us



Thermistors

TDK Corporation announces two series of narrowly tolerated EPCOS NTC thermistors in EIA 0402 and 0603 SMD case sizes.

The components have a rated resistance of 10 k Ω in tolerance classes ± 1 , $\pm 3\%$ and $\pm 5\%$. The slope of the characteristic curve (B value: 3455 K) has a narrow tolerance of $\pm 1\%$ across the board. These SMD NTC thermistors are available in two series. The automotive series is qualified to AEC-Q200 and suitable for applications up to $+150^\circ\text{C}$; the standard series for applications up to $+125^\circ\text{C}$.

www.epcos.com

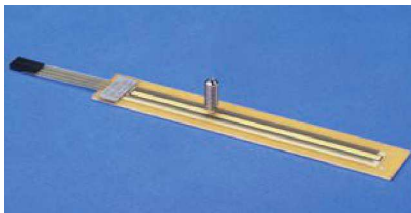


Membrane Potentiometers

Novotechnik introduced its LFP Series membrane potentiometers that offer a thin profile as well as linearity to ± 0.3 percent and life of over 25 million cycles. The

LFP Series operates using a screw-style pin attached to an application and runs across the membrane connecting a sensing track to a conductive ink track printed on a substrate through the applied pressure from the pin. As the pin moves across the membrane, the resistance monitored at the attached connector plug changes corresponding to the position of the pin. Other advantages are that the LFP Series is hermetically sealed against ingress of liquids and dust to IP67 and operates in temperatures up to 125°C . This component series is available in 10 standard lengths from 50mm to 500mm.

www.novotechnik.com/LFP



Photoelectric Sensors

Carlo Gavazzi launched a range of Background Suppression (BGS) Photoelectric Sensors in the company's PA18 and PH18 housings. The sensor line features an Active Pixel Sensor (APS) CMOS array consisting of 64 x 1 sensors, where each pixel represents a specific position of the detected object. The PA18 and PH18 sensors can withstand water pressure up to 100 bar and comply with ECOLAB and IP68/69K wash-down approvals. They have a sensing range of 200mm with two outputs: Normally open (NO) and Normally Closed (NC), available for NPN or PNP outputs. They require 10 to 30 VDC power supply and have an output current rating of 100mA with output voltage drop of 2.0 VDC at 100mA

www.gavazzionline.com



Subminiature Pressure Transducers

Honeywell Sensing and Control introduced its Model S Series of sub-miniature pressure transducers that featuring 1 percent accuracy at pressures ranging from 100 psi to 15,000 psi. The



transducers are designed to handle high pressure and temperatures, with a high natural frequency and flush diaphragm. Manufactured from 17-4 PH stainless steel, the sensors' operating temperature range is -54°C to 149°C (-65°F to 300°F). Temperature compensation

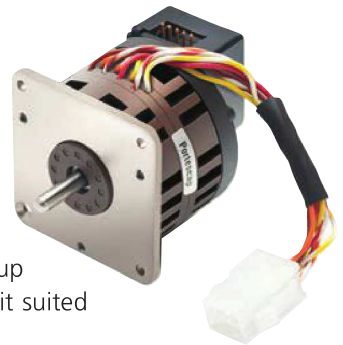
is accomplished by using temperature-sensitive components located inside the transducers. All the series' transducers have four active bonded strain gages arranged in a Wheatstone-bridge configuration.

<http://measurementsensors.honeywell.com>

Motors

Disc Magnet Motor

Portescap introduced its P532 series disc magnet step motor with encoder. The step motor series has a diameter of 52mm, length up to 55mm, and rated torque of 0.2 Nm (boosted up to 0.5 Nm). This allows the P532 to deliver acceleration up to 400K rad/sec², which makes it suited



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for applications where rapid changes in rotation are required (+/- 3,000 RPM in a few ms). The motor features a unique multipolar design requiring no additional iron to the rotor and therefore giving a low inertia (12E-7 kgm²). Closing the position loop with the encoder, it is capable of accelerations which, together with a high speed up to 6,000 RPM, make this motor technology suitable for fast incremental motion.

www.portescap.com



Servo Motor

Beckhoff Automation released its AM8000 servo motor series, which combines the power and feedback system into one standard motor cable. Through the single cable, the motor's encoder data, rotor position, multi-turn information and the status of the thermal conditions are transmitted without interference via a digital interface. The AM8000 series encompasses six different motor sizes, each with two or three optional overall lengths. The line encompasses stall torque range of 0.9 to 65 Nm. In addition, the motor line features modern salient pole winding technology, small end turns and a fully encapsulated stator.

www.beckhoffautomation.com

DC Motors

PITTMAN Motors introduced its BI-05 Series slotless brushless DC motor, designed for health care devices. Its design eliminates the magnetic cogging typically found in conventionally wound "slotted" brushless DC motors. The BI-05 motor body measures 0.5-in (12.7mm) in diameter and is capable of no-load speeds of up to 60,000 RPM. The miniature motor is rated for a continu-



ous output torque rating of up to 0.9 oz-in (0.0064Nm). The overall motor construction is a combination of 17-4, 300 and 400 series stainless steels. The 4-pole rotor is built using high-energy neodymium magnets, and an internal circuit board supports hall sensor feedback spaced at 120 electrical degrees. Other standard features include shielded ball bearings and a tight rotor balancing spec.

www.Pittman-Motors.com

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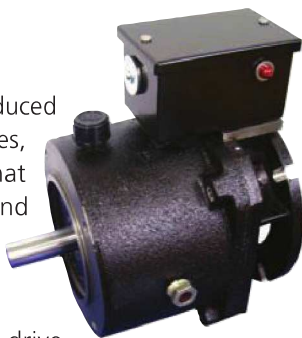
www.rittal.ca



Coupler Brake

Force Control Industries, Inc. introduced its Posistop and MagnaShear brakes, double C-face coupler brakes that mount between the reducer and C-Face motor. The units' oil shear technology includes a layer of automatic transmission fluid between the brake disc and the drive plate. This torque transmission causes the stationary surface to turn, bringing it up to the same relative speed as the moving surface. In addition, a patented fluid recirculation system helps to dissipate heat and lubricates all components of the oil shear brake, elongating their service life.

www.forcecontrol.com



nection, and support direct connection with non-contact switches and safety mats. They are DIN track-mountable or can be mounted with M4 screws. They require a 24 VDC power supply, and can operate in temperatures ranging from 0 to 55°C. They are ISO 13849-1(PLe) and IEC61508(SIL3) certified.

www.sti.com



Controllers

Safety Controllers

OMRON Automation and Safety introduced its line of G9SP Programmable Safety Controllers designed for small and mid-sized machinery. The controllers can also connect to an Omron PLC and communicate using the FINS protocol. G9SP controllers feature diagnostics and monitoring via Ethernet or serial con-

Safety Module

Pepperl+Fuchs introduced its VAS-2A8L-KE4-8SE, a programmable safety controller that's cost-effective, adaptable, and easy to install, configure and run, the company says. The device provides four redundant safe inputs and two independent safe electronic outputs. It runs on standard 24 VDC and allows any safe device with dry contacts or electronic safe outputs to be used. The controller features removable terminals and a drag-and-drop application interface to configure safety operations. When the configuration is downloaded into the safety controller, docu-



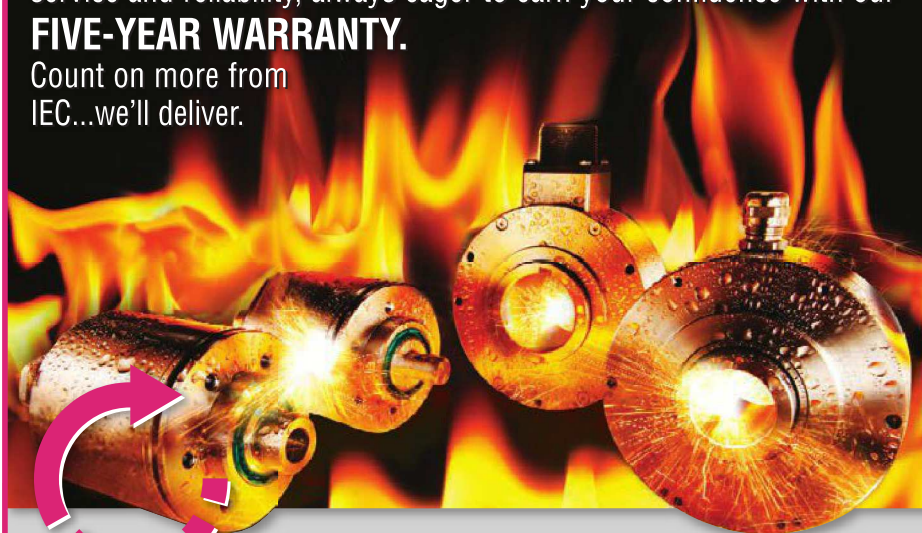
mentation is automatically created, and all necessary data is backed up on a memory card.

www.pepperl-fuchs.us

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Limit Controller

Omega introduced its CNI-AL series, a limit controller line that features universal inputs, high accuracy, 2 relay alarm outputs, totally programmable color displays, built-in excitation, AC or DC powered units, front removable plug connectors, programmable digital filter, high/low limit and remote reset input. CNI-AL can be used to monitor the temperature of a plastics extruder and, with the programmable limit alarm setpoints, the controller can provide a visual display color change and a latching limit alarm output to shut down process if an alarm condition exists.

www.omega.ca

Programmable Controller

National Instruments announced that its NI cRIO-9068 software-designed controller represents a complete redesign for the



CompactRIO platform. The controller integrates state-of-the-art technologies including the Xilinx Zynq-7020 All

Programmable system on a chip (SoC), which combines a dual-core ARM Cortex-A9 processor and Xilinx 7 Series FPGA fabric.

Based on the LabVIEW reconfigurable I/O (RIO) architecture, the new CompactRIO controller features a 667 MHz dual-core ARM Cortex-A9 processor and Xilinx Artix-7 FPGA. In addition, the controller has an extended operating temperature range (-40°C to 70°C) and comes with NI's Linux-based, real-time OS that provides greater flexibility for both LabVIEW Real-Time and C/C++ application developers, the company says.

www.ni.com

Industrial Ethernet

DRIVE-CLiQ Encoder

Leine & Linde launched DRIVE-CLiQ on an encoder designed for harsh drive environments. DRIVE-CLiQ—Siemens' communication protocol for motor feedback in a SINAMICS drive system—is an Ethernet-based interface for connection of different kinds of components and intended for transmission of real-time speed



data. The encoder features 19-bit, single-turn resolution and a cycle time of 31.25 μ s. Each DRIVE-CLiQ unit also has an electronic label with basic data, like part number and technical specification, so that the encoder is recognized by the system when installed and automatically set up. In addition, up to

five units may be connected to a hub for transfer of data over a common cable.

www.heidenhain.us

Industrial Router

Moxa introduced its EDR-810, an industrial-grade 8+2G secure router with Firewall/NAT/VPN and managed L2 switching functions. In addition to firewall policies, the EDR-810 adds VPN access. To secure Ethernet fieldbus networks that use Modbus TCP, the EDR-810 performs deep Modbus TCP protocol packet inspection using PacketGuard technology. Designed for harsh environments, the router withstands high EMC interference and temperatures from -40°C to 75°C. (-40°F to 165°F).



www.moxa.com



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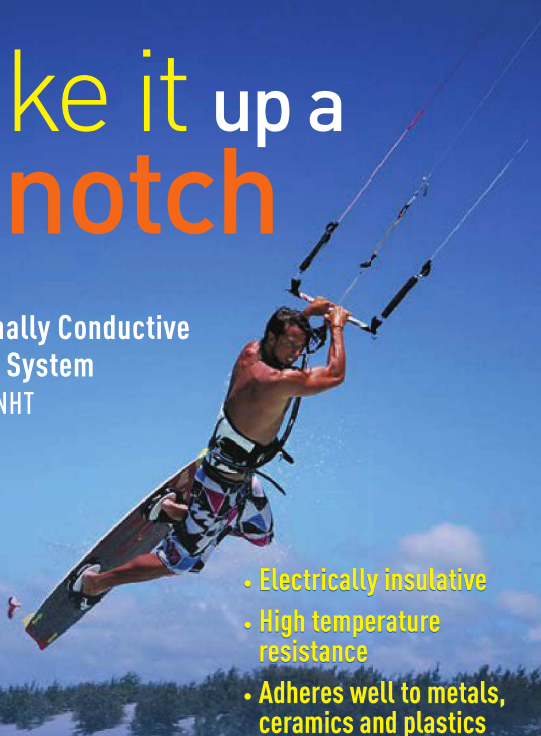



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Parker Hannifin Corp. Parker

Schunk Intec Corp.

Toro Hydraulic & Machinery

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Schneider Electric Canada

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Parker Hannifin Corp. Parker

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Electromate
Le Groupe Rotalec
Lenze Americas
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Schneider Electric Canada

DIGITAL SERVO

Advanced Drive Systems Inc.
Exlar Corporation
Lenze Americas
Parker Hannifin Corp. Parker
RG Speed Control Devices Ltd.
Yaskawa America

LINEAR SERVO

Mirai Inter-Tech
Parker Hannifin Corp. Parker

PIEZOELECTRIC

Mirai Inter-Tech

PROPORTIONAL

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Lynch Fluid Controls
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

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Reconit Electric Rebuilders
Ringball Corporation
Schaeffler Canada Inc.
Stock Drive Products/Sterling Instrument

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Ringball Corporation
Schaeffler Canada Inc.
Stock Drive Products/Sterling Instrument

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Bunting Bearings LLC
Quality Bearings & Components
Trelleborg Sealing Solutions

DUAL VEE

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Quality Bearings & Components
Ringball Corporation
Stock Drive Products/Sterling Instrument

FLANGE BLOCKS

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Global Bear Inc.
GRB, Gestion Industrielle RB Inc.
IGUS Inc.
Quality Bearings & Components
Schaeffler Canada Inc.
Stock Drive Products/Sterling Instrument

FLEXURAL PIVOT

Quality Bearings & Components

FLUID FILM

Quality Bearings & Components
Trelleborg Sealing Solutions

HYDRODYNAMIC

John Crane Canada Inc.
Quality Bearings & Components
Stock Drive Products/Sterling Instrument
Trelleborg Sealing Solutions

JOURNAL

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Bird Precision
Global Bear Inc.
Power-Motion Components, Inc.
Quality Bearings & Components
Tecom Inc.

MAGNETIC

Quality Bearings & Components

PILLOW BLOCKS

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Global Bear Inc.
IGUS Inc.
Quality Bearings & Components
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Schaeffler Canada Inc.
SKF Canada
Stock Drive Products/Sterling Instrument
Timken Canada LP

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Tecom Inc.

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IGUS Inc.
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RotoPrecision Inc.
Schaeffler Canada Inc.
Stock Drive Products/Sterling Instrument

ROLLER TYPE, PROFILE

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Tecom Inc.

ROLLING, ANGULAR CONTACT

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Schaeffler Canada Inc.
SKF Canada
Stock Drive Products/Sterling Instrument
Tecom Inc.

ROLLING, FLANGE

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Quality Bearings & Components
Stock Drive Products/Sterling Instrument

ROLLING, MINIATURE

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Quality Bearings & Components
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument

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Reid Supply
Schaeffler Canada Inc.
Stock Drive Products/Sterling Instrument
Tecom Inc.

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Schaeffler Canada Inc.
SKF Canada
Tecom Inc.
Timken Canada LP

ROLLING, SELF-ALIGNING

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Hercules Sealing Products
Power-Motion Components, Inc.
Quality Bearings & Components
Schaeffler Canada Inc.
SKF Canada

ROLLING, SPLIT

Quality Bearings & Components
Schaeffler Canada Inc.

ROLLING, TAPERED

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GRB, Gestion Industrielle RB Inc.
Power-Motion Components, Inc.
Quality Bearings & Components
Reid Supply
Schaeffler Canada Inc.
Stock Drive Products/Sterling Instrument
Timken Canada LP

ROLLING, THRUST

Amacoil
Global Bear Inc.
John Crane Canada Inc.
Quality Bearings & Components
Schaeffler Canada Inc.
SKF Canada
Stock Drive Products/Sterling Instrument
Tecom Inc.
Timken Canada LP

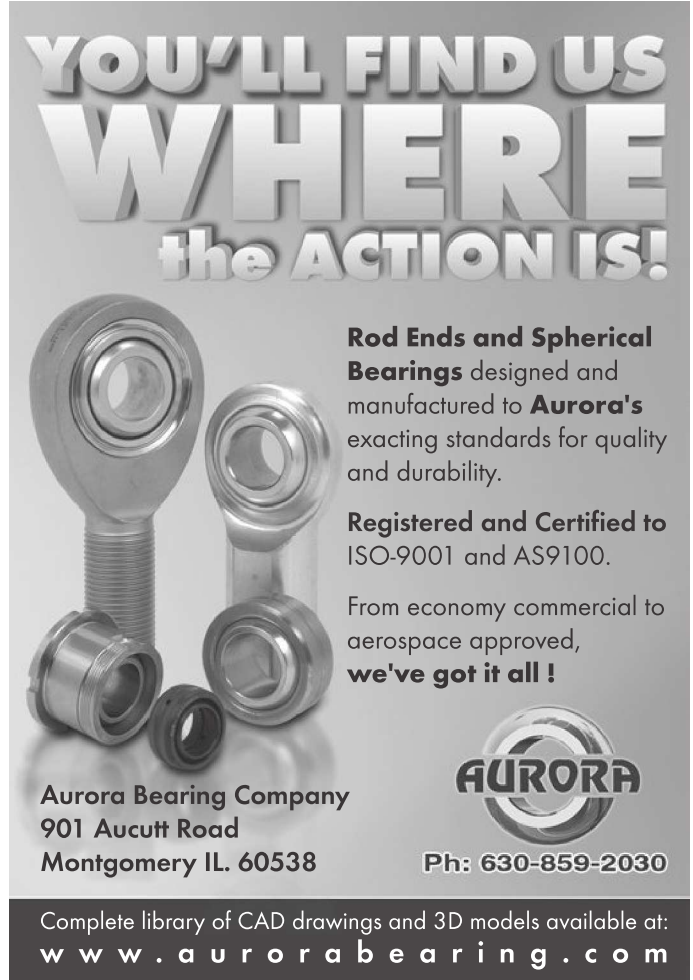


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Schaeffler Canada Inc.

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Polymotion Limited
Quality Bearings & Components
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Schaeffler Canada Inc.

SLEEVE, PLASTIC

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Quality Bearings & Components

SLEEVE, SELF-LUBRICATING

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Stock Drive Products/Sterling Instrument

ROUND

Stock Drive Products/Sterling Instrument

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Quality Transmission
R.W. Hamilton
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Mirai Inter-Tech
PIC Design
Quality Transmission
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TOOTHED

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V-BELT

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Regal Beloit Canada
Reid Supply
Stock Drive Products/Sterling Instrument

VARIABLE SPEED

Lenze Americas
R.W. Hamilton

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Drive-Line Inc.
Fairview Fittings & Mfg Ltd.
Global Sensor Systems
Grove-Crossman Equipment Ltd.
Mach III Clutch, Inc.
RG Speed Control Devices Ltd.

ELECTRIC

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MICO Inc.
Norcan Fluid Power

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SILENT SYSTEMS

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ENGINEERED

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Timken Canada LP

PINTLE

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Ringball Corporation
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Timken Canada LP

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Drive-Line Inc.
Mach III Clutch, Inc.

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Toro Hydraulic & Machinery

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Pesco Sales
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SEW Eurodrive Comp of Canada

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Le Groupe Rotalec
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Nippon Pulse America
Parker Hannifin Corp. Parker

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Lenze Americas
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IEC61131-3

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Schneider Electric Canada
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SEW Eurodrive Comp of Canada

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SEW Eurodrive Comp of Canada

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PQ Systems Ltd.
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Nord Gear Limited
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SEW Eurodrive Comp of Canada
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Cowper
Duct-O-Wire Canada
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Helander Products Inc.
Lenze Americas
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Motion Canada
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PQ Systems Ltd.
Schneider Electric Canada
Schneider Electric Motion USA
Servo2Go.com Ltd.
Siemens Canada Ltd.
Skymatic Controls
Trio Motion Technology LLC
Unico Canada Drives & Systems

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Schneider Electric Canada
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Davis Controls
Franklin Empire
J. R. Merritt Controls,
Lenze Americas
Midwest Motion Products, Inc.
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Schneider Electric Canada

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Ontario Drive & Gear

RotoPrecision Inc.
Stock Drive Products/Sterling Instrument

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John Crane Canada Inc.
Ontario Drive & Gear
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Rosta Inc.
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Timken Canada LP

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R.W. Hamilton
RotoPrecision Inc.
Seal Master Corporation
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Toro Hydraulic & Machinery

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Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

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Cowper
Fairview Fittings & Mfg Ltd.
McBurney Sales & Services
Parker Hannifin Corp. Parker
Rubberline Products Ltd.
Toro Hydraulic & Machinery

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Stock Drive Products/Sterling Instrument

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Parker Hannifin Corp. Parker

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Servometer
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Ontario Drive & Gear
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John Crane Canada Inc.
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Toro Hydraulic & Machinery

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GTC Falcon Inc.
Ontario Drive & Gear
Servometer

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Global Bear Inc.
GTC Falcon Inc.
Myostat Motion Control Inc.
Ontario Drive & Gear
RotoPrecision Inc.
Servometer
Stock Drive Products/Sterling Instrument

DRIVERS, STEPPER**FULL-STEP**

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Pesco Sales
Schneider Electric Canada

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Schneider Electric Canada
Schneider Electric Motion USA

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Cowper
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Schneider Electric Canada
Zaber Technologies,

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Stock Drive Products/Sterling Instrument

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Andy Baumen Associates
Cowper
Parker Hannifin Corp. Parker
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Schneider Electric Canada

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RG Speed Control Devices Ltd.

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Schneider Electric Canada

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Crossman Automation Inc.
Le Groupe Rotalec
Lenze Americas
Parker Hannifin Corp. Parker
Schneider Electric Canada
Unico Canada Drives & Systems

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Schneider Electric Canada
Unico Canada Drives & Systems

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Helander Products Inc.
Lenze Americas
Parker Hannifin Corp. Parker
Schneider Electric Canada
Unico Canada Drives & Systems

REGENERATIVE

Lenze Americas
Parker Hannifin Corp. Parker
Schneider Electric Canada
Unico Canada Drives & Systems

SAFE MOTION BASED

Schneider Electric Canada
Unico Canada Drives & Systems

SERVO, AC

Baldor Electric Company
Bosch Rexroth Canada
Cowper
Davis Controls
Franklin Empire
Lenze Americas
Motion Canada
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Schneider Electric Canada
SEW Eurodrive Comp of Canada
Siemens Canada Ltd.
Skeans Engineering & Machinery
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

Unico Canada Drives & Systems
Wainbee Limited
Yaskawa America

SERVO, DC

Aerotech Inc.
Baldor Electric Company
Cowper
Parker Hannifin Corp. Parker
Skeans Engineering & Machinery
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery
Unico Canada Drives & Systems
Wainbee Limited

SERVO, DIGITAL

Beckhoff Automation Canada
Cowper
Lenze Americas
Parker Hannifin Corp. Parker

VARIABLEFREQUENCY, AC

Advanced Drive Systems Inc.
AutomationDirect
Berendsen Fluid Power
Carlo Gavazzi Inc.
Cowper
Crossman Automation Inc.
Davis Controls
Grove-Crossman Equipment Ltd.
Lenze Americas
Moteurs Electriques Universal
MEP Inc.
Motion Canada
Nord Gear Limited
Parker Hannifin Corp. Parker
Regal Beloit Canada
Renown Electric Motors & Repair
RG Speed Control Devices Ltd.
Schneider Electric Canada
SEW Eurodrive Comp of Canada
Siemens Canada Ltd.
Unico Canada Drives & Systems
Yaskawa America

VARIABLESPEED, ELECTRIC

Advanced Drive Systems Inc.
Baldor Electric Company
Beckhoff Automation Canada
Carlo Gavazzi Inc.
Nord Gear Limited
Parker Hannifin Corp. Parker
Schneider Electric Canada

VARIABLESPEED, GEARSHIFT

Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

VARIABLESPEED, HYDRAULIC

Bosch Rexroth Canada
Norcan Fluid Power
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

VARIABLESPEED, MECHANICAL

Amacoil
Grove-Crossman Equipment Ltd.
Parker Hannifin Corp. Parker
SEW Eurodrive Comp of Canada
Toro Hydraulic & Machinery

VECTOR CONTROL

Advanced Drive Systems Inc.
Carlo Gavazzi Inc.
Lenze Americas
MEP Inc.
Parker Hannifin Corp. Parker
Renown Electric Motors & Repair
Schneider Electric Canada
Unico Canada Drives & Systems

FEEDBACK DEVICES**LINEAR DISPLACEMENT TRANSDUCERS**

Balluff Canada Inc.
Chartwell Automation
Cowper
Fabco-Air
Higginson Equipment
Matheson Valves
Parker Hannifin Corp. Parker
PQ Systems Ltd.

LINEAR ENCODERS

Balluff Canada Inc.
Baumer Inc.
Chartwell Automation
Connectric Systems Inc.
Heidenhain Corporation
Lenze Americas
Parker Hannifin Corp. Parker
Renishaw Canada Limited
Zakron Industries Inc.

MAGNETIC, ABSOLUTE

Balluff Canada Inc.
Baumer Inc.
Chartwell Automation
Connectric Systems Inc.
Heidenhain Corporation
Industrial Encoder Corporation
Lenze Americas

Parker Hannifin Corp. Parker
Renishaw Canada Limited

MAGNETIC, INCREMENTAL

Balluff Canada Inc.
Baumer Inc.
Chartwell Automation
Connectric Systems Inc.
CUI Inc.
Industrial Encoder Corporation
Lenze Americas
Matheson Valves
Parker Hannifin Corp. Parker
Renishaw Canada Limited
Schneider Electric Canada

MECHANICAL

Chartwell Automation
CUI Inc.
Heidenhain Corporation
Parker Hannifin Corp. Parker
Renishaw Canada Limited

OPTICAL, ABSOLUTE

Baumer Inc.
Chartwell Automation
Connectric Systems Inc.
CUI Inc.
Industrial Encoder Corporation
J. R. Merritt Controls
Parker Hannifin Corp. Parker
Renishaw Canada Limited
Schneider Electric Canada

OPTICAL, INCREMENTAL

Baumer Inc.
Chartwell Automation
Connectric Systems Inc.
CUI Inc.
Heidenhain Corporation
Industrial Encoder Corporation
Parker Hannifin Corp. Parker
Renishaw Canada Limited
Schneider Electric Canada

POTENTIOMETERS

Fabco-Air
Parker Hannifin Corp. Parker

RESOLVERS

Lenze Americas
Parker Hannifin Corp. Parker

ROTARY

Baumer Inc.
Chartwell Automation
CUI Inc.
Industrial Encoder Corporation
Parker Hannifin Corp. Parker
Renishaw Canada Limited
Schneider Electric Canada
Toro Hydraulic & Machinery

SERIAL

Industrial Encoder Corporation
Parker Hannifin Corp. Parker

TACHOMETERS

Baumer Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Lenze Americas

FLUID POWER COMPONENTS

ACCUMULATORS

BellosTech, LLC
Cowper
Cross Mfg Inc.
Higginson Equipment
Hypower Systems
Hyseco Fluid Systems Ltd.
P.S.I. Fluid Power
Parker Hannifin Corp. Parker
Peerless Engineering Sales
Ram Industries
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery

COOLERS

Advance Motion Control
Berendsen Fluid Power
Hydac Corporation
Hyseco Fluid Systems Ltd.
Norcan Fluid Power
P.S.I. Fluid Power
Peerless Engineering Sales
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery

DIRECTIONAL CONTROL

Berendsen Fluid Power
Bosch Rexroth Canada
Clippard Instrument Laboratory
Cross Mfg Inc.
Fabco-Air

Great Lakes Hydraulics Ltd.
Higginson Equipment
Humphrey Automation Inc.
Hydac Corporation
Hyseco Fluid Systems Ltd.
Waircom
Lexair
Lynch Fluid Controls
MICO Inc.
P.S.I. Fluid Power
Parker Hannifin Corp. Parker
Peerless Engineering Sales
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery
Webster Instruments
York Hydraulics Ltd.

FILTERS

Berendsen Fluid Power
Bird Precision
Cowper
Cross Mfg Inc.
Davis Controls
Fabco-Air
Great Lakes Hydraulics Ltd.
Higginson Equipment
Hydac Corporation
Hypower Systems
Hyseco Fluid Systems Ltd.
Industrial & Aviation Filters
John Crane Canada Inc.
MP Filtri (Canada) Inc.
Norcan Fluid Power
P.S.I. Fluid Power
Parker Hannifin Corp. Parker
Peerless Engineering Sales
Skeans Engineering & Machinery
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery
Wainbee Limited
York Hydraulics Ltd.

FLOW METERS

Alpha Controls/Instrumentation
Beach Filter Products Inc
E&E Process Instrumentation
Great Lakes Hydraulics Ltd.
Higginson Equipment
Hydac Corporation
John Crane Canada Inc.

Parker Hannifin Corp. Parker
Pesco Sales
Toro Hydraulic & Machinery
Webster Instruments

FLOW SWITCH

E&E Process Instrumentation
Great Lakes Hydraulics Ltd.
Higginson Equipment
Hydac Corporation
Parker Hannifin Corp. Parker
Switching Solutions Inc.
Toro Hydraulic & Machinery
Webster Instruments

GAUGES

Baumer Inc.
Cowper
Fairview Fittings & Mfg Ltd.
Higginson Equipment
Pesco Sales
Toro Hydraulic & Machinery
Webster Instruments

HOSE, HYDRAULIC HIGH PRESSURE

Fairview Fittings & Mfg Ltd.
Hyseco Fluid Systems Ltd.
McBurney Sales & Services
Parker Hannifin Corp. Parker
R.W. Hamilton
Ryco Hydraulics
Toro Hydraulic & Machinery

HOSE, PNEUMATIC AIRLINE

Clippard Instrument Laboratory
Cowper
Fairview Fittings & Mfg Ltd.
Geo. T. White Co. Ltd.
Higginson Equipment
Humphrey Automation Inc.
McBurney Sales & Services
NewAge Industries Inc
Parker Hannifin Corp. Parker
Power Beam
R.W. Hamilton
Ryco Hydraulics

HOSE/FITTINGS

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Ryco Hydraulics
Skeans Engineering & Machinery
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery
York Hydraulics Ltd.

LEVEL SWITCH

Andy Baumen Associates
Baumer Inc.
Cowper
Great Lakes Hydraulics Ltd.
Higginson Equipment
Hydac Corporation
MP Filtri (Canada) Inc.
Parker Hannifin Corp. Parker
Schneider Electric Canada
Switching Solutions Inc.
Toro Hydraulic & Machinery

LUBRICATION EQUIPMENT

Beach Filter Products Inc
Cowper
Davley Darmex Precision Lubricants
Higginson Equipment
Hydac Corporation
Hypower Systems
Hyseco Fluid Systems Ltd.
Lubrication Engr of Canada Ltd
McBurney Sales & Services
Nordson EFD
Oil-Rite Corp.
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

MANIFOLDS

Andy Baumen Associates
Berendsen Fluid Power
Bosch Rexroth Canada
Clippard Instrument Laboratory
Cowper
Cross Mfg Inc.
Great Lakes Hydraulics Ltd.
Higginson Equipment
Hydac Corporation
Lynch Fluid Controls

Main Manufacturing Products Inc
Parker Hannifin Corp. Parker
Scott Rotary Seals
Toro Hydraulic & Machinery

MOTORS

Advance Motion Control
Andy Baumen Associates
Cowper
Cross Mfg Inc.
Great Lakes Hydraulics Ltd.
Hypower Systems
Hyseco Fluid Systems Ltd.
Lafert Metric Motors
Lynch Fluid Controls
Norcan Fluid Power
P.S.I. Fluid Power
Parker Hannifin Corp. Parker
Pesco Sales
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery
Wainbee Limited
Webster Instruments
York Hydraulics Ltd.

PIPETUBE

DK-LOK Ontario Inc.
NewAge Industries Inc
Parker Hannifin Corp. Parker
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery

PRESSURE CONTROL

Andy Baumen Associates
Baumer Inc.
Clippard Instrument Laboratory
Cowper
E&E Process Instrumentation
Great Lakes Hydraulics Ltd.
Hydac Corporation
Hyseco Fluid Systems Ltd.
MICO Inc.
Parker Hannifin Corp. Parker
Schneider Electric Canada
Strictly Sales & Service Inc.
Switching Solutions Inc.
Toro Hydraulic & Machinery

PUMPS

Advance Motion Control
Berendsen Fluid Power

Bimba Manufacturing Co.
Bosch Rexroth Canada
Cross Mfg Inc.
Great Lakes Hydraulics Ltd.
Higginson Equipment
Hypower Systems
Hyseco Fluid Systems Ltd.
Lafert Metric Motors
Lubrication Engr of Canada Ltd
Lynch Fluid Controls
McBurney Sales & Services
Motion Canada
MP Filtri (Canada) Inc.
Norcan Fluid Power
P.S.I. Fluid Power
Parker Hannifin Corp. Parker
Pesco Sales
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery
Wainbee Limited
Webster Instruments
York Hydraulics Ltd.

SEALS

BellowsTech, LLC
Cowper
Flareite, Inc.
Hercules Sealing Products
Hi-Tech Seals Inc.
John Crane Canada Inc.
Seal Master Corporation
Servometer
Strictly Sales & Service Inc.
Toro Hydraulic & Machinery
Trelleborg Sealing Solutions
York Hydraulics Ltd.

SEALS, GREASE

Davley Darmex Precision Lubricants
Hercules Sealing Products
Miller-Stephenson Chemical Co. Inc.
Toro Hydraulic & Machinery
Trelleborg Sealing Solutions

SEALS, LARGE DIAMETER

BellowsTech, LLC
Hercules Sealing Products
Hi-Tech Seals Inc.
John Crane Canada Inc.
Servometer
Toro Hydraulic & Machinery
Trelleborg Sealing Solutions

SPRAY NOZZLES

Cowper
EXAIR

GEARING, GENERAL PURPOSE**BEVEL**

Diequa
Lenze Americas
Quality Transmission
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.
Wilson Machine Co. Ltd.

COMBINATION

Stock Drive Products/Sterling Instrument

CONCENTRIC

Quality Transmission
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.

CYCLOIDAL

Cowper
RotoPrecision Inc.

EPICYCLIC

Stock Drive Products/Sterling Instrument

FRACTIONAL HP

Regal Beloit Canada
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.

HELICAL

Lenze Americas
Quality Transmission
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument
Usimax Inc.
VL Motion Systems Inc.
Wilson Machine Co. Ltd.

HERRINGBONE

Stock Drive Products/Sterling Instrument

MITER

Quality Transmission
Stock Drive Products/Sterling Instrument

MULTI-SPEED

Toro Hydraulic & Machinery
VL Motion Systems Inc.
Wilson Machine Co. Ltd.

PLANETARY

Atlanta Drive Systems Inc.
Bosch Rexroth Canada
Cowper
Lenze Americas
Myostat Motion Control Inc.

Quality Transmission
Schneider Electric Canada
Toro Hydraulic & Machinery
VL Motion Systems Inc.

SHAFT-MOUNTED

Diequa
Quality Transmission
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.
Wilson Machine Co. Ltd.

SPUR

PIC Design
Quality Transmission
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.
Wilson Machine Co. Ltd.

TRACTION

Wilson Machine Co. Ltd.

VARIABLE SPEED

SEW Eurodrive Comp of Canada
Toro Hydraulic & Machinery

WORMGEAR

Cowper
Lenze Americas
Quality Transmission
Regal Beloit Canada
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument
Usimax Inc.
Wilson Machine Co. Ltd.

GEARING, HIGH PRECISION**MINIATURE**

Myostat Motion Control Inc.
PIC Design
Stock Drive Products/Sterling Instrument

PLANETARY, INLINE

Atlanta Drive Systems Inc.
Cowper
Diequa
Lenze Americas
Motion Canada
Myostat Motion Control Inc.
Quality Transmission
Schneider Electric Canada
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery
Wilson Machine Co. Ltd.

PLANETARY, RIGHT-ANGLE HARMONIC

Cowper
Schneider Electric Canada
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

ZERO BACKLASH, BALL SPEED

Atlanta Drive Systems Inc.
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument
Wilson Machine Co. Ltd.

GEARS**BEVEL**

Lenze Americas
Quality Transmission
RG Speed Control Devices Ltd.
Stock Drive Products/Sterling Instrument
Usimax Inc.
Wilson Machine Co. Ltd.

HELICAL

Atlanta Drive Systems Inc.
Lenze Americas
Myostat Motion Control Inc.
Quality Transmission
Stock Drive Products/Sterling Instrument
Usimax Inc.
Wilson Machine Co. Ltd.

HERRINGBONE

Stock Drive Products/Sterling Instrument
Wilson Machine Co. Ltd.

HYPOLID

Myostat Motion Control Inc.
Quality Transmission
Stock Drive Products/Sterling Instrument
Wilson Machine Co. Ltd.

MINIATURE

MICROMO
Myostat Motion Control Inc.
Quality Transmission
Wilson Machine Co. Ltd.

PINION

Lenze Americas
Myostat Motion Control Inc.
Quality Transmission
Stock Drive Products/Sterling Instrument
Usimax Inc.
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PLASTIC

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RACK

Atlanta Drive Systems Inc.
Myostat Motion Control Inc.
PIC Design
Quality Transmission
Stock Drive Products/Sterling Instrument
Wilson Machine Co. Ltd.

RING

Quality Transmission
Stock Drive Products/Sterling Instrument
Usimax Inc.
Wilson Machine Co. Ltd.

SPUR

Atlanta Drive Systems Inc.
Myostat Motion Control Inc.
PIC Design
Quality Transmission
Stock Drive Products/Sterling Instrument
Usimax Inc.
Wilson Machine Co. Ltd.

WORM

Atlanta Drive Systems Inc.
Lenze Americas
Myostat Motion Control Inc.
Quality Transmission
Stock Drive Products/Sterling Instrument
Usimax Inc.
Wilson Machine Co. Ltd.

INPUT/OUTPUT DEVICES

ACCELEROMETERS

Omega

CIRCUIT BREAKERS

Connectric Systems Inc.

GAUGES, DIGITAL READOUT

Baumer Inc.
Comprevac Inc.
Cowper
Great Lakes Hydraulics Ltd.
Heidenhain Corporation
Omega
Technical Systems 2002 Inc.
Webster Instruments

INDICATORS, SPEED

Baumer Inc.
Carlo Gavazzi Inc.
Connectric Systems Inc.
Omega
Technical Systems 2002 Inc.
Webster Instruments

INDICATORS, TORQUE

Technical Systems 2002 Inc.

NETWORKING SOLUTIONS

American Portwell Technology
Balluff Canada Inc.
Beckhoff Automation Canada
Chartwell Automation
Parker Hannifin Corp. Parker

OPTOELECTRONIC DEVICES

Balluff Canada Inc.
Baumer Inc.
Chartwell Automation

PHOTOELECTRICS

Access Control Sales
Balluff Canada Inc.
Baumer Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Contrinex Inc.
Cowper
Ibis Electro-Products
Le Groupe Rotalec
Schneider Electric Canada
Transorb Electrical Products Ltd.

POTENTIOMETERS

Andy Baumen Associates
J. R. Merritt Controls,

PRESS FORCE MONITORS

Baumer Inc.
Omega

SAFETY DEVICES

Beckhoff Automation Canada
Carlo Gavazzi Inc.
Chartwell Automation
Le Groupe Rotalec
Magnetlink,
Parker Hannifin Corp. Parker
Schneider Electric Canada

SIGNAL CONDITIONING & TRANSMITTERS

Carlo Gavazzi Inc.
Chartwell Automation
Omega
Technical Systems 2002 Inc.

SOLID-STATE RELAYS

Carlo Gavazzi Inc.
Chartwell Automation
Omega
Schneider Electric Canada

SWITCH CONTACTS

Magnetlink,

SWITCHES, CONTROL

Carlo Gavazzi Inc.
Chartwell Automation
Cowper
Magnetlink,
Matheson Valves
Omega
Schneider Electric Canada
Toro Hydraulic & Machinery
Transorb Electrical Products Ltd.

SWITCHES, LIMIT

AutomationDirect
Carlo Gavazzi Inc.
Cowper
Magnetlink,
Matheson Valves
Omega
Parker Hannifin Corp. Parker
Schneider Electric Canada
Toro Hydraulic & Machinery
Transorb Electrical Products Ltd.

SWITCHES, MECHANICAL

Cowper
Schneider Electric Canada
Schunk Intec Corp.
Switching Solutions Inc.

SWITCHES, POWER

Carlo Gavazzi Inc.
Schneider Electric Canada
Toro Hydraulic & Machinery

SWITCHES, PRESSURE

Alpha Controls/Instrumentation
Andy Baumen Associates
Balluff Canada Inc.
Baumer Inc.
Chartwell Automation
Cowper
Davis Controls
Great Lakes Hydraulics Ltd.
Humphrey Automation Inc.
MP Filtri (Canada) Inc.
Omega
Parker Hannifin Corp. Parker
Schneider Electric Canada
Switching Solutions Inc.
Toro Hydraulic & Machinery
Webster Instruments

SWITCHES, PROXIMITY

Access Control Sales
Balluff Canada Inc.
Baumer Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Connectric Systems Inc.
Contrinex Inc.
Cowper
Magnetlink,
Omega
Parker Hannifin Corp. Parker
Schneider Electric Canada
Transorb Electrical Products Ltd.

SWITCHES, FOOT

Cowper
J. R. Merritt Controls,
Schneider Electric Canada
Transorb Electrical Products Ltd.

TRANSDUCERS

Balluff Canada Inc.
Cowper
MP Filtri (Canada) Inc.
Omega
Parker Hannifin Corp. Parker
Schneider Electric Canada
Switching Solutions Inc.
Technical Systems 2002 Inc.
Transorb Electrical Products Ltd.
Webster Instruments

INTERFACES, OPERATOR

CONTROL GRIPS

J. R. Merritt Controls,

DIGITAL READOUT

Baumer Inc.
Chartwell Automation
Omega
Parker Hannifin Corp. Parker
Webster Instruments

DISPLAY SCREENS

American Portwell Technology
Beckhoff Automation Canada
Chartwell Automation
Cowper
Omega
Parker Hannifin Corp. Parker

HMI<0X2019>S

Advanced Motion & Controls
American Portwell Technology
Beckhoff Automation Canada
Bosch Rexroth Canada
Cowper
Davis Controls

Lenze Americas

Omega

Parker Hannifin Corp. Parker
Schneider Electric Canada
Siemens Canada Ltd.

JOYSTICKS

Beckhoff Automation Canada
Cowper
J. R. Merritt Controls,
Parker Hannifin Corp. Parker
Schneider Electric Canada
Zaber Technologies,

KEYBOARDS

American Portwell Technology
Beckhoff Automation Canada
Schneider Electric Canada

KEYPADS

Beckhoff Automation Canada
Cowper
Schneider Electric Canada

PANELS, CE EMBEDDED

Beckhoff Automation Canada
Lenze Americas
Parker Hannifin Corp. Parker

PANELS, OPERATOR

Beckhoff Automation Canada
Ibis Electro-Products
Lenze Americas
Parker Hannifin Corp. Parker
Schneider Electric Canada

REMOTE CONTROLS

Omega
Parker Hannifin Corp. Parker
Schneider Electric Canada

TOUCH SCREENS

AutomationDirect
Beckhoff Automation Canada
Cowper
Lenze Americas
Omega
Parker Hannifin Corp. Parker
Schneider Electric Canada

VISION CAMERAS

Bock Optonics Inc.
Chartwell Automation
Cowper
FLIR Systems

Manufacturers Automation Inc.
Schneider Electric Canada

VISION SYSTEMS

Advanced Motion & Controls
Bock Optonics Inc.
Cowper
Festo Inc.
Manufacturers Automation Inc.

LINEAR MOTION COMPONENTS

ACME SCREWS

PIC Design

ACTUATORS, LINEAR ACME SCREW DRIVEN

Bishop-Wisecarver Corporation
Haydon Kerk Motion Solutions
Mirai Inter-Tech
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker

ACTUATORS, LINEAR BALL SCREW DRIVEN

Bishop-Wisecarver Corporation
Cowper
Drive Systems Group Inc.
Haydon Kerk Motion Solutions
J.E. Myles
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Schaeffler Canada Inc.
Schneider Electric Canada
Schunk Intec Corp.

ACTUATORS, LINEAR BELT DRIVEN

Amacoil
Bishop-Wisecarver Corporation
Cowper
Drive Systems Group Inc.
Exlar Corporation
IGUS Inc.
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Power Beam
Schaeffler Canada Inc.
Schneider Electric Canada
Schunk Intec Corp.
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Quality Bearings & Components

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Advanced Antivibration Components
Seal Master Corporation
Stock Drive Products/Sterling Instrument
Taylor Devices

CLAMPS
Intercon Automation Parts Inc.
Oetiker Inc.
Reid Supply
Seal Master Corporation
Stock Drive Products/Sterling Instrument

CONTROLS
Heidenhain Corporation
Omega
Parker Hannifin Corp. Parker

CYLINDERS, ACCESSORIES
Cowper
Fabco-Air
Hercules Sealing Products
Higginson Equipment
Waircom

Parker Hannifin Corp. Parker
Ram Industries
Toro Hydraulic & Machinery

CYLINDERS, COMPOSITE
Advance Motion Control
Cowper
Fabco-Air
Higginson Equipment
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

CYLINDERS, HYDRAULIC
Bimba Manufacturing Co.
Cowper
Cross Mfg Inc.
Fabco-Air
Geo. T. White Co. Ltd.
Hercules Sealing Products
Higginson Equipment
Humphrey Automation Inc.
Norcan Fluid Power
Parker Hannifin Corp. Parker
Ram Industries
Rubberline Products Ltd.
Toro Hydraulic & Machinery
York Hydraulics Ltd.

CYLINDERS, PNEUMATIC
Advance Motion Control
Advanced Motion & Controls
Bimba Manufacturing Co.
Cowper
Fabco-Air
Festo Inc.
Geo. T. White Co. Ltd.
Higginson Equipment
Humphrey Automation Inc.
Waircom
Parker Hannifin Corp. Parker
Power Beam
Ram Industries
Rubberline Products Ltd.
Skeans Engineering & Machinery
Toro Hydraulic & Machinery
York Hydraulics Ltd.

DAMPERS, HYDRAULIC
Ace Controls Inc.
BellowsTech, LLC
Cowper
Parker Hannifin Corp. Parker
Servometer
Taylor Devices
Toro Hydraulic & Machinery

DAMPERS, ROTARY
Ace Controls Inc.
Cowper
Toro Hydraulic & Machinery

DRIVES, LINEAR
Amacoil
Atlanta Drive Systems Inc.
Cowper
Drive Systems Group Inc.
Omega
Parker Hannifin Corp. Parker
Power Beam
PQ Systems Ltd.

DRIVES, LINEAR VARIABLE PITCH
Amacoil

Omega
Parker Hannifin Corp. Parker
FEEDERS, VIBRATORY
DMA Ltd.

GUIDES, LINEAR BEARING
Bishop-Wisecarver Corporation
Cowper
IGUS Inc.
Motion Canada
Parker Hannifin Corp. Parker
Power Beam
RotoPrecision Inc.
Trelleborg Sealing Solutions

GUIDES, LINEAR RAIL
Advanced Motion & Controls
Bishop-Wisecarver Corporation
Cowper
IGUS Inc.
Parker Hannifin Corp. Parker
Power Beam
Reid Supply
Tecom Inc.

GUIDES, LINEAR SPLINE
Bishop-Wisecarver Corporation
Cowper
Parker Hannifin Corp. Parker

LEAD SCREWS
Bishop-Wisecarver Corporation
IGUS Inc.

LIFT TABLES
Cowper
Serapid, Inc.
Toro Hydraulic & Machinery

MOTORS, BRUSHLESS LINEAR
Cowper
Omega
Parker Hannifin Corp. Parker

MOTORS, ELECTRIC LINEAR
Cowper
Omega
Parker Hannifin Corp. Parker

MOTORS, LINEAR SERVO
Beckhoff Automation Canada
Cowper
Omega
Parker Hannifin Corp. Parker
Siemens Canada Ltd.
Yaskawa America

POSITIONERS, MANUAL
Omega
Parker Hannifin Corp. Parker
Velmex

POSITIONING TABLES, MULTI-AXIS
Aerotech Inc.
Bishop-Wisecarver Corporation
Cowper
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Serapid, Inc.
Zaber Technologies,

POSITIONING TABLES, SINGLE
Bishop-Wisecarver Corporation
Cowper
Cyclo-Index - Div. of Leggett & Platt
Parker Hannifin Corp. Parker
Serapid, Inc.
Velmex

RAILS
Bosch Rexroth Canada
Cowper
IGUS Inc.
Parker Hannifin Corp. Parker

RING SLIDES
Bishop-Wisecarver Corporation
RING SYSTEMS
Bishop-Wisecarver Corporation
DMA Ltd.

ROLLER SCREWS
J.E. Myles
PQ Systems Ltd.
Wainbee Limited

SHAFTS
Cowper
IGUS Inc.
PIC Design
RotoPrecision Inc.
Usimax Inc.

SLIDES, LINEAR
Accuride International
Bishop-Wisecarver Corporation
Cowper
Drive Systems Group Inc.
Fabco-Air
IGUS Inc.
Omega
Parker Hannifin Corp. Parker
Reid Supply
Velmex
Yaskawa America

SPLINES
GTC Falcon Inc.
PIC Design
Usimax Inc.

STAGES, LINEAR
Aerotech Inc.
Bishop-Wisecarver Corporation
Cowper
Myostat Motion Control Inc.
Nippon Pulse America,
Parker Hannifin Corp. Parker
Velmex
Zaber Technologies,

STAGES, MULTI-AXIS
Bishop-Wisecarver Corporation
Cowper
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Velmex
Zaber Technologies,

STAGES, ROTARY
Aerotech Inc.
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Velmex
Zaber Technologies,

SUSPENSION ELEMENTS
Rosta Inc.

SUSPENSION SCREENS
Rosta Inc.

TABLES, ROTARY
Aerotech Inc.
Cowper
Drive Systems Group Inc.
Geo. T. White Co. Ltd.
Parker Hannifin Corp. Parker
Servo2Go.com Ltd.
Velmex

TABLES, X-Y
Aerotech Inc.
Bishop-Wisecarver Corporation
Cowper
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Servo2Go.com Ltd.
Velmex

THRUSTERS
Bimba Manufacturing Co.
Cowper
Parker Hannifin Corp. Parker

MECHANICAL POWER TRANSMISSION COMPONENTS

ALIGNMENT DOWELS
Stock Drive Products/Sterling Instrument

BASES, ADJUSTABLE MOTOR
Rosta Inc.

BASES, AUTOMATIC BELT
Rosta Inc.

BASES, TENSIONING
DMA Ltd.
Rosta Inc.

BUSHINGS, METAL
Bunting Bearings LLC
Daemar
Hi-Tech Seals Inc.

BUSHINGS, POLYMER
Bunting Bearings LLC
Daemar
DMA Ltd.
IGUS Inc.

CAM FOLLOWERS
Global Bear Inc.
Reid Supply
Stock Drive Products/Sterling Instrument

CAMS
All Metric Small Parts
DMA Ltd.
Stock Drive Products/Sterling Instrument

FILTERS
Beach Filter Products Inc.
Bird Precision
Comprevac Inc.
Toro Hydraulic & Machinery

FLANGES
Lafert Metric Motors
Ryco Hydraulics
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

HOSE
Ryco Hydraulics
Toro Hydraulic & Machinery

IDLERS
Stock Drive Products/Sterling Instrument

JOINTS, SPHERICAL
Stock Drive Products/Sterling Instrument

JOINTS, UNIVERSAL
GTC Falcon Inc.
Stock Drive Products/Sterling Instrument
LOCKNUTS & WASHER
Advanced Antivibration Components
All Metric Small Parts
Stock Drive Products/Sterling Instrument

LUBRICANTS
Advanced Antivibration Components
Comprevac Inc.
Davley Darmex Precision Lubricants
Lubrication Engr of Canada Ltd
Miller-Stephenson Chemical Co. Inc.
Stock Drive Products/Sterling Instrument

MOUNTS, ANTI-VIBRATION
Advanced Antivibration Components
All Metric Small Parts
Cowper
Reid Supply
Rosta Inc.
Stock Drive Products/Sterling Instrument

MOUNTS, BASE PLATE FASTENED
All Metric Small Parts
Stock Drive Products/Sterling Instrument

MOUNTS, CHANNEL
Stock Drive Products/Sterling Instrument

MOUNTS, GEL
Advanced Antivibration Components
Stock Drive Products/Sterling Instrument

MOUNTS, GYRATORY
Advanced Antivibration Components
Rosta Inc.

MOUNTS, MACHINERY
Advanced Antivibration Components
All Metric Small Parts
Rosta Inc.
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

MOUNTS, OSCILLATING
Advanced Antivibration Components
Rosta Inc.

MOUNTS, SUSPENSION
Advanced Antivibration Components
Rosta Inc.
Stock Drive Products/Sterling Instrument

MOUNTS, VIBRATION
Advanced Antivibration Components
All Metric Small Parts
Cowper
Hi-Tech Seals Inc.
Rosta Inc.
Stock Drive Products/Sterling Instrument

RINGS, O-TYPE
Daemar
Hercules Sealing Products
Stock Drive Products/Sterling Instrument

RINGS, RETAINING
All Metric Small Parts
Daemar
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

SEAL RINGS
Toro Hydraulic & Machinery
Trelleborg Sealing Solutions

SEALS
Bal Seal Engineering Inc.
BellowsTech, LLC
Daemar
Flaretite, Inc.
Hercules Sealing Products
Hi-Tech Seals Inc.
Seal Master Corporation
Servometer
SKF Canada
Stock Drive Products/Sterling Instrument
Timken Canada LP
Toro Hydraulic & Machinery
Trelleborg Sealing Solutions

SHEAVES
R.W. Hamilton
Stock Drive Products/Sterling Instrument

SHIMS
Daemar
Stock Drive Products/Sterling Instrument

SHOCK ABSORBERS
Ace Controls Inc.
Advanced Antivibration Components
Cowper
Rosta Inc.
Seal Master Corporation
Taylor Devices

SLIP RINGS
Omega

SPRINGS
Advanced Antivibration Components
All Metric Small Parts
Bal Seal Engineering Inc.
Cowper

Daemar
Dendoff Springs
Reid Supply
RotoPrecision Inc.

SPRINGS, GAS
Ace Controls Inc.
Cowper
Taylor Devices

SPROCKETS, CONVEYOR
DMA Ltd.
Stock Drive Products/Sterling Instrument

SPROCKETS, NON-METAL
Stock Drive Products/Sterling Instrument

SPROCKETS, ROLLER CHAIN
Quality Transmission
Stock Drive Products/Sterling Instrument

SPROCKETS, SHEAR PIN
Stock Drive Products/Sterling Instrument

SPROCKETS, SPLIT
Stock Drive Products/Sterling Instrument

TENSIONERS, CHAIN & BELT
Advanced Antivibration Components
BRECOflex Co., L.L.C.
Quality Transmission
Rosta Inc.

WASHERS
All Metric Small Parts
Hi-Tech Seals Inc.
Stock Drive Products/Sterling Instrument

WINCHES
Toro Hydraulic & Machinery

MOTORS

AC 1 TO 15 HP, SINGLE & THREE-PHASE
AutomationDirect
Baldor Electric Company
Lenze Americas
Nord Gear Limited
Omega
Pesco Sales
Reconit Electric Rebuilders
Renown Electric Motors & Repair
RG Speed Control Devices Ltd.
RotoPrecision Inc.
Toro Hydraulic & Machinery

AC 1 TO 500 HP, SINGLE & THREE-PHASE
Baldor Electric Company
Brook Crompton Ltd.
Crossman Automation Inc.
Lafert Metric Motors
Lenze Americas
Moteurs Electriques Universal
MEP Inc.
Nord Gear Limited
Pesco Sales
Regal Beloit Canada
Renown Electric Motors & Repair
Toro Hydraulic & Machinery

AC 500 HP PLUS
Baldor Electric Company
Brook Crompton Ltd.
Moteurs Electriques Universal
MEP Inc.
Renown Electric Motors & Repair
Toro Hydraulic & Machinery

AC BRUSHLESS
Cowper
Haydon Kerk Motion Solutions
Omega
Stock Drive Products/Sterling Instrument

AC INDUCTION
Grove-Crossman Equipment Ltd.
Lenze Americas
MEP Inc.
Renown Electric Motors & Repair

AC SYNCHRONOUS
Andy Baumen Associates
Cowper
Haydon Kerk Motion Solutions
Lenze Americas
Renown Electric Motors & Repair
SEW Eurodrive Comp of Canada

AC UNIVERSAL
Andy Baumen Associates
Moteurs Electriques Universal
Stock Drive Products/Sterling Instrument

DC BRUSH-TYPE
Advanced Antivibration Components
Cowper
Lenze Americas
MICROMO
Midwest Motion Products, Inc.
Reconit Electric Rebuilders
Renown Electric Motors & Repair
VL Motion Systems Inc.

DC BRUSHLESS
Advanced Antivibration Components
Cowper
Lenze Americas

MICROMO
Midwest Motion Products, Inc.
Reconit Electric Rebuilders
Stock Drive Products/Sterling Instrument

FRACTIONAL, SINGLE & THREE-PHASE
Baldor Electric Company
Brook Crompton Ltd.
Lafert Metric Motors
Moteurs Electriques Universal
MEP Inc.

GEARMOTORS
Andy Baumen Associates
AutomationDirect
Lenze Americas
MICROMO
Midwest Motion Products, Inc.
Nord Gear Limited
Servo2Go.com Ltd.
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery
Usimax Inc.
VL Motion Systems Inc.

GEARMOTORS, AC FRACTIONAL
Andy Baumen Associates
Lenze Americas
Moteurs Electriques Universal
Parker Hannifin Corp. Parker

GEARMOTORS, DC FRACTIONAL
Andy Baumen Associates
MICROMO
Midwest Motion Products, Inc.
Parker Hannifin Corp. Parker

INTEGRATED, CLOSED-LOOP
Cowper
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Schneider Electric Motion USA

INTEGRATED, OPEN-LOOP
Cowper
Parker Hannifin Corp. Parker
Schneider Electric Motion USA

LINEAR, AC INDUCTION
Cowper
Haydon Kerk Motion Solutions
Parker Hannifin Corp. Parker

LINEAR, BRUSH DC
Cowper
Parker Hannifin Corp. Parker

LINEAR, BRUSHLESS DC
Cowper
Electromate
MICROMO
Parker Hannifin Corp. Parker

LINEAR, ELECTRIC
Baldor Electric Company
Cowper
Haydon Kerk Motion Solutions
Parker Hannifin Corp. Parker
PQ Systems Ltd.
Toro Hydraulic & Machinery

LINEAR, ELECTRIC STEP
Cowper
Haydon Kerk Motion Solutions
Parker Hannifin Corp. Parker

LINEAR, STEPPER
Andy Baumen Associates
Cowper
Haydon Kerk Motion Solutions
Nippon Pulse America,
Parker Hannifin Corp. Parker
Schneider Electric Motion USA
Toro Hydraulic & Machinery
Zaber Technologies,

PERMANENT MAGNET
Haydon Kerk Motion Solutions
Lafert Metric Motors
Lenze Americas
Moteurs Electriques Universal
MEP Inc.
MICROMO
Parker Hannifin Corp. Parker
Schaeffler Canada Inc.

PISTON
McBurney Sales & Services
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

ROTARY, BRUSHLESS
Haydon Kerk Motion Solutions
Parker Hannifin Corp. Parker

SERVO, AC
Advanced Drive Systems Inc.
Baldor Electric Company
Beckhoff Automation Canada
Cowper
Davis Controls
Drive Systems Group Inc.
Franklin Empire
Lenze Americas
Motion Canada
Myostat Motion Control Inc.

Parker Hannifin Corp. Parker
Renown Electric Motors & Repair
SEW Eurodrive Comp of Canada
Toro Hydraulic & Machinery
Yaskawa America

SERVO, AC BRUSHLESS
Cowper
Electromate
Lenze Americas
Parker Hannifin Corp. Parker

SERVO, AC INDUCTION
Cowper
Lenze Americas
Parker Hannifin Corp. Parker

SERVO, AC PERMANENT MAGNET
Cowper
Lenze Americas
MEP Inc.
Parker Hannifin Corp. Parker

SERVO, DC
Baldor Electric Company
Beckhoff Automation Canada
Cowper
Drive Systems Group Inc.
Electromate
Exlar Corporation
MICROMO
Midwest Motion Products, Inc.
Myostat Motion Control Inc.
Parker Hannifin Corp. Parker
Servo2Go.com Ltd.
Toro Hydraulic & Machinery
Zakron Industries Inc.

SERVO, DC BRUSHLESS
Cowper
Electromate
Exlar Corporation
Lenze Americas
MICROMO
Parker Hannifin Corp. Parker
Servo2Go.com Ltd.

SERVO, LINEAR
Beckhoff Automation Canada
Cowper
Nippon Pulse America,
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

SPINDLE
Parker Hannifin Corp. Parker
Renown Electric Motors & Repair
Toro Hydraulic & Machinery

STEP MOTORS
Advanced Motion & Controls
Andy Baumen Associates
AutomationDirect
Cowper
Drive Systems Group Inc.
Electromate
Haydon Kerk Motion Solutions
MICROMO
Myostat Motion Control Inc.
Nippon Pulse America,
Parker Hannifin Corp. Parker
Schneider Electric Motion USA
Servo2Go.com Ltd.
Stock Drive Products/Sterling Instrument

STEP MOTORS, GEARED
Andy Baumen Associates
Beckhoff Automation Canada
Cowper
Nippon Pulse America,
Parker Hannifin Corp. Parker
Servo2Go.com Ltd.
Stock Drive Products/Sterling Instrument

STEP MOTORS, LINEAR
Andy Baumen Associates
Cowper
Haydon Kerk Motion Solutions
MICROMO
Parker Hannifin Corp. Parker
Schneider Electric Motion USA

TORQUE
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

ULTRASONIC/PIEZO
MICROMO

NETWORK BUS COMPONENTS

CANBUS
Axiomatic Technologies
Beckhoff Automation Canada
Chartwell Automation
Cowper
Schneider Electric Canada

CANOPEN
Axiomatic Technologies
Beckhoff Automation Canada
Chartwell Automation
Cowper
J. R. Merritt Controls,
Lenze Americas

Myostat Motion Control Inc.
Schneider Electric Canada
Trio Motion Technology LLC

DEVICENET
Balluff Canada Inc.
Beckhoff Automation Canada
Chartwell Automation
Cowper
Electro Sensors
Helukabel Canada
Lenze Americas
Schneider Electric Canada

ETHERCAT
Balluff Canada Inc.
Beckhoff Automation Canada
Chartwell Automation
Cowper
Lenze Americas
Schneider Electric Canada
Trio Motion Technology LLC

ETHERNET
Balluff Canada Inc.
Beckhoff Automation Canada
Chartwell Automation
Cowper
Lenze Americas
Schneider Electric Canada
Trio Motion Technology LLC

PROFIBUS
Balluff Canada Inc.
Beckhoff Automation Canada
Chartwell Automation
Cowper
Helukabel Canada
IGUS Inc.
Lenze Americas
Myostat Motion Control Inc.
Schneider Electric Canada
SoftPLC Corporation
Trio Motion Technology LLC

PROTOCOL CONVERSION
Axiomatic Technologies
Chartwell Automation
Schneider Electric Canada
SoftPLC Corporation
Trio Motion Technology LLC

RS-232
Beckhoff Automation Canada
Chartwell Automation
Cowper
Lenze Americas
Myostat Motion Control Inc.
Schneider Electric Canada

RS-485
Chartwell Automation
Cowper
Lenze Americas
Myostat Motion Control Inc.
Schneider Electric Canada

USB
Beckhoff Automation Canada
IGUS Inc.
Schneider Electric Canada

PULLEYS

FLAT BELT
Stock Drive Products/Sterling Instrument

IDLER
BRECOflex Co., L.L.C.
Stock Drive Products/Sterling Instrument

SPLIT
Stock Drive Products/Sterling Instrument

SYNCHRONOUS BELT
BRECOflex Co., L.L.C.
Quality Transmission
Stock Drive Products/Sterling Instrument

TOOTHED
BRECOflex Co., L.L.C.
Reconit Electric Rebuilders
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument

V-BELT
Reconit Electric Rebuilders
Regal Beloit Canada
Reid Supply
Stock Drive Products/Sterling Instrument

RACK & PINION

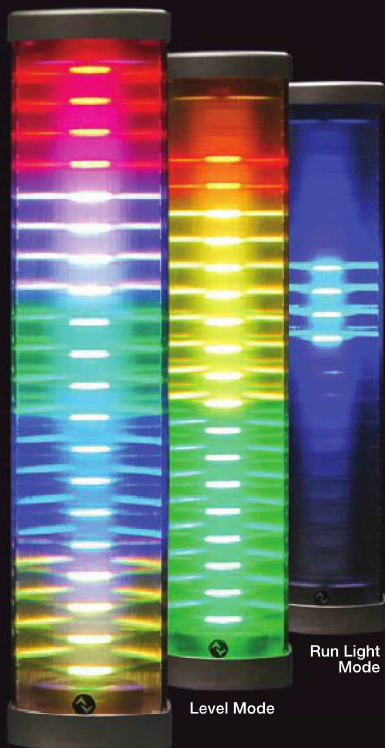
ANTI-BACKLASH
Cowper
Myostat Motion Control Inc.
Quality Transmission
Stock Drive Products/Sterling Instrument

HARDENED
Cowper
Myostat Motion Control Inc.

BALLUFF

sensors worldwide

TOO MANY COMPONENTS NOT ENOUGH OPTIONS?



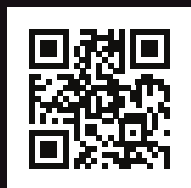
Stack Light Mode

Level Mode

Run Light Mode

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three modes,
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66 Product Listings

Quality Transmission
Stock Drive Products/Sterling Instrument

PLAIN

Quality Transmission
Stock Drive Products/Sterling Instrument

POLYMER

Myostat Motion Control Inc.

ROBOTICS**ROBOT ARMS**

Cowper
DENSO Robotics
Schunk Intec Corp.

ROBOTIC ACCESSORIES

Helukabel Canada
Ibis Electro-Products
Nordson EFD
Schunk Intec Corp.
Sommer Automatic
Techno-Omil

ROBOTS

Cowper
DENSO Robotics
Nordson EFD
Schneider Electric Canada
Yaskawa America

ROBOTS, ARTICULATED ARM (6AXIS)

Advanced Motion & Controls
Cowper
DENSO Robotics

ROBOTS, SCARA (4AXIS)

Cowper
DENSO Robotics
Nordson EFD

SENSORS**ACCELERATION**

Omega

ANALYSIS

Higginson Equipment

FLOW

Alpha Controls/Instrumentation
Balluff Canada Inc.
Chartwell Automation
E&E Process Instrumentation
Higginson Equipment
Omega
Sylvan Automation
Webster Instruments

FORCE

Baumer Inc.
Omega

HALL

Baumer Inc.
Cowper
Electro Sensors
Fabco-Air
Geo. T. White Co. Ltd.

LASER

Balluff Canada Inc.
Baumer Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Contrinex Inc.
Cowper
Ibis Electro-Products
Le Groupe Rotalec
LeddardTech Inc.
Manufacturers Automation Inc.
Omega
Schneider Electric Canada

LIGHT

Bock Optronics Inc.
Chartwell Automation
Cowper
FLIR Systems
Global Sensor Systems
Ibis Electro-Products
LeddardTech Inc.
Manufacturers Automation Inc.
Skeans Engineering & Machinery

LINEAR

Balluff Canada Inc.
Baumer Inc.
Chartwell Automation
Cowper
Electro Sensors
Magnetlink
Manufacturers Automation Inc.
Novotechnik, Inc.
Schneider Electric Canada

LOAD

Baumer Inc.
Carlo Gavazzi Inc.
Omega

POSITION

Alpha Controls/Instrumentation
Balluff Canada Inc.
Baumer Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Cowper
Electro Sensors
Fabco-Air
Festo Inc.
Heidenhain Corporation
Magnetlink
Novotechnik, Inc.
Omega
Schneider Electric Canada

PRESSURE
Alpha Controls/Instrumentation
Andy Baumen Associates
Balluff Canada Inc.
Baumer Inc.
Chartwell Automation
Cowper
E&E Process Instrumentation
Ecotherm Inc.
Neptonic
Omega
Schneider Electric Canada
Switching Solutions Inc.
Sylvan Automation
Technical Systems 2002 Inc.
Webster Instruments

PROXIMITY

Access Control Sales
Balluff Canada Inc.
Baumer Inc.
Bock Optronics Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Contrinex Inc.
Cowper
Electro Sensors
Fabco-Air
Festo Inc.
Ibis Electro-Products
Le Groupe Rotalec
Magnetlink
Omega
Schneider Electric Canada
Transorb Electrical Products Ltd.

ROTARY

Chartwell Automation
Electro Sensors
Industrial Encoder Corporation
Novotechnik, Inc.
Schneider Electric Canada
Webster Instruments

SPEED

Access Control Sales
Baumer Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Cowper
E&E Process Instrumentation
Electro Sensors
Industrial Encoder Corporation
Schneider Electric Canada
Webster Instruments

TEMPERATURE

Access Control Sales
Alpha Controls/Instrumentation
Andy Baumen Associates
Baumer Inc.
Carlo Gavazzi Inc.
Chartwell Automation
Cowper
E&E Process Instrumentation
Ecotherm Inc.
Electro Sensors
FLIR Systems
Higginson Equipment
Manufacturers Automation Inc.
Omega
Schneider Electric Canada
Switching Solutions Inc.
Technical Systems 2002 Inc.
Webster Instruments

TORQUE

Omega
Technical Systems 2002 Inc.

VIBRATION

Electro Sensors
Manufacturers Automation Inc.
Omega

VISUAL

FLIR Systems
Global Sensor Systems

SHAFTS**COLLARS**

Amacoil
Polymotion Limited
RotoPrecision Inc.
Stock Drive Products/Sterling Instrument

FLEXIBLE

BellowsTech, LLC
Servometer
Stock Drive Products/Sterling Instrument

RIGID

Stock Drive Products/Sterling Instrument

SEALS & PACKINGS

Daemar
Hercules Sealing Products
Hi-Tech Seals Inc.
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery
Trelleborg Sealing Solutions

SPLINE

Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

UNIVERSAL COUPLING

Advanced Antivibration Components
BellowsTech, LLC
Servometer
Stock Drive Products/Sterling Instrument
Toro Hydraulic & Machinery

SOFTWARE**AUTOMATION**

Beckhoff Automation Canada
Bock Optronics Inc.
Cowper
Crossman Automation Inc.
FLIR Systems
Lenze Americas
Omega
Parker Hannifin Corp. Parker
Schneider Electric Canada
SoftPLC Corporation

CAD TO MOTION

Omega

CONTROL

Beckhoff Automation Canada
Lenze Americas
SoftPLC Corporation

DESIGN

Lenze Americas
Parker Hannifin Corp. Parker

DIAGNOSTIC

FLIR Systems
Parker Hannifin Corp. Parker
Schneider Electric Canada

HUMAN MACHINE INTERFACE (HMI)

AutomationDirect

Cowper
Lenze Americas
Parker Hannifin Corp. Parker
Schneider Electric Canada
SoftPLC Corporation

MACHINE CONTROL

Beckhoff Automation Canada
Cowper
Schneider Electric Canada
SoftPLC Corporation

MOTION & LOGIC CONTROL

Beckhoff Automation Canada
Cowper
Lenze Americas
Parker Hannifin Corp. Parker
Schneider Electric Canada
Trio Motion Technology LLC

MOTION CONTROL

Beckhoff Automation Canada
Cowper
Lenze Americas
Parker Hannifin Corp. Parker
Schneider Electric Canada
Siemens Canada Ltd.
Trio Motion Technology LLC

PRODUCT DATA MANAGEMENT

Schneider Electric Canada

PRODUCT LIFE CYCLE MANAGEMENT

Schneider Electric Canada

SIMULATION

Parker Hannifin Corp. Parker
Schneider Electric Canada

SPEED REDUCERS & INCREASERS**CONCENTRIC**

Diequa
Grove-Crossman Equipment Ltd.
Nord Gear Limited
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.

FRACTIONAL HP

Andy Baumen Associates
Diequa
RG Speed Control Devices Ltd.
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.

HELICAL HERRINGBONE

Stock Drive Products/Sterling Instrument

PARALLEL

Cowper
Crossman Automation Inc.
Diequa
Lafert Metric Motors
Moteurs Electriques Universal
MEP Inc.
Nord Gear Limited
SEW Eurodrive Comp of Canada
Stock Drive Products/Sterling Instrument
Usimax Inc.
VL Motion Systems Inc.

PLANETARY

Atlanta Drive Systems Inc.
Cowper
Crossman Automation Inc.
Diequa
Lafert Metric Motors
Lenze Americas
Norcan Fluid Power
RotoPrecision Inc.
Schneider Electric Canada
SEW Eurodrive Comp of Canada
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.

RIGHT ANGLE

Cowper
Diequa
Grove-Crossman Equipment Ltd.
Lenze Americas
Nord Gear Limited
Stock Drive Products/Sterling Instrument
Usimax Inc.
VL Motion Systems Inc.

SHAFT-MOUNTED

Diequa
Lenze Americas
Nord Gear Limited
Stock Drive Products/Sterling Instrument
VL Motion Systems Inc.

SPUR

Stock Drive Products/Sterling Instrument
Usimax Inc.
VL Motion Systems Inc.

WORMGEAR

Atlanta Drive Systems Inc.
Diequa
Lafert Metric Motors
Lenze Americas
Moteurs Electriques Universal
Nord Gear Limited
Regal Beloit Canada
SEW Eurodrive Comp of Canada
Stock Drive Products/Sterling Instrument
Usimax Inc.
VL Motion Systems Inc.

VALVE COMPONENTS**VALVE ACTUATORS**

Bimba Manufacturing Co.
Cowper
DK-LOK Ontario Inc.
Higginson Equipment
Howell Pipe & Supply
M.A. Stewart & Sons
Matheson Valves
Neptonic
Nordson EFD
Omega
Parker Hannifin Corp. Parker
Pesco Sales
Rotork Controls (Canada)
Score TransCanada
Scott Rotary Seals
Setpoint Technologies
Sylvan Automation
Toro Hydraulic & Machinery
VL Motion Systems Inc.

VALVE CONTROLS

Axiomatic Technologies
Conant Controls
Cowper
Lynch Fluid Controls
Matheson Valves
Neptonic
Nordson EFD
Omega
Parker Hannifin Corp. Parker
Rotork Controls (Canada)
Score TransCanada
Setpoint Technologies
Sylvan Automation
Toro Hydraulic & Machinery

VALVE INDICATORS

Cowper
Matheson Valves
Nordson EFD
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

VALVE MOTORS

Matheson Valves
Parker Hannifin Corp. Parker
Rotork Controls (Canada)
Toro Hydraulic & Machinery

VALVE TYPES**BALL**

Beswick Engineering Co., Inc.
Cowper
DK-LOK Ontario Inc.
Great Lakes Hydraulics Ltd.
Howell Pipe & Supply
M.A. Stewart & Sons
Matheson Valves
MP Filtri (Canada) Inc.
Neptonic
Omega
Parker Hannifin Corp. Parker
Pesco Sales
Score TransCanada
Setpoint Technologies
Sylvan Automation
Toro Hydraulic & Machinery

CARTRIDGE

Beswick Engineering Co., Inc.
Cowper
Great Lakes Hydraulics Ltd.
Lynch Fluid Controls
Parker Hannifin Corp. Parker
Toro Hydraulic & Machinery

CHECK

Beswick Engineering Co., Inc.
Cowper
DK-LOK Ontario Inc.

ECOTHERM INC.

Fabco-Air
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COMPENSATOR

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Parker Hannifin Corp. Parker
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Wainbee Limited
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ELECTRO-PROPORTIONAL

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Peerless Engineering Sales
Scott Rotary Seals
Toro Hydraulic & Machinery
Wainbee Limited
Webster Instruments
York Hydraulics Ltd.

LOGIC

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MANUAL

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Humphrey Automation Inc.
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MODULAR

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MOTOR MOUNT

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NEEDLE

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Hypower Systems
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M.A. Stewart & Sons
Matheson Valves
Motion Canada
Nordson EFD
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Peerless Engineering Sales
Pesco Sales
Power Beam
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Matheson Valves
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Setpoint Technologies
Toro Hydraulic & Machinery

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DK-LOK ONTARIO INC.

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DMA LTD.

Manufacturer

22 Garside Cr
Brampton ON L6S 1H6
Tel: 905-459-5248
Fax: 905-459-0428
Email: rjplourde@sympatico.ca
Web: www.dmautomate.ca
Manufacturers Represented: Camco/Ferguson; Deprag Inc.; Hermann Ultrasonics; Interlakes Bases; Lutco; Mayr Corp.; Robohand; Svendberg Brakes; Thordon Bearings Inc.; Webster Inc.
Distributors: BDI Canada Inc - Wajax/Kinecor; Motion Industries

DRIVE-LINE INC.

Distributor

23-212 Wyecroft Rd
Oakville ON L6K 3T9
Tel: 905-845-4710
Fax: 905-845-3009
Email: jcarney@drivelineinc.com
Web: www.drivelineinc.com

DRIVE SYSTEMS GROUP INC.

Manufacturer & Distributor

1-2-7150 Torbram Rd
Mississauga ON L4T 3Z8
Tel: 905-405-0310
Fax: 905-405-0313
Web: www.drivesystemsgroup.ca
Manufacturers Represented: Axor Industries; C.G.I. Inc.; Drive Systems s.p.a.; Eltra s.p.a.; Infranor; Nidec; Powertec

DUCT-O-WIRE CANADA LIMITED

Manufacturer

10-1445 Norjohn Crt
Burlington ON L7L 0E6
Tel: 905-331-2612
Fax: 905-331-6639
Email: dow@ductowire.ca
Web: www.ductowire.com

E&E PROCESS INSTRUMENTATION

Distributor

4-40 Rivermede R N
Concord ON L4K 2H3
Tel: 905-669-4857
Fax: 905-669-2158
Email: sales@eeeprocess.com
Web: www.eeprocess.com

ECOTHERM INC.

Distributor

39-588 Edward Ave
Richmond Hill ON L4C 9Y6
Tel: 905-737-2113
Fax: 905-737-7319

Email: sales@ecotherm.ca

Web: www.ecotherm.ca

Branches: Vernon, BC; Dollard-des-Ormeaux, QC

Manufacturers Represented: ACmax; Full Gauge; Kaori; Saginomiya

ELECTRO SENSORS INC.

Manufacturer

6111 Blue Circle Dr
Minnetonka MN 55343 USA
Tel: 952-930-0100
Fax: 952-930-0130
Email: sales@electro-sensors.com
Web: www.electro-sensors.com



ELECTROMATE

Distributor

39-4300 Steeles Ave
Woodbridge ON L4L 4C2
Tel: 877-737-8698
Email: sales@electromate.com
Web: www.electromate.com
Manufacturers Represented: Advanced Motion Controls; Applied Motion Products, Inc.; Baumuller; Bayside Motion Group; Computer Conversions Corp.; Dyadic Systems; ElectroCraft; Empire Magnetics; Exor Electronic R&D; Gall Motion Control Inc.; GAM Gear; Groschopp Inc.; Harmonic Drive LLC; Haydon Kerk Motion Solutions; Ibx Engineering; Inertia Dynamics; Intelligent Actuator Inc.; ITT Torque Systems; Kollmorgen; Lintech; Macron Dynamics Inc.; Maxon Motor AG; MCG Inc.; Merkle-Korff Industries; MicroE Systems; MTS Temposonics; Netzer Precision Motion Sensors; Nippon Pulse America; Pacific Scientific; Pittman; Quantum Devices Inc.; Rabbit Semiconductor; RSF Electronics Inc.; Schneeberger Linear Technology; Servo Tek Products Company; Shippo Drives Inc.; Superior Electric; Tecnotion B.V.; Tolomatic; World Encoders

EXAIR CORPORATION

Manufacturer & Distributor

11510 Goldcoast Dr
Cincinnati OH 45249 1621-1621 USA
Tel: 513-671-3322
Fax: 513-671-3363
Web: www.exair.com

EXLAR CORPORATION

Manufacturer

18400 W 77th St
Chanhassen MN 55317 USA
Tel: 952-500-6200
Fax: 952-368-4877
Email: info@exlar.com
Web: www.exlar.com



FABCO-AIR, INC.

Manufacturer

3716 NE 49th Ave
Gainesville FL 32609 USA
Tel: 352-373-3578
Fax: 352-375-8024
Email: service@fabco-air.com
Web: www.fabco-air.com
Distributors: Visit our Website
Company Profile: Founded in 1958 by Alfred Schmidt, Fabco-Air is best known for the Pancake® Cylinder. Fabco-Air facility includes more than 61,000 sq ft. Our product lines include Air Prep, Pancakes, Square 1, Multi-power, Presses, Global series, Linear slides, Angular and Parallel grippers, Solenoid and Manual valves. 45% of our business is specials designed to meet customers specifications.

FAIRVIEW FITTINGS & MFG LTD.**Manufacturer**

449 Attwell Dr
Toronto ON M9W 5C4
Tel: 416-675-4233
Fax: 416-675-9416
Email: peterconn@fairviewfittings.com

**FESTO INC.****Manufacturer & Distributor**

5300 Explorer Dr
Mississauga ON L4W 5G4
Tel: 905-624-9000
Fax: 905-624-9001
Email: festo.canada@ca.festo.com
Web: www.festo.ca
Branches: Pointe-Claire, QC; Québec, QC
Distributors: Atlantic Compressed Air, Moncton, NB; E.B. Horsman & Son, Surrey, BC; Seaway Fluid Power Group, St Catharines, ON; Wajax Industrial Components, Lachine, QC

FLARETITE, INC.**Manufacturer & Distributor**

4036 Shadow Oak
Fenton MI 48430 USA
Tel: 810-750-4140
Fax: 810-629-4988
Email: sales@flaretite.com
Web: www.flaretite.com
Distributors: Hose Power, Ajax, ON

FLIR SYSTEMS LTD.**Manufacturer**

920 Sheldon Crt
Burlington ON L7L 5L6
Tel: 905-637-5696
Fax: 905-639-5488
Email: ircanada@flir.com
Web: www.flir.com
Branches: Edmonton, AB; Montreal, QC
Distributors: Integrys, Mississauga, ON; Shelley Automation, North York, ON; Spartan Controls, Calgary, AB

FRANKLIN EMPIRE INC.**Distributor**

8421 ch Darnley
Mont-Royal QC H4T 2B2
Tel: 514-341-3720
Fax: 514-341-3907
Email: info@feinc.com
Web: www.feinc.com
Manufacturers Represented: Siemens

GEO. T. WHITE CO. LTD.**Distributor**

1665 Turner Rd
Windsor ON N8W 3J8
Tel: 519-256-2331
Fax: 519-256-6311
Web: www.geotwhite.com
Branches: Burlington, ON; Toronto, ON
Manufacturers Represented: ASS End of Arm Tooling; BTM Corp.; CPI Products; Destaco; PIAB Conveyors; PIAB Vacuum Products; Robohand; TechRim

GLOBAL BEAR INC.**Distributor**

2064 Chartier Avenue
Dorval QC H9P 1H2
Tel: 514-631-1110
Fax: 514-636-7737
Email: sales@globalbear.ca
Web: www.globalbear.ca
Branches: Mississauga, ON
Manufacturers Represented: Ames; BECO; Centa; FK Bearings; FLURO; ISB; MTK+; NBS; NHBB & NMB; NKE; Permaglide; Randall; Smith; STS Couplings; ZNL
Distributors: BDI Canada; Canadian Bearings; Kinecor Inc.; Motion Industries

GLOBAL SENSOR SYSTEMS INC.**Manufacturer & Distributor**

400 Brunel Rd
Mississauga ON L4Z 2C2
Tel: 905-507-0007

Fax: 905-507-4177

Web: www.globalsensorsystems.com

GRB, GESTION INDUSTRIELLE RB INC.**Manufacturer & Distributor**

6200 Saint-Laurent blvd
Sainte-Catherine QC J5C 1B2
Tel: 450-632-3230
Fax: 450-632-3213
Email: sales@grbbearings.com
Web: www.grbbearings.com

GREAT LAKES HYDRAULICS LTD.**Distributor**

A9-5035 North Service Rd
Burlington ON L7L 5V2
Tel: 905-332-1500
Fax: 905-332-9122
Email: glhydltd@greatlakeshydraulicltd.com
Web: www.greatlakeshydraulicltd.com
Manufacturers Represented: Cimtek Filtration; Flow Ezy Filters; Hedland; Hydrocraft; LDI Industries (Vescor); Lenz; Marzocchi Pumps; Nason Company; Neo Valves; Northman Fluid Power; OMT Daman Manifolds; Rego; Snap-Tite QD; Sofima Hydraulic Filters; Webtec Instruments

GROVE-CROSSMAN EQUIPMENT LTD.**Distributor**

111-4238 Lozells Ave
Burnaby BC V5A 0C4
Tel: 604-421-1500
Fax: 604-421-0221
Email: nash@grovecrossman.com
Web: www.grovecrossman.com
Manufacturers Represented: Allied Locke; Autogard; Bonfiglioli; Brook-Crompton; Browning; Canimex; Cone Drive; Cougar; Dalton; Dayton; Doerr; Electra; Emerson; Falk; Flender; Furnace Belt; Grove Gear; Highfield; Hilliard; Himmel; Jason; Joyce; Koellmann; KVP; Leeson; Leroy Somer; Megga; Minarik; Morse; Motovario; Nexen; Nidec; Perske; PIC; Ram; Reeves; Reliance; Renold; Reuland; Samson; Siemens; Speed Selector; Stearns; Sterling; Twiflex; US Electric; Von-Ruden; WEG; Winsmith; Wire Belt

GTC FALCON INC.**Manufacturer**

118 Long Pond Rd.
Plymouth MA USA
Tel: 608-746-0200
Fax: 508-746-6419
Web: www.gtcfalcon.com

HAYDON KERK MOTION SOLUTIONS, INC.**Manufacturer**

1500 Meriden Rd
Waterbury CT 06705 USA
Tel: 203-756-7441
Fax: 203-756-8724
Email: info.haydonkerk@ametek.com
Web: www.haydonkerk.com

HEIDENHAIN CORPORATION**Manufacturer**

333 East State Parkway
Schaumburg IL 60173 USA
Tel: 847-490-1191
Fax: 847-490-3931
Email: info@heidenhain.com
Web: www.heidenhain.com
Branches: Mississauga, ON

HELAC CORPORATION**Manufacturer**

225 Battersby Ave
Enumclaw WA 98022 USA
Tel: 360-825-1601
Fax: 360-825-1603
Email: actuators@helac.com
Web: www.helac.com

HELANDER PRODUCTS INC.**Manufacturer & Distributor**

26 Knollwood Drive
Clinton CT 06413 USA
Tel: 860-669-7953
Fax: 860-669-6756
Email: helander@sbcglobal.net
Web: www.tinyclutch.com



HELUKABEL®

HELUKABEL CANADA**Manufacturer & Distributor**

4-3620B Laird Rd
Mississauga ON L5L 5Z7
Tel: 289-444-5040
Fax: 289-444-5041
Email: sales@helukabel.ca
Web: www.helukabel.ca

**HERCULES SEALING PRODUCTS CANADA****Distributor**

30 Saunders Rd
Barrie ON L4N 9A8
Tel: 705-739-6735
Email: barrie@herculesca.ca
Web: www.herculesca.ca
Branches: Dorval, QC
Manufacturers Represented: Dichtomatik; The Smrit Group; SKF Polyseal Inc

HI-TECH SEALS INC.**Manufacturer & Distributor**

9211 41 Ave NW
Edmonton AB T6E 6R5
Tel: 780-438-6055
Fax: 780-434-5866
Email: info@hitechseals.com
Web: www.hitechseals.com
Branches: Winnipeg, MB; Calgary, AB; Newmarket, ON; Boucherville, QC
Distributors: Hi-Tech Gaskets Inc.

HIGGINSON EQUIPMENT INC.**Manufacturer & Distributor**

1-1175 Corporate Dr
Burlington ON L7L 6R6
Tel: 905-335-2211
Fax: 905-335-8756
Email: info@higginson.ca
Web: www.higginson.ca
Manufacturers Represented: AAA; Air-Mite; Aldon Railway Equip.; Amtech Hydraclamp; Burkert; BVA Hydraulics; Deublin Unions; Dynex Hydraulics; Fabco; Gits; GO; Gusher Pumps; Humphrey; J.C. Ernst; Linemaster; Magnatrol; Magnetrol; Oberdorfer Pumps; Ohio Oscillator; Oil-Rite; SMC-Full Line; Tol-o-matic; Trico; Tubal Accumulators; Tuthill; Winters

HOWELL PIPE & SUPPLY**Manufacturer & Distributor**

11 Armstrong Ave
Georgetown ON L7G 4S1
Tel: 888-469-3557
Email: info@howellpipe.com
Web: www.howellpipe.com
Branches: London, ON; Whitby, ON
Manufacturers Represented: Benteler Steel & Tube; Flex-Hose Co.; Georg Fisher; IPSCO; NIBCO; Powell Valves; Rayovac; Shurjoint; Smith Valves; Spirax Sarco; Ward Fittings; Winters

HUMPHREY AUTOMATION INC.**Distributor**

10-570 Alden Rd
Markham ON L3R 8N5
Tel: 905-479-3633
Fax: 905-479-3755
Email: humphrey@pneumation.ca
Web: www.pneumation.ca

HYDAC CORPORATION**Manufacturer**

14 Federal Road
Welland ON L3B 3P2
Tel: 905-714-9322
Fax: 905-714-4664
Email: sales@hydac.ca
Web: www.hydac.ca

HYPOWER SYSTEMS

Manufacturer & Distributor

143 Wheeler St
Saskatoon SK S7P 0A4
Tel: 306-931-0888
Fax: 306-934-2553
Email: info@hypower.com
Web: www.hypower.com
Branches: Calgary, AB; Edmonton, AB; Fort McMurray, AB; Grande Prairie, AB; Prince George, BC; Vancouver/Delta, BC; Winnipeg, MB; Prince Albert, SK; Regina, SK; Saskatoon, SK
Manufacturers Represented: Bimba; Eaton; Enerpac; Graco; Heco Gear; Kawasaki; Norgren; Numatics; Pall; Poclain

HYSECO FLUID SYSTEMS LTD.

Manufacturer & Distributor

1-7399 River Rd
Delta BC V4G 1B2
Tel: 604-940-8865
Fax: 604-940-8802
Email: kjohnson@hyseco.com

IBIS ELECTRO-PRODUCTS CORP.

Manufacturer & Distributor

2A-50 Craig St
Brantford ON N3R 7J1
Tel: 519-756-4299
Fax: 519-756-3299
Email: sales@ibisep.com
Web: www.ibisep.com
Manufacturers Represented: Dietz Sensors; Flexa Conduits & Fittings; GPIC Interface Connectors



IGUS INC.

Manufacturer & Distributor

PO Box 14349
East Providence RI 02914 USA
Tel: 401-438-2200
Fax: 401-438-7270
Email: sales@igus.com
Web: www.igus.com
Branches: Concord, ON

INDUSTRIAL & AVIATION FILTERS

Manufacturer & Distributor

P.O. Box 211 Main Stn.
Pickering ON L1V 2R4
Tel: 905-426-4452
Fax: 905-426-4453
Email: info@envirocominc.com
Web: www.envirocominc.com
Manufacturers Represented: Hilco (The Hilliard Corp.); Wix Filters



Industrial Encoder Corp.

INDUSTRIAL ENCODER CORPORATION

Manufacturer

22 Commerce Place
St. Catharines ON L2S 0B3
Tel: 905-984-3256
Fax: 905-984-5017
Email: info@globalencoder.ca
Web: www.globalencoder.ca
Distributors: Rotalec Industries, Calgary, AB; Brantford, ON; St. Laurent, QC

INSERTA PRODUCTS INC.

Manufacturer

538 Township Line Rd
Blue Bell PA 19422 USA
Tel: 215-643-0192
Fax: 215-643-4017
Email: sales@inserta.com
Web: www.inserta.com
Distributors: Berendsen Fluid Power, Scarborough, ON; Hypower Systems, Saskatoon, SK; Kinecor, Lachine, QC; Wainbee Limited, Mississauga, ON

INTERCON AUTOMATION PARTS INC.

Distributor

14-130 Matheson Blvd E
Mississauga ON L4Z 1Y6
Tel: 705-727-7801
Fax: 705-726-2917
Email: sales@interconap.com
Web: www.interconap.com
Manufacturers Represented: Zimmer

INTRALEC ELECTRICAL PRODUCTS

Manufacturer

1200 Cardiff Blvd
Mississauga ON L5S 1P6
Tel: 905-670-0970
Fax: 905-670-3098
Email: mchamney@intralec.com
Manufacturers Represented: Crouse-Hinds; Mersen

J.E. MYLES INC.

Manufacturer & Distributor

310 Executive Dr
Troy MI 48063 4587-4587 USA
Tel: 248-583-1020
Fax: 248-583-6998
Email: sales@jem-cp-r.com
Web: www.jemyles.com
Manufacturers Represented: BuTech; Delta Computer Systems, Inc.; Denison; Greer; Haskel; Kobold; Moog Inc.; MTS; Parker; Schroeder; Taylor Shock



J. R. MERRITT CONTROLS, INC.

Manufacturer

55 Sperry Ave
Stratford CT 06615 USA
Tel: 203-381-0100
Fax: 203-381-0400
Email: info@jrmerritt.com
Web: www.jrmerritt.com

JOHN CRANE CANADA INC.

Manufacturer & Distributor

423 Green Rd
Stoney Creek ON L8E 3A1
Tel: 905-662-6191
Fax: 905-662-1564
Email: canada@johncrane.com
Web: www.johncrane.com
Branches: Edmonton, AB; Dartmouth, NS; Sarnia, ON; St Laurent, QC

JTEKT HPI

Manufacturer & Distributor

135 Nuggett Crt
Brampton ON L6T 5H4
Tel: 905-791-3388
Fax: 905-791-7322
Email: bmuller@hpicanada.com
Web: www.hpicanada.com
Distributors: BPG, Québec City, QC; Norcan Fluid Power, Richmond, BC

LA SOCIETE WAIRCOM INC. - WAIRCOM CORPORATION INC.

Manufacturer

Suite 1-209 YORK
Granby QC J2G 2B9
Tel: 450-378-4441
Fax: 450-378-0332
Email: reach@waircom.com
Web: www.waircom.com

LAFERT METRIC MOTORS

Manufacturer & Distributor

5620 Kennedy Rd
Mississauga ON L4Z 2A9
Tel: 905-629-1939
Fax: 905-629-2852
Email: sales@lafertna.com
Web: www.lafertna.com

LAPP CANADA

Manufacturer

10-3505 Laird Rd

Mississauga ON L5L 5Y7
Tel: 877-799-5277
Fax: 905-820-6516
Email: info@lappcanada.com
Web: www.lappcanada.com

LE GROUPE ROTALEC INC.

Distributor

900 rue McCaffrey
Saint-Laurent QC H4T 2C7
Tel: 514-341-3685
Fax: 514-341-5205
Email: marketing@rotalec.com
Web: www.rotalec.com
Branches: Brantford, ON
Manufacturers Represented: Ametek; Banner; Control Techniques; Danaher; Efecter; Emerson; Exlar; Fortress Interlocks; Kollmorgen; LinMot; Trio Motion

LEDDARTECH INC.

Manufacturer

2740 rue Einstein
Québec QC G1P 4S4
Tel: 418-653-9000
Fax: 418-653-9099
Email: info@leddartech.com
Web: www.leddartech.com

LENZE AMERICAS

Manufacturer

630 Douglas St
Uxbridge MA 05169 USA
Tel: 508-278-9100
Fax: 508-278-7873
Email: marketing@lenzeamericas.com
Web: www.lenze.com
Branches: Chateaugay, QC
Distributors: Armature, Vancouver, BC; Electram Rotary Equipment, Edmonton, AB; Jacmar, Anjou, QC; MEP Drives, Oakville, ON; RG Speed Control Devices, Woodbridge, ON; Rics Equipment & Supplies, Sussex, NB

LES CÂBLES MULTI CONTRÔLE DU QUÉBEC INC.

Manufacturer & Distributor

175 71e Av
Laval QC H7V 2R6
Tel: 450-688-8494
Fax: 450-681-7525
Email: cablesmulticontrôle@videotron.ca
Manufacturers Represented: Cablecraft; Quadrastat; Start Pilote

LES MOTEURS ELECTRIQUES UNIVERSAL - DIV. DE 125081 CANADA INC.

Distributor

2310 rue Guenette
Saint-Laurent QC H4R 2H2
Tel: 514-748-0260
Fax: 514-748-0261
Email: info@uemmtl.ca
Web: www.uemmtl.ca
Manufacturers Represented: Century; MGM; Omnidrive; U.S. Motors

LEXAIR INC.

Manufacturer

2025 Mercer Rd
Lexington KY 40511 USA
Tel: 859-255-5001
Fax: 859-255-6656
Email: jennings@lexairinc.com
Web: www.lexairinc.com
Distributors: Can-Act Cylinders & Controls, Delta, BC; Integrated Pneumatics Ltd., Saint John, NB; Pneumatic Industrial Equip., Mississauga, ON; Pneutech Industrial Equipment, Kitimat, BC; Pneutech Ltd., Lachine, QC; Montréal, QC; Sempress Canada Inc., Mississauga, ON; Universal Air Hydraulic Ltd., Nisku, AB

LUBRICATION ENGINEERS OF CANADA LTD.

Distributor

2200 Bristol Cir
Oakville ON L6H 5R3
Tel: 905-829-3833
Fax: 905-829-2630
Email: info@lubeng.com
Web: www.lubeng.com
Manufacturers Represented: Bijur Delimon; Lubrication Engineers, Inc.; Macnaught

LYNCH FLUID CONTROLS

Manufacturer & Distributor

1799 Argenta Rd
Mississauga ON L5N 3A2

Tel: 905-363-2400
 Fax: 905-363-1191
 Email: marketing@lynch.ca
 Web: www.lynch.ca

Manufacturers Represented: ATOS Electro-hydraulics; Kawasaki Hydraulics; Sun Hydraulics Corporation

M.A. STEWART & SONS LTD.

Manufacturer & Distributor

12900 87th Ave
 Surrey BC V3W 3H9
 Tel: 604-594-8431
 Fax: 604-594-4335
 Web: www.mastewart.com

Branches: Calgary, AB; Edmonton, AB; Surrey, BC; Bakersfield, CA; Signal Hill, CA; Charlotte, NC; Ajax, ON; Dollard des Ormeaux, QC
Manufacturers Represented: American Valve; Beric Valve; Bonney Forge; Kitz Corporation; MAS; Max-Air/Promation; Mueller Steam; Toyo Red-White; WKM

MACH III CLUTCH, INC.

Manufacturer

101 Cummings Drive
 Walton KY 41094 USA
 Tel: 859-291-0849
 Fax: 859-655-8362
 Email: info@machiii.com
 Web: www.machiii.com
Distributors: Drive Line Inc., Oakville, ON

MAGNELINK, INC.

Manufacturer

1060 NE 25th Ave Suite C
 Hillsboro OR 97124 USA
 Tel: 503-844-6620
 Fax: 503-844-6621
 Email: sales@magnelinkinc.com
 Web: www.magnelinkinc.com



MAIN MANUFACTURING PRODUCTS INC

Manufacturer & Distributor

3181 Tri-Park Dr
 Grand Blanc MI 48439 USA
 Tel: 800-521-7918
 Fax: 810-953-1385
 Email: info@mainmfg.com
 Web: www.mainmfg.com
Branches: Aurora, ON

MANUFACTURERS AUTOMATION INC.

Distributor

1600 King St N
 St Jacobs ON N0B 2N0
 Tel: 519-664-3300
 Fax: 519-664-1600
 Web: www.manufacturersautomation.com
Manufacturers Represented: Adaptive Micro Systems LLC; Balluff Canada Inc.; Carlo Gavazzi Automation Components; IMO Precision Controls Ltd. Canada; Moxa Technologies Inc.; Patlite (USA) Corp

MATHESON VALVES

Distributor

4060 boul Poirier
 Saint-Laurent QC H4R 2A5
 Tel: 514-337-1106
 Fax: 514-745-1542
 Web: www.mvfltd.com
Branches: Burlington, ON; Quebec City, QC
Manufacturers Represented: Continental Disk; Delta; Leser; Optimux; Pure Flex; Triac; Ultra Flo; Velan

MCBURNEY SALES & SERVICES

Distributor

1-3-151 Applewood Cr
 Vaughan ON L4K 4E3
 Tel: 905-791-8700
 Fax: 905-761-8710
 Email: daryl@mcburneysales.com
 Web: www.mcburneysales.com

MEP DRIVES LIMITED

Distributor

3-2821 Bristol Cir
 Oakville ON L6H 6X5
 Tel: 905-829-1020

Fax: 905-829-8155
 Email: fern.garcia@mep.ca
 Web: www.mep.ca

MEP INC.

Distributor

10021 rue Renaude-Lapointe
 Anjou QC H1J 2T4
 Tel: 514-352-1229
 Fax: 514-352-7803
 Email: daniel.frenette@mep.ca

MICO INC.

Manufacturer

1911 Lee Blvd
 North Mankato MN 56003 USA
 Tel: 507-625-6426
 Fax: 507-625-3212
 Email: micomail@mico.com
 Web: www.mico.com
Distributors: Berendsen Fluid Power, Scarborough, ON; Edmonton Brake & Clutch, Edmonton, AB; The Fluid Power House, Lively, ON; Fort Garry Industries, Winnipeg, MB; Hypower Systems Ltd., Delta, BC; Kinecor Inc., Nisku, AB; Superior Industrial Frictions Ltd., Edmonton, AB; Tectran Co., Mississauga, ON; Traction Division of UAP, Montreal, QC

MICROMO

Manufacturer & Distributor

14881 Evergreen Ave
 Clearwater FL 33762-3008 USA
 Tel: 800-807-9166
 Email: info@micromo.com
 Web: www.micromo.com
Manufacturers Represented: Faulhaber; Micro-Drives; MPS; Piezomotor; Precistep

MIDWEST MOTION PRODUCTS, INC.

Manufacturer & Distributor

10761 Ahern Ave. SE
 Watertown MN 55388 USA
 Tel: 952-955-2626
 Fax: 480-247-4096
 Email: randy@midwestmotion.com
 Web: www.midwestmotion.com

MILLER-STEPHENSON CHEMICAL CO. INC.

Manufacturer & Distributor

55 Backus Ave
 Danbury CT 06810 USA
 Tel: 203-743-4447
 Fax: 203-791-8702
 Email: ct.sales@miller-stephenson.com
 Web: www.miller-stephenson.com
Branches: Toronto, ON

MIRAI INTER-TECH

Manufacturer & Distributor

30 Pollard St
 Richmond Hill ON L4B 1A8
 Tel: 905-763-9442
 Fax: 905-763-9766
 Email: sales@miraiintertech.com
 Web: www.miraiintertech.com
Manufacturers Represented: Dyadic Systems; Sanki; Trinc

MOTION CANADA

Distributor

8985 Fraserwood Crt
 Burnaby BC V5J 5E8
 Tel: 604-433-6711
 Fax: 604-433-5473
 Web: www.motionindustries.com
Manufacturers Represented: Visit our Website



MP FILTRI (CANADA) INC.

Manufacturer & Distributor

380 Four Valley Dr
 Concord ON L4K 5Z1
 Tel: 905-303-1369
 Fax: 905-303-7256
 Email: mail@mpfiltricanada.com
 Web: www.mpfiltricanada.com



MYOSTAT MOTION CONTROL INC.

Manufacturer & Distributor

43-17817 Leslie St
 Newmarket ON L3Y 8C6
 Tel: 905-836-4441
 Fax: 905-836-1214
 Email: info@myostat.ca
 Web: www.myostat.ca
Manufacturers Represented: Hephast Seiki; Loadstar; Macron Dynamics; Muscle Corp.; Reliance Precision; Suruga Seiki; Tamagawa Seiki; THK

NEPTRONIC

Manufacturer

400 boul Lebeau
 Saint-Laurent QC H4N 1R6
 Tel: 514-333-1433
 Fax: 514-333-3163
 Web: www.neptronic.com

NEWAGE INDUSTRIES INC

Manufacturer

145 James Way
 Southampton PA 18966 USA
 Tel: 215-526-2300
 Fax: 215-526-2191
 Email: info@newageindustries.com
 Web: www.newageindustries.com

NIPPON PULSE AMERICA, INC.

Manufacturer

4 Corporate Dr
 Radford VA 24141 USA
 Tel: 540-633-1677
 Fax: 540-633-1674
 Email: info@nipponpulse.com
 Web: www.nipponpulse.com
Distributors: Electromate, Woodbridge, ON

NORCAN FLUID POWER

Distributor

603 15th Ave
 Nisku AB T9E 7M6
 Tel: 780-955-7450
 Fax: 780-955-7451
 Web: www.norcanfluidpower.com
Branches: Calgary, AB; Red Deer, AB; Kamloops, BC; Langley, BC; Prince George, BC; Saskatoon, SK
Manufacturers Represented: ASA Hydraulik; Atos; Auburn Gear; Ausco; MP Filtri; Oil-Air; Parker/Denison; Royal Cylinders; Sauer/Danfoss

NORD GEAR LIMITED

Manufacturer

41 West Dr
 Brampton ON L6T 4A1
 Tel: 905-796-3606
 Fax: 905-796-8130
 Web: www.nord.com



NORDSON EFD

Manufacturer

40 Catamore Blvd
 East Providence RI 02914 USA
 Tel: 401-431-7000
 Fax: 401-431-7079
 Email: info@nordsonefd.com
 Web: www.nordsonefd.com



NOVOTECHNIK, INC.

Manufacturer & Distributor

155 Northboro Rd
Southborough MA 01772 USA
Tel: 508-485-2244
Fax: 508-485-2430
Email: info@novotechnik.com
Web: www.novotechnik.com
Distributors: A-Tech Instruments, Scarborough, ON

NSK CANADA INC.

Distributor

5585 McAdam Rd
Mississauga ON L4Z 1N4
Tel: 905-890-0740
Fax: 905-890-0434
Email: info@ca.nsk.com
Web: www.ca.nsk.com
Branches: Burnaby, BC; Lachine, QC
Manufacturers Represented: Beemer Precision; Linkbelt Rexnord

OETIKER INC.

Manufacturer

6317 Euclid St
Marlette MI 48453 USA
Tel: 989-635-3621
Fax: 989-635-2157
Email: info@us.oetiker.com
Web: www.oetiker.com
Branches: Alliston, ON
Distributors: Acklands Grainger; BDI Canada, Inc.; DeeTag Ltd.

OIL-RITE CORP.

Manufacturer

4325 Clipper Dr
Manitowoc WI 54221 1207-1207 USA
Tel: 920-682-6173
Fax: 920-682-7699
Email: sales@oilrite.com
Web: www.oilrite.com
Distributors: Higginson Equipment Sales, Burlington, ON; Howard Marten, Pickering, ON



OMEGA

Manufacturer

976 Bergar
Laval QC H7L 5A1
Tel: 514-856-6928
Fax: 514-856-6886
Email: generalinfo@omega.ca
Web: www.omega.ca

ONTARIO DRIVE & GEAR LTD.

Manufacturer & Distributor

3551 Bleams Rd
New Hamburg ON N3A 2J1
Tel: 519-662-2840
Fax: 519-662-2127
Email: dpolanic@odg.com
Web: www.odg.com
Manufacturers Represented: KTR Corporation

P.S.I. FLUID POWER LTD.

Manufacturer & Distributor

4210 51 Ave NW
Edmonton AB T6B 3B5
Tel: 780-452-1594
Fax: 780-452-0491
Web: www.psifluidpower.ca
Branches: Calgary, AB; Red Deer, AB; Richmond, BC
Manufacturers Represented: Amca; Auburn Gear; Braden-Gearmatic; Brand; Char-Lynn; Commercial Integrated Hydraulics; Eaton; Gresen; Hi-Fog; KYB; Oil-Air; Parker; Salami; Thermal Transfer; Vickers



PARKER HANNIFIN CORP. PARKER CANADA DIVISION

Manufacturer

160 Chisholm Dr
Milton ON L9T 3G9
Tel: 905-693-3000
Fax: 905-693-4290
Email: infomc@parker.com
Web: www.parker.com
Branches: Calgary, AB; Fergus, ON; Grimsby, ON; Dorval, QC
Distributors: Please see distributor locator at www.parker.com

PEERLESS ENGINEERING SALES LTD.

Distributor

4015 1st Ave
Burnaby BC V5C 3W5
Tel: 604-659-4100
Fax: 604-659-4121
Email: info@peerlesse.com
Web: www.peerlessengineering.com
Branches: Calgary, AB; Prince George, BC; Prince Albert, SK; Edmonton, AB
Manufacturers Represented: Ace Controls; American Cylinders; ATC Electronics; Balluff Electronics; Canfield Connector; Colder Fittings; Dinamic Oil Winches; Dynex Rivett Pumps; Firestone Air Actuators; Gardner Denver Riestschle; Gardner Denver Thomas; High Country Tek; Marsh Bellofram; Mattel Compressors; Norgren Pneumatics; Northman Valves; Oilgear Pumps; Parker Hannifin Mobile Hydraulics; Pisco Tube Fittings; Richwood Conveyor Components; Sun Hydraulics; Versa Valves; Woodward Servo Valves

PESCO SALES LTD.

Distributor

3260 rue Sartelon
Saint-Laurent QC H4R 1E3
Tel: 514-331-6953
Fax: 514-331-0061
Email: pesco@total.net
Web: www.pescoquebec.com
Manufacturers Represented: Aquiflow; Badger; Cantesco Saint-Gobain; Garlock; Generant; LMI Milton Roy; Sterling Motors; Tarby; Therm-Omega-Tech; Zook

PIC DESIGN - DIV. OF THE ROLLER BEARING COMPANY OF AMERICA INC.

Manufacturer

86 Benson Rd
Middlebury CT 06762-1004 USA
Tel: 203-758-8272
Fax: 203-758-8271
Email: info@pic-design.com
Web: www.pic-design.com
Distributors: Digican Motion Control, Kirkland, QC; Electromate Ind. Sales, Woodbridge, ON; Motion Industries, Ottawa, ON; Lachine, QC; St. Jean, QC

POLYMOTION LIMITED

Manufacturer & Distributor

1-30 Rivermede Rd
Vaughan ON L4K 3N3
Tel: 416-665-5711
Fax: 905-738-0120
Email: rob@polymotion.com
Web: www.polymotion.com

POWER BEAM INC.

Manufacturer

7454 Spears Rd
Elora ON N0B 1S0
Tel: 519-846-5835
Fax: 519-846-5322
Email: mail@powerbeam.ca
Web: www.powerbeam.ca

POWER-MOTION COMPONENTS, INC.

6-40 Englehard Dr
Aurora ON L4G 6X6
Tel: 905-713-9952
Fax: 905-713-9962
Email: mcotton@power-motion.net
Web: www.power-motion.net

PQ SYSTEMS LTD.

Distributor

A2-5279 Still Creek Ave
Burnaby BC V5C 5V1
Tel: 604-299-0022
Fax: 604-299-8453
Email: info@pqsystems.com
Web: www.pqsystems.com
Manufacturers Represented: Delta Computer Systems; Exlar; Gefran; Hydraforce; Moog Inc.; MTS Sensors; Nippon Pulse; Ross Controls; TR Electronic

PRODUCTO DIEMAKERS SUPPLIES LTD.

Distributor

4-641 Chrislea Rd
Vaughan ON L4L 8A3
Tel: 905-856-9990
Fax: 905-856-9887
Email: tony@productodiemarkers.com
Web: www.productodiemarkers.com
Branches: Boisbriand, QC



Quality Transmission Components

QUALITY BEARINGS & COMPONENTS

Manufacturer & Distributor

2101 Jericho Turnpike
New Hyde Park NY 11040 USA
Tel: 516-616-0436
Fax: 516-616-0443
Email: qbcsupport@qbcbearings.com
Web: www.qbcbearings.com

QUALITY TRANSMISSION COMPONENTS

Distributor

125 Railroad Ave
Garden City Park NY 11040 USA
Tel: 516-437-6700
Fax: 516-328-3343
Email: qtcsupport@qtcs.com
Web: www.qtcs.com
Manufacturers Represented: KHK; Kohara Gear; Zetasassi

R.W. HAMILTON LTD.

Distributor

14 Wright St
St Catharines ON L2R 6V9
Tel: 905-688-3810
Fax: 905-684-9505
Email: admin@rwhamilton.com
Web: www.rwhamilton.com
Branches: Burlington, ON; Mississauga, ON
Manufacturers Represented: Campbell Fitting; Clarkson Osborn; Colson; Conbraco (Apollo); Flexible Technologies; Furbo Siegling; Goodyear; Kuriyana; Kurt; Lufkin; PT Coupling; Proto Group; Sempit; Stanley; T.B. Woods; Vanguard

RAM INDUSTRIES INC.

Manufacturer

33 York Rd E
Yorkton SK S3N 3Z4
Tel: 306-786-2677
Fax: 306-786-2651
Email: estimating@ramindustries.com
Web: www.ramindustries.com

RECONIT ELECTRIC REBUILDERS LTD

Manufacturer

8-63 McIntyre Pl
Kitchener ON N2R 1J5
Tel: 519-748-6488
Email: info@reconit.ca
Web: www.reconit.ca

REGAL BELLOIT CANADA

Manufacturer & Distributor

320 Superior Blvd
Mississauga ON L5T 2N7
Tel: 905-670-4770
Fax: 905-670-4378
Email: canadasaes@regalbelloit.com
Web: www.regalbelloit.com
Branches: Edmonton, AB; Langley, BC; Vancouver, BC; Winnipeg, MB; Moncton, NB; Hanover, ON; Candiac, QC
Manufacturers Represented: Fasco; GE Commercial by Regal Belloit; Genteq; Leeson Electric; Lovato; Morrill; Steams

REID SUPPLY COMPANY**Distributor**

2265 Black Creek Rd
Muskegon MI 49444 USA
Tel: 231-777-3951
Fax: 231-777-4485
Email: mail@reidsupply.com
Web: www.reidsupply.com

RENISHAW CANADA LIMITED**Manufacturer**

2196 Dunwin Dr
Mississauga ON L5L 1C7
Tel: 905-828-0104
Fax: 905-828-5519
Web: www.renishaw.com
Distributors: Cadence Automation, St Therese, QC; Proax Technologies, London, ON; Oakville, ON

RENOWN ELECTRIC MOTORS & REPAIR INC.**Manufacturer & Distributor**

99 Ortona Crt
Concord ON L4K 3M3
Tel: 905-738-9002
Fax: 905-738-5603
Email: info@renown-electric.com
Web: www.renown-electric.com
Manufacturers Represented: Baldor; Bonfiglioli; Brook-Crompton; Emco; Imperial; Lafert; Leroy Somer; Lesson; Nord; Siemens; Teco Westinghouse; US Motors; WEG

RG SPEED CONTROL DEVICES LTD.**Distributor**

5-643 Chrislea Rd
Woodbridge ON L4L 6A3
Tel: 905-856-6724
Fax: 905-856-6725
Email: rob@rgspeed.com
Web: www.rgspeed.com
Manufacturers Represented: Baldor Electric; Cone Drive/Texttron; Control Techniques; Dynapar; Exlar; KB Electronics; Lenze AC Tech; Marathon; Nexen Group; Nord Gear; Radicon; SEW; Stearns; Stober Gear; WEG; Yaskawa Electric

RINGBALL CORPORATION**Manufacturer & Distributor**

2160 Meadowpine Blvd
Mississauga ON L5N 6H6
Tel: 905-826-1100
Fax: 905-826-9691
Email: toronto@ringball.com
Web: www.ringball.com
Branches: Edmonton, AB; Burnaby, BC; Winnipeg, MB; Dorval, QC
Manufacturers Represented: Bishop Wisecarver; Carter; Danaher/Thomson; FHY; GMN; IKO; RBL

**RITTAL SYSTEMS LTD.****Manufacturer**

7320 Pacific Cir
Mississauga ON L5T 1V1
Tel: 905-795-0777
Fax: 905-795-9548
Email: rittal.systems@rittal.ca
Web: www.rittal.ca
Branches: Calgary, AB; St. Laurent, QC

ROSTA INC.**Manufacturer**

#6-12 Douglas Road
Uxbridge ON L9P 1S9
Tel: 905-852-1929
Fax: 905-852-1861
Email: info@rosta-inc.com
Web: www.rosta-inc.com
Manufacturers Represented: Rosta AG; Venanzetti Vibrazioni

**ROTOPRECISION INC.****Manufacturer & Distributor**

304 Watline Ave
Mississauga ON L4Z 1P4
Tel: 905-712-3800
Fax: 905-712-3805
Email: sales@rotoprecision.ca
Web: www.rotoprecision.ca
Branches: Coquitlam, BC; Dorval, QC
Manufacturers Represented: Alinabal Motion Transfer Devices; Anderton (Cirteq) International Ltd.; Motovario Corporation; NB Corporation (NB); Nordex Inc.; The Oiles Corporation; Onvio LLC; Ruland Manufacturing Co. Inc.; Smalley Steel Ring Company; SNFA Group; Strongbar (UK) Ltd.; WIB Bearings
Company Profile: World-Class Precision Products and Service. Proudly supplying Canadian OEMs and Distribution for over 50 years including a broad range of angular contact bearings, miniature and instrument bearings, linear motion components, case-hardened linear shafting, retaining rings, fasteners, wave springs, gearboxes and reducers, electric motors, shaft collars and couplings, rod ends, specialty linkages and self-lubricating bearings. Application Support Services available for technical inquiries. Canadian inventories for rapid turnaround. ISO quality certified. PDF catalogues available. Application Support: 1-888-712-3400.

ROTORK CONTROLS (CANADA) LTD.**Manufacturer**

4-2850 Argentia Rd
Mississauga ON L5N 8G4
Tel: 905-363-0313
Fax: 905-363-0320
Web: www.rotork.com
Branches: Sarnia, ON; Calgary, AB

RUBBERLINE PRODUCTS LTD.**Distributor**

81 Bleams Rd
Kitchener ON N2C 2G2
Tel: 519-894-0400
Fax: 519-894-9940
Email: sales@rubberline.ca
Web: www.rubberline.com
Branches: Brantford, ON; Cambridge, ON; Guelph, ON; London, ON; Mississauga, ON
Manufacturers Represented: Allied Witan; Asco; Burkert; Colder; Deltrol; Flexco; Gates; Habasit; Hansen; Humphrey; ITT; Kuritec; Norgren; Nycoil; Pneumadyne; Sheffer; Tapco; Tylok; Vicas

RYCO HYDRAULICS INC.**Manufacturer**

1616 Greens Rd
Houston TX 77032 USA
Tel: 281-821-4100
Fax: 281-821-4300
Email: sales@ryco.us
Web: www.ryco.com.au
Branches: London, ON
Distributors: Red L. Distributors, Edmonton, AB



Schaeffler Canada Inc.

SCHAEFFLER CANADA INC.**Distributor**

2871 Plymouth Dr
Oakville ON L6H 5S5
Tel: 905-829-2750
Fax: 905-829-2563
Email: sales@schaeffler.com
Web: www.schaeffler.ca
Branches: Leduc, AB; Saint-Laurent, QC

SCHNEIDER ELECTRIC CANADA**Manufacturer**

5985 McLaughlin Rd
Mississauga ON L5R 1B8
Tel: 905-366-3999
Email: canadian.pss@schneider-electric.com
Web: www.schneider-electric.com

SCHNEIDER ELECTRIC MOTION USA**Manufacturer**

370 Main St N
Marlborough CT 06447 USA
Tel: 860-295-6102
Fax: 860-295-6107
Email: info@imshome.com
Web: www.motion.schneider-electric.com
Distributors: Baldor Motion Industries, Oakville, ON; Digican Motion Control, Kirkland, QC; The Drive Systems, Inc., Mississauga, ON

SCHUNK INTEC CORP.**Manufacturer & Distributor**

3-340 Britannia Rd E
Mississauga ON L4Z 1X9
Tel: 905-712-2200
Fax: 905-712-2210
Email: info@ca.schunk.com
Web: www.schunk.com
Distributors: Disca, Boucherville, QC; Sempres Pneumatics, Mississauga, ON

SCORE TRANSCANADA LIMITED**Wholesaler**

5135 67 Ave NW
Edmonton AB T6B 2R8
Tel: 780-455-5273
Fax: 780-455-5276
Email: score.transcanada@score-group.com
Web: www.score-group.com

**SCOTT ROTARY SEALS****Manufacturer**

301 Franklin St
Olean NY 14760 USA
Tel: 716-376-0708
Fax: 716-372-1777
Email: sales@scottrotaryseals.com
Web: www.scottrotaryseals.com

SEAL MASTER CORPORATION**Manufacturer**

368 Martine Dr
Kent OH 44240 USA
Tel: 330-673-8410
Fax: 330-673-8242
Email: info@sealmaster.com
Web: www.sealmaster.com

SERAPID, INC.**Manufacturer**

5400 18 Mile Road
Sterling Heights MI 48314 USA
Tel: 586-274-0774
Fax: 586-274-0775
Email: info-us@serapid.com
Web: www.serapid.us

SERVO2GO.COM LTD.**Distributor**

583-4023 Kennett-Pike
Greenville DE 19807 USA
Tel: 877-378-0240
Email: sales@servo2go.com
Web: www.servo2go.com
Manufacturers Represented: Advanced Motion Controls; Applied Motion Products; Cleveland Motion Products Inc.; Dyadic Systems; ElectroCraft; Exor Electronic; Galil Motion Control; GAM Gear; Inertia Dynamics; MCG Inc.; MTS Temposonics; Nippon Pulse America; Pittman Motors; Quantum Devices Inc.; Rabbit Semiconductor; Rocom Corporation; Servo Tek Products Company; Shimpo

SERVOMETER**Manufacturer**

501 Little Falls Rd
Cedar Grove NJ 07009 1291-1291 USA
Tel: 973-785-4630
Fax: 973-785-0756
Email: info@servometer.com
Web: www.servometer.com

SETPPOINT TECHNOLOGIES

Distributor

10393 Sinclair Dr
Ilderton ON N0M 2A0
Tel: 519-666-3363
Fax: 519-666-3365
Email: info@setpointtech.com
Web: www.setpointtech.com
Manufacturers Represented: John C. Ernst; Lake Monitors; Marwin; Oberdorfer; Oseco; Price Pump; Pulsafeeder; Quest-Tec; Sure Seal



SEW EURODRIVE COMPANY OF CANADA LTD.

Manufacturer

210 Walker Dr
Bramalea ON L6T 3W1
Tel: 905-791-1553
Fax: 905-791-2999
Email: marketing@sew-eurodrive.ca
Web: www.sew-eurodrive.ca
Branches: Delta, BC; Lasalle, QC

SIEMENS CANADA LTD.

Manufacturer

1550 Appleby Line
Burlington ON L7L 6X7
Tel: 888-303-3353
Email: cic.ca@siemens.com
Web: www.siemens.ca

SKEANS ENGINEERING & MACHINERY LTD.

Distributor

1900 Brigantine Dr
Coquitlam BC V3K 7B5
Tel: 604-777-4247
Fax: 604-777-1900
Email: skeans@skeans.com
Web: www.skeans.com
Branches: Winnipeg, MB; Prince George, BC; Calgary, AB; Edmonton, AB
Manufacturers Represented: Bimba; Colder; Enidine; Galland Henning Nopak; Gardner Denver; Hansen; Horner; Legris; Leuze; Mac Valves; Mattei; Murr; PHD Cylinders; Piab; Tolomatic; Transair; TRD; Wilkerson

SKF CANADA LIMITED

Manufacturer

40 Executive Crt
Scarborough ON M1S 4N4
Tel: 416-299-1220
Email: marketing@skf.ca
Web: www.skf.ca
Branches: Montréal, QC

SKYMATIC CONTROLS INC.

Manufacturer & Distributor

121 Milvan Dr
North York ON M9L 1Z8
Tel: 416-742-4448
Fax: 416-749-5053
Email: ivan@duncaninstr.com
Web: www.skymatic.com

SOFTPLC CORPORATION

Manufacturer

25603 Red Brangus
Spicewood TX 78669 USA
Tel: 512-264-8390
Fax: 512-264-8399
Email: info@softplc.com
Web: http://softplc.com
Distributors: Rotalec, St. Laurent, QC; Rotalec - Atlantic, Moncton, NB; Rotalec - Central, Brantford, ON; Rotalec - Pacific, Vancouver, BC

SOMMER AUTOMATIC INC.

Manufacturer

14-130 Matheson Blvd E
Mississauga ON L4Z 1Y6
Tel: 416-766-6371
Fax: 416-766-6370
Email: sales@sommerautomatic.com
Web: www.sommerautomatic.com



STOCK DRIVE PRODUCTS/STERLING INSTRUMENT

Manufacturer & Distributor

2101 Jericho Place
New Hyde Park NY 11040 USA
Tel: 516-328-3300
Fax: 516-689-8409
Email: sdp-si@sdp-si.com
Branches: North Vancouver, BC; Etobicoke, ON; Hamilton, ON; Kanata, ON; Kirkland, QC
Manufacturers Represented: EMT Engineering Sales
Company Profile: Small Precision Mechanical Components Available from SDP/SI
Stock Drive Products (ISO 9001 Registered) and Sterling Instrument (ISO 9001 and AS9100 Registered) are manufacturers and suppliers of small mechanical parts and assemblies. Components such as timing belts, timing belt pulleys, gears, couplings and much more are available off-the-shelf or customized to fit your specific application.
See complete product line and 3D CAD models at: www.sdp-si.com.
Phone: 1-516-328-3300
FAX: 1-516-326-8827
e-mail: sdp-sisupport@sdp-si.com

STRICTLY SALES & SERVICE INC.

Manufacturer & Distributor

125-149 Trider Cres
Dartmouth NS B3B 1V6
Tel: 902-468-5308
Fax: 902-468-2175
Email: sales@strictlyhydraulics.com

SWITCHING SOLUTIONS INC.

Manufacturer

380 Four Valley Dr
Concord ON L4K 5Z1
Tel: 905-303-8700
Fax: 905-303-7130
Email: sales@switchingssi.com
Web: www.switchingssi.com
Distributors: Engrenage Provincial, Quebec City, QC; MP Filtri Canada, Concord, ON; Norcan Fluid Power, Richmond, BC; PSI Fluid Power, Richmond, BC

SYLVAN AUTOMATION LTD.

Distributor

1018 McNabb St
Sault Ste. Marie ON P6B 6J1
Tel: 705-254-4669
Fax: 705-254-4894
Email: sales@sylvanautomation.com
Web: www.sylvanautomation.com
Branches: Sarnia, ON; Val Caron, ON
Manufacturers Represented: Asco; Chemline; Foxboro; Invensys; Jamesbury; Magnetrol; Metso; Neles; Newco; Nextron; Valtek

TAYLOR DEVICES INC.

Manufacturer

90 Taylor Dr
North Tonawanda NY 14120 0748-0748 USA
Tel: 716-694-0800
Fax: 716-695-6015
Web: www.taylordevices.com
Distributors: Teratec Inc., Oakville, ON

TECHNICAL SYSTEMS 2002 INC.

Distributor

PO Box 650
Waterdown ON L0R 2H0
Tel: 905-575-1941
Fax: 905-575-0386
Email: sales@technical-sys.com
Web: www.technical-sys.com
Manufacturers Represented: AEMC Instruments; Beta Calibrators; Compwest USA; Fastest Inc.; Kaymont; Martel Electronics; Measurement Technologies; NK Technologies; Simpson Electric; Vaisala

TECHNO-OMIL

24 Fuller Street
Dix Hills NY 11746 USA
Tel: 800-819-3366
Fax: 516-358-2576
Email: grippersupport@techno-omil.com
Web: www.techno-omil.com



TECOM INC.

Manufacturer & Distributor

205 St. George St. Unit 5
Lindsay ON K9V 5Z9
Tel: 705-878-3650
Fax: 705-878-5019
Email: tecom@crbearing.com
Web: www.crbearing.com
Manufacturers Represented: C.R. s.r.l.; Comesa s.r.l.

TIMKEN CANADA LP

Manufacturer

100-5955 A Airport Rd
Mississauga ON L4V 1R9
Tel: 905-694-4909
Fax: 905-694-9619
Email: evan.boere@timken.com
Web: www.timken.com
Branches: Edmonton, AB; Vancouver, BC; Winnipeg, MB; Moncton, NB; Toronto, ON; Montréal, QC; Québec, QC
Distributors: Across Canada

TORO HYDRAULIC & MACHINERY INC.

Manufacturer & Distributor

15-1415 Bonhill Rd.
Mississauga ON L5T 1R2
Tel: 905-565-8887
Fax: 905-565-5788
Email: sales@torohyd.com
Web: www.torohyd.com
Manufacturers Represented: Yuken (Japan)

TRANSORB ELECTRICAL PRODUCTS LTD.

Manufacturer & Distributor

375 Industrial Dr
Grand Forks BC V0H 1H0
Tel: 250-442-5225
Fax: 250-442-5228
Email: transorb@telus.net
Web: www.transorbelectrical.com
Manufacturers Represented: ABB; Bemag; Best Quality Power; Dairyland; Electro-Meters; Erico Cadweld; Fusetek; Gentec Capacitors; Hammond & Marcus Transformers

TRELLEBORG SEALING SOLUTIONS

Manufacturer

2531 Bremer Rd
Fort Wayne IN 46803 USA
Tel: 260-749-9631
Fax: 260-749-4844
Email: tssusa@trelleborg.com
Web: www.tss.trelleborg.com/us
Branches: Etobicoke, ON

TRIO MOTION TECHNOLOGY LLC

Manufacturer

187 Northpointe Blvd
Freeport PA 16229 USA
Tel: 724-540-5018
Fax: 724-540-5098
Email: ussales@triomotion.com
Web: www.triomotion.com
Distributors: Cowper, Lachine, QC; Drive Systems Group, Mississauga, ON; Rotalec Group, Saint-Laurent, QC

UNICO CANADA DRIVES & SYSTEMS INC.

Manufacturer

B5-1515 Matheson Blvd E
Mississauga ON L4W 2P5
Tel: 905-602-4677
Fax: 905-602-4765
Email: mike.mrkonic@unicous.com
Web: www.unicous.com

USIMAX INC.

Manufacturer

1155 - 98 ROE
Saint Georges QC G5Y 8J5
Tel: 418-227-3333
Fax: 418-227-1335
Email: pierre.bertrand@usimax.com
Web: www.usimax.com

VELMEX INC.

Manufacturer & Distributor

7550 State Route 5 & 20
Bloomfield NY 14469 USA
Tel: 585-657-6151
Fax: 585-657-6153
Web: www.velmex.com

VL MOTION SYSTEMS INC.

Distributor

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Manufacturer

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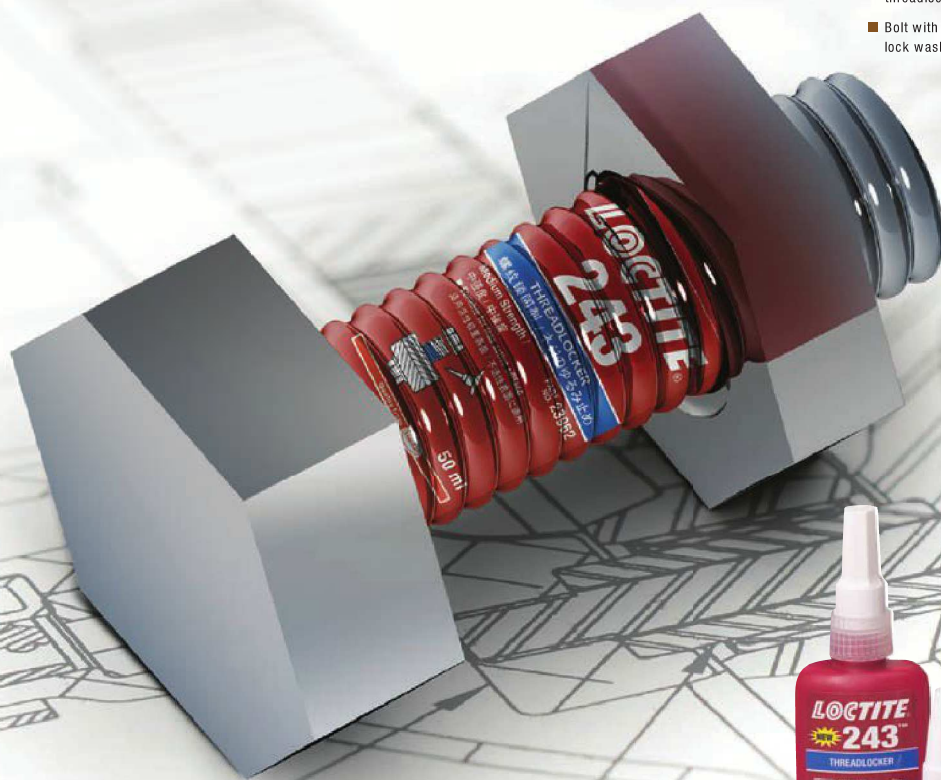
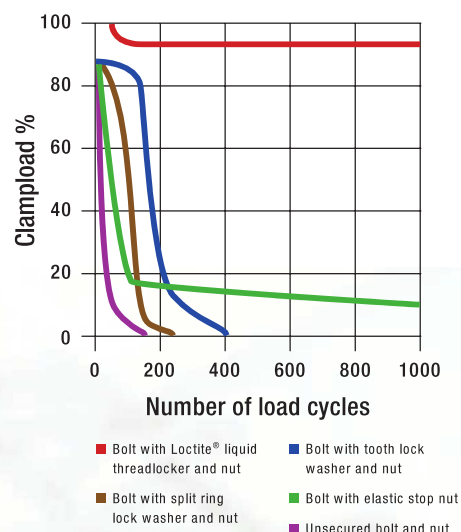
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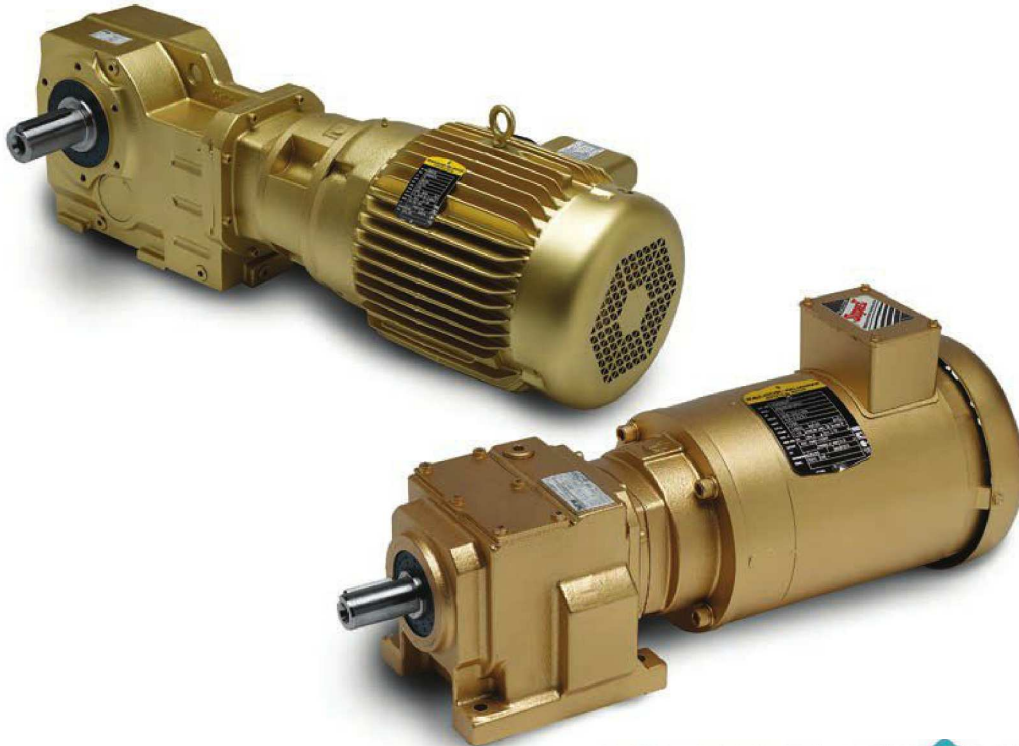
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