

# D P N

# DESIGN PRODUCT NEWS



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### Flexible modular controller

IDEC Corp. has upgraded its line of SmartRelay modular controllers. The modules can expand up to 24 digital inputs, 16 digital outputs and 8 analog inputs. The programmable units permit control of temperature, pressure or level.

[idec.com/smartrelay](http://idec.com/smartrelay)

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### Laser displacement sensor

MTI Instruments Inc. has announced the Microtrak II, a sensor system that employs CMOS laser triangulation technology for measurements of displacement, position, vibration and thickness. The product features a 40 kHz sampling frequency, up to 4x faster than CCD units.

[xtronics.ca](http://xtronics.ca)

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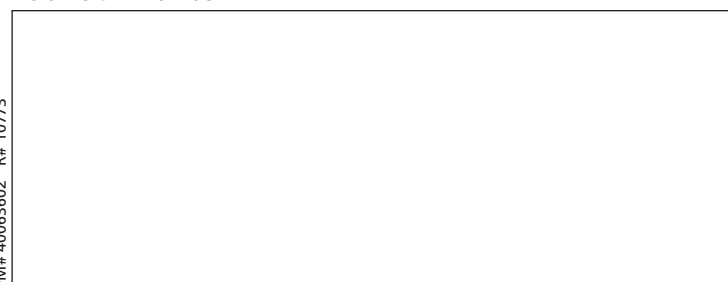
### Plastics replacement

Cortec Corp. has introduced Eco Works 70, a biodegradable plastic replacement material based on polyester extracted from corn. Compostable to water and CO<sub>2</sub>, it can be fabricated into flexible sheeting and protective wrap for applications such as grocery bags and phone cards.

[cortecvci.com](http://cortecvci.com)

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## Pneumatics propels Doctor Octopus

Doctor Octopus is alive and living in Los Angeles thanks to the ingenuity of Walter Klassen FX in Toronto. Doc Oc is part of the Marvel SUPER HEROES Science Exhibition starting this month at the California Science Center ([californiasciencecenter.org](http://californiasciencecenter.org)).

Walter Klassen FX ([walterklassen.com](http://walterklassen.com)) has typically supplied animatronics, props and special effects to the film and television industry for the last two decades, but recently won a bid to supply Doctor Octopus to Marvel's traveling exhibit destined for science centres around the world, starting in L.A. The character illustrates the complexity of prosthetic limbs, and joins fellow Marvel characters such as Spider-Man, Incredible Hulk and Magneto that demonstrate other elements of science and technology.

The special effects company is led by founder Walter Klassen, a Ryerson Polytechnical Institute mechanical engineering technologist graduate who made his way to Munich for three years in the 1970s where he completed a leather making apprenticeship. Klassen's artistic bent is on display in his downtown Toronto studio with work benches dedicated to custom leather and molded carbon-fibre attaché cases (*Chicago*), shoulder bags and boxing gloves (*Cinderella Man*), as well as steadicam film camera harnesses. The studio also sports a Mastercam software-controlled CNC machining centre that can produce custom metal and plastic parts as needed.

Klassen explained that two of Doc Oc's eight-foot arms move in various software-generated pre-programmed patterns, one arm is controlled

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## Cover Story

# Valve manifold helps Doc Oc keep quiet

### From Front Page

by science centre visitors and a fourth arm forms a tripod point to anchor the exhibit. The visitor-controlled arm times out after a set period to ensure that more participants can interact with the display. Visitor control of the arm is via a joystick at a podium directly in front of the exhibit.

Doctor Octopus is a hybrid of pneumatic, electronic and mechanical technologies. "Pneumatics is common in theme parks," said Klassen. While his company's projects have often used standalone pneumatic valves, "we employed a manifold for Doc

Oc to improve noise reduction."

Nelson Cross of Festo Inc. (festo.ca) in Mississauga, ON, explained how the "Festo CPE14 manifolded valves are used in the control system for Doc Oc to provide pneumatic outputs to all of the cylinders used for his arms and head motions." Festo was chosen in part by Walter Klassen FX because of its international presence and local availability of technical support and parts.

The air cylinders that actuate the long arms "had to be beefy," according to



Doc Oc in the shop: Walter Klassen (left) and Taku Dazai pose with the exhibit prior to dressing. Festo CPE14 manifolded valves are used to control head and arm movements.

Cover photo by Ron Elmy.

Klassen, so 4 in. bore units were specified by Doc Oc lead designer Taku Dazai to accommodate the intense torque created over a chain and sprocket assembly.

"The claws open and close using a 1-1/2 in. bore, 1 in. stroke inline air cylinder," said Dazai. "The arms rotate using two 4 in. bore air cylinders that pull a double strand 3/8 in. chain around a 20-tooth sprocket. By plumbing only the return ports on each cylinder when one cylinder is actuated, it pulls the chain around the sprocket turning it approximately 120°, as well as extending the other cylinder shaft."

Dazai uses Autodesk Inventor to map out the structure of Doc Oc's body and internal components such as chains, valves and cylinders. "Inventor has really changed the way in which we design things

## Project will pioneer remote diagnostic methods

around here. As well as being able to clearly share ideas between us in the shop, it has become an invaluable tool especially because we are always designing new ideas," Dazai said.

Working with Dazai is programmer Sean Snell, who mapped out the exhibit electronic controls courtesy of MIDI sequencers typically found in theatrical productions for lighting and sound. The sequencers are set by Snell to operate 16 channels of pneumatic valves, as well as red, white and blue LEDs integrated into the claws for special effects. "Limit switches on the cylinders are timed to provide smooth starts and braking on the arms," said Klassen.

The special effects company is also using the Doctor Octopus project to pioneer remote diagnostics and maintenance methods. Klassen explained that a dedicated phone line and high-speed Internet connection to the exhibit will permit embedded sensors to be interrogated for potential defects and an optical camera webcam signal can be viewed remotely to see if Doc Oc is behaving properly. "After exhibition hours," Klassen noted, "the dump valve on the air tank can be activated so the exhibit is ready to go the next day.

"The arms can also be reprogrammed remotely, or a memory card sent to replace the existing one."

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