control solutions international

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Part Number	Input Voltage	Output Voltage	hp	Output Amps	Price (US $)
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GS1-10P5	115V, 1ph	230V, 3ph	0.5	2.5 A	$119
GS1-20P2	230V, 1ph	230V, 3ph	0.25	1.6 A	$125
GS1-20P5	230V, 1ph	230V, 3ph	0.5	2.5 A	$132
GS1-21P0	230V, 1ph	230V, 3ph	1.0	4.2 A	$156
GS1-22P0	230V, 3ph	230V, 3ph	2.0	7.0 A	$168

GS2

Part Number	Output Voltage	hp	Amps	Price (US $)
GS2-20P5	230V	0.5	2.5	$188
GS2-21P0	230V	1.0	5.0	$209
GS2-22P0	230V	2.0	7.0	$279
GS2-23P0	230V	3.0	10.0	$329
GS2-25P0	230V	5.0	17.0	$364
GS2-27P5	230V	7.5	25.0	$597
GS2-41P0	480V	1.0	3.0	$328
GS2-42P0	480V	2.0	4.0	$358
GS2-43P0	480V	3.0	5.0	$385
GS2-45P0	480V	5.0	8.2	$425
GS2-47P5	480V	7.5	13.0	$650
GS2-4010	480V	10	18.0	$820

AC Drives: Head-to-head AutomationDirect VS. Competition

Features	AutomationDirect GS2	Reliance Electric MD60	Allen-Bradley Powerflex 4
Hp range	0.5-10hp	0.25-5hp	0.25-5hp
PID control	Yes	No	No
Removable keypad	Yes	Fixed	Fixed
RS232/RS485 communications	Yes	RS232 only	RS232 only
2 hp 230 VAC Part Number	$279 GS2-22P0	$509 6MDBN-8P0101	$342 22A-B8P0N104
5 hp 460 VAC Part Number	$425 GS2-45P0	$904 6MDBN-8P7101	Not listed 22A-D6P7N104
10 hp 460 VAC Part Number	$820 GS2-4010	Not available	Not available

All prices are U.S. list prices. *AutomationDirect* prices are Aug. 2003 prices. Allen-Bradley prices taken from online store, http://shop.rockwellautomation.com, as of November 28, 2002. Reliance prices from MD60 Product Bulletin effective June 17, 2002. Prices and specifications may vary by dealer and configuration. All product names, trademarks, and registered trademarks are the property of their respective manufacturers. Prices subject to change without notice. *AutomationDirect* disclaims any proprietary interest in the marks and names of others.

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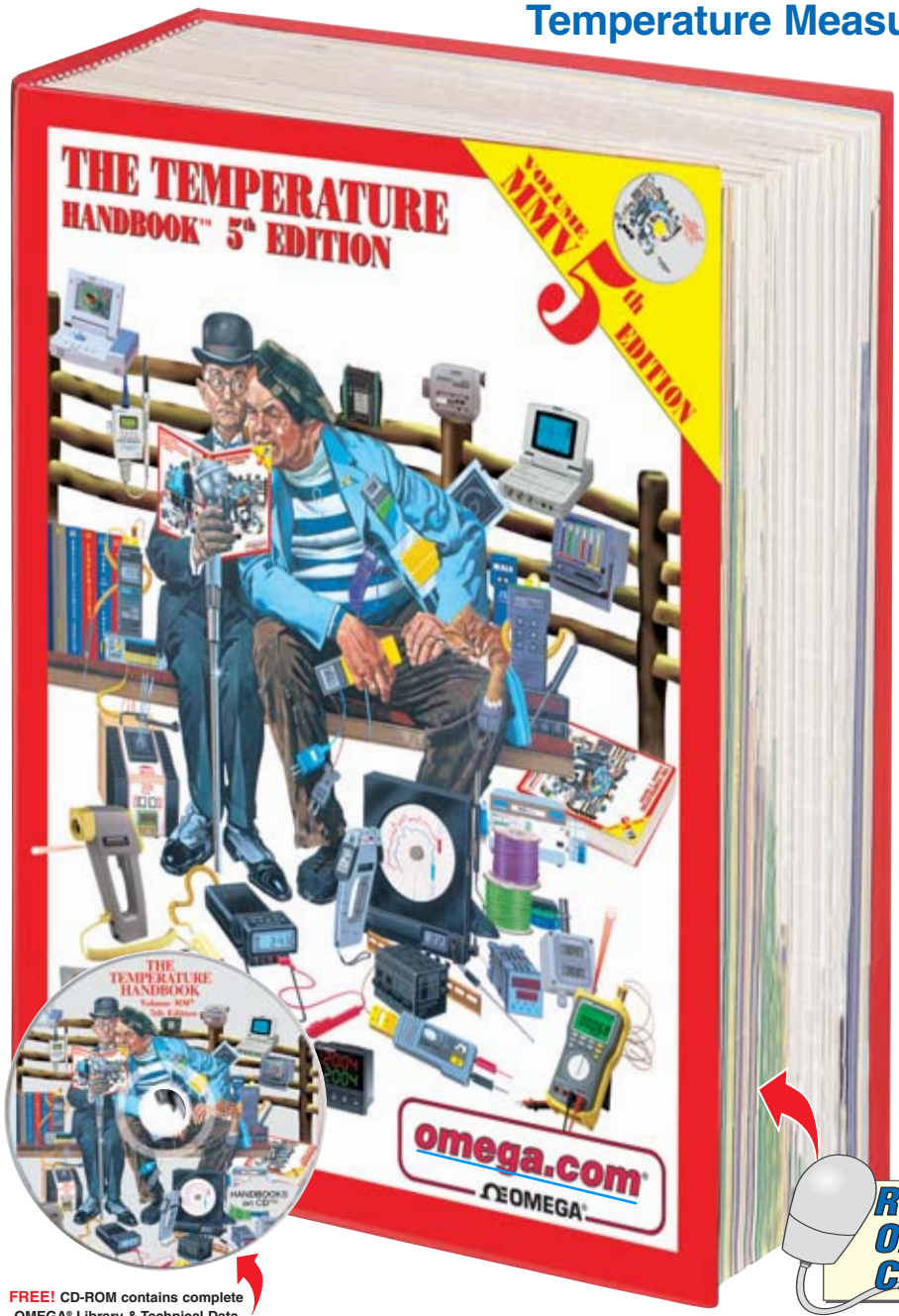

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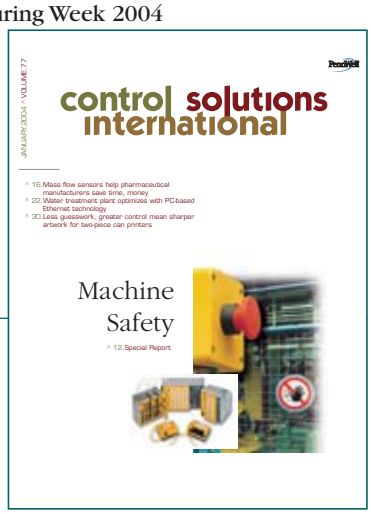
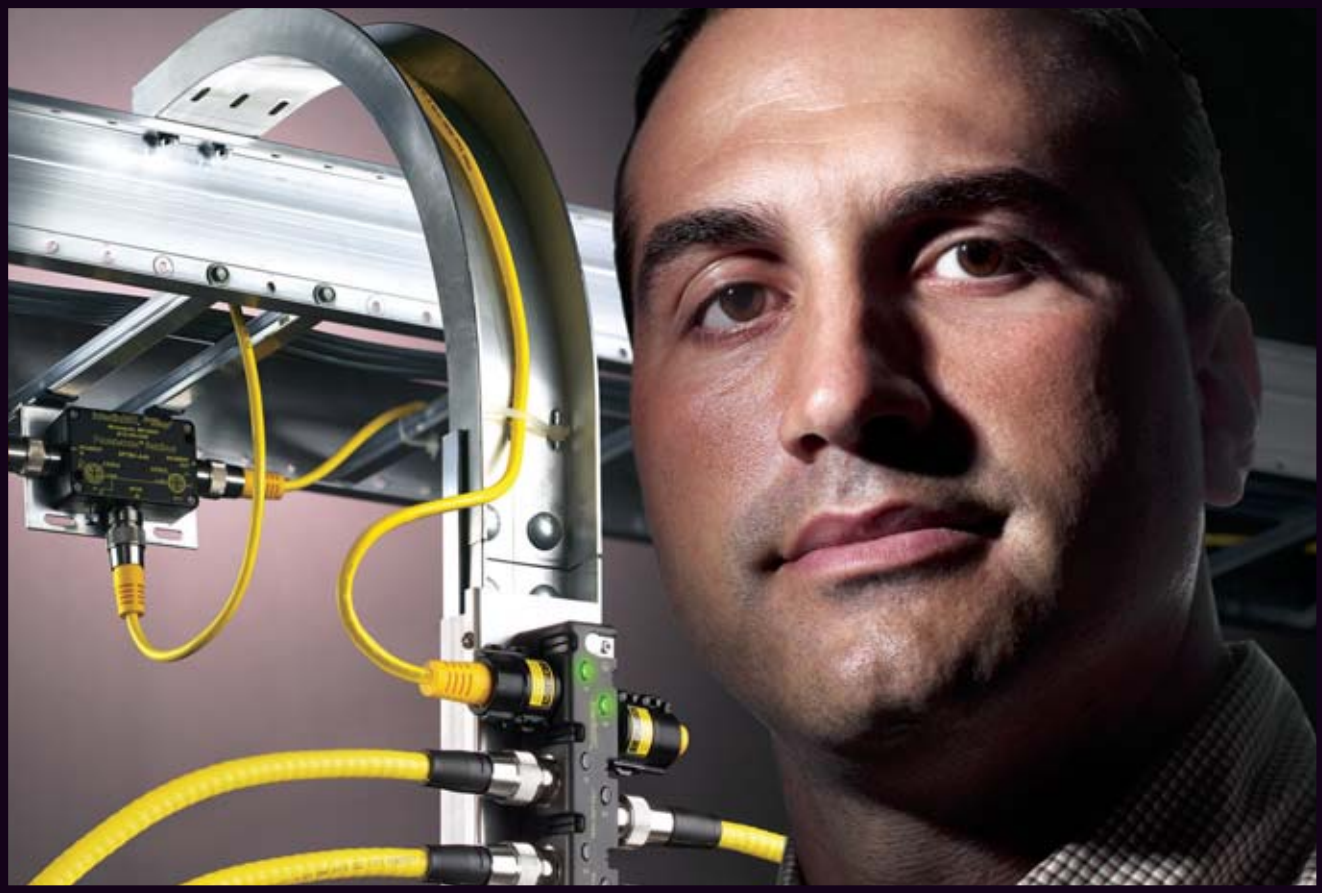


cover:
New standards and directives are extending the use of PLC technology to safety-related functions. The Pilz PSS programmable safety system shown offers advantages in configuration, approval and operation. Software blocks approved and encrypted by BG or TÜV take over the function of conventional safety relays, and fault/diagnostic tools add to the system's user-friendly features. The PSS series includes small, compact controllers as well as modular, expandable safety systems. Using tested application software, safety functions such as E-STOP and two-hand control can be cost-effectively implemented. For details on electronic safety systems, see p 12. For details on the PSS, visit www.pilz.com.



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{events}

National Manufacturing Week 2004

National Manufacturing Week, which runs from 23-26 February in Chicago, will feature six shows in one. The six include: National Design Engineering, National Plant Engineering and Facilities Management, National Industrial Automation, National Enterprise IT, Technology Transfer, and Cleantech Cleaning Technology—a new addition.

The 2004 Conference Program includes General Sessions, Free Sessions, Half-day Workshops and over 180 individual sessions covering six tracks, which match the shows. Keynote speakers will include Dr. Jeffrey L. Bleustein, chairman of the board and CEO, Harley-Davidson, Inc., and Atsushi (Art) Niimi, president and CEO, Toyota Motor Manufacturing North America, Inc. For more information, see p 40 in this issue and go to http://welcome.reedexpo.com/NMW/.

February

3-10 **12th Indian Machine Tool Exhibition**, Pragati Maidan Exhibition Centre, New Delhi, India, http://www.imtex.org/

March

3-6 **15th Korea Factory Automation System Exhibition**, 159 Samsung-dong, Seoul, http://www.kofa-expo.com

16-18 **PIPELINE Automation+ Control**, M, O, C, Munich, http://www. controlsolutionsintl.com

29-2 April, **Embedded Systems Conference,** Moscone Center, San Francisco, CA http://cmp.iconvention.com/sf

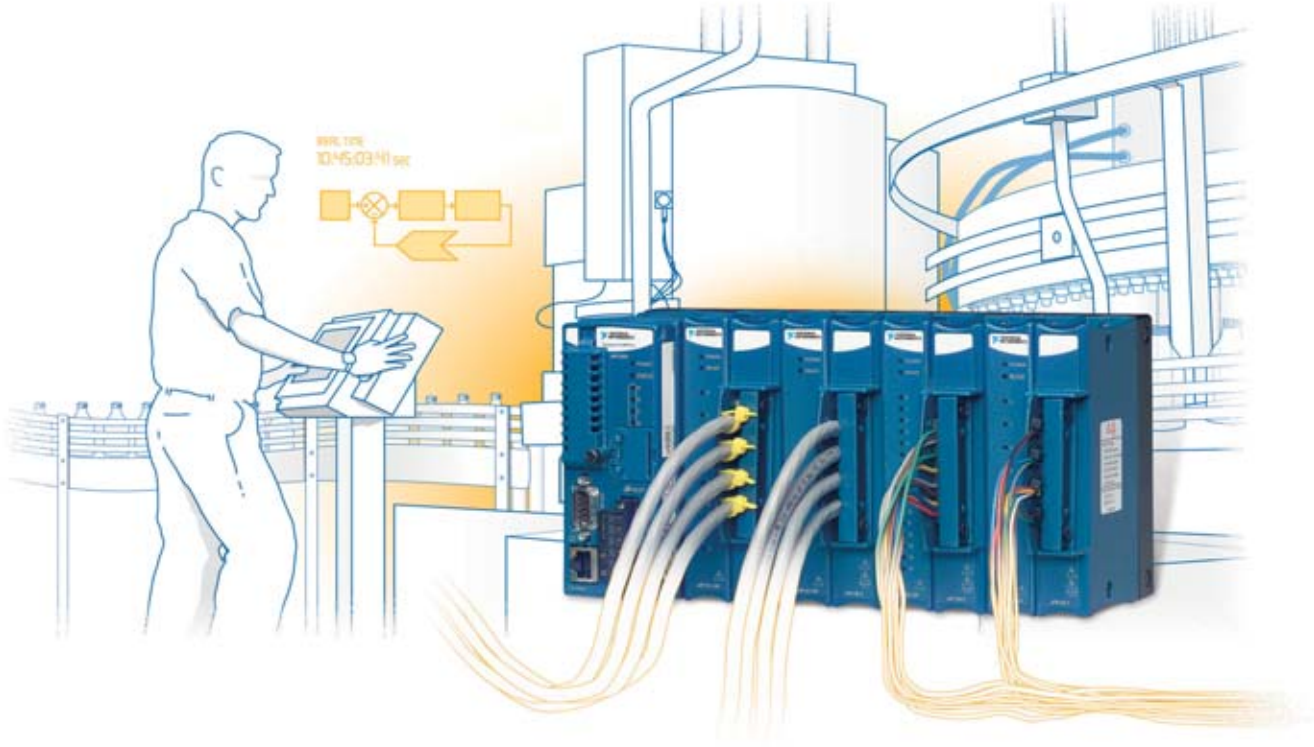
April

19-24 **Interkama+ 2004/ Hannover Messe**, Hannover, Germany, http://www.hfusa.com; http://www.hannovermesse.de

May

12-16 **ITM 2004: 18th Malaysian Intl Tradefair**, Putra World Trade Center, Kuala Lumpur, Malaysia, itm@oesallworld.com.

PAC Programmable Automation Controller



NI Compact FieldPoint™ and LabVIEW™ Real-Time deliver reliability, functionality, and ease of use.

National Instruments PACs combine the flexibility of PC-based software with the reliability of industrial hardware running a real-time operating system. LabVIEW Real-Time lets you quickly develop your application to accurately measure analog signals, perform floating-point calculations, implement custom control algorithms, log data, and then easily share the information.

Compact FieldPoint is a small, rugged, intelligent I/O system that can easily embed your application on an intelligent controller for reliable distributed or stand-alone deployment. Compact FieldPoint systems also integrate easily with existing legacy or programmable logic controller (PLC) systems.

Use these powerful NI PACs to perform advanced tasks such as:

- Implementing control of PID with autotuning or PID with gain scheduling, fuzzy logic
- Logging over a billion data points on removable CompactFlash
- Communicating using the built-in web server, FTP server, or via e-mail

Comparison Chart	PLC	PAC
Analog Measurement and Control	–	✓
Custom, Complex Algorithms	–	✓
Floating-Point Processor	–	✓
Ethernet and Web Connectivity	–	✓
Full-Featured Programming Software	–	✓
Nonvolatile Memory for Data Logging	–	✓
Digital Logic	✓	✓
Real-Time OS	✓	✓
Industrial Temperature Range	✓	✓
High Shock and Vibration Ratings	✓	✓

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ni.com/info

*To view a technical web event and learn more about PACs for industrial control and measurement, visit ni.com/info and enter **dwmnar**.*

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Taking the stress out of "middleman" communications

Ron Kuhfeld, Editor in Chief

A number of you are engineering managers or supervisors, and still more of you undoubtedly would like to move into this type of position. So, when I received an article from Terri Levine, president of Comprehensive Coaching U—The Professional's Coach Training Program, on the art of communicating as a "middleman," I knew I had to pass along her suggestions. They're designed to help relieve some of the stress associated with playing the role of a go-between for higher management and other workers and/or customers, and that's a worthy goal. Stress reducers aren't easy to come by these days, so you might want to pay close attention.

The basic conflict managers face, says Ms. Levine, boils down to this: "How do you represent the views of the upper echelon and protect the interest of those who work under you at the same time?" She extends this predicament to the manager/customer relationship, asking how a manager can look out for the best interests of both the customers and top management.

At the same time, she adds, "there is the fear factor involved in knowing when to act, when to speak up, or the desire to try something new. On the one hand, managers are encouraged to speak up and take risks—if the risks will lead to successful outcomes! But if a risk doesn't have a successful outcome, heads will roll, and we don't have to guess whose head will be rolling first! Likewise, speaking up is all very well and good, but what if it damages the working relationship?"

The best way to prevent these types of problems, she says, is to find the perfect balance through the art of communication. "We can speak the harshest truths without ruffling feathers when we choose our words carefully. We know it is possible to soothe an unhappy customer without running our company down—this is a skill sales people use every day—and we can apply that skill to in-house communications too."

Here are a few of the specifics she offers:

- Express a desire to communicate openly without intended offense. Make it known that your goal is to find agreement or solutions that will keep everyone happy.
- When communicating about matters of conflict, carefully listen to the other point of view without giving up your own. Use phrases such as "I understand..." and "I can see your point of view and why you'd think that..." to help diffuse heated discussions. Once people have gotten what they need to say off of their chests, they will be better able to listen to you.
- Choose your words carefully. Practice conversations in your head before you have them. The words will flow more easily if you have thought them through beforehand, and you'll be less likely to become emotional or to offend someone.
- When representing either your workforce or your management, be careful to just state the facts without sounding as though you are taking sides or being judgmental. Be an impartial deliverer of information. Do not become emotionally involved in the message you are delivering.
- Always show respect, even if the other person doesn't. Retain your dignity. Yours is a special position; in a sense, you work for your own workforce as well as upper management, and you need to remain on good terms with both.

If you'd like to discuss any of the above guidelines with Ms. Levine, you can call her at 215-699-4949. Or, you can email her at terri@coachinginstruction.com.

On behalf of the entire *Control Solutions International* staff, I want to wish you and your families a Happy New Year.

{editor's notebook}

Differential pressure meter

The flexible DNC-PS700-010 meter replaces most popular pressure differential switches and gages, and is designed to interface with NCC and other dust collector controls. It features a 51-element, tri-color LED meter movement and a 3-character, 7-segment digital display. The meter is DIN panel mountable and NEMA-4 compatible. The meter accepts a 0-10 in. w.c. pressure. A 4-20 mA output loop is provided for remote Delta P monitoring. Both hi/lo cleaning and hi/lo alarm setpoints can be programmed.

—AMETEK NCC National Controls Corp., www.nationalcontrols.com.

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Electromagnetic insertion flow meter

With no moving parts, the EX80 insertion magmeter is well-suited to water and other conductive fluids in which particulates or debris may be present and pose a problem. It offers insensitivity to changing viscosity and pulsating flows, such as those from diaphragm pumps used in dosing applications. The flow sensors are available in stainless steel, brass, and PVC. Fittings include tees, saddles, and weld. Options include display, 4-20 mA output, and datalogging capabilities.

—SeaMetrics, Inc., www.seametrics.com.

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{sensor update}

High-speed vision sensors

The CV-2100 Series vision system can inspect up to 20,000 parts/min. The combination of a new image-processing engine, double-speed progressive camera, and partial image capturing function produces a minimum processing time of 3 ms (at a shutter speed of 1/20000 seconds with 12-line reading). It produces a minimum processing time of 10 ms (6,000 parts/min.) for 1-screen interlaced reading. The system has an accuracy and repeatability down to ±0.05 pixels. Subpixel processing allows the display resolution to be reduced to 1/1,000 pixel.

—Keyence, www.keyence.com.

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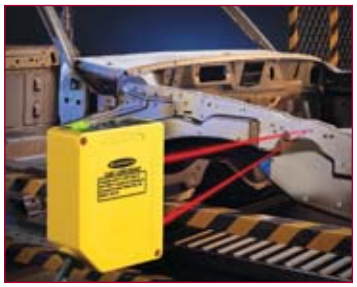
Adjustable field laser sensor



Available in both Class 1 or extended-range Class 2 laser formats, the Q60 Laser Series sensors feature a mechanically adjustable sensing cutoff point that allows them to reliably detect extremely small objects with relatively low reflectivity while ignoring background objects immediately behind the set cutoff point. The sensing cutoff point can easily be set from 200 mm to 1400 mm (8 to 55 in.) for the Class 1 version and 200 mm to 2000 mm (8 to 80 in.) for the Class 2 version.

—Banner Engineering Corp., www.bannerengineering.com

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HART flow-through level switch

The HART-based SITRANS PD500 level switches work in extreme temperatures (-200°C to 200°C) and pressures (full vacuum to 725 psi), and with aggressive, toxic chemicals such as those found in the chemical, petrochemical, or power generation industries. Typical applications include oil and water separators, dry-run alarm for pump protection, water knockout drums, interface or product presence detection, and more. Full-function diagnostics comply with NAMUR NE 43 for both local and remote diagnostics.

—Siemens AG, www.usa.siemens.com.

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Wireless flow metering

The AVM-320 area velocity flowmeter uses ultrasonic sensors and is a complete wireless flow monitoring system with battery life of up to one year. The NEMA 6P (IP68) housing and connectors withstand prolonged surcharge conditions. Three additional analog sensors can be connected to the system to provide more monitoring capabilities specific to application needs. The internal circuitry easily generates the 15 V required for the optional sonic level or water quality sensors, eliminating the need for additional battery power.

—Scientific Technologies Inc., Automation Products Group, www.watersensors.com.

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LVDTs for hostile environments

The GHSA 750 Series of ¾ inch diameter spring-loaded AC-LVDTs is designed for a wide range of position measurement and dimensional gaging applications. These rugged hermetically sealed sensors are constructed entirely of stainless steel and intended for general industrial use. The coil windings are sealed against hostile environments to IEC standard IP-68. Electrical termination is through a sealed axial connector; the mating connector plug is supplied with a unit. The use of a precision sleeve bearing results in measurement repeatability of 0.000025 inches (0.6 µm) or better.

—Macro Sensors, www.macrosensors.com.

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2-D laser measurement sensor

The Z500 laser measurement sensor combines a wide-beam laser (4 to 45 mm in width, depending on the model) and a two-dimensional CCD to conduct extremely accurate two-dimensional measurements in a single procedure. This eliminates the time needed by traditional laser sensors for multiple single-point measurements and increases accuracy by eliminating sensor and object movement during measurement. The sensor measures at distances from 5.2 to 100 mm with resolution from 2.5 to 1.0 microns. Users can measure level difference, and width or edge position, as needed.

—Omron Electronics LLC, www.info.omron.com.

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pH and conductivity transmitter

The CDTX-300 Series is a pH and conductivity transmitter that accepts signals directly from a pH electrode and a conductivity probe at the same time. Direct connection of the probes to the transmitter assures a positive electrical connection with no signal loss. This transmitter is most useful in remote process control applications. It uses two wires, which reduces costs and eliminates the need for expensive coaxial cable. It also uses top of-the-line, 4-ring potentiometric probes.

—Omega, www.omega.com/ppt/pptsc.asp?ref=CDTX300&Nav=grew01.

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{news of the world}

Dinesh Paliwal takes on added role of president, ABB Inc., in U.S.

Zurich, Switzerland

Effective 1 January, Dinesh C. Paliwal, member of the ABB Group executive committee and head of the group's Automation Technologies business, assumed the additional role of president, ABB Inc., in the United States, He succeeds Donald Aiken, who will retire at the end of January as president of ABB

Inc. and head of the group's automation activities in the U.S.

Also effective 1 January, ABB merged its six automation business areas into three globally-focused businesses. The move continues an evolution that began in late 2002 when the group merged two automation-related divisions and combined 11 business areas into six.

Martinus Brandal will head the new Process Automation business, Tom Sjökvist the new Automation Products business, and Bo Elisson will continue to head the ABB robotics, automotive and manufacturing business, which has been renamed Manufacturing Automation. ■■■

Fieldbus Foundation launches Fieldbus Forums

Austin, TX

The Fieldbus Foundation has launched its new "Fieldbus Forums," a web-based interface to FOUNDATION™ fieldbus news and technical information. Through the forums members can participate in technology development teams, as well as exchange ideas, tech tips, user feedback, event announcements, and other information.

According to Fieldbus Foundation marketing specialist Joe Conklin, "The Fieldbus Forums make it easy for those with an interest in FOUNDATION fieldbus to find answers to their questions about the technology, and learn from the

experiences of their counterparts across the globe."

To become a member of the Fieldbus Forums, go to http://forums.fieldbus.org. For additional information on the forums, you can either send an e-mail to member.services@fieldbus.org or call 512-794-8890, Ext. 21. ■■■

DCS market growth in China to exceed 15% annually

Dedham, MA

The distributed control system (DCS) market in China is expected to maintain a 15.1% compounded annual growth rate over the next five years, says a new ARC Advisory Group study titled *DCS Outlook for China*. This market totalled $531 million in 2003, and ARC is looking for it to reach $1,074 million in 2008.

The study explains that China—the fastest growing economy in the world—is witnessing massive investments in new projects and plant upgrades in almost all process industry segments. It is emerging as a destination of choice for global manufacturers. "This naturally creates tremendous growth opportunities for the DCS market, making China the major opportunity for process automation suppliers," says ARC research director Larry O'Brien (lobrien@arcweb.com), co-author of the study.

The power industry continues to contribute the major share of DCS revenues in China, but ARC believes that industries such as oil & gas and petrochemicals hold excellent growth prospects.

The study adds that while China offers growth opportunities for DCS suppliers, it also presents numerous challenges. The marketplace remained intensely competitive in 2003. Global DCS suppliers face competition from home-grown Chinese suppliers. Domestic control system suppliers are able to offer DCSs at highly competitive prices because of emerging open standards and similar factors.

For more detailed information on this just-released market study, point your browser to www.arcweb.com/res/dcs-chi. ■■■

IEC 61508 established a technical framework for the safe design, application, and use of complex electrical/electronic safety systems.

The development of machine safety solutions based upon electronic and programmable systems has significantly altered the manner in which safety systems are designed. Such systems are no longer simply added after the basic design has been completed; rather, they are becoming more closely integrated with control system design. This has led to the development of new approaches to ensure that the safety system performance is appropriate to achieve the required risk reduction necessary for the particular application.

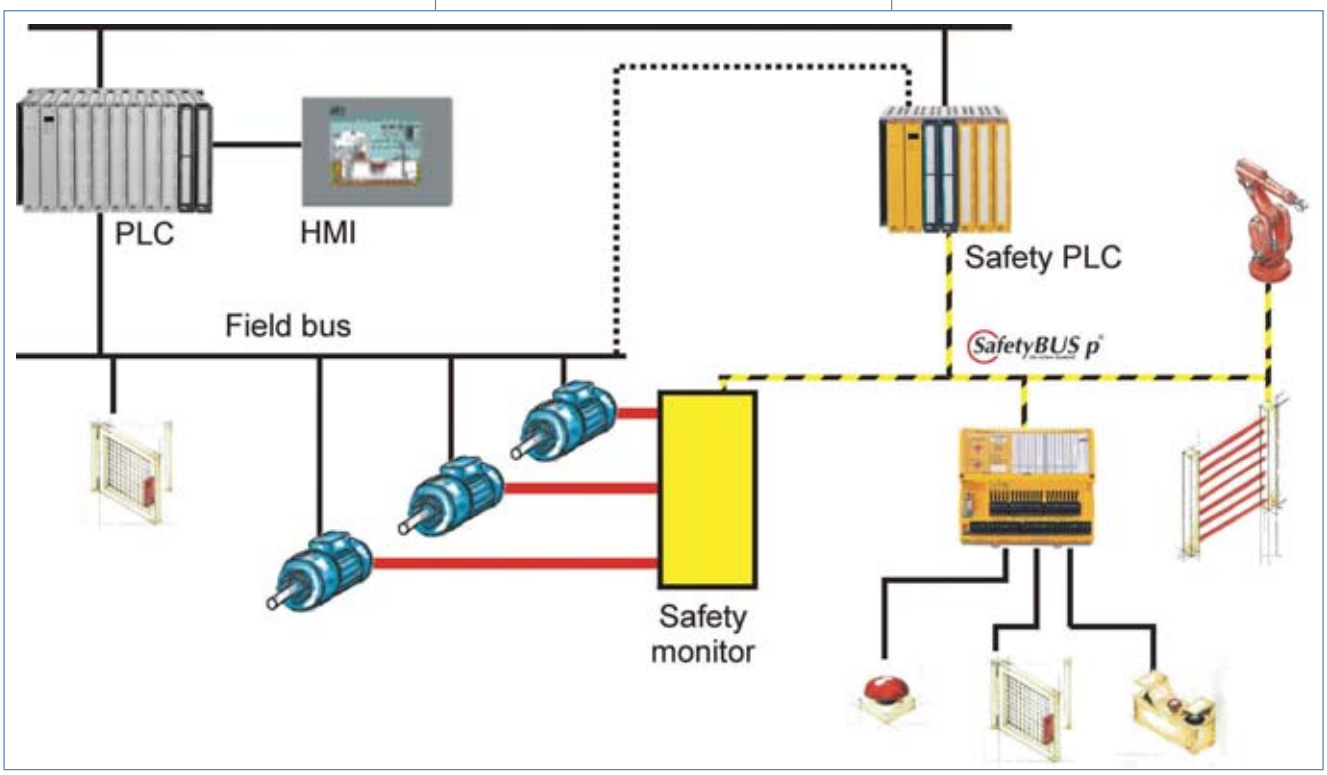
EN 954-1 offers little guidance for the design of complex electronic and programmable electronic safety devices. It does not consider such issues as robustness in the event of systematic failures, diagnostic constraints, testing requirements, product reliability and the design process itself. Rather, EN 954-1 considers safety performance as being dependent upon the fault behavior of the system.

IEC 61508 and functional safety

However, the above issues are addressed in IEC 61508 (now also a British and European standard: BS EN 61508), a basic safety standard that has also been adopted by CENELEC. This standard has established a technical framework for the safe design, application, and use of complex electrical/electronic safety systems. It uses a concept of functional safety, defining the overall safety dependent upon the correct operation of the safety-related system to reduce risk. IEC 61508 requires designers and system integrators to undertake a system-based approach in the development of complex safety-related electrical, electronic and programmable electronic control systems that have safety functions implemented to a specified Safety Integrity Level or SIL. The SIL is a measure of the safety system to perform the required safety functions within a stated period of time.

Safety-related drives

A machine sector implementation of IEC 61508 is currently in draft form (IEC 62061) and the new draft EN 954-1 will embody the same approach. The approach, which recognizes that a wide range of technical solutions may be used to satisfy the applicable functional safety and safety integrity requirements, effectively enables technology development.



Machine safety solutions based upon electronic and programmable systems, such as the one shown featuring a Pilz programmable safety system and a SafetyBUS p network, have altered the manner in which safety systems are designed. Such systems are becoming more closely integrated with control system design, rather than simply being added after the fact.

Dr Richard Piggin, Chairman of the SafetyBUS p Club International e.V., Corby, Northants, UK

Safety-related drives promise increased functionality, decreased cost of ownership

For example, a new draft standard, IEC 61800-5-2, will provide guidance on the functional safety of Power Drive Systems (PDS), enabling these devices to implement safety functions as part of a machinery safety subsystem. The standard will be a horizontal standard applicable to all product standards in the IEC 61800 series, again applying the principles of IEC 61508.

Safety-related drives promise increased functionality by allowing faster recovery after a safety-related machine or process shutdown, as well as easier commissioning and maintenance. Significantly, these benefits decrease the cost of ownership over the system lifecycle. A special Drives Group within the SafetyBUS p Club has already held workshops with drives manufacturers, who have welcomed the concept of safe drives interfaced to a safety fieldbus. A SafetyBUS p Club member has already launched a monitoring and control unit that can be used with electrical drives and the SafetyBUS p safety-related network.

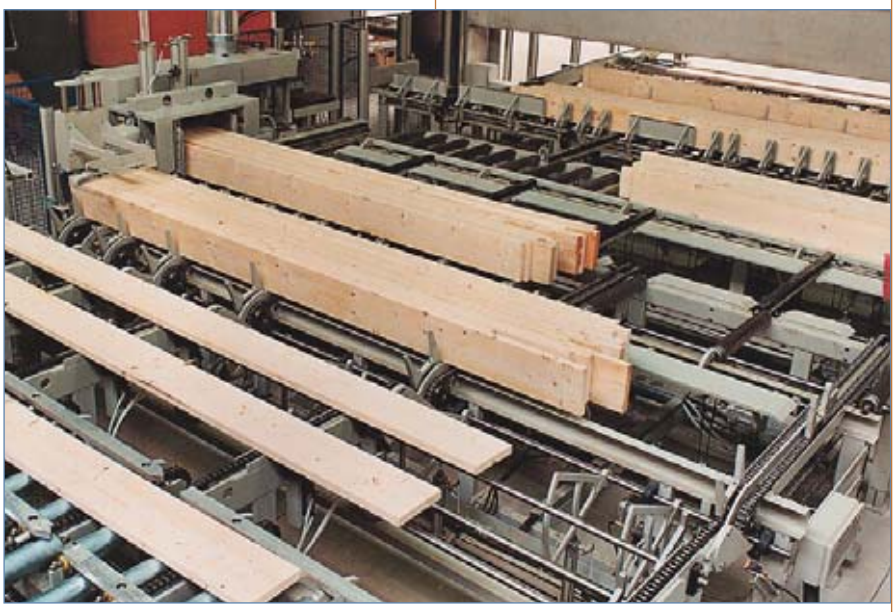
SafetyBUS p Club International e.V. is promoting safety-related drives with safety fieldbus connectivity.This independent organization of SafetyBUS p users, integrators, and developers promotes the use and technical development of SafetyBUS p technology in safety-related automation. The organization was founded in 1999 and comprises more than 60 members; there are some 90,000 SafetyBUS p installed nodes to date.

In line with IEC 61800-5-2, the concept proposed by the SafetyBUS p Club allows the programmable logic controller (PLC) to retain direct control of the drive, with the output from the drive being continuously monitored by the safety system. As long as the drive performs as expected by the safety system, the PLC retains control. Should there be any deviation, the safety system would immediately take control and shut down the drive using redundant means (removing the need for external contactors).

This overall concept allows for a couple of alternative embodiments: a separate external monitoring unit connected to the drive, or a special drive with the safety monitoring functions integrated within the same housing. Machine safety functions imple-

Research undertaken by the Japanese National Institute for Industrial Safety demonstrated that the use of a Pilz programmable safety controller and safety fieldbus in place of safety-relays can reduce total cost of ownership by some 50 percent.

{special report}



Machine safety is critical to a host of applications—from the Holzbearbeitungs lumber mill machines shown above to the Krupp presses shown below. The latest technology available to provide the level of safety required in these applications includes programmable safety systems and safety fieldbus.

mented by either approach could include:

- Stopping functions,
- Hold functions,
- Motion control functions.

Impact on safety system implementation

Conventional safety systems with drives will require a number of external devices, such as speed, standstill or voltage monitors, and encoders, to detect over speed, crawl speed, standstill or hazardous voltages on the motor connections. Similarly, external devices are needed to ensure all power is removed. For EN 954-1 Category 2, one contactor is required. For Category 3 and 4, dual contactors are required with feedback. (Category 3 does provide for the use of the drive enable to stop a drive, coupled with feedback and single contactor). A safety-related drive or external safety drive monitor can provide all necessary integrated components, without the need for any external monitoring devices or contactors.

The advantages to using the safety drive approach include significant cost savings achievable through simplified design and less reliance on external monitoring devices or contactors and their associated installation costs. Safety-related drives also allow greater flexibility in terms of control functionality and condition monitoring. The range of control can incorporate monitored stop, hold, reduced speed, positioning, and synchronization. External monitoring devices tend to operate on absolute val-

{special report}

ues; a safety-related drive will have greater flexibility with programmable threshold control. Response times can be reduced due to integrated monitoring, and more reliable operation is achievable due to the removal of electromechanical components. It has been shown that the use of certain programmable safety controllers and safety fieldbus in place of safety-relays can reduce total cost of ownership by at least 50% (see figure on page 13).

About the author

Dr. Richard Piggin was named chairman of the SafetyBUS p Club International e.V. at the annual members meeting held at the 2002 Hannover Fair—making him the first person from outside of Germany (birthplace of SafetyBUS p) to be elected to this prestigious position. Dr. Piggin undertook research for an engineering doctorate in fieldbus technology at the University of Warwick (Warwick Manufacturing Group), where he was a senior research fellow. He later became an automation analyst with ARC (the U.S.-based e-business and automation consultancy), prior to joining Pilz in the UK. Dr. Piggin can be reached by by phone at 44 1536 462205, or by e-mail at r.piggin@safetybus.co.uk

Mass flow sensors help pharmaceutical manufacturers save time, money

Doug White, President, Arcadia Equipment Inc.,
Hackensack, NJ 07460

Many manufacturers are discovering major benefits in having a chemical delivery system that's custom-designed to their needs. With this type of system, desirable components already in existence can be incorporated into the plan, and specific ways of operating can easily be accommodated. The system can be fabricated on a skid so that when it's time to install it in the plant, the utilities are hooked up, the power is connected, and the system is ready to process.

We at Arcadia Equipment, a New Jersey-based company selling positive displacement pumps, made the move to provide this type of design and fabrication for our customers when we started losing business as the economy shifted. We found our new methods to be especially applicable to the chemical industry sectors that manufacture pharmaceutical and personal care products.

In the middle 1980s, many chemical and petroleum manufacturing plants closed, while others were dramatically downsized. Those that reduced the size of their engineering, maintenance, and operator staffs realized that they now needed low-maintenance, highly-automated systems. Arcadia developed several such systems for liquid blending and chemical delivery.

A technology breakthrough came for Arcadia when we discovered that we could take a signal from a mass flowmeter and integrate it with speed control provided by a positive displacement pump. The result was a chemical delivery system that was both accurate and repeatable, and allowed the user to document what was happening. This has become the preferred type of system for many manufacturers.

FIG. 1: Coriolis sensors provided mass flow rate, density and temperature of a soap product ingredient, as well as being a conduit for data from a pressure transmitter, reducing the instrumentation required for this application.

Such a chemical delivery system is ideal for consumer care products such as soaps, deodorants, and hair care preparations. These products are similar in nature, but different in color and fragrance. During the manufacturing process, the chemistry might be adjusted to create the variety of products. Personal care products usually are manufactured most efficiently in large volumes as part of a continuous manufacturing process. A high-speed filling process packages the final product.

A company like Arcadia that's in the business of designing a chemical delivery system for such a product receives a recipe from the client, along with an indication of how many pounds per minute of that product the client wants to produce. The company then designs a system to produce that product to within an accuracy benchmark that the client specifies.

To create a chemical delivery system, the company would start with a process and instrument diagram (P&ID) and identify all the needed components. In a typical continuous manufacturing process for, say, a soap product, there would be a positive displacement pump and drive, a Coriolis mass flow sensing meter, control valving, and a pressure transmitter.

{applied solutions}

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Using Coriolis mass flow sensors, such as the Micro Motion meters that Arcadia typically chooses, a number of variables can be monitored. These meters read density, temperature and mass flow rate. Because the control systems can take those readings right from the mass flow sensor, additional instrumentation for that purpose isn't needed, which makes the control system more streamlined.

One soap product delivery system that we designed was forty feet long *(Fig. 1)*. The installation of such a system can be challenging, especially if the components need to be delivered to an upper floor in the manufacturing plant via an elevator. To make delivery and installation easier, this system was comprised of three sections that were assembled quickly on site.

The company designing the chemical delivery system might do some of the fabrication in house, and contract out other work *(Table 1)*. We at Arcadia, for example, have staff members design items for sheet metal fabrication that are then machined outside the plant. We also use outside contractors for process tank vessels and specialty finishing such as electro-polishing. In delivery systems for pharmaceutical, cosmetic, and personal care products, most of the material is stainless steel, which can be mechanically polished and finished to a sanitary quality.

Most companies would probably handle structural fabrication and mechanical assembly in house if they had their own welders and pipe fitters. In addition, they'd likely take care of the process instrumentation and on-skid wiring.

A typical machine for a pharmaceutical application would perform the function of high-end "pan coating" *(Fig. 2)*. The pan coating equipment looks like a concrete mixer that a mason might use for brickwork. An example of a low-precision application of pan coating would be the device that applies the sugar coating to M&M candy. The M&Ms tumble inside the equipment drum. A nozzle is put in through an opening and sugar is sprayed on to the chocolate candy. A wave is created as the pan turns, and the

Table 1: Comparison of in-house and out-source fabrication services

In-House	Out-Source
• Structural Fabrication	• Sheet Metal Fabrication
• Mechanical Assembly	• Machine Shop
• Process & Utility Piping	• Tank Specialists
• Process Instrumentation	• Specialty Finishing
• Mechanical Polishing	

{applied solutions}

candy tumbles in a wave form. The sugar coating material slowly builds up on the chocolate candy in the pan.

In manufacturing a pharmaceutical-type tablet, the coating layer is not just sugar candy. The coating may include the flavor the consumer tastes, but it also may be one of the medicine's time-release layers. Because an active ingredient is part of what's being applied in the pan, a greater degree of precision is necessary than in, say, our candy manufacturing example.

In the pharmaceutical pan coating application, typically there are several nozzles in the pan. For example, six nozzles were required in the example shown in Fig. 2. Each nozzle stream is controlled by its own Coriolis meter. There is an associated positive displacement pump with each stream, and a great number of process controls are used to ensure that the coating is exactly right for the medication.

For these types of applications, miniaturized microprocessor controls, like Micro Motion's MVD™ technology, can make the control panels more compact. This can be critical since there may be a number transmitters involved, many of which are relatively bulky. A small core processor can help compress this type of system into a small control panel.

Personal care products also can require a great deal of equipment *(Fig. 3)*. Using the soap manufacturing system again as an example, each ingredient is served by its own pumping system. The systems must be coordinated and linked to create a continuous manufacturing system comprised of individual control loops. In the case of heavier, waxy products, jacketed heated tanks are used to store the material, including stearates and other components that need to be melted before being injected into the process.

Each of the tanks also has its own pumping device and meter. Because the manufacturer wants to continuously blend, after each injection point, a static mixer is installed in the pipeline. As the material moves down the line, a fraction is added and mixed, then the next fraction, and so on. The process continues until all of the ingredients are added.

Sometimes the process includes a second skid that puts in the flavor, the fragrance, and final ingredients. In addition, often pH adjustments need to be made. In the case of soap products, the viscosity is controlled with saltwater brine, which is added as a final or finishing step.

Each of these skids might have its own PLC (our choice being Allen-Bradley units), which makes each a stand-alone unit. The whole process is controlled from a central PC, and operations are coordinated with remote I/O communications.

A human-machine interface (in our case, a Wonderware HMI) is used to display the process at the front end. The operator sees a picture of the pump, a picture of a valve, and a picture of the meter. He or she can then use either mouse or touch pad commands, which provide direct control of the input devices.

Because the designers typically would tie all of the Coriolis meters together with, for example, the Modbus

FIG. 2: A typical pharmaceutical example is a delivery system for a high-end pan coating (similar to a cement mixer) in which a coating is sprayed on tablets. The chemical is sprayed on the tablets as they are rotated in a tumbler-type device.

{applied solutions}

protocol and feed them right into the PLC, it is also possible to bring all the extra data points from the Micro Motion transmitter right out to the operator. This means the operator can see not only the mass flow rate, which is part of our processing single closed loop, but can also monitor density and can look at temperature.

With the Micro Motion technology, additional analog signals, such as from pressure transmitters, could be sent through the Coriolis meters, which greatly streamlines the control system. In our case, this is made possible through the use of a Pro-Soft Modbus card on the Allen-Bradley PLC 5 rack, which simplifies this type of system and results in greater economy for the customer. By using the Coriolis meter, expensive wiring—such as that from a sensor out on a skid to the transmitter in the panel, along with the wiring from panel to the PLC that runs the whole operation—is avoided. By eliminating the entire middle step, a lot of dollars are saved on hardware and installation.

Some designers of delivery systems participate in UL's control builder's program so that they have the internal capabilities to do a functional check on equipment before it goes to the plant. In this way, they can make sure that many of the most common start-up headaches are addressed before the equipment is installed.

A company like Arcadia, which deals with the pharmaceutical industry, needs to supply extensive documentation. Our staff does research required by customers that use validated processes for the FDA. We get the information from our vendors so we have it to give to our customers. Installation qualifications (IQ) and operating qualifications (OQ) are equally important; in the installation qualification, each component can be identified by model number and serial number. Installers sign off that the device listed has been installed. To comply with the operating qualifications, all ranges must be checked to ensure that the spans in the instrumentation are exactly the same as those specified.

FIG. 3: Continuous soap manufacturing system multiplexes individual loops of ingredients. Each ingredient has its own pumping system. The heavier waxy materials are heated and processed on the right hand side of the skid.

Smaller firms like Arcadia may not be ISO companies, so they are not bound by ISO 9000 specifications. However, companies that perform extensive documentation will find it easier to become ISO certified. At the customer level, the documentation helps meet FDA requirements, and eliminates the expense of hiring an engineer to perform validations.

Ultimately, spectrographic analysis might be incorporated into an ongoing effort to provide greater precision in mixing expensive components such as fragrance, flavors and colors in personal care products. ■■■

About the author

Doug White is president of Hackensack, New Jersey-based Arcadia Equipment, Inc. He can be contacted at 201-342-3308. The company's Web address is http:// www.arcadiaequipment.com.

Water treatment plant optimizes with PC-based Ethernet technology

Christof Burmann, IT Systems Division Manager, HST Hydro-Systemtechnik GmbH, Meschede, Germany

Improved cleaning performance and optimized operation were the main targets during the modernization of the waste water treatment plant at Spaichingen in Germany *(Fig. 1)*. To this end, the automation system was completely replaced with PC and PLC technology, and additional resources were tied to the plant's Ethernet LAN to further enhance system-wide data communications. Also added were the HydroDat HST process control system and KANiO maintenance and operation management system. In combination with the PC-based control and ISDN-based remote control, these additions make the previous manual monitoring and recording activities largely redundant, and help make the entire operation much more efficient.

The system was implemented by a well-rehearsed team of specialists. In cooperation with engineering consulting firm M. Mayer from Alpirsbach, the main contractor, Hans Eisele GmbH, installed the new automation system and switchgear. The door opener to the PC world was our IT systems division of HST Systemtechnik GmbH. Our company, which focuses on water management, was responsible for the control and remote control technology, with support from Beckhoff as platform supplier.

FIG. 1: Spaichingen's waste water treatment center is using PC-based Ethernet technology in its overhaul. IT departments help make the transition to Ethernet.

Innovative technology

HST covers everything from special structures within the sewer network via machine equipment to process control and operation management systems. Its TeleMatic technology links control and remote control (telecontrol) systems—offering a host of benefits to the user.

In the treatment plant itself, Ethernet and PCs are already standard. The HydroDat 32-bit control system from HST runs under Windows and the latest Microsoft technologies *(Fig. 2)*. It, therefore, seemed a natural step to also equip the external stations located upstream of the Spaichingen treatment plant (and connected to it via ISDN dial-up connection) with Ethernet-based PC technology, making the conventional telecontrol center redundant via software.

{applied solutions}

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Plant has plenty of data

The sewer network at Spaichingen includes eight external stations (pumping stations, storm water basins). Two of the special water engineering structures are equipped with two substations that are connected via BK3100 Profibus Bus Coupler. A total of roughly 2,300 process variables have to be monitored and processed within the plant. In the central treatment plant, this is handled by four hardware controllers and the HydroDat process control system from HST, comprising a server and two workstations *(Fig. 3)*. In the external stations, the modular Ethernet-based CX1000 top-hat rail PCs from Beckhoff are used. Because the Beckhoff TwinCAT automation software runs between the Bus Terminals and the HST TeleMatic software installed on the CX1000, the control system can not only access the Bus Terminals, but also any values that were precalculated in the PLC.

Given the numerous process variables and associated multitude of data, the treatment plant operator also benefits from a special HydroDat feature: the Delta Event recording technique. Traditional process control systems store mean values—e. g., over 15 minutes, one hour or one day—in the archives, thus gradually losing more and more detailed information. With the Delta Event technique, a value (including a time stamp) is recorded in the archive database whenever a change from a previously specified range (e.g., 2%) has occurred. This reduces the quantity of information, and ensures that, even after several years, all detailed information is still available.

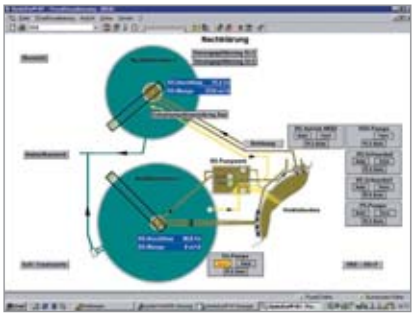

FIG. 2: HydroDAT control system runs on Windows, where Ethernet networking is the standard communications link.

Why top-hat rail PC technology?

HST has been using PC-based telecontrol for three years. Previously, a conventional industrial Windows 2000 PC was used. Spaichingen is the first project that uses the CX1000. The main reasons were the suitability of the Beckhoff system in terms of the control cabinet's space requirements and the simple I/O coupling it provided.

In the past, this capability was realized with a high-end proprietary PLC, which is a relatively expensive solution. In trying to find a replacement for this approach, we needed to address not only the I/O connectivity issue, but also the data preprocessing function that the PLC frequently handles. As a result of the latter, for the hardware we required a combination of PC and programmable controller, and the CX1000 *(Fig. 4)* fit the bill. It allows I/O to be connected directly, is compact (which can be a critical requirement in, for example, a small pumping station), can be mounted on top-hat rails, and has a PLC on board. Moreover, the CX1000 was able to reduce the commissioning time for the external stations by 50%.

Because the HST telecontrol software runs under Windows, the broad functionality of PC technology is available as part of the operating system. For example, a webcam for monitoring a storm

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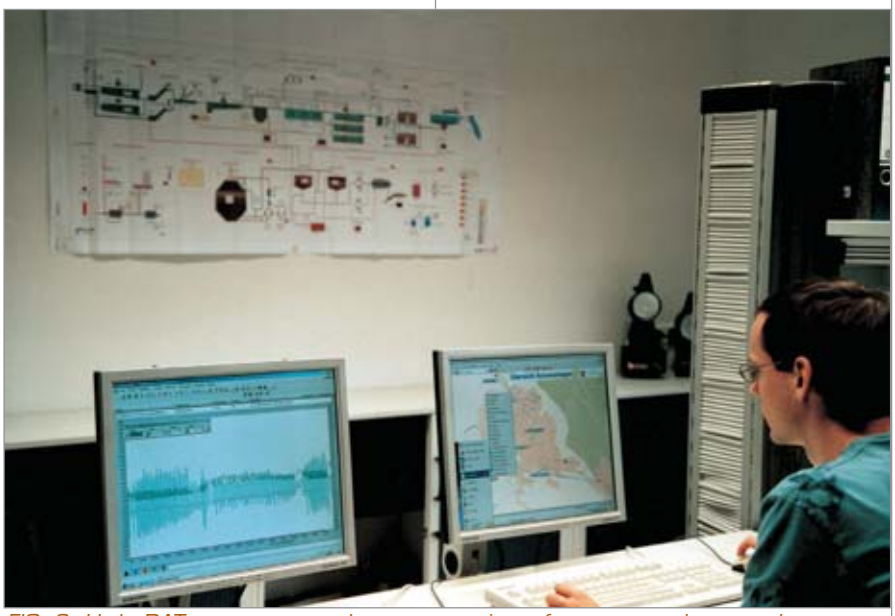

FIG. 3: HydroDAT process control system consists of a server and two workstations. In the external stations, modular CX1000 rail PCs from Beckhoff are used.

water basin can simply be connected to the embedded PC via Ethernet. Fault alarms can also be implemented remotely—that is, directly from the external stations. While PC-based telecontrol has been used by the plant for years, we are in the process of advancing to the next phase through the use of optimum hardware and the TwinCAT software. Enhanced benefits of the PC technology include simple local visualization via a panel connected to the DVI interface that displays the same process images as the central control system, and the option to fully parameterize the external stations from the central process control system.

Technology partnership

We chose Beckhoff as our platform supplier and technology partner largely because its product range provided the best match for HST's requirements. For instance, we also use the small, non-Windows-based BC series Bus Terminal Controllers—for example, for our discharge controllers without remote monitoring. Because of this, during the conversion to remote monitoring, there was no need to change the terminal wiring—only the head had to be replaced with a CX1000. An additional benefit of the Beckhoff solution is the modularity of its embedded personal computer, which enables optimum application-specific configuration of the process.

All in all, this technology partnership has been quite successful. Teams from both companies jointly worked on not only the integration of the HydroDat and TwinCAT software programs on the CX1000, but also the implementation of telecontrol protocols based on IEC 60870-5.

The results of these efforts are paying off. Orders for further HST projects with a total of 70 stations have been received and are being implemented with Beckhoff control technology. ■■■

FIG. 4: The CX1000 is an embedded PC/PLC with Ethernet functionality.

Head off attackers at the pass!

Edward Smith, Director, Security Solutions, Forsythe Solutions Group, Inc., Skokie, Illinois

It's 4:00 a.m. Saturday. Do you know where your company's network perimeter is? Most of corporate America doesn't. But I'm sure that when you left the plant on Friday evening, you unplugged the Internet connection, disconnected all of your partner extranet connections, deactivated all wireless access points, collected all laptops from the field, shut down access to your Web-enabled applications in the DMZ (*demilitarized zone*), and asked the cleaning crew and/or maintenance staff not to come back until Monday. Right?

Okay, I'm being facetious. But if you haven't considered all of these entry points into your company's crucial information, you should. In the following, we'll look at ways to increase perimeter security in all types of enterprises.

IT: Keep it safe!

The first time someone told you that you needed a firewall, maybe you thought, "But our building already has a firewall AND a sprinkler system." Soon enough, however, those of us in corporate IT departments learned what firewalls were and why they were necessary if we used the Internet for business. But it turned out that firewalls were just the beginning of our technology nightmare.

That's because we didn't stop with a simple Internet connection. We began to connect our business partners to our networks so that we could provide better customer service, achieve greater productivity from our workforces, and reduce our costs. Then, we armed our sales force, management and field engineers with laptops so that they could work off-hours, off-site, and become truly mobile. Next, we Web-enabled all of our applications and made them available on the public DMZ. Remember, a CIO's charter is *to make information as valuable and accessible as possible—and somewhere in the process, make it secure.*

Ambitious hackers soon become very experienced hackers.

With all of these technology advances, we've made our information easier to access than ever before. We've become a totally connected society in ways that we could never have predicted. However, greater productivity and reduced cost come at a higher price than we may realize. For example, with broadband and wireless at home, I now have to worry about someone a couple of miles away using my broadband, stealing my files, getting into my corporate LAN, and looking at all my online banking passwords. We've taken a relatively manageable perimeter and effectively extended it beyond our control.

Break down technology into bite-sized pieces

The Internet Connection. This is probably the best fortified point of most corporations today. Typically, investments have been made in firewalls, intrusion detection, and antivirus technologies at the gateway to provide some level of access control for inbound traffic. Many organizations also have a DMZ for Web and e-mail that passes through the firewall, to keep most people from easily accessing servers on the corporate LAN.

But, have we plugged all of the holes? Hardly. The issue is that we keep pushing more and more content to the edge with technologies like Web-enabled applications, so we keep opening up new vulnerabilities and effectively break down our perimeter defenses.

The Extranet. Most companies have instituted some form of protection at this level by having partners first go through the firewall, then move into some level of a partner DMZ to access information (for database, online ordering, payment, etc). The problem is that most companies don't have standards in place mandating security parameters on their partners' sites, let alone any visibility into activity or audit capabilities of a partners' security.

When examining corporate security on many of these *trusted sites*, one might find that perhaps we trust too much. The reality is that many partner sites pose little defense to an experienced hacker. If your firewall is locked down, hackers will find alternate routes with weak security, then traverse those *trusted* paths into the targeted company. To protect your site from these external Achilles' heels, strong forms of access control and strict DMZ designs are required, as well as policy and standards surrounding partner connections.

{applying technology}

{applying technology}

The laptop

We need to view laptops as extensions of our firewalls. Hackers use laptops to gain access into our corporate accounts, personal accounts, and critical files. They are high-theft items that hold the keys to our corporations.

Corporations need to realize that laptops are risky business. How do you protect your laptop? Require encryption, but don't stop there. Require strong authentication such as synchronized tokens that require a PIN and a token to log on. Like your ATM bank cards, synchronized tokens require something only the authorized user knows and something only the authorized user has. This technology limits theft to the data contained on the stolen laptop.

Laptops themselves often contain important information that can enable hackers to do a great deal of damage. An encrypted file structure can prevent the hacking of critical files stored here. Likewise, requiring a strong password login for boot up, as well as a frequent change of superuser accounts, can help to prevent the compromise of critical data.

You should not only require antivirus software at the desktop, but also enforce regular security updates. It is also important to inform users of the risks associated with going to unknown, untrustworthy sites. Simply visiting some Web sites can automatically trigger a download of harmful programs that record keystrokes. The next time you log on to your bank account or your corporate site, every keystroke could potentially be recorded and captured by a hacker. They now have your user name and your passwords. Say goodbye to that sensitive information.

Phones to wireless devices

If the perimeter is defined as anything that allows access into the corporate network, it includes laptops, partner access, PDAs, and even phones. If the back of a phone can be tapped for LAN access, it is also most definitely a perimeter security concern. In addition, while VoIP (voice over IP) offers wonderful capabilities to leverage applications (like CRM by tapping into client databases as clients call), reduce long distance costs, dial by extension, and more, these features bring typical security issues associated with any access point into the corporate LAN. Planning needs to be done on the front end of any VoIP installation to ensure availability, recovery, and security.

Wireless technology is inherently insecure and carries a great deal of risk. Maybe you've heard the stories of the hacker sitting out in the parking lot and hacking into a LAN. But have you heard the one about the hacker sitting 2.5 miles away with a directional antenna (purchased on eBay for $30.00) that's now accessing broadband and all corporate files as if from a desk inside the firewall? Unfortunately, this is also quite possible and very typical.

Downloadable free programs can search out open wireless access points as does software that will break WEP (Wired Equivalent Privacy) encrypted traffic, and much more. Most of these tools are free and are so simple to use that a child can learn them in a couple of hours.

Fortunately, there are things you can do to protect yourself from wireless attack. First, understand the vulnerabilities involved in deploying wireless technology before you deploy it. Design a strong architecture around access points, and include new DMZs to accommodate the technology. While it requires more resources, consider MAC (Media Access Control) address filtering. Don't advertise SSIDs (Service Set Identifier) to the world. Employ software like Fake AP to confuse outside intruders; always use the strongest encryption possible; use a strong password; and assess your environment on a regular basis. In addition, it is important to run programs that sniff out access points in the building and identify and shut off any that you didn't install.

Pushing content to the edge

Many corporations today are pushing internal content to the edge of their networks, or even outside of their networks, in order to offer Web-enabled applications to clients, prospect, partners, and others. While access to this content reduces cost and offers greater service, it also creates new avenues to damage or compromise corporate information. Firewalls keep out unwanted traffic, but typically allow all traffic in for services such as HTTP traffic. DMZs can allow servers to become playgrounds for ambitious hackers or thieves. Web-enabled applications expose increased vulnerabilities that reside in the application code itself. Most code is written for function or performance, not security. And, vulnerabilities within the code can permit skilled hackers to access information without being detected or denied, despite traditional security technologies like firewalls and network-based intrusion detection. Fortunately, a number of tools are available to help detect vulnerabilities in application code, and preventative technology can stop applications from being abused.

On being totally secure

Total security does not exist. The concept here is to put up so many roadblocks that undesirables take another road. Why hack a near-impossible site when there are so many sites that require little to no effort? The job of IT security is to constantly challenge intruders, keep an open mind, challenge current thinking about security, use best practices of both perimeter and internal security controls, test what has been implemented, look for improvements, get expert advice, and plan ahead if at all possible.

About the author

Edward Smith joined Forsythe in January 2002 as director of security solutions. Smith brings with him more than 20 years of experience in the IT and security industry. Most recently, Smith served as Chicago-based sales director at Telenisus Corporation. Contact him at esmith@forsythe.com.

Less guesswork, greater control mean sharper artwork images for two-piece can printers

Mike Barrett, Field Automation Engineer,
MSI Tec, Centennial, CO 80111

Wireless data acquisition technology is reducing the cost and waste associated with two-piece can decorating through a control panel produced by Advantech Automation partner MSI Tec. The panel, designed for a major OEM builder of aluminum can decorating machinery, uses analog sensors, wireless data acquisition modules, and a web-enabled hand-held PC to monitor and control settings on the decorating machinery.

Alcoa Packaging Machinery (APM) manufactures a number of products for two-piece can production, embossing and decorating. Its Concord Decorators *(Fig. 1)* feature up to eight ink stations, 24 or 36 mandrels, and have the ability to decorate 2,000 plus cans a minute.

However, like most machinery, the need for manual adjustments reduced the decorator's efficiency. "Adjusting the

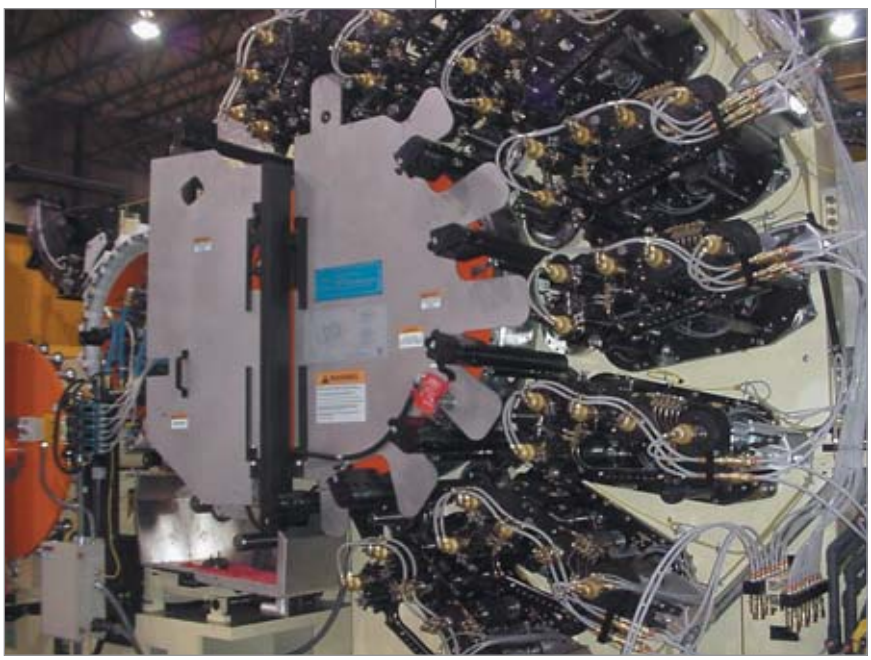

FIG. 1: Alcoa manufactures products for two-piece can production, embossing, and decorating equipment, which are programmable from a portable HMI.

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plate pressure/registration points was very time consuming. This was because manual feedback methods were required for each station," said Tom Beebe, APM Decorator specialist.

Adusting and maintaining the proper settings required skill and finesse on the part of employees. Test batches and periodic quality checks to confirm proper calibration wasted time and product.

According to Beebe, APM customers had been waiting for a number of years for a system to monitor and speed up the set-up process. "The idea of monitoring the inker registration has been in play for quite some time," he said.

After a request from a large foreign customer, the APM Engineering group began researching alternative solutions and partnered with MSI Tec to find a better method. MSI Tec (www.msitec.com) is a Rocky-Mountain-based provider of intelligent machine control components and systems, as well as engineering resources.

We used analog proximity sensors on all 24 locations to measure the actual distance or location of the particular registrations. MSI designed a method to take the raw analog signals from each of the 24 sensors and feed it to three Advantech Automation ADAM-6017 units *(Fig. 2)*. Data from the ADAM-6017—an 8-channel analog input, digital output module—was routed to a web-enabled device, the Advantech WebLink-2059, running Advantech Studio software on Windows CE.Net. All three ADAM-6017 modules, the WebLink-2059, and a wireless router were then connected to Advantech's ADAM-6520 industrial Ethernet five-port switch.

The structure set the groundwork for viewing the data via a remote monitor. MSI selected Advantech's portable, windows-CE based web tablet, the MPC-100, as the final information destination.

What we deliver is a control panel that has ADAM modules mounted with the WebLink and wireless router, along with a power supply. All 24 ink sensors are terminated on the side of the panel to obtain the analog readings from the proximity sensors.

This enables an operator to bring up Explorer on the web tablet *(Fig. 3)*, start the application, and view the actual values occurring on the machine. The application is structured to allow the operator to view values in real time with a built in warning system to alert operators when values exceed the acceptable range. When the text turns red, the operator knows the values are out of range. He can immediately shut down the machine and proceed with making the necessary manual calibrations.

The wireless capabilities of the MPC-100 provides the operator freedom to

FIG. 2 (top): Behind the machine is the controls cabinet showing ADAM-6017 data acquisition units, switch, wireless router, and WebLink 2059. FIG. 3 (bottom): The wireless tablet, MPC-100, allows operators to respond quickly to machine problems, and affords them the flexibility to move around and inspect the machine while reading data.

move throughout the facility while still monitoring the values on the machine.

According to Beebe, the benefits of this product far out-weigh the additional costs. He also believes the development will enhance APM's reputation in the canning industry.

The new control panel debuted this past spring in a Japanese plant. APM expects it to become a popular facet of can decorators, and anticipates requests to retrofit existing machinery. ■■■

About the author

Mike Barrett is a field automation engineer at MSI Tec, and can be reached directly by phne at 720-875-9835. Or, you can contact him by email at mikeb@msitec.com.

MSI Tec is a provider of intelligent machine control components and systems, and the value-adding engineering resources essential for the successful identification and implementation of their use. For more information on the company, visit MSI at www.msitec.com.

{applied solutions}

Connector technology keeps things on the move

Ron Kuhfeld, Editor in Chief

The inside of a motor housing is fraught with endless vibration, and the mobile environment of even the most modern of trains is typically bombarded with vibration, dirt, and mechanical stresses. All of this means that the connector technology used in either of these rigorous applications must be particularly durable and reliable.

In the application stories that follow, engineers come up with cost-effective connector solutions for these difficult environments. In the first, a move away from a conventional approach brought significant savings in time and money. In the second, project planning software helped engineers zero in on a connector that was able to meet the stringent requirements of EN 50155.

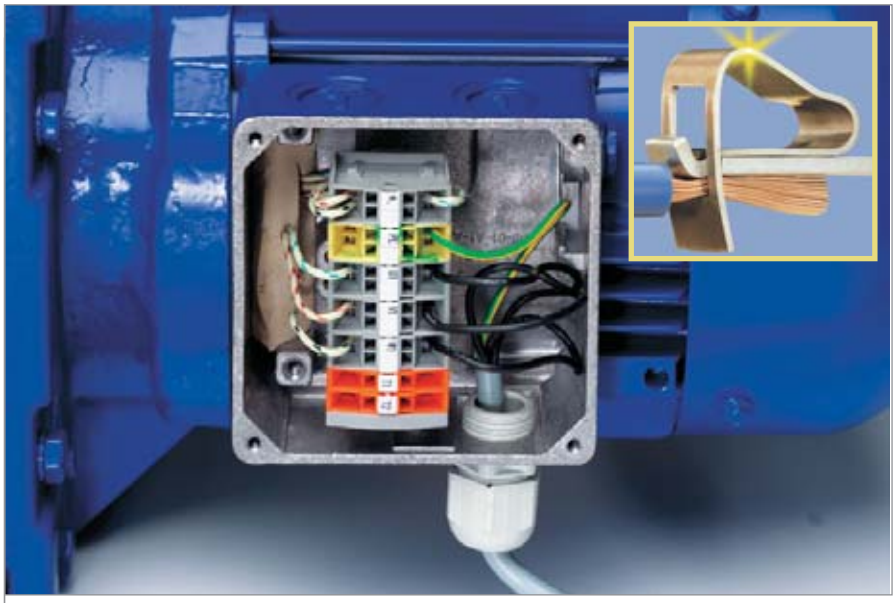


FIG. 2: CAGE CLAMP connectors make wire installation quick and easy without having to fiddle with washers and nuts. Inset: Originally patented in 1977 by Wago, CAGE CLAMP uses spring pressure compression technology to capture wires.

Danfoss replaces terminal boards with connection technology

The time taken to connect electric motors using terminal boards with bolts is now a burden of the past—at least as far as the Bauer geared motors are concerned. Since April 2002, all geared motors up to 2.2 kW produced by Danfoss Bauer GmbH, Esslingen, Germany *(Fig. 1)*, are fitted with the Series 264 CAGE CLAMP® terminal blocks from WAGO.

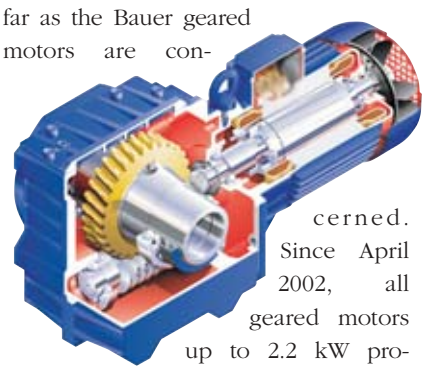


FIG. 1: Danfoss geared motors up to 2.2 kW now use Wago CAGE CLAMP connectors.

Five three-phase motor versions are available according to the type of connection. As a result, costs can be dramatically reduced during initial installation and service. This screwless connection method offers simple connection of conductors from the top of the terminal block. Opening the spring and introducing copper wires from 0.5 to 2.5 mm^2 is done in full view of the operator. Crimped ferrules, pin terminals or ring tongue terminals become relics, as do tools like crimping pliers when using stranded or fine-stranded wires. There is no possibility of overtightening or breaking the terminal bolts.

Providing a new terminal board and the time needed to search for lost washers and nuts are also eliminated *(see Fig. 2)*. Philip Crowe, product manager, geared motors, Danfoss, reports: "Convinced of the advantages of the spring clamp connections, we wanted to give our customers the benefit of this technology. Only 14 weeks elapsed between development and production start. Development was no big problem as everybody was keen to implement this technology. Moreover, support from WAGO was excellent."

Danfoss offers geared motor units equipped with the easy-to-use CAGE CLAMP® connection technology at the same price as conventional models. "We offer this advantage to our customers without additional charge", says Philip

{applied solutions}

{applied solutions}

Crowe. Today, the CAGE CLAMP® connection is part of Danfoss Bauer standard technology. Demand for motors equipped with conventional terminal boards, which are still available at extra charge, reportedly has drastically decreased.

For decades, terminal boards have been used as the accepted standard motor connection. With this in mind, every electrical trainee still knows how to deal with a star or delta connection. Therefore, it is a real revolution when a leading manufacturer changes over to a completely different type of connection technology.

Train by train, springing into action

Until the late 1980s, Deutsche Bahn's vehicle construction division in Halberstadt, Germany, belonged to the East German Deutsche Reichsbahn, and was responsible for the construction of first and second class passenger seat carriages and sleeping cars. Since 1990, the division has been responsible for not only building new carriages, but also reconstructing and maintaining passenger seat carriages and sleeping cars *(Fig. 3)*. During reconstruction, the "donor" carriages—that is, the old carriages in need of an overhaul—are dismantled and refitted on site. This work encompasses the complete steel work, paintwork, and interior furbishings, and includes the replacement of the entire electrical system *(Fig. 4)*.

Electrical configuration of the individual components to create a complete system places a lot of demands on the electrical connection technology used. It calls for fast and economical connections that can also meet the stringent requirements of EN 50155.

FIG.3: Deutsche Bahn in Halberstadt builds new train cars and refurbishes older ones. Older cars need to be completely rewired. New connection technology speeds up the process and saves money.

FIG. 4: Complete refurbishment in the sleeper carriage: when old carriages are reconstructed, the electrical system undergoes a complete overhaul.

{applied solutions}

FIG. 5: Terminal blocks with spring cage technology considerably reduce the installation costs compared to using conventional screw terminals blocks. The Phoenix Contact products meet EN 50155 specs.

Project planning software for electrical design engineers

A few years ago, 52 sleeper carriages were due for refurbishment. The Halberstadt construction department responsible for this work decided to use pre-assembled terminal strips during the refurbishment. To help in the selection/design of the terminal block assemblies, the department opted to use Phoenix Contact's (Blomberg, Germany) Clip Project planning software, which makes possible practical, time-saving project planning and documentation. With this Windows-compatible software, products are selected exactly according to technical data, such as the nominal cross-section or function of the terminal blocks. The logics test simplifies the project planning because only suitable accessories are shown.

The parts list for the required terminal strips and the CAD drawing are imported into MS Excel. The information is used to directly order the terminal strips, which are assembled and shipped by Phoenix Contact.

The spring cage feed-through terminals that Halberstadt selected surpass the requirements of the relevant standards, particularly EN 50155. Based on DIN EN 50155, IEC 68-2-6/DIN EN 60068-2-6 and IEC 68-2-27/DIN EN 60068-2-27, vibration and environmental tests, such as for (sinusoidal) oscillation and shock, ensure that durable connections can be attained even in harsh industrial conditions, or when used on rail vehicles *(Fig. 5)*.

Select with care

Whether your project is constantly in motion or has a lot of vibration and dirt, you'll want to give careful consideration to your connector selections. The wrong choice could set you up for major reliability issues and consequent maintenance headaches down the road. Fortunately, there are a host of sophisticated connector solutions available that can handle even the most difficult of application environments. ■■■

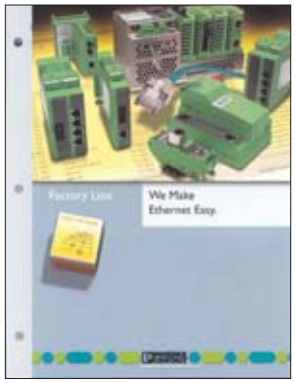
Free Industrial Automation Product Catalog

AutomationDirect® offers 3,500 industrial automation products through a 1,300-page catalog and online store. The catalog features product descriptions, technical information and price lists for PLC and PC-based control products, operator interfaces, sensors, drives and more. Call 800-633-0405, or access the company's Web site at http://www.automationdirect.com.

AutomationDirect, Cumming, GA

Circle 22 on Control Solutions International RS Card

Ethernet Solutions

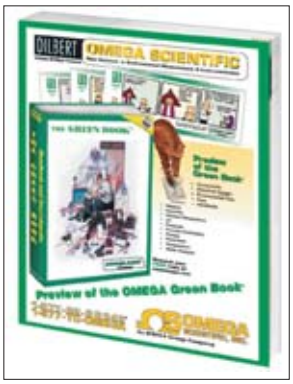


Factory Line DIN-rail mountable Ethernet infrastructure components consist of a full range of modules including distributed unmanaged switches, managed switches, cables, hubs, media converters and network management software. The components incorporate interconnection technology which allows easy installation, configuration, and integration into industrial network architectures.

Phoenix Contact Inc., Harrisburg, PA, 800-586-5525, http://www.phoenixcon.com

Circle 29 on Control Solutions International RS Card

Environmental Instrumentation

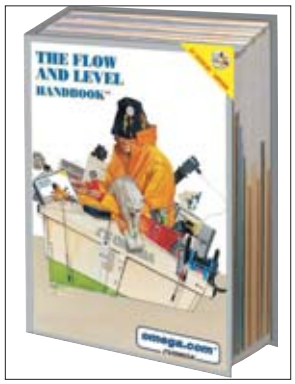


Omega Scientific *New Horizons*® is an environmental measurement and instrumentation preview for our upcoming *Green Book*® that features 48 new Dilbert cartoons. There are many new and exciting products to satisfy your application needs in pH, conductivity, dissolved oxygen, chlorine analysis, chemical metering pumps, water and air flow, process control, data acquisition, pressure and temperature.

For more information, go to usaomega.com.

Circle 27 on Control Solutions International RS Card

Flow and Level Handbook



The 21st Century™ Edition of the *The Flow and Level Handbook*™ has over 900 pages of the latest flow and level products to meet your every need including a comprehensive product selection of industrial, field, and laboratory instrumentation. It features a wide variety of industrial meters and controllers, portable, handheld and laboratory instruments for measuring air, chlorine, conductivity, dissolved oxygen, flow, and much more.

For more information, go to omega.com/literature.

Circle 26 on Control Solutions International RS Card

Pressure Sensors/Transducers

Kavlico's capability brochure highlights 20 of its standard and custom sensors, transducers and transmitters for flow, level, differential, absolute and gage pressure measurements. Typical product specs and features are noted as well as a company profile describing sensor technologies, quality and manufacturing capabilities. Kavlico's application-specific design capability and flexible configurations for unique applications are detailed.

Kavlico Corp., 805-523-2000. www.kavlico.com, sales@kavlico.com

Circle 31 on Control Solutions International RS Card

DIN Rail Surge/Lightning Protectors

CITEL offers a complete line of DIN rail surge/lightning protectors for AC power, DC/Data lines like 4-20mA, RS485, Ethernet and also RF coaxial lightning suppressors for wireless equipment protection. They use multistage heavy-duty circuitry that automatically resets.

Citel Inc., 1515 N.W. 167th St., Suite #5-223, Miami, FL 33169, http://www.citelprotection.com; citel@citelprotection.com 800-248-3548; Fax: (305)621-0766

Circle 23 on Control Solutions International RS Card

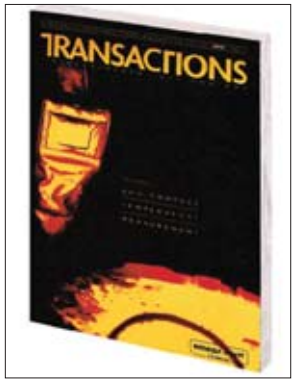
Current Transformers, Transducers & Accessories

Catalog 2011(170 pp) features split-core and solid-core current transformers, potential transformers, electrical transducers for AC and DC applications, signal conditioners, digital and analog panel and switchboard meters, current relays/switches, shunts, shunt switches, shorting terminal blocks, multi-function power meters, and accessories.

FLEX-CORE 6625 McVey Blvd., Columbus, OH 43235, 614-889-6152, http://www.flex-core.com

Circle 24 on Control Solutions International RS Card

Non-contact temperature



The premier issue entitled *Non-Contact Temperature Measurement* provides a historical and theoretical context of engineering and design principles, plus selection and application guidelines for devices ranging from low-cost infrared thermocouples to sophisticated linescanners. Omega's Transactions in Measurement & Control Series provides access to the technical information you need.

For more information, go to usaomega.com.

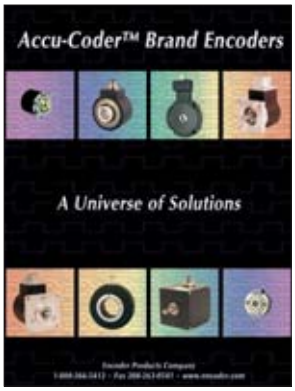
Circle 28 on Control Solutions International RS Card

{free literature}

Precision Encoders

New 104-page catalog features in depth descriptions of Accu-Coder™ Brand Encoders from Encoder Products Company. The catalog features a full line of incremental encoders, as well as EPC's new absolute encoder series, to meet a variety of industrial positioning, counting, motion and motor control needs. Expert cross reference service available. Distributors worldwide.

Encoder Products Company, Fax: 208-263-0541, www.encoderproducts.com



Circle 30 on Control Solutions International RS Card

Free 2004 NI Measurement and Automation Catalog

The National Instruments catalog is the leading virtual instrumentation resource for engineers and scientists seeking the most productive customer-defined software and hardware tools. You will find everything you need from product specifications to comprehensive tutorials. For your FREE 2004 Catalog call or visit www.ni.com/info and enter dwju4i.

National Instruments, (800) 433-3488 (U.S. and Canada), (512) 683-0100, Fax: (512) 683-9300, info@ni.com.

Circle 25 on Control Solutions International RS Card

New Digital Coriolis Mass Flow Transmitter

The new Foxboro Coriolis Mass Flow Transmitter's revolutionary design has eliminated the stalling of the flow tube, a common problem with Coriolis meters. The transmitter is designed with two digital processing systems: one controls the meter's drive sequence and the other processes the measurements from the Coriolis meter.

Foxboro, a unit of Invensys Production Management, 1-866-570-8182. Visit www.foxboro.com/m&i or e-mail ordercft50@foxboro.com

Circle 150 on Control Solutions International RS Card

High Performance Flat Panels

Only one company has been providing industrial flat panel interface solutions for over 20 years—Daisy Data, Inc. Our flat panel line includes monitors, and PC's in a variety of configurations and ratings: NEMA 12/4 or 4X, and Factory Mutual approved for hazardous area systems.

Visit us at http://www.daisydata.com or call 717 932-9999.

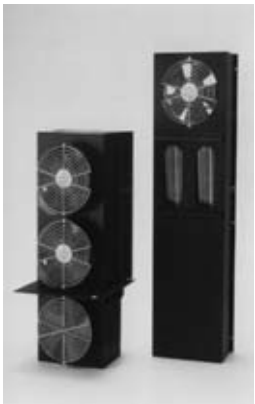
Circle 151 on Control Solutions International RS Card

{product focus}

LOW COST COOLING

MAINTENANCE FREE

The Compact Cabinet Cooler™



For all electronic equipmment in sealed enclosures(including explosion proof, washdown, and chemical reistant). Cools electronics or controls needing protection from moisture, airborne dust, oil and dirt.

HUGE ENERGY SAVINGS

Standard Models are Nema 12

Nema 4, 4X and Stainless Steel also Available

- Prevents failure and downtime caused by overheated controls
- Costs a fraction of air conditioning
- Easy to install

UL RECOGNIZED TYPE 12, TYPE 4 ALSO AVAILABLE

Circle 32 on CS Int'l Reader Service Card

Noren Products Inc.

(650)322-9500/FAX(650)324-1348

www.heatexchangerinfo.com

{free literature}

{product focus}

Fiber Optic Converter System for DeviceNet

The PSI-MOS-DNET modular fiber optic converter system for DeviceNet bus systems allows complete isolation of DeviceNet networks by converting the electrical copper-based signals to glass or polymer fiber technology. The PSI-MOS-DNET system is DIN-rail mounted and only 22.5 mm wide, making it ideal for control cabinet and industrial applications.

Phoenix Contact Inc.
800-322-3225
www.phoenixcon.com.

Circle 37 on CS Int'l Reader Service Card

Single Sensor Controller

OMEGA's ac single sensor FLCN-110 controller offers features normally found in much larger controllers. The adjustable time delay relay, invert switch, and LED status enunciators all maximize the flexibility of this powerful controller. It is ideal for use in applications where whole pump or process protection is critical. Low flow alarm systems can easily be configured with this 120 to 240 V ac controller. It is made of reinforced polypropylene. The controller swivels on its base for easy conduit alignment. Price is $185.

Omega Engineering,
http://www.omega.com/pptst/FLCN-111.html

Circle 35 on CS Int'l Reader Service Card

Thermal Dispersion Flow Switches

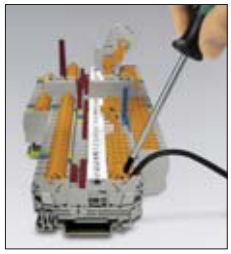
Omega's FSW-6000/7000 Series thermal flow switch monitors check air and liquid flow status and also detect level of liquids. A chain of 8 LEDs provides an indication of flow rate. In addition, there is also a di-chromatic LED, which shows the switch point status of the unit. The sensing element and connection are made with 316 S.S., and can be coated with Teflon® as an option. Price starts at $410.

www.omega.com/pptst/FSW6000_7000.html

Circle 42 on CS Int'l Reader Service Card

Quick Connection Terminal Blocks

The QTC 1.5 insulation displacement connection terminal block has a patented contact which is 20% smaller than other blocks on the market. The quick connection terminal blocks are available with 5 mm pin spacing, accept up to #22 - #16 AWG and have a current carrying capacity of 10A at 600V. Wiring is easy, the cable is simply pushed into the contact; stripping of the wire is not required.



Phoenix Contact Inc.
800-322-3225
www.phoenixcon.com

Circle 38 on CS Int'l Reader Service Card

pH or ORP Controller and Pump

The PHP-700 series pumps combine the powerful PHP-600 series dosing pumps with the state-of-the-art controllers. These unique products were developed for measuring and controlling pH or ORP and the regulated dosing of various chemicals. The latest innovation eliminates the need for multiple instruments by combining two instruments into one. No more complicated installations, wiring, and compatibility problems. This compact system features accurate regulation, proportional dosing, alarm and recorder signals and much more all in one unit. Price starts at $660.

Omega Engineering, www.omega.com/Green/pdf/PHP700.pdf

Circle 43 on CS Int'l Reader Service Card

Noncontact Level Sensors

Madison Company's new line of non-contact level sensors includes models that use either ultrasonic or radar technology. The U Series ultrasonic sensors provide continuous level measurement in a range from 0.40 to 90 ft for liquids and solids. R Series radar level sensors are designed for continuous level measurement of reflective materials beyond ultrasonic wave capabilities, providing a pulse radar measurement range of 0.83 to 100 ft. Both U and R Series are programmable and feature simple push-button calibration; custom designs are available.

Madison Company, Branford, CT 06405, 800-466-5383, www.madisonco.com

Circle 41 on CS Int'l Reader Service Card

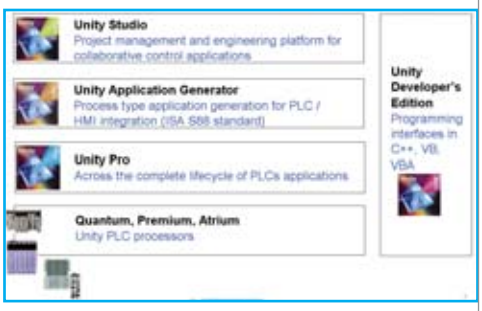
{product focus}

New software platform, range of hardware unveiled at Initi@tive 2004

Ron Kuhfeld, Editor in Chief

At Schneider Electric's "Initi@tive Automation & Control 2004" fair in Brussels last month, Alain Marbach, senior vp automation & control, made it clear that the company was poised to make a lot of noise in the marketplace. As he said at the plenary session, Schneider's goal is to be known as the "initiative leader in automation and control."

To help it secure this position, Schneider invested more than 300 million euros in R&D the past five years, the fruits of which included the 12 product lines unveiled before the 2000 international customers gathered at the fair. The event also celebrated the 80th anniversary of the Telemecanique brand, which Henri Lachmann, Schneider Electric's chairman and CEO, explained is the "brand philosophy" for the company's entire industrial automation business.



The Unity platform focuses on openness, collaboration between software products, and enhanced productivity.

The new Unity platform

At the heart of Schneider's new product lineup is Unity, its new Telemecanique PLC software and processor platform. The software is said to provide openness and collaboration between software products and, together with the company's new Premium, Atrium and Quantum PLCs, to offer an approach to software development and system operation that focuses on improved productivity.

The Unity suite of software includes:

- Unity Pro—This common programming, debugging and operating software for the new Premium, Atrium and Quantum PLCs offers portability among Telemecanique PLCs. It is IEC 61131-3 based, includes the features of PL7 software for Telemecanique PLCs and Concept software for Modicon PLCs, and adds functionality for enhanced productivity.
- Unity Studio—A tool for the project management of collaborative control applications, it incorporates Unity Pro, PowerSuite for drives and motor starters, XBT-L1000 for user interfaces, and OFS for real-time communication. It offers a customizable engineering platform.

Using Microsoft's Visio™ to graphically describe the process to be automated and the topology of the architecture, Unity Studio increases the speed and consistency required to synchronize applications over Ethernet.

- Unity Developer's Edition—UDE includes special software for IT development engineers working in VBA, VB or C++. It provides access to all Unity Pro and Unity Studio object servers.
- Unity Application Generator—This design and generation tool provides PLC/HMI integration. It enables plant design based on reusable standard objects compliant with the ISA S88 batch standard.

Other products in the lineup

- Advantys STB is an open solution for integrating Schneider Electric and third-party I/O and control system components, as well as a wiring interface and power management device.
- Modicon TSX Micro automation platform is for control systems to 248 I/O.
- Magelis XBT G graphic terminals with touch-sensitive screens feature an on-board Ethernet connection and multipoint link for simultaneous connection to Uni-Telway, Modbus, and Modbus TCP/IP.
- Zelio Logic smart relays are for use in control systems of 10 to 40 I/O.
- TeSys model U compact expandable starter is for motors up to 15 kW.
- Altivar 31 variable speed drive can control 3-phase asynchronous motors with power ratings from 0.18 to 15 kW.
- Twin Line drives, used with SER brushless motors, are suitable for many motion control applications up to 8 kW.
- Harmony control and signalling units include a wide selection of push buttons, emergency stop buttons, selector switches, and pilot lights.
- OSI (Offering Simplicity through Innovation) sensors consist of Osiris photoelectric sensors, Osiprox inductive proximity sensors, Osiswitch limit switches, and Nautilus pressure switches.
- Preventa XPS-MC configurable multifunction safety controller features 22 certified safety functions, making it suitable for Category 4 EN 954-1 applications. The new controller is the latest addition to a family of machine safeguarding products, including safety interlocks and relays and light curtains. ■■■

—Schneider Electric,
www.schneider-electric.com

Circle 180 on CS Int'l Reader Service Card

{product feature}

Controllers, displays, drives, networking products, more launched at A-B Fair 2003

Ron Kuhfeld
Editor in Chief

At this year's Rockwell Automation Fair in Milwaukee, the company announced a host of products—covering everything from OEM productivity to safety needs. Highlights follow.

For the OEM

Among the new products designed to help OEMs meet today's business and technology challenges was the Power Programming application development tool. It consists of machine control and axis routine templates, a template for functional specs, and sample program modules. Designed for packaging OEMs, it conforms to PackML guidelines.

The ControlLogix® 1769-L35E controller combines scalability and modularity with EtherNet/IP™ and Compact I/O™ connectivity. The result is networked machine control in a small package.

The MobileView™ Machine Terminal and Guard Terminal displays are now available with RSView® Machine Edition, v. 3.1 software. This allows the terminals to connect directly to a controller via EtherNet/IP, and eliminates the need for a Windows® 2000 server, reportedly reducing implementation costs by up to 50%.

OEMs and end users who need motor control for high-power applications can opt for the PowerFlex® 700 AC Drives. These modular drives can be used for applications from 200 to 350 hp (and up to 1200 hp by the end of 2004).

RSTestStand™ software streamlines the development and deployment of automation applications by allowing engineers to interactively develop and test systems directly from their desktop.

Essential components

MicroLogix™ 1200 controllers with FRN 8, and MicroLogix 1500 LSP and LRP processors with FRN 9, now support Modbus™ RTU Master protocol—as well as the Modbus RTU Slave protocol. The new protocol allows the controllers to communicate with PowerFlex 4 and 40 drives (using a 1761-NET-AIC, or other RS-232 to RS-485 electrical interface converters) to provide a low-cost drive controller.

(clockwise, top left): ControlLogix 1769-L35E; MobileView Terminal & Guard Terminal displays; PowerFlex 700 AC Drives; & MicroLogix controller.

Networks for factory control

With a complete DeviceNet™ subnet link inside, the new 1734-ADNX Point I/O™ DeviceNet adapter offers a cost-efficient option for users looking to: upgrade an existing system from an A-B 1734-ADN; increase the distance between a device or sensor and the controller (from 500 m of DeviceNet link to 1500 m); amplify the node count connected to a DeviceNet link scanner (up to 63 more nodes per adapter); or to bridge multiple DeviceNet links.

Coupled with the A-B Point I/O products, the 1734-AENT Point I/O EtherNet/IP adapter module provides a cost-effective, networked interface for highly-distributed architectures where system determinism and repeatability are important. The adapter is compatible with ControlLogix v.11 controllers and RSLogix 5000 v.11 software, and all Point I/O adapters support remote data access directly via OPC.

The 1756-EWEB module for A-B ControlLogix controllers allows users to display canned data on a Web page, display custom data screens in MS® Internet Explorer, send e-mail or page someone based on a configured trigger, and write data into a database and/or connect to third-party applications.

Safety products

The Bulletin 440K key interlock switch family is said to be the first that's fully connectorized, helping manufacturers save money when integrating safety controls into a machine. When used with safety connection systems including distribution boxes, cordsets and patchcords, the switches reportedly can save more than 17% of installation costs in reduced labor.

The new Allen-Bradley® Guardmaster® 440J Enabling Switch allows personnel in the dangerous area around a machine to control hazardous machine motion. This hand-held 3-position switch is suited for use in robot cells during maintenance, troubleshooting, programming and testing.

–Rockwell Automation,
www.rockwellautomation.com

Circle 181 on CS Int'l Reader Service Card

{product feature}

Low-cost digital, analog I/O

Five new low-cost digital input/output (DIO) and analog output (AO) boards offer an affordable and reliable I/O solution, and set a new price point for data acquisition and control. Starting at $295, these boards deliver NI-DAQmx software technology as well as superior ease of use and performance at a low cost for industrial automation and control, test and measurement, and (OEM) applications.

National Instruments
http://www.ni.com/dataacquisition.
Booth # 4323.

Circle 130 on Control Solutions Int'l RS Card

Touch panels in 8, 10, 15 in. sizes

AutomationDirect has expanded its line of of EZTouch touch panels to include 8, 10 and 15-inch slim bezel units. Certain models can be purchased with built-in Data Highway Plus capability, and Ethernet option cards are available for use with some models. Ten and 15 in. panels are now available with MODBUS TCP/IP, MODBUS Plus, DeviceNet, Profibus or Ethernet I/P capability.

AutomationDirect, 800-633-0405
www.automationdirect.com.
Booth # 5611.

Circle 131 on Control Solutions Int'l RS Card

Fuji motor controls

AutomationDirect carries Fuji's DUO series line of motor contactors, overload relays, and manual motor starters, as well as the Odyssey line of large contactors and overloads. Conventional DUO starters accommodate motors up to 100 horsepower at 480 VAC, while MMS combination starters accommodate motors up to 40 horsepower at 480 VAC. The Odyssey series comes in sizes up to 300 horsepower at 480 VAC.

AutomationDirect, 800-633-0405
www.automationdirect.com.
Booth # 5611.

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National Manufacturing Week

control solutions international

Loop-powered signal conditioners

The loop-powered signal conditioner and isolator for 4-20 mA signals, and dc-powered selectable signal conditioner and isolator for voltage/current signals have push-button programmable ranges and LED indicators. Also available: a model for conditioning, isolation and cold-junction compensation for thermocouple/mV inputs, or a loop-powered signal conditioner for RTD signals with selectable inputs.

AutomationDirect, 800-633-0405
www.automationdirect.com.
Booth # 5611.

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FDIN Rail-Mount Wireless Modems

Cirronet offers DIN Rail-mount versions of its industrial serial and Ethernet wireless communications products, enabling fast, snap-on installation and compact utilization of cabinet space. Providing 460 Kbps or 1.23 Mbps data rates, the 2.4 GHz products are Class I Div 2 certified, FCC certified and CE marked. All DIN Rail-mount products can accept 9- to 30-volt DC power and operate over industrial temperature ranges.

Cirronet, Inc., Norcross, GA 30093 USA
678-684-2000, www.cirronet.com.
Booth # 5611.

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PACSystems RX3i controller

The PACSystems™ RX3i controller features a patented portable control engine that can help users boost the overall performance of their automation systems, reduce engineering costs, and significantly decrease concerns regarding short- and long-term migration and platform longevity. The PACSystems RX3i offers a high-speed, PCI-based backplane and Pentium® 300 MHz CPU for fast throughput without data bottlenecks.

GE Fanuc
http://www.gefanuc.com.
Booth # 5636.

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Open Source HMI, SCADA software for those who'd like to give it a try!

Wayne Labs
Senior Technical Editor

You don't have to pay an arm and a leg for HMI/SCADA software if you're a little adventurous. Thanks to Dr.-Ing. Rainer Lehrig's Open Source ProcessViewBrowser project you can build your own for Windows, Linux, or OpenVMS at no cost.

Dr. Lehrig, a control engineer and head of Lehrig Software Engineering (Lennestadt, Germany), a consulting firm, got the idea for his project while doing automation engineering in steel production plants, especially hot strip mills and casters. As he explained during our interview: "ProcessViewBrowser had come into my mind when I had been working at SMS Demag AG. There we had the need for a more flexible tool for process visualization than was provided by commercial tools available. First of all, it had to be portable. We used computers with Linux/Unix, OpenVMS and Windows. It had to be possible to extend the software when needed. Its costs had to be moderate. We also wanted the source of the software. I explained my ideas to the staff.

"We wanted something like an Internet browser. But instead of displaying static HTML code, it had to display dynamic changing Qt widgets. Since the company didn't want to tackle such a task, I decided to start an Open Source project."

I asked Dr. Lehrig if anyone was working on moving the project beyond visualization and adding control functionality to the project? Dr. Lehrig's work in progress in this area is impressive. "There are a lot of bus systems for accessing real-world data," said Dr. Lehrig. "We already have experience with Reflective Memory[1], EIB-Bus[2] [signals are written to a MySQL Database using a daemon], and Modbus[3] [Modbus RTU working]. CAN connection is currently being evaluated using CIF cards from Hilscher GmbH[4] because Hilscher uses the same interface to the PC for different bus systems [a dual-ported RAM on the CIF cards]. Also Profibus, Sercos and Interbus connections should be possible."

On database connectivity and drivers, SQL connectivity is accomplished through MySQL for the EIB-Bus using the PHP version of the ProcessViewServer. You can use any database with a little programming done in C/C++, Python, Perl, PHP or Tcl. The key to drivers is the design of masks using Qt Designer. Said Dr. Lehrig, "Qt Designer is included in Linux. An old noncommercial version of Qt Designer is included in the package for Windows. Otherwise, you will need a license from Trolltech. Nothing else is needed."

On the subject of licensing, Dr. Lehrig explained that ProcessViewBrowser is free software. "You can redistribute it and/or modify it under the terms of the GNU General Public License," he said, "as published by the Free Software Foundation; either version 2 of the License or any later version. QT, VTK, Tcl/Tk, OpenGL are licensed elsewhere. There is one exception: If you don't want your ProcessViewServer to become GPL software [e.g., you don't want to publish your ProcessViewServer as GPL Software with all your code], it is possible to order a commercial license. In this case your ProcessViewServer may stay closed source. To get a license contact lehrig@t-online.de. Commercial licenses are only available from the original author of the program(s), and cost $490. You can use the license on any number of computers, and can even sell your ProcessViewServer that was developed using this package. However, you are not permitted to distribute the original software."

Dr. Lehrig needs help with testing and integrating more hardware (PLCs, DASs, fieldbuses), and with VTK programming (www.kitware.com/vtk/). Contact him in the forum at http://pvbrowser.org or via email at lehrig@t-online.de.

[1] http://www.vmic.com/products/reflectivemem
[2] http://www.eiba.com
[3] http://www.modbus.org
[4] http://www.hilscher.com

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Wonderware Touch Panel Computer (on left).

Wonderware Industrial Tablet (docking unit not shown).

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