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Product Focus: Process Control and Instrumentation

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Process Control and Measurement

Process control and measurement implies continuously changing variable data and/or control methods in an industrial process. Different from discrete (ON/OFF) states, numeric values over a set range are sensed and/or transmitted in continuous (flow production) or batch (a set quantity or output) processing. Some of the most common variables used for process control are pressure, flow, level and temperature.

Pressure Process Control
Pressure sensing devices measure pressure at a specific point in the process, used for monitoring and/or transmitting the measured value to a control device/system that may perform functions such as starting/stopping or opening/closing, or modulating an analog output that operates a valve to regulate the pressure.

- **Pressure Sensors:** Pressure/Vacuum sensors monitor relative system pressure in many process applications, as well as for hydraulics and pneumatics. Pressure switches typically provide simple setpoint-tripped output signals, while pressure transmitters provide absolute, gauge or differential analog readings over wide measuring ranges.

- **Current to Pneumatic (I/P) Transducers:** I/P transducers are electro-pneumatic devices that, with a 4-20mA input signal (I) and a high-pressure air supply, provide precisely regulated air pressure output (P). I/P transducers offer reliable, repeatable operation of pneumatic valve positioners/actuators, cylinders, web tensioners, clutches and brakes.

- **Pressure Gauges:** Pressure gauges are simple display devices for industrial and commercial applications. Mechanical dial pressure gauges use Bourdon tube sensing elements; digital pressure gauges can offer enhanced functionality. Differential gauges measure and display the pressure difference between two points. Certain models can provide a signal to tie to control devices or systems.

- **Potable Water Regulators:** Purpose-built water regulators are compact food-grade units that provide economical, high-performance pressure regulation of drinkable water. The highly sensitive diaphragm-operated design delivers accurate downstream pressure and the molded rubber supply valve provides precise regulation while helping to prevent leakage.
Flow Process Control
Flow sensing devices measure the flow rate (volume per unit of time) and/or consumption (totalized flow) of liquid traveling through a system, used for monitoring and/or transmitting the measured value to a control device/system that performs functions such as adjusting the position of a valve, or starting and stopping pumps.

- **Flow Sensors:** Flow switches monitor liquid media to provide reliable flow detection, supplying a discrete switch output; transmitters use differential pressure sensing principles to provide precise flow measurement, and supply an analog output proportional to flow rate as gallons per minute.

- **Magnetic-inductive flow meters (magmeters):** Magmeters use electromagnetic induction principles to reliably detect the flow rate of conductive media such as industrial water, drinking water, water-based coolants, water glycol mixtures, and salt water.

Go to [http://go2adc.com/flow-vid](http://go2adc.com/flow-vid) for a short video on How Do Magnetic Inductive Flow Meters Work?

[Image of flow meter and magnetic field]
Level Process Control
Level sensors monitor the level of liquids, pellets, powders, and other similar products in tanks and process systems. The measurement can be used for monitoring purposes or to control a process. Integrated level controllers can sense level and operate alarms, pumps, valves and other industrial equipment. A variety of sensing technologies are available, including contact and non-contact methods. Choose the sensing technology best suited for the material being monitored.

- **Float Level Switches**: Low-cost float switches provide single-point monitoring of liquid level in industrial applications. Powerful permanent magnets within the float actuate a highly reliable and repeatable hermetically sealed reed switch as the float rises and lowers with liquid level. A variety of material construction and mounting styles offer compatibility with many liquids, temperature ranges and system pressures.

- **Submersible Level Sensors**: Submersible sensors provide continuous liquid level measurement by sensing the hydrostatic pressure produced by the height of liquid above the sensor. These sensors typically provide a current output signal corresponding to their specific pressure sensing range.

- **Ultrasonic Level Sensors**: Ultrasonic sensors emit a sound impulse and measure the elapsed time of the echo from a detected object or material. These types of sensors can operate as downward facing, non-contact level sensors. Models with discrete outputs will indicate the presence of the material within the sensing range; distance sensing models with analog outputs can indicate the material’s relative level within the sensing range.

- **Capacitive Level Sensors**: Capacitive sensors are useful for detecting the level of solids such as plastic pellets, or water-based conductive liquids. These devices output a discrete signal when the presence of material is detected within the sensing range.

- **Vibrating Fork Switches**: Vibrating fork switches use a harmonic vibrating frequency which is reduced when the fork contacts the liquid being monitored. The frequency reduction indicates the presence of the liquid and the switch sends a signal to the control unit. These switches provide reliable level detection of dirty liquids that coat, scale or foam such as wastewater, diluted caustic soda and light oils. They can be mounted through-the-wall or inside a tank as high- or low-level indicators.
Go to http://go2adc.com/ultra-vid for a short video on Ultrasonic Liquid Level Sensors

Ultrasonic wave increases in diameter as the wave travels away from the sensor.

Float Travel is proportional to distance between float body and weight or anchor point.

Example 1: 6 inches between float body and weight will require 12 inches total float travel for proper operation of switch.

Example 2: 18 inches between float body and weight will require 36 inches total float travel to proper operation of switch.

Switch point is approximately ± 45 deg from horizontal at tethered or weighted point on cable.

Inexpensive tilt switches provide reliable level detection in open vessels.
Temperature Process Control
Temperature measuring devices sense temperature at a specific point or area and provide a signal for monitoring or control. Temperature transmitters receive the signal (or have an integral sensor) and convert it to an output more typically compatible with industrial monitoring or control devices. Temperature switches integrate sensing and a setpoint-tripped output; controllers combine sensing and control of the variable in one unit.

- **Temperature Sensing:** Sensing devices typically supply an electrical signal corresponding to temperature. The most common sensing methods include thermocouples and resistance temperature devices (RTD). Both are specialty metal wire devices providing low-level current signals that can be connected directly to a temperature sensor; either may need to be extended or amplified to be transmitted longer distances.

- **Thermocouple Sensing Elements/Probes:** A thermocouple consists of two metallic probes made of different materials. These two metals are joined together at one end. When the joined end heats up, a small current is generated at the other end where the metals are not joined. Wires connected to the separated end transmit the current to an electrical sensing device, which can calculate the temperature based on the type of sensor material and current level. Some advantages of thermocouple sensors include the ability to measure a wide range of temperature, shock and vibration resistance, and fast response time.

- **RTD Sensing Elements/Probes:** RTD temperature sensors measure the changes in resistance of a metal as the temperature of the metal changes. To accomplish this, a small electrical current is applied to the metal probe or sensor and as the current travels through the metal, a wire provides a connection to this current. Temperature changes in this metal will increase or decrease resistance, which in turn will affect the current as it travels through the metal. A sensing unit receiving this current signal can calculate the temperature based on the changes between the injected current and the received current. The main advantage of an RTD sensor is more precise and stable temperature readings.

- **Temperature Switches and Transmitters:** Switches with discrete outputs typically provide simple setpoint-tripped output signals, while temperature transmitters provide analog readings over wide measuring ranges.

- **Temperature Controllers:** Temperature process control units read the signal from a temperature device, such as a thermocouple or RTD, and maintain a setpoint via an output signal (relay, voltage pulse, current, or linear voltage) to a controlled device, using modes such as simple ON/OFF, full PID closed-loop control, special Ramp/Soak profiles, or Manual operation.

- **Thermometers:** Thermometer gauges are simple devices that measure temperature at a specific point using a bi-metallic sensing element with high accuracy. Dials with dual scales provide instant reading of degrees in both Fahrenheit and Celsius, which helps reduce operator reading errors.

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Go to http://go2adc.com/temphh-vid for a short video on Temperature Sensing.

Helpful Hints

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Other Process Control Devices
Other devices used for process control systems include displays for monitoring process values, signal conditioners, and process valves.

- **Digital Panel Meters**: Panel meters accept a wide variety of process inputs and display measured values from devices such as load cells, potentiometers, and temperature sensors. Models with outputs can provide alarm relays, analog signal re-transmission, and sensor excitation voltage.

- **Graphical Panel Meters**: These meters measure voltage, current or frequency and provide analog meter-style visual readings as well as accurate numeric formats.

- **Signal Conditioners**: Signal conditioners, transmitters and optical isolators are used in process control systems to solve ground loop problems, isolate noise issues, convert signals to desired levels and types, and to allow longer cable runs. Limit alarms monitor analog inputs and provide low limit, high limit, or other discrete output indications based on the input value.

- **Timer Relays / Counters / Tachometers**: Timer relays provide simple time-based control, with multiple modes and adjustable timing ranges, discrete outputs, and a mechanical or electronic display. Multi-function units combine features of a digital counter, timer, and tachometer.

- **Solenoid Process Valves**: Pipeline valves allow ON/OFF flow control and/or mixing and diverting of process media such as air, oil, inert gas, water, and even some caustic materials.

- **Solenoid Separated Process Valve**: Media-separated two-port discrete pipeline valves allow ON/OFF flow control of gases or fluids where the (metal) working components of the valves never come into contact with the process media.

- **Power Monitors**: Power meters are highly accurate devices that measure standard power parameters, plus metering and harmonics.
Many FREE resources are available 24/7

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- Productivity3000™ modular PLCs
- Do-more® BRX®, H2 and T1H series PLCs
- CLICK® micro brick PLCs
- Numerous I/O expansion modules available including discrete, analog, temperature and high-speed (depending on model)
- Think & Do® PC control software
- DirectLOGIC® components still available for maintaining legacy systems.

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C-more® operator interface HMI touch panels in various sizes up to 15 inches with wide screen options available
- C-more Micro®-graphic text and touch panels - 3”, 4”, and 6-inch models available starting at only $98
- ViewMarq® LED message displays
- ATLAS® industrial monitors

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- WEG CFW300 AC drives up to 5hp
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- Cost-effective GS2 series VFDs up to 10hp
- Drive accessories
- Soft starters up to 480A

**Motors and Motor Controls**

- IronHorse® general purpose AC motors up to 300hp
- Stainless steel AC motors
- DC motors up to 2hp
- Marathon® inverter duty AC motors up to 100hp
- Open Drip Proof and 4-in-1 Marathon Motors
- Compressor duty AC motors up to 5hp
- Motor controls and contactors up to 300hp

**Software**

- Free PLC programming software (download)
- System configuration
- Free motion control software (download)
- Free Micro HMI programming software (download)

**Process**

- Temperature controllers
- Digital panel meters
- Temperature sensors and transmitters
- Pressure sensors and gauges
- Level sensors and controllers
- Flow sensors
- Signal conditioners
- Pipeline valves
- Current to pneumatic (I/P) transducers
- Timer relays, counters and tachometers

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Donald in STUDIO CITY, CA wrote: “Automation Direct is now my one stop shop for all pneumatic components. They have the biggest selection of parts, and the shipping is prompt. No more searching the internet for this part and that part. Highly recommended!”

Samuel in QUEBEC, QC wrote: “The shipping was very quick and you have everything. Will buy there again”

Phillip in CAPE CANAVERAL, FL wrote: “PLC system components that I have purchased from AutomationDirect were easy to configure and have function well in the desired application! Customer support has been excellent.”

Safety
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- IDEM® and Dold® safety relays
- Speed/Standstill safety relay modules
- Magnetic safety switches
- Magnetic coded safety switches
- RFID coded safety switches
- Light curtains
- Safety relays
- Trapped key interlocks
- Safety mats and edges

Power Transmission
- Worm gearboxes
- Helical gearboxes
- Precision gearboxes
- Shaft mount gearboxes
- Timing belts and pulleys
- Couplings and bushings
- Shafting and shaft supports
- igus polymer bearings

Relays & Timers
- Electro-mechanical relays
- Solid state relays
- Relay sockets and accessories
- Timer relays
- Counters
- Tachometers
- Motor control relays
- Force guided relays

Tools
- Wera screwdrivers and torque tools
- Wera wrenches, ratchets and sockets
- Knipex® pliers, stripping and crimping tools
- Cable tie tools
- Hole cutting tools
- RUKO grinders and burrs
- SapiSelco® wire ties
- AutomationDirect interchangeable die crimping tool, self-adjusting crimper and rotatable die crimper
George in HOLLAND, MI wrote:

“I have come to trust AutomationDirect will provide a quality product and service. Questions before, during, and after the sale are addressed in a professional and courteous manner. Technical Support is great. I do not hesitate in reaching out to them for assistance. There have been occasions when follow-up calls were made, because of the complexity of the situation or my lack of experience with a product.”
Pneumatics

- Industrial managed and unmanaged Ethernet switches
- Modbus gateways
- Network adapters/converters
- Ethernet cables
- VPN routers and cloud services for secure remote access
- Power over Ethernet (PoE) switches

Pushbuttons, Switches and Lights

- KILLARK® hazardous location control stations
- IDEM emergency stops
- Fuji®, Schmersal and Eaton metal/plastic 22 and 30mm pilot devices
- IP69K-rated selector switches, pilot devices and pushbuttons from Schmersal
- WERMA audible devices and visual signals
- WERMA and Patlite stacklights
- IP69K-rated Patlite stacklights
- Patlite signal towers and LED lighting
- Foot switches

Communications

- Industrial managed and unmanaged Ethernet switches
- Modbus gateways
- Network adapters/converters
- Ethernet cables
- VPN routers and cloud services for secure remote access
- Power over Ethernet (PoE) switches

Water (Potable) Components

- Acme Electric®, Hammond and Jefferson Electric® transformers
- Rhino® DC power supplies and converters
- Mersen surge protectors
- Roxburgh and Eaton line filters and surge protectors
- Roxburgh power outlets
- ACME Electric encapsulated transformers
- Edison® power distribution blocks
- Bryant® electrical plugs, connectors and receptacles, and other wiring devices
- AcuAMP® AC current transformers
- Socomec multifunction power meters
- Trumeter graphical panel meters

Power Products

- Tubing, hose and fittings in a wide variety of configurations
- Air cylinders and position switches
- Solenoid valves
- Modular solenoid valves (Ethernet or hardwired)
- Air preparation and air relief valves
- Pushbutton valves
- Total Air Prep (TAP) all-in-one units
- Rotary actuators and grippers
- Pressure switches, transmitter, and transducers
- Regulators
- Solenoid valves
- Hand valves
- Check valves
- Push-to-connect water fittings
- Lead-free brass fittings
- Tubing
- Hose
- Hose clamps
Terminal Blocks and Wiring

- Eaton UL 489 miniature circuit breakers
- Fuji UL 489 molded case circuit breakers
- Eaton UL1077 supplementary protectors
- Edison fuses, fuse holders and fuse blocks
- Socomec, Gladiator® and Bryant® disconnect switches
- Bryant UL 508 manual motor controllers

- Electrical hook-up wire / building wire
- Connect-It® and DINectors’ terminal block systems
- Edison power distribution blocks
- Bryant power wiring devices
- Wire duct and tubing

- Wire end connectors cable glands, connectors and fittings
- Zilpport® connectors
- Multi-wire connectors
- Sensor cables
- DYMO XTL Label Makers and Labels
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- Lighting

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- Variable frequency drive (VFD) Cable
- Instrumentation cable
- Continuous flexing control cable
- Continuous flexing motor supply cable
- Continuous flexing industrial Ethernet cable
- Control and signaling cable
- Bulk sensor/actuator cable

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Enclosures

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<tr>
<td>NEMA 1 wall mount 24 x 24 x 08”</td>
<td>$218.00</td>
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<tr>
<td>NEMA 12 wall mount 20 x 16 x 08”</td>
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<td>NEMA 12 free-standing mount 60 x 60 x 12”</td>
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<td>NEMA 4 wall mount 20 x 20 x 06”</td>
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<td>NEMA 4X wall mount 20 x 20 x 06”</td>
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<td>NEMA 4/12 wall mount 30 x 24 x 08”</td>
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