Controls and Controllers are mechanical, electro-mechanical, or electronic devices which use input signals to change conditions or values in processes or oversee access to buildings, gated areas, etc. Controllers generally receive voltage inputs from sources, analyze the inputs, and then oversee condition changes via signal outputs. Some controllers are simple manual devices for controlling air flow, for instance. Motor controllers are handled in the family Motor Controllers and Drives.

Types of Controls and Controllers

Access Control Systems
Access Control Systems are electronic or electro-mechanical devices or systems composed of remote stations and centralized controlling stations which are used for security monitoring and to manage the movement of personnel, vehicles, materials, etc. through entrances and exits. Key specifications include the intended application, type, and method of identification. Access control systems use identifying methods such as facial recognition, fingerprints, metal detection, bar coding, and swipe cards, to permit entrance and exit from various secured areas. They can be used as well for tracking the movements of bulk materials, for allowing the use of certain machines such as x-ray equipment, or for vending various tools. Typical applications include high security operations in military facilities.

Flow Controllers
Flow Controllers are mechanical or electro-mechanical devices composed of measuring sensors or controlling elements that are used to ensure media flow in manufacturing processes. Key specifications include the intended application, type, media, flow rate, connection style, pressure rating, as well as mounting style. Flow controllers are used primarily in process control applications. They are made for gases as well as liquids of many types, and are available in many sizes and configurations depending on the application. Some flow controllers consist of mechanical valves, while others are electronically operated and controlled. Flow controllers are sometime
called batch controllers for their ability accurately control different ingredients in a chemical batching process, for instance.

Level Controllers
Level Controllers are mechanical or electro-mechanical devices used for controlling the levels of tanks, vats, etc. usually by means of pumps, and they are sometimes called pump controllers. Some level controllers incorporate sensors or other means of detecting the level of products in containers, etc. while others require inputs from remote switches or sensors. Key specifications include the intended application, medium type, and the control method. Level controllers rely on a variety of sensor styles including conductive, capacitance, optical, and ultrasonic, in addition to mechanical arms, floats, and levers. They can be used for liquids or bulk dry goods such as grain or powders. Many industries use level controllers in various processes. A level controller receives an input signal, compares it to a set point and via an output signal adjusts the level as the process requires.

Pressure Controllers
Pressure Controllers are electro-mechanical devices used for controlling process/system pressure in various industrial processes. Key specifications include the intended application, type, control method, sensing element, and the pressure range. Pressure controller types include differential gap, proportional, on/off types, among others. They rely on a variety of sensing elements such as a bellows, diaphragms, capsules, bourdon tubes, etc. In operation, the controller receives a process/system pressure input, compares it to the desired set point in the pressure controller, then outputs a signal (usually to a control valve) which adjusts the process/system pressure (if necessary) back to the set point.

Programmable Logic Controllers
Programmable Logic Controllers are electronic devices used for controlling automatic machinery, processes, etc. Key specifications include the intended application, type, function, mounting style, as well as power requirements. Programmable logic controllers are configurable with a range of input and output modules. They control various operating parameters and functions by receiving input signals from various sources and adjusting machine functions as required by the processes through sets of programmed instructions. Some PLC makers have begun marketing programmable automation controllers, or PACs, which are have features beyond those of ordinary PLCs but perform similar tasks. PLCs are modular in construction and can be fitted with various modules for inputs, outputs, etc.
Universal Process/Temperature Controllers

Universal Process/Temperature Controllers are electronic devices used to control various process parameters, including temperature. Key specifications include the intended application, control method, input and output types, features, connections type and mounting style, number of inputs, communication interface, as well as the power specifications for the input and output process. Universal process/temperature controllers are used mainly in manufacturing applications for ensuring various process values are within their operational ranges. Several types of control methods include set point, proportional, etc. as well as input types such as thermocouples, voltage, etc. that are used to sense and control process parameters. Controllers can be mounted in panels, walls, DIN rails, etc. Typical applications include boilers, lasers, tanks, molding machines, pumps, furnaces, etc.

Applications and Industries

Controls and controllers range from relatively simple pump controls for level applications to sophisticated PLCs with multiple input/output functions and network communications used for full factory automation. Some flow controls for pneumatic systems are nothing more than manually adjustable valves that vary the air flowing in pneumatic systems.

Many process controllers use some form of PI or PID control, acronyms for proportional integral and proportional integral derivative control. These control algorithms essentially work to lessen overshoot and undershoot errors in control loops as they try to reach controller setpoints. On/Off and Proportional are other simpler control methods.

Depending on the controller type, some will rely on external sensors for inputs and electrical loops or electronic switching for their outputs, while others rely on built in sensors. Some controllers are modular, for instance PLCs, which are often composed of processor base units and one or more modules for input/output, communication, etc. PLCs are general purpose controllers that can be configured to control processes, machinery operation, etc. Other controllers are more tailored to the control tasks and are generally sold to control specific process variables, although many of these use modular approaches to their configuring.

Considerations

Controllers are often identified as single- or multi-loop, referring to the number of inputs and outputs. Multi-loop controllers can receive data from more than one sensor and can output control functions to more than one device. Controllers are often mounted in enclosures and control panels with display and selector functions available at the front of the enclosure and panel doors. Both LED and LCD readouts are typically available. Some PLC designs house the main controller behind the panel door and use door mounted devices for displaying status and for selecting various control functions.
Important Attributes

Control Method
Choices for control method vary by controller type but choices generally range from the simplest on/off forms to the more sophisticated PID types.

Input Types
Input types will vary by controller, with thermocouple and RTD being common for temperature controllers.

Output Types
Output types again depend on the controller type, with many using 4-20 mA current loops or relays.

Features
Features for controllers vary by controller type and control method. Among the common features are Auto Tuning, Alarms, Explosion Proof, etc.

Related Product Categories

- **Sensors/Detectors/Transducers** see our Sensors/Detectors/Transducers Buying Guide.
- **Motor Controllers and Drives** see our Motor Controllers and Drives Buying Guide.
- **Monitors** are typically electronic devices used to remotely or conveniently view information as required.
- **Data Acquisition Systems** (abbreviated DAQ or DAS) collect analog signals from sensors measuring real-world samples and transduce them into digital formats that are processed by computers.
- **Data Loggers** are electronic data storage devices used to gather and record various data-over-time measurements.
- **Switches** are electro-mechanical devices that are used in electrical circuits.
- **Thermocouples** are mechanical devices formed of dissimilar metal wires welded together and used for the measurement of temperature.
- **Pendants** or pendant stations are devices used to control or program machines or robots from remote or safe distances.
- **Timers** are devices which are used to measure elapsed time.

Resources

General
A brief glossary of process control terms
The ISA maintains a collection of automation articles, with some addressing controls and controllers. General discussion of PID control and a helpful selection guide to temperature controllers. For manufacturers and suppliers, visit the following websites:

- https://www.isa.org/trade-groups

Manufacturers and Suppliers

- http://compressed-air.pneumatech.com/category/conservair
- http://catalog.simtechusa.com/keyword/all-categories?&key=all&keycateg=100&keyprod=&SchType=2&keyword=flow%20controllers
- http://ekci.thomasonet.com/keyword/all-categories?&key=all&keycateg=100&keyprod=&SchType=2&keyword=flow%20control
- http://ekci.thomasonet.com/keyword/all-categories?&key=all&keycateg=100&keyprod=&SchType=2&keyword=flow%20control
- http://catalog.carelusa.com/
- http://products.uscosupply.com/
- http://products.autonicsonline.com/category/controllers
- http://dehumidifiers.dehumidifiercorp.com/category/control-systems
- http://tellurex.stage.thomasonet-navigator.com/
- http://catalog.scaletronicscales.com/keyword/all-categories?&key=all&keycateg=100&keyprod=&SchType=2&keyword=controller
- http://panelmeters.weschler.com/category/controls&bc=100
- http://pep.pep-plastic.com/keyword/?&plpver=1001&key=all&keycateg=100&SchType=2&keyword=controller&refer=https://pep.pep-plastic.com
- http://spectroscopy.internationalcrystal.net/viewitems/temperature-controllers/temperature-controller?&bc=100|1024
- http://wiscon.thomasonet.com/keyword/all-categories/temperature-controllers?&plpver=10&page_size=25&pagenum=1&filter=1&keyword=controllers&key=product&keycategory=100&keyprod=3001005&SchType=2&keyType=P