



The Way Measurements Work - BBBB (Buy)

Measurement and Control Basics by Thomas Hughes

Reviewed by Nick Sands

Measurement and Control Basics is good review of the principles of operation of many measurements and final control elements, with many chapters updated for the 4th edition. Thomas Hughes is a long time member of ISA with over 30 years of experience including Dow Chemical, Rockwell international, and the International Atomic Energy Agency.

In the introduction Hughes tackles the age old problem of defining process control and process control systems, which contain the four elements of process, measurement, evaluation, and control. Next control loops, including the process model and the controller are reviewed, along with common tuning methods. A chapter covers electrical fundamentals, such as wire sizing, electrical components like transformers, and standard symbols. Binary, hexadecimal, and ASCII as well as Boolean logic, ladder diagram and function blocks are discussed in the chapter on digital fundamentals.

The next chapters focus on the measurement principles and technologies for pressure, level, and temperature. Pressure measurements shown include Bourdon gages, potentiometers, capacitance, and strain gauges. Level measurements shown include sight glasses, displacers, bubblers, capacitance, conductivity, ultrasonic, radar, and nuclear. Temperature measurements shown include filled systems, bimetallic, radiation pyrometers, and of course thermocouples and RTDs.

Hughes also covers a wide range of more analytical measurements, flow measurements, and final control elements, and the principles of operation. The chapter on analytical measurements includes conductivity, pH, density, humidity, turbidity, and gas detectors. The flow measurements shown include orifice plates, venturis, wedge meters, pitot tubes, turbine, vortex, magnetic, ultrasonic, coriolis and rotameters.

The last two chapters focus on the rest of the control loop, the final control element and the controller. Hughes provides a good primer on control valves, from sizing to characteristics, to choked flow. AC and DC motors are also covered. The development of modern controllers is given, with a generic DCS architecture and more detailed overview of the functionality of a PLC.

In *Measurement and Control Basics*, Hughes provides a guide for many types of measurements and how they work. This is a great introduction to instrumentation for new automation professionals, worth reading and worth buying. It is available for \$85 (member price) at ISA.Org.