Book Review

Test Measurement World Staff  - May 20, 2004

Temperature from the theoretical to the practical


Whether you build temperature sensors, calibrate them, or just use them to measure temperature, you'll find something valuable in this book. If you're new to temperature measurement, though, you'll find this book confusing if you try to read it from cover to cover. Chances are you just need to learn some aspect of temperature measurement that applies directly to your job. In that case, I recommend this book.

Having worked for a company that makes high-accuracy temperature-measuring equipment, I found this book answers many of the questions I used to get from customers. For example, the authors cover the international temperature scale ITS-90 and explain why it's important to calibrate temperature-measuring equipment. They also do a fine job of explaining how temperature sensors such as RTDs and thermocouples work, how to interpret their output-versus temperature curves, and how to understand the limitations of these sensors.

For example, Nicholas and White use a clever analogy to explain the often-misguided belief that a thermocouple junction generates a voltage. It doesn't. I've seen many descriptions of the Seebeck effect that left me confused. This book gets the point across in a clear, simple way.

Aside from discussing the specifics of temperature measurement, this book gives you some background on measurements in general. Chapter 2, for example, discusses the statistical nature of measurements and how to express uncertainty. Skip this chapter if you're not interested in statistics. You don't need this chapter to understand the material in other chapters.

Chapter 3 discusses the ITS-90 temperature scale. Here, Nicholas and White delve into the fixed points on the temperature scale, which are based on freezing and melting points of several metals as well as the triple point of water. Then you'll learn the procedures for how metrologists obtain, or 'realize,' these temperature points. Unless you're specifically interested in these techniques, you can skip this chapter, too.

Nicholas and White, in my opinion, get some of the chapters out of order. For example, they discuss calibration of the various temperature sensors in chapter 5, but they discuss the details of those sensors in chapters 6 though 9. I think they should discuss the sensors first, and then they should discuss ITS-90 and calibration techniques later. Clearly, the authors are metrologists, so the calibration topics come first in their minds.

Because the authors work for a measurement-standards lab, they focus on the calibration of
temperature sensors. Nicholas and White explain the many sources of measurement sensors, but they neglect any errors that your instrumentation might add. They never touch on errors from amplifiers, analog-to-digital converters, or curve-fitting algorithms. As a result, you get temperature measurement from the sensor side only. Even within that realm, the authors tend to frown upon the less accurate thermocouple while praising the more accurate RTD.

Despite its flaws, this book can provide you with a great deal of information about temperature measurement. The authors do a better job than most in conveying difficult concepts.\textit{-Martin Rowe, Senior Technical Editor}