1. Record Nr. UNINA9910299858603321

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Titolo	Doubt-Free Uncertainty In Measurement : An Introduction for Engineers and Students / / by Colin Ratcliffe, Bridget Ratcliffe
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2015
ISBN	3-319-12063-8
Edizione	[1st ed. 2015.]
Descrizione fisica	1 online resource (98 p.)
Disciplina	530.8 620 658.5 658.56
Soggetti	Quality control Reliability Industrial safety Physical measurements Measurement Engineering economy Quality Control, Reliability, Safety and Risk Measurement Science and Instrumentation Engineering Economics, Organization, Logistics, Marketing
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di contenuto	""Preface""; ""Contents""; ""Chapter 1""; ""Terminology""; ""Measurand""; ""True Value""; ""True Value and Uncertainty Interval""; ""Confidence, Significance and Coverage Factor (k-factor)""; ""Type A and Type B Uncertainties""; ""Systematic and Random Uncertainties""; ""Is it an Error or an Uncertainty? ""; ""Elemental Uncertainties ""; ""Calibration""; ""Measured or Calculated Quantities? ""; ""Propagation of Uncertainty""; ""Standard Uncertainty and Expanded Uncertainty""; ""Root Sum of the Squares (RSS)""; ""The Big Picture""; ""Chapter 2""; ""Type A and Type B Elemental Uncertainties"" ""Random Uncertainty""""""Repeatable, or Systematic, Uncertainty"";

""Type A and Type B Elemental Uncertainty""; ""Sources of Elemental Uncertainty ""; ""Accuracy-Pandoraa€?s Box? ""; ""Final reminder ""; ""Chapter 3""; ""Standard Uncertainty of a Measurement""; ""Finding the Standard Uncertainty when an Uncertainty Is Quoted at a Certain Level of Confidence""; ""Finding the Standard Uncertainty when an Elemental Uncertainty Is Given as a Standard Deviation with No Information About the Sample Size""
""Finding the Standard Uncertainty when the Uncertainty Is Given as a Standard Deviation and the Sample Size Is also Given""""""Finding the Standard Uncertainty when the Elemental Uncertainty has a Known Statistical Distribution""; ""Combining Several Standard Uncertainties to find the Standard Uncertainty for a Single Measured Quantity""; ""Chapter 4""; ""Expanded Uncertainty of a Measurement and an Uncertainty Budget for a Single Measurement""; ""Expanded Uncertainty, U""; ""Example""; ""Changing the Level of Confidence""; ""An Uncertainty Budget""; ""Chapter 5""
""Propagation of Uncertainty & An Uncertainty Budget Example""""""" General Principles""; ""Absolute and Relative Uncertainty""; ""Uncertainty Budgeta€?How to Use the Uncertainty Analysis to Improve the Accuracy of a Measurement Process""; ""Uncertainty Budget Example: Radiation Heat Transfer""; ""Conclusions""; ""Earlier Examples Revisited""; ""Chapter 6""; ""Sensitivity by Perturbation""; ""Returning to the CNC Cooling Fluid Problem""; ""Case Study""; ""A Fully Worked Example Developing the Uncertainty Analysis for a Process, Including a Discussion of Uncertainty Budgets""
""The Big Picture """""Description of the Experiment to Measure Viscosity ""; ""Measurements ""; ""Uncertainty Analysis ""; ""Transducer Uncertainty ""; ""Summary of Transducer Standard Uncertainties ""; ""Uncertainty of Measurement ""; ""Propagation of Uncertainty ""; ""Uncertainty Budgets ""; ""Uncertainty Budget Summary ""; ""Appendix""; ""The Mathematics of Resolution and Truncation ""; ""Derivation of the Standard Uncertainty When Using the Full-Resolution ""; ""Derivation of the Standard Uncertainty When Using the Half-Resolution ""
""Derivation of the Standard Uncertainty When Values Are Truncated ""

Sommario/riassunto

This volume presents measurement uncertainty and uncertainty budgets in a form accessible to practicing engineers and engineering students from across a wide range of disciplines. The book gives a detailed explanation of the methods presented by NIST in the “GUM” – Guide to Uncertainty of Measurement. Emphasis is placed on explaining the background and meaning of the topics, while keeping the level of mathematics at the minimum level necessary. Dr. Colin Ratcliffe, USNA, and Bridget Ratcliffe, Johns Hopkins, develop uncertainty budgets and explain their use. In some examples, the budget may show a process is already adequate and where costs can be saved. In other examples, the budget may show the process is inadequate and needs improvement. The book demonstrates how uncertainty budgets help identify the most cost effective place to make changes. In addition, an extensive fully-worked case study leads readers through all issues related to an uncertainty analysis, including a variety of different types of uncertainty budgets. The book is ideal for professional engineers and students concerned with a broad range of measurement assurance challenges in applied sciences. This book also: Facilitates practicing engineers’ understanding of uncertainty budgets, essential to calculating cost-effective savings to a wide variety of processes contingent on measurement Presents uncertainty budgets in an accessible style suitable for all undergraduate STEM courses that include a laboratory component Provides a highly adaptable supplement to graduate

textbooks for courses where students' work includes reporting on experimental results Includes an expanded case study developing uncertainty from transducers though measurands and propagated to the final measurement that can be used as a template for the analysis of many processes Stands as a useful pocket reference for all engineers and experimental scientists.