

**Measurement, instrumentation, and sensors handbook: spatial, mechanical, thermal, and radiation measurement** / John G. Webster, Halit Eren. 2<sup>nd</sup>. Ed.

ISBN 9781439848883

## Table of Contents

### ***Spatial, Mechanical, Thermal, and Radiation Measurement***

Preface

Acknowledgements

Editors

Contributors

### **Part I: Instrumentation and Measurement Concepts**

Measurements, Instrumentation, and Sensors

*Halit Eren*

Characteristics of Instrumentation

*John R. Hansman, Jr.*

Operational Modes of Instrumentation

*Richard S. Figliola*

Static and Dynamic Characteristics of Instrumentation

*Peter H. Sydenham*

Measurement Accuracy

*Ronald H. Dieck*

Development of Standards

*Halit Eren*

Measurement Standards

*DeWayne B. Sharp*

Calibrations in Instrumentation and Measurements

*Halit Eren*

Intelligent Sensors and Instruments

*Halit Eren*

Virtual Instruments

*David Potter and Halit Eren*

Fail-Safe Instruments and Devices

*Davide Quatrini, Giuseppe Fazio, Mauro Giacconi, and Adelio Salsano*

Dynamic Error Measurements of Force Sensors

*Akihiro Takita, Jin Tao, and Yusaku Fujii*

## **Part II: Spatial Variables**

Thickness Measurement

*John C. Brasunas, G. Mark Cushman, and Brook Lakew*

Distance Measurement

*W. John Ballantyne*

Altitude Measurement

*Dimitris E. Manolakis*

Attitude Measurement

*Mark A. Stedham, Partha P. Banerjee, Seiji Nishifumi, and Shogo Tanaka*

Inertial Navigation

*Halit Eren*

Level Measurement

*Detlef Brumbi*

Area Measurement

*Charles B. Coulbourn and Wolfgang P. Buerner*

Volume Measurement

*Rene G. Aarnink and Hessel Wijkstra*

Tilt Measurement

*Adam Chrzanowski and James M. Secord*

Proximity Sensing for Robotics

*Ricardo E. Saad, Ben Benhabib, A. Bonen, and K.C. Smith*

### **Part III: Displacement**

Resistive Displacement Sensors

*Keith Antonelli, James Ko, and Shyan Ku*

Inductive Displacement Sensors

*Halit Eren*

Capacitive Sensors: Displacement, Humidity, Force

*Halit Eren*

Piezoelectric Sensors and Transducers

*Ahmad Safari, Victor F. Janas, Amit Bandyopadhyay, and Andrei Khokhine*

Laser Interferometer Displacement Sensor

*Bernhard Gunther Zagar*

Bore-Gaging Displacement Sensors

*Viktor P. Astakhov*

Ultrasonic Displacement Sensors

*Nils Karlsson and Ole Pedersen*

Optical Encoder Displacement Sensors

*J.R. Rene Mayer*

Magnetic Displacement Sensors

*David S. Nyce*

Synchro/Resolver Displacement Sensors

*Robert M. Hyatt, Jr. and David Dayton*

Optical Fiber Displacement Sensors

*Richard O. Claus, Vikram Bhatia, and Anbo Wang*

Optical Beam Deflection Sensors

*Grover C. Wetzel*

Velocity Measurement

*Charles P. Pinney and William E. Baker*

#### **Part IV: Mechanical Variables**

Acceleration, Vibration, and Shock Measurement

*Halit Eren*

Strain Measurement

*Christopher S. Lynch*

Tactile Sensing

*Ricardo E. Saad, A. Bonen, K.C. Smith, and Ben Benhabib*

Pressure Measurement

*Kevin H.L. Chau*

Vacuum Measurement

*Ron Goehner, Emil Drubetsky, Howard M. Brady, and William H. Bayles, Jr.*

Force Measurement

*M.A. Elbestawi*

Angle Measurement

*Robert J. Sandberg*

Mass, Weights, and Instrumentation

*Emil Hazarian*

Torque and Power Measurement

*Ivan J. Garshelis*

Density Measurement

*Halit Eren*

Fluid Viscosity Measurement

*R.A. Secco, M. Kostic, and J.R. deBruyn*

Surface Tension Measurement

*David B. Thiessen and Kin F. Man*

**Part V: Acoustics**

Acoustic Measurement

*Per Rasmussen*

Ultrasound Measurement

*Peder C. Pedersen*

**Part VI: Flow and Spot Velocity**

Capillary-Type Mass Flow Meter

*Reza Pakdaman Zangabad and Manouchehr Bahrami*

Differential Pressure Flowmeters

*Richard Thorn*

Variable Area Flowmeters

*Adrian Melling, Herbert Köchner, and Reinhard Haak*

Positive Displacement Flowmeters

*Zaki D. Husain and Donald J. Wass*

Turbine and Vane Flowmeters

*David Wadlow*

Impeller Flowmeters

*Harold M. Miller*

Electromagnetic Flowmeters

*Halit Eren*

Ultrasonic Flowmeters

*Hans-Peter Vaterlaus, Thomas Hossle, Paolo Giordano, and Christophe Bruttin*

Vortex-Shedding Flowmeters

*Wade M. Mattar and James H. Vignos*

Thermal Anemometry

*Jugal K. Agarwal and John G. Olin*

Coriolis Effect Mass Flowmeters

*Jesse Yoder*

Drag Force Flowmeters

*Rekha Philip-Chandy, Roger Morgan, and Patricia J. Scully*

Pitot Probe Anemometer

*John A. Kleppe*

Thermal Dispersion Mass Flow Meters

*John G. Olin*

Laser Anemometry

*Rajan K. Menon*

## **Part VII: Thermal and Temperature Measurement**

Temperature Measurements, Scales, and Calibrations

*Franco Pavese*

Thermal Conductivity Measurement

*William A. Wakeham and Marc J. Assael*

Heat Flux

*Thomas E. Diller*

Resistive Thermometers

*Jim Burns*

Thermistor Thermometers

*Rod White and Meyer Sapoff*

Thermocouple Thermometry

*R.P. Reed*

Semiconductor Junction Thermometers

*Randy Frank*

Noncontact Thermometers

*Jacob Fraden*

Pyroelectric Detectors

*Jacob Fraden*

Liquid-in-Glass Thermometers

*Rod White and J.V. Nicholas*

Manometric Thermometers

*Franco Pavese*

Temperature Indicators

*Jan Stasiek, Tolestyn Madaj, and Jaroslaw Mikielewicz*

Fiber-Optic Thermometers

*Brian Culshaw*

Thermal Imaging

*Herbert M. Runciman*

Calorimetry Measurement

*Sander van Herwaarden and Elina Iervolino*

## **Part VIII: Radiation**

Radioactivity Measurement

*Bert M. Coursey*

Radioactivity Detectors

*Larry A. Franks, Ralph B. James, and Larry S. Darken*

Charged-Particle Measurement

*John C. Armitage, Madhu S. Dixit, Jacques Dubeau, Hans Mes, and F. Gerald Oakham*

Neutron Measurement

*Steven M. Grimes*

Dosimetry Measurement

*Brian L. Justus, Mark A. Miller, and Alan L. Huston*

**Part IX: Wireless Instrumentation**

Wireless Instrumentation

*J.P. Carmo and J.H. Correria*

Wireless Sensor Node Hardware

*Michael Healy, Thomas Newe, and Elfed Lewis*

Mobile Instrumentation with Wireless Design and Implementation

*Frederick Fortson and Kenneth Johnson*

Powering Autonomous Sensors

*Manel Gasulla, Maria Teresa Penella, and Oscar Lopez-Lapeña*

Wireless Sensing Technology

*Gregory C. Willden, Ben A. Abbott, and Ronald T. Green*

Telemetry

*Albert Lozano-Nieto*

**Part X: Control and Human Factors**

PID Control

*F. Greg Shinskey*

Optimal Control and the Software

*Halit Eren*

Electropneumatic and Electrohydraulic Instruments: Modeling

*M. Pachter and C.H. Houpis*

Explosion-Proof Instruments

*Sam S. Khalilieh*

Measurement and Identification of DC Brush and Brushless Stepping Motors

*Stuart Schweid, Robert Lofthus, and John McInroy*

Human Factors in Displays

*Jeffrey D. Onken, Barrett S. Caldwell, and Steven A. Murray*

Appendix: Units and Conversions

*B.W. Petley*

Index