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Nota di contenuto	Fundamentals of Instrumentation and Measurement; Table of Contents; Introduction; Chapter 1. Measurement Instrumentation; 1.1. General introduction and definitions; 1.2. The historical aspects of measurement; 1.3. Terminology: measurement, instrumentation and metrology; 1.4. MIM interactions: measurement-instrumentation-metrology; 1.5. Instrumentation; 1.6. Is a classification of instruments possible?; 1.6.1. Classification of instruments used in cars; 1.7.

Instrument modeling; 1.7.1. Model of a measurement instrument; 1.7.2. Load effects; 1.7.3. Estimating load effects 1.7.4. Effort and flow variables 1.7.5. Features and operating points of a system; 1.7.6. Generalized impedance; 1.7.7. Determining the load effect; 1.7.8. Measurement with a car battery; 1.7.9. Determining impedances; 1.7.10. Generalized admittance; 1.8. Characteristics of an instrument; 1.8.1. Components of static transfer functions; 1.8.2. Dynamic characteristics; 1.8.3. Instrument performance; 1.8.4. Combining transfer functions; 1.9. Implementing measurement acquisition; 1.9.1. Principles and methodology of measurement; 1.9.2. Field measurement constraints: instrumentation on the road 1.10. Analyzing measurements obtained by an instrument 1.10.1. Error reduction; 1.10.2. Base definitions; 1.11. Partial conclusion; 1.12. Electronic instrumentation; 1.13. Electronic instrumentation functionality; 1.13.1. Programmable instrumentation; 1.13.2. Example of an electronic instrument: how a piezoelectric sensor detects rattle in a combustion engine; 1.14. The role of instrumentation in quality control; 1.15. Conclusion; 1.16. Appendix; 1.17. Bibliography; Chapter 2. General Principles of Sensors; 2.1. General points; 2.1.1. Basic definitions; 2.1.2. Secondary definitions 2.2. Metrological characteristics of sensors 2.2.1. Systematic errors; 2.2.2. Random uncertainties; 2.2.3. Analyzing random errors and uncertainties; 2.2.3.1. Evaluating random uncertainties. Standard deviations. Variances; 2.2.3.2. Decisions about random uncertainties; 2.2.3.3. Reliability, accuracy, precision; 2.3. Sensor calibration; 2.3.1. Simple calibration; 2.3.2. Multiple calibration; 2.3.3. Linking international measurement systems; 2.4. Band pass and response time; 2.4.1. Harmonic response; 2.4.2. Response time; 2.5. Passive sensor conditioners 2.5.1. The effect of polarization instabilities 2.5.2. Effects of influence variables; 2.5.3. Conditioners of complex impedance sensors; 2.6. Conditioners for active sensors; 2.6.1. Direct reading; 2.6.2. Using operational amplifiers; 2.7. Bibliography; Chapter 3. Physical Principles of Optical, Thermal and Mechanical Sensors; 3.1. Optical sensors; 3.1.1. Energetic flux; 3.1.2. Luminous flux; 3.1.3. The relative luminous efficiency curve $V(\lambda)$ of the human eye; 3.1.4. The black body: a reference for optical sensors; 3.1.4.1. Black body radiation; 3.1.4.2. Realization of black bodies 3.1.5. Radiation exchanges between a source and a detector

Sommario/riassunto

This title presents the general principles of instrumentation processes. It explains the theoretical analysis of physical phenomena used by standard sensors and transducers to transform a physical value into an electrical signal. The pre-processing of these signals through electronic circuits - amplification, signal filtering and analog-to-digital conversion - is then detailed, in order to provide useful basic information. Attention is then given to general complex systems. Topics covered include instrumentation and measurement chains, sensor modeling, digital signal processing and diagnosti