
Automotive Sensors and Actuators

Principles, Systems, and Electronics



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Preface

The evolution of the automobile is now entirely driven by electronics and the software running within the various control units (ECUs) distributed throughout modern vehicles. Electronics plays an increasingly central role in managing systems and components that were once purely mechanical, hydraulic, or at most electromechanical. It now reaches every part of the vehicle to optimize performance, improve energy efficiency, reduce emissions, coordinate the internal combustion engine with the electric motor in hybrid vehicles, enhance both active and passive safety, and improve onboard comfort and travel experience for drivers and passengers.

To achieve all this, electronic control units and their software are not enough on their own. This extensive use of electronics requires accurate knowledge of the operating conditions of the systems and subsystems it is meant to control. The components responsible for providing this information are sensors, which can be seen as the “five senses” of automotive electronics. The components responsible for performing corrective actions or maintaining specific operating modes are the actuators, which function as the “arms” or hands of the control electronics.

The purpose of this volume is to list, describe, and explain the operation and structure of the main sensors and actuators used in automotive electronics. It begins with the basic concepts needed to understand the terminology and principles that appear throughout the analysis of each system.

After an introductory section consisting of the first two chapters, the content is organized by system. Sensors are addressed first, grouped by the systems to which they belong. This is followed by a study of the actuators, also organized by system. The volume concludes with a chapter dedicated to the electronic components that make up many of these sensors and actuators. This final section will be particularly useful for those interested in disassembling, testing, or repairing these devices.

Enjoy the reading!