

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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FORD MOTOR COMPANY

Petitioner

v.

ETHANOL BOOSTING SYSTEMS, LLC, and MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY,

Patent Owner

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Case: IPR2019-01400

U.S. Patent No. 8,069,839

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**DECLARATION OF DR. JAMES L. MULLINS**

I, Dr. James L. Mullins, declare as follows:

1. My name is Dr. James L. Mullins.
2. I have been retained by Alston & Bird, LLP on behalf of Ford Motor Company (“Ford” or “Petitioner”) in the above-captioned *inter partes* review relating to U.S. Patent No. 8,069,839 to provide opinions relating to books authored by (1) John A. Heywood, titled *Internal Combustion Engine Fundamentals* and published by McGraw-Hill in 1988 that includes 930 pages (“Heywood”), and (2) *Automotive Handbook*, 3<sup>rd</sup> Edition, edited by U. Adler published by Robert Bosch GmbH and distributed in the U.S.A. by Society of Automotive Engineers in 1993 that includes 852 pages (“Automotive 3<sup>rd</sup> Edition”). All statements made herein of my own knowledge are true, and all statements made herein based on information and belief are believed to be true.

## **I. INTRODUCTION**

3. I am presently Dean of Libraries Emeritus and Esther Ellis Norton Professor Emeritus, Purdue University. My career as a professional and academic/research spanned more than 44 years including library positions at Indiana University, Villanova University, Massachusetts Institute of Technology, and Purdue University. Ex. 1038 is a true and correct copy of my curriculum vitae describing my background and experience.

4. In 2018, I founded the firm Prior Art Documentation Librarian Services, LLC, located at 106 Berrow, Williamsburg, VA 23188 after purchasing the intellectual property of and successor to Prior Art Documentation, LLC located at 711 South Race Street, Urbana, IL 61801. Further information about my firm, Prior Art Documentation Librarian Services, LLC (PADLS), is available at [www.priorartdoelib.com](http://www.priorartdoelib.com).

5. I have been retained by Alston & Bird, LLP on behalf of Ford to offer my opinion on the authenticity and dates of public accessibility of (1) John A. Heywood, titled *Internal Combustion Engine Fundamentals* and published by McGraw-Hill in 1988 that includes 930 pages (“Heywood”), and (2) *Automotive Handbook*, 3<sup>rd</sup> Edition, edited by U. Adler published by Robert Bosch GmbH and distributed in the U.S.A. by Society of Automotive Engineers in 1993 that includes 852 pages (“Automotive 3<sup>rd</sup> Edition”) for use in the above-captioned *inter partes* review proceeding. For this service, I am being paid my usual hourly fee. I have no stake in the outcome of this proceeding or any related litigation or administrative proceedings, and my compensation in no way depends on the substance of my testimony or the outcome of this proceeding.

## **II. QUALIFICATIONS**

6. I received a Bachelor of Arts degree in History, Religion and Political Science in 1972 as well as a Master of Arts degree in Library Science in 1973 from

the University of Iowa. I received my Ph.D. in Academic Library Management in 1984 from Indiana University. Over the past forty-four years, I have held various positions in the field of library and information sciences.

7. I am presently Dean of Libraries Emeritus and Esther Ellis Norton Professor Emeritus at Purdue University, and have been since January 1, 2018. I have been previously employed as follows:

- Dean of Libraries and Professor and Esther Ellis Norton Professor, Purdue University, West Lafayette, IN (2004-2017)
- Assistant/Associate Director for Administration, Massachusetts Institute of Technology (MIT) Libraries, Cambridge, MA (2000-2004)
- University Librarian and Director, Falvey Memorial Library, Villanova University, Villanova, PA (1996-2000)
- Director of Library Services, Indiana University South Bend, South Bend, IN (1978-1996)
- Part-time instructor, School of Library and Information Science, Indiana University, Bloomington, IN (1979-1996)
- Associate Law Librarian, and associated titles, Indiana University School of Law, Bloomington, IN (1974-1978)
- Catalog Librarian, Assistant Professor, Georgia Southern College (now University), Statesboro, GA (1973-1974)

8. I am a member of the American Library Association (“ALA”), where I served as the chair of the Research Committee of the Association of College and Research Libraries (“ACRL”). My service to ALA included service on the editorial

board of the most prominent library journal, *College and Research Libraries*. I also served on the Standards Committee, College Section of the Association of College and Research Libraries, where I was instrumental in developing a re-issue of the *Standards for College Libraries* in 2000.

9. I am an author of numerous publications in the field of library science, and have given presentations in library sciences at national and international conferences. During more than 44 years as an academic librarian and library science scholar, I have gained extensive experience with catalog records and online library management systems (LMS) built using Machine-Readable Cataloging (“MARC”) standards. As an academic library administrator, I have had responsibility to ensure that students were educated to identify, locate, assess, and integrate information garnered from research library resources. I have also facilitated the research of faculty colleagues either directly or through the provision of and access to the requisite print and/or digital materials and services at the universities where I worked.

10. Based on my experience identified above and detailed in my curriculum vitae(*see* Ex. 1038), I consider myself to be an expert in the field of library science and academic library administration.

### **III. BACKGROUND ON PUBLIC ACCESSIBILITY**

#### **A. Scope of This Declaration**

11. I am not a lawyer, and I am not rendering an opinion on the legal question of whether a particular document is, or is not, a “printed publication” under the law. I am, however, rendering my expert opinion on the authenticity of the documents referenced herein and when and how this document was disseminated or otherwise made available to the extent that persons interested and ordinarily skilled in the subject matter or art, exercising reasonable diligence, could have located the document.

12. I am informed by counsel that an item is considered authentic if there is sufficient evidence to support a finding that the item is what it is claimed to be. I am also informed that authenticity can be established based on the contents of the documents themselves, such as the appearance, content, substance, internal patterns, or other distinctive characteristics of the item.

13. I am informed by counsel that a given reference qualifies as “publicly accessible” if it was disseminated or otherwise made available such that a person interested in and ordinarily skilled in the relevant subject matter could locate it through the exercise of ordinary diligence.

14. While I understand that the determination of public accessibility under the foregoing standard rests on a case-by-case analysis of the facts particular to an

individual publication, I also understand that a printed publication is rendered “publicly accessible” if it is cataloged and indexed by a library such that a person interested in the relevant subject matter could locate it (*i.e.*, I understand that cataloging and indexing by a library is sufficient, though there are other ways that a printed publication may qualify as “publicly accessible”). One manner of sufficient indexing is indexing according to subject matter. I understand that it is not necessary to prove someone actually looked at the printed publication in order to show it was publicly accessible by virtue of a library’s cataloging and indexing thereof. I understand that cataloging and indexing by a single library of a single instance of a particular printed publication is sufficient. I understand that, even if access to a library is restricted, a printed publication that has been cataloged and indexed therein is publicly accessible so long as a presumption is raised that the portion of the public concerned with the relevant subject matter would know of the printed publication. I also understand that the cataloging and indexing of information that would guide a person interested in the relevant subject matter to the printed publication, such as the cataloging and indexing of an abstract for the printed publication, is sufficient to render the printed publication publicly accessible.

15. I understand that evidence showing the specific date when a printed publication became publicly accessible is not necessary. Rather, routine business practices, such as general library cataloging and indexing practices, can be used to

establish an approximate date on which a printed publication became publicly accessible.

### **A. Library Catalog Records and Other Resources**

16. Some background on MARC (Machine-Readable Cataloging) formatted records, OCLC, and WorldCat is helpful to understand the library catalog records discussed in this declaration. I am fully familiar with the library cataloging standard known as the MARC standard, which is an industry-wide standard method of storing and organizing library catalog information.<sup>1</sup> MARC practices have been consistent since the MARC format was developed by the Library of Congress in the 1960s, and by the early 1970s became the U.S. national standard for disseminating bibliographic data. By the mid-1970s, MARC format became the international standard, and persists through the present. A MARC-compatible library is one that has a catalog consisting of individual MARC records for each of its items. The underlying MARC format (computer program) underpins the online public access catalog (OPAC) that is available to library users to locate a particular holding of a library. Today, MARC is the primary communications protocol for the transfer and

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<sup>1</sup> The full text of the standard is available from the Library of Congress at <http://www.loc.gov/marc/bibliographic/>.



storage of bibliographic metadata in libraries.<sup>2</sup> The MARC practices discussed below were in place during the late 1990s timeframe relevant to the documents referenced herein.

17. Online Computer Library Center (OCLC) is a not-for-profit world-wide consortium of libraries. Similar to MARC standards, OCLC's practices have been consistent since the 1970s through the present. Accordingly, the OCLC practices discussed below were in place during the timeframe discussed in my opinions section. OCLC was created "to establish, maintain and operate a computerized library network and to promote the evolution of library use, of libraries themselves, and of librarianship, and to provide processes and products for the benefit of library

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<sup>2</sup> Almost every major library in the world uses a catalog that is MARC-compatible. See, e.g., *MARC Frequently Asked Questions (FAQ)*, LIBRARY OF CONGRESS, <https://www.loc.gov/marc/faq.html> (last visited Jan. 24, 2018) ("MARC is the acronym for MACHine-Readable Cataloging. It defines a data format that emerged from a Library of Congress-led initiative that began over fifty years ago. It provides the mechanism by which computers exchange, use, and interpret bibliographic information, and its data elements make up the foundation of most library catalogs used today."). MARC is the ANSI/NISO Z39.2-1994 (reaffirmed 2009) standard for Information Interchange Format.

users and libraries, including such objectives as increasing availability of library resources to individual library patrons and reducing the rate of rise of library per-unit costs, all for the fundamental public purpose of furthering ease of access to and use of the ever-expanding body of worldwide scientific, literary and educational knowledge and information.”<sup>3</sup> Among other services, OCLC and its members are responsible for maintaining the WorldCat database (<http://www.worldcat.org/>), used by libraries throughout the world.

18. Libraries world-wide use the machine-readable MARC format for catalog records. MARC-formatted records include a variety of subject access points based on the content of the document being cataloged. A MARC record for a particular work comprises several fields, each of which contains specific data about the work. Each field is identified by a standardized, unique, three-digit code corresponding to the type of data that follows. For example, a work’s title is recorded in field 245, the primary author of the work is recorded in field 100, a work’s International Standard Book Number (“ISBN”) is recorded in field 020, and the work’s Library of Congress call number (assigned by Library of Congress) is

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<sup>3</sup> Third Article, Amended Articles of Incorporation of OCLC Online Computer Library Center, Incorporated (available at [http://www.oclc.org/en-US/councils/documents/amended\\_articles.html](http://www.oclc.org/en-US/councils/documents/amended_articles.html)).

recorded in field 050. Some fields can contain subfields, which are indicated by letters. For example, a work's publication date is recorded in field 260 under the subfield "c."

19. The MARC Field 040, subfield "a," identifies the library or other entity that created the catalog record in the MARC format. The MARC Field 008 identifies the date when this first MARC record was created.

20. The 9XX fields, which are not part of the standard MARC 21 format,<sup>4</sup> were defined by OCLC for use by the Library of Congress, for processing or holding notes for a local library, and for internal OCLC use. For example, the 955 field is reserved for use by the Library of Congress to track the progress of a new acquisition from the time it is submitted for Cataloging in Publication (CIP) review until it is published and fully cataloged and publicly available for use within the Library of Congress. Fields 901-907, 910, and 945-949 have been defined by OCLC for local use and will pass OCLC validation. Fields 905 or 910 are often used by an individual library for internal processing purposes, for example the date of cataloging and/or the initials of the cataloger.

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<sup>4</sup> <https://www.oclc.org/bibformats/en/9xx.html>

21. MARC records also include several fields that include subject matter classification information. An overview of MARC record fields is available through the Library of Congress at <http://www.loc.gov/marc/bibliographic/>. For example, 6XX fields are termed “Subject Access Fields.”<sup>5</sup> Among these, for example, is the 650 field; this is the “Subject Added Entry – Topical Term” field. *See* <http://www.loc.gov/marc/bibliographic/bd650.html>. The 650 field is a “[s]ubject added entry in which the entry element is a topical term.” *Id.* The 650 field entries “are assigned to a bibliographic record to provide access according to generally accepted thesaurus-building rules (e.g., *Library of Congress Subject Headings* (LCSH), *Medical Subject Headings* (MeSH)).” *Id.* Thus, a researcher can easily discover material relevant a topic of interest with a search using the terms employed in the MARC Fields 6XX.

22. Further, MARC records include call numbers, which themselves include a classification number. For example, the 050 field is dedicated as the “Library of Congress Call Number”<sup>6</sup> as assigned by the Library of Congress. A defined portion of the Library of Congress Call Number is the classification number, and “source of the classification number is *Library of Congress Classification* and

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<sup>5</sup> *See* <http://www.loc.gov/marc/bibliographic/bd6xx.html>.

<sup>6</sup> *See* <http://www.loc.gov/marc/bibliographic/bd050.html>.

the *LC Classification-Additions and Changes*.” *Id.* Thus, included in the 050 field is a subject matter classification as an example: TK5105.59 indicates books on computer networks – security measures. When a local library assigns a classification number, most often a Library of Congress derived classification number created by a local library cataloger or it could be a Dewey Decimal classification number for example, 005.8, computer networks – security measures, it appears in the 090 field. In either scenario, the MARC record includes a classification number in the call number field that represents a subject matter classification.

23. WorldCat is the world’s largest public online catalog, maintained by the OCLC, a not-for-profit international library consortium, and built with the records created by the thousands of libraries that are members of OCLC. OCLC provides bibliographic and abstract information to the public based on MARC-compliant records through its OCLC WorldCat database. WorldCat requires no knowledge of MARC tags and code and does not require a log-in or password. WorldCat is easily accessible through the World Wide Web to all who wish to search it; there are no restrictions to be a member of a particular community, etc. The date a given catalog record was created (corresponding to the MARC Field 008) appears in some detailed WorldCat records as the Date of Entry but not necessarily all. WorldCat does not provide a view of the underlying MARC format for a specific WorldCat record, in order to see the underlying MARC format searcher must locate

the book in a holding library listed among those shown in WorldCat, and search the online public catalog (OPAC) of a holding library. Whereas WorldCat records are widely available, the availability of library specific MARC formatted records varies from library to library. When a specific library wishes to make the underlying MARC format available there will be a link from the library's OPAC display, often identified as MARC record or librarian/staff view.

24. When a MARC record is created by the Library of Congress or an OCLC member institution, the date of creation for that record is automatically populated in the fixed field (008), characters 00 through 05 in year, month, day format (YYMMDD).<sup>7</sup> Therefore, the MARC record creation date reflects the date on which the publication associated with the record was first cataloged. Thereafter, the local library's computer system may automatically update the date in field 005 every time the library updates the MARC record (*e.g.*, to reflect that an item has been moved to a different shelving location within the library, or a reload of the bibliographic data with the introduction of a new library management system that creates and manages the OPAC).

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<sup>7</sup> Some of the newer library catalog systems also include hour, minute, second (HHMMSS).

## **B. Monograph Publications**

25. Monograph publications are written on a single topic, presented at length and distinguished from an article and include books, dissertations, and technical reports. A library typically creates a catalog record when the monograph is acquired by the library. First, it will search OCLC to determine if a record has already been created by the Library of Congress or another OCLC institution. If a record is found in OCLC, the record is downloaded into the library's LMS (Library Management System) that includes typically the OPAC (online public access catalog by which researchers locate a particular library holding in a user-friendly format), acquisitions, cataloging, and circulation integrated functions. Once the item is downloaded into the library's LMS, the library adds its identifier to the OCLC database so when a search is completed on WorldCat, the library will be indicated as an owner of the title. Once a record is created in a Library's LMS, it is searchable and viewable through the library's OPAC, typically by author, title, and subject heading, at that library and from anywhere in the world through the internet by accessing that library's OPAC. The OPAC also connects with the circulation function of the library, which typically indicates whether the record is available, in circulation, etc., with its call number and location in a specific departmental/disciplinary library, if applicable. The OPAC not only provides

immediate bibliographic access on site, it also facilitates the interlibrary loan process, which is when one publication is loaned from one library to another.

26. *Wisconsin TechSearch (WTS)* - WTS is a set of services offered by the University of Wisconsin Libraries. WTS offers an array of article delivery and research services to any individual or organization who requests the specialized skills of WTS staff in locating and retrieving information, regardless of whether the individual is affiliated with the University of Wisconsin.

#### **IV. OPINION REGARDING AUTHENTICITY AND PUBLIC ACCESSIBILITY**

**Document 1: John B. Heywood. *Internal Combustion Engine Fundamentals*. New York: McGraw-Hill Publishing Company, 1988. 930 pages. (“Heywood”)**

##### **A. Authentication**

27. I have been asked to opine on *Internal Combustion Engine Fundamentals* (“Heywood”). Heywood is a book authored by John B. Heywood which was published by McGraw-Hill Publishing Company in 1988. It contains, in 930 pages, Contents; Preface; Commonly Used Symbols, Subscripts, and Abbreviations; 15 Chapters; Appendixes; and an Index.

28. I have evaluated the Heywood reference in two ways: (1) by assessing scans of a copy of Heywood (Attachment 1A) provided by Wisconsin TechSearch (WTS) at my request from the Massachusetts Institute of Technology (MIT) Libraries; and (2) by requesting scans of Heywood from the Library of Engineering and Science, Purdue University Libraries (Attachment 1B).



29. Exhibit 1A is a scan of Heywood that includes: title page; verso of title page (copyright page) with handwritten notation stating call number “TJ755.H45 1988” and stamp that states “MASS. INST. TECH. LIBRARIES AUG 26 1991 Barker Engineering Library”.

30. All identifying characteristics, such as stamps and notations, on Attachment 1A are consistent with library practice and procedure that I have observed during my career as a professional librarian and specifically during my tenure as a librarian and administrator at MIT Libraries. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Heywood was found within the custody of a library, the Barker Engineering Library, MIT Libraries, one of the most likely locations for an authentic publication to be located.

31. The publication included as Attachment 1B was provided to me, at my request, from the Engineering and Science Library, Purdue University Libraries on July 9, 2019. Exhibit B contains scans of Heywood owned by the Purdue University Libraries including: scans of Heywood’s cover with Purdue University Libraries inventory bar code label and label with call number: “TJ755.H45 1988”; inside front cover flyleaf with stamp “ENGINEERING LIBRARY”; title page with handwritten Dewey Decimal call number: 621.43.H519i ; verso of the title page (copyright page); Table of Contents; back page flyleaf with book date due slip pocket with handwritten

Dewey Decimal call number “621.43.H519i c.1”, stamp that reads “ENGINEERING LIBRARY” and a label that reads “Heckman Bindery, North Manchester, Indiana 46962 and the date AUG 00”; and back cover.

32. Nothing about the condition of Attachment 1B from my experience as Dean of Libraries of Purdue University suggests any uncertainty about its authenticity. For example, the cover, inside front cover flyleaf, title page, verso of the title page (copyright page), contents, inside back cover flyleaf and back cover show no visible alterations to the document. In addition, Heywood was found within the custody of a library, the Purdue University Libraries, one of the most likely locations for an authentic publication to be located. Please note, the fact that there is both a Library of Congress call number and a Dewey Decimal call number reflects the decision I made while Dean of Libraries to convert the collections from Dewey Decimal classification to Library of Congress; this book would be one of those re-classified. It would not have affected its accessibility or retrieval since this conversion took place between 2015-2017 to the best of my knowledge.

33. I compared and found no difference between Attachment 1A with Attachment 1B. Accordingly, I affirm that Attachment 1A and Attachment 1B are of the same edition. I conclude that Attachment 1A and Attachment 1B were taken from a true and accurate copy of Heywood.

34. I conclude and affirm that Heywood is an authentic document.

## **B. Public Accessibility**

35. Attachment 1C is a true and correct copy of the WorldCat entry for Heywood for holdings in Massachusetts and Indiana. I obtained Attachment 1C by completing a search on WorldCat on July 4, 2019.

36. Attachment 1C shows that Heywood is the document associated with this WorldCat entry, as verified by the author: John B. Heywood; publisher and publication date: McGraw-Hill in 1988; title: *Internal Combustion Engine Fundamentals*; and ISBN: 00702863X. Heywood could have been located by searching for the author – John A. Heywood; title – Internal Combustion Engine Fundamentals; or by searching the subject headings: “Internal Combustion Engines; Moteurs a combustion interne; and/or Combustion – Interne – Moteur.”

37. When I searched WorldCat for holdings of Heywood in Massachusetts, MIT Libraries was third, and when I searched for holdings in Indiana, Purdue University Library was third among the 628 libraries shown as owning Heywood worldwide.

38. The searches discussed above could have been performed anywhere in the world by anyone who accessed WorldCat and its predecessor database through an OCLC member library in the 1990s to the present.

39. Attachment 1D is a download I made from MIT Libraries OPAC (online catalog) on June 18, 2019. The document cataloged in this record is

Heywood as verified by the fields listing: author - John A. Heywood; title - Internal Combustion Engine Fundamentals; and ISBN - 007028637X. I also compared the LC Classification (call number): TJ755.H45 1988 with that shown on the title and copyright pages of Attachment 1A, and it is the same on both. Heywood could have been located by searching for the author – John A. Heywood; title – *Internal Combustion Engine Fundamentals*; and/or by subject – Internal combustion engine. The MIT Libraries OPAC record indicates that it is in the Barker Library – Stacks : TJ755.H45 1988.

40. Attachment 1E is a download I made from MIT Libraries OPAC (online catalog) on June 18, 2019 that provides the MARC record for Heywood. The MARC record indicates in Field 910, (see description of the 9XX MARC field above), a date shown as: MHE880504ML. “880504” indicate the date: May 4, 1988. From my experience as a librarian and administrator and my knowledge of processes at MIT Libraries, this date indicates when the record was created for Heywood by a MIT Libraries cataloger and entered into the MIT Libraries OPAC. After the date of cataloging it would take a week for labeling and transfer to the shelf, thus Heywood would have been publicly accessible no later than May 11, 1988. The stamped date of August 26, 1991 indicates the original copy purchased in 1988 was lost or damaged, and was replaced on August 26, 1991. This copy would have been accessible in a week to ten days after receipt, therefore, September 6, 1991.

41. Attachment 1F is the Purdue University Library OPAC record. It is a download I made from Purdue OPAC (online catalog) on July 4, 2019. The document cataloged in this record is Heywood as verified by the fields listing: author - John A. Heywood; title - Internal Combustion Engine Fundamentals; and ISBN - 007028637X. I also compared the LC Classification (call number): TJ755.H45 1988 with that shown on the cover of Attachment 1B, and it is the same on both. Heywood could have been located by searching for the author – John A. Heywood; title – *Internal Combustion Engine Fundamentals* and/or subject – Internal combustion engine. The Purdue Libraries OPAC record indicates that it is shelved in the Engineering and Science Library. 2<sup>nd</sup> Floor WALC: TJ755.H45 1988. On Attachment 1B, the scans from the Purdue University Libraries copy of Heywood, the Heckman Bindery label AUG 00 (August 2000) indicates that the Purdue University Libraries copy of Heywood was re-bound due to wear (the binding appearance indicates it is not the original published cover). Therefore, the Purdue University Libraries copy of Heywood was accessible no later than August 2000.

### **Conclusion**

42. I conclude that Heywood is an authentic document and would have been publicly accessible through the Barker Engineering Library, MIT Libraries no later

than September 6, 1991 and at the Engineering Library, Purdue University no later than August 2000.

**Document 2: *Automotive Handbook*. 3<sup>rd</sup> Edition. Editor-in-Chief: Ulrich Adler. Stuttgart : Robert Bosch. Warrendale, Pennsylvania. Distributed in the USA by Society of Automotive Engineers, 1993. 852 pages. (“Automotive Handbook 3<sup>rd</sup> Edition”)**

**A. Authentication**

43. I have been asked to opine on *Automotive Handbook*, 3<sup>rd</sup> Edition (“Automotive Handbook 3<sup>rd</sup> Edition”). *Automotive Handbook 3<sup>rd</sup> Edition* is a book edited by Ulrich Adler which was published by Robert Bosch and distributed in the United States of America by the Society of Automotive Engineers in 1993. It contains, in 852 pages, sections titled: Physics basics; Mathematics, methods; Materials science; Machine elements; Bonding and joining techniques; Sheet-metal processing; Motor-vehicle dynamics; Internal-combustion (IC) engines; Engine cooling; Intake air, exhaust systems; Engine management, spark-ignition (SI) engines; Fuel management; Further engine-management; Integrated engine-management systems, Motronic; Engine test technology; Exhaust emissions, spark-ignition (SI) engines; Internal-combustion (IC) engines for alternative fuels; Engine management (diesel engines); Exhaust emissions (diesel engines); Auxiliary starting devices for diesel engines; Starting systems; Alternative drive systems; Drivetrain; Chassis systems; Braking systems; Road-vehicle systematic; Vehicle bodies, passenger-car; Vehicle bodies, commercial-vehicle; Lighting; Signaling and alarm

systems; Windshield, rear-window and headlamp cleaning systems, windshield and window glass; Heating, ventilation, and air-conditioning (HVAC); Communication and information systems; Safety systems; Comfort and convenience systems; Automotive hydraulics; Automotive hydraulics; Automotive pneumatics; Electrical system and power supply; Passenger-car-specifications; Road traffic legislation; Miscellaneous; and Index of Headings.

44. I have evaluated the Automotive Handbook 3<sup>rd</sup> Edition reference in two ways: (1) by assessing scans of a copy of Automotive Handbook 3<sup>rd</sup> Edition (Attachment 2A) provided by Wisconsin TechSearch (WTS) at my request from the Massachusetts Institute of Technology (MIT) Libraries; and (2) by requesting scans of Automotive Handbook 3<sup>rd</sup> Edition from the Purdue University Libraries (Attachment 2B).

45. Attachment 2A is a scan of Automotive Handbook 3<sup>rd</sup> Edition that includes: cover with MIT Libraries inventory bar code attached; inside front cover with bookplate indicating Massachusetts Institute of Technology Libraries; title page; verso of title page (copyright page) with handwritten notation stating call number “TL157.R613 1993” and stamp that states “MIT LIBRARIES RECEIVED FEB 12, 1993”; Foreword and For Your Information; and Contents with sections titled as described above.

46. All identifying characteristics, such as stamps and notations, on Attachment 2A are consistent with library practice and procedure that I observed during my career as a professional librarian and specifically during my tenure as a librarian and administrator at MIT Libraries. I have no cause for concern about the authenticity or accuracy of these identifying attributes. In addition, Automotive Handbook 3<sup>rd</sup> Edition was found within the custody of a library, the MIT Libraries, one of the most likely locations for an authentic publication to be located.

47. Attachment 2B was provided to me, at my request, from the Purdue University Libraries on July 9, 2019. Exhibit 2B contains scans of Automotive Handbook 3<sup>rd</sup> Edition owned by the Purdue University Libraries including: scans of Automotive Handbook's 3<sup>rd</sup> Edition cover; title page with handwritten Dewey Decimal call number: 629.23.R54KE 1993; verso of the title page (copyright page); Foreword to the 3<sup>rd</sup> Edition; Contents; inside back cover with Purdue University Libraries inventory bar code; stamp that reads "REFERENCE"; DEMCO date due book pocket with handwritten "1-13-97 [January 13, 1997] 629.23.R54KE 1993", REFERENCE DESK crossed out; ENGINEERING LIBRARY; and back cover.

48. Nothing about the condition of Attachment 2B from my experience as Dean of Libraries at Purdue University suggests any uncertainty about its authenticity. For example, the cover, title page, verso of the title page (copyright page), Foreword to the 3<sup>rd</sup> Edition; Contents; inside back cover and back cover show



no visible alterations to the document and is consistent with Purdue University Libraries policy and practice. In addition, Automotive Handbook 3<sup>rd</sup> Edition was found within the custody of a library, the Purdue University Libraries, one of the most likely locations for an authentic publication to be located.

49. I compared and found no difference between Attachment 2A with Attachment 2B. Accordingly, I affirm that Attachment 2A and Attachment 2B are of the same edition. I conclude that Attachment 2A and Attachment 2B were taken from a true and accurate copy of Automotive Handbook 3<sup>rd</sup> Edition.

50. I conclude and affirm that Automotive Handbook 3<sup>rd</sup> Edition is an authentic document.

#### **B. Public Accessibility**

51. Attachment 2C is a true and correct copy of the WorldCat entry for Automotive Handbook 3<sup>rd</sup> Edition for holdings in Massachusetts and Indiana. I obtained Attachment 2C by completing a search on WorldCat on July 4, 2019.

52. Attachment 2C shows that Automotive Handbook 3<sup>rd</sup> Edition is the document associated with these WorldCat entries, as verified by the author (editor): U Adler; publisher and publication date: Bosch, distributed in the USA by Society of Automotive Engineers; title: Automotive Handbook, 3<sup>rd</sup> Edition; and ISBN: 156091372X; 9781560913726; 0837603307; 9780837603308. Automotive Handbook 3<sup>rd</sup> Edition could have been located by searching for the author – U. Adler; title – *Automotive Handbook*, 3<sup>rd</sup> Edition; or by searching the subject

headings: “Automobile – Design and construction; Automobile – Design and construction – Handbooks, manuals, etc.; Manuals; and/or Automobiles.”

53. When I searched WorldCat for holdings of Automotive Handbook 3<sup>rd</sup> Edition in Massachusetts, MIT Libraries was third, and when I searched for holdings in Indiana, Purdue University Library was third among the 304 libraries shown as owning Automotive Handbook 3<sup>rd</sup> Edition worldwide.

54. The searches discussed above could have been performed anywhere in the world by anyone who accessed WorldCat and its predecessor database through an OCLC member library in the 1990s to the present.

55. Attachment 2D is a download I made from MIT Libraries OPAC (online catalog) on June 24, 2019. The document cataloged in this record is Automotive Handbook 3<sup>rd</sup> Edition as verified by the fields listing: author – U. Adler; title: *Automotive Handbook*, 3<sup>rd</sup> Edition; publisher and publication date: Bosch, distributed in the USA by Society of Automotive Engineers. 1993; and ISBN: 156091372X.

56. Automotive Handbook 3<sup>rd</sup> Edition could have been located in the MIT Libraries OPAC by searching for the author – U. Adler; title – *Automotive Handbook*, 3<sup>rd</sup> Edition; or by searching the subject heading: “Automobile – Design and construction – Handbooks, manuals, etc.” I also compared the LC Classification (call number): TL151.R613 1993 with that shown on the copyright page of

Attachment 2A, and it is the same on both. The MIT Libraries OPAC record indicates that it is in the Barker Library – Stacks : TL151.R613 1993.

57. Attachment 2E is a download I made from MIT Libraries OPAC (online catalog) on June 24, 2019 that provides the MARC record for Automotive Handbook 3<sup>rd</sup> Edition. The MARC record indicates in Field 910, (see description of the 9XX MARC field above), a date shown as: hk960405 “960405” indicates the date: April 5, 1996 (letters are initials of cataloger). From my experience as a librarian and administrator and my knowledge of processes at MIT Libraries, this date indicates when the record was created for Automotive Handbook 3<sup>rd</sup> Edition by a MIT Libraries cataloger and entered into the MIT Libraries OPAC. After the date of cataloging it would take a week to ten days for labeling and transfer to the shelf, thus Automotive Handbook 3<sup>rd</sup> Edition would have been publicly accessible no later than April 15, 1996.

58. Attachment 2F is the Purdue University Library OPAC record. It is a download I made from Purdue OPAC (online catalog) on July 4, 2019. The document cataloged in this record is Automotive Handbook 3<sup>rd</sup> Edition as verified by the fields listing: author: U. Adler; publisher and publication date: Bosch, distributed in the USA by Society of Automotive Engineers, 1993; title: Automotive Handbook, 3<sup>rd</sup> Edition; and ISBN: 0837603307.

59. I compared the Dewey Decimal Classification (call number): 629.23.R54kE 1993 with that shown on the title and copyright pages of Attachment 2B, and it is the same on both. Automotive Handbook 3<sup>rd</sup> Edition could have been located by searching for the author – U. Adler; title – *Automotive Handbook*, 3<sup>rd</sup> Edition; or by searching the subject heading: “Automobile – Design and construction – Handbooks, manuals, etc.”

60. The Purdue Libraries OPAC record indicates that it is shelved in “CLOSED Engineering. Closed Storage – Sign in to request 629.23.R54kE 1993”. As indicated by the date written on the Demco date due slip pock, January 13, 1997, Automotive Handbook 3<sup>rd</sup> Edition would have been available as of January 13, 1997.

### **C. Conclusion**

61. I conclude that Automotive Handbook 3<sup>rd</sup> Edition is an authentic document and would have been publicly accessible through the MIT Libraries no later than April 15, 1996 and Purdue University Libraries no later than January 13, 1997.

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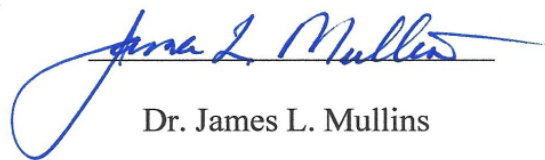
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Dated: July 26, 2019

  
Dr. James L. Mullins

# ATTACHMENT 1A

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# INTERNAL COMBUSTION ENGINE FUNDAMENTALS

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**John B. Heywood**

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Director, Sloan Automotive Laboratory  
Massachusetts Institute of Technology*

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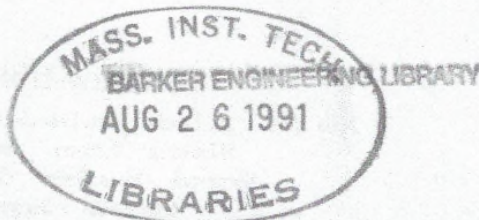
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# CONTENTS

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Preface	xvii
Commonly Used Symbols, Subscripts, and Abbreviations	xxiii
<b>Chapter 1</b> Engine Types and Their Operation	1
1.1 Introduction and Historical Perspective	1
1.2 Engine Classifications	7
1.3 Engine Operating Cycles	9
1.4 Engine Components	12
1.5 Spark-Ignition Engine Operation	15
1.6 Examples of Spark-Ignition Engines	19
1.7 Compression-Ignition Engine Operation	25
1.8 Examples of Diesel Engines	31
1.9 Stratified-Charge Engines	37
<b>Chapter 2</b> Engine Design and Operating Parameters	42
2.1 Important Engine Characteristics	42
2.2 Geometrical Properties of Reciprocating Engines	43
2.3 Brake Torque and Power	45
2.4 Indicated Work Per Cycle	46
2.5 Mechanical Efficiency	48
2.6 Road-Load Power	49
2.7 Mean Effective Pressure	50
2.8 Specific Fuel Consumption and Efficiency	51
2.9 Air/Fuel and Fuel/Air Ratios	53
	ix

2.10	Volumetric Efficiency	53
2.11	Engine Specific Weight and Specific Volume	54
2.12	Correction Factors for Power and Volumetric Efficiency	54
2.13	Specific Emissions and Emissions Index	56
2.14	Relationships between Performance Parameters	56
2.15	Engine Design and Performance Data	57
<b>Chapter 3</b>	<b>Thermochemistry of Fuel-Air Mixtures</b>	<b>62</b>
3.1	Characterization of Flames	62
3.2	Ideal Gas Model	64
3.3	Composition of Air and Fuels	64
3.4	Combustion Stoichiometry	68
3.5	The First Law of Thermodynamics and Combustion	72
3.5.1	Energy and Enthalpy Balances	72
3.5.2	Enthalpies of Formation	76
3.5.3	Heating Values	78
3.5.4	Adiabatic Combustion Processes	80
3.5.5	Combustion Efficiency of an Internal Combustion Engine	81
3.6	The Second Law of Thermodynamics Applied to Combustion	83
3.6.1	Entropy	83
3.6.2	Maximum Work from an Internal Combustion Engine and Efficiency	83
3.7	Chemically Reacting Gas Mixtures	85
3.7.1	Chemical Equilibrium	86
3.7.2	Chemical Reaction Rates	92
<b>Chapter 4</b>	<b>Properties of Working Fluids</b>	<b>100</b>
4.1	Introduction	100
4.2	Unburned Mixture Composition	102
4.3	Gas Property Relationships	107
4.4	A Simple Analytic Ideal Gas Model	109
4.5	Thermodynamic Charts	112
4.5.1	Unburned Mixture Charts	112
4.5.2	Burned Mixture Charts	116
4.5.3	Relation between Unburned and Burned Mixture Charts	123
4.6	Tables of Properties and Composition	127
4.7	Computer Routines for Property and Composition Calculations	130
4.7.1	Unburned Mixtures	130
4.7.2	Burned Mixtures	135
4.8	Transport Properties	141
4.9	Exhaust Gas Composition	145
4.9.1	Species Concentration Data	145
4.9.2	Equivalence Ratio Determination from Exhaust Gas Constituents	148
4.9.3	Effects of Fuel/Air Ratio Nonuniformity	152
4.9.4	Combustion Inefficiency	154

<b>Chapter 5</b>	<b>Ideal Models of Engine Cycles</b>	<b>161</b>
5.1	Introduction	161
5.2	Ideal Models of Engine Processes	162
5.3	Thermodynamic Relations for Engine Processes	164
5.4	Cycle Analysis with Ideal Gas Working Fluid with $c_v$ and $c_p$ Constant	169
5.4.1	Constant-Volume Cycle	169
5.4.2	Limited- and Constant-Pressure Cycles	172
5.4.3	Cycle Comparison	173
5.5	Fuel-Air Cycle Analysis	177
5.5.1	SI Engine Cycle Simulation	178
5.5.2	CI Engine Cycle Simulation	180
5.5.3	Results of Cycle Calculations	181
5.6	Overexpanded Engine Cycles	183
5.7	Availability Analysis of Engine Processes	186
5.7.1	Availability Relationships	186
5.7.2	Entropy Changes in Ideal Cycles	188
5.7.3	Availability Analysis of Ideal Cycles	189
5.7.4	Effect of Equivalence Ratio	192
5.8	Comparison with Real Engine Cycles	193
<b>Chapter 6</b>	<b>Gas Exchange Processes</b>	<b>205</b>
6.1	Inlet and Exhaust Processes in the Four-Stroke Cycle	206
6.2	Volumetric Efficiency	209
6.2.1	Quasi-Static Effects	209
6.2.2	Combined Quasi-Static and Dynamic Effects	212
6.2.3	Variation with Speed, and Valve Area, Lift, and Timing	216
6.3	Flow Through Valves	220
6.3.1	Poppet Valve Geometry and Timing	220
6.3.2	Flow Rate and Discharge Coefficients	225
6.4	Residual Gas Fraction	230
6.5	Exhaust Gas Flow Rate and Temperature Variation	231
6.6	Scavenging in Two-Stroke Cycle Engines	235
6.6.1	Two-Stroke Engine Configurations	235
6.6.2	Scavenging Parameters and Models	237
6.6.3	Actual Scavenging Processes	240
6.7	Flow Through Ports	245
6.8	Supercharging and Turbocharging	248
6.8.1	Methods of Power Boosting	248
6.8.2	Basic Relationships	249
6.8.3	Compressors	255
6.8.4	Turbines	263
6.8.5	Wave-Compression Devices	270
<b>Chapter 7</b>	<b>SI Engine Fuel Metering and Manifold Phenomena</b>	<b>279</b>
7.1	Spark-Ignition Engine Mixture Requirements	279
7.2	Carburetors	282

7.2.1	Carburetor Fundamentals	282
7.2.2	Modern Carburetor Design	285
7.3	Fuel-Injection Systems	294
7.3.1	Multipoint Port Injection	294
7.3.2	Single-Point Throttle-Body Injection	299
7.4	Feedback Systems	301
7.5	Flow Past Throttle Plate	304
7.6	Flow in Intake Manifolds	308
7.6.1	Design Requirements	308
7.6.2	Air-Flow Phenomena	309
7.6.3	Fuel-Flow Phenomena	314
<b>Chapter 8</b>	<b>Charge Motion within the Cylinder</b>	<b>326</b>
8.1	Intake Jet Flow	326
8.2	Mean Velocity and Turbulence Characteristics	330
8.2.1	Definitions	330
8.2.2	Application to Engine Velocity Data	336
8.3	Swirl	342
8.3.1	Swirl Measurement	343
8.3.2	Swirl Generation during Induction	345
8.3.3	Swirl Modification within the Cylinder	349
8.4	Squish	353
8.5	Prechamber Engine Flows	357
8.6	Crevice Flows and Blowby	360
8.7	Flows Generated by Piston-Cylinder Wall Interaction	365
<b>Chapter 9</b>	<b>Combustion in Spark-Ignition Engines</b>	<b>371</b>
9.1	Essential Features of Process	371
9.2	Thermodynamic Analysis of SI Engine Combustion	376
9.2.1	Burned and Unburned Mixture States	376
9.2.2	Analysis of Cylinder Pressure Data	383
9.2.3	Combustion Process Characterization	389
9.3	Flame Structure and Speed	390
9.3.1	Experimental Observations	390
9.3.2	Flame Structure	395
9.3.3	Laminar Burning Speeds	402
9.3.4	Flame Propagation Relations	406
9.4	Cyclic Variations in Combustion, Partial Burning, and Misfire	413
9.4.1	Observations and Definitions	413
9.4.2	Causes of Cycle-by-Cycle and Cylinder-to-Cylinder Variations	419
9.4.3	Partial Burning, Misfire, and Engine Stability	424
9.5	Spark Ignition	427
9.5.1	Ignition Fundamentals	427
9.5.2	Conventional Ignition Systems	437
9.5.3	Alternative Ignition Approaches	443
9.6	Abnormal Combustion: Knock and Surface Ignition	450
9.6.1	Description of Phenomena	450

	9.6.2 Knock Fundamentals	457
	9.6.3 Fuel Factors	470
<b>Chapter 10</b>	<b>Combustion in Compression-Ignition Engines</b>	<b>491</b>
10.1	Essential Features of Process	491
10.2	Types of Diesel Combustion Systems	493
	10.2.1 Direct-Injection Systems	493
	10.2.2 Indirect-Injection Systems	494
	10.2.3 Comparison of Different Combustion Systems	495
10.3	Phenomenological Model of Compression-Ignition Engine Combustion	497
	10.3.1 Photographic Studies of Engine Combustion	497
	10.3.2 Combustion in Direct-Injection, Multispray Systems	503
	10.3.3 Application of Model to Other Combustion Systems	506
10.4	Analysis of Cylinder Pressure Data	508
	10.4.1 Combustion Efficiency	509
	10.4.2 Direct-Injection Engines	509
	10.4.3 Indirect-Injection Engines	514
10.5	Fuel Spray Behavior	517
	10.5.1 Fuel Injection	517
	10.5.2 Overall Spray Structure	522
	10.5.3 Atomization	525
	10.5.4 Spray Penetration	529
	10.5.5 Droplet Size Distribution	532
	10.5.6 Spray Evaporation	535
10.6	Ignition Delay	539
	10.6.1 Definition and Discussion	539
	10.6.2 Fuel Ignition Quality	541
	10.6.3 Autoignition Fundamentals	542
	10.6.4 Physical Factors Affecting Delay	546
	10.6.5 Effect of Fuel Properties	550
	10.6.6 Correlations for Ignition Delay in Engines	553
10.7	Mixing-Controlled Combustion	555
	10.7.1 Background	555
	10.7.2 Spray and Flame Structure	555
	10.7.3 Fuel-Air Mixing and Burning Rates	558
<b>Chapter 11</b>	<b>Pollutant Formation and Control</b>	<b>567</b>
11.1	Nature and Extent of Problem	567
11.2	Nitrogen Oxides	572
	11.2.1 Kinetics of NO Formation	572
	11.2.2 Formation of NO <sub>2</sub>	577
	11.2.3 NO Formation in Spark-Ignition Engines	578
	11.2.4 NO <sub>x</sub> Formation in Compression-Ignition Engines	586
11.3	Carbon Monoxide	592
11.4	Unburned Hydrocarbon Emissions	596
	11.4.1 Background	596
	11.4.2 Flame Quenching and Oxidation Fundamentals	599

	11.4.3	HC Emissions from Spark-Ignition Engines	601
	11.4.4	Hydrocarbon Emission Mechanisms in Diesel Engines	620
11.5		Particulate Emissions	626
	11.5.1	Spark-Ignition Engine Particulates	626
	11.5.2	Characteristics of Diesel Particulates	626
	11.5.3	Particulate Distribution within the Cylinder	631
	11.5.4	Soot Formation Fundamentals	635
	11.5.5	Soot Oxidation	642
	11.5.6	Adsorption and Condensation	646
11.6		Exhaust Gas Treatment	648
	11.6.1	Available Options	648
	11.6.2	Catalytic Converters	649
	11.6.3	Thermal Reactors	657
	11.6.4	Particulate Traps	659
<b>Chapter 12</b>		<b>Engine Heat Transfer</b>	<b>668</b>
	12.1	Importance of Heat Transfer	668
	12.2	Modes of Heat Transfer	670
	12.2.1	Conduction	670
	12.2.2	Convection	670
	12.2.3	Radiation	671
	12.2.4	Overall Heat-Transfer Process	671
	12.3	Heat Transfer and Engine Energy Balance	673
	12.4	Convective Heat Transfer	676
	12.4.1	Dimensional Analysis	676
	12.4.2	Correlations for Time-Averaged Heat Flux	677
	12.4.3	Correlations for Instantaneous Spatial Average Coefficients	678
	12.4.4	Correlations for Instantaneous Local Coefficients	681
	12.4.5	Intake and Exhaust System Heat Transfer	682
	12.5	Radiative Heat Transfer	683
	12.5.1	Radiation from Gases	683
	12.5.2	Flame Radiation	684
	12.5.3	Prediction Formulas	688
	12.6	Measurements of Instantaneous Heat-Transfer Rates	689
	12.6.1	Measurement Methods	689
	12.6.2	Spark-Ignition Engine Measurements	690
	12.6.3	Diesel Engine Measurements	692
	12.6.4	Evaluation of Heat-Transfer Correlations	694
	12.6.5	Boundary-Layer Behavior	697
	12.7	Thermal Loading and Component Temperatures	698
	12.7.1	Component Temperature Distributions	698
	12.7.2	Effect of Engine Variables	701
<b>Chapter 13</b>		<b>Engine Friction and Lubrication</b>	<b>712</b>
	13.1	Background	712
	13.2	Definitions	714
	13.3	Friction Fundamentals	715

	13.3.1 Lubricated Friction	715
	13.3.2 Turbulent Dissipation	719
	13.3.3 Total Friction	719
13.4	Measurement Methods	719
13.5	Engine Friction Data	722
	13.5.1 SI Engines	722
	13.5.2 Diesel Engines	724
13.6	Engine Friction Components	725
	13.6.1 Motored Engine Breakdown Tests	725
	13.6.2 Pumping Friction	726
	13.6.3 Piston Assembly Friction	729
	13.6.4 Crankshaft Bearing Friction	734
	13.6.5 Valve Train Friction	737
13.7	Accessory Power Requirements	739
13.8	Lubrication	740
	13.8.1 Lubrication System	740
	13.8.2 Lubricant Requirements	741
<b>Chapter 14</b>	<b>Modeling Real Engine Flow and Combustion Processes</b>	<b>748</b>
14.1	Purpose and Classification of Models	748
14.2	Governing Equations for Open Thermodynamic System	750
	14.2.1 Conservation of Mass	750
	14.2.2 Conservation of Energy	751
14.3	Intake and Exhaust Flow Models	753
	14.3.1 Background	753
	14.3.2 Quasi-Steady Flow Models	753
	14.3.3 Filling and Emptying Methods	754
	14.3.4 Gas Dynamic Models	756
14.4	Thermodynamic-Based In-Cylinder Models	762
	14.4.1 Background and Overall Model Structure	762
	14.4.2 Spark-Ignition Engine Models	766
	14.4.3 Direct-Injection Engine Models	778
	14.4.4 Prechamber Engine Models	784
	14.4.5 Multicylinder and Complex Engine System Models	789
	14.4.6 Second Law Analysis of Engine Processes	792
14.5	Fluid-Mechanic-Based Multidimensional Models	797
	14.5.1 Basic Approach and Governing Equations	797
	14.5.2 Turbulence Models	800
	14.5.3 Numerical Methodology	803
	14.5.4 Flow Field Predictions	807
	14.5.5 Fuel Spray Modeling	813
	14.5.6 Combustion Modeling	816
<b>Chapter 15</b>	<b>Engine Operating Characteristics</b>	<b>823</b>
15.1	Engine Performance Parameters	823
15.2	Indicated and Brake Power and MEP	824

15.3	Operating Variables That Affect SI Engine Performance, Efficiency, and Emissions	827
15.3.1	Spark Timing	827
15.3.2	Mixture Composition	829
15.3.3	Load and Speed	839
15.3.4	Compression Ratio	841
15.4	SI Engine Combustion Chamber Design	844
15.4.1	Design Objectives and Options	844
15.4.2	Factors That Control Combustion	846
15.4.3	Factors That Control Performance	850
15.4.4	Chamber Octane Requirement	852
15.4.5	Chamber Optimization Strategy	857
15.5	Variables That Affect CI Engine Performance, Efficiency, and Emissions	858
15.5.1	Load and Speed	858
15.5.2	Fuel-Injection Parameters	863
15.5.3	Air Swirl and Bowl-in-Piston Design	866
15.6	Supercharged and Turbocharged Engine Performance	869
15.6.1	Four-Stroke Cycle SI Engines	869
15.6.2	Four-Stroke Cycle CI Engines	874
15.6.3	Two-Stroke Cycle SI Engines	881
15.6.4	Two-Stroke Cycle CI Engines	883
15.7	Engine Performance Summary	886
<b>Appendixes</b>		
A	Unit Conversion Factors	899
B	Ideal Gas Relationships	902
B.1	Ideal Gas Law	902
B.2	The Mole	903
B.3	Thermodynamic Properties	903
B.4	Mixtures of Ideal Gases	905
C	Equations for Fluid Flow through a Restriction	906
C.1	Liquid Flow	907
C.2	Gas Flow	907
D	Data on Working Fluids	911
	Index	917



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# INTERNAL COMBUSTION ENGINE FUNDAMENTALS

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# CONTENTS

---

Preface	xvii
Commonly Used Symbols, Subscripts, and Abbreviations	xxiii
<b>Chapter 1</b> Engine Types and Their Operation	1
1.1 Introduction and Historical Perspective	1
1.2 Engine Classifications	7
1.3 Engine Operating Cycles	9
1.4 Engine Components	12
1.5 Spark-Ignition Engine Operation	15
1.6 Examples of Spark-Ignition Engines	19
1.7 Compression-Ignition Engine Operation	25
1.8 Examples of Diesel Engines	31
1.9 Stratified-Charge Engines	37
<b>Chapter 2</b> Engine Design and Operating Parameters	42
2.1 Important Engine Characteristics	42
2.2 Geometrical Properties of Reciprocating Engines	43
2.3 Brake Torque and Power	45
2.4 Indicated Work Per Cycle	46
2.5 Mechanical Efficiency	48
2.6 Road-Load Power	49
2.7 Mean Effective Pressure	50
2.8 Specific Fuel Consumption and Efficiency	51
2.9 Air/Fuel and Fuel/Air Ratios	53
	ix

2.10	Volumetric Efficiency	53		
2.11	Engine Specific Weight and Specific Volume	54		
2.12	Correction Factors for Power and Volumetric Efficiency	54		
2.13	Specific Emissions and Emissions Index	56		
2.14	Relationships between Performance Parameters	56		
2.15	Engine Design and Performance Data	57		
<b>Chapter 3</b>	<b>Thermochemistry of Fuel-Air Mixtures</b>	<b>62</b>		
3.1	Characterization of Flames	62		
3.2	Ideal Gas Model	64		
3.3	Composition of Air and Fuels	64		
3.4	Combustion Stoichiometry	68		
3.5	The First Law of Thermodynamics and Combustion	72		
3.5.1	Energy and Enthalpy Balances	72		
3.5.2	Enthalpies of Formation	76		
3.5.3	Heating Values	78		
3.5.4	Adiabatic Combustion Processes	80		
3.5.5	Combustion Efficiency of an Internal Combustion Engine	81		
3.6	The Second Law of Thermodynamics Applied to Combustion	83		
3.6.1	Entropy	83		
3.6.2	Maximum Work from an Internal Combustion Engine and Efficiency	83		
3.7	Chemically Reacting Gas Mixtures	85		
3.7.1	Chemical Equilibrium	86		
3.7.2	Chemical Reaction Rates	92		
<b>Chapter 4</b>	<b>Properties of Working Fluids</b>	<b>100</b>		
4.1	Introduction	100		
4.2	Unburned Mixture Composition	102		
4.3	Gas Property Relationships	107		
4.4	A Simple Analytic Ideal Gas Model	109		
4.5	Thermodynamic Charts	112		
4.5.1	Unburned Mixture Charts	112		
4.5.2	Burned Mixture Charts	116		
4.5.3	Relation between Unburned and Burned Mixture Charts	123		
4.6	Tables of Properties and Composition	127		
4.7	Computer Routines for Property and Composition Calculations	130		
4.7.1	Unburned Mixtures	130		
4.7.2	Burned Mixtures	135		
4.8	Transport Properties	141		
4.9	Exhaust Gas Composition	145		
4.9.1	Species Concentration Data	145		
4.9.2	Equivalence Ratio Determination from Exhaust Gas Constituents	148		
4.9.3	Effects of Fuel/Air Ratio Nonuniformity	152		
4.9.4	Combustion Inefficiency	154		
<b>Chapter 5</b>	<b>Ideal Models of E</b>			
5.1	Introduction			
5.2	Ideal Models of Engine			
5.3	Thermodynamic Relatic			
5.4	Cycle Analysis with Ide Constant			
5.4.1	Constant-Volum			
5.4.2	Limited- and Co			
5.4.3	Cycle Comparis			
5.5	Fuel-Air Cycle Analysi			
5.5.1	SI Engine Cycle			
5.5.2	CI Engine Cycle			
5.5.3	Results of Cycle			
5.6	Overexpanded Engine			
5.7	Availability Analysis o			
5.7.1	Availability Rel.			
5.7.2	Entropy Chang			
5.7.3	Availability An			
5.7.4	Effect of Equiv			
5.8	Comparison with Real			
<b>Chapter 6</b>	<b>Gas Exchange P</b>			
6.1	Inlet and Exhaust Pro			
6.2	Volumetric Efficiency			
6.2.1	Quasi-Static El			
6.2.2	Combined Qu			
6.2.3	Variation with			
6.3	Flow Through Valves			
6.3.1	Poppet Valve			
6.3.2	Flow Rate and			
6.4	Residual Gas Fractio			
6.5	Exhaust Gas Flow R			
6.6	Scavenging in Two-S			
6.6.1	Two-Stroke E			
6.6.2	Scavenging Pe			
6.6.3	Actual Scaven			
6.7	Flow Through Ports			
6.8	Supercharging and T			
6.8.1	Methods of P			
6.8.2	Basic Relatio			
6.8.3	Compressors			
6.8.4	Turbines			
6.8.5	Wave-Compr			
<b>Chapter 7</b>	<b>SI Engine Fuel Phenomena</b>			
7.1	Spark-Ignition Engi			
7.2	Carburetors			

<b>Chapter 5</b>	<b>Ideal Models of Engine Cycles</b>	<b>161</b>
5.1	Introduction	161
5.2	Ideal Models of Engine Processes	162
5.3	Thermodynamic Relations for Engine Processes	164
5.4	Cycle Analysis with Ideal Gas Working Fluid with $c_v$ and $c_p$	
	Constant	169
5.4.1	Constant-Volume Cycle	169
5.4.2	Limited- and Constant-Pressure Cycles	172
5.4.3	Cycle Comparison	173
5.5	Fuel-Air Cycle Analysis	177
5.5.1	SI Engine Cycle Simulation	178
5.5.2	CI Engine Cycle Simulation	180
5.5.3	Results of Cycle Calculations	181
5.6	Overexpanded Engine Cycles	183
5.7	Availability Analysis of Engine Processes	186
5.7.1	Availability Relationships	186
5.7.2	Entropy Changes in Ideal Cycles	188
5.7.3	Availability Analysis of Ideal Cycles	189
5.7.4	Effect of Equivalence Ratio	192
5.8	Comparison with Real Engine Cycles	193
<b>Chapter 6</b>	<b>Gas Exchange Processes</b>	<b>205</b>
6.1	Inlet and Exhaust Processes in the Four-Stroke Cycle	206
6.2	Volumetric Efficiency	209
6.2.1	Quasi-Static Effects	209
6.2.2	Combined Quasi-Static and Dynamic Effects	212
6.2.3	Variation with Speed, and Valve Area, Lift, and Timing	216
6.3	Flow Through Valves	220
6.3.1	Poppet Valve Geometry and Timing	220
6.3.2	Flow Rate and Discharge Coefficients	225
6.4	Residual Gas Fraction	230
6.5	Exhaust Gas Flow Rate and Temperature Variation	231
6.6	Scavenging in Two-Stroke Cycle Engines	235
6.6.1	Two-Stroke Engine Configurations	235
6.6.2	Scavenging Parameters and Models	237
6.6.3	Actual Scavenging Processes	240
6.7	Flow Through Ports	245
6.8	Supercharging and Turbocharging	248
6.8.1	Methods of Power Boosting	248
6.8.2	Basic Relationships	249
6.8.3	Compressors	255
6.8.4	Turbines	263
6.8.5	Wave-Compression Devices	270
<b>Chapter 7</b>	<b>SI Engine Fuel Metering and Manifold Phenomena</b>	<b>279</b>
7.1	Spark-Ignition Engine Mixture Requirements	279
7.2	Carburetors	282



7.2.1	Carburetor Fundamentals	282	9.6.2	Knock Fundamentals	
7.2.2	Modern Carburetor Design	285	9.6.3	Fuel Factors	
7.3	Fuel-Injection Systems	294			
7.3.1	Multipoint Port Injection	294			
7.3.2	Single-Point Throttle-Body Injection	299			
7.4	Feedback Systems	301			
7.5	Flow Past Throttle Plate	304			
7.6	Flow in Intake Manifolds	308			
7.6.1	Design Requirements	308			
7.6.2	Air-Flow Phenomena	309			
7.6.3	Fuel-Flow Phenomena	314			
<b>Chapter 8</b>	<b>Charge Motion within the Cylinder</b>	<b>326</b>	<b>Chapter 10</b>	<b>Combustion in Compression-Ignition Engines</b>	
8.1	Intake Jet Flow	326	10.1	Essential Features of Process	
8.2	Mean Velocity and Turbulence Characteristics	330	10.2	Types of Diesel Combustion	
8.2.1	Definitions	330	10.2.1	Direct-Injection Systems	
8.2.2	Application to Engine Velocity Data	336	10.2.2	Indirect-Injection Systems	
8.3	Swirl	342	10.2.3	Comparison of Direct and Indirect Injection	
8.3.1	Swirl Measurement	343	10.3	Phenomenological Model of Combustion	
8.3.2	Swirl Generation during Induction	345	10.3.1	Photographic Studies	
8.3.3	Swirl Modification within the Cylinder	349	10.3.2	Combustion in Diesel Engines	
8.4	Squish	353	10.3.3	Application of Models	
8.5	Prechamber Engine Flows	357	10.4	Analysis of Cylinder Pressure	
8.6	Crevice Flows and Blowby	360	10.4.1	Combustion Efficiency	
8.7	Flows Generated by Piston-Cylinder Wall Interaction	365	10.4.2	Direct-Injection Engines	
			10.4.3	Indirect-Injection Engines	
			10.5	Fuel Spray Behavior	
			10.5.1	Fuel Injection	
			10.5.2	Overall Spray Structure	
			10.5.3	Atomization	
			10.5.4	Spray Penetration	
			10.5.5	Droplet Size Distribution	
			10.5.6	Spray Evaporation	
			10.6	Ignition Delay	
			10.6.1	Definition and Effect	
			10.6.2	Fuel Ignition Quality	
			10.6.3	Autoignition Fuel	
			10.6.4	Physical Factors	
			10.6.5	Effect of Fuel Pressure	
			10.6.6	Correlations for Ignition Delay	
			10.7	Mixing-Controlled Combustion	
			10.7.1	Background	
			10.7.2	Spray and Flame Interaction	
			10.7.3	Fuel-Air Mixing	
<b>Chapter 9</b>	<b>Combustion in Spark-Ignition Engines</b>	<b>371</b>	<b>Chapter 11</b>	<b>Pollutant Formation</b>	
9.1	Essential Features of Process	371	11.1	Nature and Extent of Pollutants	
9.2	Thermodynamic Analysis of SI Engine Combustion	376	11.2	Nitrogen Oxides	
9.2.1	Burned and Unburned Mixture States	376	11.2.1	Kinetics of NO <sub>x</sub>	
9.2.2	Analysis of Cylinder Pressure Data	383	11.2.2	Formation of NO <sub>x</sub>	
9.2.3	Combustion Process Characterization	389	11.2.3	NO Formation	
9.3	Flame Structure and Speed	390	11.2.4	NO <sub>x</sub> Formation	
9.3.1	Experimental Observations	390	11.3	Carbon Monoxide	
9.3.2	Flame Structure	395	11.4	Unburned Hydrocarbons	
9.3.3	Laminar Burning Speeds	402	11.4.1	Background	
9.3.4	Flame Propagation Relations	406	11.4.2	Flame Quench	
9.4	Cyclic Variations in Combustion, Partial Burning, and Misfire	413			
9.4.1	Observations and Definitions	413			
9.4.2	Causes of Cycle-by-Cycle and Cylinder-to-Cylinder Variations	419			
9.4.3	Partial Burning, Misfire, and Engine Stability	424			
9.5	Spark Ignition	427			
9.5.1	Ignition Fundamentals	427			
9.5.2	Conventional Ignition Systems	437			
9.5.3	Alternative Ignition Approaches	443			
9.6	Abnormal Combustion: Knock and Surface Ignition	450			
9.6.1	Description of Phenomena	450			

	9.6.2 Knock Fundamentals	457
	9.6.3 Fuel Factors	470
<b>Chapter 10</b>	<b>Combustion in Compression-Ignition Engines</b>	<b>491</b>
10.1	Essential Features of Process	491
10.2	Types of Diesel Combustion Systems	493
	10.2.1 Direct-Injection Systems	493
	10.2.2 Indirect-Injection Systems	494
	10.2.3 Comparison of Different Combustion Systems	495
10.3	Phenomenological Model of Compression-Ignition Engine Combustion	497
	10.3.1 Photographic Studies of Engine Combustion	497
	10.3.2 Combustion in Direct-Injection, Multispray Systems	503
	10.3.3 Application of Model to Other Combustion Systems	506
10.4	Analysis of Cylinder Pressure Data	508
	10.4.1 Combustion Efficiency	509
	10.4.2 Direct-Injection Engines	509
	10.4.3 Indirect-Injection Engines	514
10.5	Fuel Spray Behavior	517
	10.5.1 Fuel Injection	517
	10.5.2 Overall Spray Structure	522
	10.5.3 Atomization	525
	10.5.4 Spray Penetration	529
	10.5.5 Droplet Size Distribution	532
	10.5.6 Spray Evaporation	535
10.6	Ignition Delay	539
	10.6.1 Definition and Discussion	539
	10.6.2 Fuel Ignition Quality	541
	10.6.3 Autoignition Fundamentals	542
	10.6.4 Physical Factors Affecting Delay	546
	10.6.5 Effect of Fuel Properties	550
	10.6.6 Correlations for Ignition Delay in Engines	553
10.7	Mixing-Controlled Combustion	555
	10.7.1 Background	555
	10.7.2 Spray and Flame Structure	555
	10.7.3 Fuel-Air Mixing and Burning Rates	558
<b>Chapter 11</b>	<b>Pollutant Formation and Control</b>	<b>567</b>
11.1	Nature and Extent of Problem	567
11.2	Nitrogen Oxides	572
	11.2.1 Kinetics of NO Formation	572
	11.2.2 Formation of NO <sub>2</sub>	577
	11.2.3 NO Formation in Spark-Ignition Engines	578
	11.2.4 NO <sub>x</sub> Formation in Compression-Ignition Engines	586
11.3	Carbon Monoxide	592
11.4	Unburned Hydrocarbon Emissions	596
	11.4.1 Background	596
	11.4.2 Flame Quenching and Oxidation Fundamentals	599

11.4.3	HC Emissions from Spark-Ignition Engines	601	13.3.1	Lubricated Frictic	
11.4.4	Hydrocarbon Emission Mechanisms in Diesel Engines	620	13.3.2	Turbulent Dissipa	
11.5	Particulate Emissions	626	13.3.3	Total Friction	
11.5.1	Spark-Ignition Engine Particulates	626	13.4	Measurement Methods	
11.5.2	Characteristics of Diesel Particulates	626	13.5	Engine Friction Data	
11.5.3	Particulate Distribution within the Cylinder	631	13.5.1	SI Engines	
11.5.4	Soot Formation Fundamentals	635	13.5.2	Diesel Engines	
11.5.5	Soot Oxidation	642	13.6	Engine Friction Compone	
11.5.6	Adsorption and Condensation	646	13.6.1	Motored Engine I	
11.6	Exhaust Gas Treatment	648	13.6.2	Pumping Friction	
11.6.1	Available Options	648	13.6.3	Piston Assembly I	
11.6.2	Catalytic Converters	649	13.6.4	Crankshaft Bearir	
11.6.3	Thermal Reactors	657	13.6.5	Valve Train Fricti	
11.6.4	Particulate Traps	659	13.7	Accessory Power Require	
			13.8	Lubrication	
			13.8.1	Lubrication Syste	
			13.8.2	Lubricant Require	
<b>Chapter 12</b>	<b>Engine Heat Transfer</b>	<b>668</b>			
12.1	Importance of Heat Transfer	668	<b>Chapter 14</b>	<b>Modeling Real Eng</b>	
12.2	Modes of Heat Transfer	670		<b>Processes</b>	
12.2.1	Conduction	670	14.1	Purpose and Classificatio	
12.2.2	Convection	670	14.2	Governing Equations for	
12.2.3	Radiation	670	14.2.1	Conservation of I	
12.2.4	Overall Heat-Transfer Process	671	14.2.2	Conservation of I	
12.3	Heat Transfer and Engine Energy Balance	671	14.3	Intake and Exhaust Flow	
12.4	Convective Heat Transfer	673	14.3.1	Background	
12.4.1	Dimensional Analysis	676	14.3.2	Quasi-Steady Flc	
12.4.2	Correlations for Time-Averaged Heat Flux	676	14.3.3	Filling and Empt	
12.4.3	Correlations for Instantaneous Spatial	677	14.3.4	Gas Dynamic M	
	Average Coefficients	678	14.4	Thermodynamic-Based I	
12.4.4	Correlations for Instantaneous Local Coefficients	681	14.4.1	Background and	
12.4.5	Intake and Exhaust System Heat Transfer	682	14.4.2	Spark-Ignition E	
12.5	Radiative Heat Transfer	683	14.4.3	Direct-Injection I	
12.5.1	Radiation from Gases	683	14.4.4	Prechamber Eng	
12.5.2	Flame Radiation	684	14.4.5	Multicylinder an	
12.5.3	Prediction Formulas	688	14.4.6	Second Law Ana	
12.6	Measurements of Instantaneous Heat-Transfer Rates	689	14.5	Fluid-Mechanic-Based I	
12.6.1	Measurement Methods	689	14.5.1	Basic Approach ;	
12.6.2	Spark-Ignition Engine Measurements	690	14.5.2	Turbulence Mod	
12.6.3	Diesel Engine Measurements	692	14.5.3	Numerical Meth	
12.6.4	Evaluation of Heat-Transfer Correlations	694	14.5.4	Flow Field Predi	
12.6.5	Boundary-Layer Behavior	697	14.5.5	Fuel Spray Mod	
12.7	Thermal Loading and Component Temperatures	698	14.5.6	Combustion Mo	
12.7.1	Component Temperature Distributions	698			
12.7.2	Effect of Engine Variables	701			
<b>Chapter 13</b>	<b>Engine Friction and Lubrication</b>	<b>712</b>	<b>Chapter 15</b>	<b>Engine Operating</b>	
13.1	Background	712	15.1	Engine Performance Par	
13.2	Definitions	714	15.2	Indicated and Brake Po	
13.3	Friction Fundamentals	715			

	13.3.1 Lubricated Friction	715
	13.3.2 Turbulent Dissipation	719
	13.3.3 Total Friction	719
13.4	Measurement Methods	719
13.5	Engine Friction Data	722
	13.5.1 SI Engines	722
	13.5.2 Diesel Engines	724
13.6	Engine Friction Components	725
	13.6.1 Motored Engine Breakdown Tests	725
	13.6.2 Pumping Friction	726
	13.6.3 Piston Assembly Friction	729
	13.6.4 Crankshaft Bearing Friction	734
	13.6.5 Valve Train Friction	737
13.7	Accessory Power Requirements	739
13.8	Lubrication	740
	13.8.1 Lubrication System	740
	13.8.2 Lubricant Requirements	741
<b>Chapter 14</b>	<b>Modeling Real Engine Flow and Combustion Processes</b>	<b>748</b>
14.1	Purpose and Classification of Models	748
14.2	Governing Equations for Open Thermodynamic System	750
	14.2.1 Conservation of Mass	750
	14.2.2 Conservation of Energy	751
14.3	Intake and Exhaust Flow Models	753
	14.3.1 Background	753
	14.3.2 Quasi-Steady Flow Models	753
	14.3.3 Filling and Emptying Methods	754
	14.3.4 Gas Dynamic Models	756
14.4	Thermodynamic-Based In-Cylinder Models	762
	14.4.1 Background and Overall Model Structure	762
	14.4.2 Spark-Ignition Engine Models	766
	14.4.3 Direct-Injection Engine Models	778
	14.4.4 Prechamber Engine Models	784
	14.4.5 Multicylinder and Complex Engine System Models	789
	14.4.6 Second Law Analysis of Engine Processes	792
14.5	Fluid-Mechanic-Based Multidimensional Models	797
	14.5.1 Basic Approach and Governing Equations	797
	14.5.2 Turbulence Models	800
	14.5.3 Numerical Methodology	803
	14.5.4 Flow Field Predictions	807
	14.5.5 Fuel Spray Modeling	813
	14.5.6 Combustion Modeling	816
<b>Chapter 15</b>	<b>Engine Operating Characteristics</b>	<b>823</b>
15.1	Engine Performance Parameters	823
15.2	Indicated and Brake Power and MEP	824

15.3	Operating Variables That Affect SI Engine Performance, Efficiency, and Emissions	827
15.3.1	Spark Timing	827
15.3.2	Mixture Composition	829
15.3.3	Load and Speed	839
15.3.4	Compression Ratio	841
15.4	SI Engine Combustion Chamber Design	844
15.4.1	Design Objectives and Options	844
15.4.2	Factors That Control Combustion	846
15.4.3	Factors That Control Performance	850
15.4.4	Chamber Octane Requirement	852
15.4.5	Chamber Optimization Strategy	857
15.5	Variables That Affect CI Engine Performance, Efficiency, and Emissions	858
15.5.1	Load and Speed	858
15.5.2	Fuel-Injection Parameters	863
15.5.3	Air Swirl and Bowl-in-Piston Design	866
15.6	Supercharged and Turbocharged Engine Performance	869
15.6.1	Four-Stroke Cycle SI Engines	869
15.6.2	Four-Stroke Cycle CI Engines	874
15.6.3	Two-Stroke Cycle SI Engines	881
15.6.4	Two-Stroke Cycle CI Engines	883
15.7	Engine Performance Summary	886
<b>Appendixes</b>		
A	Unit Conversion Factors	899
B	Ideal Gas Relationships	902
B.1	Ideal Gas Law	902
B.2	The Mole	903
B.3	Thermodynamic Properties	903
B.4	Mixtures of Ideal Gases	905
C	Equations for Fluid Flow through a Restriction	906
C.1	Liquid Flow	907
C.2	Gas Flow	907
D	Data on Working Fluids	911
	Index	917

Internal combustion engines date to the spark-ignition engine and 1892 when the internal combustion engine was first used in an automobile. Since that time these engines and the technology of engine processes has increased, and the demand for new types of engine and engine use changed. Internal combustion engines and their manufacture and support have expanded into new fields of power, propulsion, and energy. There has been an explosive growth in engine research, development, and market competition. An enormous technical literature has been developed and summarized adequately organized and summarized.

This book has been written as a reference for the student and to that need. It contains a broadly based treatment of the principles which govern internal combustion engines and attempts to provide a simplifying framework for the technical material that now exists. It is intended to be a sound knowledge of the relevant fundamentals of internal combustion engines, and at the same time to provide a base which has been built up over the years by research, development, and design. It is intended to be about engines. The emphasis here is on the fundamentals of internal combustion engines and chemistry, fluid flow, heat transfer, and combustion, and the fuels requirements.

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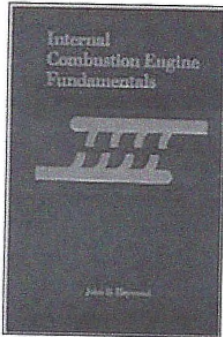
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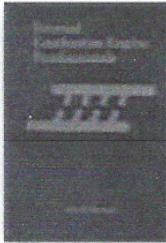
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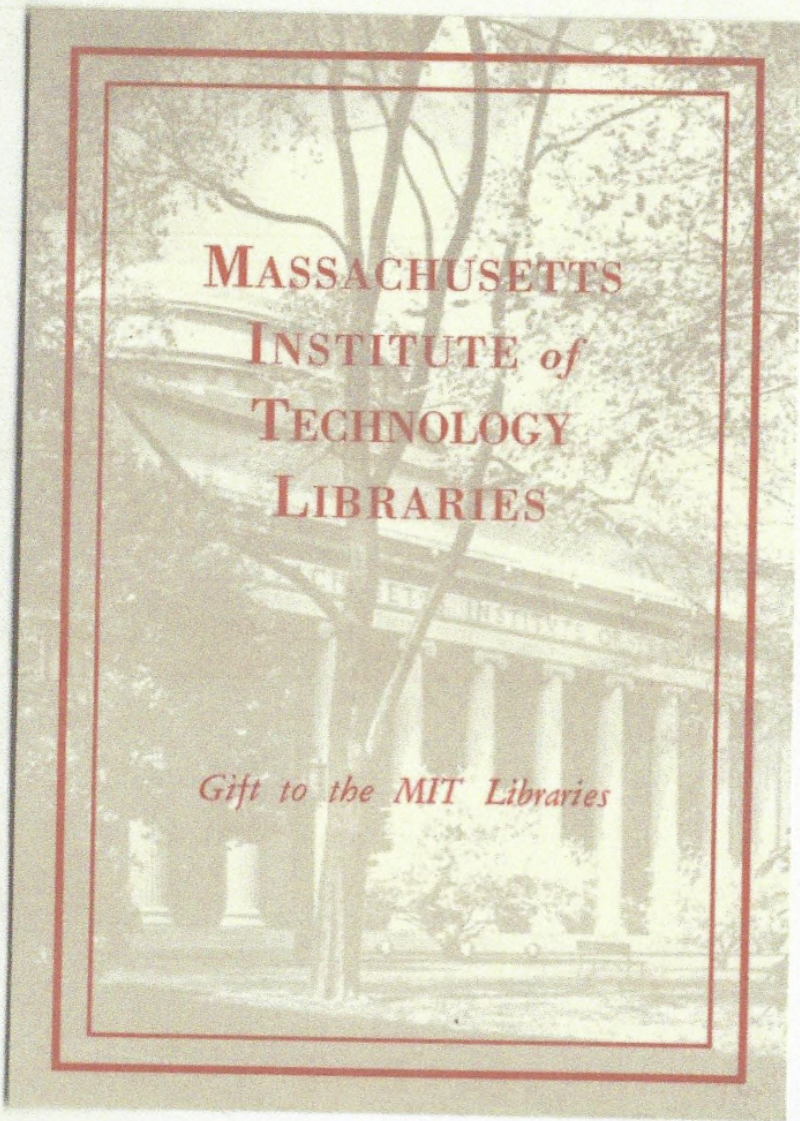
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## Foreword to the 3rd Edition

The "Automotive Handbook" is a handy, concise, pocket-sized technical reference work. Its primary purpose is to provide the automotive engineer, the mechanic, the student, and all those interested in technical matters, with a wealth of reliable technical data as well as an insight into present-day state-of-the-art automotive technology in Germany. With this assignment in mind, the scope of the theoretical chapters dealing with **passenger cars and commercial vehicles**, as well as the remaining contents, has been kept to the practical and necessary level.

With the framework of a pocket-sized handbook, it is impossible to present a detailed coverage of individual technical subjects. On the other hand, with the very wide range of users in mind, we did not want to dispense with generally applicable topics and data.

We recommend that you leaf through this Automotive Handbook before attempting to use it, this will prove to be a valuable help when you actually want to refer to a particular point at a later date.

The addition of new technical subjects and the expansion and up-dating of existing material are reflected in the fact that this 3rd Edition is 140 pages longer than its predecessor.

This 3rd English Edition was revised and up-dated by specialists from the Bosch Group, as were the two previous editions. For certain chapters, other firms also made contributions. At this point, we would like to express our appreciation to all concerned.

The editors

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## For your information:

Compared to the 2nd Edition, we have up-dated the following subjects:

- Oscillations: Modal analysis
- Electronics: Solar cells, PC-board techniques, micromechanics, mechatronics, A/D conversion
- Technical optics: Laser engineering, beam waveguides
- Materials: Automotive paints
- Motor-vehicle dynamics:
  - Driving dynamics (as per ISO)
- Exhaust systems: Catalytic converters, soot filters
- Engine management (spark-ignition (SI) engines):
  - Electronic engine-power control (EMS), electronic boost-pressure control, variable-length intake manifold, evaporative-emissions control, exhaust-gas recirculation (EGR), alcohol/hydrogen-powered engines
- Engine management (diesel engines):
  - In-line control-sleeve fuel-injection pump, unit injectors (PDE), exhaust-gas analyzers
- Drivetrain: Traction control (ASR)
- Suspension: Suspension systems, active suspensions
- Tires: Traction
- Steering: Power-assisted steering, rear-wheel steering
- Braking systems:
  - Antilock braking systems (ABS), Electronically controlled commercial-vehicle braking systems (ELB)
- Lighting: PES headlamps, Litronic
- Safety systems: Seat-belt tighteners, airbags, rollover protection, tire-pressure monitoring system
- Comfort systems:
  - Central locking systems
- Vehicle electrical systems:
  - Compact alternators, CAN, EMC

And we have introduced the following subjects:

- Sensors, Actuators, Quality, Reliability,
- Automotive data-processing,
- Bonding techniques / Sheet-metal processing, Tribology / Wear,
- Park-Pilot, Navigation systems,
- Mobile telephone, Driver information systems

**Contents**

<b>Physics, basics</b>		<b>Tribology, wear</b>	315
Quantities and units	10	<b>Motor-vehicle dynamics</b>	
Conversion tables	17	Road-going vehicle requirements	320
Oscillations	39	Fuel requirements	321
Mechanics	44	Dynamics of linear motion	324
Strength of materials	52	Dynamics of lateral motion	336
Acoustics	60	Operating behavior (as per ISO)	340
Heat	66	Operating dynamics, comm. vehicles	345
Electrical engineering	70	Agricultural-tractor requirements	348
Electronics	86	Environmental stress	350
Sensors	102	<b>Internal-combustion (IC) engines</b>	
Actuators	116	Principle of operation and classification	352
Electric machines	123	Thermodynamic cycles	353
Technical optics	128	Reciprocating-piston engine with internal combustion	355
<b>Mathematics, methods</b>		Spark-ignition (SI) engine	358
Mathematical signs, symbols	136	Diesel engine	362
Trigonometry	138	Hybrid processes	367
Volumes and surface areas	142	Gas exchange	368
Quality	144	Supercharging/Turbocharging	372
Engineering statistics, measuring techniques	150	Power transmission	376
Reliability	158	Cooling, lubrication	392
Data processing in motor vehicles	160	Values and data for calculations	394
Control engineering	164	Reciprocating-piston engine with external combustion (Stirling engine)	406
<b>Materials science</b>		Wankel rotary engines	408
Chemical elements	168	Gas turbines	410
Terminology and parameters	172	<b>Engine cooling</b>	
Material groups	174	Air cooling	412
Material properties	178	Water cooling	412
Lubricants	218	Charge-air cooling	414
Fuels	226	Oil cooling	415
Chemicals	236	<b>Intake air, exhaust systems</b>	
Corrosion/corrosion protection	242	Air filters	416
Heat treatment	252	Superchargers and turbochargers	418
Hardness	258	Exhaust systems	424
<b>Machine elements</b>		<b>Engine management, spark-ignition (SI) engines</b>	
Tolerances	263	Parameters, operation	428
Sliding and rolling bearings	268	<b>Fuel management</b>	430
Spring calculation	276	Carburetors	431
Threaded fasteners	282	Single-point electronic fuel-injection systems (TBI)	436
Gears and gear teeth	292	Mono-Jetronic	436
Belt drives	302	Multipoint electronic fuel-injection systems (MPI)	438
<b>Bonding and joining techniques</b>		K-Jetronic	438
Welding	306	KE-Jetronic	440
Soldering	308	L-Jetronic	442
Adhesives	309	LH-Jetronic	444
Riveting	310		
Pressurized clinching	311		
<b>Sheet-metal processing</b>			
Deep-drawing techniques	312		
Laser techniques	314		

<b>Ignition</b>			
Basics	446	Fuel filters	506
Components		Nozzles and nozzle holders	506
Ignition coils	449	Fuel-injection pump test benches	511
Spark plugs	450	<b>Exhaust emissions (diesel engines)</b>	
Ignition systems		Combustion products	512
Conventional coil ignition (CI)	455	Exhaust-gas control	512
Transistorized ignition (TCI)	458	Exhaust-gas testing	513
Capacitor-discharge ignition (CDI)	460	Exhaust-gas limits	515
Electronic ignition (EI)	461	Exhaust-gas analyzers	518
Distributorless electronic ignition (DLI)	463	<b>Auxiliary starting devices for diesel engines</b>	
Knock control	464	Sheathed-element glow plugs	520
<b>Further engine-management functions</b>		Flame plugs	521
Idle-speed control	466	Heater plugs	521
Electronic engine-power control (EMS)	467	Glow control unit	521
Electronic boost-pressure control	468	<b>Starting systems</b>	523
Variable-length intake manifolds	469	<b>Alternative drive systems</b>	
Evaporative-emissions control	470	Electric drives	527
Exhaust-gas recirculation (EGR)	470	Hybrid drives	533
<b>Integrated engine-management systems, Motronic</b>		<b>Drivetrain</b>	
Detection and processing of measured variables	472	Basics	536
Motronic system	473	Clutches	538
System configuration	475	Transmissions and gearboxes	541
Competition and racing	475	Final drives	551
<b>Engine test technology</b>	476	Differentials	553
<b>Exhaust emissions, spark-ignition (SI) engines</b>		All-wheel drive (AWD)	555
Combustion products	478	Traction control/acceleration slip regulation (ASR)	555
Exhaust-gas control	479	ASR for passenger cars	556
Lambda closed-loop control	482	ASR for commercial vehicles	558
Testing exhaust and evaporative emissions	483	<b>Chassis systems</b>	
Exhaust-gas limits	485	Suspension	560
Exhaust-gas analyzers	489	Suspension linkage	568
<b>Internal-combustion (IC) engines for alternative fuels</b>		Wheels	572
LPG operation	490	Tires	576
Alcohol operation	492	Steering	586
Hydrogen operation	493	<b>Braking systems</b>	
<b>Engine management (diesel engines)</b>		Definitions and principles	594
Fuel metering	494	Legal regulations	598
Fuel-injection systems	494	Braking-system classification	603
Fuel-injection pumps, in-line	496	Braking-system configuration	604
Fuel-injection pumps, control-sleeve type	502	Braking systems for passenger cars and light commercial vehicles	606
Fuel-injection pumps, distributor type	502	Control devices	606
Unit injectors (PDE)	505	Wheel brakes	608
		Antilock braking systems (ABS) for passenger cars	610
		Braking systems for commercial vehicles	620
		Classification and configuration	620
		Braking-force metering	621

## 6 Contents

Wheel brakes	624	<b>Communication and information systems</b>	
Parking-brake systems	628	Car radio	704
Retarder braking systems	628	Check control	707
Compressed-air braking-system components	633	Trip computer	708
Antilock braking systems (ABS) for commercial vehicles	638	Park-Pilot	709
Electronically controlled commercial-vehicle braking systems (ELB)	642	Trip recorder	710
Brake analyzers	644	Navigation systems	712
		Mobile radio, mobile telephone	714
<b>Road-vehicle systematics</b>	646	Board Information Terminal (BIT)	716
<b>Vehicle bodies, passenger-car</b>		<b>Safety systems</b>	
Main dimensions	648	Seat-belt tightener	717
Body structure	652	Air bag	718
Body materials	653	Rollover protection system	720
Body surface	654	Tire-pressure monitoring system (RKS)	721
Body finishing components	654	<b>Comfort and convenience systems</b>	
Safety	656	Power windows	722
Calculations	660	Power sunroof	723
<b>Vehicle bodies, commercial-vehicle</b>		Seat and steering-column adjustment, electrical	724
Commercial vehicles	662	Central locking systems	724
Delivery trucks and vans	662	<b>Automotive hydraulics</b>	
Medium and heavy-duty trucks and tractor vehicles	663	Basics	726
Buses	664	Pumps, motors	727
Passive safety	666	Valves	730
Commercial-vehicle noise reduction	667	Cylinders	733
		Tractor hydraulics	734
<b>Lighting</b>		Hydraulic accumulators	737
Legal regulations	668	Hydrostatic fan drive	738
Headlamps	670	Hydrostatic drives	740
Lamps	682	<b>Automotive pneumatics</b>	
Lamp bulbs	687	Door operation	742
Headlamp aiming devices	689	Radiator louvers	743
<b>Signaling and alarm systems</b>		<b>Electrical system and power supply</b>	
Visual signaling systems	690	Symbols	744
Acoustic signaling devices	691	Circuit diagrams	752
Theft-deterrent systems (Car Alarm)	692	Conductor-size calculations	756
		Electrical power supply	758
<b>Windshield, rear-window and headlamp cleaning systems, windshield and window glass</b>		Starter batteries	763
Windshield wipers	694	Battery chargers	767
Rear-window wipers	695	Alternators	768
Headlamp wash-wipe systems	696	Controller Area Network (CAN)	776
Windshield and window glass	698	Electromagnetic compatibility (EMC) and interference suppression	779
		<b>Passenger-car specifications</b>	784
<b>Heating, ventilation, and air-conditioning (HVAC)</b>		Specifications of German and foreign passenger cars	
Engine-dependent heating systems	700	<b>Road traffic legislation</b>	814
Air-conditioning systems	701	<b>Miscellaneous</b>	
Engine-independent heating systems	703	Alphabets and numbers	822
		<b>Index of Headings</b>	823



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## Foreword to the 3rd Edition

The "Automotive Handbook" is a handy, concise, pocket-sized technical reference work. Its primary purpose is to provide the automotive engineer, the mechanic, the student, and all those interested in technical matters, with a wealth of reliable technical data as well as an insight into present-day state-of-the-art automotive technology in Germany. With this assignment in mind, the scope of the theoretical chapters dealing with **passenger cars and commercial vehicles**, as well as the remaining contents, has been kept to the practical and necessary level.

With the framework of a pocket-sized handbook, it is impossible to present a detailed coverage of individual technical subjects. On the other hand, with the very wide range of users in mind, we did not want to dispense with generally applicable topics and data.

We recommend that you leaf through this Automotive Handbook before attempting to use it, this will prove to be a valuable help when you actually want to refer to a particular point at a later date.

The addition of new technical subjects and the expansion and up-dating of existing material are reflected in the fact that this 3rd Edition is 140 pages longer than its predecessor.

This 3rd English Edition was revised and up-dated by specialists from the Bosch Group, as were the two previous editions. For certain chapters, other firms also made contributions. At this point, we would like to express our appreciation to all concerned.

The editors

## For your information:

### Compared to the 2nd Edition, we have up-dated the following subjects:

- Oscillations: Modal analysis
- Electronics: Solar cells, PC-board techniques, micromechanics, mechatronics, A/D conversion
- Technical optics: Laser engineering, beam waveguides
- Materials: Automotive paints
- Motor-vehicle dynamics:
  - Driving dynamics (as per ISO)
- Exhaust systems: Catalytic converters, soot filters
- Engine management (spark-ignition (SI) engines):
  - Electronic engine-power control (EMS), electronic boost-pressure control, variable-length intake manifold, evaporative-emissions control, exhaust-gas recirculation (EGR), alcohol/hydrogen-powered engines
- Engine management (diesel engines):
  - In-line control-sleeve fuel-injection pump, unit injectors (PDE), exhaust-gas analyzers
- Drivetrain: Traction control (ASR)
- Suspension: Suspension systems, active suspensions
- Tires: Traction
- Steering: Power-assisted steering, rear-wheel steering
- Braking systems:
  - Antilock braking systems (ABS), Electronically controlled commercial-vehicle braking systems (ELB)
- Lighting: PES headlamps, Litronic
- Safety systems: Seat-belt tighteners, airbags, rollover protection, tire-pressure monitoring system
- Comfort systems:
  - Central locking systems
- Vehicle electrical systems:
  - Compact alternators, CAN, EMC

### And we have introduced the following subjects:

- Sensors, Actuators, Quality, Reliability, Automotive data-processing, 6
- Bonding techniques / Sheet-metal processing, Tribology / Wear, 6
- Park-Pilot, Navigation systems, 6:
- Mobile telephone, Driver information systems, 6:

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**Contents**

<b>Physics, basics</b>			
Quantities and units	10		
Conversion tables	17		
Oscillations	39		
Mechanics	44		
Strength of materials	52		
Acoustics	60		
Heat	66		
Electrical engineering	70		
Electronics	86		
Sensors	102		
Actuators	116		
Electric machines	123		
Technical optics	128		
<b>Mathematics, methods</b>			
Mathematical signs, symbols	136		
Trigonometry	138		
Volumes and surface areas	142		
Quality	144		
Engineering statistics, measuring techniques	150		
Reliability	158		
Data processing in motor vehicles	160		
Control engineering	164		
<b>Materials science</b>			
Chemical elements	168		
Terminology and parameters	172		
Material groups	174		
Material properties	178		
Lubricants	218		
Fuels	226		
Chemicals	236		
Corrosion/corrosion protection	242		
Heat treatment	252		
Hardness	258		
<b>Machine elements</b>			
Tolerances	263		
Sliding and rolling bearings	268		
Spring calculation	276		
Threaded fasteners	282		
Gears and gear teeth	292		
Belt drives	302		
<b>Bonding and joining techniques</b>			
Welding	306		
Soldering	308		
Adhesives	309		
Riveting	310		
Pressurized clinching	311		
<b>Sheet-metal processing</b>			
Deep-drawing techniques	312		
Laser techniques	314		
<b>Tribology, wear</b>			315
<b>Motor-vehicle dynamics</b>			
Road-going vehicle requirements	320		
Fuel requirements	321		
Dynamics of linear motion	324		
Dynamics of lateral motion	336		
Operating behavior (as per ISO)	340		
Operating dynamics, comm. vehicles	345		
Agricultural-tractor requirements	348		
Environmental stress	350		
<b>Internal-combustion (IC) engines</b>			
Principle of operation and classification	352		
Thermodynamic cycles	353		
Reciprocating-piston engine with internal combustion	355		
Spark-ignition (SI) engine	358		
Diesel engine	362		
Hybrid processes	367		
Gas exchange	368		
Supercharging/Turbocharging	372		
Power transmission	376		
Cooling, lubrication	392		
Values and data for calculations	394		
Reciprocating-piston engine with external combustion (Stirling engine)	406		
Wankel rotary engines	408		
Gas turbines	410		
<b>Engine cooling</b>			
Air cooling	412		
Water cooling	412		
Charge-air cooling	414		
Oil cooling	415		
<b>Intake air, exhaust systems</b>			
Air filters	416		
Superchargers and turbochargers	418		
Exhaust systems	424		
<b>Engine management, spark-ignition (SI) engines</b>			
Parameters, operation	428		
<b>Fuel management</b>			
Carburetors	430		
Single-point electronic fuel-injection systems (TBI)	436		
Mono-Jetronic	436		
Multipoint electronic fuel-injection systems (MPI)	438		
K-Jetronic	438		
KE-Jetronic	440		
L-Jetronic	442		
LH-Jetronic	444		

<b>Ignition</b>			
Basics	446	Fuel filters	506
Components		Nozzles and nozzle holders	506
Ignition coils	449	Fuel-injection pump test benches	511
Spark plugs	450	<b>Exhaust emissions (diesel engines)</b>	
Ignition systems		Combustion products	512
Conventional coil ignition (CI)	455	Exhaust-gas control	512
Transistorized ignition (TCI)	458	Exhaust-gas testing	513
Capacitor-discharge ignition (CDI)	460	Exhaust-gas limits	515
Electronic ignition (EI)	461	Exhaust-gas analyzers	518
Distributorless electronic ignition (DLI)	463	<b>Auxiliary starting devices for diesel engines</b>	
Knock control	464	Sheathed-element glow plugs	520
<b>Further engine-management functions</b>		Flame plugs	521
Idle-speed control	466	Heater plugs	521
Electronic engine-power control (EMS)	467	Glow control unit	521
Electronic boost-pressure control	468	<b>Starting systems</b>	523
Variable-length intake manifolds	469	<b>Alternative drive systems</b>	
Evaporative-emissions control	470	Electric drives	527
Exhaust-gas recirculation (EGR)	470	Hybrid drives	533
<b>Integrated engine-management systems, Motronic</b>		<b>Drivetrain</b>	
Detection and processing of measured variables	472	Basics	536
Motronic system	473	Clutches	538
System configuration	475	Transmissions and gearboxes	541
Competition and racing	475	Final drives	551
<b>Engine test technology</b>	476	Differentials	553
<b>Exhaust emissions, spark-ignition (SI) engines</b>		All-wheel drive (AWD)	555
Combustion products	478	Traction control/acceleration slip regulation (ASR)	555
Exhaust-gas control	479	ASR for passenger cars	556
Lambda closed-loop control	482	ASR for commercial vehicles	558
Testing exhaust and evaporative emissions	483	<b>Chassis systems</b>	
Exhaust-gas limits	485	Suspension	560
Exhaust-gas analyzers	489	Suspension linkage	568
<b>Internal-combustion (IC) engines for alternative fuels</b>		Wheels	572
LPG operation	490	Tires	576
Alcohol operation	492	Steering	586
Hydrogen operation	493	<b>Braking systems</b>	
<b>Engine management (diesel engines)</b>		Definitions and principles	594
Fuel metering	494	Legal regulations	598
Fuel-injection systems	494	Braking-system classification	603
Fuel-injection pumps, in-line	496	Braking-system configuration	604
Fuel-injection pumps, control-sleeve type	502	Braking systems for passenger cars and light commercial vehicles	606
Fuel-injection pumps, distributor type	502	Control devices	606
Unit injectors (PDE)	505	Wheel brakes	608
		Antilock braking systems (ABS) for passenger cars	610
		Braking systems for commercial vehicles	620
		Classification and configuration	620
		Braking-force metering	621



## 6 Contents

Wheel brakes	624	<b>Communication and information systems</b>	
Parking-brake systems	628	Car radio	704
Retarder braking systems	628	Check control	707
Compressed-air braking-system components	633	Trip computer	708
Antilock braking systems (ABS) for commercial vehicles	638	Park-Pilot	709
Electronically controlled commercial-vehicle braking systems (ELB)	642	Trip recorder	710
Brake analyzers	644	Navigation systems	712
		Mobile radio, mobile telephone	714
		Board Information Terminal (BIT)	716
<b>Road-vehicle systematics</b>	646	<b>Safety systems</b>	
<b>Vehicle bodies, passenger-car</b>		Seat-belt tightener	717
Main dimensions	648	Air bag	718
Body structure	652	Rollover protection system	720
Body materials	563	Tire-pressure monitoring system (RKS)	721
Body surface	564	<b>Comfort and convenience systems</b>	
Body finishing components	654	Power windows	722
Safety	656	Power sunroof	723
Calculations	660	Seat and steering-column adjustment, electrical	724
<b>Vehicle bodies, commercial-vehicle</b>		Central locking systems	724
Commercial vehicles	662	<b>Automotive hydraulics</b>	
Delivery trucks and vans	662	Basics	726
Medium and heavy-duty trucks and tractor vehicles	663	Pumps, motors	727
Buses	664	Valves	730
Passive safety	666	Cylinders	733
Commercial-vehicle noise reduction	667	Tractor hydraulics	734
		Hydraulic accumulators	737
		Hydrostatic fan drive	738
		Hydrostatic drives	740
<b>Lighting</b>		<b>Automotive pneumatics</b>	
Legal regulations	668	Door operation	742
Headlamps	670	Radiator louvers	743
Lamps	682	<b>Electrical system and power supply</b>	
Lamp bulbs	687	Symbols	744
Headlamp aiming devices	689	Circuit diagrams	752
		Conductor-size calculations	756
<b>Signaling and alarm systems</b>		Electrical power supply	758
Visual signaling systems	690	Starter batteries	763
Acoustic signaling devices	691	Battery chargers	767
Theft-deterrent systems (Car Alarm)	692	Alternators	768
		Controller Area Network (CAN)	776
<b>Windshield, rear-window and headlamp cleaning systems, windshield and window glass</b>		Electromagnetic compatibility (EMC) and interference suppression	779
Windshield wipers	694	<b>Passenger-car specifications</b>	784
Rear-window wipers	695	Specifications of German and foreign passenger cars	
Headlamp wash-wipe systems	696	<b>Road traffic legislation</b>	814
Windshield and window glass	698	<b>Miscellaneous</b>	
		Alphabets and numbers	822
<b>Heating, ventilation, and air-conditioning (HVAC)</b>		<b>Index of Headings</b>	823
Engine-dependent heating systems	700		
Air-conditioning systems	701		
Engine-independent heating systems	703		

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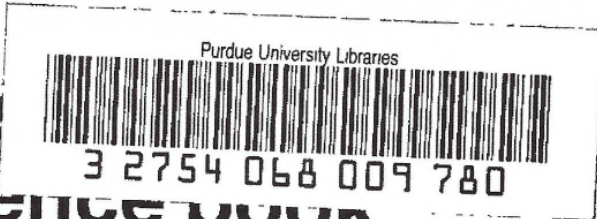
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  - Energy supply
  - Starter battery
  - Alternators

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## Automotive handbook

Author: [U Adler; H Bauer, Dipl.-Ing.; Robert Bosch GmbH](#)  
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Summary: This handbook is a concise technical reference work. Its primary purpose is to provide the automotive engineer, the mechanic, the student, and all those interested in technical matters, with a wealth of reliable technical data as well as an insight into present-day state-of-the-art automotive technology in Germany.

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