



EUROPA REFERENCE BOOKS
for Automotive Technology

Modern Automotive Technology

Fundamentals, service, diagnostics

2nd English edition

The German edition was written by technical instructors, engineers and technicians

Editorial office (German edition): R. Gscheidle, Studiendirektor, Winnenden – Stuttgart

VERLAG EUROPA-LEHRMITTEL · Nourney, Vollmer GmbH & Co. KG
Düsselberger Straße 23 · 42781 Haan-Gruiten, Germany

Europa-No.: 23018

Modern Automotive Technology - Fundamentals, service, diagnostics, 2nd edition, 2014
Original title: Fachkunde Krafftfahrzeugtechnik, 30th edition, 2013

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Drawing office of Verlag Europa-Lehrmittel, Ostfildern, Germany

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2nd edition 2014

Impression 5 4

All impressions of the same edition can be used in parallel, as they do not differ from each other except with regard to the correction of printing errors.

ISBN 978-3-8085-2302-5

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Cover design and illustration: Braunwerbeagentur, Stefanie Braun, 42477 Radevormwald, Germany, using photographs and illustrations provided by Dr. Ing. H. C. Porsche AG, Stuttgart, Audi AG, Ingolstadt, Volkswagen AG, Wolfsburg, KTM, Mattighofen, Austria (photo: H. Mitterbauer) and Mercedes Benz AG, Stuttgart.

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<http://www.europa-lehrmittel.de>

Translation and editing of the 2nd English edition: Lynn E. Webb, Helena, MT, USA with assistance from
Kevin J. Fulton, Ann Arbor, MI, USA

Typesetting: Satz+Layout Werkstatt Kluth GmbH, 50374 Erftstadt, Germany

Printing: mediaprint solutions GmbH, 33100 Paderborn, Germany

Foreword

"Modern Automotive Technology" is a standard work covering the subject of automotive technology. This second English edition is based on the 30th German edition titled "Fachkunde Kraftfahrzeugtechnik". It has for many years proven to be a highly popular textbook used for training and further education. It provides apprentices, trainees, teachers and all those interested in this subject with the theoretical knowledge necessary to gain a firm grasp of the practical and technical skills involved. Fundamental, technical connections between individual systems are presented in a clear and comprehensible way.

The book is intended to be used as a reference work by employees in the automotive industry and in motor vehicle service outlets, by teachers, apprentices, trainees and automotive technology students to help them look up information and supplement their technical knowledge. The work is intended to be used by all those interested in automotive technology as a means of extending their technical knowledge through private study.

The 22 chapters are logically arranged by subject and cover the changes that have occurred in the field of automotive technology. The book is particularly suitable for practical training in all matters pertaining to motor vehicles.

This work covers the latest developments in automotive technology, including service and maintenance of vehicle systems, management, communication, supercharging technology, common-rail systems, dual clutch gearboxes, electronic transmission control, electronic brake systems, compressed-air monitoring systems, adaptive cornering lights, new headlamp systems, high-frequency technology, electrical circuit diagrams, multifunction regulators, new data bus systems (LIN, MOST, FlexRay), alternative drive concepts, electric drive systems, differential locks, axle alignment checks, driving dynamics, steering systems, electromagnetic compatibility and comfort and convenience systems such as adaptive cruise control, parking assistance and navigation. A large chapter is devoted to the subject of electrical engineering. Here, the detailed coverage of the fundamentals of electrical engineering forms the basis for all the crucial issues and topics pertaining to automotive electrics, up to and including data transmission in motor vehicles. A separate chapter is devoted to the increasing importance in engineering of comfort and convenience technology.

Reference is made to German and European standards in the chapters on environmental protection and occupational safety, emissions-control engineering, braking technology and motorcycle engineering. However, compliance with the standards applicable in the respective individual countries is required.

The work features numerous coloured pictures, drawings and system diagrams as well as particularly clearly and comprehensibly laid-out tables. These will help the reader to digest and comprehend the complex subject matter.

This edition includes a CD of all the illustrations found in the book.

The work has been written and compiled – in close co-operation with the automotive trade and industry – by a team of educationally experienced vocational school teachers, engineers and master tradesmen. The authors and the publishers will be grateful for any suggestions and constructive comments.

We would like to thank all the companies and organisations who have kindly contributed pictures and technical documents.

Abbreviations

AAS	Adaptive air suspension	CB	Centre bore, Common ball	EDP	Electronic data processing
A/C	Air conditioning	CBS	Combined brake system	EDTC	Engine drag torque control
A/F	Air/fuel (mixture)	CC	Cruise control	EEPROM	Electrically erasable programmable read-only memory
ABA	Active brake assist	CDI	Capacitive discharge ignition	EGR	Exhaust gas recirculation
ABC	Active body control	CFPP	Cold filter plugging point	EGS	Electronic gearbox control unit (German: Elektronisches Getriebesteuerg�r�t)
ABS	Antilock braking system	CFRP	Carbon fibre reinforced plastic	EH	Extended hump
ABV	Automatic braking-force distribution (German: Automatische Bremskraftverteilung)	CH	Combination hump	EHB	Electro-hydraulic braking system
AC	Alternating current	CIH	Camshaft in head	EI	Emissions inspection, electronic ignition
ACC	Adaptive cruise control, automatic cruise control	CIP	Continuous improvement process	ELSD	Electronic limited-slip differential
ACEA	Association des Constructeurs Europ�ens d'Automobiles	CN	Cetane number	EMC	Electromagnetic compatibility
ACS	Automatic clutch system	CNG	Compressed natural gas	EMS	Electronic engine management system
AD	Analogue digital (converter)	CPOD	Child Seat Presence and Orientation Detection	Eo	Exhaust valve opens
ADC	Analog digital converter	CPU	Central processing unit	EOBD	European on board diagnostics
ADSL	Asymmetrical digital subscriber line	CR	Common rail	EP	Exhaust passage, extreme pressure, epoxy resin
AFS	Airflow sensor	CRDI	Common rail direct injection	EPS	Electronic power steering
AFRP	Aramid fibre reinforced plastic	CB	Centre bore	ESI	Electronic service information
AGM	Absorbed glass mat battery	CS	Crankshaft	ESP	Electronic stability program
AHL	Automatic headlight leveling	CV	Commercial vehicle	ETC	Electronic throttle control
ALDBFR	Automatic load-dependent brake force regulator	CV	Check valve	ETN	European type number
ALSD	Automatic limited-slip differential	CVlft	Check valve left	EV	Exhaust valve
AM	Amplitude modulation	CVrt	Check valve right	FA	Front axle
API	American Petroleum Institute	CVT	Continuously variable transmission	FB	Function button
APB	Automatic parking brake	DA	Drive axle	FC	Fuel cell
ARS	Angle of rotation sensor	DC	Direct current	FF	Free-form (reflector)
ASC	Anti-stability control, acceleration skid control	DCT	Dual clutch transmission	FH	Flat hump
ASHEV	Axle split hybrid electric vehicle	DI	Direct injection	FL	Front left
ASTM	American Society for Testing and Materials	DIN	Deutsches Institut f�r Normung	FOC	Fibre optic cable
ATC	Adaptive transmission control	DIP	Distributor injection pump	FOT	Fibre optic transceiver
ATF	Automatic transmission fluid	DME	Digital motor electronics	FR	Front right
AWD	All-wheel drive	DOHC	Double overhead camshaft	GD/GND	Ground
AYC	Active yaw control	DOT	Department of Transportation	GDI	Gasoline direct injection
BAS	Brake assist system	DPNR	Diesel particulate NO _x reduction system	GFRP	Glass fibre reinforced
BDC	Bottom dead centre	DSC	Dynamic stability control	GI	General inspection
BDW	Brake disc wiping	DSG	Direct-shift gearbox	GPS	Global positioning system
BEV	Battery powered electric vehicle	DSP	Dynamic shift program selection	HDC	Hill descent control
CA	Crankshaft angle	DVD	Digital versatile disc	HEV	Hybrid electric vehicle
CS	Camshaft	EBA	Electronic brake assist, emergency brake system	HF	High frequency
CAN	Controller area network	EBS	Electronic braking system	HGV	Heavy goods vehicle
CAT	Catalytic converter, catalyst	Ec	Exhaust valve closes	HHC	Hill hold control
		ECE	Economic Commission for Europe	HNS	Homogeneous numerically calculated surface
		ECM	Electronic clutch management	HS	High-solid (paints)
		ECS	Electronic clutch system	HTHS	High temperature, high shear
		ECU	Electronic control unit, engine control unit	HUD	Head up display
		EDC	Electronic diesel control, electronic damper control		

Abbreviations

HV	Hybrid vehicle, high voltage	NEDC	New European driving cycle	SAE	Society of Automotive Engineers
IC	Integrated circuit	NF	Non-ferrous	SAM	Signal acquisition and actuation module
lc	Inlet valve closes	NIT	Network idle time	SBC	Sensotronic brake control
IC	Individual control	NLGI	National Lubricating Grease Institute	SC	Signal conditioning
IHPF	Internal high-pressure forming	NTC	Negative temperature coefficient	SCR	Selective catalytic reduction
lo	Inlet valve opens	OBD	On-board diagnostics	SCV	Solenoid control valve
IP	Inlet passage	OD	Outside diameter	SDC	Semi-drop centre
IPO	Input/Processing/Output (principle)	OHC	Overhead camshaft	SE	Sensor
IS	Input shaft	OHV	Overhead valves	SG	Strain gauge
ISA	Integrated starter alternator	ON	Octane number	SI	Safety inspection
ISAD	Integrated starter alternator damper	OV	Outlet valve	SL	Special ledge
ISC	Idle speed control	OVlft	Outlet valve left	SLC	Select-low control
ISG	Integrated starter generator	OVrt	Outlet valve right	SoC	State of charge
ISO	International Organization for Standardization	PBC	Parking brake circuit	SPI	Single-point injection
IV	Inlet valve	PC	Polycarbonate, personal computer	SRR	Short range radar
IVlft	Inlet valve left	PCD	Pitch circle diameter	SRS	Safety restraint systems, supplemental restraint system
IVrt	Inlet valve right	PEM	Proton exchange membrane	SSlft	Speed sensor left
LA	Lifting axle	PES	Poly ellipsoid system (reflector)	SSrt	Speed sensor right
LAN	Local area network	PHEV	Plug-in hybrid electric vehicle	STP	Shielded twisted pair
LDC	Liquid crystal display	PIN	Personal identification number	STVZO	Straßenverkehrs-zulassungsordnung (Germany)
LDR	Light-dependent resistor	PM	Particulate matter	SUV	Sport Utility Vehicle
LED	Light-emitting diode	POF	Plastic optical fibre	SV	Solenoid valve
LEV	Low-emission vehicle	POT	Plastic optical transceiver	SV	Side valve
LF	Low frequency	PS	Pressure sensor	SW	Short wave
LI	Load index	PTC	Positive temperature coefficient	SWR	Standing wave ratio
LIN	Local interconnect network	PWM	Pulse width modulation	Tc	Transfer passage closes
Li-ion	Lithium ion	QA	Quality assurance	TC	Turbocharger
LNG	Liquefied natural gas	QM	Quality management	TCS	Traction control system
LS	Limited slip	RA	Rear axle	TDC	Top dead centre
LSG	Laminated safety glass	RAM	Random access memory	TIG	Tungsten-inert gas
LU	Logical unit	RDS	Radio data system	TL	Tubeless
LV	Low voltage	RL	Rear left	TMC	Traffic message channel
LW	Long wave	RLFS	Return-less fuel system	To	Transfer passage opens
MAF	Mass air flow	RON	Research octane number	TP	Transfer passage
MAG	Metal active-gas (welding)	ROM	Read-only memory	TPC	Tyre pressure check, tyre pressure control
MC	Microcomputer	ROP	Rollover protection	TSG	Tempered safety glass
MC	Main cylinder	ROV	Rotating high voltage distribution (German: Rotierende Hochspannungs-Verteilung)	TÜV	German technical inspection association
ME	Motor electronics	RR	Rear right	TWI	Tread wear indicator
MED	Motor electronics direct injection	RRC	Radio remote control	UIS	Unit injector system
MG	Motor generator	RUV	Static high voltage distribution (German: Ruhende Hochspannungs-Verteilung)	UPS	Unit pump system
MIG	Metal inert-gas (welding)	SAC	Self-adjusting clutch	VDC	Vehicle dynamics controller
MIL	Malfunction indicator lamp			VDR	Voltage-dependent resistor
MODIC	Mobile diagnostic computer			VF	Variable focus (reflector)
MON	Motor octane number			VHF	Very high frequency
MOST	Media oriented systems			VI	Viscosity index
MPI	Multipoint injection			VT	Viscosity temperature
MS	Medium-solid (paints)			VTEC	Variable valve timing and lift electronic control
MW	Medium wave			VTG	Variable turbine geometry

We wish to thank the companies listed below for providing technical advice, information, photographs and illustrations.

- Alfa-Romeo Automobiles**
Milan, Italy
- ALLIGATOR Ventilfabrik GmbH**
Giengen/Brenz, Germany
- Aprilia Motorrad-Vertrieb**
Düsseldorf, Germany
- Aral AG**, Bochum, Germany
- Audatex Deutschland**, Minden, Germany
- Audi AG**, Ingolstadt – Neckarsulm, Germany
- Autokabel**, Hausen, Germany
- Autoliv**, Oberschleißheim, Germany
- G. Auwärter GmbH & Co**
(Neoplan) Stuttgart, Germany
- BBS Kraftfahrzeugtechnik AG**,
Schiltach, Germany
- BEHR GmbH & Co**, Stuttgart, Germany
- Beissbarth GmbH**, Automobil Service-
geräte, Munich, Germany
- BERU**, Ludwigsburg, Germany
- Aug. Bilstein GmbH & Co KG**
Ennepetal, Germany
- Boge GmbH**, Eitdorf/Sieg, Germany
- Robert Bosch GmbH**, Stuttgart, Germany
- Bostik GmbH**
Oberursel/Taunus, Germany
- BLACK HAWK**, Kehl, Germany
- BMW Bayerische Motoren-Werke AG**
Munich/Berlin, Germany
- CAR-OLINER**, Kungsör, Sweden
- CAR BENCH INTERNATIONAL S.P.A.**
Massa, Italy
- Continental Teves AG & Co, OHG**
Frankfurt, Germany
- Celette GmbH**, Kehl, Germany
- Citroen Deutschland AG**
Cologne, Germany
- Dataliner Richtsysteme**
Ahlerstedt, Germany
- Deutsche BP AG**, Hamburg, Germany
- DUNLOP GmbH & Co KG**
Hanau/Main, Germany
- ESSO AG**, Hamburg, Germany
- FAG Kugelfischer Georg Schäfer KG aA**
Ebern, Germany
- J. Eberspächer**, Esslingen, Germany
- EMM Motoren Service**, Lindau, Germany
- Ford-Werke AG**, Cologne, Germany
- Carl Freudenberg**
Weinheim/Bergstraße, Germany
- GKN Löbro**, Offenbach/Main, Germany
- Getrag Getriebe- und Zahnradfabrik**
Ludwigsburg, Germany
- Girling-Bremsen GmbH**
Koblentz, Germany
- Glasurit GmbH**
Münster/Westphalia, Germany
- Globaljig, Deutschland GmbH**
Clöppenburg, Germany
- Glyco-Metall-Werke B.V. & Co KG**
Wiesbaden/Schierstein, Germany
- Goetze AG**, Burscheid, Germany
- Grau-Bremse**, Heidelberg, Germany
- Gutmann Messtechnik GmbH**
Ihringen, Germany
- Hazet-Werk**, Hermann Zerver
Remscheid, Germany
- HAMEG GmbH**, Frankfurt/Main, Germany
- Hella KG, Hueck & Co**
Lippstadt, Germany
- Hengst Filterwerke**, Nienkamp, Germany
- Fritz Hintermayr**, Bing-Vergaser-Fabrik
Nuremberg, Germany
- HITACHI Sales Europa GmbH**
Düsseldorf, Germany
- HONDA DEUTSCHLAND GMBH**
Offenbach/Main, Germany
- Hunger Maschinenfabrik GmbH**
Munich and Kaufering, Germany
- IBM Deutschland**, Böblingen, Germany
- IVECO-Magirus AG**, Neu-Ulm, Germany
- ITT Automotive (ATE, VDO,**
MOTO-METER, SWF, KONI, Kienzle)
Frankfurt/Main, Germany
- IXION Maschinenfabrik**
Otto Häfner GmbH & Co
Hamburg-Wandsbeck, Germany
- Jurid-Werke**, Essen, Germany
- Alfred Kärcher GmbH & Co. KG**
Winnenden, Germany
- Kawasaki-Motoren GmbH**
Friedrichsdorf, Germany
- Knecht Filterwerke GmbH**
Stuttgart, Germany
- Knorr-Bremse GmbH**, Munich, Germany
- Kolbenschmidt AG**, Neckarsulm, Germany
- KS Gleitlager GmbH**
St. Leon-Rot, Germany
- KTM Sportmotorcycles AG**
Mattighofen, Austria
- Kühnle, Kopp und Kausch AG**
Frankenthal/Palatinate, Germany
- Lemmerz-Werke**, Königswinter, Germany
- LuK GmbH**, Bühl/Baden, Germany
- MAHLE GmbH**, Stuttgart, Germany
- Mannesmann Sachs AG**
Schweinfurt, Germany
- Mann und Hummel, Filterwerke**
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- MAN Maschinenfabrik**
Augsburg-Nürnberg AG
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- Mazda Motors Deutschland GmbH**
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- MCC – Mikro Compact Car GmbH**
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- Messer-Griesheim GmbH**
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- Mercedes Benz**, Stuttgart, Germany
- Metzeler Reifen GmbH**
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- Michelin Reifenwerke KGaA**
Karlsruhe, Germany
- Microsoft GmbH**
Unterschleißheim, Germany
- Mitsubishi Electric Europe B.V.**
Ratingen, Germany
- Mitsubishi MMC**, Trebur, Germany
- MOBIL OIL AG**, Hamburg, Germany
- NGK/NTK Europe GmbH**
Ratingen, Germany
- Adam Opel AG**, Rüsselsheim, Germany
- OSRAM AG**, Munich, Germany
- OMV AG**, Vienna, Austria
- Oxigen-, Carmanin-LM-Räder**,
Unterensingen, Germany
- Peugeot Deutschland GmbH**
Saarbrücken, Germany
- Pierburg GmbH**, Neuss, Germany
- Pirelli AG**, Höchst im Odenwald, Germany
- Dr. Ing. h.c. F. Porsche AG**
Stuttgart-Zuffenhausen, Germany
- Renault Nissan Deutschland AG**
Brühl, Germany
- Samsung Electronics GmbH**
Cologne, Germany
- SATA Farbspritztechnik GmbH & Co**
Kornwestheim, Germany
- SCANIA Deutschland GmbH**
Koblenz, Germany
- SEKURIT SAINT-GOBAIN**
Deutschland GmbH, Aachen, Germany
- Schäffler Automotive**, Langen, Germany
- Siemens AG**, Munich, Germany
- SKF Kugellagerfabriken GmbH**
Schweinfurt, Germany
- Snap-on/SNA Germany**,
Hohenstein-Ernstthal, Germany
- SOLO Kleinmotoren GmbH**
Sindelfingen, Germany
- SONAX GmbH**, Neuburg, Germany
- Stahlwille E. Wille**
Wuppertal, Germany
- Steyr-Daimler-Puch AG**
Graz, Austria
- Subaru Deutschland GmbH**
Friedberg, Germany
- SUN Elektrik Deutschland**
Mettmann, Germany
- Suzuki GmbH**
Oberschleißheim/Heppenheim, Germany
- Technolit GmbH**, Großlüder, Germany
- Telma Retarder Deutschland GmbH**
Ludwigsburg, Germany
- Temic Elektronik**, Nuremberg, Germany
- TOYOTA Deutschland GmbH**
Cologne, Germany
- UNIWHEELS GmbH**
Bad Dürkheim, Germany
- VARTA Autobatterien GmbH**
Hannover, Germany
- Vereinigte Motor-Verlage GmbH & Co KG**
Stuttgart, Germany
- ViewSonic Central Europe**
Willich, Germany
- Voith GmbH & Co KG**
Heidenheim, Germany
- Volkswagen AG**, Wolfsburg, Germany
- Volvo Deutschland GmbH**
Brühl, Germany
- Wabco Westinghouse GmbH**
Hannover, Germany
- Webasto GmbH**, Stockdorf, Germany
- Yamaha Motor Deutschland GmbH**
Neuss, Germany
- ZF Getriebe GmbH**
Saarbrücken, Germany
- ZF Sachs AG**, Schweinfurt, Germany
- ZF Zahnradfabrik Friedrichshafen AG**
Friedrichshafen/Schwäbisch Gmünd,
Germany

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