



EUROPEAN TEXTBOOK SERIES
for professions in the metal industry

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Metal Engineering Textbook

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Preface

METAL ENGINEERING TEXTBOOK is the first English edition of "Fachkunde Metall" (57th edition). Fachkunde Metall is the leading textbook for metalworking in Germany, a country that boasts a highly developed metalworking industry and a world renowned dual training system. For years, the textbook has been implemented in a wide range of applications in vocational schools within programs geared towards jobs in the metalworking trade.

METAL ENGINEERING TEXTBOOK encompasses the fundamentals of the entire professional field of metal technology and expert knowledge pertaining to jobs within the fields of mechanical, metal cutting and automation technology. METAL ENGINEERING TEXTBOOK has an extensive spectrum of application in on-the-job training and continuing education for apprentices, foremen and technicians in businesses within the metalworking industry.

For students of the various specialist fields of engineering studies, it offers a comprehensive introduction. Together with the reference book MECHANICAL AND METAL TRADES HANDBOOK published by Europa-Lehrmittel it serves as an invaluable source of information and reference also for students doing their professional traineeship and those in their first semesters of study.

Target groups

- Industrial mechanics
- Precision mechanics
- Production mechanics
- Cutting machine operators
- Technical product designers
- Foremen and technicians
- Trainees in the metal-processing industry and in trade
- Technical school students
- Trainees and students in the subject of mechanical engineering

METAL ENGINEERING TEXTBOOK assists users in their qualified vocational endeavours. The information available in the form of text and illustrations helps students hone and broaden their skills in the areas of independent planning, performance and supervision. The authors have placed special importance on application and problem orientation in order to make the scientific-technical operating principles and their context within the production process more accessible to students. The scientific-technical and trade-relevant mathematical foundations are incorporated in certain topic segments so as to provide a clearer understanding of the context.

METAL ENGINEERING TEXTBOOK follows the norms DIN, DIN EN and DIN EN ISO applicable in Germany. Please keep in mind that these norms vary in countries in which other national norms apply.

The authors and the publisher are grateful to all users of METAL ENGINEERING TEXTBOOK for critical information and suggestions for improvement (lektorat@europa-lehrmittel.de).

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Subject guide

The content of "Metal Engineering Textbook" is logically structured to give teachers and students maximum educational and methodological freedom. The structure of the topics selected in the book aims to allow students to independently familiarise themselves with the different technical content required in the subject areas.

The following selection shows the allocation of the chapters and the content in the textbook to the individual subject areas. It is provided as a suggestion and guideline in order to hold lessons that target the subject areas.

Subject area	Factual information in the book (examples)
Manufacturing components using hand-held tools Preparing and manufacturing components typical of the profession using hand-held tools. Creating and modifying drawings for simple components.	Project: Key fob 638 3.6.2 Manufacturing with handheld tools 1.2 Principles of metrology 1.2.1 Basic terms 1.2.2 Errors of measurement 1.2.3 Measuring equipment capability and inspection of measuring instruments 1.3 Length-measuring devices 1.5 Tolerances and fits
Planning work steps with tools and materials and performing calculations. Selecting and using appropriate measuring instruments and recording the results. Roughly estimating production costs.	2.7.1 Inspection planning 3.2 Structure of manufacturing processes 3.4.1 Material behaviour during forming 3.4.2 Forming processes 3.4.3 Bend forming 3.5 Cutting 3.5.1 Shear cutting 4.1 General survey of materials and process materials 4.2 Material selection and properties 4.4 Steels and iron casting alloys 4.5 Non-ferrous metals 4.9 Plastics 4.10 Composite materials
Documenting and presenting work results.	10.5 Documenting technical projects
Complying with health and safety and environmental protection regulations.	3.1 Safety at work 3.11 Manufacturing operations and environmental protection 4.12 Environmental issues of materials and process materials
Manufacturing components using machines Evaluating drawings and part lists. Selecting materials based on specific properties. Planning production sequences using calculations.	Project: Clamp for round workpieces 640 5.6 Drive units 5.5 Functional units for power transmission 1.4 Surface testing 1.5 Tolerances and fits 3.7 Manufacturing with machine tools 3.8 Joining 4.4 Steels and iron casting alloys 5.6 Drive units 5.5 Functional units for power transmission
Construction and mode of action of machines. Using tools.	5.1 Classifying machines 5.2 Functional units of machines and devices 3.7.1 Cutting materials
Selecting and using measuring instruments.	1.2 Principles of metrology 1.2.1 Basic terms

Subject area	Factual information in the book (examples)
<p>Documenting and presenting work results.</p> <p>Complying with health and safety and environmental protection regulations.</p>	<p>1.2.2 Errors of measurement</p> <p>1.2.3 Measuring equipment capability and inspection of measuring instruments</p> <p>1.3 Length-measuring devices</p> <p>2 Quality management</p> <p>2.3 Quality requirements</p> <p>2.4 Quality features and defects</p> <p>2.7.1 Inspection planning</p> <p>10.5 Documenting technical projects</p> <p>3.1 Safety at work</p> <p>3.11 Manufacturing operations and environmental protection</p> <p>4.12 Environmental issues of materials and process materials</p>
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<p>Reading and understanding assembly drawings and circuit diagrams.</p> <p>Planning simple controls.</p> <p>Assembling components.</p> <p>Marking parts in compliance with standards.</p>	<p>5.1 Classifying machines</p> <p>5.4 Functional units for bracing and support</p> <p>5.6 Drive units</p> <p>5.5 Functional units for power transmission</p> <p>8.3.3 Circuit diagrams for pneumatic controls</p> <p>8.3.4 Systematic designing of circuit diagrams</p> <p>8.3.5 Examples of pneumatic controls</p>
<p>Distinguishing joining techniques.</p> <p>Selecting tools and standard parts.</p>	<p>3.8 Joining</p> <p>4.4 Steels and iron casting alloys</p>
<p>Documenting and presenting work results.</p>	<p>2 Quality management</p> <p>2.1 Scope of QM</p> <p>2.2 The DIN EN ISO 9000 series of standards</p> <p>2.3 Quality requirements</p> <p>2.4 Quality features and defects</p> <p>10.1.1 Work organisation for the line and project</p> <p>10.5.1 Word processing</p> <p>10.5.2 Spreadsheet</p> <p>10.5.3 Presentation software</p> <p>10.5.4 Technical communication</p>
<p>Complying with health and safety and environmental protection regulations.</p>	<p>3.1 Safety at work</p> <p>3.11 Manufacturing operations and environmental protection</p> <p>4.12 Environmental issues of materials and process materials</p>
Maintaining technical systems	Project: Maintaining an upright drilling machine . . . 644
<p>Evaluating the service and maintenance measures.</p>	<p>1 Inspection technology</p> <p>1.1 Quantities and units</p> <p>7.3 Maintenance</p> <p>7.4 Corrosion and corrosion protection</p> <p>7.5 Failure analysis and failure prevention</p> <p>7.6 Load and strength of parts</p>
<p>Planning maintenance activities, determining tools and process materials.</p>	<p>4.1.3 Process materials and energy</p> <p>5.6 Drive units</p> <p>5.5 Functional units for power transmission</p> <p>7.3.6 Inspection</p> <p>7.3.7 Repair</p>
<p>Documenting and presenting work results.</p>	<p>10.5 Documenting technical projects</p>
<p>Complying with health and safety and environmental protection regulations.</p>	<p>3.1 Safety at work</p> <p>3.11 Manufacturing operations and environmental protection</p> <p>4.12 Environmental issues of materials and process materials</p>

Subject area	Factual information in the book (examples)
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Annealing, hardening, quenching and tempering.	4.4 Steels and iron casting alloys 2.4 Quality features and defects 2.7.1 Inspection planning 4.8 Heat treatment of steels
Developing inspection plans based on quality management.	
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Identifying components and functional processes from controls in different equipment technology.	5.6 Drive units 8.2 Principles and basic elements of controls 8.3 Pneumatic controls 8.4 Electropneumatic controls 8.5 Hydraulic controls
Construction and commissioning of various controls.	
Assembling technical systems	Project: Bevel gear 650
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Developing inspection plans based on quality management.	2.7.1 Inspection planning 1.2 Principles of metrology 1.4 Surface testing 1.5 Tolerances and fits 1.6 Checking of form and positions

Subject area	Factual information in the book (examples)
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Monitoring the production process in mass and series production using quality assurance methods, documenting the progress and identifying corrective measures.	2.10 Statistical process control with quality control cards 2.12 Continuous improvement process 10.5 Documenting technical projects
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Investigating causes of defects.	2.5 Quality management tools
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