



EUROPEAN TEXTBOOK SERIES
for professions in the metal industry

Jörg Bartenschlager

Josef Dillinger

Walter Escherich

Werner Günter

Dr Eckhard Ignatowitz

Stefan Oesterle

Ludwig Reißler

Andreas Stephan

Reinhard Vetter

Falko Wieneke

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Authors:

Bartenschlager, Jörg	Oberstudienrat	Rheinbreitbach
Dillinger, Josef	Studiendirektor	Munich
Escherich, Walter	Studiendirektor	Munich
Günter, Werner	Dipl.-Ing. (FH)	Oberwolfach
Ignatowitz, Dr Eckhard	Dr.-Ing.	Waldbronn
Oesterle, Stefan	Dipl.-Ing.	Amtzell
Reißler, Ludwig	Studiendirektor	Munich
Stephan, Andreas	Dipl.-Ing. (FH)	Kressbronn
Vetter, Reinhard	Oberstudiendirektor	Ottobeuren
Wieneke, Falko	Dipl.-Ing.	Essen

The authors are specialist teachers for technical training courses and engineers.

Editor:

Josef Dillinger

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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. Complying with health and safety and environmental protection regulations.	10.5 Documenting technical projects 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)
Documenting and presenting work results.	1.2.2 Errors of measurement 1.2.3 Measuring equipment capability and inspection of measuring instruments 1.3 Length-measuring devices 2 Quality management 2.3 Quality requirements 2.4 Quality features and defects 2.7.1 Inspection planning
Complying with health and safety and environmental protection regulations.	10.5 Documenting technical projects 3.1 Safety at work 3.11 Manufacturing operations and environmental protection 4.12 Environmental issues of materials and process materials
Manufacturing simple components	Project: Drill stands for hand drills 642 Reading and understanding assembly drawings and circuit diagrams. Planning simple controls. Assembling components. Marking parts in compliance with standards.
Distinguishing joining techniques. Selecting tools and standard parts.	3.8 Joining 4.4 Steels and iron casting alloys
Documenting and presenting work results.	2 Quality management 2.1 Scope of QM 2.2 The DIN EN ISO 9000 series of standards 2.3 Quality requirements 2.4 Quality features and defects
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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

Subject area	Factual information in the book (examples)
Manufacturing individual parts using machine tools	Project: Hydraulic clamping fixture 646
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Selecting appropriate manufacturing processes and clamps for tools and workpieces.	1.2 Principles of metrology 1.3 Length-measuring devices 1.4 Surface testing 1.5 Tolerances and fits 1.6 Checking of form and positions
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
Installing and commissioning control systems	Project: Separating and identifying different metal balls 648
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Identifying components and functional processes from controls in different equipment technology. Construction and commissioning of various controls.	5.6 Drive units 8.2 Principles and basic elements of controls 8.3 Pneumatic controls 8.4 Electropneumatic controls 8.5 Hydraulic controls
Assembling technical systems	Project: Bevel gear 650
Planning the assembly of technical subsystems and preparing assembly plans.	1.5 Tolerances and fits 1.6 Checking of form and positions 3.8 Joining 5.4 Functional units for bracing and support
Assembling components.	
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Strength properties.	4.11 Material testing
Documenting and presenting work results.	10.5 Documenting technical projects
Programming and manufacturing on numerically controlled machine tools	Project: Gear shaft and bearing cap 652
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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.	
Maintaining technical systems	Project: Bottling plant 660
Maintaining technical systems.	2.12 Continuous improvement process
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