



Designation: E92—17 E92 – 23

Standard Test Methods for Vickers Hardness and Knoop Hardness of Metallic Materials¹

This standard is issued under the fixed designation E92; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval. A superscript letter (a) indicates an editorial change since the last revision or approval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope^a

1.1 These test methods cover the determination of the Vickers hardness and Knoop hardness of metallic materials by the Vickers and Knoop indentation hardness principles. This standard provides the requirements for Vickers and Knoop hardness machines and the procedures for performing Vickers and Knoop hardness tests.

1.2 This standard includes additional requirements in annexes:

Verification of Vickers and Knoop Hardness Testing Machines
Vickers and Knoop Hardness Standardizing Machines
Standardization of Vickers and Knoop Indenters
Standardization of Vickers and Knoop Hardness Test Blocks
Correction Factors for Vickers Hardness Tests Made on Spherical and Cylindrical Surfaces

Annex A1
Annex A2
Annex A3
Annex A4
Annex A5

1.3 This standard includes nonmandatory information in an appendix which relates to the Vickers and Knoop hardness tests:

Examples of Procedures for Determining Vickers and Knoop Hardness Uncertainty

Appendix 30

1.4 This test method covers Vickers hardness tests made utilizing test forces ranging from 9.807×10^{-2} N to 1176.80 N (1 gf to 120 kgf), and Knoop hardness tests made utilizing test forces from 9.807×10^{-2} N to 19.613 N (1 gf to 2 kgf).

1.5 Additional information on the procedures and guidance when testing in the microindentation force range (forces ≤ 1 kgf) may be found in Test Method E394, Test Method for Microindentation Hardness of Materials.

1.6 *Units*—When the Vickers and Knoop hardness tests were developed, the force levels were specified in units of grams-force (gf) and kilograms-force (kgf). This standard specifies the units of force and length in the International System of Units (SI); that is, force in Newtons (N) and length in mm or μm . However, because of the historical precedent and continued common usage, force values in gf and kgf units are provided for information and much of the discussion in this standard as well as the method of reporting the test results refers to these units.

¹ These test methods are under the jurisdiction of ASTM Committee E18 on Mechanical Testing and is the direct responsibility of Subcommittee E18.06 on Indentation Hardness Testing.

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^aA Summary of Changes section appears at the end of this standard.

Astm E92 Standard Test Methods For Vickers Hardness

Raffaella Di Napoli



Astm E92 Standard Test Methods For Vickers Hardness :

Hardness Testing Konrad Herrmann,2011 **Steel Metallurgy - Volume II** Marco V. Boniardi,Andrea Casaroli,

Introduction to Engine Valvetrains Yushu Wang,2006-10-27 Many books have been written about the design construction and maintenance of valvetrains but until now information has been scattered and difficult to find This comprehensive book will serve as your single resource providing a systematic introduction to valvetrain systems and components Focusing on the fundamental concepts this book enables you to appreciate design and material considerations while at the same time understanding the difficulties in designing valvetrains to satisfy functional requirements and manufacturing challenges *Corrosion Control in the Oil and Gas Industry* Sankara Papavinasam,2013-10-15 The effect of corrosion in the oil industry leads to the failure of parts This failure results in shutting down the plant to clean the facility The annual cost of corrosion to the oil and gas industry in the United States alone is estimated at 27 billion According to NACE International leading some to estimate the global annual cost to the oil and gas industry as exceeding 60 billion In addition corrosion commonly causes serious environmental problems such as spills and releases An essential resource for all those who are involved in the corrosion management of oil and gas infrastructure *Corrosion Control in the Oil and Gas Industry* provides engineers and designers with the tools and methods to design and implement comprehensive corrosion management programs for oil and gas infrastructures The book addresses all segments of the industry including production transmission storage refining and distribution Selects cost effective methods to control corrosion Quantitatively measures and estimates corrosion rates Treats oil and gas infrastructures as systems in order to avoid the impacts that changes to one segment if a corrosion management program may have on others Provides a gateway to more than 1 000 industry best practices and international standards *Weld Cracking in Ferrous Alloys* R Singh,2008-12-12 Weld cracks are unacceptable defects that can compromise the integrity of welded structures Weld cracking can lead to structural failures which at best will require remedial action and at worst can lead to loss of life *Weld cracking in ferrous alloys* reviews the latest developments in the design evaluation prevention and repair of weld cracks Part one reviews the fundamentals as well as recent advances in the areas of welding technology design and material selection for preventing weld cracking Part two analyses weld crack behaviour evaluation and repair of cracking cracked welds The book benefits from an extensive and robust chapter on the topic of NDE and quality control that was contributed by one of the most respected non destructive evaluation and development groups in the world Part three covers environment assisted weld cracking With its distinguished editor and international team of contributors *Weld cracking in ferrous alloys* is a valuable source of reference for all those concerned with improving the quality of welding and welded components In the planning and development of this book particular care has been taken to make the chapters suitable for people from other disciplines who need to understand weld cracking and failure Reviews the latest developments in the design evaluation prevention and repair of weld cracks Assesses

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Rock Mechanics Davood Fereidooni,2025-12-04 Rock mechanics is a multidisciplinary subject that uses the principles of mechanical science to investigate rock engineering behavior An important part of rock mechanics is laboratory studies of rock behavior Rock Mechanics Theoretical Foundations of Laboratory Tests is the first book that introduces the theoretical foundations of laboratory testing in an analytical manner It covers all main aspects from the definition and classification of intact rock sampling and specimen preparation petrographic description and physical properties and wave velocity and dynamic elastic constants via durability and deterioration hardness and abrasiveness seepage and permeability and

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there is need to control all three but quality is the most significant Many manufacturers recognize that quality leads to a higher customer retention rate and helps to build competitive boundaries However the term quality by itself isn t sufficient ISO 9000 definitions the QC is the operational techniques and activities that are utilized to fulfil requirements for quality and QA is all those planned and systematic activities implemented to provide adequate confidence that the entity will fulfil requirements for quality QC is a production line function The aim of QC is to offer the highest reasonable quality of product or service to the client thereby meeting or even exceeding the client s requirements The QA manager is interested in investigating technologies and processes that prevent defects QA is a staff function The aim of QA is to apply a planned and systematic production process establishing confidence that the process generates suitable products QC method is intended to provide regular product inspection thereby guaranteeing the output s correctness completeness and integrity It finds and addresses mistakes They file and record all the QC procedures The product or service needs to be suitable and fit for the intended purpose The methods and processes should decrease errors and shortcomings the first time through the manufacturing process QC is product oriented it focuses on tests and inspections carried out at various production line checkpoints QA is process oriented its concerns are process definitions proper selection of tools proper use of testing methods and operator training QC works at locating defects QA works at preventing them QC emphasizes testing of products to discover defects and reporting the results to management QA attempts to improve and stabilize production to minimize or prevent the conditions that trigger defects Typically quality control involves problem identification problem analysis problem correction and feedback Quality assurance involves data collection problem trend analysis process identification process analysis and process improvement

Oil and Gas Pipelines R. Winston Revie,2025-03-18 Discover the integrity safety and security of new and aging oil and gas pipelines in this comprehensive reference guide Oil and gas pipelines are typically used to transport oil and gas but can be adapted to transport ethanol carbon dioxide hydrogen and more A pipeline network is an efficient method for transporting any number of energy providing products but safety and integrity are critical aspects of pipeline integrity management The demand for pipeline safety and security is increasing in the face of more stringent standards and deepening environmental concerns including those related to climate change Oil and Gas Pipelines Integrity Safety and Security Handbook provides a comprehensive introduction to the integrity of new and aging pipelines and their management repair and maintenance All major varieties of pipeline are included along with all pertinent public safety and environmental protections Now fully updated to reflect the latest research and technological developments the book is a critical contribution to the reliability and safety of the global energy grid and ongoing efforts at carbon capture utilization and storage Readers of the second edition of Oil and Gas Pipelines will also find 26 new chapters including a new section on the digitalization of pipelines Detailed discussion of topics including management of geohazards mechanical damage internal corrosion monitoring and many more Extensive case histories with practical accompanying solutions Oil and Gas Pipelines is

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Materials Science and Engineering William D. Callister, Jr., David G. Rethwisch, 2020-06-23 Materials Science and Engineering An Introduction promotes student understanding of the three primary types of materials metals ceramics and polymers and composites as well as the relationships that exist between the structural elements of materials and their properties The 10th edition provides new or updated coverage on a number of topics including the Materials Paradigm and Materials Selection Charts 3D printing and additive manufacturing biomaterials recycling issues and the Hall effect

Shape Memory Alloy Engineering Antonio Concilio, Vincenza Antonucci, Ferdinando Auricchio, Leonardo Lecce, Elio Sacco, 2021-01-13 Shape Memory Alloy Engineering For Aerospace Structural and Biomedical Applications Second Edition embraces new advancements in materials systems and applications introduced since the first edition Readers will gain an understanding of the intrinsic properties of SMAs and their characteristic state diagrams Sections address modeling and design process aspects explore recent applications and discuss research activities aimed at making new devices for innovative implementations The book discusses both the potential of these fascinating materials their limitations in everyday life and tactics on how to overcome some limitations in order to achieve proper design of useful SMA mechanisms Provides a greatly expanded scope looking at new applications of SMA devices and current research activities Covers all aspects of SMA technology from a global state of the art survey to the classification of existing materials basic material design material manufacture and from device engineering design to implementation within actual systems Presents the material within a modular architecture over different topics from material conception to practical engineering realization

Department Of Defense Index of Specifications and Standards Federal Supply Class Listing (FSC) Part III July 2005 , *Manufacturing Engineer's Reference Book* D. KOSHAL, 2014-06-28 Never before have the wide range of disciplines comprising manufacturing engineering been covered in such detail in one volume Leading experts from all over the world have contributed sections The coverage represents the most up to date survey of the broad interests of the manufacturing engineer Extensive reference lists are provided making this an indispensable work for every engineer in industry Never before have the wide range of disciplines comprising manufacturing engineering been covered in such detail in one volume Leading experts from all over the world have contributed sections Materials and processes are described as well as management issues ergonomics maintenance and computers in industry CAD Computer Aided Design CAE Computer Aided Engineering CIM Computer Integrated Manufacturing and Quality are explored at length The coverage represents the most up to date survey of the broad interests of the manufacturing engineer Extensive reference lists are provided making this an indispensable work for every engineer in industry

High-Entropy Alloy Coatings Viswanathan S. Saji, Jamieson M.

Brechtl,2025-11-14 High Entropy Alloy Coatings Fundamentals and Applications is a comprehensive overview of the exciting potential of HEA coatings This book will cover the fundamentals fabrication methods applications and recent advancements in this field with concise chapters on each topic written by a team of experts Part I concentrates on the fundamental principles while Parts II III and IV are dedicated to coating type fabrication methods and applications of HEA coatings High entropy alloys HEAs consist of multiple five or higher principal elements distributed in roughly equal atomic percentages This makes them well suited as coating materials for extreme operational conditions HEA coatings have attracted considerable interest due to their remarkable mechanical and tribological properties and their resistance to high temperature oxidation as well as protective coating applications against corrosion and wear HEA coatings have diverse applications in several fields including energy storage and conversion electrocatalysis biomedical and nuclear sectors This book is written for senior undergraduate and graduate students research students engineers and researchers in the fields of Materials Science Mechanical Engineering Metallurgical Engineering Corrosion Engineering Surface Science and Coating Technologies Offers a dedicated volume on HEA coatings in distinction to existing books that focus on HEAs in bulk form Provides case studies specific to industries Outlines suitability of HEAs as coating materials for extreme operating environments Details methods for developing HEA coatings such as laser cladding physical vapour deposition methods such as sputtering thermal spraying techniques including plasma spraying high velocity oxy fuel spraying and cold spraying Considers the nature of the substrate material coating thickness and the intended applications *Springer Handbook of Additive Manufacturing* Eujin Pei,Alain Bernard,Dongdong Gu,Christoph Klahn,Mario Monzón,Maren Petersen,Tao Sun,2023-10-24 This Handbook is the ultimate definitive guide that covers key fundamentals and advanced applications for Additive Manufacturing The Handbook has been structured into seven sections comprising of a thorough Introduction to Additive Manufacturing Design and Data Processes Materials Post processing Testing and Inspection Education and Training and Applications and Case Study Examples The general principles and functional relationships are described in each chapter and supplemented with industry use cases The aim of this book is to help designers engineers and manufacturers understand the state of the art developments in the field of Additive Manufacturing Although this book is primarily aimed at students and educators it will appeal to researchers and industrial professionals working with technology users machine or component manufacturers to help them make better decisions in the implementation of Additive Manufacturing and its applications

Corrosion in the Petrochemical Industry, Second Edition ,2015-12-01 Originally published in 1994 this second edition of Corrosion in the Petrochemical Industry collects peer reviewed articles written by experts in the field of corrosion that were specifically chosen for this book because of their relevance to the petrochemical industry This edition expands coverage of the different forms of corrosion including the effects of metallurgical variables on the corrosion of several alloys It discusses protection methods including discussion of corrosion inhibitors and corrosion resistance of aluminum magnesium stainless

steels and nickels It also includes a section devoted specifically to petroleum and petrochemical industry related issues

Mechanical Testing of Materials Emmanuel Gdoutos, Maria Konsta-Gdoutos, 2024-01-19 This book offers a comprehensive and in depth exploration of the most widely used test methods for characterizing the deformation and failure behavior of materials It presents a thorough treatise on mechanical testing providing a valuable resource for researchers engineers and students seeking to understand the mechanical properties and performance of materials across various applications The book is organized into ten chapters dedicated to specific test methods including tensile compression bending torsion multiaxial indentation fracture fatigue creep high strain rates nondestructive evaluation ensuring a thorough examination of each technique s principles procedures and applications It features two special chapters focusing specifically on the mechanical characterization of concrete and fiber composite materials These chapters delve into the unique aspects and challenges associated with testing and analyzing these specific materials

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