1. Record Nr. UNINA9910254578703321

Titolo	The Theory of Laser Materials Processing : Heat and Mass Transfer in Modern Technology / / edited by John Dowden, Wolfgang Schulz
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2017
ISBN	3-319-56711-X
Edizione	[2nd ed. 2017.]
Descrizione fisica	1 online resource (XVII, 432 p. 177 illus., 15 illus. in color.)
Collana	Springer Series in Materials Science, , 0933-033X ; ; 119
Disciplina	621.366
Soggetti	Lasers Photonics Thermodynamics Heat engineering Heat transfer Mass transfer Metals Engineering—Materials Manufactures Optics, Lasers, Photonics, Optical Devices Engineering Thermodynamics, Heat and Mass Transfer Metallic Materials Materials Engineering Manufacturing, Machines, Tools, Processes
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	1 Mathematics in Laser Processing; John Dowden -- 2 Simulation of Laser Cutting; Wolfgang Schulz, Markus Nießen, Urs Eppelt and Kerstin Kowalick -- 3 Glass Cutting; Wolfgang Schulz -- 4 Keyhole Welding: the Solid and Liquid Phases ; Alexander Kaplan -- 5 Laser Keyhole Welding: The Vapour Phase; John Dowden -- 6 Basic Concepts of Laser Drilling; Wolfgang Schulz and Urs Eppelt -- 7 Arc Welding and Hybrid Laser-Arc Welding; Ian Richardson. - 8 Metallurgy and Imperfections of

Welding and Hardening; Alexander Kaplan -- 9 Laser Cladding; Frank Brückner and Dietrich Lepski -- 10 Laser Forming; Thomas Pretorius -- 11 Femtosecond Laser Pulse Interactions with Metals; Bernd Hüttner -- 12 Meta-Modelling and Visualisation of Multi-Dimensional Data for Virtual Production Intelligence; Wolfgang Schulz -- 13 Comprehensive Numerical Simulation of Laser Materials Processing; Markus Gross -- Index.

Sommario/riassunto

The revised edition of this important reference volume presents an expanded overview of the analytical and numerical approaches employed when exploring and developing modern laser materials processing techniques. The book shows how general principles can be used to obtain insight into laser processes, whether derived from fundamental physical theory or from direct observation of experimental results. The book gives readers an understanding of the strengths and limitations of simple numerical and analytical models that can then be used as the starting-point for more elaborate models of specific practical, theoretical or commercial value. Following an introduction to the mathematical formulation of some relevant classes of physical ideas, the core of the book consists of chapters addressing key applications in detail: cutting, keyhole welding, drilling, arc and hybrid laser-arc welding, hardening, cladding and forming. The second edition includes a new a chapter on glass cutting with lasers, as employed in the display industry. A further addition is a chapter on meta-modelling, whose purpose is to construct fast, simple and reliable models based on appropriate sources of information. It then makes it easy to explore data visually and is a convenient interactive tool for scientists to improve the quality of their models and for developers when designing their processes. As in the first edition, the book ends with an updated introduction to comprehensive numerical simulation. Although the book focuses on laser interactions with materials, many of the principles and methods explored can be applied to thermal modelling in a variety of different fields and at different power levels. It is aimed principally however at academic and industrial researchers and developers in the field of laser technology.