Power Converters For Medium Voltage Networks Green Energy And Technology 2014 Edition By Islam Md Rabiul Guo Youguang Zhu Jianguo 2014 Hardcover

Advanced Power Electronics ConvertersPredictive Control of Power Converters and Electrical DrivesSliding Mode Observation of Capacitor Voltage in Multilevel Power ConvertersPower Electronics HandbookHigh Voltage Direct Current TransmissionSwitching Power ConvertersDesign and Control of Power Converters for Medium Voltage DC Applications Enabled by Medium Voltage SiC-MOSFETsMulti-Level Converters for Medium Voltage Applications2018 International Power Electronics Conference (IPEC Niigata 2018 ECCE Asia)Pulse-width Modulated DC-DC Power ConvertersPower Converters for Medium Voltage NetworksHigh-power Medium-voltage DC-DC ConvertersPower Converters for Medium Voltage NetworksMultilevel Converters for Industrial ApplicationsControl of Medium-Voltage Drives at Very Low Switching FrequencyDesign, Control, and Application of Modular Multilevel Converters for HVDC Transmission SystemsModular Multilevel ConvertersUtility-Scale Solar Power ConverterModel Predictive Control of High Power Converters and Industrial DrivesSelf-Commutating Converters for High Power ApplicationsModular Multilevel ConvertersControl and Topology of High

Power ConvertersMedium-Voltage Direct Current GridMulti-Terminal High Voltage ConverterSwitching Power ConvertersHigh-Power Converters and AC DrivesModel Predictive Control of High Power Converters and Industrial DrivesRenewable EnergyPower Electronics DesignPower-Switching ConvertersMultilevel Converters for Industrial ApplicationsElectrical Power Systems and ComputersPulse Width Modulation for Power ConvertersModular Multilevel ConvertersHigh-Power Converters and AC DrivesModeling and Design Optimization of Medium Frequency Transformers for Medium-Voltage High-Power ConvertersHigh-Power Converters and AC DrivesAdvanced Power Electronics ConvertersHigh Performance Control of AC Drives with Matlab / Simulink ModelsMultilevel Converters for Industrial Applications

Advanced Power Electronics Converters

Medium Voltage Direct Current Grid is the first comprehensive reference to provide advanced methods and best practices with case studies to Medium Voltage Direct Current Grid (MVDC) for Resilience Operation, Protection and Control. It also provides technical details to tackle emerging challenges, and discuss knowledge and best practices about Modeling and Operation, Energy management of MVDC grid, MVDC Grid Protection, Power quality management of MVDC grid, Power quality analysis and control methods, AC/DC, DC/DC modular power converter,

Renewable energy applications and Energy storage technologies. In addition, includes support to end users to integrate their systems to smart grid. Covers advanced methods and global case studies for reference Provides technical details and best practices for the individual modeling and operation of MVDC systems Includes guidance to tackle emerging challenges and support users in integrating their systems to smart grids

Predictive Control of Power Converters and Electrical Drives

Power converters are at the heart of modern power electronics. From automotive power systems to propulsion for large ships, their use permeates through industrial, commercial, military, and aerospace applications of various scales. Having reached a point of saturation where we are unlikely to see many new and revolutionary technologies, industry no

Sliding Mode Observation of Capacitor Voltage in Multilevel Power Converters

Power Electronics Handbook

Design, Control and Application of Modular Multilevel Converters for HVDC Transmission Systems is a comprehensive guide to semiconductor technologies applicable for MMC design, component sizing control, modulation, and application of the MMC technology for HVDC transmission. Separated into three distinct parts, the first offers an overview of MMC technology, including information on converter component sizing, Control and Communication, Protection and Fault Management, and Generic Modelling and Simulation. The second covers the applications of MMC in offshore WPP, including planning, technical and economic requirements and optimization options, fault management, dynamic and transient stability. Finally, the third chapter explores the applications of MMC in HVDC transmission and Multi Terminal configurations, including Supergrids. Key features: Unique coverage of the offshore application and optimization of MMC-HVDC schemes for the export of offshore wind energy to the mainland. Comprehensive explanation of MMC application in HVDC and MTDC transmission technology. Detailed description of MMC components, control and modulation, different modeling approaches, converter dynamics under steady-state and fault contingencies including application and housing of MMC in HVDC schemes for onshore and offshore. Analysis of DC fault detection and protection technologies, system studies required for the integration of HVDC terminals to offshore wind power plants, and commissioning procedures for onshore and offshore HVDC terminals. A set of self-explanatory simulation models for HVDC test cases is available to download from the companion website. This book provides essential reading for graduate students

and researchers, as well as field engineers and professionals who require an in-depth understanding of MMC technology.

High Voltage Direct Current Transmission

Part I: Medium Voltage (MV) variable speed motor drives have brought significant advantages to the high power industry process. Multilevel inverters are a desirable solution for MV motor drives. Through addressing the practical issues in motor drive system based on the hexagram inverter, the work reported herein aims to pave the road to practically implementation of hexagram inverters for high power MV motor drives. One critical issue in high power motor drive is the reliability. A simple, cost-effective fault tolerant method is proposed to improve the reliability of the hexagram inverter motor drive. The proposed method demonstrates the motor drive's ability to operate when one module of the hexagram inverter is failed. This work is supported by simulations and small scale experiments. The thesis further explores other practical issues in motor drive using the hexagram inverter and makes a comparison to the popular Cascaded H-bridge inverter in aspects such as: system design, reliability estimate, output waveform, common-mode voltage, efficiency, fault tolerant ability. It is concluded that the hexagram inverter is an optimal option for MV motor driver applications with many advantages including low DC bus energy storage requirement, high reliability, high efficiency, modular and symmetric structure, simple control and easy design. Part II: DC-DC converters

are necessary in many applications including renewable energy and energy storage systems, which impose very challenging requirement on the DC-DC converter: high power, high current on the low-voltage side, high voltage gain, electric isolation, and bidirectional power flow. The second part of this thesis is devoted to the development of a family of bidirectional, isolated, high voltage gain DC-DC converters. A new three-phase DC-DC converter is introduced with a structure where three boost circuit connected in parallel on the low voltage side, while three buck circuit connected in a string on the high voltage side. The thesis further extrapolates the three-phase circuit to a generalized M-phase converter. Simulations and experiments have demonstrated that the proposed converter presents a breakthrough in the aspect of high voltage gain with electric isolation and bidirectional power flow.

Switching Power Converters

Modern semiconductor devices have reached high current and voltage levels, and their power-handling limits can be extended if they are used in multilevel converter configurations. To create high-performance and reliable control designs, however, engineers need in-depth understanding of the characteristics and operation of these topologies. Multilevel Converters for Industrial Applications presents a thorough and comprehensive analysis of multilevel converters with a common DC voltage source. The book offers a novel perspective to help readers understand the

principles of the operation of voltage-source multilevel converters as power processors, and their capabilities and limitations. The book begins with an overview of medium-voltage power converters and their applications. It then analyzes the topological characteristics of the diode-clamped multilevel converter, the flying capacitor multilevel converter, and the asymmetric cascaded multilevel converter. For each topology, the authors highlight particular control issues and design trade-offs. They also develop relevant modulation and control strategies. Numerous graphical representations aid in the analysis of the topologies and are useful for beginning the analysis of new multilevel converter topologies. The last two chapters of the book explore two case studies that analyze the behavior of the cascade asymmetric multilevel converter as a distribution static compensator and shunt active power filter, and the behavior of the diode-clamped topology configured as a back-to-back converter. These case studies demonstrate how to address the associated control problems with advanced control and modulation schemes. Examining recent advances, this book provides deep insight on the design of high-power multilevel converters and their applications. It is a valuable reference for anyone interested in medium-voltage power conversion, which is increasingly being used in industry and in renewable energy and distributed generation systems to improve efficiency and operation flexibility.

Design and Control of Power Converters for Medium Voltage

DC Applications Enabled by Medium Voltage SiC-MOSFETs

* The first single volume resource for researchers in the field who previously had to depend on separate papers and conference records to attain a working knowledge of the subject. * Brings together the field's diverse approaches into an integrated and comprehensive theory of PWM

Multi-Level Converters for Medium Voltage Applications

Presents the latest developments in switchgear and DC/DC converters for DC grids, and includes substantially expanded material on MMC HVDC This newly updated edition covers all HVDC transmission technologies including Line Commutated Converter (LCC) HVDC; Voltage Source Converter (VSC) HVDC, and the latest VSC HVDC based on Modular Multilevel Converters (MMC), as well as the principles of building DC transmission grids. Featuring new material throughout, High Voltage Direct Current Transmission: Converters, Systems and DC Grids, 2nd Edition offers several new chapters/sections including one on the newest MMC converters. It also provides extended coverage of switchgear, DC grid protection and DC/DC converters following the latest developments on the market and in research projects. All three HVDC technologies are studied in a wide range of topics, including: the basic converter operating principles; calculation of losses; system

modelling, including dynamic modelling; system control; HVDC protection, including AC and DC fault studies; and integration with AC systems and fundamental frequency analysis. The text includes: A chapter dedicated to hybrid and mechanical DC circuit breakers Half bridge and full bridge MMC: modelling, control, start-up and fault management A chapter dedicated to unbalanced operation and control of MMC HVDC The advancement of protection methods for DC grids Wideband and high-order modeling of DC cables Novel treatment of topics not found in similar books, including SimPowerSystems models and examples for all HVDC topologies hosted by the 1st edition companion site. High Voltage Direct Current Transmission: Converters, Systems and DC Grids, 2nd Edition serves as an ideal textbook for a graduate-level course or a professional development course.

2018 International Power Electronics Conference (IPEC Niigata 2018 ECCE Asia)

This book examines a number of topics, mainly in connection with advances in semiconductor devices and magnetic materials and developments in medium and large-scale renewable power plant technologies, grid integration techniques and new converter topologies, including advanced digital control systems for medium-voltage networks. The book’s individual chapters provide an extensive compilation of fundamental theories and in-depth information on current research and

development trends, while also exploring new approaches to overcoming some critical limitations of conventional grid integration technologies. Its main objective is to present the design and implementation processes for medium-voltage converters, allowing the direct grid integration of renewable power plants without the need for step-up transformers.

Pulse-width Modulated DC-DC Power Converters

The utilisation of renewable energies is not at all new; in the history of mankind renewable energies have for a long time been the primary possibility of generating energy. This only changed with industrial revolution when lignite and hard coal became increasingly more important. Later on, also crude oil gained importance. Offering the advantages of easy transportation and processing also as a raw material, crude oil has become one of the prime energy carriers applied today. Moreover, natural gas used for space heating and power provision as well as a transportation fuel has become increasingly important, as it is abundantly available and only requires low investments in terms of energy conversion facilities. As fossil energy carriers were increasingly used for energy generation, at least by the industrialised countries, the application of renewable energies decreased in absolute and relative terms; besides a few exceptions, renewable energies are of secondary importance with regard to overall energy generation.

Power Converters for Medium Voltage Networks

An invaluable academic reference for the area of high-power converters, covering all the latest developments in the field High-power multilevel converters are well known in industry and academia as one of the preferred choices for efficient power conversion. Over the past decade, several power converters have been developed and commercialized in the form of standard and customized products that power a wide range of industrial applications. Currently, the modular multilevel converter is a fast-growing technology and has received wide acceptance from both industry and academia. Providing adequate technical background for graduate- and undergraduate-level teaching, this book includes a comprehensive analysis of the conventional and advanced modular multilevel converters employed in motor drives, HVDC systems, and power quality improvement. Modular Multilevel Converters: Analysis, Control, and Applications provides an overview of high-power converters, reference frame theory, classical control methods, pulse width modulation schemes, advanced model predictive control methods, modeling of ac drives, advanced drive control schemes, modeling and control of HVDC systems, active and reactive power control, power quality problems, reactive power, harmonics and unbalance compensation, modeling and control of static synchronous compensators (STATCOM) and unified power quality compensators. Furthermore, this book: Explores technical challenges, modeling, and control of various modular multilevel converters in a wide range of applications such as

transformer and transformerless motor drives, high voltage direct current transmission systems, and power quality improvement Reflects the latest developments in high-power converters in medium-voltage motor drive systems Offers design guidance with tables, charts graphs, and MATLAB simulations Modular Multilevel Converters: Analysis, Control, and Applications is a valuable reference book for academic researchers, practicing engineers, and other professionals in the field of high power converters. It also serves well as a textbook for graduate-level students.

High-power Medium-voltage DC-DC Converters

Describes the general principles and current research into Model Predictive Control (MPC); the most up-to-date control method for power converters and drives The book starts with an introduction to the subject before the first chapter on classical control methods for power converters and drives. This covers classical converter control methods and classical electrical drives control methods. The next chapter on Model predictive control first looks at predictive control methods for power converters and drives and presents the basic principles of MPC. It then looks at MPC for power electronics and drives. The third chapter is on predictive control applied to power converters. It discusses: control of a three-phase inverter; control of a neutral point clamped inverter; control of an active front end rectifier, and; control of a matrix converter. In the middle of the book there is Chapter four -

Predictive control applied to motor drives. This section analyses predictive torque control of industrial machines and predictive control of permanent magnet synchronous motors. Design and implementation issues of model predictive control is the subject of the final chapter. The following topics are described in detail: cost function selection; weighting factors design; delay compensation; effect of model errors, and prediction of future references. While there are hundreds of books teaching control of electrical energy using pulse width modulation, this will be the very first book published in this new topic. Unique in presenting a completely new theoretic solution to control electric power in a simple way Discusses the application of predictive control in motor drives, with several examples and case studies Matlab is included on a complementary website so the reader can run their own simulations

Power Converters for Medium Voltage Networks

This book serves as an invaluable reference to Power Electronics Design, covering the application of high-power semiconductor technology to large motor drives, power supplies, power conversion equipment, electric utility auxiliaries and numerous other applications. Design engineers, design drafters and technicians in the power electronics industry, as well as students studying power electronics in various contexts, will benefit from Keith Sueker's decades of experience in the industry. With this experience, the author has put the overall power electronics

design process in the context of primary electronic components and the many associated components required for a system. The seeming complexity of power electronics design is made transparent with Keith Sueker's simple, direct language and a minimum reliance on mathematics. Readers will come away with a wealth of practical design information that has hundreds of explanatory diagrams to support it, having also seen many examples of potential pitfalls in the design process. * A down-to-earth approach, free of complex jargon and esoteric information. * Over 200 illustrations to clarify discussion points. * Examples of costly design goofs will provide invaluable cautionary advice.

Multilevel Converters for Industrial Applications

This book covers power electronics, in depth, by presenting the basic principles and application details, which can be used both as a textbook and reference book. Introduces a new method to present power electronics converters called Power Blocks Geometry (PBG) Applicable for courses focusing on power electronics, power electronics converters, and advanced power converters Offers a comprehensive set of simulation results to help understand the circuits presented throughout the book

Control of Medium-Voltage Drives at Very Low Switching

Frequency

This book presents the latest cutting-edge technology in high-power converters and medium voltage drives, and provides a complete analysis of various converter topologies, modulation techniques, practical drive configurations, and advanced control schemes. Supplemented with more than 250 illustrations, the author illustrates key concepts with simulations and experiments. Practical problems, along with accompanying solutions, are presented to help you tackle real-world issues.

Design, Control, and Application of Modular Multilevel Converters for HVDC Transmission Systems

This book studies switch-mode power supplies (SMPS) in great detail. This type of converter changes an unregulated DC voltage into a high-frequency pulse-width modulated (PWM) voltage controlled by varying the duty cycle, then changes the PWM AC voltage to a regulated DC voltage at a high efficiency by rectification and filtering. Used to supply electronic circuits, this converter saves energy and space in the overall system. With concept-orientated explanations, this book offers state-of-the-art SMPS technology and promotes an understanding of the principle operations of PWM converters, as well as enabling the readers to evaluate their

characteristics. Design-orientated analysis (including a steady-state analysis for both continuous and discontinuous conduction modes) and numerous real-world practical examples (including circuit models of the PWM converters) demonstrate how to design these from scratch. The book provides an in-depth presentation of topologies of PWM DC-DC power converters, voltage- and current-mode control of PWM DC–DC power converters, considers power losses in all components, device stresses, output voltage ripple, converter efficiency and power factor correction (PFC). It also includes extensive coverage of the following: topologies of high-efficiency switching-mode PWM and soft-switching DC-DC power converters; DC voltage transfer functions (conversion ratios), component values, losses, efficiency, and stresses; small-signal averaged circuit models; current-mode and voltage-mode feedback controls; metal-oxide-semiconductor field-effect power transistors (MOSFETs); silicon (Si) and silicon carbide (SiC) power semiconductor devices. Before now, there has been no book that covers silicon carbide devices. Pulse-width Modulated DC-DC Power Converters is a comprehensive textbook for senior undergraduate and graduate students in the areas of electrical, electronics, and telecommunications engineering. It includes end-of-chapter review questions, problems, and thorough summaries of the key concepts to aid learning, and a Solutions Manual is available for professors. Scientists and practicing design engineers working with SMPS, within such applications as computers, telecommunications, industrial systems, automobile electronics, medical equipment, aerospace power technology, and radars (amongst others) will also

find this text insightful.

Modular Multilevel Converters

This volume includes extended and revised versions of a set of selected papers from the International Conference on Electric and Electronics (EEIC 2011) , held on June 20-22 , 2011, which is jointly organized by Nanchang University, Springer, and IEEE IAS Nanchang Chapter. The objective of EEIC 2011 Volume 3 is to provide a major interdisciplinary forum for the presentation of new approaches from Electrical Power Systems and Computers, to foster integration of the latest developments in scientific research. 133 related topic papers were selected into this volume. All the papers were reviewed by 2 program committee members and selected by the volume editor Prof. Xiaofeng Wan. We hope every participant can have a good opportunity to exchange their research ideas and results and to discuss the state of the art in the areas of the Electrical Power Systems and Computers.

Utility-Scale Solar Power Converter

Modern semiconductor devices have reached high current and voltage levels, and their power-handling limits can be extended if they are used in multilevel converter

configurations. To create high-performance and reliable control designs, however, engineers need in-depth understanding of the characteristics and operation of these topologies. Multilevel Converters for Industrial Applications presents a thorough and comprehensive analysis of multilevel converters with a common DC voltage source. The book offers a novel perspective to help readers understand the principles of the operation of voltage-source multilevel converters as power processors, and their capabilities and limitations. The book begins with an overview of medium-voltage power converters and their applications. It then analyzes the topological characteristics of the diode-clamped multilevel converter, the flying capacitor multilevel converter, and the asymmetric cascaded multilevel converter. For each topology, the authors highlight particular control issues and design trade-offs. They also develop relevant modulation and control strategies. Numerous graphical representations aid in the analysis of the topologies and are useful for beginning the analysis of new multilevel converter topologies. The last two chapters of the book explore two case studies that analyze the behavior of the cascade asymmetric multilevel converter as a distribution static compensator and shunt active power filter, and the behavior of the diode-clamped topology configured as a back-to-back converter. These case studies demonstrate how to address the associated control problems with advanced control and modulation schemes. Examining recent advances, this book provides deep insight on the design of high-power multilevel converters and their applications. It is a valuable reference for anyone interested in medium-voltage power conversion, which is

increasingly being used in industry and in renewable energy and distributed generation systems to improve efficiency and operation flexibility.

Model Predictive Control of High Power Converters and Industrial Drives

Self-Commutating Converters for High Power Applications

Modular Multilevel Converters

Control and Topology of High Power Converters

Mots-clés de l'auteur: Solid State Transformer ; Medium Frequency Transformer ; Modeling ; Design ; Optimization.

Medium-Voltage Direct Current Grid

An examination of all of the multidisciplinary aspects of medium- and high-power

converter systems, including basic power electronics, digital control and hardware, sensors, analog preprocessing of signals, protection devices and fault management, and pulse-width-modulation (PWM) algorithms, Switching Power Converters: Medium and High Power, Second Edition discusses the actual use of industrial technology and its related subassemblies and components, covering facets of implementation otherwise overlooked by theoretical textbooks. The updated Second Edition contains many new figures, as well as new and/or improved chapters on: Thermal management and reliability Intelligent power modules AC/DC and DC/AC current source converters Multilevel converters Use of IPM within a "network of switches" concept Power semiconductors Matrix converters Practical aspects in building power converters Providing the latest research and development information, along with numerous examples of successful home appliance, aviation, naval, automotive electronics, industrial motor drive, and grid interface for renewable energy products, this edition highlights advancements in packaging technologies, tackles the advent of hybrid circuits able to incorporate control and power stages within the same package, and examines design for reliability from the system level perspective.

Multi-Terminal High Voltage Converter

1 Static Power Converters 2 Power Devices, Passive Components and System Integrations 3 Modeling, Simulation, EMI and Reliability 4 Electric Machines,

Actuators and Sensors 5 Motor Control and Drives 6 Motion Control and Robotics 7 Conversion Technologies for Renewable Energy and Energy Saving 8 Power Electronics Applied to Transmission, Smart Grid, DC grid and Distribution Systems 9 Power Electronics and Drives Applied to Railway Systems 10 Power Electronics and Drives Applied to Electric and Hybrid Vehicles 11 Power Supply Technologies for Information and Communication Systems 12 Power Electronics and Drives Applied to Home Appliance 13 Power Electronics and Drives for Industrial Applications 14 Education in Power Electronics and Electrical Engineering 15 Other Related Topics

Switching Power Converters

Medium-voltage ac drives are employed in numerous industrial setups that demand adjustable frequency. The present work focuses on the control of the voltage source inverter, which feeds the ac machine of the drive system with variable-frequency, switched voltage waveforms. The objective is to allow the inverter operate at very low switching frequency down to 200 Hz. The switching losses of the power semiconductors are then reduced which permits increasing the maximum load current of the inverter. Setting the switching frequency to very low values entails high harmonic distortion of the stator currents. The machine losses increase, as a consequence. To overcome this problem, synchronous optimal pulsewidth modulation is employed for inverter control; it minimizes the harmonic

current at steady-state conditions. A fast controller is introduced: it eliminates harmonic excursions that occur when the operating point changes. Rather than the stator current, the method is based on the evaluation of an optimal stator flux linkage trajectory, which introduces insensitivity against variations of the machine parameters. A further issue of concern in the present work is the dynamic behavior of vector-controlled medium-voltage drives: low switching frequency values intensify the cross-coupling between torque and flux in vectorcontrolled systems. In a first approach, linear current controllers are designed in the frequency domain to compensate this undesired effect. A nonlinear controller is subsequently introduced, especially for operation at synchronous optimal modulation: it makes use of an optimal trajectory of the stator flux linkage vector to achieve deadbeat performance and complete decoupling.

High-Power Converters and AC Drives

For very high voltage or very high current applications, the power industry still relies on thyristor-based Line Commutated Conversion (LCC), which limits the power controllability to two quadrant operation. However, the ratings of self-commutating switches such as the Insulated-Gate Bipolar Transistor (IGBT) and Integrated Gate-Commutated Thyristor (IGCT), are reaching levels that make the technology possible for very high power applications. This unique book reviews the present state and future prospects of self-commutating static power converters for

applications requiring either ultra high voltages (over 600 kV) or ultra high currents (in hundreds of kA). It is an important reference for electrical engineers working in the areas of power generation, transmission and distribution, utilities, manufacturing and consulting organizations. All topics in this area are held in this one complete volume. Within these pages, expect to find thorough coverage on: modelling and control of converter dynamics; multi-level Voltage Source Conversion (VSC) and Current Source Conversion (CSC); ultra high-voltage VSC and CSC DC transmission; low voltage high DC current AC-DC conversion; industrial high current applications; power conversion for high energy storage. This text has a host of helpful material that also makes it a useful source of knowledge for final year engineering students specializing in power engineering, and those involved in postgraduate research.

Model Predictive Control of High Power Converters and Industrial Drives

Modern semiconductor devices have reached high current and voltage levels, and their power-handling limits can be extended if they are used in multilevel converter configurations. To create high-performance and reliable control designs, however, engineers need in-depth understanding of the characteristics and operation of these topologies. Multilevel Converters for Industrial Applications presents a

thorough and comprehensive analysis of multilevel converters with a common DC voltage source. The book offers a novel perspective to help readers understand the principles of the operation of voltage-source multilevel converters as power processors, and their capabilities and limitations. The book begins with an overview of medium-voltage power converters and their applications. It then analyzes the topological characteristics of the diode-clamped multilevel converter, the flying capacitor multilevel converter, and the asymmetric cascaded multilevel converter. For each topology, the authors highlight particular control issues and design trade-offs. They also develop relevant modulation and control strategies. Numerous graphical representations aid in the analysis of the topologies and are useful for beginning the analysis of new multilevel converter topologies. The last two chapters of the book explore two case studies that analyze the behavior of the cascade asymmetric multilevel converter as a distribution static compensator and shunt active power filter, and the behavior of the diode-clamped topology configured as a back-to-back converter. These case studies demonstrate how to address the associated control problems with advanced control and modulation schemes. Examining recent advances, this book provides deep insight on the design of high-power multilevel converters and their applications. It is a valuable reference for anyone interested in medium-voltage power conversion, which is increasingly being used in industry and in renewable energy and distributed generation systems to improve efficiency and operation flexibility.

Renewable Energy

An all-in-one guide to high-voltage, multi-terminal converters, this book brings together the state of the art and cutting-edge techniques in the various stages of designing and constructing a high-voltage converter. The book includes 9 chapters, and can be classified into three aspects. First, all existing high-voltage converters are introduced, including the conventional two-level converter, and the multi-level converters, such as the modular multi-level converter (MMC). Second, different kinds of multi-terminal high-voltage converters are presented in detail, including the topology, operation principle, control scheme and simulation verification. Third, some common issues of the proposed multi-terminal high-voltage converters are discussed, and different industrial applications of the proposed multi-terminal high-voltage converters are provided. Systematically proposes, for the first time, the design methodology for high-voltage converters in use of MTDC grids; also applicable to constructing novel power electronics converters, and driving the development of HVDC, which is one of the most important technology areas Presents the latest research on multi-terminal high-voltage converters and its application in MTDC transmission systems and other industrially important applications Offers an overview of existing technology and future trends of the high-voltage converter, with extensive discussion and analysis of different types of high-voltage converters and relevant control techniques (including DC-AC, AC-DC, DC-DC, and AC-AC converters) Provides readers with sufficient context to delve

into the more specialized topics covered in the book Featuring a series of novel multi-terminal high-voltage converters proposed and patented by the authors, Multi-terminal High Voltage Converters is written for researchers, engineers, and advanced students specializing in power electronics, power system engineering and electrical engineering.

Power Electronics Design

A comprehensive guide to understanding AC machines with exhaustive simulation models to practice design and control Nearly seventy percent of the electricity generated worldwide is used by electrical motors. Worldwide, huge research efforts are being made to develop commercially viable three- and multi-phase motor drive systems that are economically and technically feasible. Focusing on the most popular AC machines used in industry – induction machine and permanent magnet synchronous machine – this book illustrates advanced control techniques and topologies in practice and recently deployed. Examples are drawn from important techniques including Vector Control, Direct Torque Control, Nonlinear Control, Predictive Control, multi-phase drives and multilevel inverters. Key features include: systematic coverage of the advanced concepts of AC motor drives with and without output filter; discussion on the modelling, analysis and control of three- and multi-phase AC machine drives, including the recently developed multi-phase-phase drive system and double fed induction machine; description of model

predictive control applied to power converters and AC drives, illustrated together with their simulation models; end-of-chapter questions, with answers and PowerPoint slides available on the companion website www.wiley.com/go/aburub_control This book integrates a diverse range of topics into one useful volume, including most the latest developments. It provides an effective guideline for students and professionals on many vital electric drives aspects. It is an advanced textbook for final year undergraduate and graduate students, and researchers in power electronics, electric drives and motor control. It is also a handy tool for specialists and practicing engineers wanting to develop and verify their own algorithms and techniques.

Power-Switching Converters

In this original book on model predictive control (MPC) for power electronics, the focus is put on high-power applications with multilevel converters operating at switching frequencies well below 1 kHz, such as medium-voltage drives and modular multi-level converters. Consisting of two main parts, the first offers a detailed review of three-phase power electronics, electrical machines, carrier-based pulse width modulation, optimized pulse patterns, state-of-the art converter control methods and the principle of MPC. The second part is an in-depth treatment of MPC methods that fully exploit the performance potential of high-power converters. These control methods combine the fast control responses of deadbeat

control with the optimal steady-state performance of optimized pulse patterns by resolving the antagonism between the two. MPC is expected to evolve into the control method of choice for power electronic systems operating at low pulse numbers with multiple coupled variables and tight operating constraints it. Model Predictive Control of High Power Converters and Industrial Drives will enable to reader to learn how to increase the power capability of the converter, lower the current distortions, reduce the filter size, achieve very fast transient responses and ensure the reliable operation within safe operating area constraints. Targeted at power electronic practitioners working on control-related aspects as well as control engineers, the material is intuitively accessible, and the mathematical formulations are augmented by illustrations, simple examples and a book companion website featuring animations. Readers benefit from a concise and comprehensive treatment of MPC for industrial power electronics, enabling them to understand, implement and advance the field of high-performance MPC schemes.

Multilevel Converters for Industrial Applications

A comprehensive reference of the latest developments in MV drive technology in the area of power converter topologies This new edition reflects the recent technological advancements in the MV drive industry, such as advanced multilevel converters and drive configurations. It includes three new chapters, Control of Synchronous Motor Drives, Transformerless MV Drives, and Matrix Converter Fed

Drives. In addition, there are extensively revised chapters on Multilevel Voltage Source Inverters and Voltage Source Inverter-Fed Drives. This book includes a systematic analysis on a variety of high-power multilevel converters, illustrates important concepts with simulations and experiments, introduces various megawatt drives produced by world leading drive manufacturers, and addresses practical problems and their mitigations methods. This new edition: Provides an in-depth discussion and analysis of various control schemes for the MV synchronous motor drives Examines new technologies developed to eliminate the isolation transformer in the MV drives Discusses the operating principle and modulation schemes of matrix converter (MC) topology and multi-module cascaded matrix converters (CMCs) for MV drives, and their application in commercial MV drives Bin Wu is a Professor and Senior NSERC/Rockwell Automation Industrial Research Chair in Power Electronics and Electric Drives at Ryerson University, Canada. He is a fellow of Institute of Electrical and Electronics Engineers (IEEE), Engineering Institute of Canada (EIC), and Canadian Academy of Engineering (CAE). Dr. Wu has published more than 400 papers and holds more than 30 granted/pending US/European patents. He co-authored several books including Power Conversion and Control of Wind Energy Systems and Model Predictive Control of Wind Energy Conversion Systems (both by Wiley-IEEE Press). Mehdi Narimani is a Postdoctoral Research Associate with the Department of Electrical and computer Engineering at Ryerson University, Canada, and Rockwell Automation Canada. He is a senior member of IEEE. Dr. Narimani is author/co-author of more than 50 technical papers

and four US/European patents (issued/pending review). His current research interests include power conversion, high power converters, control of power electronics, and renewable energy systems.

Electrical Power Systems and Computers

This book covers power electronics, in depth, by presenting the basic principles and application details, which can be used both as a textbook and reference book. Introduces a new method to present power electronics converters called Power Blocks Geometry (PBG) Applicable for courses focusing on power electronics, power electronics converters, and advanced power converters Offers a comprehensive set of simulation results to help understand the circuits presented throughout the book

Pulse Width Modulation for Power Converters

A comprehensive reference of the latest developments in MV drive technology in the area of power converter topologies This new edition reflects the recent technological advancements in the MV drive industry, such as advanced multilevel converters and drive configurations. It includes three new chapters, Control of Synchronous Motor Drives, Transformerless MV Drives, and Matrix Converter Fed

Drives. In addition, there are extensively revised chapters on Multilevel Voltage Source Inverters and Voltage Source Inverter-Fed Drives. This book includes a systematic analysis on a variety of high-power multilevel converters, illustrates important concepts with simulations and experiments, introduces various megawatt drives produced by world leading drive manufacturers, and addresses practical problems and their mitigations methods. This new edition: Provides an in-depth discussion and analysis of various control schemes for the MV synchronous motor drives Examines new technologies developed to eliminate the isolation transformer in the MV drives Discusses the operating principle and modulation schemes of matrix converter (MC) topology and multi-module cascaded matrix converters (CMCs) for MV drives, and their application in commercial MV drives Bin Wu is a Professor and Senior NSERC/Rockwell Automation Industrial Research Chair in Power Electronics and Electric Drives at Ryerson University, Canada. He is a fellow of Institute of Electrical and Electronics Engineers (IEEE), Engineering Institute of Canada (EIC), and Canadian Academy of Engineering (CAE). Dr. Wu has published more than 400 papers and holds more than 30 granted/pending US/European patents. He co-authored several books including Power Conversion and Control of Wind Energy Systems and Model Predictive Control of Wind Energy Conversion Systems (both by Wiley-IEEE Press). Mehdi Narimani is a Postdoctoral Research Associate with the Department of Electrical and computer Engineering at Ryerson University, Canada, and Rockwell Automation Canada. He is a senior member of IEEE. Dr. Narimani is author/co-author of more than 50 technical papers

and four US/European patents (issued/pending review). His current research interests include power conversion, high power converters, control of power electronics, and renewable energy systems.

Modular Multilevel Converters

This book presents a detailed comparison of state-of- the-art 2L-VSC, 3L-NPC VSC, and different ML VSCs for MV converters. On the basis of the application requirements, different ML converter structures are designed, simulated, and evaluated. The development of design tools based on state-of-the-art converters and semiconductors, which enable the dimensioning of power semiconductors, dc link capacitors, and transformers; are one major part of this book. Finally, the amount of active and passive components, the modulation, losses, and efficiency are calculated and compared. The book is arranged in seven main chapters: The introduction in chapter 1 is followed by an overview of MV converter topologies in chapter 2. Chapter 3 presents the basic structure and function of VSC topologies. The dimensioning and design of power semiconductors, dc link capacitors, and isolation transformers are developed in chapter 4. The basic converter data for comparison are described in chapter 5. The complete comparison of the different converter topologies is performed in chapter 6. Finally, the conclusion and discussion are presented in chapter 7.

High-Power Converters and AC Drives

Power electronics, which is a rapidly growing area in terms of research and applications, uses modern electronics technology to convert electric power from one form to another, such as ac-dc, dc-dc, dc-ac, and ac-ac with a variable output magnitude and frequency. Power electronics has many applications in our every day life such as air-conditioners, electric cars, sub-way trains, motor drives, renewable energy sources and power supplies for computers. This book covers all aspects of switching devices, converter circuit topologies, control techniques, analytical methods and some examples of their applications. * 25% new content * Reorganized and revised into 8 sections comprising 43 chapters * Coverage of numerous applications, including uninterruptable power supplies and automotive electrical systems * New content in power generation and distribution, including solar power, fuel cells, wind turbines, and flexible transmission

Modeling and Design Optimization of Medium Frequency Transformers for Medium-Voltage High-Power Converters

High-Power Converters and AC Drives

An examination of all of the multidisciplinary aspects of medium- and high-power converter systems, including basic power electronics, digital control and hardware, sensors, analog preprocessing of signals, protection devices and fault management, and pulse-width-modulation (PWM) algorithms, Switching Power Converters: Medium and High Power, Second Edition discusses the actual use of industrial technology and its related subassemblies and components, covering facets of implementation otherwise overlooked by theoretical textbooks. The updated Second Edition contains many new figures, as well as new and/or improved chapters on: Thermal management and reliability Intelligent power modules AC/DC and DC/AC current source converters Multilevel converters Use of IPM within a "network of switches" concept Power semiconductors Matrix converters Practical aspects in building power converters Providing the latest research and development information, along with numerous examples of successful home appliance, aviation, naval, automotive electronics, industrial motor drive, and grid interface for renewable energy products, this edition highlights advancements in packaging technologies, tackles the advent of hybrid circuits able to incorporate control and power stages within the same package, and examines design for reliability from the system level perspective.

Advanced Power Electronics Converters

Solar ADEPT Project: Satcon is developing a compact, lightweight power conversion

device that is capable of taking utility-scale solar power and outputting it directly into the electric utility grid at distribution voltage levels--eliminating the need for large transformers. Transformers?step up? the voltage of the power that is generated by a solar power system so it can be efficiently transported through transmission lines and eventually?stepped down? to usable voltages before it enters homes and businesses. Power companies step up the voltage because less electricity is lost along transmission lines when the voltage is high and current is low. Satcon's new power conversion devices will eliminate these heavy transformers and connect a utility-scale solar power system directly to the grid. Satcon's modular devices are designed to ensure reliability--if one device fails it can be bypassed and the system can continue to run.

High Performance Control of AC Drives with Matlab / Simulink Models

In this original book on model predictive control (MPC) for power electronics, the focus is put on high-power applications with multilevel converters operating at switching frequencies well below 1 kHz, such as medium-voltage drives and modular multi-level converters. Consisting of two main parts, the first offers a detailed review of three-phase power electronics, electrical machines, carrier-based pulse width modulation, optimized pulse patterns, state-of-the art converter

control methods and the principle of MPC. The second part is an in-depth treatment of MPC methods that fully exploit the performance potential of high-power converters. These control methods combine the fast control responses of deadbeat control with the optimal steady-state performance of optimized pulse patterns by resolving the antagonism between the two. MPC is expected to evolve into the control method of choice for power electronic systems operating at low pulse numbers with multiple coupled variables and tight operating constraints it. Model Predictive Control of High Power Converters and Industrial Drives will enable to reader to learn how to increase the power capability of the converter, lower the current distortions, reduce the filter size, achieve very fast transient responses and ensure the reliable operation within safe operating area constraints. Targeted at power electronic practitioners working on control-related aspects as well as control engineers, the material is intuitively accessible, and the mathematical formulations are augmented by illustrations, simple examples and a book companion website featuring animations. Readers benefit from a concise and comprehensive treatment of MPC for industrial power electronics, enabling them to understand, implement and advance the field of high-performance MPC schemes.

Multilevel Converters for Industrial Applications

An invaluable academic reference for the area of high-power converters, covering all the latest developments in the field High-power multilevel converters are well

known in industry and academia as one of the preferred choices for efficient power conversion. Over the past decade, several power converters have been developed and commercialized in the form of standard and customized products that power a wide range of industrial applications. Currently, the modular multilevel converter is a fast-growing technology and has received wide acceptance from both industry and academia. Providing adequate technical background for graduate- and undergraduate-level teaching, this book includes a comprehensive analysis of the conventional and advanced modular multilevel converters employed in motor drives, HVDC systems, and power quality improvement. Modular Multilevel Converters: Analysis, Control, and Applications provides an overview of high-power converters, reference frame theory, classical control methods, pulse width modulation schemes, advanced model predictive control methods, modeling of ac drives, advanced drive control schemes, modeling and control of HVDC systems, active and reactive power control, power quality problems, reactive power, harmonics and unbalance compensation, modeling and control of static synchronous compensators (STATCOM) and unified power quality compensators. Furthermore, this book: Explores technical challenges, modeling, and control of various modular multilevel converters in a wide range of applications such as transformer and transformerless motor drives, high voltage direct current transmission systems, and power quality improvement Reflects the latest developments in high-power converters in medium-voltage motor drive systems Offers design guidance with tables, charts graphs, and MATLAB simulations

Modular Multilevel Converters: Analysis, Control, and Applications is a valuable reference book for academic researchers, practicing engineers, and other professionals in the field of high power converters. It also serves well as a textbook for graduate-level students.