

Preface

Every technical book has, on account of continuing new discoveries, further developments in equipment set-up and changes in the area, only a finite actuality. During my professional career, I had the great benefit of engaging myself with latest technical books of high-voltage engineering, in general, and measurement technique, in particular. A part of it has been published a long time ago and is, in the meantime, out of print or available only as unchanged reprint of older editions. I have therefore taken it upon myself to publish in the present book the result of my experience gained over the past decades in the areas of high impulse voltage and current measurement techniques. The intention thereby is to take over actual fundamentals presented in older textbooks, which are valid even today, and combine them with recent developments in technical equipment, test specifications, calibration of measuring systems and data processing.

Besides the partial discharge measurement technique, high impulse voltage and current measurement technique is generally considered to be an important building block of secured transmission of electrical energy at high voltage potential. Over and above that, it poses high requirements on the engineer and technician entrusted with measurements in the testing area. In addition to the transmission of electrical energy, high pulse-type voltages and currents are encountered in other areas of physics and engineering, in which they are made use of for various applications. Catchwords for these applications are: plasma physics, power electronics, medical technology, spot-welding technology, electronic ignition systems for combustion engines, electro-shock weapons and electromagnetic compatibility. Even in these areas, impulse measurement technique acquires a special significance either to prevent an overstressing or understressing of the test object or to guarantee the quality of the application.

At the outset, it has to be borne in mind that in the energy technology area, international testing and measuring methodology has always had a strong influence, not the least on the basis of globalised market economy. This pertains, on the one hand, to national and international test specifications which lay down impulse parameters and fundamental measuring and evaluation procedures, and on the other, to the world-wide network of testing and calibration laboratories; these are accredited as per internationally accepted rules and their measurement and test results are mutually recognised and accepted. The present book is not thought of as

a copy of the specifications, which have continually changed in course of time, and according to our experience, will continue to change even in the future. Nevertheless, a few core aspects and the background, especially about the procedures and changes in the latest editions of the ‘horizontal’ Publications IEC 60060 (High-voltage test techniques) and IEC 62475 (High-current test techniques) will be dealt with. As usual, both IEC Publications were accepted as harmonised editions by many National Committees.

Over the last two decades, digital impulse voltage and impulse current measurement techniques have improved due to the enormously improved properties of digital recorders and personal computers. These permit the widest application of software with numerical calculating methods not only for the evaluation of the recorded waveforms, but also for filtering of the data or even to determine the dynamic behaviour of voltage dividers and current sensors with the help of convolution.

For understanding the content of this book, fundamental knowledge of high-voltage engineering is a prerequisite for the reader. While in Europe, measuring systems as well as testing and measurement techniques are tailor-made for the maximum voltage level of 400 kV, in other parts of the world, more than twice these levels of transmission voltages are required for bridging large distances between energy sources and consumers. Based on the enormous economic development of the Asiatic region, voltages higher than 1,000 kV for alternating voltage transmission and 800 kV for direct voltage transmission are under discussion. In this connection, whether the proven measuring set-ups and testing techniques can be used without any hesitation at these higher voltages too must be examined.

In the area of high impulse voltage and current measurement technique, a large number of publications exist in technical journals and conference volumes since about 100 years. As a compromise, mainly, only such references appearing in the last 30 years have been taken into consideration in this book. The historically interested reader would find earlier references in older books cited in the first chapter of this book. Multifarious possibilities of research are also available to such readers through the internet.

As thanksgiving, I wish to mention in the very first place, Prof. Dr.-Ing. Dr.-Ing. h.c. Dieter Kind, Professor at the Technical University of Braunschweig and Past-President of the Physikalisch Technische Bundesanstalt Braunschweig und Berlin (PTB). He has strongly influenced and fostered my professional career at the High-Voltage Laboratory of PTB, supported me on many small and big occasions and introduced me to the international group of high-voltage experts. I also thank him for his friendly interest in the manuscript of the German edition of this book and for having gone through the first draft.

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Klaus Schon

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Fundamentals - Measuring Instruments - Measuring
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Schon, K.

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