



METROLOGY STANDARDIZATION AND CERTIFICATION IN ENERGY SECTOR

Manual for graduate students

UDC 621.3 (075)
LBC 31.2 я 73
M 61

*Recommended for publication by the Scientific Council
of the Faculty of Physics and Technology
and RISO of Al-Farabi Kazakh National University
(Protocol №3 dated 06.02.2019)*

Reviewers:

Doctor of Technical Sciences, Professor **A.B. Ustimenko**
Doctor of Physical and Mathematical Sciences, Professor **M.E. Abishev**

Authors:

A.S. Askarova, S.A. Bolegenova, S.A. Bolegenova, O.A. Lavrishev,
V.Yu. Maksimov, A.M. Maksutkhanova, Zh.K. Shortanbayeva

M 61 **Metrology**, standardization and certification in energy sector: manual for graduate students / A.S. Askarova, S.A. Bolegenova, S.A. Bolegenova [et al.]. – Almaty: Qazaq University, 2019. – 129 p.

ISBN 978-601-04-3896-5

The manual reviews the basics of metrology and metrological support: terms, physical quantities, measurement theory basic, measuring and control means, metrological characteristics, measuring and controlling electrical and magnetic quantities. The basics of standardization are outlined: development history, legal and regulatory base, international, regional and national, standardization methods, product quality. Particular attention is paid to the fundamentals of certification and conformity assessment.

The manual is intended for students of technical specialties of universities, but may also be useful for undergraduates and PhD doctoral candidates.

UDC 621.3 (075)
LBC 31.2 я 73

ISBN 978-601-04-3896-5

© Askarova A.S., Bolegenova S.A.,
Bolegenova S.A. [et al.], 2019
© Al-Farabi KazNU, 2019

CONTENTS

INTRODUCTION 6

SECTION 1

Metrology as the science of measurement

Chapter 1. BASIC TERMS AND DEFINITIONS.....10

- 1.1. The concept and main problems of metrology...10
- 1.2. The concept of measurement.....12

Chapter 2. GENERAL INFORMATION ON MEASUREMENTS...14

- 2.1. Specific features of the measuring process.....14
- 2.2. Measuring instruments17
- 2.3. Measurement classification.....18

Chapter 3. MEASURING INSTRUMENTS20

- 3.1. Weight measurement and control20
- 3.2. Measurement and control of geometrical quantities.....21
- 3.3. Measurement and control of mechanical quantities.....23
 - 3.3.1. Methods and means of measurement and control kinematic quantities.....23
 - 3.3.2. Methods and means of measurement and control of dynamic quantities.....25
 - 3.3.3. Methods and means of measurement and control of mechanical properties of substances and materials26
- 3.4. Measurement and control of thermal quantities.....27
 - 3.4.1. Methods and means of temperature measurement and control.....27