

INTERNATIONAL MEASUREMENT CONFEDERATION IMEKO BULLETIN

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Secretary of IMEKO

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Dear Reader:

In October 1972 the first issue of IMEKO Bulletin was published and received with interest. January 2013 marks the appearance of the last one, the 50th. Lots of things have happened during these forty years. The International Measurement Confederation has grown and spread over five continents. More and more Member Organizations have joined (unfortunately, some did not remain long with us), Technical Committees have been established on 24 special subjects of measurement technology and related themes. We were proud to welcome highly esteemed experts in our midst with their extremely valuable contributions and gradually a large IMEKO community has come about. They were always happy to meet at TC conferences, symposia, workshops and first of all, at the triennial World Congresses. IMEKO Bulletin reported on all these events and was greeted favourably by individuals, institutes and libraries. However, times have changed and we need to step further. Therefore we made the decision to stop the publication (when if not at the 50th occasion). We thank our Readers for the encouragement and for accompanying us on this long journey, for helping with advice and useful comments. We did our best to serve and fulfill the requests and the expectations. In the future, IMEKO Newsletters will be made available to all of you, at irregular intervals on the Internet.

However, there is a lot to report to you now:



This was the highlight of the year. The total number of registrants reached 574 (349 from outside the host country, from 41 countries). The scientific program included 246 oral and 146 poster presentations, selected out of 533 submissions. Every day began with an invited plenary talk:

1. by Prof. Michael Kühne, Germany, Director of the Bureau International des Poids et Mesures (BIPM) – ***Metrology for the 21st century: The greatest challenges***
2. by Prof. Dong Il Kwon, Republic of Korea, Seoul National University – ***Multi-scale evaluation of mechanical properties using instrumented indentation technique***
3. by Dr. Ono Akira, Japan, National Institute of Advanced Industrial Science and Technology – ***International standardization of measurement and characterization for nanotechnologies***
4. by Klaus-Dieter Sommer, Germany, Physikalisch-Technische Bundesanstalt – ***New challenges arising from sustainable energy supply to metrology***
5. by Dr. Jin Seog Kim, Republic of Korea, Korea Research Institute of Standards and Science – ***The status of metrology for greenhouse gases***

The overall Congress activity was determined by the subjects of the 24 Technical Committees, their contributions, sessions, round tables and meetings. 22 exhibition stands rounded up the picture.

The 20th IMEKO World Congress was excellently hosted by our Member Organization in the Republic of Korea, the Korea Research Institute of Standards and Science (KRISS), assisted by the Korean Society for Precision Engineering.

The **21st** IMEKO World Congress will be in 2015 in the capital of the Czech Republic, Prague, from August 30 to September 4 – MARK THE DATE!

www.imeko2015.org

As a tradition, the 55th **IMEKO General Council Session and related meetings** took place right before the World Congress. The Advisory Board, the Technical Board and the Measurement Editorial Board met on September 8 to discuss future strategy to improve the efficiency of and the benefit from general activities. Particular plans as required by our changing life are being set and analyzed carefully. A slate of Officers were elected for the coming triennium based on recommendations and proposals by the Member Organizations.

IMEKO Officers and Standing Committee members 2012–2015

President: Prof. Pasquale Daponte, Italy

Past President and Chairman of the Advisory Board: Dr. Dae-Im Kang, South Korea

President Elect and Chairman of the Technical Board: Prof. Klaus-Dieter Sommer, Germany

Secretary General: Mr. Zoltán Zelenka, Hungary

Treasurer: Prof. Roland Collay, France

Vice President for IMEKO XXI: Prof. Jaromir Volf, Czech Republic

Vice President for External Relations: Dr. Hidetaka Imai, Japan

Vice President for Scientific Publications: Prof. P.P.L. Regtien, The Netherlands

Information Officer: Dr. Dirk Röske, Germany

Standing Committees

Credentials and Membership Committee – Prof. L. Van Biesen, Belgium, (Chair)

Dr. M. Sedlacek, Czech Republic

Dr. Sam-Yong Woo, South Korea

Drafting Committee – Mr. M. Yates, UK (Chair)
Prof. T. Pfeifer, Germany
Prof. Ch. Eugene, Belgium

Advisory Board Dr. Dae-Im Kang, South Korea, (Chair)
Dr. A. Germak, Italy
Prof. R.Z. Morawski, Poland
Prof. P.S. Girao, Portugal
Prof. T. Ono, Japan, HONORARY MEMBER (Secretary)
Prof. O. Aumala, Finland HONORARY MEMBER
Prof. L. Van Biesen, Belgium HONORARY MEMBER
Dr. K. Iizuka, Japan, HONORARY MEMBER
Dr. T. Kemény, Hungary, HONORARY MEMBER
Prof. M. Peters, Germany, HONORARY MEMBER
Prof. T. Pfeifer, Germany, HONORARY MEMBER
Prof. F. Righini, Italy, HONORARY MEMBER
Prof. A.M. Da Cruz Serra, HONORARY MEMBER

Technical Board Prof. K.-D. Sommer, Germany, (Chair)
Dr. D. Röske, Germany (Information Officer)
Prof. J. Halttunen, Finland
Ms. M. Chambon, France
All TC Chairmen ex officio
Editor-in-chief of MEASUREMENT ex officio

Chairman of the MEASUREMENT Editorial Board: Prof. K.T.V. Grattan, UK
Editor-in-chief

At the *Closing Session* of the World Congress the GYÖRGY STRIKER JUNIOR PAPER AWARD was handed over to Mr. Ville Rantanen, Researcher at the Tampere Technical University in Finland for his paper “Capacitive facial activity measurement”. The Award is the donation of the founding Secretary General of IMEKO and his wife, Barbara.

DISTINGUISHED SERVICE AWARD holders 2012:

Ms. Karolina Havrilla (Hungary), Secretary of IMEKO and Editor of the Bulletin on the occasion of her retirement

Prof. Antonio da Cruz Serra (Portugal), Past President and Chair of the Advisory Board
Prof. Mladen Boršić (Croatia), Past Secretary General
Prof. Albert Weckenmann (Germany), Chair of TC14 on Measurement of Geometrical Quantities
Prof. Paul P.L. Regtien (The Netherlands), Editor of the e-journal ACTA IMEKO
Mr. Michael Yates, UK IMEKO delegate and Chair of the Drafting Committee
Dr. Hee Joon Eun, former South Korean IMEKO delegate and
Dr. Carlo Ferrero (Italy), former Chair of TC8 on Traceability

At the Congress Banquet Ms. Havrilla also received a honorary Plaque for her 41 years' devoted service to IMEKO.

Looking into the future, the Advisory Board decided to work out a ***Strategic plan to set directives for the general improvement of the activities of the Confederation.*** The relevant Working Group is led by the newly elected Secretary General.

The ***Technical Board*** approved the organization of several TC events.



EVENT CALENDAR

2013

TC1 – Education and Training in Measurement and Instrumentation

TC7 – Measurement Science

TC13 – Measurements in Biology and Medicine

15th Symposium on Measurement across Physical and Behavioural Sciences

Genova, Italy

September 4–6

Contact: Dr. G.B. Rossi

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16145 Genova, ITALY

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Fax: +39 010 353 2834

E-mail: gb.rossi@dimec.unige.it

TC2 – Photonics

21st Symposium on Photonics in Measurement

Gdansk, Poland

September 16–18

Contact: Dr. M. Gnyba

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Faculty of Electronics, Telecommunications and Informatics

Narutowicza 11/12

80-233 Gdansk, POLAND

Fax: +48 58 347 24 82

E-mail: marcin.gnyba@gmail.com

www.imeko2013.eti.pg.gda.pl

TC4 – Measurement of Electrical Quantities

19th Symposium on Measurement of Electrical Quantities and
17th Workshop on ADC/DAC Modelling and Testing

Barcelona, Spain

July 18–19

Contact: Dr. Joaquin del Rio Fernández

SARTI Research Group

Department of Electronic Engineering

Universitat Politècnica de Catalunya

Rambla Exposicio, 24 Ed. C

08800 Vilanova i la Geltru, SPAIN

Phone: +34 93 896 72 00 Fax: +34 93 896 72 01

E-mail: joaquin.del.rio@upc.edu www.cdsarti.org

TC9 – Flow Measurement

16th Conference, FLOMEKO XVI

Paris, France

September 24–26

Contact: Mr. J.P. Vallet

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86036 Poitiers Cedex, FRANCE

Phone: +33 5 49 37 91 26 Fax: +33 5 49 52 85 76

E-mail: jp.vallet@cesame-exadebit.fr www.flomeko2013.fr

TC10 – Technical Diagnostics

12th Workshop on New Perspectives in Measurements, Tools and Techniques for
Industrial Applications

Firenze, Italy

June 6–7

Contact: Prof. M. Catelani

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E-mail: marcantonio.catelani@unifi.it

<http://www.imekotc10-florence.org>

TC12 - Temperature and Thermal Measurement

12th Symposium on Temperature and Thermal Measurement in Industry and Science

– TEMPMEKO 2013

Funchal, Madeira

October 14–18

Contact: Ms. E. Filipe

Instituto Portugues da Qualidade

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2829-513 Caparica, PORTUGAL

Phone: +351 21 2948184

Fax: +351 21 2948188

E-mail: efilipe@mail.ipq.pt

TC18 – Measurement of Human Functions

5th Symposium on Measurement, Analysis and Modeling of Human Functions

Vancouver, Canada

June 27-29

Contact: Prof. David Ostry

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McGill University

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Phone: +1 514 398 6111

Fax: +1 514 398 4896

E-mail: ostry@motion.psych.mcgill.ca

TC14 – Measurement of Geometrical Quantities

11th International Symposium on Measurement and Quality Control

Cracow and Kielce, Poland

September 11–13

Contact: Prof. Stanislaw Adamczak

Rector, Kielce University of Technology

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25-314 Kielce, POLAND

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Fax: +48 41 3442997

E-mail: adamczak@tu.kielce.pl

TC15 – Experimental Mechanics

12th Youth Symposium on Experimental Solid Mechanics

Bari, Italy

April 21–14

Contact: Prof. K. Casavola

Phone: +39 080 5962787

E-mail: casavola@poliba.it

http://www.dmmm.poliba.it/residualstress/YSESM_2013.html

TC19 – Environmental Measurements

4th Symposium on Environmental Instrumentation and Measurements

Lecce, Italy

June 3–4

Contact: Aimé Lay-Ekuakille

Department of Innovation Engineering

University of Salento

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73100 Lecce, ITALY

Phone: +39 0832 297821

Fax: +39 0832 297827

E-mail: aime.lay.ekuakille@unisalento.it

www.imekotc19.2013.unisalento.it

Co-sponsorships:

Sensor&Test 2013 – The Measurement Fair

Nürnberg, Germany

May 14–16

Contact: AMA Service GmbH

Von Münchhausen-Str. 49

31515 Wunstorf, GERMANY

Phone: +49 5033 9639-0

Fax: +49 5033 1056

E-mail: info@sensorfairs.de

www.sensorfairs.de

COMADEM 2013 – 26th International Congress of Condition Monitoring and Diagnostic (TC10)

Engineering Management

Helsinki, Finland

June 11–13

Contact: Prof. B.K.N. Rao

E-mail: rajbknrao@btinternet.com

www.comadem2013.net

4th International Conference on Integrity, Reliability and Failure (TC10)

Funchal, Madeira/Portugal

June 23–27

Contact: Prof. Joaquim Silva Gomes

E-mail: sg@fe.up.pt

<http://paginas.fe.up.pt/clme/IRF2013/>

Asia-Pacific Symposium on Measurement of Mass, Force and Torque – APMF2013 (TC3)

Taipei, Taiwan

November 20–22

Contact: Dr. Gwo-Sheng Peng

E-mail: Gwo-Sheng.Peng@itri.org.tw

2014

TC3 – Measurement of Force, Mass, Torque and Density

TC5 – Hardness Measurement

TC22 – Vibration Measurement

Joint IMEKO 2014 Conference

Cape Town, South Africa

February 3–6

Contact: Ms. Christelle Lourens

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WELCOME to attend!

The Place of ‘Force’ in Several Graphic Representations of the International System of Units (SI)

Dan Mihai Stefanescu (stefidanro@yahoo.com), Aurel Millea (amillea@upcmail.ro)
Romanian Measurement Society, Bucharest, Romania

The International System of Units (SI) is the most widespread system of measurement units and presently it is the official one in almost all countries of the world. Its detailed presentation may be found for example in [1] where all names, symbols, definitions and inter-relations of the base and derived units are given. Other international norms and documents are devoted to various recommendations and rules for using, writing, expressing and converting the SI units, especially in scientific texts and also in trade and commercial documents.

To a lesser extent are known and used the graphical representations of the International System of Units. Three variants might be considered as most eloquent, and at the same time scientifically correct and explicit. They could be called (a) “tree”, (b) “planetary system” and, respectively, (c) “subway map” representation, in accordance with their specific shape.

The purpose of this letter is to describe the three graphic representations and to highlight the place of the quantity “force” and its measurement unit, the “Newton”, in these representations.

1. Graphic representations of the SI units

(a) *The “tree” representation (Fig. 1)* originates from an OIML (International Organization of Legal Metrology) idea, first appearing in 1984 in the “OIML Bulletin”.

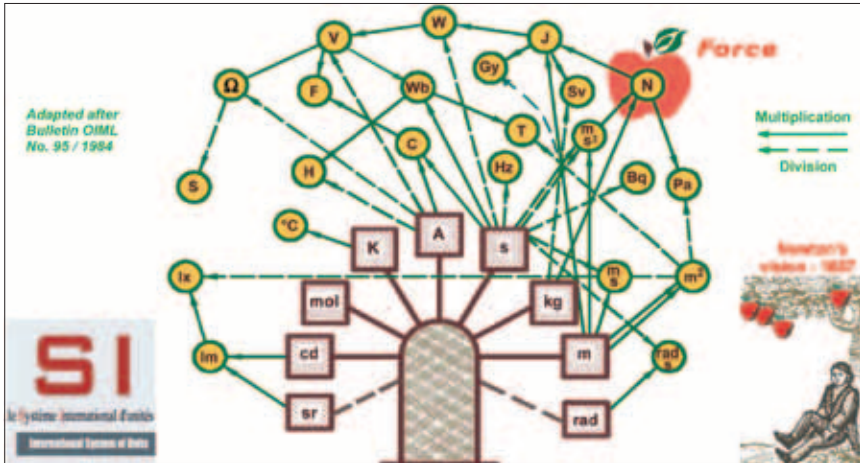


Fig. 1. European “knowledge tree” representation for SI units

The “SI tree” has a trunk whose main branches are the fundamental units, counter-clockwise disposed from right to left: meter, kilogram, second, ampere, Kelvin, mol and candela. Emerging from these fundamental units, placed to form a semicircular base, a number of derived units are connected, in the form of branches of a tree, resulting in an arborescent representation or chart.

The following “colour code” has been adopted: brown – for the trunk and the thicker branches with the seven base units; green – for the thinner branches and the circles that contain the symbols of the derived units; red – for the “Newton apple”.

All significant connections are in green: solid lines indicate multiplication, dotted lines indicate division.

In this representation, the base units are closer to the roots of the tree, while the derived units are spread throughout the foliage of the tree.

It is to be noted that in this representation the radian and the stereo-radian are still regarded as “supplementary” units – in accordance with the SI rules valid up to 1995 [2], when the 20th CGPM abolished the supplementary units and decided to consider them as derived units of dimension 1 (see the next two graphic representations!).

As for the position of “force” with its unit, the “Newton”, it is located at the top of this tree, here symbolized by a red apple.

(b) The “planetary” representation (Fig. 2) was taken over (with permission) by one of the authors, during his Asian travel, from KRISS (Korea Research Institute of Standards and Science) and Center for Measurement Standards – Industrial Technology

Research Institute (Taiwan, R.O.C.) respectively, where it is exposed as large sized posters. However, its real origin remains unclear.

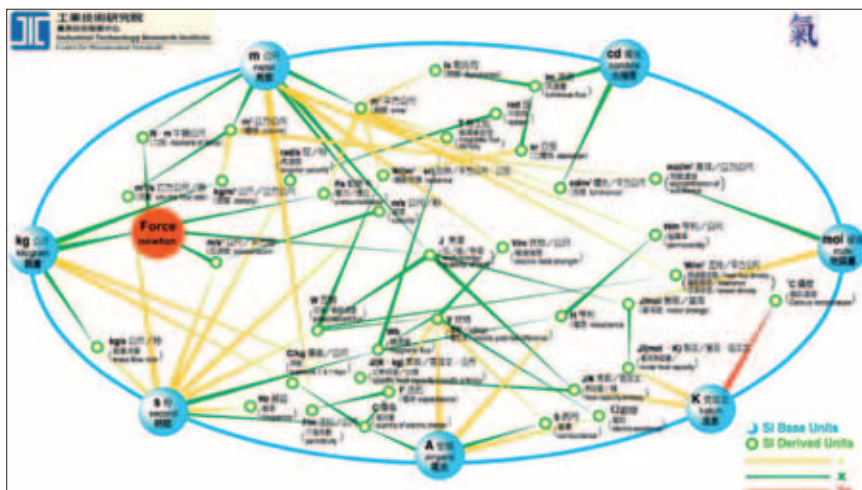


Fig. 2. Asian “planetary system” representation for SI units

In this representation there are seven “planets” along the border of an elliptic field, corresponding to the seven above-mentioned base units (starting counter-clockwise with the Length atop, on the left side, in the same succession as before), and a lot of “satellites”, as derived units, “orbiting” inside the ellipse.

Thus, more space is available for representing the derived SI units, their ramification and interconnections are more visible and the whole picture is more intuitive and much richer in information than the “European” SI tree.

The base units appear as blue spheres, and the derived units as smaller green circles. Connections are drawn as green lines for multiplication, yellow lines for division and red lines for other conversions (e.g. Kelvin to Celsius degrees).

An interesting feature of this representation is that mechanical units are located in the left side of the figure, while the electromagnetic units are situated in the center and others in the right side. Also, the “energetic” quantities (with their units, J, W, W/m² etc.) are mostly grouped around the center of the ellipse, irrespective of their nature (mechanical, electrical, thermal).

“Force”, with its unit “Newton”, has been emphasized by an orange circle, in the left side of the diagram. The quantity “moment of force” together with its unit, N•m, is also apparent in this representation, being the 5th connection to the “force” unit.

(c) The “subway map” representation (so called by its authors) was posted on internet by Dr. Barry N. Taylor (22 March 2004), then a second variant was obtained by courtesy of Paul Trusten, Director of Public Relations, U.S. Metric Association, Inc. (copyright 2006), and finally published, under a similar form (Fig. 3), by NIST (National Institute of Standards and Technology, USA) [3].

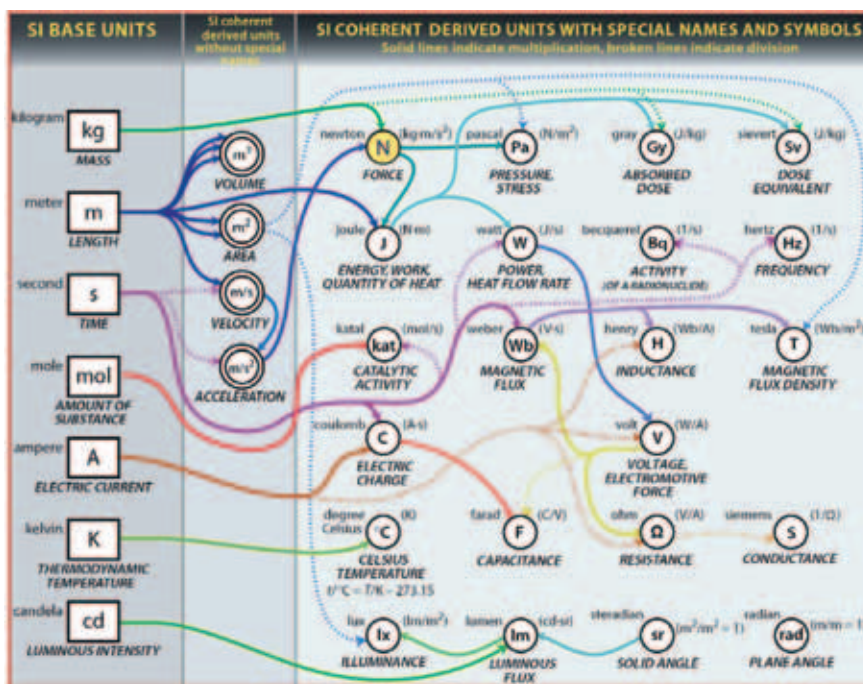


Fig. 3. American “subway map” representation for SI units

This is another kind of “tree”, with multiple inter-connecting lines; the representation has the merit of being highly “transparent”, easily “visible” and with a logic grouping of quantities and units. The first column is for the SI base units, the second comprises SI derived units without special names (volume, area, velocity, acceleration) and the third displays 22 derived units with special names. A number of units specific to certain disciplines or chapters of physics are not included (for example, strain, permittivity and permeability, signal level, attenuation, viscosity, thermal conductivity and capacity, entropy, a.o.).

Colours have no distinct significance. Conventions for the connecting lines: solid lines indicate multiplication; dotted lines indicate division.

The rectangular shape of this representation is optimal from the point of view of space usage, and the “information density”. Moreover, the defining equations of the derived units are explicitly given (e.g. $\Omega = V / A$).

The position of “force” and the associated unit “Newton” is a “dominant” one, on the first column and first row of the derived units.

2. Some thoughts related to the “force” as a physical quantity

The global vision of Attila Naszladý defines the Energy, Work and Power from four different angles: mechanical, electrical, chemical and thermal, illustrating the various energetic transformations that can take place in the Universe [4]. As one can see in Figure 4, Force is on the first position in this picture, its electrical measurement being made by appropriate transducers.



Fig. 4. Different definitions of Work (Energy) and Power

Force is one of the most complex mechanical quantities. It is a derived quantity in the ISQ (the International System of Quantities, on which the SI is based), an important physical measurand with which many other quantities such as pressure, torque, strain, etc. are related.

Five electrical methods of sensing force were categorized by Jacob Fraden in [5] as follows:

- weighing the unknown force against the gravitational force of a standard mass;
- determining the acceleration of a body with known mass to which the force is applied;
- converting the concentrated force to a distributed fluid pressure and measuring that pressure;
- balancing the force against an *electromagnetically* or *electrostatically* developed force;
- measuring the strain produced in an elastic body by the unknown force.

We tried to find a unified approach [6] treating the force measurements in a close relation with other mechanical quantities, tightly connected by corresponding physical formulas. The recent “*Springer Handbook of Force Transducers*” [7] (with cover presented in **Figure 5**) systematizes the knowledge and measuring techniques of force, laying down two basic classifications in this area:

- 12 principles and methods of force measurement;
- 12 types of elastic elements for force transducers.

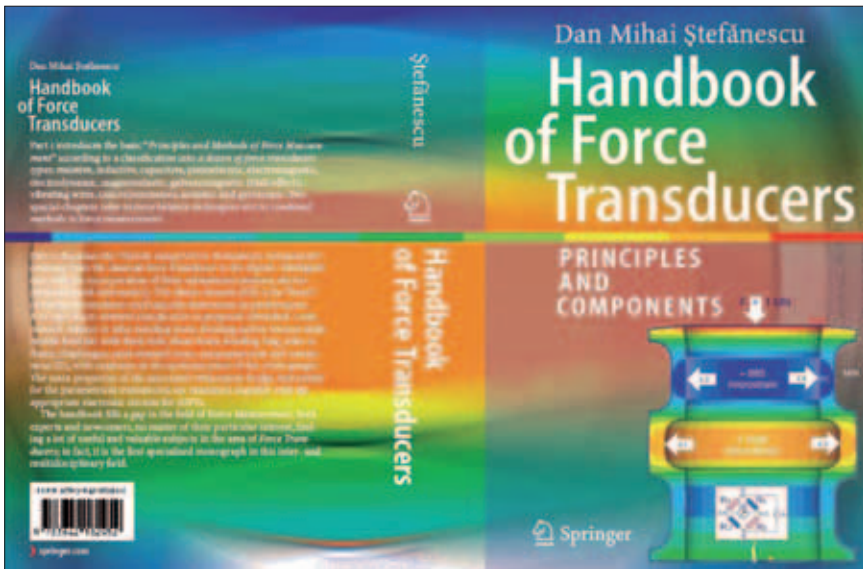


Fig. 5. Back- and front cover of the “Springer Handbook of Force Transducers”

Part I introduces the basic “*Principles and Methods of Force Measurement*” according to a classification into *a dozen of force transducers types*: resistive, inductive, capacitive, piezoelectric, electromagnetic, electrodynamic, magnetoelastic, galvano-

magnetic (Hall-effect), vibrating wires, (micro)resonators, acoustic and gyroscopic. Two special chapters refer to *force balance* techniques and to *combined methods* in force measurement.

Part II discusses the “(*Strain Gauge*) *Force Transducers Components*”, evolving from the classical force transducer to the digital / intelligent one, with the incorporation of three subsystems (sensors, electromechanics and informatics). The elastic element (EE) is the “heart” of the force transducer and basically determines its performance. A *12-type elastic element classification* is proposed (stretched / compressed column or tube, bending beam, bending and/or torsion shaft, middle bent bar with fixed ends, shear beam, bending ring, yoke or frame, diaphragm, axial-stressed torus, axisymmetrical and voluminous EE), with emphasis on the optimum location of the *strain gauges*. The main properties of the associated *Wheatstone bridge*, best suited for the parametrical transducers, are examined, together with the appropriate electronic circuits for SGFTs.

The handbook fills a gap in the field of Force Measurement, both experts and newcomers, no matter of their particular interest, finding a lot of useful and valuable subjects in the area of *Force Transducers*; in fact, it is the first specialized monograph in this inter- and multidisciplinary field.

*

We believe that the three suggestive representations of the SI measurement units interconnection – the (European) “tree” representation, the (Asian) “planetary” chart and the (American) “subway map” diagram – could be helpful for a better grasping of the nature and peculiarities of the physical quantity “force”.

References

- [1] http://www.bipm.org/utis/common/pdf/si_brochure_8_en.pdf Last updated: May, 2011
- [2] Millea A, 2009, In the World of Measurements and Measurements Units (in Romanian), Editura AGIR Bucharest
- [3] <http://www.nist.gov/pml/wmd/metric/everyday.cfm> Last updated: February, 2011
- [4] Naszlady A, 2006, Universality of measurement in medical sciences, CD Proc. XVIII IMEKO World Congress on Metrology for a Sustainable Development, Rio de Janeiro, Brazil, Paper 654
- [5] Fraden J, 2010, Handbook of Modern Sensors – Physics, Design and Applications, 4th edn, Springer-Verlag New York
- [6] Stefanescu D M, 2007, Strain gauged elastic elements for force and related quantities measurement, Proc. IMEKO Int’l Conf. on Cultivating Metrological Knowledge, Merida, Mexico, Paper 22
- [7] Stefanescu D M, 2011, Handbook of Force Transducers – Principles and Components, Springer-Verlag Berlin Heidelberg

The highly valuable contribution of the authors is gratefully acknowledged by the Editor of IMEKO Bulletin.

NEWS in brief

TC4 – Measurement of Electrical Quantities elected a new Chair in the person of Prof. J. Mindykowski from Poland, as successor of Prof. L. Michaeli, Slovakia. Dr. P.M. Ramos (Portugal) became Scientific Secretary. The Committee also set up a Working Group on Electrical Metrology in Nano and Microelectronics.

The establishment and work of TC4 has been summarized by a former Chair Prof. M. Savino (Politecnico di Bari, Italy) analyzing the noticeable trend of the measurement of electrical quantities towards a remarkably wider range of frequencies between 1979 and 2002. The paper is available online:

<http://www.sciencedirect.com/science/article/pii/S0263224112000395>

New Chair of *TC7 – Measurement Science*: Prof. G.B. Rossi, Italy following Prof. L. Mari (also from Italy).

Prof. A. Freddi (Italy) former Chair of *TC15 – Experimental Mechanics* wrote a historical survey about the Youth Symposia successfully initiated by the Committee in 2002 to attract young researchers and scientists to an exchange of knowledge and information in the field of Experimental Solid Mechanics. The Symposia took place every year since then, five times in Italy, once in Slovakia, Serbia, Germany, Hungary and Romania. The next, 12th one will be in Italy again, in April 2013 – see our Event Calendar for details. To learn more, please contact the author directly: freddi.ale@gmail.com

ICCE-21 – the 21st Annual International Conference on Composites or Nano Engineering will be at the Canary Islands, Tenerife, Spain, from 21 to 27 July, 2013, with IMEKO co-sponsorship, as usual. (The previous Conference was in July 2012 in Beijing, China.)
www.icce-nano.org

The 16th International Metrology Congress organized by our French Member Organization, the Collège Français de Métrologie will be in Paris, October 7–10, 2013
www.metrologie2013.com

TC23 – Metrology in Food and Nutrition has concluded a Memorandum of Understanding with the European Food Information Resource (EuroFIR) about an institutional scientific co-operation in the coming 5 years.

The IMEKO Community mourns the death of *Mrs. Barbara Striker*, wife of the late founding Secretary General Prof. György Striker (+ 1991), who passed away in April 2012 at the age of 99. Together they donated the György Striker Junior Paper Award to encourage younger scientists and engineers working in metrology. The Award is given to the author of the best paper at the triennial World Congresses.

The death of *Prof. Sergio Sartori*, Italian delegate to the IMEKO General Council for several years and the death of *Prof. Komyo Kariya*, a pioneer of international activities in measurement science, engineering and education in Japan, esteemed contributor to *TC7 – Measurement Science* have also been noted with great regret.

May they rest in peace! They will be remembered.

From foreign sources....

SEM XII International Congress & Exposition on Experimental & Applied Mechanics took place in June 2012 at Costa Mesa, CA, USA.

IMAC-XXXI Conference & Exposition on Structural Dynamics (Engineering Nonlinearities in Structural Dynamics) will be organized at Garden Grove, CA, USA, February 11–14, 2013

<http://sem.org>

PCIM Asia 2013 – Power Electronics/Intelligent Motion Conference will be in Shanghai, China from 18 to 20 June

www.pcim-asia.com

PCIM Europe 2013 – in Nuremberg, Germany, from May 14 to 16

www.pcim.de

FORUMESURE – Exhibition of measurement and control equipments – Exhibition on Measurement and Quality is scheduled for April 22–25. Organizer: CAFMET, The African Committee of Metrology. Place: Casablanca, Morocco

www.forumasure.com

The Spring Conference of the European Materials Research Society will mark the 30th anniversary of E-MRS in Strasbourg, France, May 27–31 comprising of 25 symposia in parallel, as well as several satellite events.

<http://www.european-mrs.com>

X SEMETRO – 10th International Congress on Electrical Metrology will be organized by the Instituto Nacional de Tecnología Industrial (INTI, Argentina) and the Instituto Nacional de Metrologia, Qualidade e Tecnologia (INMETRO, Brazil) in Buenos Aires, Argentina, September 25–27, 2013. For further information visit

<http://www.inti.gob.ar/xsemetro/>

Member Organizations of IMEKO and their delegates to the General Council

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The General Director
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1000 Tirana

Australia

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Lindfield, NSW 2070

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ÖVE Österreichische Gesellschaft für
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Institute for National Measurement Standards
National Research Council
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People's Republic of China

Chinese Society for Measurement
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Egypt

Egyptian Organization for
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El-Ameriya, Cairo

Finland

Finnish Society of Automation
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