METRIC STANDARDS FOR WORLDWIDE MANUFACTURING

2012 ELECTRONIC 8th EDITION

Knut O. Kverneland

ALGERIA
ARGENTINA
AUSTRALIA
AUSTRIA
BARBADOS
BELGIUM
BRAZIL
BULGARIA
CANADA
CHILE
CHINA
COLOMBIA
CROATIA
CUBA
CYPRUS
CZECH REPUBLIC
DENMARK
EGYPT
FINLAND
FRANCE
GERMANY
GREECE
HUNGARY
ICELAND
INDIA
INDONESIA
IRELAND
ISRAEL
ITALY
JAMAICA
JAPAN
REPUBLIC OF KOREA
MALAWI
MALAYSIA
MEXICO
MONGOLIA
NETHERLANDS
NEW ZEALAND
NORWAY
PAKISTAN
PAPUA NEW GUINEA
PERU
PHILIPPINES
POLAND
PORTUGAL
ROMANIA
RUSSIAN FEDERATION
SINGAPORE
SLOVAKIA
SLOVENIA
SOUTH AFRICA
SPAIN
SRI LANKA
SWEDEN
SWITZERLAND
SYRIA
TANZANIA
THAILAND
TRINIDAD & TOBAGO
TUNISIA
TURKEY
UNITED KINGDOM
URUGUAY
USA
VENEZUELA
VIET NAM
YUGOSLAVIA
ZIMBABWE

METRIC STANDARDS FOR WORLDWIDE MANUFACTURING

By
Knut O. Kverneland

2012 Edition

GO metric USA™.org, Inc., Statesville, North Carolina, USA 1978-2012

Library of Congress Cataloging-in-Publication Data

Kverneland Knut O., 1937-
METRIC STANDARDS for Worldwide Manufacturing / by Knut O. Kverneland.
Includes indexes.
ISBN 0-9744477-7-3 (e-book)

1. Manufacturers – Standards. 2. Metric System. 3. Standards, Engineering

FOREWORD

ISO Metric Standards: A Key to World Trade

There is an old and wise saying, “No standards-no trade.” This is certainly true for standard quantities and units. Without consensus on these, trade, from shopping at the supermarket to exporting goods worldwide, would be very haphazard affair indeed.

Most industrialized countries have long recognized the necessity, and advantage, of adopting the metric system of measurement-or to give it its official title, the International System of Units (SI, for short-derived from its French title, Système international d’unités), which ISO (the International Organization for Standardization) is responsible for maintaining.

The SI is contained in the International Standard ISO 31, Quantities and Units, which consist of 14 separate parts. It is not only an important standard in itself, but it also serves as a basis and guideline for many other International Standards, ISO 31 is the work of ISO Technical Committee ISO/TC 12, Quantities, Units, Symbols, Conversion Factors, which has also produced the accompanying standard, ISO 1000, SI Units and Recommendations for the Use of Their Multiples and of Certain Other Units.

The reasons for aligning with the international consensus for worldwide use of the SI system become even more compelling as the relative importance of trade over production continues to grow. In nearly every year since the end of the Second World War, the volume of world trade has increased more rapidly than that of world production.

More than 20 years after most of the industrialized world has gone over to metric measurements, many in my own home country, the USA, are still dragging behind. Quite apart from the USA government’s pro-metric stance, the USA is being forced by market pressure to change.

The pressure is coming from American exporters who have to bear the expense of incorporating two systems of basic measurements into their offering: one for the home market, and one for the rest of the world. Pressure will also increase from American clients as the presence of incompatible systems denies them the possibility to mix and match products, deprives them of the greatest freedom of choice, or ties them to one supplier because they cannot integrate new equipment with what they already have.

There are, however certain sectors which have been completely metric, even in the USA For example, dimensions for film have always been metric: 8 mm, 16 mm, 35 mm, etc. In electro-technology, the SI units such as ampere, volt, watt, ohm, etc., have been used since the beginning of this country.

In industry outside electro-technology is also going metric step by step rather than inch by inch, even in the USA All specifications for the defense industry have long been in metric units. It has been decided that all Federal orders to industry from now on shall be given in metric units. All certificates from NIST, the National Institute for Standards and Technology, have also, for many years now, been given only in SI units. Thus, it is certain that the largest industrial nation will eventually become metric-maybe, I dare to hope, in my lifetime!

It is a particular pleasure for me, as ISO Secretary-General, and as an American, to be invited to provide the Foreword for this second edition of Knut O. Kverneland’s book. Like ISO’s International Standards, it contributes to a common basis for the international exchange of goods, services, and technological know-how, as well as promoting common understanding in the scientific and engineering communities worldwide.

Dr. Lawrence D. Eicher
Former ISO Secretary-General

INTRODUCTION

The publication of Knut O. Kverneland's book is most timely for the USA and Canada. It should prove to be a valuable reference volume as well in other English speaking countries which are in the midst of or are completing the transition to the metric system.

National standards having a metric base have been virtually unknown in the USA. Although many standards-developing groups use dual measurement notation, the standard sizing and rating practices are still based on the conventional inch-pound-gallon, USA customary system. USA technical committees are now coming to grips with the problem of developing metric-based standards. As references in their work, they will be using the standards of ISO and IEC, as well as those of industrialized nations which are already on the metric system.

Knut O. Kverneland's *METRIC STANDARDS for Worldwide Manufacturing* will provide a very useful bridge for those engineers who are required to develop components to metric specifications in advance of availability of applicable American National Standards. The book will also be a valuable tool in guiding the many technical committees and subcommittees which will be working on the new metric American National Standards.

A native of Norway, Mr. Kverneland received his early education in that country and graduated with a Masters of Science in Mechanical Engineering from the Technical University of Hanover, Germany. He has been fully conversant with the metric measurement units since childhood and is completely familiar with their use in engineering.

The author joined Massey Ferguson in 1966 as a design engineer, and has risen through consecutive positions as Engineering Analyst and Standards Engineer until being appointed to the position of Supervisor of Standards. In this capacity, Mr. Kverneland was responsible for Massey Ferguson's North American standards.

Mr. Kverneland also maintains a heavy outside professional commitment. He was a member of the Society of Automotive Engineers, Director of the Detroit Section of the Standards Engineering Society, and Chairman of the American National Standards Committee B4 on Standards for Limits and Fits.

In 1972 and 1973, Mr. Kverneland participated as a member of an ad hoc metric study committee of the SAE Off-Road Vehicle Council. He also served on the engineering standards evaluation and promotion subcommittee of the group. Because of its international manufacturing operations, Massey Ferguson's need for world metric standards information was apparent. Mr. Kverneland was thus aided in his SAE committee work by the high degree of interest of his company's management, which provided him with ready access to the computer and to standards data accumulated in its many manufacturing operations around the world. It was this work which prompted him to undertake writing of this book.

Mr. Kverneland is to be commended for his dedication to this project, and a well-deserved vote of thanks must be given to Massey Ferguson for the management support it provided the author in this undertaking,

Roy P. Trowbridge
Past Director, Engineering Standards
General Motors Corporation
Past President, American National Standards Institute

PREFACE

The change to the metric system offers North American manufacturing unique opportunities to introduce new thinking to the old ways products were made. The metric system requires new fastener sizes, new material stock sizes, new cutting tools, new gages, etc., to be used in production. This is where tremendously rewarding opportunities come into play. For example, 11 or less threaded fastener sizes may be selected to replace more than 50 sizes used in the old systems (see Table 8-1). Multiply the number of unique fastener sizes that can be eliminated by several thousand dollars each (automotive actual savings), and the total dollar savings for your company can very well become quite impressive.

The selection of metric material and components must be based on existing international and national metric standards. Therefore, in providing a foundation for this volume, the author has compared standards in the eight largest industrial countries of the world, which together produce the majority of the worlds products.

The preferred numbering system, coupled with the preferred metric sizes, preferred metric tolerances for holes (4) and shafts (4), and the preferred fits (10) (see Table 6-1), is another powerful tool available to you.

This highly integrated ISO tolerance system has been in use in the European continent for 60 years, where it has saved industry there millions, if not billions, of dollars in reduced costs in manufacturing, engineering, purchasing, and inspection.

Among other things, this volume is also one of the most powerful rationalization tools available (see Table 4-1). It is now up to the reader to make the rationalized selection of standard parts and components listed in this book that will return the most benefits. The motto the author supports is "**SELL AMERICAN**" rather than the negative promotion we frequently hear. "**BUY AMERICAN**."

PREFACE to the 2005 edition:

Chapter 10 on Steel Material Data and Chapter 11 on Nonferrous Material show data from the recently released American National Standards ANSI B32.100-2005 on Preferred Metric Sizes for Flat, Round, Square, Rectangular, and Hexagonal Metal Products. The proposed drafts ANSI B32.200-200X Preferred Metric Sizes for Round, Square, and Rectangular Tubular Metal Products Other Than Pipe, and ANSI B32.300-200X Preferred Metric Sizes for Equal and Unequal Leg Angles, T- and Channel - Sections, IPN- and Wide Flange-Beams Structural Steel are also referenced and they are pending approvals. All these material standards reflect existing ISO standards for nominal sizes and tolerances. They are *therefore* well suited for global design, manufacturing and marketing, and will help create USA manufacturing jobs. Use the METRIC STANDARDS for Worldwide Manufacturing latest book edition to find ways to cut costs and to increase export of manufactured Products from the company you work for.

PREFACE to the 2006 edition:

Chapter 2 International System of Measuring Units (SI) and Chapter 17 Conversion Factors and Program are now made available free of charge from the web site http://www.kok.com/. This public service feature help educate Americans on the correct use of the global metric system.

Several companies now make the electronic version of the METRIC STANDARDS for Worldwide Manufacturing book available on their Intranet. Contact Rosemary Maginniss <RMAGINNI@ansi.org> at ANSI for quotes. This will help companies reduce the cost of metric training and implementation. It also makes the top quality METRIC STANDARDS material immediately available throughout the organization in marketing, manufacturing and engineering.

PREFACE to the 2007 edition:

Data from the new standard for Metric Continuous and Double End Studs ANSI B18.31-2005 was added to Chapter 9 and the tables in Chapter 11 now have the preference ratings specified in the American National Standards ANSI B32.100-2005 on Preferred Metric Sizes for Flat, Round, Square, Rectangular, and Hexagonal Metal Products.

The latest national and international standards references are shown in this edition as well as new links to national and international standard documentations sources.

PREFACE to the 2012 edition:

Chapter 7 is completely replaced by material from the ISO 1938-1: 2012 standard. The ISO standard reflects available GO NOGO gages now in use throughout EU, and the ANSI B4.4M has been withdrawn. Data from the new ANSI B18.2.5M-2009 12-Point Flange Screws replaced the 12-Spline version. A large number of updates have also been made in all chapters of the new edition.

Knut O Kverneland

ACKNOWLEDGMENTS

The completion of the large project of writing the first edition of this book was possible only because of the extensive cooperation of top management people within the Massey Ferguson organization. Standards engineers, working for this multi-national company throughout the world, have provided substantial input to this publication in the form of national standards information and other data. The author, therefore, wishes to express his appreciation to Massey Ferguson, his former employer, for its encouragement and exceptional support in enabling him to undertake and complete the first edition of this volume. Without Massey Ferguson worldwide resources, without access to the company's computer capabilities, and without the company's generous backing in stenographic assistance, the time required for researching and preparing this manuscript would have been many times greater.

The third electronic edition has been completed with the help of my own resources through the company **GO metric USA™.org, Inc.** Countless hours have been spent typing and updating the manuscript.

I would like to extend special thanks to the family of the late Dr. Lawrence D. Eicher, Secretary-General of ISO (International Organization for Standardization), who has expressed his views in the foreword. In addition, the ISO Central Secretariat in Geneva has helped update several chapters of this book, for which I am most grateful.

My sincerest thanks also to Mr. Roy P. Trowbridge, former president of the American National Standards Institute who, during the initial planning stages of the first edition of this book, visualized the need for such a publication and gave the author encouragement and support.

My sincere thanks to the publisher of the second edition of my book, ASME Press, that had the vision to take on this large project and to grant me permission to publish the following electronic editions.

The author wishes to express his sincere appreciation to the following individuals and organizations:

GO metric USA™.org, Inc., Statesville, North Carolina, USA

Massey Ferguson Inc., Detroit, Michigan, USA
E. J. Flewelling, Manager (Former Supervisor); J. W. Carson, Standards Engineer

Major American Contributing Organizations[1]

American National Standards Institute (ANSI)
American Society of Mechanical Engineers (ASME)
Industrial Fastener Institute (IFI)

Other Contributing American Organizations[1]
American Gear Manufacturing Association (AGMA)
American National Metric Council (ANMC)
American Society for Quality (ASQ)
American Society for Testing and Materials (ASTM)
American Bearing Manufacturers Association (ABMA)
Cemented Carbide Producers Association (CCPA)
Institute of Electrical and Electronics (IEEE)
Rubber Manufacturers Association (RMA)
Society of Automotive Engineers (SAE)

Contributing International and National Standards Organizations[1]
British Standards Institute (BSI)
Committee of the Russian Federation for Standardizations (GOST R)
European Committee for Standardization (CEN)

[1]Addresses of the organizations listed are shown in Chapter 1 Table 1-1.
German Standards Organization (DIN)
French Standards Organization (AFNOR)
Italian Standards Organization (UNI)
International Electrotechnical Commission (IEC)
International Organization for Standardization (ISO)
Japanese Industrial Standards Committee (JISC)
Standards Australia International (SAI)
Standards Council of Canada (SCC)

Chapter 1
Anke Varcin-Head of Promotion and Press Services, ISO Central Secretariat, Geneva
W. A. McAdams-Past President, USA National Committee of the International Electro-technical Commission, General Electric Company

Chapter 3
PERA Training Charts, Ford Motor Company, Ltd.
L. W. Foster-Vice Chairman ANSI Y14.5; Honeywell Inc.

Chapter 5
R. G. Lenz - Past Chairman, USA Technical Advisory Group (TAG); ISO/Technical Committee (TC) 57; General Motors Corporation

Chapter 6
F. H. Briggs - Computer Program Consultant, Massey Ferguson Inc

Chapter 8
T. C. Baumgartner - Past Chairman, ANSI B1; Standard Pressed Steel Company

Chapter 9
R. B. Belford - Past Chairman, USA TAG ISO/TC2

Chapter 10
E. A. Domzal – Past Senior Project Engineer, Materials, Massey Ferguson Inc
F. V. Kupchak – Past Chairman, USA TAG ISO/TC62; Chairman, ANSI B32; Westinghouse Electric Corporation
Japanese Standards Association; Japan Iron and Steel Exporters' Association
German Steel Trade Association – VDEH

Chapter 12
P. S. Given – Past Director, SKF Industries, Inc
J. R. Hull – Past Chief Engineer, The Torrington Company
C. A. Moyer – Past USA Delegate , ISO/TC4 SC9; Assistant Chief Engineer, The Timken Company
A. O. Dehart – Past USA Observer, ISO/TC123; General Motors Corporation
W. G Looft – Past USA Delegate, ISO/TC4 SC7; Manager of Engineering, REXNORD

Chapter 13
B. C. Cummins – Past Manager, The Louis Allis Company, Litton Industries
W. D. Erickson – Past Chief Engineer, The Gates Rubber Company
Dr. F. Buchsbaum – Past President, Stock Drive Products
G. W. Michalec – Author and Professor
C. K. Reece – Past USA Delegate, ISO/TC32; Vice Chairman, ANSI B92; John Deere Waterloo Tractor Works

Chapter 14
J. I. Morgan – Past Chairman, USA TAG ISO/TC131; Executive Vice President, National Fluid Power Association

Chapter 15
W. Jenninck – Past Assistant Chief Engineer, Illinois/Eclipse, A Division of Illinois Tool Works, Inc
R. W. Berry – Member, ANSI B94; Director, Cutting Tool Research, VR/Wesson Company

Chapter 16
Donald Marquardt – ISO/TC176 Ad Hoc Task Force
Maureen Breitenberg – USA Department of Commerce, NIST
Roger Frost – Press and Communication Manager, ISO
David Zimmerman – Interim Secretary, ISO/TC176 - Quality Management and Quality Assurance

Special Courtesy Note to Contributing Standards Bodies and Companies

Tables and figures where a standards reference or a company abbreviation is shown in parenthesis have been reprinted with the permission of the organization that hold the copyright of the works cited.

Tables and figures without any reference have been reproduced courtesy Massey Ferguson Inc., Detroit, Michigan, and **GO metric USA™.org, Inc.** , Statesville, North Carolina.

The author also wishes to express his sincere appreciation to the referenced organizations for granting permission to use their tables, figures and standards in this publication. Special thanks go to the American National Standards Institute (ANSI), the American Society of Mechanical Engineers (ASME), the International Organization for Standardization (ISO), and Industrial Fastener Institute (IFI). Without their comprehensive support, the publication of *METRIC STANDARDS for Worldwide Manufacturing* , with its extensive standards material, would not have been possible.

Finally, the author's sincere gratitude is extended to the following organizations and companies for granting permission to republish their standards, figures, or tables: the American Society for Testing and Materials (ASTM), Philadelphia, Pennsylvania; Ford Motor Company, Ltd., Brentwood, Essex, United Kingdom; Chrysler Corporation, Detroit, Michigan; Gates Rubber Company, Denver, Colorado; Stock Drive Products, New Hyde Park, New York; and the Metric and Multistandard Components Corporation, Hawthorne, New York.

Please always refer to the most recent edition of the referenced standards. In the United States, American National Standards, International Standards, and national standards of other countries may be obtained from the American National Standards Institute (ANSI), New York, NY. Outside of the United States, sales of standards are transacted through the national standardizing body for the particular country.

Knut O. Kverneland

CONTENTS

Chapter 1

World Standards Organizations

SUMMARY

International standards are herein listed and compared to major industrial (63% of global GDP) national standards throughout this book (see Fig. 1-1). American National Standards for metric products are the basis for all tables in this publication when available. Pertinent global ISO (International Organization for Standardization) standard numbers are shown for each product, and related ISO and national standards are shown with hyperlinks to the standards organizations at the end of each chapter. Acronyms, standard prefixes, name and addresses as well as email and telephone numbers to a number of important national and international standards sources are shown in Table 1-1. Key standards groupings with links to ISO search engines are shown in Tables 1-2 and 1-3. ISO Members Worldwide list provide contact information for standards organization in each country.

A strong emphasis on cost savings and rationalization of parts and material has been stressed; Chapter 4, Preferred Numbers, provides detailed descriptions of the best tools to help rationalize metric sizes and products.

ROLE OF STANDARDIZATION: PAST, PRESENT, AND FUTURE

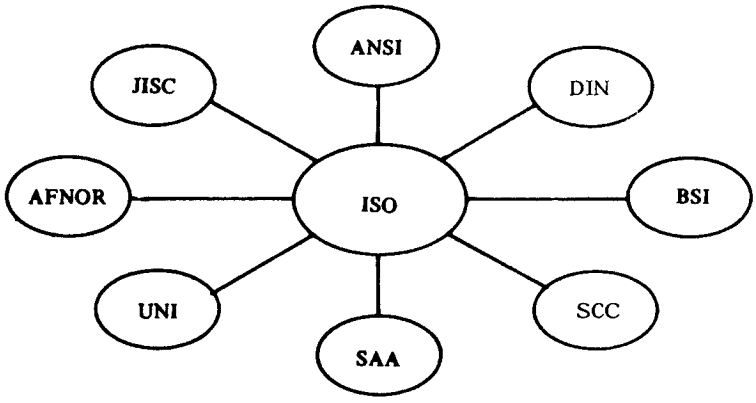
By definition, standards are rules set up and established by authority, often for the measure of quantity, weight, extent, value, or quality. Monetary standards, used in determining the weight of silver and gold pieces for the exchange of goods, were among the first to be developed.

During the industrialization period, manufacturing plants developed and became more and more specialized. A need for standards to control such simple parts as fasteners evolved, hereby making them industrially interchangeable. The demand for company and trade organization standards grew apace with the formation of larger plants and the wider distribution of manufactured products.

The basis for most standards is a uniform unit of measure to check mass, length, volume, time, and other physical quantities. Many systems were developed over the years, and the original metric system was developed in France after the French Revolution. Since 1875, all international matters concerning the metric system have been the responsibility of the Conférence Générale des Poids et Mesures (CGPM), which was constituted following the Metric Convention signed in Paris that same year.

Before the invention of the metric system, a number of inch systems were used throughout the world, one of which is commonly known as the customary inch system. National and international standards were developed, however, based on *both* measuring systems. This made the worldwide interchangeability of simple standard components, such as fasteners, impossible.

WORLD STANDARDS ORGANIZATIONS



MEMBER COUNTRIES

LISTED IN ORDER OF GNP

ANSI	USA
JISC	Japan
DIN	Germany
AFNOR	France
BSI	UK
UNI	Italy
SCC	Canada
SAA	Australia

FIG. 1-1 PARTIAL ISO MEMBERSHIP STRUCTURE

METRIC AND INCH STANDARDS

An increasing number of multinational corporations and their local suppliers operating with two systems of measures and standards have found expenses to be continually increasing. In order to use available expertise in a central location, one machine might be designed in an “inch” nation, only to be produced later in a “metric” country, or vice versa. This obviously generates additional costs in the conversion of drawings, substitutions of standard steel sizes and fasteners, the conversion of testing and material specifications, etc.

ISO METRIC STANDARDS – THE KEY TO WORLD TRADE

The WTO (World Trade Organization), which is supported by more than 120 countries, now replaces the GATT (General Agreement on Trade and Tariffs) with the result being a considerable strengthening of its standards codes. The WTO urges governments to make maximum use of International Standards to prevent unnecessary obstacles to the free flow of goods.

The EU (European Union) has been in existence for a few years now, and they have published a large number of European Standards identified by the prefix EN (European Norm)[1] Approximately 41% of these standards conform to an existing ISO or IEC standard on the subject.

For example, ISO 898-1 on Mechanical Properties of Fasteners is now identified within EU as: DIN EN ISO 898-1 (Germany); NF EN ISO 898-1 (France); BS EN ISO 898-1 (United Kingdom); and UNI EN ISO 898-1 (Italy).

ISO standards adopted as EN standards are put into effect with a minimum effort on the part of EU, and two important goals are met such as:

1. allow free flow of goods among the EU countries; and
2. allow free flow of goods to and from EU meeting the ISO standards.

Regional trade agreements and related activities in other parts of the world are similarly leading to greater use of international standards. For example, the Pan American Standards Commission, which is trying to develop uniform standards for the Latin-American Free Trade Association, has now agreed to use the ISO and IEC standards wherever possible. Also, the countries of Eastern Europe have become increasingly active in the development of international standards; apparently they are using them as the basis for trade in that region and in opening trade channels with the rest of the world as well.

Another factor in the use of international standards is the increasing number of international cooperation programs. A prime example is the North Atlantic Treaty Organization (NATO), which has been ordering a great deal of its equipment in terms of ISO and IEC standards. This also is happening within many of the social and economic programs of the UN. and other world organizations. One result is the adoption of many ISO and IEC standards by the developing countries.

[1]Norm means standard in English, German, and French

ACCELERATING PACE IN PUBLICATION OF ISO STANDARDS

The above-mentioned factors have accelerated the speed with which ISO develops international standards.[2] As an example, only 100 ISO Recommendations were published in the 1950s, yet approximately 1400 international standards agreements were reached in the following decade. See ISO in Figures.

Today, there are over 16 000 ISO standards, half of which have been published only in the last ten years. A further 9000 drafts and proposals are in preparation, and around 1250 new projects are added annually.

The time required to develop a standard in the Technical Committee has been reduced from an average of 76.8 months to 52.9 months. The central Secretariat has reduced the processing time for a proposed standard from 10.2 months to 7.5 months. The ISO target is to reduce standards development to three years from start to finish by the end of 1996.

How many international standards are needed is a matter of opinion. It has been suggested that in a highly industrialized society, the total requirement for national and international standards is on the order of 15 000, or a maximum of 20 000. This number is also suggested if all national standards were to be replaced by ISO standards. (When more than that number is found in a single country, there is usually some duplication and overlapping, which is the case in the USA, or, as is the case in socialist countries, what could be called “company standards” are listed as “national standards.”)

Other suggest that in the future, as industries merge and multinational companies further develop, some of the present national standards will become company standards, but there will always be a demand for some national standards to cater to specific local needs.

However, recent experience indicates that as new technologies emerge, there is an accompanying demand for new standards that have never existed at a national level. The scope for new international standards is, therefore, increasing continuously.

[2]Since ISO documents are constantly being upgraded, for simplicity the author refers to all ISO publications in the text of this book as “standards,” designating a particular document as “ISO…” followed by the appropriate identification number.

However, the actual status of a particular ISO document might be: (a) *Recommendation*, in which case it would be officially designated by “ISO/R…” preceding the appropriate identification number. (b) *Draft International Standards*, (“ISO/DIS…”). (c) An officially adopted international standard, in which case the initials “ISO” followed by the identification number is the appropriate designation. The ISO references given at the end of each chapter describe the current status of the standard. Information on the various designations is given at the website http://www.iso.org or in ISO catalogs and supplements available from: American National Standards Institute, 25 West 43rd Street, 4th Floor, New York NY 10036

.

A VISION OF THE FUTURE

Since 1986, the leadership of ISO and IEC has placed increasing importance on the necessity to understand and respond effectively to new needs for international standards. In 1987, approval was given to establish two important new groups for this purpose.

THE ISO/IEC PRESIDENTS' ADVISORY BOARD ON TECHNOLOGICAL TRENDS (ABTT)

This is a group of top-level industrial and technology policy leaders invited by the two Presidents to advise ISO and IEC on global trends in technology and industrial development, and their consequential impact on the demand for global standardization.

THE ISO/IEC AD HOC GROUP ON LONG-RANGE PLANNING (LRPG)

This is a new group of individuals nominated by the ISO and IEC members for Canada, France, Japan, UK, USA, and the former USSR. The group undertook the task of forecasting future needs for international standardization in specific sectors. These two groups have worked interactively since they started operating in 1988, and the results of their efforts are presented in the publication *A Vision for the Future- Standards Need for Emerging Technologies.*

ISO DEFINITION OF STANDARDIZATION AND STANDARD

The definition of standardization and standard differ in the many publications on the subject. The following are the excerpts from the *ISO/IEC Guide 2: 1991- General Terms and Their Definitions Concerning Standardization and Related Activities.*

Standardization- activity of establishing, with regard to actual or potential problems, *provisions* for common and repeated use, aimed at the achievement of the optimum degree of order in a given context

NOTES:
1. In particular, the activity consists of the processes of formulating, issuing and implementing standards
2. Important benefits of standardization are improvement of the suitability of products, processes, and services for their intended purposes, prevention of barriers to trade, and facilitation of technological cooperation.

subject of standardization — topic to be standardized

NOTES:
1. The expression "product, process or service" has been adopted throughout to encompass the subject of standardization in a broad sense, and should be understood equally to cover, for example, any material, component, equipment, system, interface, protocol, procedure, function, method, or activity.
2. Standardization may be limited to particular aspects of any subject. For example, in the case of shoes, sizes and durability criteria could be standardized separately.

field of standardization — (deprecated: domain of standardization) — group of related *subjects of standardization*

NOTE: Engineering, transport, agriculture, quantities, and Units, for example, could be regarded as fields of standardization.

state of the art — developed stage of technical capability at a given time as regards products, processes, and services, based on the relevant consolidated findings of science, technology, and experience
acknowledged rule of technology — technical provision acknowledged by a majority of representative experts as reflecting the *state of the art*

NOTE: A *normative document* on a technical subject, if prepared with the cooperation of concerned interests by consultation and *consensus* procedures, is presumed to constitute an *acknowledged rule of technology* at the time of its approval.

level of standardization — geographical, political, or economic extent of involvement in *standardization*
international standardization — standardization in which involvement is open to relevant bodies from all countries
regional standardization — standardization in which involvement is open to relevant bodies from countries from only one geographical, political, or economic area of the world
national standardization — standardization that takes place at the level of one specific country
provincial standardization — standardization that takes place at the level of a territorial division of a country

NOTE: Within a country or a territorial division of a country, *standardization* may also take place on a branch or sectoral basis (e.g., ministries), at local levels, at association and company levels in industry, and in individual factories, workshops, and offices.

consensus — general agreement, characterized by the absence of sustained opposition to substantial issues by any important part of the concerned interests and by a process that involves seeking to take into account the views of all parties concerned and to reconcile any conflicting arguments
NOTE: *Consensus* need not imply unanimity.

IMPORTANT OBJECTIVES OF STANDARDIZATION

A primary purpose of standardization is to manufacture goods for less direct and indirect incurred costs and to adapt the finished products to the demands of the marketplace.

A more detailed description of the objectives is as follows:

(a) Lower the production costs, when the aim is to:

1. facilitate and systematize the skilled work of designing
2. ensure optimum selection of materials, components, and semi-finished products
3. reduce stocks of materials, semi-finished products and finished products
4. minimize the number of different products sold
5. facilitate and economize the procurement of purchased goods

(b) Meet the demands of the marketplace, when the objective is to:

1. conform to regulations imposed by governments and trade organizations
2. stay within safety regulations set forth by governments
3. facilitate interchangeability requirements with existing products

DEVELOPMENT OF STANDARDS

The Conditions for a Standard. When there is a question of working out a standard, the conditions must first be analyzed before actual technical standardization work can be carried out. Preparatory analysis must be as comprehensive as possible and must take into account both technical and economic conditions. It is not sufficient to study only the internal circumstances. It must also be understood that, with regard to standards, the company is dependent on such external factors as the suppliers' stocks of products, the production program of competitors, the customers' wishes, existing standards, governmental requirements, etc.

Waiting for the right moment to begin a particular standardization is most important. An investigation should be made as to whether an intended standard could possibly impede any technical development already under way. Lack of a standard is more often the condition, and it is important to engage in standardization at an early stage, at least to the extent of working out an experimental standard of a temporary nature.

A certain type of regularly recurrent part may, for example, be used in many products in functionally equivalent, but constructionally different, forms. In such a case, the task of standardization will be to create order out of chaos through variety-reduction, size standardization, etc. The work should be started as soon as the possibilities of direct cost savings in purchasing, production, inventory, etc., and indirect cost savings in engineers' time can be established.

STANDARDIZATION TECHNIQUES

Two basic principles for the preparation of a standard are commonly used; these are as follows. *analytical standardization* — standard developed from scratch
conservative standardization — standard based, as far as possible, on existing practice

In practice, it appears that a standard cannot often be a completely prepared in one or the other of these two methods, but emerges from a compromise between the two. The quintessence of the standardization technique should be to utilize the basic material, the rules, and the aids available, in such way that a valid and practical compromise solution is reached.

The basic material could be comprised of such items as:

- former company standards
- vendor catalogs
- national and international standards
- requirements of the company's customers
- competitors' material

Increasingly important are the national and international standards in existence on the subject; they should always play an important role in any conservative standardization work. It would be foolish to create a unique new metric standard without first considering some existing European metric standards.

NORMAL DEVELOPMENT LEVELS OF A STANDARD

The most common standardization levels are:

- company standard
- professional society or trade standard
- national standard
- regional standard
- international standard

The normal path through which a standard must pass in the developmental stages depends on the organization level and the standardization technique applied. A new international standard generated by applying the analytical principle follows the organization levels in a numerical order, while a company standard prepared after the conservative principle might be based directly on the applicable international standard.

A more recent trend in international standardization is to draft a new standard directly when a need for it has been established.

USER ACCEPTANCE OF STANDARDS

The development cycle of the standards is completed when the user applies the standards in his or her work. The designer should, whenever possible, use internationally standardized parts and components. This would result in an increase of the demand for the standard sizes and a decrease in manufacturing costs for the parts. With the above principle applied to the increasing world flow of material and products, a substantial increase in worldwide productivity can be visualized.

STANDARDS ORGANIZATIONS INTERNATIONAL LEVEL

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies, at present comprising 146 members. The objective of ISO is to promote the development of standardization and related activities in the world with a view to facilitating international exchange of goods and services, and to developing cooperation in the sphere of intellectual, scientific, technological, and economic activity. The results of ISO technical work are published as *International Standards.* The scope of ISO covers standardization in all fields except electrical and electronic engineering standards, which are the responsibility of the International Electro-technical Commission (IEC).

ISO brings together the interests of producers, users (including consumers), governments worldwide, and the scientific community, in the preparation of International Standards. Its technical work is carried out through 2940 technical bodies utilizing more than 30 000 experts, resulting in the publication of 14 000 ISO standards.

A listing of acronyms and addresses for standards organizations is found in Table 1-1.

Origin

International standardization started in the electro-technical field some 90 years ago. While some attempts were made in the 1930s to develop international standards in other technical fields, it was not until ISO was created that an international standards organization devoted to standardization as a whole came into existence.

Following a meeting in London in 1946, delegates from 25 countries decided to create a new international organization “the object of which would be to facilitate the international coordination and unification of industrial standards.” The new organization, ISO, began to function officially on February 23, 1947.

Members

A member body of ISO is the national body “most representative of standardization in its country.” It follows that only one such body for each country is accepted for membership in ISO. Member bodies are entitled to participate and exercise full voting rights on any technical committee of ISO, are eligible for Council membership, and have seats in the General Assembly.

By January 2003, the number of member bodies was 94.

More than 70% of the ISO member bodies are governmental institutions or organizations incorporated by public law. The remainder have close links with the public administration in their own countries.

A *correspondent member* is normally an organization in a developing country which does not yet have its own national standards body. Correspondent members do not take an active part in the technical work, but are entitled to be kept fully informed about the work of interest to them. They may attend the General Assembly as observers. Nearly all the present correspondent members are governmental institutions.

By January 2003, the number of correspondent members was 37.

Technical Work

The technical work of ISO is carried out through *technical committees (TC).* The decision to establish a technical committee is taken by the ISO Technical Management Board which also approves ISO scope. Within this scope, the committee determines its own program of work.

Work in the field of information technology is carried out through a joint ISO/IEC technical committee, ISO/IEC JTC I

Information Technology, established in 1987 by the ISO and IEC Councils.

Each technical committee may, in turn, establish subcommittees (SC) and working groups (WG) to cover different aspects of its work.

Each technical committee or sub-committee has a secretariat, assigned to an ISO member body: in the case of technical committees, by the Technical Board on behalf of Council, and in the case of subcommittees, by the parent committee. For each working group, a convener is appointed by the parent committee.

By January 2003, there were 188 technical committees, 550 subcommittees, 2175 working groups, and 24 ad hoc study groups.

A proposal to begin work in a new field of technical activity normally comes from within ISO itself, but it may also originate from some other international organization. Since the resources are limited, priorities must be considered. Therefore, all new proposals are submitted for consideration by the ISO member bodies. If accepted, either the new work will be referred to the appropriate existing technical committee, or a new technical committee will be established.

To ensure coordination of work in all matters of common interest, liaisons are established between related technical committees.

Each member body interested in a subject for which a technical committee has been authorized has the right to be represented on that committee.

subcommittees (ISO/TC/SC) — This is the level at which most of the technical decisions are made and is also the level at which much of the technical liaison takes place. Subcommittees are charged with the study of one or several items within the scope of the technical committee.

working groups (ISO/TC/SC/WG) —The technical committees and subcommittees may set up working groups composed of a restricted number of individuals to prepare working drafts for standards development. The group may function between meetings of the parent committee, but it is automatically disbanded on completion of its task.

ad-hoc working group — a group that may be formed to deal with a matter on which it is required to report to the parent committee at the same meeting in which it is formed.

EVOLUTION OF AN INTERNATIONAL STANDARD

Prior to July 1971, subjects proposed and approved by ISO were known as “ISO Recommendations.” Although the ISO charter included provision for the approval and publication as ISO standards, the procedure had never been invoked. In mid-1971, a decision was made to publish all ISO draft Recommendations as draft international standards and, subsequently, as international standards. At the same time a new category of document, to be known as a “Technical Report,” was introduced. The descriptions which follow reflect current terminology.

draft proposals — a draft submitted to the participating (P) members of a technical committee for study which is intended eventually to become an International Standard. A given subject may undergo several successive committee drafts, i.e., first draft, second draft, etc.

draft international standard (DIS) — a committee draft which has received substantial support from the participating members of the technical committee and is transmitted to the Central Secretariat for registration. This is then circulated to the P-members and all the other Member Bodies for final letter ballot.

international standard — a draft international standard which has been adopted by a two-thirds majority vote of the P-members of the technical committee and approved by 75% of all the Member Bodies voting

technical report — there are three types of technical reports, as follows

(a) When the required support cannot be obtained for a DIS to pass the approval stage, or in case of doubt concerning consensus, the committee may decide, by a simple majority vote of its P-members, that the document should be published in the form of a technical report.

(b) When the subject in question is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an international standard, the committee may decide that the publication of a technical report would be appropriate. The decision to publish the technical report requires a simple majority vote of the P-members of the committee. A technical report of type (b) may be used for “pre-standardization” purposes.

(c) When a committee has collected data of a different kind from that which is normally published as an international standard (this may include, for example, data obtained from a survey carried out among the national bodies, data on work in other international organizations, or data on the “state of the art” in relation to standards of national bodies on a particular subject), the committee may decide, by a simple majority vote of its P-members, to publish such data in the form of a technical report. Such a document will be entirely informative in nature.

Technical reports of types (a) and (b) are subject to review not later than three years after their publication. The aim of such a review is to reexamine the situation, and if possible, to achieve the agreement necessary for the publication of an international standard to replace the technical report.

FINANCE

ISO is maintained by the financial contributions of its members; the amount varies according to the circumstances of the country concerned. Additional revenue, however, is gained from the sale of international standards and other publications.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (IEC)

The International Electrotechnical Commission came into being in 1906.

ISO and JEC have established a formal agreemer4, stating the relationship between the two organizations. In accordance with this agreement, ISO and IEC form the specialized system for worldwide standardization.

It is agreed that questions related to international standardization in the electrical and electronic engineering fields are the concern of IEC. Other subject areas are the responsibility of ISO. In matters of international standardization not related to any particular technology, ISO undertakes, in consultation with IEC, to safeguard any electro-technical interests which may be involved. To ensure the necessary technical coordination, ISO and IEC have established a joint ISO/IEC Technical Programming Committee.

The members of the IEC are the *national committees*, one for each country, which are required to be as representative as possible of all electrical interests in the country concerned:
manufacturers, users, governmental authorities, teaching, and professional bodies. They are composed of representatives of the various organizations which deal with questions of electrical standardization at the national level. Most of them are recognized and supported by their governments.

In the technical work, numerous liaisons have been established between ISO and IEC committees, and a joint ISO/IEC technical committee has been established in the field of information technology.

REGIONAL STANDARDS ORGANIZATIONS

ASAC (Asian Standards Advisory Committee) — setup in 1966 under ECAFE (Economic Commission for Asia and the Far East). Regional standards are not envisaged.
COPANT (Pan American Standards Commission) — comprises national standards bodies of USA and 11 Latin American countries. Regional standards published and available from ANSI in the Spanish language.
CEN (European Committee for Standardization) — comprises national standards bodies of the EU (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, The Netherlands, Portugal, Spain, Sweden, and United Kingdom) and EFTA (Iceland, Norway and Switzerland). Over 1300 working groups prepare European standards which, if accepted by 71% of CEN members, are published without variation of text in the countries accepting them as the national standard.
CENELEC (European Committee for Electro-technical Standardization) — electro-technical counterpart of CEN. Comprises national electro-technical committees of EEC and EFTA countries. The CENELEC Electronic Components Committee produces harmonization documents with which national standards can be brought into line, with built-in quality assessment. There are 12 working groups.
ECSC (European Coal and Steel Community) — the ECSC has produced more than 150 steel material (EURONORM) standards, some of which are referred to in this publication
ECISS (European Committee for Iron and Steel Standardization) — revised and republished most of the EURONORM standards as European standards (EN). An ***EN* standard** (German: Norm, French: Norme) is a document that has been adopted by one of the three recognized European Standardization Organizations: CEN, CENELEC or ETSI. An EN is available, in principle, in the three official languages of CEN (English, French and German).
PASC (Pacific Area Standards Congress) — comprises national standards bodies from the USA, Canada, Japan, Australia, and New Zealand.

NATIONAL STANDARDS ORGANIZATIONS

ANSI (American National Standards Institute) — Only a brief review of the various functions ANSI fulfills will be presented in this book. More details about the ANSI organization are available from the institute upon request.

ANSI provides the machinery for creating voluntary standards. It serves to eliminate duplication of standards activities and to weld conflicting standards into single, nationally accepted standards under the designation “American National Standards.”

The Standards Institute, under whose auspices this work is being done, is the USA clearinghouse and coordinating body for standards activity on the national level. It is a federation of trade associations, technical societies, professional groups, and consumer organizations. Some 1000 companies are affiliated with the Institute as company members.

The American National Standards Institute is the USA member of the International Organization for Standardization (ISO), the International Electro-technical Commission (IEC), the Pan American Standards Commission (COPANT), and the Pacific Area Standards Congress (PASC). Through these channels American interests make their position felt on the international level.
other national standards bodies at the ISO — The eight national standards organizations with the largest gross national products are listed in Fig. 1-1 and their addresses are given in Table 1-1. ANSI has the distribution of their national standards in the USA.

TABLE 1-1 ACRONYMS AND LINKS TO IMPORTANT STANDARDS ORGANIZATIONS

Acronyms Std Prefix	Organization Address	Email Web Page	Phone Fax
ABMA	American Bearing Manufacturers Association	info@americanbearings.org	202 367 1155
	2025 M Street NW Suite 800	http://www.americanbearings.org	202 367 2155
	Washington DC 20036 USA		
AFNOR,	Association française de normalisation	uari@afnor.org	33 1 41 62 80 00
NF	11, avenue Francis de Pressensé 93571 Saint-Denis La Plaine Cedex France	http://www.afnor.fr	33 1 49 17 90 00
AGMA	American Gear Manufacturers Association	website@AGMA.org	703 684 0211
	1001 N Fairfax Street, Suite 500	http://www.agma.org	703 684 0242
	Alexandria, VA 22314-1587 USA		
AISI*	American Iron & Steel Institute	webmaster@steel.org	202 452 7100
	1140 Connecticut Ave., NW Suite 705	http://www.steel.org	
	Washington, DC 20036 USA		
ANMC*	American National Metric Council	anmc@paimgmt.com	301 718 6508
	4340 EW Highway, Suite 401	http://lamar.colostate.edu/~hillger/anmc.htm	301 656 0989
	Bethesda MD 20814-4411 USA		
ANSI	American National Standards Institute	info@ansi.org	212 642 49 00
	25 West 43rd Street 4 floor	http://www.ansi.org	212 398 00 23
	New York, NY 10036 USA	http://webstore.ansi.org	
API	American Petroleum Institute	mediacenter@api.org.	202 682 8000
	1220 L Street NW	http://www.api.org	202 962 4739
	Washington DC 20005-4070 USA		202 682 8114
ASAC	Asian Standards Advisory Committee		
ASABE	American Society for Agricultural and Biological Engineers	hq@asabe.org	269 429 0300
	2950 Niles Road	http://www.asae.org	269 429 3852
	St Joseph MI 49085-9659 USA		
	American Society for Metals International	CustomerService@asminternational.org	800 336 5152
ASM*	9639 Kinsman Rd	http://www.asm-intl.org	440 338 5151
	Materials Park OH 44073 USA		440 338 4634
ASME	American Society for Mechanical Engineers	infocentral@asme.org	800 843 2763
	Three Park Ave	http://www.asme.org	973 882 1170
	New York NY 10016-5990 USA		973 882 1717
ASQ	American Society for Quality	cs@asq.org	800 248 1946
	600 North Plankinton Ave	http://www.asq.org	414 272 8575
	Milwaukee, WI 53203 USA		414 272 1734

NOTE *Books but no standards

TABLE 1-1 ACRONYMS AND LINKS TO IMPORTANT STANDARDS ORGANIZATIONS (CONT'D)

Acronyms Std Prefix	Organization Address	Email Web Page	Phone Fax
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken PA 19428-2959	Webmaster@astm.org http://www.astm.org	610 832 9585 610 832 9555
BSI, BS	British Standards Institution 389 Chiswick High Road London W4 4AL United Kingdom	standards.international@bsi-global.com http://www.bsi-global.com	44 20 89 96 90 01 44 20 89 96 74 00
CCPA	Cemented Carbide Producers Association 30200 Detroit Road Cleveland OH 44145	leh@wherryassoc.com http://www.ccpa.org	440 899 0010 440 892 1404
CDA*	Copper Development Association, Inc 260 Madison Avenue 16th Floor New York NY 10016	questions@cda.copper.org http://www.copper.org	212 251 7200 212 251 7234
CEE	International Commission on Rules for the Approval of Electrical Equipment 310 Utrechtseweg Arnhem Netherlands	http://www.cee-nl.org.mx/default.asp	
CEN, EN	European Committee for Standardization 36 rue de Strassart 1050 Brussels Belgium	infodesk@cenorm.be http://www.cenorm.be	32 25 50 08 11 32 25 50 08 19
CENELEC, EN	European Committee for Electro-technical Standardization 35 rue de Stassart 1050 Brussels Belgium	info@cenelec.org http://www.cenelec.org	32 25 19 68 71 32 25 19 69 19
CGPM	Central Conference of Weights and Measures (see OIML)	http://www.sizes.com/units/cgpm.htm	
CIPM	International Conference on Weights and Measures (see OIML)	http://www.bipm.fr/en/committees/cipm	
COPANT	Pan American Standards Commision Manuel Díaz Portocarrero Torre Fondo Común. Piso 11 Caracas Venezuela	copant@cantv.net http://www.copant.org (Refer to ANSI)	58 25 74 29 41 58 25 74 29 41
DIN	DIN Deutsches Institut für Normung Burggrafenstrasse 6 10787 Berlin Germany	directorate.international@din.de http://www.din.de Order; http://www.din.de/beuth	49 30 26 01 0 49 30 26 01 12 31
ECSC	European Coal and Steel Community	http://www.cordis.lu/ecsc/home.html	
EURO-NORM	EURONORM standards issued in German, French, Italian, Dutch. Contact DIN-Beuth		

NOTE *Books but no standards

TABLE 1-1 ACRONYMS AND LINKS TO IMPORTANT STANDARDS ORGANIZATIONS (CONT'D)

Acronyms Std Prefix	Organization Address	Email Web Page	Phone Fax
IEC	International Electro-technical Commision Central Office, 3 rue de Varembe 1211 Geneva 20 Switzerland	info@iec.ch http://www.iec.ch	41 22 919 0211 41 22 919 0300
IEEE	Institute of Electrical and Electronics Engineers, Inc 445 Hoes Lane POB 1331 Piscataway NJ 08855-1331 USA	webmaster@ieee.org http://standards.ieee.org	800 678 4333 732 981 0060 732 981 9667
IFI	Industrial Fastener Institute 6363 Oak Tree Boulevard Independence Ohio 44131 USA	rharris@indfast.org http://www.industrial-fasteners.org	216 241 1482 216 241 5901
ISO	International Organization for Standardizn 1, ch. de la Voie-Creuse, Case postale 56 1211 Geneva 20 Switzerland	central@iso.org http://www.iso.org	41 22 749 01 11 41 22 733 34 30
JISC, JIS	Japanese Industrial Standards Committee 4-1-24 Akasaka Minato-ku, Tokyo 107-8440 Japan	csd@jsa.or.jp http://www..jsa.or.jp Order; http://www.jsa.or.jp	81 3 35 01 9471 81 3 35 80 8637
JSA*	Japanese Standards Association 4-1-24 Akasaka Minato-ku Tokyo 107-8440 Japan	jisc_iso@jsa.or.jp http://www.jsa.or.jp/default_english.asp	81 3 35 83 8005 81 3 35 86 2014
JSA*	Japanese Standards Association 16, Chemin de la Voie-Greuse 1202 Geneva Switzerland	po@jsa.or.jp	
NEMA	National Electrical Manufacturers Assocn 1300 North 17th Street Suite 1752 Rosslyn, VA 22209 USA	webmaster@nema.org http://www.nema.org	703 841 3200 703 841 5900
NFPA	National Fluid Power Association 3333 N Mayfair Road Suite 211 Milwaukee WI 53222-3219 USA	nfpa@nfpa.com http://www.nfpa.com	414 778 3344 414 778 3361
NIST	National Institute of Standards & Technology USA DoC 100 Bureau Drive Gaithersburg MD 20899 USA	inquiries@nist.gov TheSI@nist.gov http://www.nist.gov	301 975 6478 301 975 8295
OIML	International Organization of Legal Metrology Rue Turgot 11 75009 Paris France	biml@oiml.org http://www.oiml.org	33 1 48 78 12 82 33 1 42 82 17 27

NOTE *Books but no standards

TABLE 1-1 ACRONYMS AND LINKS TO IMPORTANT STANDARDS ORGANIZATIONS (CONT'D)

Acronyms Std Prefix	Organization Address	Email Web Page	Phone Fax
PASC	Pacific Area Standards Congress (USA, Canada, Australia, Japan, New Zealand India, China, Russia, Chile, Peru, Thailand, Colombia, Republic of Korea, Vietnam, etc)	TISI (Thailand) http://www.pascnet.org http://www.pascnet.org/roster.jsp	
RMA	Rubber Manufacturers Association 1400 K Street NW Suite 900 Washington DC 20005	info@rma.org http://www.rma.org	202 682 4800 202 682 4854
SAA, AS	Standards Australia 20 Bridge Street Sydney NSW 2001 Australia	mail@standards.org.au http://www.standards.org.au	612 8206 6000 612 8206 6001
SAE	Society of Automotive Engineers, Inc 400 Commonwealth Drive Warrendale PA 15096	automotive_hq@sae.org http://www.sae.org	724 776 4841 724 776 0790
SCC	Standards Council of Canada 270 Albert Street, Suite 200 Ottawa, Ontario K1P 6N7 Canada	info@scc.ca http://www.scc.ca	613 238 32 22 613 569 78 08
SES*	Standards Engineers Society 1950 Lafayette Road, Box 1 Portsmouth NH 03801	admin@ses-standards.org http://www.ses-standards.org	603 610 7101 603 926 0750
SME*	Society of Manufacturing Engineers One SME Drive Dearborn MI 48128	service@sme.org http://www.sme.org	800 733 4763 313 425.3000 313 425 3400
ULI	Underwriters Laboratories, Inc 2600 N.W. Lake Road Camas, WA 98607-8542	cec.us@us.ul.com http://www.ul.com	877 854 3577 360 817 6278
UNI	Ente Nazionale Italiano di Unificazione Via Battistotti Sassi 11/b IT-20133 Milano	uni@uni.com http://www.uni.com	39 02 70 02 41 39 02 70 10 61 49
USCTI*	United States Cutting Tool Institute 1300 Sumner Avenue Cleveland OH 44115	uscti@uscti.com http://www.uscti.com	216 241 7333 216 241 0105
USMA	US Metric Association 10245 Andasol Ave Northridge CA 91325-1504	hillger@cira.colostate.edu http://lamar.colostate.edu/~hillger	818 363 5606 818 368 7443

NOTE *Books but no standards

ISO Members Worldwide

RELATED ISO PUBLICATIONS AVAILABLE FROM ANSI

ANSI Catalog Contains listing with prices of ANSI standards published annually.

ISO General Information Publications;
http://www.iso.org/iso/en/prods-services/otherpubs/General.PublicationList?CLASSIFICATION=GENERAL

ISO Technical Program Information on the titles and stages of development of all draft standards. (Biannual)

ISO/IEC Directives Part 1 Procedures for technical work
Part 2 Methodology for the development of International Standards.
Part 3 Drafting and presentation of International Standards.

ISO Memento Information, English and French, on the scope of responsibility, organizational structure, and secretariats for each technical committee. In addition, the Memento contains general information on the organization and administration of the work of ISO. (Annual)

ISO Participation This table indicates the membership of technical committees, technical divisions, and committees reporting to the ISO Council. (Biannual)

ISO Bulletin Standardization news; calendar of ISO meetings; list of all new draft ISO standards and newly published ISO standards. (Monthly)

ISO/IEC Guide 2: 1991 General terms and their definitions concerning standardization and related activities. Approximately 40 Guides, designated ISO/IEC Guide Nos. 2-57, cover subjects related to international standardization, and are listed in the ISO catalog.

ISO Video Film International standardization 18 min video cassette VHS. Other video films are also available.

CEN Catalog Complete list of EN standards (German: Norm, French: Norme) and tables of corresponding material standards for CEN National Affiliate Members. See website; Welcome to the On-line Catalogue of European Standards with links to most European national standards organizations and their standards catalogs.

HOW TO FIND AND ORDER INTERNATIONAL AND NATIONAL STANDARDS

Grouping of International Standards by Technical Committees **(TC)** see Table 1-2 and by International Classification for Standards **(ICS)** see Table 1-3. Order international or national standards from ANSI or the applicable web page shown in Table 1-1. For all EN and national standards in Europe see CEN above and use websites shown.

TABLE 1-2 TECHNICAL COMMITTEES (TC)

JTC 1 Information technology
JTC 2 Joint Project Committee - Energy efficiency and renewable energy sources – Common terminology
TC 1 Screw threads
TC 2 Fasteners
TC 4 Rolling bearings
TC 5 Ferrous metal pipes and metallic fittings
TC 6 Paper, board and pulps
TC 8 Ships and marine technology
TC 10 Technical product documentation
TC 11 Boilers and pressure vessels
TC 12 Quantities and units
TC 14 Shafts for machinery and accessories
TC 17 Steel
TC 18 Zinc and zinc alloys - STANDBY
TC 19 Preferred numbers - STANDBY
TC 20 Aircraft and space vehicles
TC 21 Equipment for fire protection and fire fighting
TC 22 Road vehicles
TC 23 Tractors and machinery for agriculture and forestry
TC 24 Particle characterization including sieving
TC 25 Cast irons and pig irons
TC 26 Copper and copper alloys
TC 27 Solid mineral fuels
TC 28 Petroleum products and lubricants
TC 29 Small tools
TC 30 Measurement of fluid flow in closed conduits
TC 31 Tyres, rims and valves
TC 33 Refractories
TC 34 Food products
TC 35 Paints and varnishes
TC 36 Cinematography

TC 37 Terminology and other language and content resources
TC 38 Textiles
TC 39 Machine tools
TC 41 Pulleys and belts (including veebelts)
TC 42 Photography
TC 43 Acoustics
TC 44 Welding and allied processes
TC 45 Rubber and rubber products
TC 46 Information and documentation
TC 47 Chemistry
TC 48 Laboratory equipment
TC 51 Pallets for unit load method of materials handling
TC 52 Light gauge metal containers
TC 54 Essential oils
TC 58 Gas cylinders
TC 59 Buildings and civil engineering works
TC 60 Gears
TC 61 Plastics
TC 63 Glass containers
TC 67 Materials, equipment and offshore structures for petroleum, petrochemical and natural gas industries
TC 68 Financial services
TC 69 Applications of statistical methods
TC 70 Internal combustion engines
TC 71 Concrete, reinforced concrete and pre-stressed concrete
TC 72 Textile machinery and accessories
TC 74 Cement and lime
TC 76 Transfusion, infusion and injection, and blood processing equipment for medical and pharmaceutical use
TC 77 Products in fibre reinforced cement
TC 79 Light metals and their alloys
TC 81 Common names for pesticides and other agrochemicals
TC 82 Mining - STANDBY
TC 83 Sports and recreational equipment
TC 84 Devices for administration of medicinal products and intravascular catheters
TC 85 Nuclear energy, nuclear technologies, and radiological protection
TC 86 Refrigeration and air-conditioning
TC 87 Cork
TC 89 Wood-based panels
TC 91 Surface active agents
TC 92 Fire safety
TC 93 Starch (including derivatives and by-products)
TC 94 Personal safety -- Protective clothing and equipment
TC 96 Cranes
TC 98 Bases for design of structures
TC 100 Chains and chain sprockets for power transmission and conveyors
TC 101 Continuous mechanical handling equipment
TC 102 Iron ore and direct reduced iron
TC 104 Freight containers
TC 105 Steel wire ropes
TC 106 Dentistry
TC 107 Metallic and other inorganic coatings
TC 108 Mechanical vibration, shock and condition monitoring
TC 109 Oil and gas burners
TC 110 Industrial trucks
TC 111 Round steel link chains, chain slings, components and accessories
TC 112 Vacuum technology
TC 113 Hydrometry
TC 114 Horology
TC 115 Pumps
TC 117 Fans
TC 118 Compressors and pneumatic tools, machines and equipment
TC 119 Powder metallurgy
TC 120 Leather
TC 121 Anaesthetic and respiratory equipment
TC 122 Packaging
TC 123 Plain bearings
TC 126 Tobacco and tobacco products
TC 127 Earth-moving machinery
TC 129 Aluminium ores - STANDBY
TC 130 Graphic technology
TC 131 Fluid power systems
TC 132 Ferroalloys
TC 133 Sizing systems and designations for clothes
TC 134 Fertilizers and soil conditioners
TC 135 Non-destructive testing
TC 136 Furniture
TC 137 Footwear sizing designations and marking systems
TC 138 Plastics pipes, fittings and valves for the transport of fluids
TC 142 Cleaning equipment for air and other gases
TC 145 Graphical symbols
TC 146 Air quality

TC 147 Water quality
TC 148 Sewing machines
TC 149 Cycles
TC 150 Implants for surgery
TC 153 Valves
TC 154 Processes, data elements and documents in commerce, industry and administration
TC 155 Nickel and nickel alloys
TC 156 Corrosion of metals and alloys
TC 157 Non-systemic contraceptives and STI barrier prophylactics
TC 158 Analysis of gases
TC 159 Ergonomics
TC 160 Glass in building
TC 161 Control and protective devices for gas and/or oil burners and appliances
TC 162 Doors and windows
TC 163 Thermal performance and energy use in the built environment
TC 164 Mechanical testing of metals
TC 165 Timber structures
TC 166 Ceramic ware, glassware and glass ceramic ware in contact with food - STANDBY
TC 167 Steel and aluminium structures
TC 168 Prosthetics and orthotics
TC 170 Surgical instruments
TC 171 Document management applications
TC 172 Optics and photonics
TC 173 Assistive products for persons with disability
TC 174 Jewellery
TC 176 Quality management and quality assurance
TC 177 Caravans
TC 178 Lifts, escalators and moving walks
TC 179 Masonry - STANDBY
TC 180 Solar energy
TC 181 Safety of toys
TC 182 Geotechnics
TC 183 Copper, lead, zinc and nickel ores and concentrates
TC 184 Automation systems and integration
TC 185 Safety devices for protection against excessive pressure
TC 186 Cutlery and table and decorative metal hollow-ware
TC 188 Small craft
TC 189 Ceramic tile
TC 190 Soil quality
TC 191 Animal (mammal) traps - STANDBY
TC 192 Gas turbines
TC 193 Natural gas
TC 194 Biological evaluation of medical devices
TC 195 Building construction machinery and equipment
TC 197 Hydrogen technologies
TC 198 Sterilization of health care products
TC 199 Safety of machinery
TC 201 Surface chemical analysis
TC 202 Microbeam analysis
TC 203 Technical energy systems
TC 204 Intelligent transport systems
TC 205 Building environment design
TC 206 Fine ceramics
TC 207 Environmental management
TC 208 Thermal turbines for industrial application (steam turbines, gas expansion turbines)- STANDBY
TC 209 Cleanrooms and associated controlled environments
TC 210 Quality management and corresponding general aspects for medical devices
TC 211 Geographic information/Geomatics
TC 212 Clinical laboratory testing and in vitro diagnostic test systems
TC 213 Dimensional and geometrical product specifications and verification
TC 214 Elevating work platforms
TC 215 Health informatics
TC 216 Footwear
TC 217 Cosmetics
TC 218 Timber
TC 219 Floor coverings
TC 220 Cryogenic vessels
TC 221 Geosynthetics
TC 222 Personal financial planning - STANDBY
TC 223 Societal security
TC 224 Service activities relating to drinking water supply systems and wastewater systems – Quality criteria of the service and performance indicators
TC 225 Market, opinion and social research
TC 226 Materials for the production of primary aluminium
TC 227 Springs
TC 228 Tourism and related services
TC 229 Nanotechnologies
TC 230 Project Committee: Psychological assessment
TC 231 Project Committee: Brand valuation
TC 232 Learning services for non-formal education and training
TC 234 Fisheries and aquaculture

TC 235 Project Committee: Rating services
TC 236 Project Committee: Project Management
TC 237 Project committee: Exhibition terminology
TC 238 Solid biofuels
TC 239 Project Committee: Network services billing
TC 240 Project Committee: Product recall
TC 241 Project Committee: Road-Traffic Safety Management System
TC 242 Energy Management
TC 243 Project Committee: Consumer product safety
TC 244 Industrial furnaces and associated processing equipment
TC 245 Project Committee: Cross-border trade of second-hand goods
TC 246 Project committee: Anti-counterfeiting tools
TC 247 Fraud countermeasures and controls
TC 248 Project committee: Sustainability criteria for bioenergy
TC 249 Traditional chinese medicine
TC 250 Project committee: Sustainability in event management
TC 251 Project committee: Asset management
TC 252 Project committee: Natural gas fuelling stations for vehicles
TC 253 Project committee: Treated wastewater re-use for irrigation
TC 254 Safety of amusement rides and amusement devices
TC 255 Biogas
TC 256 Pigments, dyestuffs and extenders
TC 257 General technical rules for determination of energy savings in renovation projects, industrial enterprises and regions
TC 258 Project, programme and portfolio management
TC 259 Project committee: Outsourcing
TC 260 Human resource management
TC 261 Additive manufacturing
TC 262 Project committee: Risk management
TC 263 Coalbed methane (CBM)
TC 264 Fireworks
TC 265 Carbon capture and storage (CCS)
TC 266 Biomimetics
TC 267 Facilities management

CASCO Committee on conformity assessment
CIE International Commission on Illumination
COPOLCO Committee on consumer policy
IIW International Institute of Welding
IULTCS International Union of Leather Technologists and Chemists Societies
REMCO Committee on reference materials
TMB Technical Management Board
VAMAS Versailles Project on Advanced Materials and Standards

TABLE 1-3 INTERNATIONAL CLASSIFICATION FOR STANDARDS (ICS)

01 Generalities. Terminology. Standardization. Documentation
03 Services. Company organization, management and quality. Administration. Transport. Sociology
07 Mathematics. Natural Sciences
11 Health care technology
13 Environment. Health protection. Safety
17 Metrology and measurement. Physical phenomena
19 Testing
Analytical chemistry, see 71.040
21 Mechanical systems and components for general use
23 Fluid systems and components for general use
Measurement of fluid flow, see 17.120
25 Manufacturing engineering
27 Energy and heat transfer engineering
29 Electrical engineering
31 Electronics
33 Telecommunications. Audio and video engineering
35 Information technology. Office machines
37 Image technology
39 Precision mechanics. Jewellery
43 Road vehicles engineering
45 Railway engineering
47 Shipbuilding and marine structures
49 Aircraft and space vehicle engineering
53 Materials handling equipment
55 Packaging and distribution of goods
59 Textile and leather technology
61 Clothing industry
65 Agriculture
67 Food technology
71 Chemical technology

73 Mining and minerals
75 Petroleum and related technologies
77 Metallurgy
79 Wood technology
81 Glass and ceramics industries
83 Rubber and plastic industries
85 Paper technology
87 Paint and colour industries
91 Construction materials and building
93 Civil engineering
95 Military engineering
97 Domestic and commercial equipment. Entertainment. Sports

ISO Handbook 1 Documentation and information.

A number of ISO books (formerly named Handbooks) are available and listed on the following ISO link:
http://www.iso.org/iso/en/prods-services/otherpubs/Handbooks.PublicationList?CLASSIFICATION=HANDBOOKS

Technical product specification

Compilation on CD-ROM of the entire collection of Technical Product Specification (TPS) standards which are essential to manufacturing on a global basis, as well as providing a common language for product and contract specification, and other communication along global supply chains. It allows the 242 standards to be accessed easily and rapidly and puts this "library" of standards into a conveniently transportable format. Technical product specification
Year of publication: 2009 Edition: 1 .ISBN 978-92-67-10510-9

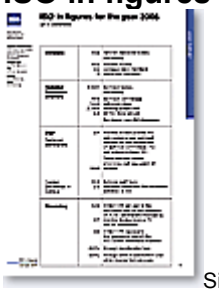
ISO Focus


A selection of centre spreads from ISO Focus+ magazine of the last two years provide the theme for the ISO 2012 calendar. Topics covered include motor vehicle safety, standards in everyday life, energy, accessibility of buildings, the economic benefits of standards, social responsibility and space exploration. ISO Calendar 2012. Year of publication: 2011. Edition: 1

ISO Strategic Plan 2011-2015. Solutions to Global Challenges


The route map, via seven key objectives, to the global vision for ISO in 2015: to be the world's leading provider of high quality, globally relevant International Standards through its members and stakeholders. ISBN 978-92-67-10542-0

ISO in figures for the year 2010



Significant statistics on ISO and ISO's work for 2010. Year of publication: 2011. Edition: 1. ISBN 978-92-67-10546-8

ISO in brief

A four-page introduction to the ISO standardization system, the ISO system's output, ISO's partners and ISO's path forward. *Year of publication: 2011. Edition: 3.* ISBN 978-92-67-10550-5

ISO Annual Report 2010

Year of publication: 2011, *Periodicity:* Annual

ISO Catalogue 2011

The ISO Catalogue includes more than 18 500 published International Standards classified according to the International Classification for Standards (ICS) and by Technical Committee (TC).

CataloguePlus 2011 on CD-ROM

This CD-ROM contains information on all published ISO standards and other publications, plus the ISO technical work programme of draft standards. The listings are presented by subject according to the International Classification for Standards (ICS). Lists in numerical order and in technical committee order are also given. In addition, there is an alphabetical index and a list of withdrawn standards.