

BARRIERS TO TRADE

Towards a global measurement system: Contributions of international organizations

MANFRED KOCHSIEK AND ANDREAS ODIN,
Physikalisch-Technische Bundesanstalt (PTB)
Braunschweig / Berlin
Bundesallee 100, D-38116 Braunschweig, Germany

1 Introduction

Practically all goods and services are subject to barriers to trade, be they industrial goods, agricultural products or the latest forms of electronic commerce via the Internet. But the desire to reduce these barriers, which may impede or prevent fair competition and the exchange of goods, is not new. Not only are there very diverse interests at the root of this desire, but also reducing barriers is an ongoing objective that is expressed by almost all sectors of the world economy. Reliable and comparable measurements play an important role in many cases for the requirements to be met by the products and services (which may be different in the individual states), as do the various approval and test methods laid down by the responsible authorities. But the latter may themselves turn into barriers to trade, defeating the object of the exercise.

For this reason, the international metrology organizations and the organizations concerned with conformity assessment are increasingly tackling the problem of how best to eliminate technical barriers to trade.

After intensive discussions, all the international metrology organizations (as well as some regional ones) developed strategy papers. The Metre Convention, for example, published the *Blevin Report* [1], and the OIML the *Birkeland Study* [2]. As a consequence, action plans are being developed and the implementation thereof has already started.

In June 1998 the BIPM, IMEKO, OIML and PTB held a joint conference on *The Role of Metrology in Economic and Social Development* [3]. The problems facing the world economy were discussed from the most diverse angles by 230 delegates from about 80 countries and 17 international and regional organizations.

The conclusion drawn by the working groups from the lectures and discussions covering the entire scope of the problem was essentially that the seminar had undeniably been a real success thanks to the high quality of the speakers' presentations and lectures and

the sheer number of different subjects raised. The groups underlined that there was certainly much food for thought for follow-up meetings, and that the delegates had left the information-saturated week of activity conscious of the fact that metrology was keeping up with the times and evolving throughout the world.

In his closing address Mr. Athané (Director, BIPM) had emphasized that OIML activity must be adapted to match the work of the BIPM, IMEKO, ILAC, ISO, etc. and to fulfill the needs of international organizations such as the WTO (notably its TBT activity), regional bodies, Member States, and especially those of developing countries.

The seminar was the first to offer the three large metrology organizations an opportunity to discuss matters of such importance as those addressed on this occasion, to exchange views and to discover each other's activities more fully.

Based on the outputs of this seminar, the OIML launched activities and proposed new directions aimed at enhancing the role of metrology in economic and social development. The conclusions from this work were drawn during the CIML Meeting held in Seoul in 1998, while the OIML meetings in Tunis in 1999 and in London last year served to discuss measures by which further progress could be achieved.

2 General situation as regards the removal of technical barriers to trade

There are in fact a large number of barriers to trade, which obstruct free trading and the exchange of goods and services in the world (cf. Fig. 1). Metrologists, for their part, may only influence the technical side of the non-tariff barriers to trade.

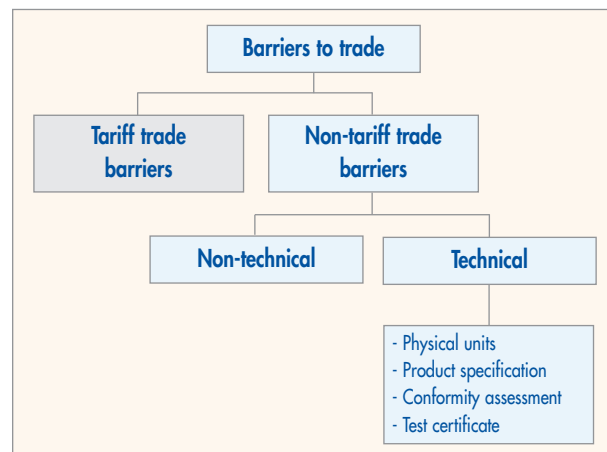


Fig. 1 Barriers to trade

2.1 World Trade Organization (WTO)

The WTO was established in 1995, continuing the work of the GATT which was founded as early as 1948. As the new umbrella organization for the world-wide harmonization of international trade, the WTO has made the liberalization of the world economy and the reduction of protectionism its goals. The foundation document signed on January 1, 1995 assigned far-reaching powers to the WTO, which supervises compliance with regulations and national trade policy, and also settles trade-related disputes. The WTO is the most significant political organization after the UNO and 134 states have since joined.

For the purpose of transparency, WTO members were required to fulfill notification obligations and establish national inquiry points. Another aim of the WTO is to improve market access.

Under the umbrella of the WTO, an agreement on Technical Barriers to Trade - the so-called TBT Agreement [4] - was signed by 46 countries five years ago. This Agreement is supposed to advise metrologists in harmonization matters (cf. Fig. 2).

With a view to developing an improved understanding of the role of international standards under the TBT Agreement, a TBT information session was organized in November 1998. This session aimed at keeping international standardizing bodies informed of ongoing discussions about international standards within the TBT Committee and at increasing the awareness of WTO members of the activities of these bodies. Presentations were made by ten international organizations, including OIML, ISO, IEC, ITU, WHO, FAO/Codex, etc. Questions were put to these organizations, mainly on the openness of their programs, transparency of procedures for comments and decision-making, application of adopted standards, when and how the specific problems of developing countries were taken into consideration, and the coordination of activities among these international standardizing organizations. As regards the OIML, the TBT Committee

was informed that the directives for the development of international Recommendations were in line with paragraphs L, M and N of the *WTO/TBT Code of Good Practice for the Preparation, Adoption and Application of Standards*. In the same way, the cooperation agreement between the OIML and ISO/IEC aimed at eliminating any risk of divergences and reducing the duplication of work, as well as the existence of a special OIML activity for developing countries were appreciated. This issue was also discussed in an ISO DEVCO/CASCO* meeting held in Milan, Italy, in September 2000 on the theme "Facilitating recognition of conformity assessment activities in the 21st century".

2.2 Organization for Economic Cooperation and Development (OECD)

The OECD has also taken up this topic and in March 2000 organized a large-scale meeting at which technical barriers to trade, international standardization and conformity assessment were dealt with. As a next step, a study will be initiated on the usefulness of the international harmonization of joint aims laid down in regulatory technical directives, and this for the very promising product area of telecommunication terminals.

2.3 United Nations Economic Commission for Europe (UN/ECE)

Last but not least, the UN/ECE deliberates on an international model for the harmonization of technical regulations based on references to relevant standards. This model was discussed in Geneva in June 2000. Further meetings of the UN/ECE concerning this topic and a workshop were held in November 2000 on *The Role of International Standards and Technical regulations in International Trade*.

In 2000 a number of initiatives were launched by these organizations to demonstrate the significance of the field of measurement, standards and quality in connection with the removal of technical barriers to trade. Examples of such meetings are the Special OECD Meeting on *Technical Barriers to Trade: International Standards and Conformity Assessment* held in Paris in March 2000 and a WTO Workshop on *Technical Assistance and Special and Differential Treatment in the Context of the TBT Agreement* held in Geneva in July 2000.

As a provisional result it can be stated that the decision makers in political and technical fields must be made aware of the problems, that the international

Technical Barriers to Trade (TBT) Agreement, 1995 (46 Signatories)	
• All WTO members have to sign – 134 signatories	
• Requires national technical regulations to be:	
- transparent	
- justifiable	
- non-discriminatory based on international standards (if possible)	
• Encourages members to sign mutual recognition agreements on conformity assessment	
• Encourages the development of international conformity assessment systems	

Fig. 2 The World Trade Organization (WTO) TBT Agreement

* DEVCO: ISO Committee for Developing Country Matters

CASCO: ISO Committee for Conformity Assessment Matters

organizations must better coordinate their programs, and that the necessary infrastructures must be improved or - in developing countries - be established first.

2.4 International standardization

Proof of compliance with international standards is also increasingly gaining in importance in connection with the removal of technical barriers to trade. What is concerned here are tools with the aid of which the facilitation of world trade can be speeded up through a harmonization of technical regulations. An example of highly successful international standardization work is the ISO 9000 series of standards in the field of quality management. The ISO 9000 standards have become an international reference for quality requirements in business-to-business dealings and form the basis of more than 350.000 certified quality management systems within private and public sector organizations in at least 150 countries.

It was, therefore, important as a result of the broad experience gained over the past years through the application of guidelines drawn up by international organizations and standardization bodies, that these guidelines have been transformed into international standards and adopted throughout the world. This process took place in steps, on the basis of the rules commonly applied in standardization.

The revision of ISO/IEC Guide 25, which describes the requirements for laboratory competence, was also of significance in this context. The conclusions drawn from the experience gained and the results of extensive discussions were taken into account when ISO/IEC 17025:1999 *General requirements for the competence of testing and calibration laboratories* was drawn up, a standard jointly issued by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC). CEN and CENELEC, the European standardization organizations, have taken over the exact wording of this fundamental standard in the European Standard EN ISO/IEC 17025:2000 [7]. Any laboratory in the world which meets the requirements of this standard can therefore be regarded as competent to produce results which are well founded from a technical viewpoint.

3 Activities of international organizations for metrology and accreditation

3.1 Metre Convention

Following the *Blevin Report*, a major step on the path towards the removal of technical barriers to free trade

was taken in Paris on October 14, 1999, during the 21st CGPM, the General Conference of the Metre Convention, when representatives of 38 national metrology institutes (NMIs) and two international organizations signed a Mutual Recognition Arrangement (MRA).

This MRA was prepared by the Director of the BIPM and specifies two different ways in which permanent compliance with the competence criteria can be proved and confidence preserved. Depending on the national and regional conditions, self-declaration as well as formal accreditation by internationally recognized accreditation bodies are stated as equivalent means.

In the case of self-declaration, compliance with the agreed criteria is made transparent above all by well-defined cooperation among the NMIs. If necessary, all information required is disclosed to remove possible doubts. "Peer reviews" by renowned experts from other NMIs are another tool by which transparency can be ensured.

In the case of accreditation, proof is usually established indirectly, by the obligation of the national accreditation systems to apply equivalent working methods. The accreditation systems themselves are then subject to international control through regular evaluations. Here, too, clear rules of procedure have been defined as regards the lines along which mutual recognition can be achieved.

Essential points of the MRA, the full title of which is *Mutual recognition of national measurement standards and of calibration and measurement certificates issued by national metrology institutes* [9], are regulations concerning world-wide key comparisons. The key comparisons are to show the degree of equivalence of national standards and measurement capabilities. The MRA stipulates that the results of the key comparisons are to be published by the BIPM, which will also maintain a key comparison database accessible via the Internet. Besides the results of key comparisons, the database will contain information on the calibration and measurement capabilities notified by the NMIs through their regional metrology organizations (RMOs) and reviewed by a Joint Committee of the RMOs and the BIPM.

Operation of an efficient QM system is indispensable to ensure that equivalent working methods are constantly applied and that confidence is preserved in the intervals between regular comparison measurements. This QM system must fully satisfy the requirements of ISO/IEC 17025. Moreover, it serves as a tool which will also make highly accurate, complex measurements possible in the future. It is in addition a means well-suited to reveal both strong and weak points and to implement internal measures for the remedy thereof.

3.2 OIML

According to the *Birkeland Study* and the discussions at the Braunschweig Seminar it is the main task of the OIML to harmonize legal metrology requirements and practices. An important contribution to the removal of technical barriers to trade is the development of the OIML Certificate System which will help to better respond to the needs of manufacturers and to develop procedures for acceptance or equivalence agreements in the years to come. Mutual cooperation, mutual confidence and mutual recognition are three steps to achieve international harmonization in legal metrology. A *Mutual Acceptance Arrangement on OIML Type Evaluations* (MAA) [10] is under discussion and expected to be adopted in 2001/2002.

3.3 International Laboratory Accreditation Cooperation (ILAC)

ILAC, too, has strongly supported the development of a world-wide infrastructure which will allow uniform criteria to be applied in assessing the equivalence of test and calibration results and the competence of laboratories. The bases for this are regional agreements already concluded between regional accreditation systems. The aim is to interlink these regional accreditation systems and to support the development of new regional structures wherever necessary.

The main tasks to which ILAC devoted itself in this context were the following:

- definition and publication of criteria and methods to be applied in the evaluation of accreditation bodies;
- development of a method for the evaluation of regional accreditation systems;
- training of independent experts as ILAC evaluators; and
- continuation of cooperation with the BIPM in the definition and establishment of fundamental principles ensuring comparability of national standards.

At the last ILAC General Conference in Washington (USA) in November 2000, an MRA [11] was signed by 37 accreditation bodies from 28 countries. The German Calibration Service (DKD) was among the first signatories. The core of the Arrangement is the mutual recognition of the equivalence of national accreditation systems. Application of this Arrangement is linked to the recommendation to recognize calibration certificates and test reports issued by the accredited laboratories which are among the signatories to this MRA.

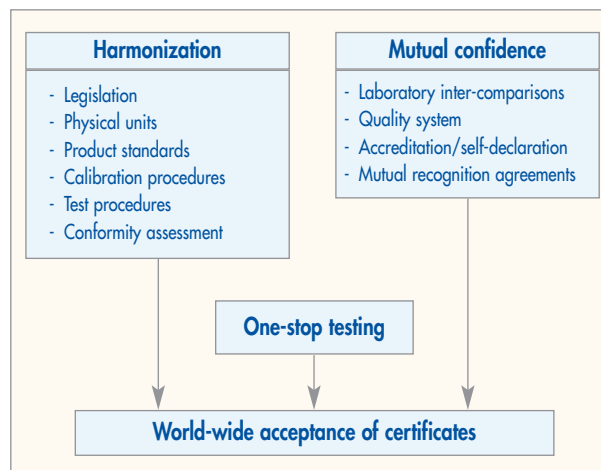


Fig. 3 Removal of metrological barriers to trade

Another important decision was that aimed at closer cooperation with the International Accreditation Forum (IAF). In future, general conferences and meetings will be prepared by a joint committee and the topics to be treated will be coordinated. It has moreover been agreed to give the user a uniform interpretation of the relation between ISO 9001 and ISO/IEC 17025 (cf. section 2.4).

4 Removal of metrological barriers to trade

How can metrologists support the removal of metrological barriers to trade? First of all they may try to exert influence on those bodies which have to do with legislation, the fixing of physical units, product standards, calibration and test procedures, as well as conformity assessment with the effect that all these issues will be harmonized world-wide and will be implemented in practice.

It is important for the recognition of calibration and test results to establish mutual confidence by means of laboratory intercomparisons, by installation of a quality system, by application for accreditation and by accession to mutual recognition agreements. The intended objective of all these measures is to reach one-stop testing and world-wide acceptance of certificates [5].

Three key points arising in Fig. 3 will be discussed briefly.

4.1 Harmonization in legislation

A good example (although negative as regards the time schedule aspect!) is the harmonization of requirements for measuring instruments intended for use for legal



Fig. 4 General principles of the Measuring Instruments Directive (MID)

purposes - laid down in a draft of the Measuring Instruments Directive (MID) of the European Union (EU). This New Approach Directive provides the basis for trade within the EU, since type testing and conformity assessment carried out in one particular country and the certificates issued in this context will be recognized by all EU member countries. The first New Approach Directive for measuring instruments has been successfully applied to nonautomatic weighing instruments since 1994. Unfortunately, the MID has been under discussion for 10 years, and a further four years are necessary for further discussion by the European Council and for its implementation. The general requirements of the MID are listed in Fig. 4.

4.2 Physical units - Implementation of the metric system

Even 125 years after the signing and introduction of the metric system a few countries still use old-fashioned, i.e. non-metric, units in their daily lives. In the meantime **all** the countries have officially introduced the SI metric system, some of them on the basis of transition periods.

The problems which may arise whenever harmonization is carried out half-heartedly became obvious by the failure of the Mars Climate Orbiter mission in September 1999 [6]. Instead of being launched into stable orbit, the satellite burnt out in the atmosphere of

Mars. One reason for the failure was that the control centers in Denver and Pasadena had used different units of measurement, i.e. one team had used meters and kilograms, the other had used feet and pounds. Apparently, the efforts of the American metrologists and the US Government to introduce the SI metric system represent a tough “battle” against old habits!

4.3 Quality system of metrology laboratories

Independent of whether metrology laboratories or national metrology institutes (NMIs) choose the path of self-declaration or accreditation,

- regular participation in comparison measurements,
- the determination of the uncertainty of measurement in compliance with the *Guide to the Expression of Uncertainty in Measurement* (GUM) [8], and
- the operation of an appropriate quality management system meeting the requirements of EN ISO/IEC 17025:2000 *General requirements for the competence of testing and calibration laboratories* [7]

are indispensable to ensure reliable metrological services. Only a combination of these elements builds up confidence in the work of the NMIs and fulfils the expectations of the customers at home and abroad.

The basic rules which are to be valid in Europe for the application of QM principles were discussed at a EUROMET workshop. Practical application of the results will be accompanied by a EUROMET project, responsibility for which lies with The Netherlands. The aim of this project is to develop methods for the introduction and maintenance of measures which build up confidence in the measurement and calibration capabilities and in the QM system of NMIs, and to organize an intensive exchange of experience. A “Quality System Forum” has been created specially for this exchange of information and know-how, and it has been agreed that before the end of 2001 all EUROMET NMIs in this circle will have presented their respective QM system and reported on the experience gained with the introduction of ISO/IEC 17025.

5 Steps towards a global measurement system

The development of a global measurement system will be the challenge *per se* for the decades to come. Some prerequisites and elements are illustrated by Fig. 5.

An essential point will be to include these elements in the system, cf. also chapter 4.

Obtain mutual confidence by

- Metrological traceability
- Estimation of measurement uncertainty
- Interlaboratory comparisons
- Quality-system

➤ Proof of competence

Problems

- No interest for economic political reasons
- Financial reasons for NMI's issuing authorities

Fig. 5 Towards a global measurement system

Mutual confidence is to be established by:

- metrological traceability, vertically from the NMI to the customer, and horizontally between NMIs and calibration/testing laboratories at the different levels;
- estimation of measurement uncertainties following the GUM [8], including modeling of the measurement task and calculation of the uncertainty budget; and
- inter-laboratory comparisons following, for example, the Metre Convention's MRA (so-called key comparisons).

In order not to question the equivalence of self-declaration and accreditation, in the case of self-declaration specific minimum criteria should be regarded as having been agreed for the respective field of work:

- proof of several years of work in the respective field including participation in technical committees;
- declaration of compliance with ISO 17025;
- successful participation in international comparison measurements; and
- active cooperation in the exchange of information and know-how on the international level.

6 Summary

In the years ahead, the metrology community should:

- pursue the strategic policies and action plans of international organizations (Metre Convention/BIPM, OIML, WTO, ILAC, IAF, ISO, IEC, ISO/CASCO, etc.) and continue to make use of the numerous opportunities for cooperation and information sharing with these organizations;

- intensify cooperation among regional organizations such as EA, EUROMET, WELMEC, etc.; and
- continue close cooperation between the BIPM, OIML and ILAC.

In this connection it must be kept in mind that:

- citizens rely on correct measurements and true results, for example in trade, environmental protection, safety issues, medicine, etc.;
- scientists foster the continuous improvement of knowledge, traceable calibrations and statements of measurement uncertainties; and
- trade and industry demand "one-stop testing" and world-wide acceptance of certificates. ■

Bibliography

- [1] Blevin report: National and international needs relating to metrology, appropriate international collaborations, and the role of BIPM, 1998
- [2] Birkeland, Knut: Legal Metrology at the Dawn of the 21st Century. 33rd CIML Meeting, Seoul, 10/1998
- [3] Seiler, Eberhard (ed.): The Role of Metrology in Economic and Social Development. *PTB-Texte*, volume 9, 1998
- [4] Liu, Vivien: The WTO Agreement on Technical Barriers to Trade - the Path to Free World Trade. *PTB-Texte* 9: The Role of Metrology in Economic and Social Development, 1998, 15–24
- [5] Kose, Volkmar: Competition and cooperation among national metrology institutes for achieving an efficient and sustainable global metrology. *Metrologia* 2000, 37, 75–80
- [6] Mars Climate Orbiter Mishap: Investigation Board. Phase I Report, November 10, 1999
- [7] EN ISO/IEC 17025:2000: General requirements for the competence of testing and calibration laboratories
- [8] Guide to the Expression of Uncertainty in Measurement (GUM), BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML. ISO, Geneva, Corrected & reprinted 1995
- [9] Mutual recognition of national measurement standards and calibration and measurement certificates issued by national metrology institutes, BIPM, Paris, 14 October 1999
- [10] Mutual acceptance arrangement on OIML type evaluations, 7th draft, October 2000
- [11] ILAC Mutual Recognition Arrangement, signed in Washington, DC, USA on 2 November 2000 (see www.ilac.org)