BUSINESS PLAN

CEN/TC 123
LASERS AND PHOTONICS

EXECUTIVE SUMMARY

Business environment

- Optical technologies, in particular laser technology, are innovative and fast developing new technologies. Laser technology and photonics are self-consistent fields and "enabling" cross-disciplinary technologies.
- Europe represents nearly 30 % of the global laser market, which has an estimated annual growth rate of 2 %.
- Companies producing lasers, laser optics and micro-optical, diffractive optical or integrated optical components are in most cases small or medium-sized enterprises (SME).
- The trade is globally oriented.
- Photonics is also considered a key enabler in exploiting the potential of nanotechnology.

Benefits

- CEN/TC 123 has developed and maintained over 20 European Standards.
- Clear characterization of laser beams and related optical components facilitates the negotiations between customers and suppliers, allows proper calculation of systems or parts of them (e.g.: the beam guiding system) or obviates disputes with the customers. Standards also help establishing quality management systems and support benchmarking.
- The standardisation undertaken within CEN/TC 123 supports the EU Directives on medical devices and on machinery and is also helpful for accident prevention regulations.
- Standards support system competence, which is a sensitive capability for cross-sectional products that have the complexity of optical systems, and enable the application of modular design.

Priorities

To make European Standards available related to:

- test methods for laser beam and optics characterization
- safety standards for laser materials processing machines
- interfaces and documentation
- micro-optics, diffractive optics and integrated optics

1 BUSINESS ENVIRONMENT OF THE CEN/TC

1.1 Description of the Business Environment

The following political, economic, technical, regulatory, legal, societal and/or international dynamics describe the business environment of the industry sector, products, materials, disciplines or practices related to the scope of this CEN/TC, and they may significantly influence how the relevant standards development processes are conducted and the content of the resulting standards:

General information regarding the sector

Lasers are one of the most powerful sources of high-quality optical radiation but, for a long time, they were considered just as objects of research and tools for scientists. However, during the last two decades, lasers made the step from being only applied for those specific industrial applications that could not be performed by conventional techniques, to a tool that is used in 'normal' industrial manufacturing procedures. Laser radiation can be applied in combination with robots, can be handled by remote control, is flexible in its application and does not necessarily need high numbers of produced pieces. There are many more reasons for the advancing progress of applications of laser radiation. Lasers are incorporated in systems for many applications in order to serve a wide variety of purposes, which range from a measuring function via information carrying and medical treatment to processing of materials.

This economic success stimulated in turn the construction of reliable laser devices, which again contributed to the growth of the market. The growing number and market importance of laser applications was accompanied by an increasing interest in the characterisation of laser beams. Laser manufacturers and users need clear, comparable and improved information on the characteristic parameters of laser beams. The more sophisticated laser applications are, the more improved the characterisation of the source of energy or power has to be.

At the beginning of the 1990's, standards for laser safety existed already, but not for the characterisation of laser beams. An important contribution to a good infrastructure for laser applications during the last decade was therefore the development of a consistent set of European and International Standards for terminology and test procedures for laser beam parameters.

Some of the most important fields of application are industrial production, information technology (including optical storage) and communication, as well as healthcare and life sciences. For information and communication applications, there is a trend towards ultra-broadband and ultra-fast. For lithography and the generation of micro-structures and texture, ultra-short wavelengths (EUV and XUV) and pulse durations (femtoseconds) promise advantages. These developments and the new optical sensor technology (hybrid and self-calibrating) demand not only new sources of radiation, but also a step forward in the development of micro-optics, diffractive optics and integrated optics.

A further tendency is the growing use of diode lasers, which become increasingly powerful. They proceed from being applied only in consumer products and telecommunication to being the main radiation sources for industrial applications – either applied directly or as pump sources for solid state lasers. The issue of lifetime of high-power diode lasers is therefore of growing importance.

Increasingly, the complexity of optical systems requires the definition of interfaces and the application of modular design. System competence is a sensitive capability for cross-disciplinary products. Interchangeability and interface definitions are crucial technical factors for such

products. Mechanical, optical and software interfaces are most important and need clear and uniform definitions and appropriate standardized test procedures.

Photonics is also playing a major role in nanotechnology. In this novel field lasers are e.g. used in nanotechnology fabrication processes, and in addition, nanoparticles can change the optical attributes of materials used in photonics. Scientists work on the development of nanotechnology enabled photonic devices, e.g. designs which are nanofabricated in optical materials with eventual application in optical communication and biophotonic chips.

Laser technology and photonics as self-consistent fields and cross-sectional technologies are going to play an even more significant role in our lives. It is expected that the photon will be the basis for a technical revolution in this century like the electron was the one for the 20th century. Laser technology and photonics are "enabling technologies" which will influence not only information technology, telecommunications and lighting and energy, but also healthcare and life sciences, as well as industrial production and automation and will contribute to the welfare of the humanity.

Interested parties in the standardisation process

Parties particularly interested in the standardisation process of CEN/TC 123 are industrial manufacturers, users (industry as well as medical institutions and research institutes), and public authorities.

Structure of the market

Companies producing lasers, laser optics and micro-optical, diffractive optical or integrated optical components are in most cases small or medium-sized enterprises (SME). The production of lasers is a cross-sectional technology. The laser is in fact the most important single component, the main value creation, however, occurs when the radiation source „laser“ is incorporated in a system (e.g.: materials processing machine, medical system or measuring device).

Information on European and international cross-boarder trade

The trade is globally oriented.

Political Factors

Optical technologies, in particular laser technology, are innovative and fast developing new technologies. Standardisation already starting in the R & D phase is considered as an important supportive measure for the introduction and opening of the market.

Legal Factors

The standardisation undertaken within CEN/TC 123 supports the EU Directives on medical devices and on machinery and is also helpful for accident prevention regulations.

International trade and standardisation aspects

International Standards serve as the preferred basis of agreements and contracts in bi- or multi-lateral business relationships throughout the world and are therefore of particular importance.

1.2 Quantitative Indicators of the Business Environment

The following list of quantitative indicators describes the business environment in order to provide adequate information to support actions of the CEN/TC:

The world market for laser material processing systems has grown at a compound annual growth rate of 11 % over the last decades. After the recession in 2008/2009, the global market for laser systems for materials processing has recovered. In 2012, it accounted for 10.2 billion US $. The European market shares about 30 % [1].

The photonics industry report 2013 concluded that photonics are a strong industry with excellent prospects. The world market volume in 2011 accounted for 350 billion Euro and is expected to reach around 615 billion Euro in 2020. In Europe a stable market share of 18 % has been reached [2].

2 BENEFITS EXPECTED FROM THE WORK OF THE CEN/TC

Particularly for small and medium enterprises, it is important that reliable standards are available on the characterisation of laser beams and related optics, which include micro-optics, diffractive optics and integrated optics. Clear characterisation facilitates the negotiations with the customers, allows proper calculation of systems or parts of them (e.g.: the beam guiding system) or obviates disputes with the customers (standardized test methods for beam parameters or the laser-induced damage threshold of optical components to be inserted in the beam). Standards also help establishing quality management systems and support benchmarking.

System competence is a sensitive capability for cross-sectional products: Interchangeability and interface definitions are crucial technical factors for such products. In the area of lasers and photonics, the „optical interfaces“, i.e. beam parameters, are most important and need clear and uniform definitions and appropriate standardized test procedures, because e.g. the beam width of a beam can be defined by a lot of different concepts.

Some of the European Standards developed by CEN/TC 123 are harmonized under the EU Directives on Machinery (2006/42/EC) and on Medical Devices (93/42/EEC) and support the manufacturers to show conformity with the legal requirements for market access for their products.

3 PARTICIPATION IN THE CEN/TC

All the CEN national members are entitled to nominate delegates to CEN Technical Committees and experts to Working Groups, ensuring a balance of all interested parties. Participation as observers of recognised European or international organisations is also possible under certain conditions. To participate in the activities of this CEN/TC, please contact the national standards organisation in your country.

CEN/TC 123 is particularly interested in participation and contribution of experts from the new EU Member States.

4 OBJECTIVES OF THE CEN/TC AND STRATEGIES FOR THEIR ACHIEVEMENT

4.1 Defined objectives of the CEN/TC

Elaboration of standards on terminology, requirements, interfaces, test methods for lasers and photonics, as well as for optical components intended for use with lasers and photonics and related applications.

These European Standards shall provide means for a good infrastructure of the European laser and photonics market. Market expansion needs clear and uniform terminology and test methods as well as standards to handle safety issues properly. From legal aspects some of the standards help the manufacturer to show conformity with the requirements of the Machinery Directive 2006/42/EC as well as with the Directive on Medical Devices 93/42/EEC. In addition the standards on test methods for beam parameters are very helpful for the documentation of beam parameters for quality assurance purposes.

In view of the global market for lasers and photonics the deliverables of CEN/TC 123 shall be as far as possible harmonized with the results of the international standardisation.

4.2 Identified strategies to achieve the CEN/TC's defined objectives

The TC decided already in 1992 to produce as far as possible European Standards which are identical with International Standards. CEN/TC 123 developed a close working relationship with ISO/TC 172 *Optics and photonics* SC 9 *Electro-optical systems*, the secretariat of which is also administered by DIN. After signature of the Vienna Agreement, CEN/TC 123 applied the Vienna Agreement (ISO lead) for all its work items. The decision was taken that all work items of ISO/TC 172/SC 9 shall also be registered in the work programme of CEN/TC 123.

Consequently the working groups of CEN/TC 123 were disbanded in 1996. It has been ensured that the European member bodies active in CEN/TC 123 are well represented in ISO/TC 172/SC 9. The meetings are normally held in conjunction with meetings of ISO/TC 172/SC 9, if SC 9 meets in Europe.

In this context CEN/TC 123 decided to meet annually in order to review the European needs and in case of discrepancy between the international and the European needs to reactivate specific European work.

The work on test procedures for laser beam parameters and laser optics has highest priority. This work was complemented by the pre- and co-normative research performed in the EUREKA Project CHOCLAB (Characterization of optical components and laser beams). The Seventh Framework Programme of the European Union is of high importance for CEN/TC 123 that is requesting cooperation of experts from those programmes and initiatives.

The innovative nature of the field calls for an early start of standardisation. In this case, however, it very important that the standardized test methods are under a steady process of validation and that the standards have short revision cycles.

Liaisons are established with CEN/TC 85/WG 1 concerning the laser guards, with CEN/TC 121/SC 9 developing standards on the measurement of fumes and gases emitted in materials processing procedures, with CENELEC/TC 76 concerning radiation safety, with EUREKA, and with the ALAS project," Adaptive LASer cladding system with variable spot sizes".

CEN/TC 123 encourages experts from the new EU Member States to take part in the work of this Technical Committee and asks for contribution.

4.3 Environmental aspects

The requirements put down in CEN/TC 123 standards are aimed at eliminating/reducing environmental hazards to an acceptable level during all stages of the life cycle of the products.

Standard writers should assess and take into account the environmental impact during the various stages with particular reference to materials and energy consumption, emission, radiation and likelihood of accidents, noise, vibration and end of life disposal.

5 FACTORS AFFECTING COMPLETION AND IMPLEMENTATION OF THE CEN/TC WORK PROGRAMME

The range of applications of this cross-disciplinary technology is such wide that none of the affected industries identifies themselves in a total with this area. In particular, the co-operation of the SMEs is - due to financial problems - sometimes not satisfactory.

Validation of a test method is dependent upon funding being available to undertake the necessary pre- and co-normative research. The early start of standardisation accompanying R & D can sometimes lead to completely new aspects (as could be seen in the development of EN ISO 11146, EN ISO 11254 and EN ISO 14880) which might retard the completion of the standard, but helps industry and research anyhow to a better understanding of the technology and the basic physics.

[1]http://www.optech-consulting.com/html/latest_press_release.html
[2]http://www.photonikforschung.de/fileadmin/MEDIENDATENBANK/SERVICE/Publikationen/UT_Photonik_Handout_English.pdf