KAN Report 38

The relevance of cross-sectional standards*: the example of machine safety

* The term "generic standard", which would normally be the most appropriate equivalent of the German term "Querschnittsnorm", is already formally defined (refer to CEN Guide 414 for the definition). For this reason, the term "cross-sectional standard" has been used for the purpose of this study. For the definition of "cross-sectional standard", please refer to Section 3.2, "Terminology".

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1 Introduction

1.1 Background

Standards are an integral part of daily life; so much so, in fact, that they often go unnoticed. They are crucial to the process of quality assurance for products and services. With the Europeanization and globalization of the economy, their importance has increased even further. Standards have in fact been essential in making Europeanization and globalization possible in the first place.

However, Europeanization and globalization have also made the body of standards increasingly complex, difficult to manage, and opaque. A system of guidelines, directives and development standards, created at international and European level and subject to continual development, is to contribute to the entire body of standards being as comprehensive, consistent, and free of contradictions as possible in its presentation and structure.

Now more than ever before, the development and updating of standards demands an enormous contribution, both financial and immaterial, from all parties involved. The purchase and application of increasingly numerous and complex standards also entails effort and costs on a not inconsiderable scale, however.

In the light of this situation, it is essential that both the development and updating of standards on the one hand, and their application, i.e. their purchase, use and administration on the other, be managed in the most efficient and user-friendly manner possible. Standards which govern recurring, fundamental subject-matter and which can be used in a number of areas have a role to play here. Such standards will be described below as cross-sectional standards.

1.2 The relevance of cross-sectional standards

As part of a carefully designed and maintained standards structure, cross-sectional standards can help to make both the development of standards and their application more efficient.

The area of machine safety serves as a good example of the development and use of cross-sectional standards. A standards structure has been created here in which developers of product safety standards in the area of machine safety (Type C standards) can take advantage of a comprehensive body of Type A and B standards. The Type A and B standards set out fundamental rules for the development of the Type C standards, and govern common subject-matter in group standards for safety aspects and safety equipment/protective systems.

Agreements have been reached by which this body of regulations supports both the manufacturer and the user of a machine in meeting their statutory obligations to safeguard the health and safety of the machine's operating personnel. This situation, which includes the direct exertion of influence during development of the standards, is the context in which the stakeholders meet in order to develop product standards.

A different situation exists for the development and updating of cross-sectional standards which serve as tools, management of the standards structure, and with regard to identification and preparation of information on the standards system. Since this activity frequently has no direct relevance to the product, a will-

ingness is frequently also lacking to make a financial and immaterial contribution to the development of cross-sectional standards. This in turn makes it difficult for national interests to be presented and pursued at European and international level.

1.3 Objective

The objective of the present study is to demonstrate, with reference to the model area of machine safety, how standards which may be regarded as cross-sectional standards have a facilitating function during product standardization, and to analyze the particular relevance of cross-sectional standardization to occupational health and safety.

The study's purpose is to promote motivation to participate in the development of standards suitable for use by a number of disciplines. In order to achieve this objective, the following were to be identified:

- The possible benefits which may be offered by such standards
- The tools which may be considered beneficial by which, where appropriate, the content of these cross-sectional standards may be made known to and available to the standards committees for the purpose of their work
- The organizational measures (guidance documents) which should be considered if appropriate

2 Standardization activity

2.1 Provisions concerning standardization activity

In the context of the study's objectives, the general principles and concepts of standardization activity and the associated provisions governing the development and application of standards are of interest. Since the particular focus of the study lies upon machine safety and occupational health and safety, the specific provisions governing the development of standards involving safety aspects are also of particular relevance. These will therefore be considered in brief below, and the essential conclusions formulated.

General provisions concerning the standardization activity of DIN can be found in DIN 820-1:1994-04, "Standardization - principles", in particular in the following sections:

- General principles
- Preparation of standards
- Application of standards

Concepts for general standardization activity and the associated tasks are defined in the following standards:

- DIN 820-3:1998-07, Standardization - Concepts
- EN 45020:1998-07, Standardization and related activities - General vocabulary (identical to ISO/IEC Guide 2:1996)
- EN ISO/IEC 17000:2004-11, Conformity assessment - Vocabulary and general principles (replaces EN 45020, identical to ISO/IEC Guide 2:2004).

2.2 General principles

In accordance with DIN 820-1, the standardization activity of DIN is based upon the following principles:

Standardization is the systematic process by which tangible or intangible subjects are reduced to a desired degree of order by the joint efforts of the inerested parties for the benefit of the entire community. It is not to result in individual interests gaining a special economic advantage.

It enhances efficiency in industry, technology, science, and government. It serves to safeguard people and property and to improve quality in all areas of life.

It further serves as an instrument with which a given field of standardization can be effectively organized and facilitates the exchange of information.

Standardization is carried out at national, regional and international level.

In the context of the present study, the statement that standardization serves as an instrument with which a given field of standardization can be effectively organized and facilitates the exchange of information is of particular significance.

2.3 Preparation of standards

2.3.1 General provisions

Section 5 of DIN 820-1 contains general provisions governing the development of standards. In the context of the present study, the following provisions are of particular relevance:

- Section 5.2: "The work programmes of the technical committees shall be organized and monitored in the light of economic efficiency and ongoing developments in science and technology, with consideration being given to the concurrent harmonization of technical rules at international and European level.

  The number of new standards projects shall be restricted to the absolute minimum and individual standards formulated as concisely as possible. It shall be ascertained in good time whether national standards of relevance exist in other fields; if so, they shall be duly taken into account. These principles shall also be applied in European and international standards work.

  Where results of regional or international standards work are already available, these should be adopted as far as possible without amendments...“
- Section 5.4: " Care shall be taken in drafting standards to ensure that they do not conflict with legal provisions or administrative regulations"
- Section 5.5: "Collectively, German Standards constitute a uniform body of rules. They must hence be consistent with one another in terms of content. One and the same subject of standardization shall not be stanardized under different standards numbers."
- Section 5.6: "A standard shall be precise and clear in its wording, free of contradictions, and provide as complete a treatment of its subject as possible."

2.3.2 Principles for the drafting of standards

In July 2006, i.e. after completion of the project activity, the draft revised version of DIN 820-2 "*Standardization - Part 2: Presentation of documents (ISO/IEC-Directives - Part 2, modified); Trilingual version CEN/CENELEC-Internal Regulations - Part 3: Rules for the structure and drafting of CEN/CENELEC publications*" was adopted. The document was drafted by the DIN Standardization Committee for the Drafting of Standards. As its title suggests, it contains the fifth edition of ISO/IEC directives Part 2:2004, which is expected to be adopted in 2006 with European amendments in the form of Part 3 of the CEN/CENELEC Internal Regulations.

The addition of a new Annex A, "Principles for drafting", is of key relevance to the present project. Section 4, "General principles" of the document for example requires the following in 4.1 "Objective":

"The objective of documents published by ISO and IEC is to define clear and unambiguous provisions in order to facilitate international and European trade and communication. To achieve this objective, the document shall

- *be as complete as necessary within the limits specified by its scope,*
- *be consistent, clear and accurrate,*

- *take full account of the state of the art (see3.13),*
- *provide a framework for future technological development,*
- *be comprehensible to qualified persons who have not participated in its preparation, and*
- *take into account the principles for the drafting of documents (see Annex A).”*

A new feature of the revised edition is the last of these requirements, namely that the principles for drafting set out in Annex A must be observed.

Annex A of E DIN 820-2 is an informative annex in which “*principles for drafting […] are expressed in terms of product documents”*. Where relevant, these principles apply equally to other types of document.

In the context of the project, Section A.7, "Avoidance of repetition" and its subsections A.7.2 and A.7.3 are relevant. Section A.7 states:

"***A.7 Avoidance of repetition***

A.7.1 *Any requirement concerning a product shall be specified in only one document: that which, according to its title, contains that requirement.*

A.7.2 *In some fields it may be desirable to establish a document specifying generic requirements applicable to a group of products.*

A.7.3 *It it is necessary to invoke a requirement elsewhere, this should preferably be done by reference, not by repetition. See 6.6.7.1.*

If, for convenience, the repetition of a requirement in another document seems useful, this may be done, provided that it is made clear that the requirement is repeated for information only, and that an informative reference is made to the document from which the requirement is reproduced.

2.3.3 Specific rules for standards containing safety-related provisions

Particular rules apply to standards containing safety-related provisions. The essential bodies of regulations governing this area are:

- DIN 820-12:1995-01, Standardization - Presentation of standards concerning safety regulations
- DIN 820-120:2001-10, Standardization - Guidelines for the inclusion of safety aspects in standards (identical to ISO/IEC Guide 51:1999).

The area of machine safety is subject to a dedicated body of regulations, namely:

- CEN Guide 414:2004, Safety of machinery - Rules for the drafting and presentation of safety standards.

Like its predecessor, EN 414:2000, this guide sets out requirements for the drafting and presentation of European safety standards for machines and safety components, primarily in order to attain consistency between the various standards which are developed within the agenda.

2.4 Application of standards

Section 6 of DIN 820-1 contains general provisions governing standardization with regard to the application of standards. In the context of the present study, the following provision is of particular relevance:

Section 6.4: "*DIN maintains an informative service on German Standards*"

2.5 Terminology in standardization activity

Within the context of the present study, the following terms and their definitions are of particular relevance.

DIN 820-3 and EN 45020 include definitions for the following general standard categories:

- Basic standard: Standard that has a wide-ranging coverage or contains general provisions for one particular field (see EN 45020)
- Technical standard*: Standard containing provisions for a particular technical area (see DIN 820-3)
- Generic standard*: Basic standard for a particular technical area (see DIN 820-3)
- Safety standard*: Standard containing provisions for the avoidance of hazards to human beings, animals and property (installations, structures, products, etc.) (see DIN 820-3)

CEN Guide 414 defines the types of standards within the hierarchical standards structure in the area of machine safety.

- Type A standard (basic safety standard): standard giving basic concepts, principles for design, and general aspects that can be applied to machinery

  (Note: it would be more correct to speak of "basic machinery safety standards", since the standards' scope of application is the safety of machinery, and not safety in general.)
- Type B standard (generic safety standard): standard dealing with one safety aspect or one type of safeguard that can be used across a wide range of machinery:
  - type B1 standard on particular safety aspects (e.g. safety distances, surface temperature, noise);
  - type B2 standard on safeguards (e.g. two-hand control devices, interlocking devices, pressure sensitive devices, guards)

  (Note: it would be more correct to speak of "generic machinery safety standards", since the standards' scope of application is the safety of machinery, and not safety in general.)

* Unofficial English translation. As this report went to press, the standard was available in German only.

- Type C standard (machine safety standard): standard dealing with detailed safety requirements for a particular machine or group of machines
  NOTE The term “group of machines” means machines which have similar intended use and similar hazards, hazardous situations and events.

DIN 820-120 (identical to ISO/IEC Guide 51) also draws a distinction between the following types of standard (these are descriptions, not definitions):

- **basic safety standard**, comprising fundamental concepts, principles and requirements with regard to general safety aspects applicable to a wide range of products, processes and services;
- **group safety standard**, comprising safety aspects applicable to several or a family of similar products, processes or services dealt with by more than one committee, making reference, as far as possible, to basic safety standards;
- **product safety standard**, comprising safety aspect(s) for a specific, or a family of, product(s), process(es) or service(s) within the scope of a single committee, making reference, as far as possible, to basic safety standards and group safety standards;
- **product standards** containing safety aspects but which do not deal exclusively with safety aspects; these should make reference to basic safety standards and group safety standards.

3 Cross-sectional standards

3.1 Characteristics

Interested groups who develop standards, for example governing planning, products and services, can already take advantage of basic standards and generic standards in many areas. Basic standards have existed since before 1930.

Standardization of machine safety is an example. In this area, machine safety standards (Type C standards) are developed based upon basic safety standards (Type A standards) and group safety standards (Type B standards). Further examples can be found for example in standardization for the areas of electrical technology, construction technology and electromagnetic compatibility. A feature common to these hierarchically structured standards is that they have been developed for a particular area of application, such as construction, or for a particular discipline, such as electrical technology, in which a certain hierarchical structure already exists.

In addition, a range of standards exist which are used across several applications and disciplines. These include standards governing terminology, documentation, and standardization activity. They also include basic/generic standards in the area of environmental protection and of human health and safety, and general standards concerning metrology, measuring and test methods, and quality assurance. Standards in the field of ergonomics enjoy a particular status, since they can generally be used across many disciplines and applications whenever they deal with issues in which consideration is to be given to the human factor.

3.2 Terminology

For the purpose of the present study, "cross-sectional standard" is defined as follows*:

Cross-sectional standard:

A standard which:

- Governs subject-matter in a cross-sectional manner
- Has the purpose or potential of being used within other standards in the same or other areas, either by direct inclusion within these standards or by suitable references within them, for addressing of the issues concerned
- May however also be applied directly and generically if appropriate.

In short, it may be said that a cross-sectional standard is a standard which contains subject-matter of a generic nature and enables it to be governed at a higher level.

This definition is intended solely for the purpose of the study.

The particular characteristic of cross-sectional standards in the context of the present study is that they need not necessarily be embedded within a hierarchi-

* The term "generic standard", which would normally be the most appropriate equivalent of the German term "Querschnittsnorm", is already formally defined (refer to CEN Guide 414 for the definition). For this reason, the term "cross-sectional standard" has been used for the purpose of this study.

cal system, as is the case for example with basic standards or the Type A and Type B standards in the area of machine safety. A basic standard, for example, is always a cross-sectional standard within the context of this study; a cross-sectional standard, however, need not necessarily be a basic standard. On the contrary: cross-sectional standards may more correctly be regarded as forming part of a network structure, contributing within it to the stability of the entire standards system.

Examples of cross-sectional standards in this context are:

- The basic ergonomic standard EN ISO 6385, "Ergonomic principles in the design of work systems". This standard may be regarded as a cross-sectional standard, for example in the regulatory areas of machine safety or medical devices, or in other areas such as ambient climate, human-machine interaction, workplace design, etc.
- The generic ergonomic standard EN ISO 9241-400, "Ergonomics of human-system interaction - Principles and requirements for physical input devices". This standard is for example a cross-sectional standard within the technical area of "ergonomics of human-system interaction", and can be applied generically in areas such as machine safety, medical devices or information technology.
- The basic safety standard DIN EN ISO 12100-1, "Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology". This standard is used generically in the area of machine safety, and serves as a cross-sectional standard for the Type B and Type C standards.
- The generic safety standard EN 614-1, "Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles". This standard is used generically across many technical and product groups in the area of machine safety as a cross-sectional standard for the Type B and Type C standards. Reference is also made generically across sectors to EN 614-1, for example in the standard EN ISO 9241-5, "Ergonomic requirements for office work with visual display terminals (VDTs) - Workstation layout and postural requirements", and in various parts of the EN ISO 11064 series of standards, "Ergonomic design of control centres". In other words, EN 614-1 is used as a cross-sectional standard outside the actual scope of machine safety.
- The generic standards in the area of electromagnetic compatibility (EMC), EN 61000, Parts 6-1, 6-2, 6-3 and 6-4. These standards contain provisions governing emissions from electrical and electronic equipment and immunity to them in residential and industrial environments. They can be used generically as cross-sectional standards in sectors such as machine safety, event technology, medical devices or information technology.
- The standard DIN IEC 61000-4-6, "Electromagnetic compatibility (EMC) - Testing and measurement techniques; Immunity to conducted disturbances, induced by radio-frequency fields", is a generic EMC standard and is employed generically in numerous areas.

4 Project procedure - summary

The following procedure was followed for the project:

(1) Identification and analysis of cross-sectional standards in the area of machine safety

- Within the hierarchical structure of machine safety, the cross-sectional standards directly associated with the EU Machinery Directive, i.e. the Type A and Type B standards, were first identified. This task was accomplished with the aid of various databases, search tools and other sources of data. At this stage, the national mirror committees of the standards committees were also identified which were chiefly responsible for development of these cross-sectional standards.
- For the cross-sectional standards identified in this way, the number of references to the individual standards was determined. In order for an initial impression to be obtained of whether these standards are also exploited by standards committees other than those in the area of machine safety, further standards committees were identified which had made use of the identified cross-sectional standards during development of their own standards. By no means were all committees which had done so necessarily identified.
- An analysis was performed of the citations found in selected examples of these standards. Specifically, a distinction was drawn between the citations according to whether they took the form of normative references or simple bibliographical references, and in the case of normative references, whether or not they were dated. This may be significant with regard to the updating on the one hand of both the basic safety standards and the generic safety standards (Type A and Type B standards), i.e. cross-sectional standards in the context of the present study, and of the machine safety standards (Type C standards) on the other.

(2) Identification of further standards which may be regarded as potential cross-sectional standards in relation to machine safety and/or occupational health and safety.

(3) Identification of examples for the results of the analyses from areas of relevance to occupational health and safety, for the following case groups:

- Case group 1: Existing cross-sectional standards are cited in product standards. This particular study is achieved by random sampling in the area of Type C machine safety standards.
- Case group 2: Product standards make no reference to existing cross-sectional standards. The European standard for office desks is cited here as an example.
- Case group 3: A number of product standards contain similar/identical fundamental statements which could be grouped in a single cross-sectional standard. Standards for input devices and visual display terminals are cited here as examples.

(4) Investigation of the hypotheses presented in the project description. This investigation was based in particular upon discussions with and consul-

tation of the chairs, conveners and members of relevant German, European and international standards committees, in particular of the Mechanical Engineering standards committee (NAM).

(5) Identification of the tools which may be considered useful for making the content of cross-sectional standards known to and available to the standards committees for the purpose of their work, and of the organizational measures (guides) which should be considered if appropriate.

(6) Estimation of the economic benefit of cross-sectional standards within the possible framework.

5 Identification of cross-sectional standards in the area of machine safety

5.1 Area of standardization: machinery - machine safety

In accordance with the project's terms of reference, the first step entailed a study of standardization in the area of machines with specific consideration for cross-sectional standards, and identification of the latter. Since the project was commissioned with reference to occupational health and safety, this study is limited to standards in the area of machine safety, with particular consideration for harmonized standards.

With regard to product safety, standards governing machinery fall within the scope of the EU Machinery Directive, 98/37/EC. For the development of standards in this area, a three-tier standards hierarchy has been agreed at European level with the objective of avoiding duplication of effort and of implementing a logical approach which permits efficient development of the standards and simple cross-referencing.

The area covered by the EU Machinery Directive is very broad, and in some cases closely linked to other EU directives (see Fig. 1, Safety of Machinery in Europe, DIN, 2005). Harmonized/mandated standards from within the scope of other directives may therefore be of relevance to many products in the area of machine safety. Many of these standards may also be described as cross-sectional standards.

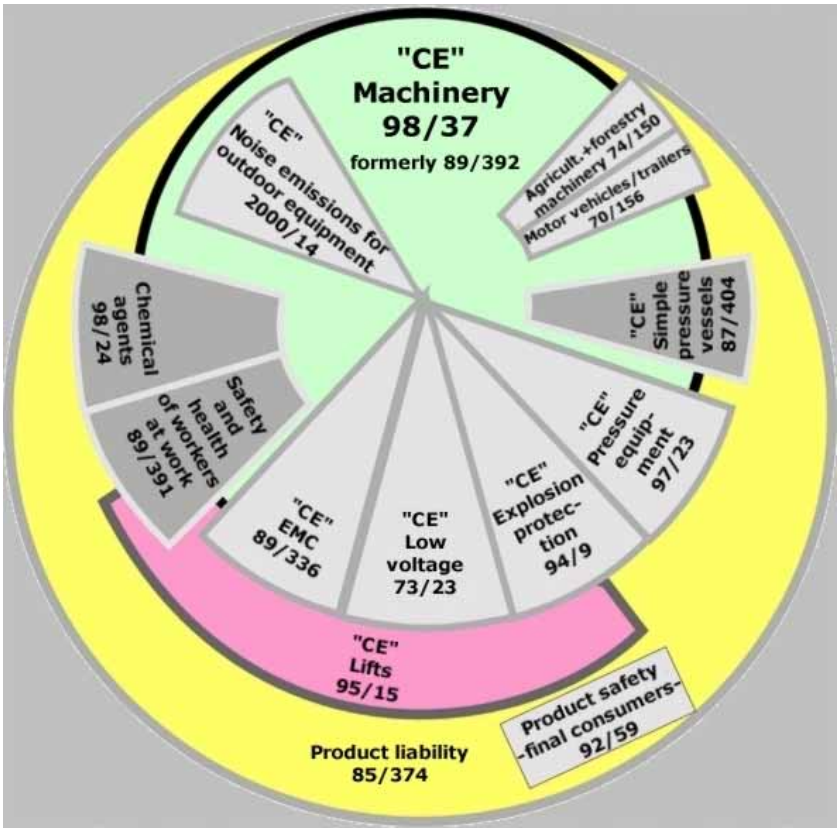


Fig. 1

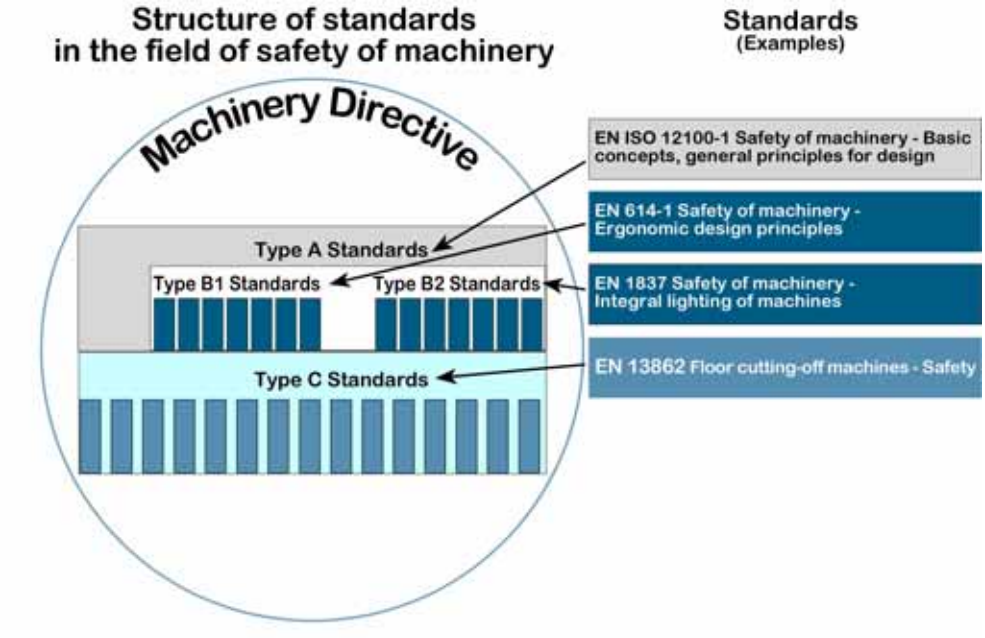
EU directives in the area of machine construction (source: Safety of Machinery in Europe, DIN, 2005)

5.2 The hierarchy of standards in the area of machine safety

The hierarchy of the standards structure in the area of machine safety (see Fig. 2) is described as follows in the introduction to EN ISO 12100-1, based upon the definitions in CEN Guide 414:

- type-A standards (basic safety standards) giving basic concepts, principles for design, and general aspects that can be applied to all machinery;
- type-B standards (generic safety standards) dealing with one safety aspect or one type of safeguard that can be used across a wide range of machinery:
  - type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);
  - type-B2 standards on safeguards (e.g. two-hand controls, interlocking devices, pressure sensitive devices, guards);
- type-C standards (machine safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

Fig. 2: Presentation of the standards structure within the scope of the EU Machinery Directive, 98/37/EC



The system of standards within the area of machine safety is conceived such that Type A standards serve as tools, in conjunction with the Type B standards, for the development of Type C standards. The standard cited above, EN ISO 12100-1, is for example a Type A standard.

Under the definition used in the present study, Type A and B standards can therefore be regarded as cross-sectional standards within the area of machinery standardization. The principle is that the specific provisions of Type C standards always take precedence over the provisions of Type A and B standards.

5.3 Identification of Type A and B standards

5.3.1 Tools employed for searches

The tools described below were employed for the search for Type A and B standards. The list distinguishes between sources which are publicly accessible, i.e. in this case those found on the Internet, and sources for which payment must be made.

Search tools publicly accessible on the Internet (as of December 2005):

- DIN website - product search (**http://www.din.de**)
- NoRA database (OH&S standards search tool) (**http://www.kan.de/nora**)
- Index of standards in accordance with the German Machinery Regulation (the 9th ordinance of the Equipment and Product Safety Act, GPSGV), as of January 2004, with incorporation of five supplements (last updated 20 September 2005), Bundesanstalt für Arbeitsschutz und Arbeitsmedizin (see BAuA, 2005)[1]
- Safety of Machinery: list of European Type A and Type B standards (basic safety standards and generic safety standards), as of July 2004 (NAM/GS HSch/mb), source: VDMA website, posted September 2004 *(After this study had gone to press, a new, revised version was published, Part V.4 of which corresponds approximately to the document which it replaces:* ***http://www.vdma.org/wps/wcm/resources/file/eb88534ccd24d66/CEN-Normung%20Sicherheit%20von%20Maschinen.pdf****)*

Search tools available for a fee:

- Safety of Machinery in Europe, DIN (eds.), Beuth Verlag, Berlin Vienna Zürich, 1994 (23rd supplement, December 2005)
- Perinorm Online, most recent version used: December 2005
- Perinorm DVD, most recent version used: September 2005

5.3.2 DIN website - product search

The search facilities available on the DIN website are rudimentary. Searches can be performed for the terms in the title, the keywords and the contents of the abstract.

The search for the terms "Type A standard", "Type B standard" and "Type C standard" (i.e. for their German equivalents) by means of the search facility on the DIN website did not produce a usable result. Four DIN standards were found (DIN EN 1746, DIN EN 12096, DIN 12786, DIN EN 13861). Although these standards are Type B standards, these terms are not used to denote the type of the standard, but are merely indicated in the text of the abstracts of the standards identified in this way.

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[1] A new index was published by the BAuA in March 2006, at which point the project work had already been completed.

5.3.3 NoRA database (OH&S standards search tool)

The NoRA database was developed as a search tool by which searches for aspects relevant to OH&S in standards could be facilitated or supported. The services of the Beuth-Verlag (product search at DIN and Perinorm) also provide certain information which is useful for this purpose, although this is not their primary function. The use of Perinorm is also not free of charge, and is not therefore available without restriction. A particular, additional feature of the NoRA database is the facility for searches for standards to be performed according to particular hazards.

- The function of NoRA is to provide the essential information on a standard which is of relevance to occupational health and safety. As such, the NoRA database is limited in its scope, which does not extend to the information necessary for the identification of Type A, B and C standards within the area of machine safety.

5.3.4 BAuA index of standards pursuant to the German Machinery Regulation (the 9th ordinance of the Equipment and Product Safety Act, GPSGV)

With publication of the index for the 9th GPSGV (index of standards in accordance with the Machinery Regulation pursuant to the Equipment and Product Safety Act, as of January 2004) and the five updates that have been published in the meantime (the last of these on 20 September 2005), the BAuA is complying with the relevant requirements of the EU Machinery Directive[2].

The index is divided into four parts:

- Part 1.1 lists the harmonized standards the references of which have been published in the Official Journal of the European Union and which give rise to a presumption of conformity.
- Part 1.2 lists the harmonized standards the references of which have not yet been published in the Official Journal of the European Union. These standards do not yet give rise to a presumption of conformity. In general, however, it may be presumed that they will be published in the OJ unchanged. They will then be included in Part 1.1.
- Part 2.1 lists the existing national standards which are regarded as important or useful by the authorities for proper implementation of the essential health and safety requirements stated in Annex I of the Machinery Directive in cases where no suitable harmonized standards are available for this purpose. This list includes standards which are European or international as well as German in origin.
- Part 2.2 lists the technical specifications corresponding to the description in Part 2.1.

The index is highly informative, and also useful to the usual users such as manufacturers and certification bodies. For identification of whether a certain standard

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[2] A new index was published by the BAuA in March 2006, at which point the project work had already been completed.

is a Type A, B or C standard, its use is however limited. This information can be determined only in a limited number of cases from the title. It may however generally be assumed that Parts 1.1 and 1.2 of the index contain standards in these categories. The index is also limited to standards proper; draft standards are not listed.

5.3.5 List of European Type A and Type B standards at the VDMA

This document provides an overview of European Type A and B standards as of July 2004[3]. It exhibits a particular feature which can be found only in this index. In this document, the European Type A and Type B standards are divided as follows into three groups:

- Group 1: Standards for the guidance of designers of machines in cases where machine safety standards (Type C standards) do not exist, and to which standards developers can provide explicit references
- Group 2: Standards concerning terminology, methods or design theory (intended as rules or guides for developers of Type C standards)
- Group 3: Standards in the area of testing or measurement for special aspects of machine construction

The document contains three lists in total:

- The first list contains the numbers and abbreviated titles of European basic and generic standards, listed by safety aspects/protective devices. The list also indicates whether the standard concerned is a Type A, Type B1 or Type B2 standard. Compared to the list contained in the Safety of Machinery in Europe guide (Section 5.3.1) and shown below, the VDMA list is clearly considerably less up to date, and contains some major differences.
- The second list represents a numerical list of the standards, and contains a reference to Groups 1-3 indicated above; it does not, however, indicate the type of the standard in question. With approximately 230 elements, this list contains considerably more standards than does the first list, which features around 70 standards and draft standards.
- The third list contains a detailed table of the standards contained in the second list, together with a number of standards which have since been withdrawn or replaced. This table is reproduced in Annex B of the present report, "Overview of Type A and Type B machine safety standards", together with the information of essential relevance to the study. This information comprises the document number, the date of issue, the group to which the standard belongs and its title, and indication of whether the standard has been published in the Official Journal of the EU and whether it was developed in response to a mandate.

All three lists appear under the same page heading (Safety of machines - list of European Type A and Type B standards (basic safety standards and generic safety standards), date: July 2004 (NAM/GS HSch/mb)).

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[3] After this study had gone to press, a new revised version was posted on the Internet by the VDMA. Part V.4 of the revised version corresponds approximately to the previous document.

5.3.6 The "Safety of Machinery in Europe" guide

The following sections of the "Safety of Machinery in Europe" guide contain information relevant to the search:

- Volume 1, Annex B 5.1: This section contains a list of the harmonized standards pursuant to the Machinery Directive (98/37/EC) (as of December 2003, with supplements in May 2004 and December 2005) with indication of whether the standard concerned is a Type A, B or C standard.
- Volume 2, Section 3.3.1: This section contains the numbers and the abbreviated titles of the European basic standards and generic standards as of October 2005, listed by safety aspects/protective devices, and indicates whether the standard concerned is a Type A, Type B1 or Type B2 standard. The list is however not complete, containing only the standards considered by the author to be important to design. A whole range of standards, such as EN 614-2 and EN 1127-2, are therefore missing. This list differs in many respects from the corresponding VDMA list. EN 1127-1 was for example classified as a Type A basic standard; various standards dealing with the safety aspect of explosion were designated, correctly, as Type B2 rather than Type B1 standards; some ergonomics standards which have since been adopted were included; standards dealing with the safety aspect of temperature removed; standards dealing with the safety aspect of radiation included; etc.
  It is also notable that a number of standards denoted in this list as Type B standards are missing from the list in Volume 1, Annex B 5.1. These include the standards governing electromagnetic compatibility (EN 61000-6-1 to -6-4).
- Volume 2, Section 3.3.2: This section contains the list and summaries of the contents of the standards listed in Volume 2, Section 3.3.1, broken down into Type A and B standards, as of October 2005.
- Volume 2, Section 3.4.1: This section contains the list of the harmonized machine safety standards (Type C standards) pursuant to the Machinery Directive, as of April 2004.

5.3.7 Perinorm Online

The online search for the three types of standards performed by means of the full-text-search function in Perinorm yielded the same four standards as the corresponding search in the DIN product search facility.

Only the search using the "Legislation" search category proved helpful, and even then only to a limited degree. Searches performed by means of the following search terms yielded the documents which are also listed in the BAuA index:

- "GPSGV9Verz-1.1 (2004-02-16)",
- "GPSGV9Verz-1.2 (2004-02-16)",
- "GPSGV9Verz-2.1 (2004-02-16)",
- "GPSGV9Verz-2.2 (2004-02-16)"

The standards published in the supplements are evidently not all displayed (EN 1010-4:2004-09, EN 1218-4:2004-12, EN ISO 14314:2004-11 were for example missing). Since no data are added by Perinorm itself, the problem is evidently attributable to the DITR database or to the organization supplying the data.

5.3.8 Perinorm on DVD

The search for the three types of standards by means of the DVD version of Perinorm also yielded no results beyond the four standards already indicated.

As with the online version, only the search by means of the "Legislation" search category yielded any further information.

5.3.9 Result

The search for Type A and Type B standards in the area of machine safety proved to be very difficult. It was found that the information sources available to the public free of charge enabled cross-sectional standards in the area of machine safety to be identified neither clearly, nor comprehensively. The information source accessible to the public which yielded the most comprehensive information was the document containing the VDMA lists. This document was, however, not easy to find; furthermore, the lists contained within it are out of date and their information inconsistent, and no reasons for this are given.

Of the sources of information available for a fee, however, none of the tools was sufficient on its own to provide a complete overview or classification of the different types of standard. The content of many of the Type A and Type B standards identified, and also of numerous Type C standards, therefore had to be inspected.

Table 1 in Annex B, "Overview of Type A and Type B machine safety standards", lists the Type A, B1 and B2 standards identified, according to safety aspects and protective devices. The list is based upon Volume 2, Section 3.3.2 of the "Safety of Machinery in Europe" guide, since this list best reflects the system of the hierarchical standards structure. Missing standards were added to the list, and in some areas the list was also updated. The reader's attention is drawn to the fact that although the greatest of care was taken, no guarantee can be given that this list is complete; and that it may contain elements which are not Type B standards in the area of machine safety (e.g. the generic EMC standards).

Table 1 also indicates, for the individual groups, the national mirror committees involved in the development of the standards. As can clearly be seen, the standards were essentially developed by subject-specific standards committees, and not in the area of machine construction. In other words, standards were developed in the various specialist areas for a particular area of application, in this case that of machine safety. The work was generally performed in close cooperation with the DIN Mechanical Engineering standards committee (NAM). The standards committees responsible were essentially the following (listed in alphabetical order):

- DKE: German Commission for Electrical, Electronic and Information Technologies of DIN and VDE
- FNL: Lighting Technology Standards Committee
- NAErg: Ergonomics Standards Committee
- NAFuO: Optics and Precision Mechanics Standards Committee
- NAL: Food and Agricultural Products Standards Committee
- NALS: Acoustics, Noise Control and Vibration Engineering Standards Committee in DIN and VDI

- NASG: Safety Design Principles Standards Committee
- NATank: Tank Installations Standards Committee

In the context of the study, differences between the revision cycles of the Type A, B and C standards are also of interest.

A search in Perinorm revealed that a large proportion of the Type B standards have not been changed since their adoption. If the standards listed in the 9th GPSGV index are sorted by date of issue, almost half the 100 "oldest" standards are found to be Type B standards; conversely, of the 100 most recent standards, only eight are Type B standards, of which in turn half are entirely new. Of the four Type A standards, two have been replaced in recent years (EN 292-1, -2 by EN ISO 12100-1, -2), and one redrafted in the form of a Type A standard (EN 1127-2, the successor to prEN 13462). (Note: although designated a Type A standard, this standard is often excluded from lists of Type A standards, since its scope is limited to mining installations. It is closely associated with EN 1127-1, which explicitly excludes mining installations.)

5.4 Analysis of the references to the cross-sectional standards

The essential function of cross-sectional standards is the prevention of duplicate provisions, and in suitable cases the adoption of existing, proven arrangements for the subject-matter to be standardized. A cross-sectional standard is generally considered by way of a normative reference, through which it acquires a normative effect, or by a reference to it in the bibliography, in which case it is only informative in nature.

Which standards must be included by normative references is governed in the standard DIN 820-2:2004 for standards in general and in CEN Guide 414, formerly in the standard DIN EN 414:2002, for the drafting of machine safety standards in particular. The same documents govern the conditions under which the form of these references must be dated or undated. Only the version to which reference is made applies in the case of dated references. Where a reference is made in undated form, the latest edition of the document referred to applies, including any amendments made. Whether the reference to a standard is made in dated or undated form may be of great importance, since standards with the same document number have undergone major or in some cases fundamental changes in recent years. Fundamental changes have been made for example to the standards EN ISO 6385, EN 614-1 and ISO 8995. ISO 8995 has even been transmuted from an "ergonomics" to a "planning" standard, with a different classification. Many references to these standards are undated, which could lead to considerable problems if the new versions were actually to be observed.

It may however be assumed that dating is not always applied properly and intelligently. One case in which dating is assumed not to have been used properly is the EN 1005 series of standards (see Annex G, "Example of inappropriate or incorrect dating in references").

In this context, it is notable that the provisions governing normative references differ between the currently applicable CEN Guide 414 and the EN 414 standard which it replaces, particularly with regard to the concepts. According to the EN

414 standard, the references to the relevant standards should be undated; CEN Guide 414 conversely requires them to be dated.

5.5 Identification of the number and origin of the references to Type A/B standards

For the purposes of the present study, the frequency with which reference is made in product standards to a particular cross-sectional standard was assumed to be an indicator of the latter's importance. To this end, the number of references to potential cross-sectional standards in the area of machine safety, i.e. to Type A/B standards, was ascertained. Only the references to these standards made in current DIN standards or draft standards were considered for this purpose. The standards were identified with the aid of the online version of Perinorm. The number of references is shown next to each standard in Annex B, Table 1, "Overview of Type A and Type B machine safety standards".

The search revealed that Perinorm does not distinguish between whether a reference is a dated or undated normative reference, a dated or undated informative reference, or merely supplementary information on a standard. This issue is described in greater detail in Annex A, "Problems associated with searches in Perinorm".

Annex D, "Analysis of the standards cited in DIN EN ISO 11553-1:2005", shows with reference to this standard the difference in status which may be accorded to the standards cited within another standard.

It was noted with interest during the searches that virtually all Type A and B standards are also cited in standards which were developed outside the DIN Mechanical Engineering standards committee (NAM). The standards committees in which these standards were developed were therefore identified and likewise documented in the table (see Table 1 in Annex B, "Overview of Type A and Type B machine safety standards").

The overall importance of the cited standards in the standards committees was not determined, as this lies outside the scope of the study. Some standards committees, notably NASG, NALS and NAErg, are however substantially involved in the development of Type A and B standards, and doubtless make reference to certain standards in this context.

6 Identification of further potential "cross-sectional standards"

Standards governing machine safety also contain numerous references to standards of relevance to occupational safety which lie outside the scope of machine safety. The latter references are generally informative in nature, and are indicated as bibliographical references.

Table 4 (Annex E, "Further potential cross-sectional standards of relevance to occupational health and safety") lists the results of the search for standards of relevance to occupational health and safety which are cited in Type A, B and C machinery standards but which are not harmonized standards pursuant to the EU Machinery Directive. The list in Table 4 should not be assumed to be complete. The standards listed there may in some cases also be regarded as cross-sectional standards in the context of this study.

An indication of this may be the number of references in other standards to the standard concerned. The number of current DIN standards in which these standards are cited was therefore also established. An attempt was also made to include the respective preceding versions in the search, as for example in the case of EN ISO 6385 and EN ISO 7250 (for which prEN 26385 and prEN 979 respectively were also considered).

The number of references should not however be regarded as the sole yardstick for the significance and influence of the cited standard. On the one hand, a great many standards exist which are relatively new, have no predecessor, and cannot therefore have been cited; on the other, the influence of a standard varies according to the status of the standard in which it is cited. An example of this is the ISO 10075 series of standards governing mental work-load. This series was developed only in recent years and has now been cited, together with a large number of other standards, in the Type A standard EN ISO 12100-2, "Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles". If a reference is made at this level to a standard, the effect is greater, i.e. broader, than when the reference is made in a Type C standard. Since EN ISO 12100-2, as a Type A standard, must always be considered normatively during the development of a Type C standard, the EN ISO 10075 series of standards is also considered indirectly as a result where appropriate in the Type C standard.

The majority of Type A and B standards were developed some time in the past. Many standards have been developed in the meantime which are relevant to the machine safety standards system. These will probably be considered at the next revision of the standard concerned. Table 5 (Annex E, "Further potential cross-sectional standards of relevance to occupational health and safety") lists further examples of standards and draft standards from the area of ergonomics which may be regarded as potential cross-sectional standards of relevance to occupational health and safety. The standards listed here are the result of a search throughout all areas of standardization for which ergonomics is relevant.

An overview of all standards considered to be possible cross-sectional standards relevant to occupational health and safety can be found in Annex H, Table 7, "Complete overview of identified possible cross-sectional standards of relevance to occupational health and safety". The list is limited to standards of European or international origin; standards of German origin are not listed.

7 Analysis of the application of cross-sectional standards in areas of relevance to occupational health and safety

7.1 Overview

In order for an impression to be gained of the application of cross-sectional standards in practice, examples were identified and studied in accordance with the project description for the following case groups:

- Case group 1: Existing cross-sectional standards are cited in product standards.
- Case group 2: Product standards make no reference to existing cross-sectional standards. The reasons for this are to be demonstrated.
- Case group 3: A number of product standards contain similar/identical fundamental statements which could be grouped in a single cross-sectional standard. A suitable cross-sectional standard does not exist, however.

In addition, the authors report on their own experience with cross-sectional standards from many years of standardization activity at the ERGONOMIC institute.

7.2 Case group 1: Existing cross-sectional standards are cited in product standards

Within the scope of the analysis, numerous machine safety standards (Type C standards) for the following products and product groups were inspected at random with regard to whether the relevant Type A and B standards are considered:

- Lifts, escalators, moving walks
- Doors and gates
- Lifting platforms
- Woodworking machines
- Machine tools
- Agricultural and forestry machinery
- Garden equipment
- Rubber and plastics machines
- Packing machines
- Cranes
- Continuous conveyors
- Storage and retrieval units for high-bay warehouses
- Industrial trucks
- Construction equipment and building material machines

- Earthmoving machinery
- Road construction machinery

As already indicated elsewhere, CEN Guide 414 (and formerly the EN 414 standard) governs the drafting and presentation of machine safety standards. The standard is supplemented by EN 1746:1998-12: "Safety of machinery - Guidance for the drafting of the noise clauses of safety standards".

An analysis of the Type C standards would therefore be expected to confirm that proper consideration had been given to cross-sectional standards. This was indeed confirmed for the most part in the case of more recently issued standards. The standards generally exhibit the same structure and refer to the relevant Type B1 and B2 standards for the identification of hazards and for the provisions governing the relevant safety measures. With certain exceptions, the requirements of CEN Guide 414/EN 414 were observed in the standards examined, and reference was made to relevant Type A and B standards with regard to the hazards identified for the product or product group concerned. Whether these standards are applied properly cannot be ascertained within the scope of the present study.

One reason for this situation may be assumed to be the fundamental revision of the EN 414:2000 standard, the draft of which had already appeared in 1996 with a recommendation that the draft should be used for the development of Type C standards. The differences between the bodies of regulations were evidently substantial. This can be seen from the structure and uniformity of the standards. Whereas the majority of Type C standards issued after 2000, and in some cases since 1996, exhibit a very similar structure and set out the same formulations for certain sections, the most diverse forms and formulations are encountered in the period before this time. In some cases, even the indication that the standard concerned is a Type C standard is missing, even though according to the current CEN Guide 414 or EN 414 this information is absolutely mandatory.

The group of standards governing lifting platforms drafted in CEN/TC 98 represents an example in which appropriate consideration has been given to the requirements formulated in CEN Guide 414/EN 414 concerning the references. Table 6 (Annex F, "Overview of the standards developed in CEN/TC 98 governing lifting platforms and of the Type A/B standards cited in them") provides a summary of the standards cited in these standards.

Deviations from this procedure were identified only in some cases in the area of machine safety. These deviations will be considered in the following section.

7.3 Case group 2: Existing cross-sectional standards are not cited in product standards

7.3.1 Area of machine safety

Among the Type C machine safety standards which were examined, a small number of cases were identified in which reference was not always made to existing cross-sectional standards. This was the case for example with the older Type C standards, in which reference was not always made to the Type B standards. One reason for this is assumed to be that at the point in time concerned, a large proportion of the Type B standards had not yet been developed. A further

reason may be that no requirements to this effect existed, or that such requirements were not sufficiently well known.

An older machine safety standard which serves as an example is DIN EN 632, "Combine harvesters and forage harvesters", date of issue August 1995. The following situation was observed in this case:

- The standard does not refer to EN 349:1993, "Safety of machinery - minimum gaps to avoid crushing of parts of the human body", despite the fact that the latter had already been developed and a relevant hazard exists. The relevant values for the safety measures to prevent crushing are set out without reference to a source. The values specified do not deviate from those stated in EN 349:1993, however.
- The standard does not refer to DIN EN 953:1997, "Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards", despite the fact that a relevant hazard was identified. The reason is considered to be that at the time of development of EN 632, EN 953 existed only in draft form (prEN 953:1992). The examination revealed no deviations between the provisions in EN 632 and the relevant provisions in EN 953, however.

Further examples of deviations from the requirements of CEN Guide 414/EN 414 can be found in the group of standards governing lifts, escalators and moving walks (CEN/TC 10).

- EN 81-3:2001: The standard "Safety rules for the construction and installation of lifts - Part 3: Electric and hydraulic service lifts" does not make reference to the relevant Type B standards. Technical reasons clearly exist for this, however. Detailed statements and information to this effect are for example provided in EN 81-3:2001 in the section "0.2 Principles".
- EN 115/A1:1998: The standard "Safety rules for the construction and installation of escalators and passenger conveyors" does not satisfy the requirements. This standard is however currently being brought into line with the requirements of CEN Guide 414. Draft prEN 115:2005 thus contains the following statement with regard to indication of the changes: "… covering the requirements of CEN Guide 414 by creating a new structure which addresses the safety rules for the machine and provides requirements in the normative annexes and information in the informative annexes."
- EN 627:1995: The standard "Specification for data logging and monitoring for lifts, escalators and passenger conveyors" was issued in 1995 and by definition does not therefore satisfy the current requirements, including for example the formal requirements, for the development of machine safety standards. The standard also makes no reference to any cross-sectional standards. A Perinorm search did not however reveal the existence of any cross-sectional standards for the areas addressed by it.
- Purely formal deviations are also encountered, for example in the following standards, from the provisions of EN 414 applicable at the time of development. The deviation concerns the fact that reference is not made to EN 1070 in the sections "Normative References" and "Terms and definitions" / "Definitions". The reasons for this are not evident.
  - EN 12158-1:2000: Builders hoists for goods - Part 1: Hoists with accessible platforms

– EN 13015:2001: Maintenance for lifts and escalators - Rules for maintenance instructions

Altogether, the machine safety standards which have been updated in recent years frequently contain statements regarding the amendments made such as the following:

- "Fundamental specifications have been supplemented by references to basic standards or the references have been given instead." (For example in EN ISO 11111-1:2005-06)
- "The standard was formulated more precisely at numerous points and adapted to progress in development of the body of standards, in particular new editions of Type B standards." (For example in prEN 848-1:2004-03)*

It may be presumed that in the course of routine revision, all machine safety standards are being successively brought into line with the provisions of CEN Guide 414 concerning the content, structure and formal requirements.

7.3.2 Other areas of application and technical areas

In areas outside machine safety, too, it was found that product standards failed to make reference to possible cross-sectional standards.

An example of this is EN 527-1:2000, "Office furniture - Work tables and desks - Part 1: Dimensions". This standard contains no references whatsoever to other standards. The minimum dimensions are specified without indication of any data sources. Only the introduction states the following:

"The dimensional requirements of the tables and desks are based upon the 5th and 95th percentile of the European office user group. In general, this is the 5th percentile female and the 95th percentile male. To accomplish the needs of users outside this span, individual solutions can be applied. Some European countries can have 5th percentile females and/or 95th percentile males outside this European user group."

In contrast to other standards of relevance to the design of workplaces, such as EN ISO 14738, "Safety of machinery - Anthropometric requirements for the design of workstations at machinery", the requirements concerning the dimensions of the desk are not derived explicitly from the body dimensions relevant to the desk dimensions. For this purpose, EN ISO 14738 refers among other sources to the standards EN ISO 7250, "Basic human body measurements for technological design" and EN ISO 9241-5, "Ergonomic requirements for office work with visual display terminals (VDTs) - Part 5: Workstation layout and postural requirements". Both of these standards may be regarded as possible cross-sectional standards for product standardization of the office desk.

Had these two standards been referred to, the result would have been minimum dimensions different to those in EN 527-1. The following example describes the process for deduction of the minimum height of the leg space, which is defined in EN 527-1 as 650 mm.

* Unofficial English translation.

The minimum height of the leg space is derived from the anthropometric data "lower leg length (popliteal height)" and "thigh clearance height" (see EN ISO 7250 and EN ISO 9241-5) for the 95th percentile male, with an allowance for the shoe height (usually 30 mm) and if appropriate an allowance for movement (generally 10 mm). Based upon these considerations and the current anthropometric data for the European population, EN ISO 14738 arrives at a minimum height of 720 mm for the leg space. Even had the calculation been based upon the anthropometric data in DIN 33402-1:1986, the values of which would be considered too low today, the result would have been a minimum height for the leg space of 497 mm + 164 mm + 30 mm + (10 mm) = 691 mm (701 mm), based in this case upon the 95th percentile of the population group with the largest body dimensions.

The following deviations thus arise for the minimum height of the leg space:

- Height of leg space in EN ISO 14738: 720 mm.
  The deviation from EN 527-1 is 70 mm.
- Height of leg space to EN ISO 7250 and EN ISO 9241-5 based upon the obsolete values for the relevant anthropometric data in DIN 33402-2:1986: 691 mm/701 mm.
  The difference between these values and those of EN 527-1 is 41 mm/51 mm.

Comparison with the remaining values of EN ISO 14738 relevant to the desk shows that they also differ, in some cases considerably. The minimum leg space width, for example, is specified as 790 mm, compared to 600 mm in EN 527-1. This is despite the fact that the prEN ISO 14738 draft standard and the EN ISO 7250 standard had already been published in 1997.

7.4 Case group 3: Similar / identical fundamental statements exist in product standards which could give rise to a cross-sectional standard

For case group 3, examples were to be given of product standards setting out similar/identical basic provisions which could be grouped in a cross-sectional standard which, however, does not yet exist. No such examples were identified in the Type C machine safety standards examined, to the extent that this was possible within the scope of the study.

However, consultation of the standards committees revealed a need during the development of product standards (and also of other standards) for cross-sectional standards governing the same subject-matter. Such subjects include test principles, rules for instruction handbooks, characterization of laser radiation, etc. (see Annex I.3.4.8, "The need for standards at a higher level").

Product standards and product-oriented standards containing similar or identical essential provisions are however familiar from other areas, such as visual display terminal technology. At present, new standards summarizing fundamental statements of this kind are being developed in the relevant standards committees in the course of a restructuring process. The following standards are affected:

Product standards and product-oriented standards for visual display terminals:

- EN 29241-3: Ergonomic requirements for office work with visual display terminals (VDTs); Part 3: visual display requirements
- EN ISO 9241-7: Ergonomic requirements for office work with visual display terminals (VDTs) - Part 7: Requirements for display with reflections
- EN ISO 9241-8: Ergonomic requirements for office work with visual display terminals (VDTs) - Part 8: Requirements for displayed colours
- EN ISO 13406-1: Ergonomic requirements for work with visual display based on flat panels - Part 1: Introduction
- EN ISO 13406-2: Ergonomic requirements for work with visual displays based on flat panels - Part 2: Ergonomic requirements for flat panel displays

Product standards and product-oriented standards for data input devices:

- EN ISO 9241-4: Ergonomic requirements for office work with visual display terminals (VDTs) - Part 4: Keyboard requirements for visual display terminals
- EN ISO 9241-9: Ergonomic requirements for office work with visual display terminals (VDTs) - Part 9: Requirements for non-keyboard input devices

The following draft standard is already available for the area of input devices:

- prEN ISO 9241-400:2005-06: Ergonomics of human-system interaction - Principles and requirements for physical input devices

This standard may be employed at a later stage as a cross-sectional standard not only for visual display terminals, but for many product standards.

7.5 The authors' own experience from standardization activity

Since its inception in 1979, the ERGONOMIC institute has been represented actively and continuously on various national and international standards committees, particularly in the area of application of visual display terminal work and the specialist area of lighting. Problems which have been observed during standardization work in connection with the subject of cross-sectional standards include the following:

- Cross-sectional standards are lacking in certain specialist areas of ergonomics. These include standards governing cognitive factors.
- During the drafting of standards, difficulty was often experienced in identifying suitable cross-sectional standards in the particular specialist areas concerned, and also in applying them properly. This was particularly the case during the drafting of EN ISO 9241-6, "Ergonomic requirements for office work with visual display terminals (VDTs) - Part 6: Guidance on the work environment", which deals with all relevant environmental factors (acoustics, climate, lighting, vibrations, etc.) for office work involving visual display terminals. The reasons for this included:
  - Lack of awareness that suitable (basic/generic) standards in other areas existed, despite the fact that experts from the various disciplines were involved in the standardization activity.
  - Incorrect application of the cross-sectional standards from other areas, partly because the members of the standards committee did not have ac-

cess to them. (At the time, standards which were to be used for standards work had to be purchased by the members of the standards committee if needed. It was difficult to convince members to do this, and in general they did not.)

- Standards which are intended as cross-sectional standards or which could potentially have this function for other areas are not used by standards committees in other disciplines, even though they are known. The reasons for this vary widely, and are not always technical in nature. Examples include:
  - EN ISO 9241-5: This standard contains principles and provisions for an ergonomic posture and workplace design for office tasks involving visual display terminals. The standard can also be used as a cross-sectional standard for the drafting of product standards for office chairs and office desks, as it has been for example by the North American organization BIFMA (the Business and Institutional Furniture Manufacturer's Association) in conjunction with ANSI. However, the standard was not considered during development of the European standards for office desks and office chairs.
  - EN ISO 9241-6: This standard contains principles for an ergonomic working environment for office tasks involving visual display terminals, and therefore also for lighting. The standard is cited only in the form of a bibliographical reference during development of the planning standard EN 12464-1 governing the lighting of indoor workplaces; it is not referred to as a cross-sectional standard, despite the fact that this would have been very useful, since EN 12464-1 also governs the lighting of visual display terminal workplaces yet fails to cover all relevant ergonomic aspects.
- Terminological standards and terminology databases, which ideally should be multilingual, are lacking. Terminology for example is frequently used with different meanings within one and the same discipline; terms and definitions are not adopted correctly or are redefined; and different translations of the same terms in different standards may lead to inconsistent results. Numerous examples can be stated which may lead to errors in planning.
  A recent example can be found in the German version of EN ISO 6385:2004, in which "work space" has been translated incorrectly as "Arbeitsraum". In the German version of EN 614-1, the German term used with the same definition is "Arbeitsbereich". In the German version of EN 1837:1999, "Safety of machinery - Integral lighting of machines", "task area" is in turn translated incorrectly as "Arbeitsbereich" rather than as "Bereich der Sehaufgabe". This situation may result in costly errors in the planning of lighting.
  The problem concerning the terminology is of particular importance where cross-sectional standards are concerned. The problems exist and continue to arise, even though clear provisions exist at both European and international level for the definition of terminology.

8 Examination of hypotheses concerning the advantages and benefits of cross-sectional standards

8.1 Formulated hypotheses

In order for the advantages and possible benefits of cross-sectional standards to be identified, the Commission for Occupational Health and Safety and Standardization (KAN) formulated six hypotheses in the project description:

Hypothesis 1

Reference to cross-sectional standards enables the necessary content of product standards to be reduced. Time and expense are saved during development of the standards.

Hypothesis 2

Owing to their higher level of abstraction, cross-sectional standards have longer revision cycles than the product-related documents.

Hypothesis 3

Changes to fundamental aspects of occupational health and safety can be implemented simply, quickly, and highly effectively, without changes being made to a large number of product standards.

Hypothesis 4

It is easier for cross-sectional standards to gain acceptance when they summarize subject areas and are limited to essential statements.

Hypothesis 5

In new market segments in which product standards remain underdeveloped, designers are able to address the fundamental OH&S aspects more effectively, and in accordance with the provisions already in existence, from the outset.

Hypothesis 6

Cross-sectional standards enhance clarity. The OH&S provisions which occur repeatedly in product standards are set out in cross-sectional standards in a generically valid form. This assures freedom from contradictions and from duplicate provisions.

These hypotheses will be tested below in accordance with the terms of reference, and conclusions drawn from the results.

8.2 Basis of testing

The hypotheses are tested essentially on the basis of:

- The results of the analysis of the Type A, B and C standards conducted in the study, and the experience gained in the course of this analysis

- Discussions with a number of experts from international standards committees
- The authors' own experience in standardization work, gained over almost three decades in a number of specialist areas

And, in particular:

- The results of consultation of the Mechanical Engineering standards committee (NAM) and of a number of other standards committees which exhibit some connection to occupational safety and also make use of Type A and B machine safety standards, concerning the experiences of these committees with cross-sectional standards and their expectations of them. Particular importance was attached to the results of consultation of NAM, since this standards committee has already acquired considerable experience with cross-sectional standards owing to the use of the hierarchical standards structure in the area of machine safety. The consultation method and the detailed results of it can be found in Annex I, "Consultation of standards committees".

8.3 Results of testing of the hypotheses

8.3.1 Hypothesis 1: Reduction in the necessary content of product standards

Hypothesis 1 states:

> *"Reference to cross-sectional standards enables the necessary content of product standards to be reduced. Time and expense are saved during development of the standards."*

This hypothesis can be confirmed in principle, but not unreservedly.

The reason is as follows:

The results of the consultation of NAM show that cross-sectional standards reduce the anticipated content of product standards and that the work involved is also perceived as less; that at the same time, however, in the view of DIN/NAM, "*The success of the 'hierarchical structure in machine safety standardization' model is substantially dependent upon the quality of the Type A/B standards available, which must be geared to the needs on the Type C level.*" For example, the internal consultation conducted in NAM revealed that acceptance was clearly higher in the standards committees responsible for stationary machines than in those responsible for mobile machines, since Type A/B standards have evidently been developed with greater reference to stationary machines to date. "*Problems evidently arise when complex reasoning is required to justify deviations from cross-sectional standards which are deemed inadequate*." (See Question 10 in Annex I.2.2, "Results of the consultation in the areas of 'mobile machines' and 'stationary machines', and Annex I.2.3, "View of DIN/NAM concerning the participation of industry experts on Type A/B standards committees".)

Similar conclusions can be drawn from the consultation of the other standards committees. The reduction in the effort required for the development of standards is regarded as major; at the same time, however, those consulted pointed out that the references in the standard to be developed must be examined with care, and that the provisions of the cross-sectional standards, which are often

more general in nature, must be defined more closely. Consequently, a hierarchical standards structure is not expected to lead to a reduction in the effort entailed by development and updating; development of the standards is however expected to be more rapid. The reason given for this is that specific knowledge is available in the relevant cross-sectional standards and need not first be located with great effort. The knowledge must however be examined carefully for its suitability for application, and modified if necessary.

Analysis of the Type A/B/C standards revealed that although many Type C standards refer to relevant cross-sectional standards, it was debatable whether this could always be regarded as reducing the content. The informative reference to a Type B standard, as frequently practised in Type C standards, generally results in the user of the Type C standard having to read and also understand the cross-sectional standard concerned in its entirety in order to be able to identify or infer the relevant provisions. This also presupposes that the user is in possession of the cross-sectional standard. If reference is made to several cross-sectional standards, the resulting cost and effort may be considerable. The work in the standards committee on the "content" may be reduced as a result; the "content" however requires a greater investment on the part of the user of the standard, in terms of both time and financial outlay. Similar conclusions can be drawn from the comments made in the results of the survey.

8.3.2 Hypothesis 2: A higher level of abstraction of cross-sectional standards results in longer revision cycles

Hypothesis 2 states:

> *"Owing to their higher level of abstraction, cross-sectional standards have longer revision cycles than the product-related documents."*

This hypothesis can be confirmed.

This is demonstrated by the analysis of the Type A/B/C machine safety standards. As described in Section 5.3, "Identification of the Type A and Type B standards", a Perinorm search revealed that a large proportion of the Type B standards have remained unchanged since their adoption. If for example the harmonized standards listed in the 9th GPSGV index are sorted by date of issue, almost half of the 100 "oldest" standards are found to be Type B standards; conversely, of the 100 most recent standards, only eight are Type B standards, of which half in turn are entirely new. Of the Type A standards, two out of four have been replaced in recent years (EN 292-1, -2 by EN ISO 12100-1, -2), and one redrafted as a Type A standard (EN 1127-2, the successor to prEN 13462, which must be considered in close relation to EN 1127-1).

A corresponding analysis of the Type C standards shows their revision cycle to be considerably shorter. Perinorm for example reveals that a total of 46 standards amongst the harmonized machine safety standards have been withdrawn. Eight of these are Type A/B standards. An analysis of Type C standards issued more recently also shows that the majority of product standards have a revision cycle of 1 x 5 (± 1) years, and of at least 2 x 5 (± 1) years. Examination of older Type C standards which have not been revised also shows them to be for the most part more general in nature, defining general principles, test principles and the like for product groups. Their function within the product group is therefore similar to that of cross-sectional standards.

8.3.3 Hypothesis 3: Simple and effective implementation in the event of changes to fundamental OH&S aspects

Hypothesis 3 states:

> *"Changes to fundamental aspects of occupational health and safety can be implemented simply, quickly, and highly effectively, without changes being made to a large number of product standards."*

This hypothesis can be confirmed only in part.

Whether changes to fundamental aspects of occupational health and safety can be implemented simply, quickly, and highly effectively by means of cross-sectional standards, without changes being made to a large number of product standards, depends in part upon the way in which reference is made within the product standards to the cross-sectional standards containing the relevant OH&S aspects. If the references are normative and dated, the product standards will without a doubt require updating; undated normative references however must also at the very least be checked before being left unchanged. The informative references may also necessitate changes in the product standards.

An example of this is the EN ISO 10075 series of standards, which must also be considered in the area of machine safety in the future. This standard is cited in EN ISO 12100-2 in Section 4.8, "Observing ergonomic principles". In future, it must be assumed that normative or informative references will be made to this standard in relation to protective measures concerning hazards arising from the neglecting of ergonomic principles in the design of machinery. At present, reference is not made to this series of standards in any of the harmonized machine safety standards, despite prEN ISO 10075-1 having been available since 2000 at least in draft form and therefore in the form of a document which may be cited. To date, reference has been made to this series of standards, which is of relevance to machine safety, only in EN 45510-8-1: "Guide for procurement of power station equipment - Part 8-1: Control and instrumentation".

As the computerization of machinery progresses, reference may also increasingly be made to ergonomics standards relating to visual display terminal work. Such standards are generally of direct relevance to occupational health and safety.

The first part of the hypothesis can however be answered in principle in the affirmative. If the relevant occupational health and safety aspects are well structured and comprehensively addressed in the relevant cross-sectional standards, it can be assumed that these aspects can be implemented simply, quickly and highly effectively in the standards.

8.3.4 Hypothesis 4: Creation of greater acceptance of cross-sectional standards under certain conditions

Hypothesis 4 states:

> *"It is easier for cross-sectional standards to gain acceptance when they summarize subject areas and are limited to essential statements."*

This hypothesis can be confirmed.

As demonstrated consistently by the results of the consultation, one significant factor for the acceptance of cross-sectional standards is their "fitness for use" in the development and updating of product standards. Essential aspects of a cross-sectional standard's fitness for use include a good structure which focuses the specialist areas, and limitation to essential statements. This can also be confirmed from the standards work conducted by the ERGONOMIC institute itself. Attention has correspondingly been paid to this aspect during the development of potential cross-sectional standards.

A summary of the specialist areas is also beneficial not least in order for the number of dated normative references to be kept to a minimum if necessary.

The points of this hypothesis apply in principle to all standards, but are particularly relevant to cross-sectional standards.

8.3.5 Hypothesis 5: Addressing of OH&S aspects for products in new market areas

Hypothesis 5 states:

> *"In new market segments in which product standards remain underdeveloped, designers are able to address the fundamental OH&S aspects more effectively, and in accordance with the provisions already in existence, from the outset."*

This hypothesis can be confirmed.

This conclusion is based on the one hand on the results of the consultation of NAM, which in the main confirm the hypothesis. By appropriate use of the relevant harmonized Type A and B standards, a designer in the area of machine safety is also assured of being able to satisfy the statutory requirements.

In the light of the observations made in this study, an issue is however seen in the designer being completely unfamiliar with the relevant standards, and possibly also being unable to comprehend and apply them properly. The numerous guides in particular may be of assistance in this respect. These include EN 13861, "Safety of machinery - Guidance for the application of ergonomics standards in the design of machinery", and the EN 11688 series of standards, "Acoustics - Recommended practice for the design of low-noise machinery and equipment".

8.3.6 Hypothesis 6: Cross-sectional standards enhance clarity

Hypothesis 6 states:

> *"Cross-sectional standards enhance clarity. The OH&S provisions which occur repeatedly in product standards are set out in cross-sectional standards in a generically valid form. This assures freedom from contradictions and from duplicate provisions."*

The hypothesis consists in fact of two discrete hypotheses.

The first specific hypothesis states:

> *"Cross-sectional standards enhance clarity."*

This hypothesis can be confirmed only in part.

The statement is based on the one hand on the results of consultation of the standards committees, who largely confirm it or expect it to be the case. For the area of machine safety, however, the concern is voiced that "*an excessive number of references to Type A + B standards, which in turn may refer to further Type A + B standards, impacts negatively upon the clarity and ease of use of the standard.*" (From a comment made in the consultation.)

That many product standards do in fact contain an extremely high number of references was confirmed by the analysis of the Type A/B/C standards. Since the references are also not always up to date at the time of the standard's publication, further problems may arise.

The second specific hypothesis states:

> *"The OH&S provisions which occur repeatedly in product standards are set out in cross-sectional standards in a generically valid form. This assures freedom from contradictions and from duplicate provisions."*

This specific hypothesis can however be confirmed unreservedly.

The statement is based upon the following facts. Firstly, a freedom from contradictions and the avoidance of duplicate provisions are essential requirements for the area of machine safety, and have led to the creation of the hierarchical standards structure. Corresponding provisions are contained in CEN Guide 414. Provided the requirements are applied properly, it can be assumed that contradictions do not exist and that duplicate provisions are avoided. Secondly, the results of the consultation in the standards committees revealed high expectations concerning the freedom from contradictions when cross-sectional standards are applied.

8.4 Conclusions

Testing of the hypotheses resulted in the following essential conclusions:

In many areas, cross-sectional standards may be beneficial for the development and updating of standards.

This has been shown by experience for example in the area of machine safety, with its hierarchical structure of Type A/B/C standards, and the system of OH&S provisions embedded within it.

The experience which has been gained in this area encompasses the development, updating and application of cross-sectional standards (Type A and B standards) and of product standards (Type C standards) which make reference to them.

The principal benefits of cross-sectional standards in this area are considered to be the following:

- The consistency achieved within the system of standards
- Clarity and freedom from contradictions of the body of standards
- Avoidance of duplicate provisions
- Specialist expertise is prepared, compiled and updated specifically for the scope of machine safety, which is subject to statutory regulation. The availability of this expertise is deemed very helpful and beneficial during both the

drafting of product standards, and the development of products for which no product standards exist

- Greater effectiveness during the development of product standards
- Reduction in the time required for the development of product standards
- Enhancement of the quality of product standards

Benefits more secondary in nature are considered to be the following:

- Reduced costs for the development and updating of product standards which make reference to the cross-sectional standards concerned

The results of the study also show that similar benefits derived from the application of cross-sectional standards are anticipated or have already been observed in other areas.

In order for cross-sectional standards to have this desired effect, they must possess certain quality characteristics. These are, essentially:

- Selective compilation and purposeful preparation of the specialist expertise
- A logical structure which focuses the specialist areas in such a way that purposeful reference can be made to each of them separately
- Limitation of the regulated subject-matter to the essentials, thereby avoiding superfluous provisions
- Revision cycles which are as long as possible
- A good update status
- Precise terminology
- A proper national language version
- Adequate awareness of the standard amongst the target groups

Should cross-sectional standards fail to exhibit these quality characteristics to the necessary degree, the following problems in particular may be anticipated:

- A lack of acceptance amongst the relevant target groups
- Product standards containing unnecessary provisions or justification for deviations
- Bloated product standards
- Unwarranted effort in the development and updating of product standards
- Incorrect application of cross-sectional standards, resulting in defective product standards or defective products
- A lack of use owing to inadequate awareness

8.5 Measures for the successful application of cross-sectional standards

8.5.1 Overview

The following measures make a particular contribution to the successful application of cross-sectional standards:

- Dedicated quality assurance measures, above and beyond the usual level
- The provision of suitable guides for the application of cross-sectional standards
- Information and publicity concerning cross-sectional standards
- The availability of a suitable range of standards

8.5.2 Particular measures for the quality assurance of cross-sectional standards

A whole range of directives, standards and procedures contributing to quality assurance apply to the development and updating of standards. More far-reaching measures are considered necessary for the development and updating of cross-sectional standards, since particular quality requirements are imposed upon standards of this kind owing to their more general and in some cases more serious impact. The primary requirement is considered to be particular care to integrate the relevant stakeholders into the standards development process, not only at the standards' inception, but also throughout their life cycle.

Standards, like computer programs, may be regarded as "soft" products. Tools and procedures similar to those used for software products are therefore conceivable for the successful development and application of standards.

The success of software products is based essentially upon intensive communication between developers and direct and indirect users. An organized pooling of experience such as that commonly practised between all parties to software development is therefore also recommended for the development of standards, with the objective of standards being fit for use in a sense analogous to the "usability of software", i.e. capable of being used in an efficient, effective and satisfactory manner. This applies all the more to cross-sectional standards, upon which particular quality requirements are imposed.

Where cross-sectional standards are concerned, the roles of the parties involved are as follows:

- Developers: the specialist disciplines of standards committees in which the particular cross-sectional standards are drafted.
- Direct users: the developers of lower-level standards, e.g. product standards; also third parties who apply the standards directly, e.g. manufacturers of machines who require a reliable basis for the development of products for which specific standards do not exist.
- Indirect users: the developers of products who are required to deal with both product standards and the cross-sectional standards to which reference is made within the product standards.

Various models exist for application-oriented and user-oriented software development. It is recommended that a controlled procedure be developed for the entire life cycle of cross-sectional standards; this procedure should adequately involve all parties concerned in all phases of the development and updating of these standards. The committees for standards in which reference is made to cross-sectional standards should be adequately represented on the standards committees responsible for developing the cross-sectional standards concerned. Potential obstacles to such involvement should be avoided, or identified and eliminated/reduced where they already exist.

Suitable guides, equivalent to the development and style guides employed in software development, should be available for the development and updating of cross-sectional standards. Guides and parts thereof have already proved effective in many areas during the development of standards.

In the development of machine safety standards, the relevant standard was:

- EN 414, "Safety of machinery - Rules for the drafting and presentation of safety standards"

This standard has now been superseded by:

- CEN Guide 414, "Safety of machinery — Rules for the drafting and presentation of safety standards"

In the area of electrical engineering, the following document has a similar function:

- IEC Guide 104, "The preparation of safety publications and the use of basic safety publications and group safety publications"

Since 2005, consideration for requirements of this kind has been a requirement within the general body of regulations governing standardization activity, specifically:

- 5th edition of ISO/IEC Directives Part 2:2004, Rules for the structure and drafting of International Standards.

As already indicated elsewhere in this report, the new edition also states under "General Principles" that principles for drafting must be observed, and refers to the relevant annex in which these principles are set out.

8.5.3 Guides to the application of cross-sectional standards

The above guides also govern application of the particular cross-sectional standards.

A special guide is applied in the area of electrical engineering:

- IEC Guide 108, "The relationship between technical committees with horizontal functions and product committees and the use of basic publications"

This guide contains provisions governing close co-operation between the technical committees developing fundamental documents, and those developing product-related documents. The experience which has been gained with these guides should also be exploited in other areas.

Besides the guides to the application of cross-sectional standards during the *development* of machine-safety standards and safety-related documents in the area of electrical engineering, a range of guidance documents also exist which have been developed both for the *application* of potential cross-sectional standards in the form of references to them in other standards, and for their direct use in practice. The examples indicated below take the form of standards and technical reports (TRs); other forms of regulatory document are however also possible:

- EN 13861:2003, Safety of machinery - Guidance for the application of ergonomics standards in the design of machinery

- ISO/TR 18569:2004, Safety of machinery - Guidelines for the understanding and use of safety of machinery standards
- EN ISO 3740:2000, Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards
- EN ISO 9241-1:2001, Ergonomic requirements for office work with visual display terminals (VDTs) - Part 1: General introduction. This standard contains "Guidance on use of ISO 9241"
  (Note: all 17 parts of the ISO 9241 series are concerned: Ergonomic requirements for office work with visual display terminals (VDTs).)
- EN ISO 11200:1996, Acoustics - Noise emitted by machinery and equipment - Guidelines for the use of basic standards for the determination of emission sound pressure levels at a work station and at other specified positions
- CEN/TS 15224:2006 (pre-standard), Health services - Quality management systems - Guide for the use of EN ISO 9001:2000

Experience gained with these guides should be evaluated and taken into consideration during the development of further guides.

8.5.4 Information and publicity concerning cross-sectional standards

Wide awareness of a standard and knowledge of its subject and scope are of great importance. Publicity concerning these standards is necessary for this purpose.

Standards are announced by standards institutes, or in certain cases, such as that of harmonized standards, also by the (German) Federal Gazette and by organizations such as the Federal Institute for Occupational Safety and Health (BAuA). Announcements are made at discrete intervals; the instantaneous status is not therefore actually known.

Data on these standards can be found in databases. The most comprehensive databases of this kind in Germany are organized and maintained at DIN, specifically DIN Software GmbH, and at Beuth Verlag. Further, specialist databases are maintained by certain organizations. These include the publicly accessible NoRA database maintained by the Commission for Occupational Health and Safety and Standardization (KAN), which provides information on standards relevant to occupational health and safety, together with a facility for online searches in this area.

Perinorm provides the most comprehensive and detailed data on standards and other bodies of regulations. The online and DVD versions of Perinorm are updated monthly. The use of Perinorm is not free of charge, however. In consideration of the information provided on potential cross-sectional standards, the existence and content of which is frequently not known, the quality of the Perinorm application/functionality and of the data to which it provides access is highly important. Perinorm provides a facility for detailed searches. However, information on cross-sectional standards cannot be obtained systematically at present, since no data authorized for this purpose exist at DIN at this time. Such data do not even exist for the system of Type A/B/C standards, which has been in place for some time in the area of machine safety.

It is recommended that the NoRA and Perinorm applications be optimized with regard to the identification of potential cross-sectional standards. This concerns both the status of the data, for which DIN Software GmbH is responsible, and the applications, which are developed and updated by KAN and Beuth Verlag respectively.

The information concerning the mere existence of the standard and the associated data generally provided are not normally sufficient for the successful application of standards. It must also be possible to report on these standards and to exchange information. The sources indicated are sources of raw data only. They do not provide any information on the status and importance of the standard, nor do they contain information on potential applications.

Specialist journals frequently report on standards; in general, however, these reports concern specialist standards, and not cross-sectional standards. New approaches should be taken to this issue, such as publications in specialist journals or the presentation of papers at conferences, geared in each case to the target group concerned. The ISO 10075 series of standards, "Ergonomic principles related to mental work-load", or reports on the amendments to the ISO 9241 series of standards, "Ergonomics of human-system interaction", could for example be presented in specialist journals such as the "VDI-Nachrichten".

The Internet is an interesting alternative. The websites of organizations such as the VDMA, VDI and BauNet could be used to report on the cross-sectional standards relevant to these areas.

8.5.5 The availability of cross-sectional standards

Many software products comprise a number of modules which can be combined according to the purpose and objective of their application, enabling them to fulfil their particular function. It is practical in such cases for a particular combination of modules to be offered on special terms in the form of a software package.

A similar situation may be said to apply to standards. Many standards, too, have a synergetic effect and can or must be used together. Consequently, packages of standards for specific applications and subjects are increasingly being compiled and offered on special terms; custom solutions have now also become the norm. It is conceivable for example for a product standard to be offered in a package together with all relevant cross-sectional standards. Where necessary, an interested direct user of the product standard can then study in detail all cross-sectional standards referenced within it. The direct user may be the product standard committee, or for that matter an interested manufacturer or developer. Another advantage is that the standards are now also available in digital form. This simplifies their use and any work involving them.

9 Estimation of the economic benefit

9.1 Economic benefit

In accordance with the terms of reference and to the degree possible, the economic benefit of cross-sectional standards was to be estimated, particularly with regard to the development of product standards.

For the purpose of the observations, the term "cost-effectiveness" must first be defined. The principles of cost-effectiveness are as follows:

Cost-effectiveness is a general measure of efficiency, i.e. of the intelligent use of resources. Cost-effectiveness is generally defined as the ratio between an achieved result (output) and the resources required for it (input). Cost-effectiveness can be increased by accomplishment of the most favourable ratio between attainment of the objectives and the use of resources. In simplified terms, two basic principles apply to cost-effectiveness:

- Maximum return: Attainment of the best possible result by means of the specified resources.
- Minimum effort: Attainment of the specified result with the lowest possible expenditure of resources.

Considerations regarding the economic benefit are more complicated.

In economic theory, the benefit is considered to be the measure of the capacity of a good or group of goods to satisfy the needs of an economic player.

A universal definition of economic benefit does not exist. Rather, a distinction is generally drawn between the benefit to the political economy and that to the business economy.

The same principle was followed in a study commissioned by DIN into the benefit of standardization to the economy as a whole. This study distinguished between the benefit to companies on the one hand and to the political economy on the other.

In the summary of the study by DIN (DIN, 2000), the editor's foreword stresses:

- *"From a macroeconomic perspective, it is significant that standards make a greater contribution to economic growth than patents or licences, that export-oriented sectors of industry make use of standards as a strategy in opening up new markets, and that standards help technological change."*
- *"This research project shows that industry-wide standards not only have a positive effect on the economy as a whole, but also provide benefits for individual businesses who use them as strategic market instruments."*

Against the background of this study, the statements concerning the benefit of standards to companies which stress the strategic relevance of standardization are particularly important. In a situation analysis, experts demonstrated "*that the relevance of standards could be demonstrated in 'numerous arguments, illustrations and examples' exist which show the importance of standards. However, although this information is well-known to standardizers, decision-makers within companies seem hardly aware of it. This inadequate information means that the strategic potential of standards is not fully appreciated, and the decision to par-*

ticipate in the standardization process is made only on the basis of how time-consuming and costly this will be."

It was however also shown that "*even though some companies are not sufficiently well-informed, they are at least partly aware of the strategic potential of standardization and can benefit from it.*"

It was also ascertained that companies "*actively involved in standards work more frequently reap short- and long-term benefits with regard to costs and competitive status than those which do not participate. Participating companies have more of a say in the adoption of a national standard as a European or International Standard.*"

In the context of the objective of the present study, that of motivating companies to become involved in the development of cross-sectional standards, the following observation is particularly relevant:

"*When a legislative body requires a technical rule, it will frequently turn to standards. If a company has been actively involved in developing these standards, it can adopt the standard before it becomes law.*"

The DIN study found that this strategy may produce large to very large cost savings.

9.2 The economic benefit of cross-sectional standards

9.2.1 General considerations

The results of consultations conducted in the context of the present study have shown that the application of cross-sectional standards can be expected to deliver both improvements in quality and savings in time, and that in areas in which experience has been gained over many years with the use of hierarchical standards structures, these benefits are also acknowledged. In terms of the essential approaches to cost-effectiveness described above, i.e. those of maximum return and minimum effort, this result translates into greater cost-effectiveness, both in standards development work and in work with standards. At the same time, where the standards produced are of higher quality, they yield a superior result (maximum return), even before the savings in time and other resources are considered. In terms of minimum effort, a time saving means an improvement in cost-effectiveness even without an improvement in the quality. A multiple benefit may therefore be assumed for standardization work. Since it is reasonable to assume that an infrastructure element which is available sooner and in better quality equates to an economic benefit for its user, cross-sectional standards also improve cost-effectiveness for those applying them.

Provided the cross-sectional standards are applied properly in the standards which refer to them, the same or very similar subject-matter which is regulated in the former, generally to a high technical standard, is also regulated to a high standard and, in particular, in the same or a similar way, in the latter. This doubtless constitutes the greatest economic benefit, both to the political economy and to companies: not least in view of the legal situation concerning, for example, product liability or occupational health and safety, as for example in

Germany in the case of product standards in the context of the German Equipment and Product Safety Act and the Occupational Health and Safety Act.

All industry players, including industry associations, manufacturers and their organizations, and employers and their associations, should therefore have an interest in suitable cross-sectional standards being available. Cross-sectional standards which are developed at international level are particularly important in this context.

The hierarchical structure of machine safety standards dealt with in this project is a very successful example within the European Economic Area. Numerous standards have already been adopted at international level, including for example the two Type A standards, EN ISO 12000-1 and -2, which are basic machine safety standards. A hierarchical structure of standards which has long proved effective at international level already exists in the area of electrical engineering. Hierarchical structures of standards are increasingly being employed at international level in other areas, such as that of visual display terminal work.

At this point, the reader is reminded that cross-sectional standards by no means need necessarily be embedded within a hierarchical system. On the contrary: cross-sectional standards may more correctly be regarded as forming part of a network structure, contributing within it to the stability of the entire standards system.

9.2.2 The economic benefit for the process of development and updating of product standards

The logic behind the economic benefit of cross-sectional standards for the process of development and updating of product standards is as follows:

- Cross-sectional standards are beneficial to product standardization because they enhance the quality of the product standards, contribute to greater consistency and freedom from contradictions within the body of standards, simplify updating of the product standards, accelerate their development, and thus make them available more quickly. This leads to a reduction in the cost of development and updating. This constitutes an anticipated benefit, since it cannot be quantified precisely.
- It must be weighed against the costs entailed by purchase, appropriate consideration, application and organization of the cross-sectional standards.
- A consensus exists that benefit can be derived from cross-sectional standards only if they attain a certain level of quality.
- In order for this level of quality to be attained, the direct users of cross-sectional standards must be adequately involved in standards development. Direct users may be the members of product standards committees which take advantage of these cross-sectional standards, or for that matter designers who apply the cross-sectional standards directly.
- Expenses are incurred by participation in standardization work.
- If the resources which are freed by the net benefit of the cross-sectional standards are employed for their development, the economic principle of maximum return is being followed, according to which the maximum result is attained from given resources.

9.2.3 Spill-over effects

Participation in the development of cross-sectional standards may deliver spill-over effects above and beyond the actual objective. In the context of product standardization, such benefits to companies include greater planning confidence, and greater competitiveness owing to predictive knowledge of essential developments. As already shown by the study of the overall economic benefit of standardization, the associated economic benefit may be considerable. A company which considers these spill-over effects in its corporate strategy may assure specific benefits for itself through its participation in the development of cross-sectional standards.

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Annex A Problems associated with Perinorm searches

The use of Perinorm for searches proved more difficult than had been anticipated at the beginning of the project. The problems particularly concern the handling of cross references in Perinorm:

- No distinction is drawn between cross-referenced standards listed as normative references and those listed in bibliographical references. The display and search field facility makes no provision for such a distinction. The result however is that when a search is conducted, the document must also be inspected each time for ascertainment of whether the cross reference is a normative reference or a bibliographical reference.
- All standards included in the references are listed in Perinorm together with their dates, irrespective of whether they were also cross-referenced in this way in the standard. The date indicated is evidently that of the version applicable at the time of inclusion of the standard in the database, even where the actual reference is to an older, undated version. An example is ISO 8995, which is listed in DIN EN 12464-1 in the bibliographical references. This reference is an undated reference to the standard from 1989, as can be deduced from the title of the standard. In the PERINORM database, this is replaced by the superseding document from 2002, which however differs substantially from its predecessor in both its title and, in particular, its scope. A similar situation can be seen with ISO 6385. This standard has undergone considerable change in recent years. In these cases, citation of the new version constitutes falsification of information, particularly when the original reference in a standard was dated.
- The bibliographical references include standards which are intended purely for information. These standards are not referred to in the text of the standard, not even informatively. As already stated, the Perinorm data field facility for cross references makes no provision for a corresponding distinction in the output.
- Owing to the informative and normative national annexes, in which the documents listed in the standards are referenced to the corresponding national documents, a large number of documents are listed in many cases for the cross references. This rendered the study difficult.
- In some cases, the preceding versions of the standards or draft standards were incorrectly stated for the cross references. Similar errors can however also be found in various forewords to German standards in which the relevant international/European standards are referenced to these standards. Cases were also found in which standards were not referenced, or standards were – listed in the references which were not mentioned anywhere in the entire standard.

During the searches it was also established that in only a small number of cases, and essentially only in the area of electrical engineering, is the information indicating the type of standard to be found, i.e. whether it is a basic standard, a test standard or a safety standard. And unfortunately, as already indicated, no indication is provided for machine safety standards of whether they are Type A, B or C standards. Standards are not designated by type in this way at the present time.

In the area of machine safety, at least, however, changes can be observed. As soon as an authorized designation of a standard as Type A, B or C is available, the standards are to be designated accordingly at a suitable place in Perinorm.

A further factor exacerbating searches was that in a number of cases, occupational health and safety was indicated in the sectional list, although this area bore no clear and direct relationship to the scope, and little in the way of an indirect relationship. This entry is made as specified by KAN, which commissioned this profile.

For technical reasons, a subscription was first taken out for the online version of the PERINORM database. This decision was taken in ignorance of the fact that the search and link facilities of the online version are inferior to those of the DVD version, and that the overall functionality is therefore substantially lower. For this reason, some searches were difficult or impossible with the online version. A subscription was therefore also taken out for the DVD version.

Annex B Overview of Type A and Type B machine safety standards

Table 1 provides an overview of the Type A standards (basic standards) and Type B standards (generic standards) in the area of machine safety, listed by safety aspects (Type B1 standards) and by systems and protective devices (Type B2 standards). The table was based upon a list found in the "Safety of Machinery in Europe" guide (DIN, 2005), which contains the basic and group standards important for design; the structure in this list was retained. For the sake of simplicity, the standards are listed at EN rather than at DIN level.

Since this table was not complete and was also not up to date, it was completed and updated. The changes were based upon:

- The two relevant parts, 1.1 and 1.2, of the "Verzeichnis der Normen gemäß Maschinenverordnung - 9. GPSGV" (January 2004 version) with the updated status as of September 2005, published by the BAuA (Federal Institute for Occupational Safety and Health)
- The "Liste der harmonisierten Normen im Sinne der Maschinenrichtlinie 98/37/EG mit Stand von 09/2003", updated in April 2004, which is contained in "Safety of Machinery in Europe" (Annex B5.1).

The changes are marked in the left-hand column (Code) as follows:

- The standards which have been added are for the greater part measurement and test standards. The changes made are marked in the Code column with an "A".
- The "control systems" safety aspect has been added to the list of B1 standards, and relevant standards assigned to it. These changes are marked "U" in the Code column.
- The list in the "Safety of Machinery in Europe" guide also contains standards which do not primarily fall within the scope of machine safety. These standards are not contained in the index for machine safety (9th GPSGV). The standards concerned fall within the regulatory scope of other EU directives, such as explosion protection, electromagnetic compatibility, etc., the scope of which overlaps with that of the EU Machinery Directive. Specifically:
  - The list in the guide contains harmonized standards from within the scope of EMC Directive 89/336/EEC, the titles of which indicate that they are generic standards. These standards are marked "F" in the left-hand column (Code).
  - The list in the guide contains one Type C standard. The standard in question concerns the safety aspect of "hygiene". This standard is marked "C" in the left-hand column.
  - The list in the guide also contains guidance standards; these are not harmonized standards, but are beneficial and helpful in practical use. These standards are marked "L" in the left-hand column.
- The list also contains draft standards, which by their nature cannot be listed in any of the sources indicated above. The documents are marked "E" in the left-hand column (Code).

The standards listed in Table 1 were developed by a number of different standards committees. The committees are indicated together with the standards groups.

In order to provide an impression of how frequently the individual standards are cited in other standards, the respective number of references was determined which are made to these standards from current DIN standards.

In order to provide an impression of whether these standards are also relevant to other standards committees, the standards committees responsible for the cited standards were also identified.

Table 1: Overview of Type A and Type B machine safety standards, grouped by safety aspects and by systems and protective devices, and the references made to them from other standards (as of September 2005).

Code	Standard / draft standard (CEN level)	Subject / area	References in DIN standards N	Standards committees excluding NAM, e.g.
Basic standards (Type A)				
Principles for design, concepts (NASG)				
	EN ISO 12100-1/ EN 292-1	Methodology, terminology	582	FNFW, NBF, NABAu, FNH, DKE, NKT, NAEBM, NASport, NASG, Textilnorm, NAL
	EN ISO 12100-2/ EN 292-1	Technical principles	567	FNLa, FNFW, NVT, NBF, NAW, NKT, NL, NARK, NAEBM, NASG, NAL, FSF, NARD, DKE
Risk analysis, risk assessment (NASG)				
	EN 1050	Principles, list of hazards	281	AGN, FNFW, DKE, NKT, NASG, NAGas, NRK, NAL, NABau, NAErg, NAD, FSF, NARD
Explosive atmospheres (NASG, FABERG)				
	EN 1127-1	Explosion prevention and protection; methodology	89	NABau, DKE, NAGas, NASG
A	EN 1127-2	Explosion prevention and protection for mining - methodology	8	FABERG, NASG
Generic standards (Type B1 group standards) governing safety aspects				
Fire (NASG)				
	EN 13478	Fire prevention and protection	18	DKE, FABERG, FNK, NASG
Electromagnetic compatibility (DKE)				
F	EN 61000-6-1	Immunity for residential, commercial and light-industrial environments	40	NSMT, NABau, NATank, DKE, NALS

Code	Standard / draft standard (CEN level)	Subject / area	References in DIN standards N	Standards committees excluding NAM, e.g.
F	EN 61000-6-2	Immunity for industrial environments	86	NAR, NSMT, NABau, NATank, NAGas, NAFuO, FNFW, DKE, NALS
F	EN 61000-6-3	Emissions in residential, commercial and light-industrial environments	33	FNFW, DKE, NAR, NABau, NATank, NALS
F	EN 61000-6-4	Emissions in industrial environments	29	NVT, NAR, DKE, NABau, NATank
Ergonomic design (NAErg)				
	EN 614-1	Principles for design	148	DKE, NAErg, NARK, NALS
A	EN 614-2	Principles for design - interactions between the design of machinery and work tasks	13	NAErg, NWM,
	EN 547-1	Whole body access into machinery – dimensions	77	FNH, NL, DKE, NALS, NAErg
	EN 547-2	Access openings - dimensions	79	FNFW, FNH, NAEBM, NALS
	EN 547-3	Anthropometric data	68	FNFW, FNH, NAErg, NAEBM, NALS
	EN 1005-1	Human physical performance (terms and definitions)	40	NAErg, NL, NALS
	EN 1005-2	Manual handling of objects	71	NL, FNFW, NBü, NAErg
	EN 1005-3	Force limits for machinery operation	71	NAErg, NL
A	EN 1005-4	Postures and movements	14	NWM, FSF, Textilnorm
L	EN 13861	Guidance for the application of ergonomics standards	2	FNFW, NAErg
E	prEN 14386	Principles of design for mobile machines	--	---
A	EN ISO 7250	Basic human body measurements for technological design	48	FNH, NAErg, FVT, NWM, NL
	EN ISO 14738	Design of workstations at machinery	12	FNLa, NAErg, NAL
Hazardous substances (NASG)				
	EN 626-1	Reduction of risk to health from hazardous substances - principles	53	AWL, Textilnorm, NAL, NATG, NWM
	EN 626-2	Reduction of risk to health from hazardous substances - verification procedures	18	AWL, Textilnorm, NASG, NAL
	EN 1093-1	Airborne hazardous substances; test methods	12	NASG, NAL, NAS
A	EN 1093-3	Airborne hazardous substances; test bench method with given pollutant	8	NASG, NAL, NAS
A	EN 1093-4	Airborne hazardous substances; evaluation - tracer method	4	NASG, NAS
A	EN 1093-6	Airborne hazardous substances; evaluation - separation efficiency by mass - unducted outlet	3	NASG, NAS
A	EN 1093-7	Airborne hazardous substances; evaluation - separation efficiency by mass - ducted outlet	2	NASG, NAS

Code	Standard / draft standard (CEN level)	Subject / area	References in DIN standards committees excluding NAM, e.g. N	
A	EN 1093-8	Airborne hazardous substances; evaluation - concentration parameter - test bench method	2	NASG
A	EN 1093-9	Airborne hazardous substances; evaluation - concentration parameter - room method	2	NASG
A	EN 1093-11	Airborne hazardous substances; evaluation - decontamination index	1	NASG
Hygiene (NAM, NAL)				
	EN ISO 14159	Machinery (general)	2	NAL
C	EN 1672-2	Food processing machinery - basic concepts (note: Type C standard)	67	NAVp, NAL
Noise (NALS)				
L	EN ISO 3740	Determination of sound power levels	58	NÖG, NALS, NARD,
A	EN ISO 3741	Determination of sound power levels - methods for reverberation rooms	59	DKE, NARK, NHRS, FNKä, NALS
A	EN ISO 3743-1	Determination of sound power levels in hard-walled test rooms	93	DKE, NALS
A	EN ISO 3743-2	Determination of sound power levels in special reverberation test rooms	72	DKE, NABau, NALS
	EN ISO 3744	Determination of sound power levels in an essential free field over a reflecting plane (1)	228	NASport, NALS, NAGD, NARK, NAEBM, FNFW, NL, NAL, FAKRA, NKT, FNKä, NAEBM, DKE, NÖG,
A	EN ISO 3745	Determination of sound power levels in anechoic and hemi-anechoic rooms	80	DKE, NALS
A	EN ISO 3746	Determination of sound power levels in an essential free field over a reflecting plane (2)	144	NASport, NALS, NAGD, NARK, NAEBM, FNFW, NL, NAL, FAKRA, NKT, FNKä, NAEBM, DKE, NÖG, NAMed
A	EN ISO 3747	Determination of sound power levels - comparison method	45	NHRS, NALS
	EN ISO 4871	Declaration and verification of values	179	NASport, NALS, NAErg, NKT, FNFW, NL, NAL
A	EN ISO 5136	Determination of sound power radiated by fans etc. - in-duct method	4	NABau, NALS
A	EN ISO 7235	Laboratory measurements on ducted silencers	13	DKE, NABau, NALS, NÖG
A	EN ISO 9614-1	Determination of sound power levels at discrete points	118	FNFW, NARK, NWM, NÖG, NALS
A	EN ISO 9614-3	Determination of sound power levels - scanning method	11	NARK, NWM, NÖG, NALS

Code	Standard / draft standard (CEN level)	Subject / area	References in DIN standards N	Standards committees excluding NAM, e.g.
	EN ISO 11200	Guidelines for the determination of emission sound pressure levels at a work station	36	FNLa, NARK, NALS
A	EN ISO 11201	Measurement of emission sound pressure levels in an essentially free field over a reflecting plane - accuracy Class 2	103	DKE, NAGD, NAEBM, FNFW, NL, NARK, NABau, NWM, Textilnorm, NALS,
A	EN ISO 11202	Measurement of sound pressure levels in situ - accuracy Class 3	100	DKE, NAGD, NAEBM, NARK, NWM, Textilnorm, NALS,
A	EN ISO 11203	Determination of emission sound pressure levels from the sound power level	41	DKE, NAGD, NALS, Textilnorm, NWM,
A	EN ISO 11204	Measurement of emission sound pressure levels - method requiring environmental corrections	95	DKE, NAGD, NWM, NALS
A	EN ISO 11546-1	Determination of sound insulation performances under laboratory conditions	10	FNFW, NWM, NALS, Textilnorm
A	EN ISO 11546-2	Determination of sound insulation performances in situ	10	FNFW, NABau, NALS, Textilnorm
	EN ISO 11688-1	Design of low-noise machinery and equipment - planning	136	FNFW, DKE, NKT, NAEBM, NALS, NAErg
	EN ISO 11688-2	Design of low-noise machinery and equipment - low-noise design	43	FNFW, NL, NALS
	EN ISO 11689	Comparison of noise emission	13	NKT, NALS, NAErg
A	EN ISO 11691	Determination of insertion loss of ducted silencers without flow - laboratory method	13	NAEBM, NABau, NALS, NWM
A	EN ISO 11957	Determination of sound insulation performance of sound protecting cabins	4	NALS
A	EN ISO 12001	Rules for the creation of noise test codes	37	DKE, NALS
Lasers (NAFuO)				
	EN 60825-1	Laser products - safety - classification	110	NASG, NWT, NATG, NVT, NAFuO, NMP, NADENT, NDWK, DKE, FNL
A	EN ISO 11145	Laser equipment - vocabulary and symbols	33	NAS, NAFuO
A	EN ISO 11252	Minimum requirements for documentation of a laser device	2	NAFuO
	EN ISO 11553-1	Laser processing machines - general safety requirements	2	NWM, NAFuO
Vibration (NALS)				
A	EN 1032	Determination of vibration - mobile machinery	9	NAEBM, NL
	EN 1299	Vibration isolation	11	NALS, NAErg
A	EN 28662-1	Measurement of vibrations at the handle - general	34	NALS, NAEBM, NALS, FSF,

Code	Standard / draft standard (CEN level)	Subject / area	References in DIN stan- N	Standards committees excluding NAM, e.g.
A	EN 30326-1	Evaluation of vehicle seat vibration - basic requirements	11	NALS, NAEBM
A	EN ISO 13753	Measurement of the vibration transmissibility of hand-arm vibration	2	NALS
A	EN ISO 20643 (formerly EN 1033)	Evaluation of vibration emission - hand-guided machinery - principles of the procedure	10	NAEBM, NWM, NALS
Safety distances (NAErg, NASG)				
	EN 294	Upper limbs	323	FNFW, NVT, FNH, NAW, NAGas, NASport, NMP, NL, DKE, FNK, NALS, NA-Bau, NWM
	EN 349	Avoidance of crushing	153	FNFW, NVT, NAW, NASport, NMP, NL, NALS
	EN 811	Lower limbs	68	NARK, NL, NASport, DKE,
	EN 999	Approach speed	70	Textilnorm
Control systems (NASG)				
U	EN 954-1	Safety-related parts of control systems - design	263	FNKä, NABau, NKT, NMP, FNCA, FNFW, NL, NAGas, NASG, NATank, DKE, NALS
U	prEN ISO 13849-1	Safety-related parts of control systems - general principles for design (revision of EN 954-1)	20	DKE, NAFuO
U	EN ISO 13849-2	Safety-related parts of control systems - validation	8	NABau
Radiation (NASG)				
	EN 12198-1	Assessment, reduction of risks	11	FNL, NAErg, NASG
	EN 12198-2	Radiation emission measurement procedure	2	NASG
	EN 12198-3	Attenuation/screening	5	FNL, Textilnorm, NASG
Temperatures (NAErg)				
	EN 563	Hot surfaces	177	DKE, FNFW, FNH, NALS, NAErg, NAEBM, NABau, NKT, NAGD,
Generic standards (Type B2 group standards) for safety systems and safety facilities				
Lighting (FNL)				
	EN 1837	Integral lighting of machines	35	FNL, NWM, FSF,

Electrical equipment (DKE)				
	EN 60204-1	General requirements	353	FNFW, NVT, FNH, NAW, NMP, NAMed, NHRS, FNKä, NKT, DKE
A	EN 60335-1	Household appliances - general requirements	283	FNH, NAGas, NHRS, FNKä, NABau, NASport, FNFW
A	EN 60947-5-5	Electrical emergency stop device with mechanical latching function	3	DKE, NABau
Explosion protection (NASG, NATank)				
A	EN 1839	Explosion limits of gases and vapours	---	---
	EN 12874	Flame arresters	6	NASG, NATank, NÖG
	EN 13237	Terms and definitions for equipment and protective systems	1	NASG
	EN 13463-1	Requirements for non-electrical equipment	28	FABERG, NATank, NASG, DKE
	EN 13463-2 (Note: not harmonized)	Flow restricting enclosure	---	---
	EN 13463-3 (Note: not harmonized)	Flameproof enclosure	2	DKE, NASG
	EN 13463-5	Constructional safety of non-electrical devices	6	---
	EN 13463-6 (Note: not harmonized)	Control of ignition source	2	NASG
	EN 13463-8	Liquid immersion	1	NASG
Hydraulic and pneumatic equipment (NAM)				
	EN 982	Hydraulics	191	FNFW, NABau, DKE,
	EN 983	Pneumatics	159	NABau, DKE, NWM,
Protective equipment (NASG)				
	EN 953	Design of guards	190	FNFW, NL, DKE, NÖG,
	EN 1088	Interlocking devices	184	NKT
	EN 61496-1	Electro-sensitive protective equipment	57	NABau, NAErg, DKE
Signals and control actuators (DKE, NAErg)				
	EN 842	Visual danger signals	32	FNLa, FNFW, NAS
	EN 894-1	Interaction with displays and control actuators	66	FNFW, NL, NALS
	EN 894-2	Design of displays	67	FNFW, NALS
	EN 894-3	Design of control actuators	111	FNFW, FNH, NAErg
	EN 981	Auditory/visual systems	25	NAMed, DKE, NL
	EN 61310-1	Visual, auditory, tactile signals - requirements	92	FNFW, NABau
	EN 61310-2	Visual, auditory, tactile signals - marking	58	FNFW, NAErg, DKE
	EN 61310-3	Visual, auditory, tactile signals - actuators; location, operation	8	FNFW, DKE

EN ISO 7731 (replaces EN 457)	Auditory danger signals	51	FNLa, NALS, FNFW, NPS, NL, FSF, DKE, NAS
Control systems (NASG)			
EN 418	Emergency stop equipment	220	FNKä, FNFW, NBF, NA-Bau, DKE, NAW, NKT, NVT, NL, NARK, NASport, NALS
EN 574	Two-hand control devices	67	NKT, NL, NWM
EN 1037	Unexpected start-up	123	NKT, NL, DKE
EN 1760-1	Pressure sensing mats and pressure sensitive floors	47	NABau
EN 1760-2	Pressure sensitive edges and pressure sensitive bars	48	NABau
EN 1760-3	Pressure sensitive bumpers, plates, wires	5	NWM
EN 62061	Electrical/electronic and programmable electronic control systems	3	DKE
Access to / within machines (NAErg, NAM)			
EN 547-1	Whole body access	77	FNH, NL, NALS, DKE, NAErg
EN 547-2	Access openings	79	FNFW, FNH, NL, NALS, NAEBM
EN 547-3	Human body measurements	68	FNFW, FNH, NAEBM, NASport, NAErg, NALS
EN ISO 14122-1	Choice of access between two levels	39	NABau, NWM
EN ISO 14122-2	Working platforms and walkways	41	FNFW, NABau, NARK, DKE,
EN ISO 14122-3	Stairs, stepladders and guard-rails	39	NABau, NKT, NSMT, NATank, DKE, NAErg
EN ISO 14122-4	Fixed ladders	27	DKE

Annex C VDMA list of European Type A and Type B standards

Table 2 contains the essential data from the list of European Type A and Type B machine safety standards, "Sicherheit von Maschinen - Liste von Europäischen Typ-A- und Typ-B-Normen (Sicherheitsgrund- und Sicherheitsfachgrundnormen)", provided by the VDMA (as of July 2004) on its website[4]. A comparable VDMA list with the same update status can also be found in English on one of the CEN websites.

The data from the list are shown in the table in updated form. The updated parts are highlighted. The following data are listed:

- Identifier of the European standard or European draft standard
- Issue date of the current version of the document
- Indication of the group (column G: 1, 2 or 3) to which the document is assigned by the VDMA for internal purposes
- Title of the standard or of the draft standard
- European or international standards committee responsible for drafting the standard
- Indication of whether the standard was issued in response to a mandate (column M: x= mandated)
- Indication of whether the standard has already been published in the Official Journal of the EU (column EU: x= published).

Table 2: Abridged summary of the VDMA list on European Type A and Type B standards, as of July 2004, updated by the authors of the study. The authors' updates are marked in italics. (Update status: September 2005)

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	294	92-06		Safety of machinery - Safety distances to prevent danger zones being reached by the upper limbs	CEN/TC114/WG2	x	x
EN	349	93-04	1	Safety of machinery - Minimum gaps to avoid crushing of parts of the human body	CEN/TC114/WG2	x	x
EN	418	92-10	1	Safety of machinery; emergency stop equipment, functional aspects; principles for design	CEN/TC114	x	x

[4] After this study had gone to press, a new revised version was posted on the Internet by the VDMA. Part V.4 of the revised version corresponds approximately to the previous document.

Annex C VDMA list of European Type A and Type B standards

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	457	92-02	1	Safety of machinery; auditory danger signals; general requirements, design and testing ***(as of 2005-12 replaced by EN ISO 7731)***	CEN/TC122/WG8	x	x
EN	482	94-07	3	Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents	CEN/TC137	-	-
EN	547-1	96-12	1	Safety of machinery - Human body measurements - Part 1: Principles for determining the dimensions required for openings for whole body access into machinery	CEN/TC122/WG1	x	x
EN	547-2	96-12	1	Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings	CEN/TC122/WG1	x	x
EN	547-3	96-12	1	Safety of machinery - Human body measurements - Part 3: Anthropometric data	CEN/TC122/WG1	x	x
EN	563	94-06	1	Safety of machinery - Temperatures of touchable surfaces - Ergonomics data to establish temperature limit values for hot surfaces	CEN/TC122/WG3	x	x
EN	574	96-11	1	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design	CEN/TC114-CLC/TC44x JWG7	x	x
EN	614-1	95-02	1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles	CEN/TC122/WG2	x	x
EN	614-2	00-07	1	Safety of machinery - Ergonomic design principles - Part 2: Interactions between the design of machinery and work tasks	CEN/TC122/WG2	x	x
EN	626-1	94-09	1	Safety of machinery - Reduction of risks to health from hazardous substances emitted by machinery - Part 1: Principles and specifications for machinery manufacturers	CEN/TC114/WG15	x	-
EN	626-2	96-07	1	Safety of machinery - Reduction of risk to health from hazardous substances emitted by machinery - Part 2: Methodology leading to verification procedures	CEN/TC114/WG15	-	-
EN	689	95-02	2	Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy	CEN/TC137	-	-
EN	***764***	***94-07***	***2***	***replaced by the series of standards indicated below***	CEN/TC54	-	-

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	***764-1***	***04-09***	2	Pressure equipment - Terminology - Part 1: Pressure, temperature, volume, nominal size	CEN/TC54	-	-
EN	764-2	02-09	2	Pressure equipment - Part 2: Quantities, symbols and units	CEN/TC54	-	-
EN	764-3	02-09	2	Pressure equipment - Part 3: Definition of parties involved	CEN/TC54	-	-
EN	764-4	02-10	2	Pressure equipment - Part 4: Establishment of technical delivery conditions for metallic materials	CEN/TC54	-	-
EN	764-5	02-10	2	Pressure equipment - Part 5: Compliance and inspection documentation of materials	CEN/TC54	-	-
prEN	764-6	02-04	2	***withdrawn 2004-10***	CEN/TC54	-	-
EN	764-7	02-05	2	Pressure equipment - Part 7: Safety systems for unfired pressure equipment	CEN/TC54	--	-
EN	792-1 to -13	2000-2001	2	Hand-held non-electric power tools - Safety requirements – Part 1 to Part 13	CEN/TC255		x
EN	792-14	95-08	2	Note: Content incorporated in EN 792-1 / -2; reassignment of Parts 14 and Part 15 currently not envisaged	CEN/TC 255	-	-
EN	792-15	95-08	2		CEN/TC255	-	-
EN	811	96-10	1	Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs	CEN/TC114/WG2	x	x
EN	838	95-11	3	Workplace atmospheres - Diffusive samplers for the determination of gases and vapours - Requirements and test methods	CEN/TC137	-	-
EN	842	96-06	1	Safety of machinery - Visual danger signals - General requirements, design and testing	CEN/TC122/WG8	x	x
EN	894-1	97-02	1	Safety of machinery - Ergonomic requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators	CEN/TC122/WG6	x	x
EN	894-2	97-02	1	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays	CEN/TC122/WG6	-	-
EN	894-3	00-03	1	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 3: Control actuators	CEN/TC122/WG6	-	-
prEN	894-4	04-05	1	Safety of machinery - Ergonomic requirements for the design of displays and control actuators - Part 4: Location and arrangement of displays and control actuators	CEN/TC122/WG6	-	-

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	953	97-10	1	Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards	CEN/TC114/WG11	-	-
EN	954-1	96-12	1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (see also prEN ISO 13849-1)	CEN/TC114-CLC/TC44x JWG6	x	x
EN	954-2	99-12	1	withdrawn 2003-10			
CR	954-100	99-08	2	Safety of machinery - Safety-related parts of control systems - Part 100: Guide on the use and application of EN 954-1:1996	CEN/TC114-CLC/TC44x JWG6	-	-
EN	981	96-12	1	Safety of machinery - System of auditory and visual danger and information signals	CEN/TC122/WG8	x	x
EN	982	96-04	1	Safety of machinery - Safety requirements for fluid power systems and their components - Hydraulics	CEN/TC114/WG12	x	x
EN	983	96-04	1	Safety of machinery - Safety requirements for fluid power systems and their components – Pneumatics	CEN/TC114/WG12	x	x
EN	999	98-10	1	Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body	CEN/TC114/WG5	x	x
EN	1005-1	01-10	2	Safety of machinery - Human physical performance - Part 1: Terms and definitions	CEN/TC122/WG4	x	x
EN	1005-2	03-04	2	Safety of machinery - Human physical performance - Part 2: Manual handling of machinery and component parts of machinery	CEN/TC122/WG4	x	x
EN	1005-3	02-01	1	Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation	CEN/TC122/WG4	x	x
EN	1005-4	05-05	2	Safety of machinery - Human physical performance - Part 4: Evaluation of working postures and movements in relation to machinery	CEN/TC122/WG4	x	-
CR	1030-1	95-06	2	Hand-arm vibration - Guidelines for vibration hazards reduction - Part 1: Engineering methods by design of machinery	CEN/TC231/WG2	-	-
CR	1030-2	95-06	2	Hand-arm vibration - Guidelines for vibration hazards reduction - Part 2: Management measures at the workplace	CEN/TC231/WG2	-	-
prEN	1031	93-02	3	withdrawn, Note: published as EN 1032 together with prEN 1032 (95-07)			
EN	1032	03-04	3	Mechanical vibration - Testing of mobile machinery in order to determine the vibration emission value	CEN/TC231/WG1	x	-
EN	***1033***	***95-08***	***3***	***replaced by EN ISO 20643***			

Annex C VDMA list of European Type A and Type B standards

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	1037	95-12	1	Safety of machinery - Prevention of unexpected start-up	CEN/TC114-CLC/TC44x JWG9	x	x
EN	1050	96-11	1	Safety of machinery - Principles for risk assessment	CEN/TC114/WG14	x	x
EN	1070	98-08	1	withdrawn; Note: replaced by EN ISO 12100-1	CEN/TC114/WG10	x	x
EN	1088	95-12	1	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection	CEN/TC114/WG15	x	x
EN	1093-1	98-09	1	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 1: Selection of test methods	CEN/TC114/WG15	x	x
EN	1093-3	96-03	3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 3: Test bench method for the measurement of the emission rate of a given pollutant	CEN/TC114/WG15	x	x
EN	1093-4	98-09	3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 4: Capture efficiency of an exhaust system - Tracer method	CEN/TC114/WG15	x	x
EN	1093-6	98-09	3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 6: Separation efficiency by mass, unducted outlet	CEN/TC114/WG15	x	x
EN	1093-7	98-09	3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 7: Separation efficiency by mass, ducted outlet	CEN/TC114/WG15	x	x
EN	1093-8	98-09	3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 8: Pollutant concentration parameter, test bench method	CEN/TC114/WG15	x	x
EN	1093-9	98-09	3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 9: Pollutant concentration parameter, room method	CEN/TC114/WG15	x	x
EN	1093-11	01-04	3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 11: Decontamination index	CEN/TC114/WG15	x	-
CR	1100	93-09	2	Memorandum on health and safety standardization in support of "new approach" directives; application on the field of machinery (CEN Report 1100)	BT/WG60	-	-
EN	1127-1	97-08	1	Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology	CEN/TC114/WG16 + TC305/WG4	x	x

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	1127-2	02-04	1	Explosive atmospheres - Explosion prevention and protection - Part 2: Basic concepts and methodology for mining	CEN/TC305	x	
EN	1232	97-02	3	Workplace atmospheres - Pumps for personal sampling of chemical agents - Requirements and test methods	CEN/TC137	-	-
EN	1299	97-02	1	Mechanical vibration and shock - Vibration isolation of machines - Information for the application of source isolation	CEN/TC231/WG1	x	x
EN	1540	98-10	2	Workplace atmospheres - Terminology	CEN/TC137	-	-
EN	1672-2	97-03	1	Food processing machinery - Basic concepts - Part 2: Hygiene requirements	CEN/TC153	x	x
EN	1746	98-09	2	Safety of machinery - Guidance for the drafting of the noise clauses of safety standards	CEN/TC211	x	-
EN	1760-1	97-08	1	Safety of machinery - Pressure sensitive protective devices - Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors	CEN/TC114 / CLC/TC44x JWG8	x	x
EN	1760-2	01-03	1	Safety of machinery - Pressure sensitive protective devices - Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars	CEN/TC114 / CLC/TC44x JWG8	x	x
EN	1760-3	04-02	1	Safety of machinery - Pressure sensitive protective devices - Part 3: General principles for the design and testing of pressure sensitive bumpers, plates, wires and similar devices	CEN/TC114 / CLC/TC44x JWG8	x	-
EN	1837	99-02	1	Safety of machinery - Integral lighting of machines	CEN/TC169	x	x
EN	1838	99-04	2	Lighting applications - Emergency lighting	CEN/TC169	-	-
EN	1839	03-09	3	Determination of explosion limits of gases und vapours	CEN/TC305/WG1	x	-
EN	12096	97-07	2	Mechanical vibration - Declaration and verification of vibration emission values	CEN/TC231	-	-
EN	12198-1	00-06	1	Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 1: General principles	CEN/TC114/WG13	x	x
EN	12198-2	02-11	1	Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 2: Radiation emission measurement procedure	CEN/TC114/WG13	x	x

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	12198-3	02-11	1	Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 3: Reduction of radiation by attenuation or screening	CEN/TC114/WG13	x	x
EN	12366	96-04	3	Note: published as a new draft prEN ISO 15744			
EN	12437-4	96-06	1	Note: to be published as EN ISO 14122-4			
EN	12464-1	02-11	2	Light and lighting - Lighting of work places - Part 1: Indoor work places	CEN/TC169	-	-
EN	12619	99-06	3	Stationary source emissions - Determination of the mass concentration of total gaseous organic carbon at low concentrations in flue gases - Continuous flame ionisation detector method	CEN/TC264	-	-
EN	12626	97-02	1	Safety of machinery - Laser processing machines - Safety requirements (ISO 11553:1996 modified) (see also the new prEN ISO 11553: 02-08)	CEN/TC123 + ISO/TC172	x	x
EN	12786	99-08	2	Safety of machinery - Guidance for the drafting of the vibration clauses of safety standards	CEN/TC231	-	-
EN	12874	01-01	1	Flame arresters - Performance requirements, test methods and limits for use	CEN/TC305	x	-
EN	13237	03-06	2	Potentially explosive atmospheres - Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres	CEN/TC305	x	x
EN	13284-1	01-11	3	Stationary source emissions - Determination of low range mass concentration of dust - Part 1: Manual gravimetric method	CEN/TC137	-	-
EN	13463-1	01-11	1	Non-electrical equipment for potentially explosive atmospheres - Part 1: Basic method and requirements	CEN/TC305	x	-
EN	13463-2	02-11	1	Non-electrical equipment intended for use in potentially explosive atmospheres - Part 2: Protection by flow restricting enclosure "fr"	CEN/TC305	x	-
EN	13463-3	02-08	1	Non-electrical equipment for use in potentially explosive atmospheres - Part 3: Protection by flameproof enclosure 'd'	CEN/TC305	x	-
EN	13463-5	03-12	1	Non-electrical equipment intended for use in potentially explosive atmospheres - Part 5: Protection by constructional safety "c"	CEN/TC305	x	-
EN	13463-6	02-08	1	Non-electrical equipment for use in potentially explosive atmospheres - Part 6: Protection by control of ignition source 'b'	CEN/TC305	x	-

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	13463-8	03-09	1	Non-electrical equipment for potentially explosive atmospheres - Part 8: Protection by liquid immersion "k"	CEN/TC305	x	-
EN	13478	01-12	1	Safety of machinery - Fire prevention and protection	CEN/TC114	x	x
EN	13526	01-11	1	Stationary source emissions - Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes - Continuous flame ionisation detector method	CEN/TC264	-	-
EN	13649	01-11	3	Stationary source emissions - Determination of the mass concentration of individual gaseous organic compounds	CEN/TC264	-	-
EN	13673-1	03-04	3	Determination of the maximum explosion pressure and the maximum rate of pressure rise of gases and vapours - Part 1: Determination of the maximum explosion pressure	CEN/TC305	x	-
EN	13673-2	02-07	3	Determination of maximum explosion pressure and maximum explosion pressure rise of gases and vapours - Part 2: Determination of the maximum explosion pressure rise	CEN/TC305	x	-
EN	13821	02-11	1	Determination of minimum ignition energy of dust/air mixtures	CEN/TC305	x	-
CR	13841	00-02	2	Workplace atmospheres - Scientific basis to describe the influence of the reference period on the presentation of exposure data	CEN/TC137	-	-
EN	13861	02-12	2	Safety of machinery - Guidance for the application of ergonomics standards in the design of machinery	CEN/TC122	-	-
EN	14034-1	04-04	3	Determination of the explosion characteristics of dust clouds - Part 1: Determination of the maximum explosion pressure	CEN/TC305	-	-
EN	14034-4	04-04	3	Determination of the explosion characteristics of dust clouds - Part 4: Determination of the limiting oxygen concentration LOC of dust clouds	CEN/TC305	-	-
EN	14042	03-04	2	Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents	CEN/TC137	-	-
EN	14253	03-11	2	Mechanical vibration - Measurement and calculation of occupational exposure to whole- body vibration with reference to health - Practical guidance	CEN/TC231	-	-

Annex C VDMA list of European Type A and Type B standards

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	14386	02-02	1	Safety of machinery - Ergonomic design principles for the operability of mobile machinery	CEN/TC122	x	-
EN	14460	02-04	1	Explosion resistant equipment	CEN/TC305/WG3	x	-
EN	***26385***	***90-06***	***2***	***replaced by ISO 6385:2004-02***	CEN/TC122/WG2	-	-
EN	28662-1	92-10	3	Hand-held portable power tools; measurement of vibrations at the handle; part 1: general (ISO 8662-1:1988)	CEN/TC231/WG2	x	x
EN	30326-1	94-05	2	Mechanical vibration - Laboratory method for evaluating vehicle seat vibration - Part 1: Basic requirements (ISO 10326-1:1992)	CEN/TC231/WG1	x	x
EN	***31252***	***94-04***	***2***	***replaced by EN ISO 11252***			
EN	31253	94-04	2	withdrawn	CEN/TC123	x	x
EN	45020	98-02	2	Standardization and related activities - General vocabulary (ISO/IEC Guide 2:1996)	ISO/IEC	-	-
EN	50144-1	98-05	1	Safety of hand-held electric motor operated tools - Part 1: General requirements	CLC/TC61F	x	x
EN	50178	97-10	1	Electronic equipment for use in power installations	CLC/BTTF 60-1	x	x
EN	60204-1	97-12	1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements	CLC/TC44x	x	x
EN	60204-11	00-11	1	Safety of machinery - Electrical equipment of machines - Part 11: Requirements for HV equipment for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV (IEC 60204-11:2000)	CLC/TC44X	-	-
EN	60335-1	02-10	1	Household and similar electrical appliances - Safety - Part 1: General requirements (IEC 60335-1:2001, modified)	CLC/TC61	x	x
EN	60445	00-02	1	Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system	IEC/TC16	-	-
EN	60446	99-04	1	Basic and safety principles for man-machine interface, marking and identification - Identification of conductors by colours or numerals (IEC 60446:1999)	IEC/TC16	x	x
EN	60529	91-10	1	Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)	IEC/TC70	-	-
EN	60704-1	97-03	1	Household and similar electrical appliances - Test code for the determination of airborne acoustical noise - Part 1: General requirements (IEC 60704-1:1997)	IEC/SC59A CENELEC	-	-

Annex C VDMA list of European Type A and Type B standards

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	60745-1	03-04	1	Hand-held motor-operated electric tools - Safety - Part 1: General requirements	CLC/TC61F	-	-
EN	60825-1	94-03	1	Safety of laser products; part 1: equipment classification, requirements and user's guide (IEC 60825-1:1993 + A2:2001)	CLC/TC76	x	x
EN	60825-4	97-11	1	Safety of laser products - Part 4: Laser guards (IEC 60825-4:1997)	IEC/TC76 CLC/TC76	x	x
EN	60825-5	03-06	2	Safety of laser products - Part 5: Manufacturer's checklist for IEC 60825-1	IEC/TC76	-	-
EN	60825-10	02-02	2	Safety of laser products - Part 10: Application guidelines and explanatory notes to IEC 60825-1	IEC/TC76	-	-
EN	61000-2-4	02-09	2	Electromagnetic compatibility (EMC) - Part 2-4: Environment; Compatibility levels in industrial plants for low-frequency conducted disturbances (IEC 61000-2-4:2002) / Note: Endorsement notice	CLC/TC210 IEC/TC77	-	-
EN	61000-6-1	01-10	1	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards; Immunity for residential, commercial and light-industrial environments (IEC 61000-6-1:1997, modified)	CLC/TC 210	x	x
EN	61000-6-2	01-10	1	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards; Immunity for industrial environments (IEC 61000-6-2:1999, modified)	CLC/TC 210 IEC/TC77	x	x
EN	61000-6-3	01-10	1	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards; Emission standard for residential, commercial and light-industrial environments (IEC 61000-6-3:1996, modified)	CLC/TC 210	x	x
EN	61000-6-4	01-10	1	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards; Emission standard for industrial environments (IEC 61000-6-4:1997, modified)	CLC/TC210	x	x
EN	61029-1	00-02	1	Safety of transportable motor-operated electric tools - Part 1: General requirements	CLC/TC61F	x	x
EN	61310-1	95-03	1	Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, auditory and tactile signals	CLC/TC44x-CEN/TC114/JWG 4	x	x
EN	61310-2	95-03	1	Safety of machinery - Indication, marking and actuation - Part 2: Requirements for marking	CLC/TC44x-CEN/TC114/JWG4	x	x
EN	61310-3	99-04	1	Safety of machinery - Indication, marking and actuation - Part 3: Requirements for the location and operation of actuators	CLC/TC44x-CEN/TC114/JWG4	x	x

Annex C VDMA list of European Type A and Type B standards

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN	61496-1	04-05	1	Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests	IEC/TC44 CLC/TC44x	x	x
prEN	61496-2	05-08	1	IEC 61496-2: Safety of machinery - Electro- sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)	IEC/TC44 CLC/TC44x	x	x
EN	61496-3	01-02	1	Safety of machinery - Electro-sensitive protective equipment - Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR) (IEC 61496-3:2001)	IEC/TC44 CLC/TC44x	-	-
EN ISO	3740	00-11	1	Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards	CEN/TC211 ISO/TC43	-	-
EN ISO	3741	99-08	3	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms	CEN/TC211 ISO/TC43	x	x
EN ISO	3744	95-09	3	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane	CEN/TC211 ISO/TC43	x	x
EN ISO	3746	95-08	3	Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane	CEN/TC211 ISO/TC43	x	x
EN ISO	3747	00-07	3	Acoustics - Determination of sound power levels of noise sources using sound pressure - Comparison method for use in situ	CEN/TC211 ISO/TC43	x	x
EN ISO	4871	96-12	1	Acoustics - Declaration and verification of noise emission values of machinery and equipment	CEN/TC211 ISO/TC43	x	x
EN ISO	5349-1	01-08	2	Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 1: General requirements	CEN/TC231 ISO/TC108/SC 4	x	-
EN ISO	5349-2	01-08	2	Mechanical vibration - Measurement and evaluation of human exposure to hand-transmitted vibration - Part 2: Practical guidance for measurement at the workplace	CEN/TC231 ISO/TC108/SC 4	x	-
EN ISO	7250	97-07	2	Basic human body measurements for technological design	CEN/TC122/WG1	x	x

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN ISO	9614-1	95-04	3	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points	CEN/TC211 ISO/TC43	x	x
EN ISO	9614-2	96-08	3	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning	CEN/TC211 ISO/TC43	x	-
EN ISO	9614-3	02-11	3	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 3: Precision method for measurement by scanning	CEN/TC211 ISO/TC43	-	-
EN ISO	11064-1	00-12	2	Ergonomic design of control centres - Part 1: Principles for the design of control centres	CEN/TC122 ISO/TC159	-	-
EN ISO	11064-2	00-12	2	Ergonomic design of control centres - Part 2: Principles for the arrangement of control suites	CEN/TC122	x	-
EN ISO	11064-3	99-12	2	Ergonomic design of control centres - Part 3: Control room layout	CEN/TC122	x	-
EN ISO	***11064-4***	***04-07***	2	Ergonomic design of control centres - Part 4: Layout and dimensions of workstations	CEN/TC122	-	-
EN ISO	***11064-6***	***05-07***	2	Ergonomic design of control centres - Part 6: Environmental requirements for control centres	CEN/TC122	-	-
prEN ISO	***11064-7***	***04-09***	***3***	***Ergonomic design of control centres - Part 7: Principles for the evaluation of control centres***	CEN/TC122	-	-
EN ISO	11145	01-11	2	Optics and optical instruments - Lasers and laser-related equipment - Vocabulary and symbols	CEN/TC123	x	x
EN ISO	11200	95-12	1	Acoustics - Noise emitted by machinery and equipment - Guidelines for the use of basic standards for the determination of emission sound pressure levels at a work station and at other specified positions	CEN/TC211 ISO/TC43	x	x
EN ISO	11201	95-12	3	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Engineering method in an essentially free field over a reflecting plane	CEN/TC211 ISO/TC43	x	x
EN ISO	11202	95-12	3	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Survey method in situ	CEN/TC211 ISO/TC43	x	x

Annex C VDMA list of European Type A and Type B standards

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN ISO	11203	95-12	3	Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level	CEN/TC211 ISO/TC43	x	x
EN ISO	11204	95-12	3	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Method requiring environmental corrections	CEN/TC211 ISO/TC43	x	x
EN ISO	11205	03-12	3	Acoustics - Noise emitted by machinery and equipment - Engineering method for the determination of emission sound pressure levels in situ at the work station and at other specified positions using sound intensity	CEN/TC211 ISO/TC43	-	-
EN ISO	11252	04-03	2	Lasers and laser-related equipment - Laser device - Minimum requirements for documentation	CEN/TC123 ISO/TC172	x	-
EN ISO	11546-1	95-12	3	Acoustics - Determination of sound insulation performances of enclosures - Part 1: Measurements under laboratory conditions (for declaration purposes)	CEN/TC211 ISO/TC43	x	x
EN ISO	11546-2	95-12	3	Acoustics - Determination of sound insulation performances of enclosures - Part 2: Measurements in situ (for acceptance and verification purposes)	CEN/TC211 ISO/TC43	x	x
EN ISO	***11553-1***	***05-00***	1	Safety of machinery - Laser processing machines - Safety requirements	CEN/TC172 ISO/TC172	x	-
EN ISO	11688-1	98-06	1	Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning	CEN/TC211 ISO/TC43	x	x
EN ISO	11688-2	00-12	3	Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 2: Introduction to the physics of low-noise design	CEN/TC211 ISO/TC43	-	-
EN ISO	11689	96-12	1	Acoustics - Procedure for the comparison of noise emission-data for machinery and equipment	CEN/TC211 ISO/TC43	-	-
EN ISO	11690-1	96-11	2	Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 1: Noise control strategies	CEN/TC211 ISO/TC43	-	-
EN ISO	11690-2	96-11	2	Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 2: Noise control measures	CEN/TC211 ISO/TC43	-	-

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN ISO	11690-3	98-11	2	Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 3: Sound propagation and noise prediction in workrooms	CEN/TC211 ISO/TC43		
EN ISO	12001	96-12	2	Acoustics - Noise emitted by machinery and equipment - Rules for the drafting and presentation of a noise test code	CEN/TC211 ISO/TC43	x	x
EN ISO	12100-1	03-11	1	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology	CEN/TC114/WG1	x	-
EN ISO	12100-2	03-11	1	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles	CEN/TC114/WG1	x	x
EN ISO	13090-1	98-06	2	Mechanical vibration and shock - Guidance on safety aspects of tests and experiments with people - Part 1: Exposure to whole-body mechanical vibration and repeated shock	CEN/TC231 ISO/TC108	-	-
prEN ISO	13732-1	***04-04***	***1***	***Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces***	CEN/TC122/WG3	x	-
prEN ISO	13732-3	***05-02***	***1***	***Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces***	CEN/TC122	x	x
prEN ISO	13849-1	04-04	1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design	CEN/TC114/WG6	x	
EN ISO	13849-2	03-08	1	Safety of machinery - Safety-related parts of control systems - Part 2: Validation	CEN/TC114/WG6	x	x
EN ISO	14122-1	01-05	1	Safety of machinery - Permanent means of access to machinery - Part 1: Choice of a fixed means of access between two levels	CEN/TC114/WG17	x	x
EN ISO	14122-2	01-05	1	Safety of machinery - Permanent means of access to machinery - Part 2: Working platforms and walkways	CEN/TC114/WG17	x	x
EN ISO	14122-3	01-05	1	Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guard-rails	CEN/TC114/WG17	x	x
EN ISO	14122-4	02-11	1	Safety of machinery - Permanent means of access to machinery - Part 4: Fixed ladders	CEN/TC114/WG 17	x	-
EN ISO	14159	04-02		Safety of machinery - Hygiene requirements for the design of machinery	CEN/TC114/ ISO/TC43	-	-
EN ISO	14163	98-10	2	Acoustics - Guidelines for noise control by silencers	CEN/TC211 ISO/TC43	-	-

Annex C VDMA list of European Type A and Type B standards

Standard / draft standard (CEN level)		Date of issue	G	Title	Committee	M	EU
EN ISO	14738	02-09	1	Safety of machinery - Anthropometric requirements for the design of workstations at machinery	CEN/TC122 ISO/TC159	x	-
EN ISO	15536-1	***05-00***	1	Ergonomics - Computer manikins and body templates - Part 1: General requirements	CEN/TC122/WG1	x	-
EN ISO	15667	00-05	2	Acoustics - Guidelines for noise control by enclosures and cabins	CEN/TC211 ISO/TC43	-	-
EN ISO	15744	02-03	3	Hand-held non-electric power tools - Noise measurement code - Engineering method (grade 2)	CEN/TC211 ISO/TC43	x	-
CEN Guide 414		04-11	2	Safety of machinery - Rules for the drafting and presentation of safety standards	CEN/TC114/WG4	x	-
CLC/R 044-001 (CENELEC-Report)		99-02	1	Safety of machinery - Guidance and recommendations for the avoidance of hazards due to static electricity	CLC/TC44X	-	-
CLC/R 061-001 (CENELEC-Report)		00-07	1	Safety of household and similar electrical appliances - Interpretation statements related to European Standards within the scope of CENELEC/TC 61	CLC/TC61	-	-

Annex D Sample analysis of the standards referenced in DIN EN ISO 11553-1:2005

Table 3 reproduces by way of example the results of an analysis of DIN EN ISO 11553-1:2005-05: "Safety of machinery - Laser processing machines - Part 1: General safety requirements" for standards indicated in the PERINORM database as being cross-referenced within it. DIN EN ISO 11553-1:2005-05 was adopted only recently. A study was performed of where in DIN EN ISO 11553-1:2005-05 the standards indicated in the PERINORM database were cited. The standards cited were also checked for their up-to-dateness.

The analysis showed that substantially more standards are listed in DIN EN ISO 11553-1:2005-05 under bibliographical references than in the normative references. In addition, no reference is made throughout the entire text of the standard to some of the standards indicated under bibliographical references. These standards are shown separately.

In certain further cases, the references are not correct. The footnotes indicate errors in the references to the standards.

Table 3: Sample analysis of DIN EN ISO 11553-1:2005 with regard to the standards cited in it (update status: September 2005)

The standards indicated in the PERINORM database as being cross-referenced are listed in DIN EN ISO 11553-1:2005-05 under			
Normative references	National annex NA (informative) Bibliographical references[5]	Bibliographical references	
		With reference from the text of the standard	Without reference from the text of the standard
ISO 3864:1984 [6]	**DIN 4844-3** [7]	ISO 2631-1:1997	ISO 11145:2001
ISO 11252:2004	DIN EN 31252	IEC 60601-222:1992	ISO 13850:1996
ISO 12100-1:2003	**DIN EN 292-1** [8]	EN 165:1995	IEV:1992
ISO 12100-2:2003	**DIN EN 292-2**	EN 166:2001	EN 1070:1998
ISO 13849-1:1999	DIN EN 954-1	EN 167:2001	
ISO 14118:2000	DIN EN 1037	EN 168:2001	
ISO 14119:1998	DIN EN 1088	EN 169:2002	
IEC 60204-1:2001	DIN EN 60204-1	EN 170:2002	
IEC 60825-1:2001	DIN EN 60825-1	EN 171:2002	
IEC 60825-4:1997	DIN EN 60825-4	EN 207:1998	
		EN 208:1998	
		EN 563:1994	
		EN 1050:1996	

5 The national annex NA lists the standards in undated form; the PERINORM database by contrast lists them in dated form.

6 At the time of adoption of DIN EN ISO 11443-1:2005-05, the standard ISO 3864:1984 (Safety colours and safety signs) was no longer up to date. It had already been withdrawn in May 2002 and replaced by ISO 3864-1:2002 (Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs in workplaces and public areas) and ISO 7010:2003 (Graphical symbols - Safety colours and safety signs - Safety signs used in workplaces and public areas).

Annex D Sample analysis of the standards referenced in DIN EN ISO 11553-1:2005

[7] The standard cited in the national annex is incorrect. The German equivalent for ISO 3864-1:2002 (and not for ISO 3864:1984) is DIN 4844-**1** (Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs in workplaces and public areas), and not DIN 4844-**3** (Safety marking - Part 3: Escape- and rescueplan).

[8] In the national foreword, the international standards ISO/TR 12100-1 and -2 are listed with the corresponding German standards DIN EN 292-1 and -2. These had all already ceased to be valid at this point, however. Standards ISO 12100-1 and -2 should have been listed instead, with the corresponding German standards DIN EN ISO 12100-1 and -2. The corresponding standards in the national informative annex NA are likewise incorrect.

Annex E Further potential cross-sectional standards of relevance to occupational health and safety

Standards are listed below which are referred to in the area of machine safety despite not having been specifically drafted for this area, and which are regarded as being suitable as further cross-sectional standards of relevance to occupational health and safety.

Table 4 shows the result of searches for standards of relevance to occupational health and safety which are cited in Type A, B and C standards in the area of machinery standardization. The number of DIN standards in which these standards were cited was also determined. At the same time, an attempt was made to consider the respective preceding versions, as for example in the case of EN ISO 6385 and EN ISO 7250 (for which prEN 26385 and prEN 979 respectively were also considered).

The significance and influence of the cited standard should not be judged by this figure alone, however. On the one hand, a great many standards exist which are relatively new and are not preceded by any other document; on the other, the influence of a standard varies according to the status of the standard in which it is cited. An example of this is the ISO 10075 series of standards governing mental work-load. This series of standards was developed only in recent years, and has now been included, together with a large number of safety standards, in the bibliographical references section of Type A standard EN ISO 12100-2, "Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles". A reference made at this level to a standard has a greater effect than a reference made in a Type C standard.

Table 4: Overview of standards of relevance to occupational health and safety which are cited in the Type A, Type B and Type C standards in the area of machine safety standardization despite the fact that they were not specifically drafted for this area, and the number (N) of references made in current DIN standards to the standard concerned. (Update status: December 2005)

Standard / draft standard (CEN level)		Title	N
EN	12665	Light and lighting - Basic terms and criteria for specifying lighting requirements	20
EN	27243	Hot environments; estimation of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature)	7
EN	60073	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators	41
EN	60447	Basic and safety principles for man-machine interface - Marking and identification - Actuating principles	17
EN	62079	Preparation of instructions - Structuring, content and presentation	11
EN	27574 -1	Acoustics; statistical methods for determining and verifying stated noise emission values of machinery and equipment; part 1: general considerations and definitions	24

Annex E Further potential cross-sectional standards of relevance to occupational safety and health

Standard / draft standard (CEN level)		Title	N
EN	27574 -2	Acoustics; statistical methods for determining and verifying stated noise emission values of machinery and equipment; part 2: methods for stated values for individual machines	15
EN	27574 -3	Acoustics; statistical methods for determining and verifying stated noise emission values of machinery and equipment; part 3: simple (transition) method for stated values for batches of machines	11
EN ISO	6385	Ergonomic principles in the design of work systems	19
EN ISO	7730	Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria	19
EN ISO	7779	Acoustics - Measurement of airborne noise emitted by information technology and telecommunications equipment	14
EN ISO	7933	Ergonomics of the thermal environment - Analytical determination and interpretation of heat stress using calculation of the predicted heat strain	8
EN ISO	9241 -5	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 5: Workstation layout and postural requirements	14
EN ISO	9241 -10	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 10: Dialogue principles	12
EN ISO	9611	Acoustics - Characterization of sources of structure- borne sound with respect to sound radiation from connected structures - Measurement of velocity at the contact points of machinery when resiliently mounted	8
EN ISO	9921	Ergonomics - Assessment of speech communication	3
EN ISO	10075 -1	Ergonomic principles related to mental work-load - Part 1: General terms and definitions	7
EN ISO	10075 -2	Ergonomic principles related to mental workload - Part 2: Design principles	5
EN ISO	13850	Safety of machinery – Emergency stop – Principles for design	20
EN ISO	14163	Acoustics - Guidelines for noise control by silencers	10
EN ISO	15667	Acoustics - Guidelines for noise control by enclosures and cabins	5
ISO	7000	Graphical symbols for use on equipment - Index and synopsis	167
ISO/ ISO	8995 8995/ CIE S008	Principles of visual ergonomics; the lighting of indoor work systems (ISO TC 159) Lighting of indoor work places (ISO TC 169)	7 + 4

The majority of Type A and B standards were developed some time in the past. Since then, further standards have been developed which may be of relevance to this system of standards. These will probably be considered at the next revision of the standard concerned. Table 5 lists examples of standards and draft standards which may be regarded as possible cross-sectional standards relevant to occupational health and safety. This table contains no information on the cross references.

Annex E Further potential cross-sectional standards of relevance to occupational safety and health

Table 5: Overview of further standards and draft standards of European or international origin which are of relevance to occupational health and safety and which may be considered as cross-sectional standards (update status: December 2005)

Standard / draft standard (CEN level)		Title
EN	340	Protective clothing - General requirements
EN	482	Workplace atmospheres – General requirements for the performance of procedures for the measurement of chemical agents
EN	1540	Workplace atmospheres – Terminology
EN	12464-1	Light and lighting - Lighting of work places - Part 1: Indoor work places
prEN	12464-2	Light and lighting - Lighting of work places - Part 2: Outdoor work places
EN	12786	Safety of machinery - Guidance for the drafting of the vibration clauses of safety standards
EN	13202	Ergonomics of the thermal environment - Temperatures of touchable hot surfaces - Guidance for establishing surface temperature limit values in production standards with the aid of EN 563
EN	14042	Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents
EN	14253	Mechanical vibration - Measurement and calculation of occupational exposure to whole- body vibration with reference to health – Practical guidance
EN	14255-1	Measurement and assessment of personal exposures to incoherent optical radiation - Part 1: Ultraviolet radiation emitted by artificial sources in the workplace
EN	14255-2	Measurement and assessment of personal exposures to incoherent optical radiation - Part 2: Visible and infrared radiation emitted by artificial sources in the workplace
EN	14386	Safety of machinery - Ergonomic design principles for the operability of mobile machinery
EN	29241-2	Ergonomic requirements for office work with visual display terminals (VDTs); part 2: guidance on task requirements
EN	29241-3	Ergonomic requirements for office work with visual display terminals (VDTs); part 3: visual display requirements
EN	30326-1	Mechanical vibration - Laboratory method for evaluating vehicle seat vibration - Part 1: Basic requirements
EN	50274	Low-voltage switchgear and controlgear assemblies - Protection against electric shock - Protection against unintentional direct contact with hazardous live parts
EN ISO	7726	Ergonomics of the thermal environment - Instruments for measuring physical quantities
EN ISO	7731	Ergonomics - Danger signals for public and work areas - Auditory danger signals
EN ISO	8996	Ergonomics of the thermal environment - Determination of metabolic rate
EN ISO	9241-1	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 1: General introduction
EN ISO	9241-4	Ergonomic requirements for office work with visual display terminals (VDTs) – Part 4: Keyboard requirements

Annex E Further potential cross-sectional standards of relevance to occupational safety and health

Standard / draft standard (CEN level)		Title
EN ISO	9241-6	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 6: Guidance on the work environment
EN ISO	9241-7	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 7: Requirements for display with reflections
EN ISO	9241-8	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 8: Requirements for displayed colours
EN ISO	9241-9	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 9: Requirements for non-keyboard input devices
EN ISO	9241-11	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 11: Guidance on usability
EN ISO	9241-12	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 12: Presentation of information
EN ISO	9241-13	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 13: User guidance
EN ISO	9241-14 to 9241-17	Ergonomic requirements for office work with visual display terminals (VDTs) – Parts 14-17 various dialogues
EN ISO	9886	Ergonomics - Evaluation of thermal strain by physiological measurements
EN ISO	9920	Ergonomics of the thermal environment - Estimation of the thermal insulation and evaporative resistance of a clothing ensemble
EN ISO	10075-3	Ergonomic principles related to mental workload - Part 3: Principles and requirements concerning methods for measuring and assessing mental workload
EN ISO	10551	Ergonomics of the thermal environment - Assessment of the influence of the thermal environment using subjective judgement scales
EN ISO	11064-1 to 11064-7	Ergonomic design of control centres - Part 1 to Part 7
ENV ISO 11079	11079	Evaluation of cold environments - Determination of required clothing insulation (IREQ)
EN ISO	11399	Ergonomics of the thermal environment - Principles and application of relevant International Standards
EN ISO	13406-1	Ergonomic requirements for work with visual display based on flat panels - Part 1: Introduction
EN ISO	13406-2	Ergonomic requirements for work with visual displays based on flat panels - Part 2: Ergonomic requirements for flat panel displays
EN ISO	13407	Human-centred design processes for interactive systems
EN ISO	13731	Ergonomics of the thermal environment - Vocabulary and symbols
EN ISO	13732-1	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces
EN ISO	13732-3	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces
EN ISO	14505-3	Ergonomics of the thermal environment - Evaluation of the thermal environment in vehicles - Part 3: Evaluation of thermal comfort using human subjects
EN ISO	14915-1	Software ergonomics for multimedia user interfaces - Part 1: Design principles and framework
EN ISO	14915-2	Software ergonomics for multimedia user interfaces - Part 2: Multimedia navigation and control

Annex E Further potential cross-sectional standards of relevance to occupational safety and health

Standard / draft standard (CEN level)		Title
EN ISO	15005	Road vehicles - Ergonomic aspects of transport information and control systems - Dialogue management principles and compliance procedures
EN ISO	15006	Road vehicles - Ergonomic aspect of transport information and control systems - Specification and compliance procedures for in-vehicle auditory presentation
EN ISO	15007-1	Road vehicles - Measurement of driver visual behaviour with respect to transport information and control systems - Part 1: Definitions and parameters
EN ISO	15265	Ergonomics of the thermal environment - Risk assessment strategy for the prevention of stress or discomfort in thermal working conditions
EN ISO	15535	General requirements for establishing anthropometric databases
EN ISO	15536-1	Ergonomics - Computer manikins and body templates - Part 1: General requirements
EN ISO	15536-2	Ergonomics - Computer manikins and body templates - Part 2: Verification of functions and validation of dimensions for computer manikin systems
EN ISO	15537	Principles for selecting and using test persons for testing anthropometric aspects of industrial products and designs
EN ISO	15743	Ergonomics of the thermal environment - Cold workplaces - Risk assessment and management
EN ISO	15831	Clothing - Physiological effects - Measurement of thermal insulation by means of a thermal manikin
EN ISO	16201	Technical aids for disabled persons - Environmental control systems for daily living
EN ISO	17287	Road vehicles - Ergonomic aspects of transport information and control systems - Procedure for assessing suitability for use while driving

Annex F Overview of the standards governing lifting platforms drafted in CEN/TC 98 and of the Type A/B standards cited in them

Table 6: TC 98 - lifting platforms - overview of the standards cited in the relevant machine safety standards. The cited Type A and Type B standards are highlighted. These standards are all cited in the form of normative references.

EN 280: 2001	EN 1398: 1997	EN 1493: 1998	EN 1494: 2000	EN 1495: 1998	EN 1570: 1998	EN 17561: 2002	EN 1808: 1999
DIN 15019-2 (1979-06)	DIN VDE 0100-410 (1997-01)	DIN VDE 0470-1 (1992-11)	EN 292-1 (1991-09)	DIN 3990-1 (1987-12)	DIN 8187-1 (1996-03)	EN 292-1 (1991-09)	DIN VDE 0470-1 (1992-11)
DIN 15020-2 (1974-04)	DIN VDE 0100-470 (1996-02)	DIN VDE 0660-200 (1992-07)	EN 292-2 (1991-09)	DIN 3990-2 (1987-12)	DIN 15020-1 (1974-02)	EN 292-2 (1991-09)	prEN 280 (1998-06)
EN 81-1 (1998-08)	DIN VDE 0470-1 (1992-11)	EN 292-1 (1991-09)	EN 349 (1993-04)	DIN 3990-3 (1987-12)	DIN 15020-2 (1974-04)	EN 292-2/A1 (1995-03)	EN 292-1 (1991-09)
EN 81-2 (1998-08)	DIN VDE 0660-102 (1992-07)	EN 292-2 (1991-09)	EN 811 (1996-10)	DIN 3990-5 (1987-12)	DIN VDE 0470-1 (1992-11)	EN 294 (1992-06)	EN 292-2 (1991-09)
EN 292-1 (1991-09)	DIN VDE 0660-109 (1992-05)	**EN 414** [9] (1992-02)	EN 954-1 (1996-12)	DIN 15018-1 (1984-11)	DIN VDE 0660-200 (1992-07)	EN 349 (1993-04)	EN 294 (1992-06)
EN 292-2 (1991-09)	EN 292-1 (1991-09)	EN 418 (1992-10)	EN 1070 (1998-08)	DIN 15018-3 (1984-11)	EN 292-1 (1991-09)	EN 414 [10] (2000-04)	EN 418 (1992-10)
EN 292-2/A1 (1995-03)	EN 292-2 (1991-09)	EN 954-1 (1996-12)	EN 60204-32 (1998-10)	DIN VDE 0470-1 (1992-11)	EN 292-2 (1991-09)	EN 457 (1992-02)	EN 614-1 (1995-02)
EN 349 (1993-04)	EN 292-2/A1 (1995-03)	EN 982 (1996-04)	EN 60947-5-1 (1997-11)	DIN VDE 0660-200 (1992-07)	EN 294 (1992-06)	EN 574 (1996-11)	EN 954-1 (1996-12)
EN 418 (1992-10)	EN 294 (1992-06)	EN 983 (1996-04)	EN 61496-1 (1997-12)	EN 292-1 (1991-09)	EN 349 (1993-04)	EN 811 (1996-10)	EN 982 (1996-04)
EN 528 (1996-08)	EN 349 (1993-04)	prEN 1760-2 (1996-07)	EN ISO 4871 (1996-12)	EN 292-2 (1991-09)	**EN 414** [11] (1992-02)	EN 954-1 (1996-12)	EN 983 (1996-04)

9 According to the provisions governing standardization, EN 414 should not be cited under the normative references. These provisions did not take effect until after the appearance of this standard, however.

10 EN 414 is cited correctly under the bibliographical references in this case.

11 According to the provisions governing standardization, EN 414 should not be cited under the normative references. These provisions did not take effect until after the appearance of this standard, however.

Annex F Overview of the standards governing lifting platforms drafted in CEN/TC 98 and of the Type A/B standards cited in them

EN 280: 2001	EN 1398: 1997	EN 1493: 1998	EN 1494: 2000	EN 1495: 1998	EN 1570: 1998	EN 17561: 2002	EN 1808: 1999
EN 1070 (1998-08)	EN 418 (1992-10)	EN 10025 (1990-03)	EN ISO 11201 (1995-12)	EN 292-2/A1 (1995-03)	EN 418 (1992-10)	EN 982 (1996-04)	EN 1050 (1996-11)
EN 1495 (1997-09)	prEN 954-1 (1996-03)	EN 60204-1 (1992-10)		EN 294 (1992-06)	EN 563 (1994-06)	EN 1005-3 (2002-01)	EN 60204-1 (1992-10)
EN 1570 (1998-05)	prEN 982 (1996)	EN 60529 (1992)		EN 349 (1993-04)	EN 811 (1996-10)	EN 1050 (1996-11)	EN 60529 (1991-10)
prEN 1726-2 (1999-12)	prEN 983 (1996)	EN 60947-5-1 (1991-10)		EN 418 (1992-10)	EN 954-1 (1996-12)	EN 61310-1 (1995-03)	EN 60947-5-1 (1991-10)
prEN 1756-1 (1994-12)	EN 60204-1 (1992-10)			EN 614-1 (1995-02)	EN 982 (1996-04)	EN ISO 14122-2 (2001-05)	
prEN 1756-2 (1997-08)	EN 60529 (1991-10)			EN 953 (1997-10)	EN 983 (1996-04)	ISO 7000 (1989-11)	
prEN 1777 (1994-12)	EN 60947-4-1 (1991			prEN 954-1 (1996-03)	EN 1088 (1995-12)		
EN 1808 (1999-03)				prEN 982 (1996)	EN 1760-1 (1997-08)		
prEN 1915-1 (1995-05)				EN 60065 (1993-09)	EN 45014 (1998-02)		
prEN 1915-2 (1995-05)				EN 60204-1 (1992-10)	EN 60204-1 (1992-10)		
prEN 12159 (1995-09)				EN 60529 (1991-10)	EN 60529 (1991-10)		
EN 60204-1 (1997-12)				EN 60947-5-1 (1991-10)	EN 60947-5-1 (1997-11)		
EN 60529 (1991-10)				ISO 4301-1 (1986-06)	ISO 606 (1994-02)		
EN 60947-5-1 (1997-11)				ISO 4302 (1989)	ISO 2408 (1985-12)		
ISO 2408 (1985-12)				ISO 6336-1 (1996-05)	ISO 4301-1 (1986-06)		
ISO 3864 (1984-03)				ISO 6336-2 (1996-06)	ISO 4308-1 (1986-05)		
ISO 4301-4 (1989-09)				ISO 6336-3 (1996-06)	ISO 4308-2 (1988-06)		

Annex F Overview of the standards governing lifting platforms drafted in CEN/TC 98 and of the Type A/B standards cited in them

EN 280: 2001	EN 1398: 1997	EN 1493: 1998	EN 1494: 2000	EN 1495: 1998	EN 1570: 1998	EN 17561: 2002	EN 1808: 1999
ISO 4302 (1981-05) ISO 4305 (1991-05) ISO 4308-2 (1988-06) ISO 4309 (1990-08) ISO 8087 (1985-08)				ISO 6336-5 (1996-06) ISO 8686-1 (1989-11)			

Annex G Example of inappropriate or incorrect dating in references

The EN 1005 series of standards comprises five parts, four of which have been published to date. As described below, references are made to Type A standards in different ways in the Terms and definitions section of the individual parts of the standards series. The reasons for this are only partly clear. Differences exist for example between the relevant provisions of the EN 414 standard and of CEN Guide 414.

Parts 1-3 of the series of standards refer in Section 3, "Terms and definitions", of their current version to the EN 1070 terminology standard as follows:

- EN 1005 Part 1:2001: "For the purposes of this European Standard, the terms and definitions given in EN 1070 together with the following apply"
  EN 1070 is indicated in this case only in undated form, under the bibliographical references. The undated reference is consistent with the requirements valid at the time (EN 414:2000); this is not the case for the assignment to the bibliographical references. The standard should have been indicated under the normative references.
- EN 1005 Part 2:2003: "For the purpose of this European Standard, the terms and definitions given in EN 1005-1:2001 and EN 1070:1998 apply"
  The section "Normative References" also contains a dated normative reference to EN 1005-1:2001 and to EN 1070:1998. Although beneficial from the current perspective, dating is not consistent with the requirements applicable at the time (EN 414:2000). The standards should have been undated.
- EN 1005 Part 3: 2002: "For the purposes of this European Standard, the terms and definitions given in EN 614-1, EN 1005-1:2005 and EN 1070 apply."
  Accordingly, the Section "Normative References" contains an undated normative reference to EN 614-1 and EN 1070 and a dated reference to EN 1005:2001. This is consistent with the requirements in force at the time (EN 414).

Part 4 of the series of standards was also adopted recently. Since the concepts formerly defined in DIN EN 1070 are now defined in DIN EN ISO 12100-1, reference is made to this standard as follows:

- EN 1005 Part 4:2005: "For the purposes of this European Standard, the terms and definitions given in EN 1005-1:2001 and EN ISO 12100-1:2003 apply."
  The section "Normative References" accordingly contains a dated normative reference to EN 1005-1:2002 and to EN ISO 12100-1:2003.
  Since the EN 414 standard has now been replaced by CEN Guide 414, the relevant requirements of the latter apply. The guide requires dated references to the relevant Type A standards.

Annex H Complete overview of identified possible cross-sectional standards of relevance to occupational health and safety

Table 7 contains a complete list of the standards identified as potential cross-sectional standards of relevance to occupational health and safety. The table summarizes Tables 1, 2, 4 and 5. The list makes no claim to completeness. It covers only standards of European or international origin; standards of national origin are not listed.

Table 7: Overview of standards and draft standards of European or international origin which are of relevance to occupational health and safety and which may potentially be regarded as cross-sectional standards (update status: December 2005)

Standard / draft standard (CEN level)		Title
EN	294	Safety of machinery - Safety distance to prevent danger zones being reached by the upper limbs
EN	340	Protective clothing – General requirements
EN	349	Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
EN	418	Safety of machinery; emergency stop equipment, functional aspects; principles for design
EN	457	Safety of machinery; auditory danger signals; general requirements, design and testing
EN	482	Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents
EN	547-1	Safety of machinery - Human body measurements - Part 1: Principles for determining the dimensions required for openings for whole body access into machinery
EN	547-2	Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings
EN	547-3	Safety of machinery - Human body measurements - Part 3: Anthropometric data
EN	563	Safety of machinery - Temperatures of touchable surfaces - Ergonomics data to establish temperature limit values for hot surfaces
EN	574	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design
EN	614-1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
EN	614-2	Safety of machinery - Ergonomic design principles - Part 2: Interactions between the design of machinery and work tasks
EN	626-1	Safety of machinery - Reduction of risks to health from hazardous substances emitted by machinery - Part 1: Principles and specifications for machinery manufacturers

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Standard / draft standard (CEN level)		Title
EN	626-2	Safety of machinery - Reduction of risk to health from hazardous substances emitted by machinery - Part 2: Methodology leading to verification procedures
EN	689	Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy
EN	764-1	Pressure equipment - Terminology - Part 1: Pressure, temperature, volume, nominal size
EN	764-2	Pressure equipment - Part 2: Quantities, symbols and units
EN	764-3	Pressure equipment - Part 3: Definition of parties involved
EN	764-4	Pressure equipment - Part 4: Establishment of technical delivery conditions for metallic materials
EN	764-5	Pressure equipment - Part 5: Compliance and inspection documentation of materials
EN	764-7	Pressure equipment - Part 7: Safety systems for unfired pressure equipment
EN	792-1 to -13	Hand-held non-electric power tools - Safety requirements – Part 1-13
EN	811	Safety of machinery - Safety distances to prevent danger zones being reached by the lower limbs
EN	838	Workplace atmospheres - Diffusive samplers for the determination of gases and vapours - Requirements and test methods
EN	842	Safety of machinery - Visual danger signals - General requirements, design and testing
EN	894-1	Safety of machinery - Ergonomic requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators
EN	894-2	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays
EN	894-3	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 3: Control actuators
EN	894-4	Safety of machinery - Ergonomic requirements for the design of displays and control actuators - Part 4: Location and arrangement of displays and control actuators
EN	953	Safety of machinery - Guards - General requirements for the design and construction of fixed and movable guards
EN	954-1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
CR	954-100	Safety of machinery - Safety-related parts of control systems - Part 100: Guide on the use and application of EN 954-1:1996
EN	981	Safety of machinery - System of auditory and visual danger and information signals
EN	982	Safety of machinery - Safety requirements for fluid power systems and their components - Hydraulics
EN	983	Safety of machinery - Safety requirements for fluid power systems and their components - Pneumatics
EN	999	Safety of machinery - The positioning of protective equipment in respect of approach speeds of parts of the human body

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Standard / draft standard (CEN level)		Title
EN	1005-1	Safety of machinery - Human physical performance - Part 1: Terms and definitions
EN	1005-2	Safety of machinery - Human physical performance - Part 2: Manual handling of machinery and component parts of machinery
EN	1005-3	Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation
EN	1005-4	Safety of machinery - Human physical performance - Part 4: Evaluation of working postures and movements in relation to machinery
EN	1005-5	Safety of machinery - Human physical performance - Part 5: Risk assessment for repetitive handling at high frequency
CR	1030-1	Hand-arm vibration - Guidelines for vibration hazards reduction - Part 1: Engineering methods by design of machinery
EN	1030-2	Hand-arm vibration - Guidelines for vibration hazards reduction - Part 2: Management measures at the workplace
EN	1032	Mechanical vibration - Testing of mobile machinery in order to determine the vibration emission value
EN	1037	Safety of machinery - Prevention of unexpected start-up
EN	1050	Safety of machinery - Principles for risk assessment
EN	1088	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
EN	1093-1	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 1: Selection of test methods
EN	1093-3	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 3: Test bench method for the measurement of the emission rate of a given pollutant
EN	1093-4	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 4: Capture efficiency of an exhaust system - Tracer method
EN	1093-6	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 6: Separation efficiency by mass, unducted outlet
EN	1093-7	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 7: Separation efficiency by mass, ducted outlet
EN	1093-8	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 8: Pollutant concentration parameter, test bench method
EN	1093-9	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 9: Pollutant concentration parameter, room method
EN	1093-11	Safety of machinery - Evaluation of the emission of airborne hazardous substances - Part 11: Decontamination index
CR	1100	Memorandum on health and safety standardization in support of "new approach" directives; application on the field of machinery (CEN Report 1100)
EN	1127-1	Explosive atmospheres - Explosion prevention and protection - Part 1: Basic concepts and methodology
EN	1127-2	Explosive atmospheres - Explosion prevention and protection - Part 2: Basic concepts and methodology for mining

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Standard / draft standard (CEN level)		Title
EN	1232	Workplace atmospheres - Pumps for personal sampling of chemical agents - Requirements and test methods
EN	1299	Mechanical vibration and shock - Vibration isolation of machines - Information for the application of source isolation
EN	1540	Workplace atmospheres - Terminology
EN	1672-2	Food processing machinery - Basic concepts - Part 2: Hygiene requirements
EN	1746	Safety of machinery - Guidance for the drafting of the noise clauses of safety standards
EN	1760-1	Safety of machinery - Pressure sensitive protective devices - Part 1: General principles for the design and testing of pressure sensitive mats and pressure sensitive floors
EN	1760-2	Safety of machinery - Pressure sensitive protective devices - Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars
EN	1760-3	Safety of machinery - Pressure sensitive protective devices - Part 3: General principles for the design and testing of pressure sensitive bumpers, plates, wires and similar devices
EN	1837	Safety of machinery - Integral lighting of machines
EN	1838	Lighting applications - Emergency lighting
EN	1839	Determination of explosion limits of gases und vapours
EN	12096	Mechanical vibration - Declaration and verification of vibration emission values
EN	12198-1	Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 1: General principles
EN	12198-2	Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 2: Radiation emission measurement procedure
EN	12198-3	Safety of machinery - Assessment and reduction of risks arising from radiation emitted by machinery - Part 3: Reduction of radiation by attenuation or screening
EN	12464-1	Light and lighting - Lighting of work places - Part 1: Indoor work places
EN	12464-2	Light and lighting - Lighting of work places - Part 1: Outdoor work places
EN	12619	Stationary source emissions - Determination of the mass concentration of total gaseous organic carbon at low concentrations in flue gases - Continuous flame ionisation detector method
EN	12626	Safety of machinery - Laser processing machines - Safety requirements (ISO 11553:1996 modified) (see also the new prEN ISO 11553: 02-08)
EN	12665	Light and lighting - Basic terms and criteria for specifying lighting requirements
EN	12786	Safety of machinery - Guidance for the drafting of the vibration clauses of safety standards
EN	12874	Flame arresters - Performance requirements, test methods and limits for use

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Standard / draft standard (CEN level)		Title
EN	13202	Ergonomics of the thermal environment - Temperatures of touchable hot surfaces - Guidance for establishing surface temperature limit values in production standards with the aid of EN 563
EN	13237	Potentially explosive atmospheres - Terms and definitions for equipment and protective systems intended for use in potentially explosive atmospheres
EN	13284-1	Stationary source emissions - Determination of low range mass concentration of dust - Part 1: Manual gravimetric method
EN	13463-1	Non-electrical equipment for potentially explosive atmospheres - Part 1: Basic method and requirements
EN	13463-2	Non-electrical equipment intended for use in potentially explosive atmospheres - Part 2: Protection by flow restricting enclosure "fr"
EN	13463-3	Non-electrical equipment for use in potentially explosive atmospheres - Part 3: Protection by flameproof enclosure 'd'
EN	13463-5	Non-electrical equipment intended for use in potentially explosive atmospheres - Part 5: Protection by constructional safety "c"
EN	13463-6	Non-electrical equipment for use in potentially explosive atmospheres - Part 6: Protection by control of ignition source 'b'
EN	13463-8	Non-electrical equipment for potentially explosive atmospheres - Part 8: Protection by liquid immersion "k"
EN	13478	Safety of machinery - Fire prevention and protection
EN	13526	Stationary source emissions - Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes - Continuous flame ionisation detector method
EN	13649	Stationary source emissions - Determination of the mass concentration of individual gaseous organic compounds
EN	13673-1	Determination of the maximum explosion pressure and the maximum rate of pressure rise of gases and vapours - Part 1: Determination of the maximum explosion pressure
EN	13673-2	Determination of maximum explosion pressure and maximum explosion pressure rise of gases and vapours - Part 2: Determination of the maximum explosion pressure rise
EN	13821	Determination of minimum ignition energy of dust/air mixtures
CR	13841	Workplace atmospheres - Scientific basis to describe the influence of the reference period on the presentation of exposure data
EN	13861	Safety of machinery - Guidance for the application of ergonomics standards in the design of machinery
EN	13921-1	Personal protective equipment - Ergonomic principles - Part 1: General guidance
EN	13921-3	Personal protective equipment - Ergonomic principles - Part 3: Biomechanical characteristics
EN	13921-4	Personal protective equipment - Ergonomic principles - Part 4: Thermical characteristics
EN	13921-6	Personal protective equipment - Ergonomic principles - Part 6: Sensory factors
EN	14034-1	Determination of the explosion characteristics of dust clouds - Part 1: Determination of the maximum explosion pressure

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Standard / draft standard (CEN level)		Title
EN	14034-4	Determination of the explosion characteristics of dust clouds - Part 4: Determination of the limiting oxygen concentration LOC of dust clouds
EN	14042	Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents
EN	14253	Mechanical vibration - Measurement and calculation of occupational exposure to whole- body vibration with reference to health - Practical guidance
EN	14255-1	Measurement and assessment of personal exposures to incoherent optical radiation - Part 1: Ultraviolet radiation emitted by artificial sources in the workplace
EN	14255-2	Measurement and assessment of personal exposures to incoherent optical radiation - Part 2: Visible and infrared radiation emitted by artificial sources in the workplace
EN	14386	Safety of machinery - Ergonomic design principles for the operability of mobile machinery
EN	14460	Explosion resistant equipment
EN	14750-1	Railway applications - Air conditioning for urban and suburban rolling stock - Part 1: Comfort parameters
EN	27243	Hot environments; estimation of the heat stress on working man, based on the WBGT-index (wet bulb globe temperature)
EN	27574 -1	Acoustics; statistical methods for determining and verifying stated noise emission values of machinery and equipment; part 1: general considerations and definitions
EN	27574 -2	Acoustics; statistical methods for determining and verifying stated noise emission values of machinery and equipment; part 2: methods for stated values for individual machines
EN	27574 -3	Acoustics; statistical methods for determining and verifying stated noise emission values of machinery and equipment; part 3: simple (transition) method for stated values for batches of machines
EN	28662-1	Hand-held portable power tools; measurement of vibrations at the handle; part 1: general
EN	29241-2	Ergonomic requirements for office work with visual display terminals (VDTs); part 2: guidance on task requirements
EN	29241-3	Ergonomic requirements for office work with visual display terminals (VDTs); part 3: visual display requirements
EN	30326-1	Mechanical vibration - Laboratory method for evaluating vehicle seat vibration - Part 1: Basic requirements
EN	45020	Standardization and related activities - General vocabulary
EN	50144-1	Safety of hand-held electric motor operated tools - Part 1: General requirements
EN	50178	Electronic equipment for use in power installations
EN	50274	Low-voltage switchgear and controlgear assemblies - Protection against electric shock - Protection against unintentional direct contact with hazardous live parts
EN	60073	Basic and safety principles for man-machine interface, marking and identification - Coding principles for indicators and actuators

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Standard / draft standard (CEN level)		Title
EN	60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN	60204-11	Safety of machinery - Electrical equipment of machines - Part 11: Requirements for HV equipment for voltages above 1000 V a.c. or 1500 V d.c. and not exceeding 36 kV
EN	60335-1	Household and similar electrical appliances - Safety - Part 1: General requirements
EN	60445	Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system
EN	60446	Basic and safety principles for man-machine interface, marking and identification - Identification of conductors by colours or numerals
EN	60447	Basic and safety principles for man-machine interface - Marking and identification - Actuating principles
EN	60529	Degrees of protection provided by enclosures (IP code)
EN	60704-1	Household and similar electrical appliances - Test code for the determination of airborne acoustical noise - Part 1: General requirements
EN	60745-1	Hand-held motor-operated electric tools - Safety - Part 1: General requirements
EN	60825-1	Safety of laser products; part 1: equipment classification, requirements and user's guide
EN	60825-4	Safety of laser products - Part 4: Laser guards (IEC 60825-4:1997)
EN	60825-5	Safety of laser products - Part 5: Manufacturer's checklist for IEC 60825-1
EN	60825-10	Safety of laser products - Part 10: Application guidelines and explanatory notes to IEC 60825-1
EN	61000-2-4	Electromagnetic compatibility (EMC) - Part 2-4: Environment; Compatibility levels in industrial plants for low-frequency conducted disturbances
EN	61000-6-1	Electromagnetic compatibility (EMC) - Part 6-1: Generic standards; Immunity for residential, commercial and light-industrial environments
EN	61000-6-2	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards; Immunity for industrial environments
EN	61000-6-3	Electromagnetic compatibility (EMC) - Part 6-3: Generic standards; Emission standard for residential, commercial and light-industrial environments
EN	61000-6-4	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards; Emission standard for industrial environments
EN	61029-1	Safety of transportable motor-operated electric tools - Part 1: General requirements
EN	62079	Preparation of instructions - Structuring, content and presentation
EN	61310-1	Safety of machinery - Indication, marking and actuation - Part 1: Requirements for visual, auditory and tactile signals
EN	61310-2	Safety of machinery - Indication, marking and actuation - Part 2: Requirements for marking

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Standard / draft standard (CEN level)		Title
EN	61310-3	Safety of machinery - Indication, marking and actuation - Part 3: Requirements for the location and operation of actuators
EN	61496-1	Safety of machinery - Electro-sensitive protective equipment - Part 1: General requirements and tests
prEN	61496-2	IEC 61496-2: Safety of machinery - Electro- sensitive protective equipment - Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)
EN	61496-3	Safety of machinery - Electro-sensitive protective equipment - Part 3: Particular requirements for Active Opto-electronic Protective Devices responsive to Diffuse Reflection (AOPDDR)
EN	62061, VDE 0113-50	Safety of machinery - Functional safety of safety- related electrical, electronic and programmable electronic control systems
IEC	60204-1, VDE 0113-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
EN ISO	3740	Acoustics - Determination of sound power levels of noise sources - Guidelines for the use of basic standards
EN ISO	3741	Acoustics - Determination of sound power levels of noise sources using sound pressure - Precision methods for reverberation rooms
EN ISO	3744	Acoustics - Determination of sound power levels of noise sources using sound pressure - Engineering method in an essentially free field over a reflecting plane
EN ISO	3746	Acoustics - Determination of sound power levels of noise sources using sound pressure - Survey method using an enveloping measurement surface over a reflecting plane
EN ISO	3747	Acoustics - Determination of sound power levels of noise sources using sound pressure - Comparison method for use in situ
EN ISO	4871	Acoustics - Declaration and verification of noise emission values of machinery and equipment
EN ISO	5349-1	Mechanical vibration - Measurement and evaluation of human exposure to hand- transmitted vibration - Part 1: General requirements
EN ISO	5349-2	Mechanical vibration - Measurement and evaluation of human exposure to hand- transmitted vibration - Part 2: Practical guidance for measurement at the workplace
EN ISO	6385	Ergonomic principles in the design of work systems
EN ISO	7250	Basic human body measurements for technological design
EN ISO	8996	Ergonomics of the thermal environment - Determination of metabolic rate
EN ISO	7726	Ergonomics of the thermal environment - Instruments for measuring physical quantities
EN ISO	7730	Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria
EN ISO	7731	Ergonomics - Danger signals for public and work areas - Auditory danger signals
EN ISO	7779	Acoustics - Measurement of airborne noise emitted by information technology and telecommunications equipment

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Standard / draft standard (CEN level)		Title
EN ISO	7933	Ergonomics of the thermal environment - Analytical determination and interpretation of heat stress using calculation of the predicted heat strain
EN ISO	8996	Ergonomics of the thermal environment – Determination of the metabolic rate
EN ISO	9241-1	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 1: General introduction
EN ISO	9241-4	Ergonomic requirements for office work with visual display terminals (VDTs) – Part 4: Keyboard requirements
EN ISO	9241-6	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 6: Guidance on the work environment
EN ISO	9241-7	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 7: Requirements for display with reflections
EN ISO	9241-8	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 8: Requirements for displayed colours
EN ISO	9241-9	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 9: Requirements for non-keyboard input devices
EN ISO	9241-11	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 11: Guidance on usability
EN ISO	9241-12	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 12: Presentation of information
EN ISO	9241-13	Ergonomic requirements for office work with visual display terminals (VDTs) - Part 13: User guidance
EN ISO	9241-14 to 9241-17	Ergonomic requirements for office work with visual display terminals (VDTs) – Parts 14-17 various dialogues
EN ISO	9611	Acoustics - Characterization of sources of structure- borne sound with respect to sound radiation from connected structures - Measurement of velocity at the contact points of machinery when resiliently mounted
EN ISO	9614-1	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 1: Measurement at discrete points
EN ISO	9614-2	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 2: Measurement by scanning
EN ISO	9614-3	Acoustics - Determination of sound power levels of noise sources using sound intensity - Part 3: Precision method for measurement by scanning
EN ISO	9886	Ergonomics - Evaluation of thermal strain by physiological measurements
EN ISO	9920	Ergonomics of the thermal environment - Estimation of the thermal insulation and evaporative resistance of a clothing ensemble
EN ISO	9921	Ergonomics - Assessment of speech communication
EN ISO	10075-1	Ergonomic principles related to mental work-load - Part 1: General terms and definitions
EN ISO	10075-2	Ergonomic principles related to mental workload - Part 2: Design principles
EN ISO	10075-3	Ergonomic principles related to mental workload - Part 3: Principles and requirements concerning methods for measuring and assessing mental workload

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Standard / draft standard (CEN level)		Title
EN ISO	10551	Ergonomics of the thermal environment - Assessment of the influence of the thermal environment using subjective judgement scales
EN ISO	11064-1	Ergonomic design of control centres - Part 1: Principles for the design of control centres
EN ISO	11064-2	Ergonomic design of control centres - Part 2: Principles for the arrangement of control suites
EN ISO	11064-3	Ergonomic design of control centres - Part 3: Control room layout
EN ISO	11064-4	Ergonomic design of control centres - Part 4: Layout and dimensions of workstations
EN ISO	11064-6	Ergonomic design of control centres - Part 6: Environmental requirements for control centres
prEN ISO	11064-7	Ergonomic design of control centres - Part 7: Principles for the evaluation of control centres
ENV ISO	11079	Evaluation of cold environments - Determination of required clothing insulation (IREQ)
EN ISO	11145	Optics and optical instruments - Lasers and laser-related equipment - Vocabulary and symbols
EN ISO	11200	Acoustics - Noise emitted by machinery and equipment - Guidelines for the use of basic standards for the determination of emission sound pressure levels at a work station and at other specified positions
EN ISO	11201	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Engineering method in an essentially free field over a reflecting plane
EN ISO	11202	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Survey method in situ
EN ISO	11203	Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level
EN ISO	11204	Acoustics - Noise emitted by machinery and equipment - Measurement of emission sound pressure levels at a work station and at other specified positions - Method requiring environmental corrections
EN ISO	11205	Acoustics - Noise emitted by machinery and equipment - Engineering method for the determination of emission sound pressure levels in situ at the work station and at other specified positions using sound intensity
EN ISO	11252	Lasers and laser-related equipment - Laser device - Minimum requirements for documentation
EN ISO	11399	Ergonomics of the thermal environment - Principles and application of relevant International Standards
EN ISO	11546-1	Acoustics - Determination of sound insulation performances of enclosures - Part 1: Measurements under laboratory conditions (for declaration purposes)
EN ISO	11546-2	Acoustics - Determination of sound insulation performances of enclosures - Part 2: Measurements in situ (for acceptance and verification purposes)

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Standard / draft standard (CEN level)		Title
EN ISO	11553-1	Safety of machinery - Laser processing machines - Safety requirements
EN ISO	11688-1	Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 1: Planning
EN ISO	11688-2	Acoustics - Recommended practice for the design of low-noise machinery and equipment - Part 2: Introduction to the physics of low-noise design
EN ISO	11689	Acoustics - Procedure for the comparison of noise emission-data for machinery and equipment
EN ISO	11690-1	Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 1: Noise control strategies
EN ISO	11690-2	Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 2: Noise control measures
EN ISO	11690-3	Acoustics - Recommended practice for the design of low-noise workplaces containing machinery - Part 3: Sound propagation and noise prediction in workrooms
EN ISO	12001	Acoustics - Noise emitted by machinery and equipment - Rules for the drafting and presentation of a noise test code
EN ISO	12100-1	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology
EN ISO	12100-2	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles
EN ISO	13090-1	Mechanical vibration and shock - Guidance on safety aspects of tests and experiments with people - Part 1: Exposure to whole-body mechanical vibration and repeated shock
EN ISO	13406-1	Ergonomic requirements for work with visual display based on flat panels - Part 1: Introduction
EN ISO	13406-2	Ergonomic requirements for work with visual displays based on flat panels - Part 2: Ergonomic requirements for flat panel displays
EN ISO	13407	Human-centred design processes for interactive systems
prEN ISO	13732-1	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces
prEN ISO	13732-3	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces
prEN ISO	13849-1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design
EN ISO	13849-2	Safety of machinery - Safety-related parts of control systems - Part 2: Validation
EN ISO	13850	Safety of machinery – Emergency stop – Principles for design
EN ISO	14122-1	Safety of machinery - Permanent means of access to machinery - Part 1: Choice of a fixed means of access between two levels
EN ISO	14122-2	Safety of machinery - Permanent means of access to machinery - Part 2: Working platforms and walkways
EN ISO	14122-3	Safety of machinery - Permanent means of access to machinery - Part 3: Stairs, stepladders and guard-rails
EN ISO	14122-4	Safety of machinery - Permanent means of access to machinery - Part 4: Fixed ladders
EN ISO	14159	Safety of machinery - Hygiene requirements for the design of machinery

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Standard / draft standard (CEN level)		Title
EN ISO	14163	Acoustics - Guidelines for noise control by silencers
EN ISO	14505-3	Ergonomics of the thermal environment - Evaluation of the thermal environment in vehicles - Part 3: Evaluation of thermal comfort using human subjects
EN ISO	14738	Safety of machinery - Anthropometric requirements for the design of workstations at machinery
EN ISO	14915-1	Software ergonomics for multimedia user interfaces - Part 1: Design principles and framework
EN ISO	14915-2	Software ergonomics for multimedia user interfaces - Part 2: Multimedia navigation and control
EN ISO	15005	Road vehicles - Ergonomic aspects of transport information and control systems - Dialogue management principles and compliance procedures
EN ISO	15006	Road vehicles - Ergonomic aspect of transport information and control systems - Specification and compliance procedures for in-vehicle auditory presentation
EN ISO	15007-1	Road vehicles - Measurement of driver visual behaviour with respect to transport information and control systems - Part 1: Definitions and parameters
EN ISO	15265	Ergonomics of the thermal environment - Risk assessment strategy for the prevention of stress or discomfort in thermal working conditions
EN ISO	15535	General requirements for establishing anthropometric databases
EN ISO	15536-1	Ergonomics - Computer manikins and body templates - Part 1: General requirements
prEN ISO	15536-2	Ergonomics - Computer manikins and body templates - Part 2: Verification of functions and validation of dimensions for computer manikin systems
EN ISO	15537	Principles for selecting and using test persons for testing anthropometric aspects of industrial products and designs
EN ISO	15667	Acoustics - Guidelines for noise control by enclosures and cabins
EN ISO	15743	Ergonomics of the thermal environment - Cold workplaces - Risk assessment and management
EN ISO	15744	Hand-held non-electric power tools - Noise measurement code - Engineering method (grade 2)
EN ISO	15831	Clothing - Physiological effects - Measurement of thermal insulation by means of a thermal manikin
EN ISO	16201	Technical aids for disabled persons - Environmental control systems for daily living
EN ISO	17287	Road vehicles - Ergonomic aspects of transport information and control systems - Procedure for assessing suitability for use while driving
EN ISO	20643	Mechanical vibration - Hand-held and hand-guided machinery - Principles for evaluation of vibration emission
ISO	7000	Graphical symbols for use on equipment - Index and synopsis
ISO and	8995	Principles of visual ergonomics; the lighting of indoor work systems
ISO	8995, CIE S008	Lighting of indoor work places

Annex I Consultation of standards committees

I.1 Concerning the consultation

The consultation was performed in order to test the formulated hypotheses and to obtain a basis by which the economic benefit of cross-sectional standards could be estimated.

The consultation was divided into two parts:

- Consultation of the Mechanical Engineering standards committee (NAM) by means of a questionnaire, for the purpose of obtaining information on experience with the use of the hierarchical standards structure within the area of machine safety.
  (The questions are reproduced in the presentation of the results, see Annex I.2.2, "Results of consultation of the 'mobile machines' and 'stationary machines' groups".)
- Consultation of further standards committees by means of a questionnaire, beginning with an introduction to the subject of the hierarchical standards structure within the area of machine safety, and in which the concept of cross-sectional standards was explained. The questions were aimed at existing experience gained with cross-sectional standards and the possible expectations/concerns associated with their application.
  (The questions are reproduced in the presentation of the results, see Annex I.3.1: "Consultation of other standards committees".) For the sake of completeness, the introduction to the questionnaire is reproduced in Annex I.3.5, "Introduction to the questionnaire for the other standards committees".)

I.2 Questionnaire used in the Mechanical Engineering standards committee (NAM)

I.2.1 Concerning the questionnaire used within NAM

A total of ten practising standards experts from various technical spheres within the Mechanical Engineering standards committee (NAM) were involved in the consultation of NAM. Since some of the questions might have caused misunderstandings among persons unfamiliar with the background of the study, the decision was taken to conduct the consultation by means of interviews.

The results of the consultation revealed significant variation between the groups responsible for mobile machines and those responsible for stationary machines. NAM therefore grouped the results of the consultation. As can be seen from the letter from NAM concerning the results of the consultation, the variation in the results was also anticipated.

As part of the questionnaire procedure, members of NAM were also asked what conditions would motivate industry experts to join Type A/B standards committees. The summary for this subject is reproduced in the form of a statement by NAM (see Annex I.2.3, "View of DIN/NAM concerning the participation of industry experts on Type A/B standards committees").

I.2.2 Results of consultation of the "mobile machines" and "stationary machines" groups within NAM

The responses reproduced with comments below were made by four practising standards experts in technical groups relating to mobile machines, and six practising standards experts in technical groups dealing with stationary machines.

The responses of the two groups are compared in a table, thus illustrating the differences.

Question 1: *Standards in the area of machine safety have been developed in accordance with a hierarchical structure (Type A, Type B and Type C standards).* *What effect has this structure had upon the development of product standards?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
Very helpful 2 x Useful 1 x Hardly 1 x More negative than positive Negative	2 x Very helpful 4 x Useful Hardly More negative than positive Negative
Two respondents described the structure as "useful"; the other two were of the opinion that the structure had "hardly" had an effect or that its effect had been "more negative than positive". The reason for the "hardly" response was that owing to the historical development in relevant ISO/TCs, standards already existed governing almost all generic safety issues. The reason for the "more negative than positive" response may be assumed to be of great importance for the project. It was stated that during the development of Type C standards, it was frequently difficult to justify necessary deviations from the Type A/B standards, since the latter had generally been developed with reference to stationary machines. This was also emphasized in the consensus position issued by NAM (see "View of DIN/NAM concerning the participation of industry experts on Type A/B standards committees"), which calls for Type A/B standards to be geared to the needs of Type C standard development.	The impact of the structure was considered to be "very helpful" to "useful", and helpful in particular with regard to generic issues.

Question 2: *Did references to Type A or Type B standards enable the work effort to be reduced during the development of Type C standards?* *If you answered "YES", please indicate your estimation of the reduction in the necessary work effort.*	
"Mobile machines" technical groups	"Stationary machines" technical groups
3 x YES 1 x NO	6 x YES NO
Three of the four respondents replied in the affirmative. The reason given for the one negative response was the difficulty associated with having to justify deviations where these became necessary, as mentioned above. Opinions differed regarding the reduction in the work effort required. The responses were: 1 x substantial 1 x notable 1 x not notable	The response was affirmative in all cases. The reduction in the work effort required was assessed as being "substantial" to "notable", as follows: 3 x substantial 3 x notable

Question 3: *Can you name a product standard for which the hierarchical structure has had a particularly favourable impact?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
1 x YES 3 x NO	3 x YES 3 x NO
Four standards from the field "safety of industrial trucks" (EN 1726-1 and –2, EN 1459, EN 1551) were cited here by one respondent. The other three respondents were not able to name any standards explicitly, but indicated that on the Type C tier of standards development, their experience with a hierarchical structure had been positive during safety standardization concerning certain families of machines (e.g. the EN 474 series governing earthmoving machinery).	The following three standards were cited. EN 1539: Dryers and ovens, in which flammable substances are released EN 12331: Food processing machinery - Mincing machines - Safety and hygiene requirements EN 12418: Masonry and stone cutting-off machines for job site - Safety It was also indicated that many "standard" hazard aspects can be covered by references to Type A and Type B standards.

Question 4: *Can you name a product standard upon which the impact of the hierarchical structure has been more negative than positive?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
2 x YES 2 x NO	1 x YES 5 x NO
Two respondents answered this question in the affirmative, the other two in the negative. The reason given for the affirmative answer is that certain provisions of the Type A and B standards, such as those of EN 1088 (Safety of machinery - Interlocking devices associated with guards), could not be applied to mobile machines.	This question was answered primarily in the negative. One respondent did indicate however that during formulation of state-of-the-art safety requirements which are suitable for practical application, the existence of Type B standards and excessively strict interpretation of them can lead to problems with product standards (such as EN 294, "Safety of machinery; safety distances to prevent danger zones from being reached by the upper limbs").

Question 5: *Can you envisage a hierarchical structure of this kind being implemented throughout standardization?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
- YES 4 x Possibly - Hardly - Probably NOT - NO	- YES 6 x Possibly - Hardly - Probably NOT - NO
The question was answered by all respondents with "possibly". It was pointed out that this question cannot be answered competently for lack of knowledge of the content and structures of other areas of standardization outside the scope of NAM.	

Question 6: *CEN Guide 414 (formerly the DIN EN 414 standard) governs the drafting and presentation of machine safety standards. How do you rate the benefit of this body of regulations for the development of product standards?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
2 x Very helpful 1 x Useful - Hardly useful 1 x More negative than positive - Negative	2 x Very helpful 4 x Useful - Hardly useful - More negative than positive - Negative
Two respondents described the body of regulations as "Very helpful", one as "Useful". The fourth respondent described the body of regulations as "More negative than positive", stating that the formal component in the standards was "bloated" by the imposition of text modules.	The body of regulations was described as very helpful or useful in all cases. The requirements in Section 6 of CEN Guide 414 concerning "verification" for Type C standards were however considered excessive by some respondents.

Question 7: *Has a need arisen for new Type B standards as a result of the standardization work in your committee?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
- YES 4 x NO	1 x YES 5 x NO
This question was answered in the negative by those consulted, the reason given being that many machine-specific standards had already been introduced for generic safety issues relating to mobile machines. There is therefore virtually no need for new Type B standards. In this context, standards committees at Type B level are advised to conduct an appropriate requirements analysis among the Type C committees before launching new projects in order to avoid negative examples, such as prEN 14386, "Ergonomic design principles for the operability of mobile machinery".	This question was answered predominantly in the negative by those consulted. One respondent stated however that a need had been identified for provisions concerning the subject of fire and explosion safety and protection with particular reference to machines. The provisions governing this subject in the existing general Type B standards were frequently not suitable for application.

Question 8: *Has a need arisen for amendment to a Type B standard or Type A standard as a result of the standardization work in your committee?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
- YES 4x NO	5 x YES 1 x NO
This question was answered in the negative by all respondents. Since no comments were made in response to this question, it appears that no attempt has been made to amend a standard considered to be inappropriate (see above).	This question was answered predominantly in the affirmative, and attention was drawn to the following standards and problems: EN 294 and EN 999: the safety distances here were considered to be too great; Excessively strict formulation was not appropriate for the machine combinations, which were often specific (refer to the safeguard clause against EN 13683, "Garden Equipment - Integrally Powered Shredders/Chippers"). EN 1837, "Integral lighting of machines" EN 954-1 (prEN ISO 13849-1), "Safety-related parts of control systems"

Question 9: *The Type A standards recently underwent substantial changes. What consequences do you see for product standardization when Type A and/or relevant Type B standards change?*	
"Mobile machines" technical groups	"Stationary machines" technical groups
All respondents indicated that the result would be adaptation to the updated status following review of the suitability for the product standard in question; this adaptation would take place during revision (in the course of the five-year review; possibly earlier in the event of major changes to the state of the art). It was also recommended that a transitional period be observed for all Type A/B and Type C standards where revisions and amendments are made. For harmonized European standards supporting the requirements of an EU directive, a transitional period of two to three years is considered essential. Such a transitional period would facilitate the implementation of adaptations within a reasonable timeframe.	

Question 10: *Do you agree with the following statement:* *Reference to cross-sectional standards enables the necessary content of product standards to be reduced.*	
"Mobile machines" technical groups	"Stationary machines" technical groups
1 x YES 2 x The statement is correct but not of major significance 1 x NO	6 x YES The statement is correct but not of major significance NO
One vote each for "YES" and "NO". The two other respondents indicated that the statement was correct, but was not of major significance.	This question was answered in the affirmative by all respondents.

Question 11: *Do you agree with the following statement:* *Cross-sectional standards enhance the clarity of the body of standards.*	
"Mobile machines" technical groups	"Stationary machines" technical groups
2 x YES 2 x The statement is correct but not of major significance NO	4 x YES The statement is correct but not of major significance 2 x NO
Two respondents answered this question unreservedly in the affirmative; the remaining two agreed, but did not attach any great importance to the effect.	This question was answered unreservedly in the affirmative by four respondents. Two respondents replied in the negative, stating that an excessive number of references to Type A and B standards, which in turn may refer to further Type A and B standards, impact negatively upon the clarity and ease of use of the standard.

Question 12: *Do you agree with the following statement:* *In new market areas which still lack product standards, designers can take essential occupational health and safety aspects into consideration more effectively by making use of cross-sectional standards.*	
"Mobile machines" technical groups	"Stationary machines" technical groups
2 x YES 2 x The statement is correct but not of major significance NO	4 x YES The statement is correct but not of major significance 2 x NO
Two respondents answered this question unreservedly in the affirmative; the other two agreed, but did not attach any great importance to the effect. No reason was given.	This question was answered unreservedly in the affirmative by four respondents. Two respondents replied in the negative. No reason was given.

I.2.3 The view of DIN/NAM concerning the participation of industry experts on Type A/B standards committees

As already indicated, in addition to the questionnaire, the DIN/NAM committee was also asked in the interviews what conditions would motivate industry experts to join Type A/B standards committees. This subject is summarized by the following quotation:

"*The success of the 'hierarchical structure in machine safety standardization' model is substantially dependent upon the quality of the Type A/B standards available, which must be geared to the needs on the Type C level. This hypothesis is supported by the results of our internal survey, which clearly revealed a greater acceptance in standards committees responsible for stationary machines than in those responsible for mobile machines. (Type A/B standards have evidently been developed to date with closer consideration for stationary machines.)*

The involvement of experts from the Type C level in the work of the Type A/B committees is an important condition for this acceptance.

In the light of the declining involvement of industry experts from the Type C level, such experts could be motivated to take part in the development of Type A/B standards if subjects were addressed for which a practical need for action currently exists. Artificial bloating of the agenda with projects for which no market need exists is a deterrent to industry experts.

Strict orientation of standardization activity to the requirements also ensures that the financial and personnel resources available for it, which are generally in decline, will be employed more efficiently.

Any further financial burden upon industry experts participating in the development of Type A/B standards is counter-productive, and should be avoided under all circumstances."

I.3 The results of consultation in standards committees outside machine construction

I.3.1 Consultation of other standards committees

For consultation of the standards committees outside the area of machine construction, a small group of contacts was selected who were assumed to have wide-ranging experience of standardization (e.g. managers of standards committees, secretaries with many years of experience, chairs of standards committees). Essential criteria for selection were that the individual's area of activity be related to occupational health and safety; that this relationship be evident from the standards which had been developed; and that during the development of standards in their respective areas, they should have made use of Type A and B machine safety standards, these standards being regarded as cross-sectional. Given these criteria, a certain degree of sympathy for the issue was anticipated.

The individuals contacted were free to reply in person, to ask further individuals for an answer, or to form an opinion within their committee. The replies received are therefore those of both individuals and groups. In some cases, they are also the consensus of a standards committee or individual technical groups within standards committees.

Given this situation, statistical information, apart from the frequency, is of no relevance. This was intentional, since the objective was not to produce a balanced picture, but to identify a trend, should one exist, and to obtain comments which could be followed up individually.

A statistical evaluation would also not be meaningful, owing to the variations in size between the standards committees, and the intended users of the standards which they develop. Ergonomics standards, for example, are intended for a group of direct users which are not specified in any greater detail. They therefore include designers, programmers, design engineers, and also management personnel; conversely, other standards are developed for a specialist public with specific training. If similar comments are noted from standards committees with different terms of reference, this may be regarded as a trend. Conversely, even a single opinion which differs substantially from the others may indicate a possible aspect which is important to the concept under examination here.

In a statistical evaluation, the result of Question 5, which concerns the potential drawbacks of a hierarchical system of standards, would for example be inter-

preted as indicating that such drawbacks are observed only by a minority (4 of 22). The comments written by this "minority", however, indicate that a concept of this type is accompanied by fundamental problems which require attention.

The presentation of the results relates to the role of the respondent. The respondents are either the person or the institution completing the questionnaire.

I.3.2 Comments on standards from the area of electrical engineering

As one respondent correctly observed, the area of electrical engineering was omitted from this consultation. This was not co-incidental. The authors are very familiar with the area of electrical engineering for professional reasons, and equally with the handling of hierarchical structures, which are not the sole preserve of standards. There was therefore no need to ascertain how a hierarchical system of a normative body of regulations is regarded within the electrical industry.

Two of the examples of successful hierarchies which we indicated in Question 7 are taken from the area of electrical engineering, and are among the most important technical achievements of all time. Telephone technology for example follows a strict hierarchy which ensures that a telephone call reaches a single subscriber from among over a billion people. With its hierarchical provisions set out in the 1930s, this technology has transformed the former telecommunications islands, once connected largely manually, into what is probably the world's largest machine. So powerful was its philosophy that one of the two "fathers" of information theory, Claude E. Shannon, employed it as a basis for this theory (Bell, 1986).

The other technology used as an example, that of control and instrumentation, is based upon a self-contained hierarchical concept developed for the automation of power stations. An analysis based upon the action regulation theory of engineering psychology, which maps human actions as hierarchical sequences, reveals a high degree of congruence, i.e. control and instrumentation technology is a faithful image of human action, implemented in technology.

For these reasons, the consultation was not conducted in this area. According to experts, approximately a third of the value in the area of machine construction is created in the area of electrical engineering alone, where the use of hierarchies, whether in a technical or regulatory context, is standard practice.

I.3.3 General trend

The questionnaire contains twelve questions in total. Questionnaires were returned from 22 respondents in eight standards committees; replies were received in some cases from several technical groups within one and the same standards committee. The questions and the corresponding answers/comments are reproduced below, and in some cases discussed.

The general trend among the answers shows that the respondents anticipate many benefits from a hierarchical standards structure. This can be seen most clearly in the answer to Question 1. The statement: "Cross-sectional standards, developed in accordance with a hierarchical structure (for example Type A, Type B and Type C standards in the area of machine safety, as described), can increase the clarity of the body of standards" met with the approval of all respon-

dents, who answered either "YES" (13 out of 22) or "More YES than NO" (8 out of 22). Not a single respondent answered "NO" or "More NO than YES".

Opinions tended to differ regarding whether the hierarchical structure, as implemented in the area of machine safety, could be implemented throughout standardization (Question 6). Here too, however, the overall assessment is positive. Apart from one reply of "More NO than YES", the responses are distributed between "YES" and "YES and NO" - with the concentration at "More YES than NO". Since the majority of respondents are either familiar or very familiar with the background of standards development in the area of machine safety, and in particular with the effort involved, this result is surprisingly positive.

A further reason for rating this response as very positive can be inferred from the aspects which, in the respondents' view, a committee must consider when accepting the task of developing a "cross-sectional standard" (Question 11). The answers to this question show clearly that the respondents consider this by no means a simple task. 20 out of 22 responses indicated for example that a need for consensus-finding must be observed, and 16 out of 22 responses saw potential for conflict. What this means in practice can be seen from the response of NAM, a committee with the greatest experience in the handling of hierarchical standards developed during the last two decades. As already indicated, this committee has stated in its position paper on the project that "The success of the 'hierarchical structure in machine safety standardization' model is substantially dependent upon the quality of the Type A/B standards available, which must be geared to the needs on the Type C level."

The nature of the perceived benefits reinforces the assumption that the respondents are considering the quality of the result more than the reduction in costs. In the answers to Question 12, for example, the highest number of votes was observed for "Improved integrity" and "More rapid development" (13 out of 22 in each case), and not for "Fewer meetings" (4 out of 22) or "Lower updating costs" (8 out of 22).

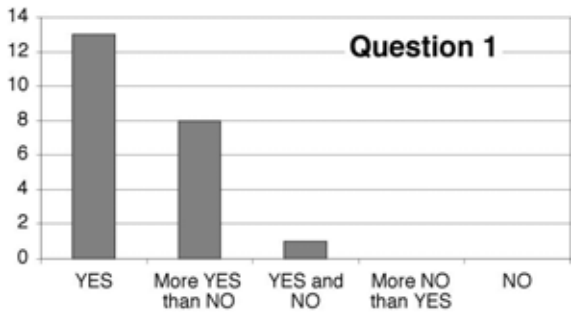
I.3.4 Detailed results

I.3.4.1 Improvement in the clarity of the body of standards

Question 1 concerns the improvement in the clarity of the body of standards which is delivered by cross-sectional standards. The answer is unequivocally positive. This view was not rejected by any respondent.

Question 1:

Cross-sectional standards, developed in accordance with a hierarchical structure (for example Type A, Type B and Type C standards in the area of machine safety, as described), can increase the clarity of the body of standards".
Do you agree with this statement?
— YES
— More YES than NO
— YES and NO
— More NO than YES
— NO



Three comments were made on this question:

- One respondent replied in the affirmative and added that cross-sectional standards of this kind can always be applied when Type C standards are not available.

This statement holds true not only for the standards discussed here, but for all regulatory standards, at least in Germany. The bodies of regulations governing occupational health and safety also form a hierarchical structure. One benefit of this is that detailed provisions can be dispensed with in some or all cases. A further advantage is that specific provisions can be checked for their consistency with the standards structure as a whole.

The remaining comments address the potential downsides of such a structure.

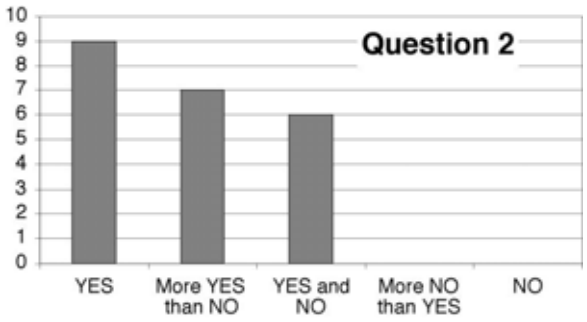
- Clarity is improved only where expertise and the standards exist. For the indirect user, clarity is not improved.
- The direct user is forced to work with a number of standards.

Both of these comments must be taken very seriously, since they accurately reflect a situation which is the subject of general criticism. The notorious complaint about the first clause of the German road traffic regulations, which demands reciprocal consideration for other road users and which regulates **everything** which has been left unregulated in the traffic legislation, is limited neither to certain groups of society, nor to specific subject-matter. The need for a requirement to be stated in black and white rather than having to be pieced together from two or more documents is also frequently voiced.

I.3.4.2 Reduction in the development effort

Once again, a scale of five possible responses to this question was offered. Although the most frequent reply was "YES", and no respondent answered with "More NO than YES" or with "NO", scepticism could be discerned in six of the replies.

Question 2:
The effort required for the development of standards can be reduced by references to standards in the higher levels of the hierarchy (e.g. basic/generic standards).
Do you agree with this statement?
— YES
— More YES than NO
— YES and NO
— More NO than YES
— NO



I.3.4.3 Knowledge of cross-sectional standards from respondents' own standardization work

Only five respondents were not aware of any standard in their own specialist field which could be described as a cross-sectional standard. The other respondents each indicated not only one, but a number of standards for different areas, in particular numerous Type B1 and B2 standards, and all Type A standards with the exception of EN 1127-2. In addition, general terminology and ergonomics standards were indicated.

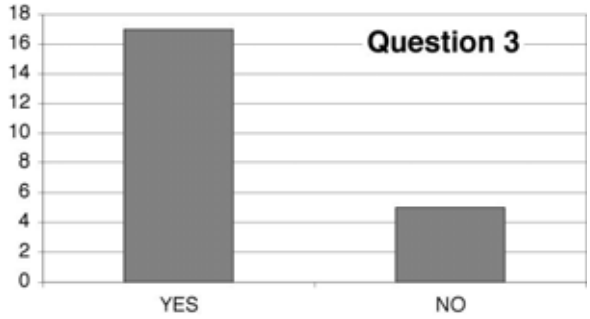
Question 3:

Are you aware of any standards from your standardization work which could be regarded as cross-sectional standards (i.e. standards which could serve as tools for the development of further standards)?

If your answer is YES, please state an example.

— YES

— NO



The examples listed below are not among the cross-sectional standards already known. To demonstrate that recourse is made to these standards in many places, the number of references to them was determined with the aid of the PERINORM database, and is indicated here in parentheses:

- DIN VDE 0100-410: Low-voltage electrical installations - Part 4-41: Protection for safety - Protection against electric shock (IEC 60364-4-41:1992, modified)/DIN IEC 60364-4-41 (131 references)
- EN 132: Respiratory protective devices - Definitions of terms and pictograms (46 references)
- EN 1846-2: Firefighting and rescue service vehicles - Part 2: Common requirements - Safety and performance (20 references)
- ISO 384: Laboratory Glassware; Principles of Design and Construction of Volumetric Glassware (9 references)

The responses to this question show that a concept of a "cross-sectional standard" can quite conceivably be created.

I.3.4.4 Knowledge of beneficial impact of a hierarchical structure

Question 4 was answered in the affirmative by 14 respondents and in the negative by 8.

Examples of a beneficial impact can be found in 12 answers. Besides a large number of individual standards, all Type C standards were named, as were other standards including the Type A standards EN 1050 and EN ISO 12100-1/-2, various Type B standards, and recognized good safety practice, "extending beyond the field of machine safety". The following individual standards were also cited explicitly:

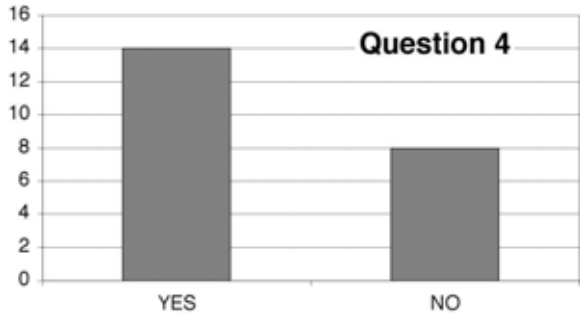
- EN ISO 9241-11: Ergonomic requirements for office work with visual display terminals (VDTs) - Part 11: Guidance on usability
- EN ISO 6385 (preceded by: ENV 6385): Ergonomic principles in the design of work systems

Question 4:

Are you aware of an example, from your standardization work, in which a hierarchical structure has had a particularly favourable impact?

— YES
— NO

If your answer is YES, please provide a brief explanation if possible.



The respondents stated examples and comprehensive reasons, some of which are reproduced below:

- Only a hierarchical body of standards can guarantee the consistency of the body of standards at justifiable expense.
- Basic/generic standards set out concepts/models/methods which need not be cited again at a later stage. They assure the integrity of the body of standards. Examples are DIN EN 614-1 and DIN EN ISO 6385:2005.
- Group product standards may set out interesting approaches for concepts/models/methods which, if they prove effective, can be adopted into basic/generic standards. An example is "usability" in DIN EN ISO 9241-11 in ISO/NP 6385-1.
- Wherever requirements or tests apply to a group of products, it is advantageous for them to be set out in a "cross-sectional standard".
- For the development of EN 14466. Complex descriptions and instructions were avoided by use of the hierarchical structure. The reference to higher-level standards should however be applied with greater precision than has been the case to date. (Indication of sections and if necessary paragraphs should be obligatory; for example, the general reference to EN 563 in a Type C standard is not sufficient. The precise sections to be applied must be stated in the Type C standard concerned.)

Reference was also made to the area of medical devices, such as surgical implants, and it was pointed out that a hierarchical structure was also employed in this area.

Again, this question shows that a concept of a "cross-sectional standard" can quite conceivably be created.

I.3.4.5 Potential detrimental impact of a hierarchical structure

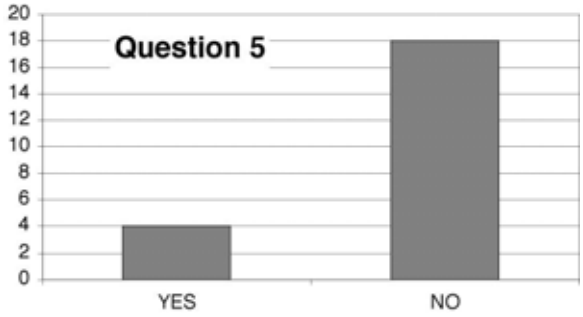
Four respondents considered it possible for a hierarchical structure to have a negative effect. This number is low in comparison with the 18 responses which can be rated positive; statistically speaking, a threat to standardization or to users would therefore have to be negated.

Question 5:

Can you envisage a hierarchical structure having an impact which on balance is negative?

— YES
— NO

If your answer is YES, please provide a brief explanation if possible.



The reasons given for a negative impact are however notable, and are as follows:

- A hierarchical structure may have a negative impact, since direct users of the standard are confronted with greater complexity as the number of hierarchical levels rises.
- Where the system is not understood or is not applied properly by the direct user (e.g. a designer or the developer of a Type C standard).
- Where provisions are formulated in higher-level standards which place excessive constraints upon other standards.
- Where Type A or B standards are cited only in general terms within a Type C standard (see also the response to Question 4).

It is clearly also feared that for the correct product to be purchased, all relevant standards of the hierarchical structure would have to be considered, i.e. including the cross-sectional standards. Correspondingly, the following reason is stated:

- For the end user, e.g. a small municipal authority needing to purchase a fire engine, almost prohibitively expensive.

One response described a possible detrimental impact in particular detail:

- The hierarchical structure requires regular communication from "the top down" and vice-versa. The benefits cannot otherwise be achieved.
  An exacerbating factor is that the three tiers of standardization activity are not organized in a single standards committee/TC, but distributed over a number of standards committees/TCs between horizontal standardization (A+B) and product standardization (C).
  This makes communication between the principles (A+B) and their application (C) particularly difficult.

The following point is made in this context:

- It is therefore important:
  - That communication between committee secretaries and selected experts (liaison officers) be maintained. This involves regular reports and comments.
  - That the hierarchy be regarded as structural and not personal. The latter can however easily be the case: "That lot up there are producing a standard without (asking us) (...) or "That lot down there have no idea (because they ignore the basic/generic standard) (...)"

– That homogeneity be assured by the integration of comments from the "other" level (e.g. from the Type C tier into Type A+B standards and vice-versa).

At this point, it should be noted that this is a general problem, one which was addressed comprehensively in KAN Report 25 (Eichener, 2001). The solution envisaged by small and medium-sized enterprises is as follows: the standards themselves should be clear and comprehensible, contain clear requirements, codes of practice and actual technical solutions (instead of general objectives of protection), and on the whole should reproduce sections from other standards rather than making reference to them.

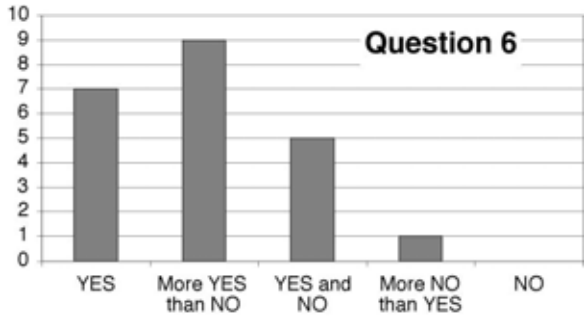
I.3.4.6 Perspectives for general implementation

The answers offered for this question took the form of a scale. The responses were for the greater part affirmative (7 and 9 answers respectively out of 22 were" YES" or "More YES than NO"). Only one respondent selected "More NO than YES".

Question 6:

Can you envisage a hierarchical structure similar to that in the area of machine safety being implemented throughout standardization? This would mean that part of the provisions of a standard governing a subject would be dealt with in a standard governing many subjects of the same kind.

— YES
— More YES than NO
— YES and NO
— More NO than YES
— NO



The comment was made several times that this objective should be regarded as having been achieved, for example in the fields of:

- Vehicle standards
- Screws
- Wood materials (reference to DIN EN 13986, "Wood-based panels for use in construction - Characteristics, evaluation of conformity and marking"): this is a harmonized construction products standard used for the CE marking of wood construction products for which product-specific requirements are set out in numerous other standards (e.g. DIN EN 310, "Wood-based panels; determination of modulus of elasticity in bending and of bending strength").

A further example stated was:

- The EU directive for PPE

A hierarchical structure was considered promising for:

- The area of laboratory equipment
- Sectors

It was emphasized several times that:

- The potential for attainment depended upon the subject of standardization

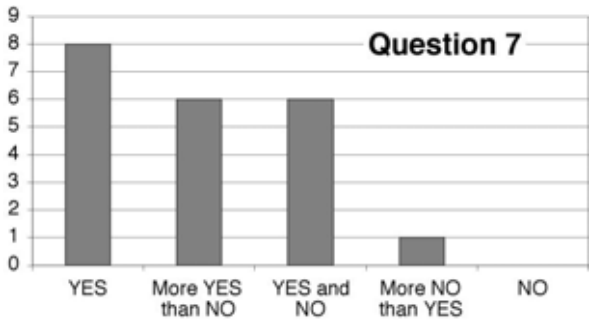
I.3.4.7 Prospects for success in the development and updating of standards

Overall, the question was answered in the affirmative, in one case with the particular emphasis that it was "essential".

Six respondents replied "YES and NO", however, and one with "More NO than YES".

Question 7:

A hierarchical structure of rules, regulations or system specifications is common in many areas and is applied successfully, for example:
In the legal sphere (constitution - act - executive order)
In telephone technology (tertiary exchange - regional exchange - nodal exchange - local exchange)
In process automation (control and instrumentation - process control level - shopfloor control level - field level)
Can a similar level of success also be expected for the development and updating of standards?
— YES
— More YES than NO
— YES and NO
— More NO than YES
— NO



The comments on this question reveal a fundamental problem:

- A change in a higher-level standard may have various impacts upon the lower-level standards, where it may necessitate changes involving considerable effort.

This problem is common to all hierarchical systems, including legislation and internal plant standardization. In standardization as practised in Germany or at ISO, it has a different quality, since standards committees and their volunteer members are not obliged to follow instructions from a higher level. Management competence similar to that held by an employer or obligations such as those imposed by the legislator do not exist in this context. It must also be considered that the significance of "higher-level" and "lower-level" should be viewed in reverse. The following comment is also relevant in this context:

- Success is subject to natural limits.
  The fact described above, i.e. that standardization in the form of Type A, B and C standards has its origin in multiple standards committees/TCs, would mean, if transferred to the legal sphere, that a number of ministries would have to create this structure jointly.
  In the legislation, too, certain differences are found between the provisions originating in different ministries (e.g. labour legislation vs. product legislation).

The critical responses also drew attention to the following points:

- Not generally transferable
- Impairs clarity even further

With questions 8 and 9, the aim was to identify the respondents' reasons for answering Question 7 affirmatively or negatively. The reasons stated can be regarded as further comments upon Question 7.

No negative answer was given. The reasons for affirmative answers are therefore summarized below (answers identical in essence have been grouped; the order is irrelevant):

- Practical experience with the IEC body of electrical safety standards and the CEN/ISO body of machine safety standards confirms this statement
- Fewer redundancies
- Fewer contradictions, less overlap, and fewer duplicate provisions: a hierarchy reduces the number of contradictions within a large legal or standards structure, since the terminology and principles are co-ordinated
- Rationalization of normative regulations
- Coverage of a wide scope by means of standards located high up in the hierarchy. Supplementing according to need by discrete provisions in "lower-level" standards
- Clear structuring of the entire body of standards
- Higher-level rules result in more uniform and more generally valid downstream standards
- The structuring of standards is as intelligent as the structuring of legislation and processes (i.e. technical processes)
- Greater clarity
- Attainment of a better overall understanding
- More rapid location of the relevant standard/provision
- Complex scientific relationships can be modelled well in hierarchies, particularly where the latter encompass the formation of terminology, principles, and their application
- At European level, the New Approach automatically brings with it a convergence of the legislative and standardization structures

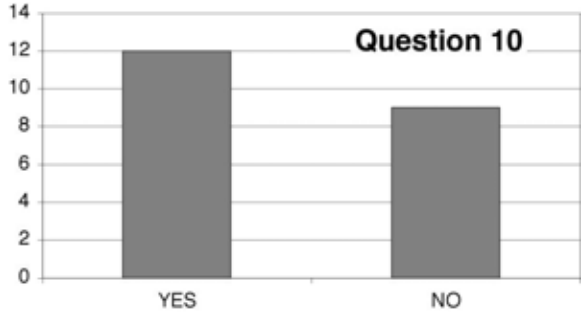
I.3.4.8 The need for standards at a higher level

The results show that in somewhat over half of all cases, a need has been identified for standards which should be assigned to a higher level.

Question 10:

Has the activity within your committee resulted in a need being identified for standards which belong on a higher level? (Example: during the formulation of provisions, a need is observed for a measurement method for determining the properties of a range of products.)

— YES
— NO



If your answer is YES, please state an example.

In addition to various individual standards from the area of electrical safety, the following standards and areas were stated as examples:

- Uniform test principles/test rules, for example in the areas of:
  - Firefighting technology
  - Machine tools
  - Respiratory protective devices
- Rules for instruction handbooks
- Rules for the handling of risks
- Characterization of laser radiation
- Accessibility
- Usability
- Mental stress

Attention was drawn to the following experience:

- On occasions, it becomes evident only at a later stage, or in the course of many years, that several standardization projects should have been structured differently.

The following was also stated as a topical subject:

- Mandate of the European Commission to CEN (M/366) to develop European standards which set out the methods for detecting hazardous substances in construction products. The methods will be determined by the substances to be detected, and only secondarily by the construction products concerned.

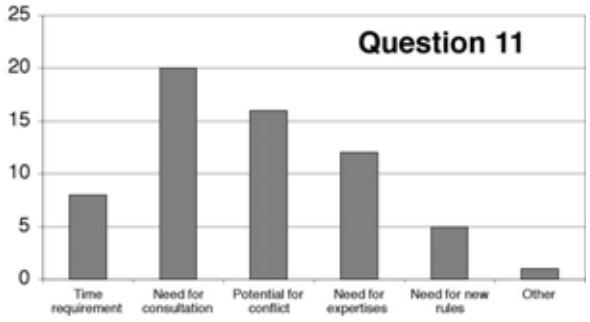
I.3.4.9 Aspects relevant to the development of cross-sectional standards

Five multiple-choice answers were provided to this question, together with an option for additions to the list. Facility was also provided for the provision of comments and additional information.

Question 11:

If a committee has accepted the task of developing a cross-sectional standard, to what aspects do you think it must pay particular attention?
Multiple answers are possible.

(1) Time requirement
(2) Need for consultation
(3) Potential for conflict
(4) Need for expertise
(5) Need for new rules for standardization work
(6) Other



In addition, two respondents indicated the following aspects:

- All aspects are important, but in different ways from one project to another, according to priority.

- Balanced composition of the committee (schools of thought, stakeholders)

The two aspects stated most frequently by the respondents, "Need for consultation" and "Potential for conflict", were described in detail by one respondent (who was not aware of the other responses) in the response to Question 5. This was also indicated elsewhere (see Annex I.3.4.5, "Potential detrimental impact of a hierarchical structure"), but will be reproduced again at this point:

- "The hierarchical structure requires regular communication from the 'top down' and vice-versa. The benefits cannot otherwise be achieved. (...)
  The problem is made worse by the fact that the three levels of standardization activity are not organized in a single standards committee/TC, but distributed over a number of standards committees/TCs between horizontal standardization (A+B) and product standardization (C). This makes communication between the principles (A+B) and their application (C) particularly difficult. (...)"
  "It is therefore important: (...)
  That the hierarchy be regarded as structural and not personal. The latter can however easily be the case: 'That lot up there are producing a standard without (asking us) (...)' or 'That lot down there have no idea (because they ignore the basic/generic standard)' (...)"

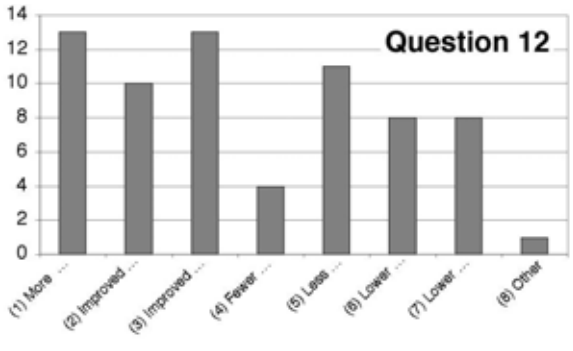
If these comments are anything to go by, a comprehensive part of the "potential for conflict" which was indicated may not be attributable to the inevitable arguments concerning the subject-matter, for the purpose of which a consensus is sought during standardization activity. Whereas arguments concerning the subject-matter may be regarded more as an internal problem of committees, and indeed may contribute substantially to the identification of solutions, external conflicts are much less desirable. A proposed concept should therefore include an appropriate strategy for conflict avoidance.

I.3.4.10 Potential benefits of hierarchical standardization

Seven multiple-choice answers were provided to this question, together with an option for additions to the list. Facility was also provided for the provision of comments and additional information.

Question 12:

Certain benefits can be anticipated from changes to the structure of standards which are the result of a more hierarchical approach.
In your estimation, which of the benefits listed below are realistic?
Multiple answers are possible
(1) More rapid development of standards
(2) Improved content
(3) Improved integrity
(4) Fewer meetings
(5) Less effort involved in updating
(6) Lower development costs
(7) Lower updating costs
(8) Other



The purpose of this question was to obtain a preliminary general view of opinion with regard to the scope for:

- Improvement in the quality of standards

- Greater efficiency in standardization work in terms of the time and money invested in development and updating

Benefits were clearly anticipated in the form of improvements to the quality of standards. The benefits stated most frequently were "more rapid development of standards" and "improved integrity (in the sense of greater freedom from contradictions)". In the view of DIN, the second aspect is one of the most important principles of standardization, and has been since the institute's inception. For this reason, one of the instruments required for this purpose, the Standards Inspection Office at DIN, has since the 1920s had the function of assuring the integrity, both formal and of content, of standards: *"In order to ensure that a standard is not composed arbitrarily and on the basis of random agreements, but is instead founded upon a certain legality, the Inspection Office must ensure that no discrepancies exist between the standards. Each standard is dependent upon another; no standard exists in isolation"* (emphasis as in the original) (Zimmermann und Brinkmann, 1931). If a new concept is able to offer an advantage in this respect, it should be considered highly beneficial.

Benefits in the form of greater efficiency are less widely anticipated; in particular, only four of the 22 respondents expected fewer meetings to be held. The focus lies primarily upon an anticipated reduction in the effort entailed by updating, and less upon the costs of development and updating.

Comments were also made in response to this question to the effect that although an improvement may be expected in the development and updating of standards, the effect for the direct user of the standard will be less positive, since it is evidently feared that more standards will have to be referred to. Suitable attention must be paid to this objection, since standards are not an end to themselves. At the same time, however, it must be considered that inconsistent bodies of regulations may have a greater negative impact upon direct users than upon the parties involved in the standards' development. Where a hierarchical system does not exist, the user of a standard becomes aware that he has a problem only when he comes to carry out the task itself. Conversely, the problem feared here, in the case of a hierarchical system, is encountered as soon as he begins searching for a standard with which he can complete it.

I.3.5 Introduction to the questionnaire for the other standards committees

The request for participation, the text of the introduction and the associated description preceding the questionnaire for the other standards committees are reproduced below.

"The significance of cross-sectional standards for standardization in general and for occupational health and safety in particular"

Survey conducted in DIN standards committees concerning hierarchical structures for standards
Berlin, November 2005

Dear Sirs,
On behalf of the Commission for Occupational Health and Safety and Standardization (KAN), we are currently conducting the project entitled "The significance of cross-sectional standards for standardization in general and for occupational health and safety in particular".
As part of this project, we are dealing intensively with subjects including the hierarchical structuring of standardization as implemented in the area of machine safety with Type A/B and C standards. This principle is presented and described in brief overleaf.
Within this hierarchical structure of standards, the Type A and Type B standards can be regarded as typical "cross-sectional standards" in the context of the project: they constitute the basis for the development of Type C standards in the area of machine safety, and are applicable across products and trades.
Further examples of typical cross-sectional standards are, in general:
- Terminology standards
- Quality standards, such as ISO 9000
- Standards containing principles or guidelines
In your work developing standards, it is likely that you use a range of cross-sectional standards.
In this context, we are interested in the experience and expectations of standards committees concerning this subject, and in particular in their experience with standards which may be considered to have a bearing upon occupational health and safety.
A questionnaire is provided below which we would ask you to complete and return to our fax or e-mail address.
We trust that you will be able to support us in our work and respond to our request.
We shall be pleased to answer any queries. Should you be interested in receiving the results of the project, please let us know. We shall inform you upon completion of the project.

Yours faithfully,
Gisela Çakir *Dr.-Ing. Ahmet Çakir*

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Presentation of the hierarchical standards structure in the area of machine safety

A hierarchical structure of standards enables provisions which relate to subjects similar in kind to be distributed among documents differing in their level of abstraction and detail. In the area of machine safety, the procedure shown in Fig. 1 was and continues to be followed, in order for the statutory mandate of the EU Machinery Directive to be supported.

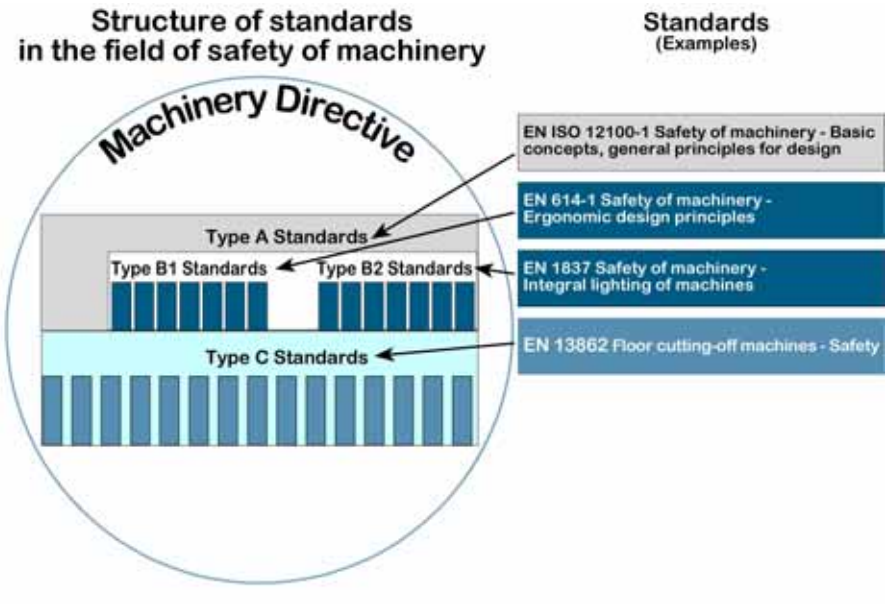

Fig. 1 The standards structure in the area covered by the Machinery Directive, with the three tiers of its hierarchy.

The structure of standards in the area of machine safety follows the following hierarchy:

- *Type A standards are basic safety standards. They deal with basic concepts, principles of design and general aspects which may be applied to machines;*
- *Type B standards are generic safety standards. They deal with a certain safety aspect or a certain type of safety device which can be used for a whole range of machines:*
  - *Type B1 standards for certain safety aspects (e.g. safety distances, surface temperature, noise).*
  - *Type B2 standards for safety devices (e.g. two-hand controls, interlocks, pressure-sensitive safety devices, guards).*
- *Type C standards are machine safety standards or product safety standards. They deal with detailed safety requirements concerning a certain machine or group of machines.*

The system of standards within the area of machine safety is conceived such that Type A standards serve as tools, in conjunction with the Type B standards, for the development of Type C standards. Type C standards refer wherever possible to Type A and Type B standards, but may also contain independent provisions of their own.