

The contribution of OSH-related standardization to implementation of the UN Convention on the Rights of Persons with Disabilities

Feasibility study

Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages

The "Commission for Occupational Health and Safety and Standardization" project is supported financially by the German Federal Ministry of Labour and Social Affairs (BMAS).

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Published by: Association for the Promotion of
Occupational Safety in Europe (VFA)

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March 2018 (original German version published 2016)

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About this report

The Commission for Occupational Health and Safety (KAN) has the mandate of safeguarding German occupational safety and health interests in national, European and international standardization activity, and of assuring the participation of the social partners in standardization. It therefore pursues the objective of ensuring that the best possible consideration is given to OSH issues in not only German and European but also international standardization. KAN comprises five representatives each from employers' organizations, employees' organizations and the state, and one representative each from the German Social Accident Insurance (DGUV) and the DIN German Institute for Standardization.

KAN analyses OSH-related issues in standards and identifies scope for improvement in standardization work. One means by which this is achieved is the commissioning of studies and reports.

Background

The UN Convention on the Rights of Persons with Disabilities (UNCRPD) pursues the objective of equality for persons with disabilities by formulating and specifying universally applicable human rights, including the right to access to the world of work. The convention sets out binding rules governing participation by persons with disabilities.

As a signatory to the UNCRPD, Germany has undertaken to create equality of access for all people to the physical environment, transportation, information, communications, education and training, and work. The UNCRPD has had binding legal force in Germany since 26 March 2009. It is aimed at all state institutions and all bodies incorporated under public law.

In 2011, the German Social Accident Insurance adopted its own action plan for implementation of the UNCRPD in the period from 2012 to 2014. One of the measures of the action plan is to gear the prevention activity of the German accident insurance institutions to making companies and educational establishments – in other words, the premises, workstations, tools and ambient conditions – accessible, in order for tasks to be performed safely, ergonomically, and with reasonable stress and strain, by persons both with and without disabilities.

The issue of "living environments and inclusion" addressed by the action plan is of key importance for the study. Inclusion is one of the main principles of the UNCRPD, and means the avoidance of parallel worlds for persons with disabilities. One target of the action plan is for the world of work to be inclusive. Since its inception, the German Social Accident Insurance has had the aim of returning victims of occupational accidents to their jobs if at all possible; that environments

should be designed such that they can be used by people both with and without disabilities; and that where possible, services should be sufficiently accessible for persons with disabilities and their families to be able to reach them from their living environments without unreasonable cost or effort.¹

For the sphere of work (cf Article 27² of the UNCRPD), the target of the DGUV's action plan is to promote a diverse and inclusive world of work and education. To this end, the DGUV endeavours to achieve safe and healthy working conditions for persons with as well as without disabilities. In order to reach its targets, the DGUV will review and if necessary revise standards and regulations – in particular those lying within its own scope – with regard to how they address the specific needs of persons with disabilities; beyond that, it will lobby for the revision of acts, regulations and standards; it will use its presence on state committees to call for consideration to be given to the particular needs of persons with disabilities; and it will reinforce the consideration given to their perspectives in current and future activities, including those in the area of prevention and in new research projects.³

One of the tasks/measures resulting from this target is a proposal that is aimed indirectly at KAN. The proposal, made to the Association for the Promotion of Occupational Safety in Europe (VFA), is for the perspective of the UNCRPD be added to its list of functions. Standards, such as those developed by ISO/TC 159 SC 1 WG 1, "Principles of ergonomics and ergonomic design", are to be reviewed for whether they give consideration to the UNCRPD, for example with regard to universal design.

The envisaged review of the standards is to determine whether they are conducive to the objective of enhancing accessibility. The strategy of universal design addressed in the UNCRPD serves the same purpose. Universal design means that

¹ DGUV Action Plan, 2011, p. 27.

²Article 27 of the UNCRPD states:

Work and employment

1. States Parties recognize the right of persons with disabilities to work, on an equal basis with others; this includes the right to the opportunity to gain a living by work freely chosen or accepted in a labour market and work environment that is open, inclusive and accessible to persons with disabilities. States Parties shall safeguard and promote the realization of the right to work, (...) to, inter alia (...)
 - b) Protect the rights of persons with disabilities, on an equal basis with others, to just and favourable conditions of work, (...) and the redress of grievances;
 - i) Ensure that reasonable accommodation is provided to persons with disabilities in the workplace;
 - k) Promote vocational and professional rehabilitation, job retention and return-to-work programmes for persons with disabilities.

³ DGUV Action Plan, 2011, p. 28.

products, buildings, etc. are designed to satisfy the most diverse requirements possible.

Purpose of the study

A feasibility study is to be conducted to determine the degree to which OSH-related standardization can contribute to implementation of the UN Convention on the Rights of Persons with Disabilities (UNCRPD), and to examine whether existing standards consider the principle of universal design.

A further aim of the study is to estimate the potential impacts of the UNCRPD and its implementation at national level upon KAN. The results of the study are to enable KAN to estimate the possible consequences for OSH-related standardization within this area.

One question for example is how machines must be designed in order for persons with disabilities to be able to work on them safely and ergonomically⁴. It must be considered in this context that standards (and products) are not able to address all forms of disability; instead, the underlying conditions at the workplaces concerned, and the possible measures, must be examined on a case-by-cases basis when persons with disabilities are employed there. The use of assistive equipment, in particular, must be possible and permissible.

KAN wishes to thank the project contractor, Dr Hansjürgen Gebhard, and the supporting team at the Institute for Occupational Medicine, Safety and Ergonomics (ASER) in Wuppertal for conducting the project, and the following experts in the supervisory project working group for their supervision and support:

- Norbert Breutmann, Confederation of German Employers' Associations (BDA), Berlin
- Ulf-Thorsten Dohne, German Social Accident Insurance Institution for the health and welfare services (BGW), Würzburg
- Sabine Heegner, Heegner Seminare, Beratung, Mediation, Munich
- Michael Jansen, German Social Accident Insurance (DGUV), Sankt Augustin
- Eckhard Metze, Employers' Liaison Office, KAN Secretariat, Sankt Augustin
- Hans-Jürgen Penz, German Social Accident Insurance Institution for the administrative sector (VBG), Hamburg
- Thomas Rüschemschmidt, German Social Accident Insurance Institution for the woodworking and metalworking industries (BGHM), Dortmund
- Dr Beate Schlutter, KAN Secretariat, Sankt Augustin

⁴ 'In this context, it is important to consider different forms of impairment.' (DGUV Action Plan, 2011, p. 20)

- Marc Schulze, German Federal Ministry of Labour and Social Affairs (BMAS), Bonn
- Werner Sterk, Head of the Department of Safety Technology at the KAN Secretariat
- Daniela Tieves-Sander, Employees' Liaison Office, KAN Secretariat, Sankt Augustin
- Dr Dirk Watermann, Head of the KAN Secretariat, Sankt Augustin

Summary by KAN

During the feasibility study, the areas of presses, industrial trucks and combi steamers were selected as examples, and the corresponding standards analysed. The product safety standards of the product groups under consideration were found to differ widely in their structure.

The product safety standards for presses and the machine safety standards/product safety standards for industrial trucks address detailed safety requirements for these groups of machines.

By contrast, the product standards analysed governing combi steamers fall within the non-harmonized sphere of standardization under the German Product Safety Act.

In none of the standards studied is reference made to relevant standards, guides, DIN technical reports or DIN Handbooks dealing with accessibility or particular user groups at risk.

For determining what forms and degrees of ability are assumed to be present for use of a product or item of work equipment, the study applies a model list of requirements criteria to protective equipment and safety aspects. The list of criteria is based upon human abilities, divided into the categories: sensory, physical, cognitive and allergies. A six-level scale is applied to the list with regard to the requirements to be met/skills needed:

- 0: None
- 1: Very low
- 2: Low
- 3: Average
- 4: High
- 5: Very high

It was observed in the process that:

- The list permits estimation with reasonable effort.
- In some standards, the protective devices/safety aspects were described with virtually no reference to human abilities.
- In other standards, use of the protective equipment/safety aspects described necessitated possession of at least some human abilities above the level of "very low".

For standards governing protective equipment/safety aspects (Type B standards), the list is suitable for use even by experts not directly involved in the standardization process. However, its use for product safety standards (Type C standards), which deal comprehensively with more complex technical products, presents substantially greater difficulty. The references stated in these standards to the essential health and safety requirements for design and construction of the products differ widely. Detailed knowledge is required in this area, particularly by members of the relevant standards committees, and of course by the experts at the manufacturers in the sectors concerned.

Recommendations (see Annex 4) for standards committees have been developed. The aim of the recommendations is to raise awareness on the standards committees for aspects of inclusion. Better incorporation of aspects of inclusion into standards would enable more strategies to be found for satisfying product safety requirements. This in turn would extend the range of application of products and work equipment, thereby enabling them also to be used by persons of impaired ability without endangering safety or health.

The project contractor proposes that manufacturers be called upon, for example in the "User information" section of a standard, to draw up a requirements profile with reference to human characteristics and abilities. The purpose of this is to urge manufacturers to consider aspects of inclusion and thereby to promote greater participation of persons with disabilities in working life. In the medium term, product standards should be supplemented by a section on "Human characteristics and abilities".

KAN's recommendations

KAN requests that **DIN**:

- Disseminate the recommendations on the relevant standards committees. The aim here is to raise awareness on standards committees for aspects of inclusion. Better incorporation of these aspects into standards would enable products and work equipment to be used more widely and would yield more solutions to

occupational safety and health requirements that require only lower levels of ability.

The **KAN Secretariat** is mandated:

- To make the results of the study known to the relevant institutions and committees (such as the expert committees and subcommittees of the DGUV);
- To disseminate the results through the KAN media (KANBrief, KANMAIL, Twitter, KAN website);
- To commission conceptual development of an online tool for "accessible design/abilities profiles and standardization"; this tool is to be made accessible through the KAN Praxis ergonomics lecture modules;
- To incorporate the topic of "accessible design/abilities profiles and standardization" into the KAN/IAG seminar on the principles of standardization work in occupational safety and health.

The **DGUV** is requested:

- To examine how dissemination of the results can be promoted, including by discrete activities within DGUV Action Plan 2.0 for implementation of the UNCRPD.

1 Introduction

This feasibility study examines the contribution made by OSH-related standardization to implementation of the UN Convention on the Rights of Persons with Disabilities. Its focus lies upon product safety standards. The study analyses whether and to what extent these standards currently contribute to eliminating barriers and thereby assuring greater participation by disabled persons in working life. The analysis is predicated upon product safety having a pioneering function in this context, since the use of products and work equipment is conditional upon their design and construction meeting the essential health and safety requirements. Fewer barriers means that this should be assured as far as possible independently of human characteristics and abilities. Product safety standards have an important function in this respect, since they are a key element in implementation of the essential health and safety requirements for the design and construction of products and work equipment.

The present feasibility study is not concerned with accessibility in a general sense. The design of work systems is explicitly excluded from the analysis.

The design and construction of products and work equipment is among the areas to which principles of accessible design can be applied. Aspects of accessibility such as "recognizability – reachability – usability" can also be transferred.

In this area, standardization documents in the form of guidelines and technical reports have been produced at national and international level in the past 15 years or so that are intended to support standards committees, and also the manufacturers of products and work equipment, in their work with regard to issues relating to accessibility.

The terms "universal design" and "design for all" are often used in this context. These terms reflect an objective, similar to "accessible", "CO₂-neutral", etc. Objectives formulated in this way have the advantage of being (apparently) uncompromising ("universal", "-free", "-neutral", etc.). At the same time however, they have the drawback that this uncompromising approach can easily be misunderstood to mean that when the objective is (at least apparently) unattainable, there is also little to be gained from making the effort.

In the view of the study's authors, the term "inclusive design" presents fewer risks (and reservations) in this respect, since it describes more an approach to design that takes account of ever greater numbers of people with their diverse characteristics and abilities – in other words, it includes them – and thus describes a process of continual improvement.

Against this background, the present feasibility study examined product standards with reference to three product groups serving as examples. The study was

performed with the use of a requirements-based list of criteria that appears suitable for furthering the process of raising awareness and thus conducive to constructive development.

2 Background to the study

2.1 UN Convention on the Rights of Persons with Disabilities (UN CRPD)

By formulating and specifying universally applicable human rights, including the right to access to the world of work, the UN Convention on the Rights of Persons with Disabilities (UN CRPD) pursues the objective of equality for persons with disabilities. The convention sets out binding rules governing participation by persons with disabilities. It thus makes clear that the rights concerned are human rights acknowledged as enjoying utmost importance in our society.

As a signatory to the UN CRPD, Germany has undertaken to create equality of access for all people to the physical environment, transportation, information, communications, education and training, and work. The UN convention has had legal force in Germany since 26 March 2009 [1]. It is addressed to all state institutions and bodies incorporated under public law.

The terms "inclusion" and "inclusive society" reflect the UN CRPD's objective that special systems for persons with disabilities should generally be avoided. "Inclusive design" is of particular importance in this context. Inclusive design means that products, buildings, forms of transport, etc. are designed such that they can meet the most diverse requirements possible. This is frequently to everyone's advantage. The same principle applies not only to products, but also to the design of work premises and schools. The German Social Accident Insurance and the relevant state institutions are able to exert a not inconsiderable influence here.

2.2 Facts and figures

The recent report by the German Federal government on participation, concerning the circumstances of people with disabilities [2], refers in its introduction to essential terms of reference.

Its relevance is illustrated by statistics. These show that around 17 million German residents aged over 18 have health impairments or chronic diseases that constrain them in everyday life. This figure equates to just over 25% of this age group.

Of these, over 7 million are classified as severely disabled, i.e. they have been issued with official documentation to this effect [3]. Persons classified as being severely disabled are those recognized by the pension office as having a disability level of at least 50%. This figure thus corresponds to approximately 9% of the population.

The classification is illustrated by the graph (Figure 1). It shows that people formally recognized as being disabled are not the only ones constrained in their participation. The purpose of the UN Convention on the Rights of Persons with Disabilities (UN CRPD) and its content is to change this situation for the better in the medium and long term.

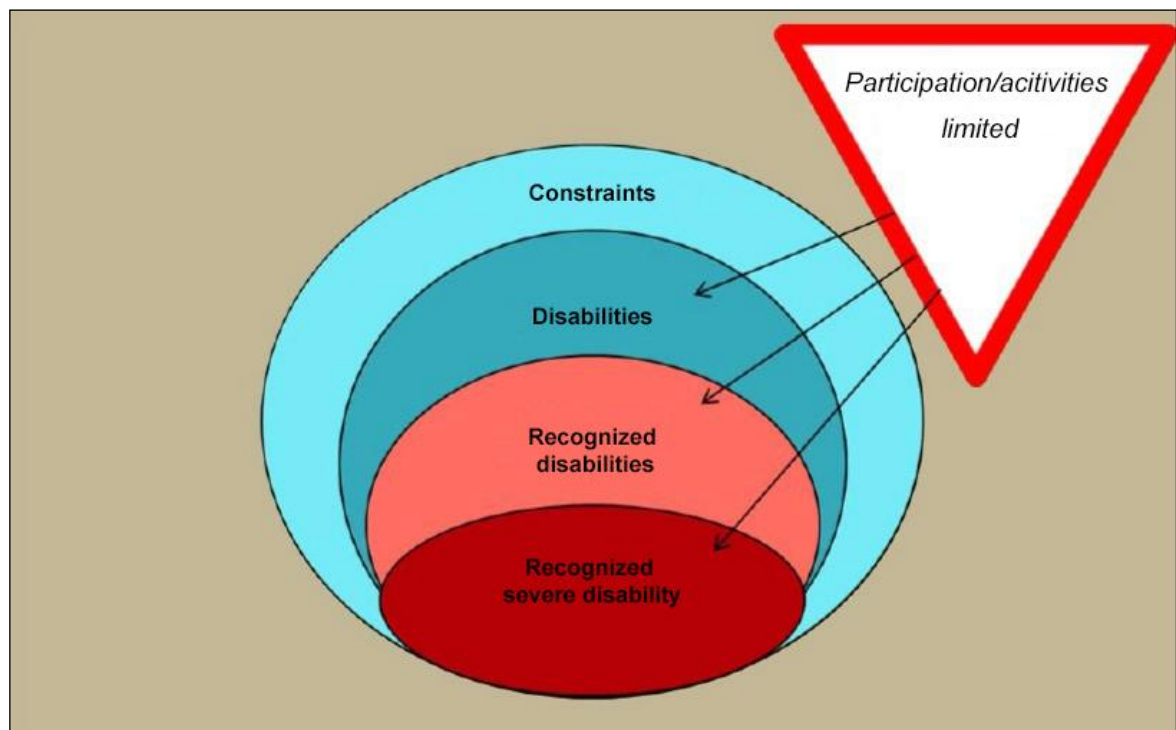


Figure 1: Constraints in participation and activities are not limited to those formally recognized as being severely disabled (source: BMAS 2013 [3])

In its recent report on participation [2], the German Federal Government considers for the first time the actual circumstances of persons with such constraints. The report considers the extent to which persons subject to health constraints experience limitations in their opportunities for participation as a function of factors in their environment, i.e. to what extent they are handicapped only as a result of the latter. In other words, it examines factors that limit participation, and circumstances that are shown to be favourable to it.

The report thus illustrates the key and essential processes of a change in thinking.

Further interpretation of the statistics for severely disabled persons shows that a little under half are aged 64 or under (see Figure 2). In the great majority of cases – over 83% – the disability was primarily caused by a disease; in approximately 4% of cases, the individuals were born with the disability, or it occurred in the first year of their life.

The ASTA state committee on work premises had already addressed this issue and drawn up a technical rule on the subject (ASR V3a.2, concerning the design of work premises for accessibility [4]).

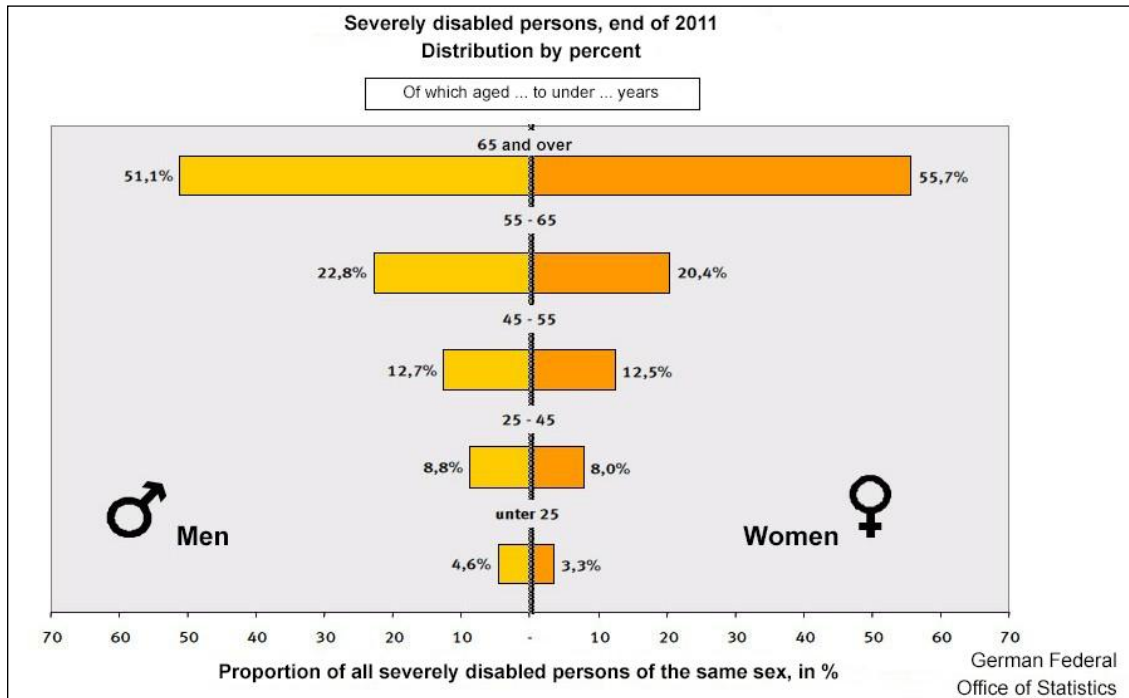


Figure 2: Age distribution of severely disabled persons in Germany as at the end of 2011 (source: Federal Office of Statistics 2013 [3])

Figure 3 illustrates different forms of functional impairment, showing their frequency by percentage. These figures are based upon the WHO's international classification of functioning, disability and health (ICF) [6]. According to this classification, the most common cause of disability, accounting for around 25% of cases, is functional impairment of the inner organs. In 14% of severely disabled persons, function of the limbs is impaired. A further 12% exhibit impairment of the spine and upper body. Altogether, physical disabilities account for 64% and thus the majority of functional impairments.

The proportion of blind persons and persons with impaired vision is approximately 5%. Those with a speech, hearing or balance impairment account for approximately 4%. Approximately 10% of cases are accounted for by mental or emotional disability; cerebral disabilities account for approximately 9% (see [5]).

The diagram clearly illustrates one of the essential challenges: that not all functional impairments are the same. The whole spectrum of functional impairments must be considered, which naturally leads to greater challenges for

the inclusive design of products and work systems, and must also address the area of product safety.

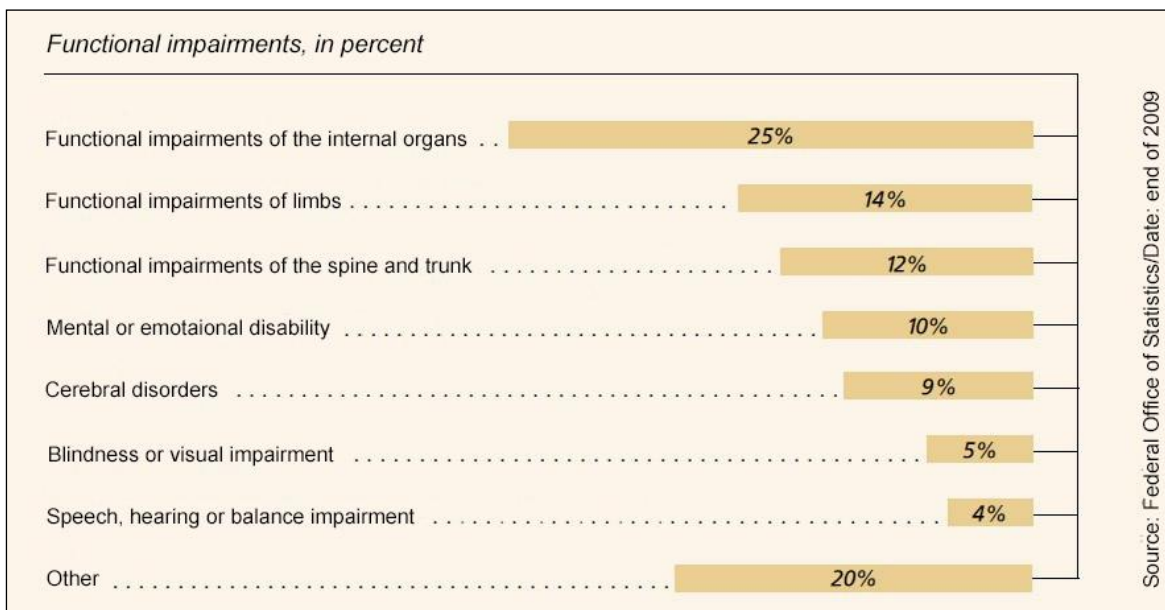


Figure 3: Form of functional impairment, in percent (source: evaluation by the Federal Association of the Integration Offices and Main Welfare Associations (BIH), 2011 [5] based upon data from the Federal Office of Statistics 2013 [3])

2.3 DGUV Action Plan

Various action plans have been produced for implementation of the UN Convention on the Rights of Persons with Disabilities (UN CRPD). These include:

- The national action plan of the **German Federal Government** for implementation of the UN Convention on the Rights of Persons with Disabilities: **Our path to an inclusive society** [7]
- Inclusion initiative of the state of North Rhine-Westphalia (Landesinitiative nrw inklusiv) – action plan of the **state government of North Rhine-Westphalia** – implementation of the UN Convention on the Rights of Persons with Disabilities: **One society for all** [8]
- **DGUV** – German Social Accident Insurance: **action plan of the German Social Accident Insurance (2012-2014) for implementation of the UN Convention on the Rights of Persons with Disabilities** [9]

In 2011, the German Social Accident Insurance adopted an action plan of its own for implementation of the UN Convention on the Rights of Persons with Disabilities for the period from 2012 to 2014 [9]. This plan defined a total of 5 issues, to which a total of 12 objectives of the activities are assigned.

The issues are as follows (see Figure 4):

- Awareness-raising
- Accessibility
- Participation
- Individualization and diversity
- Living environments and inclusion

Through these issues, the action plan is focussed upon the issues of the German Social Accident Insurance. The action plan can however be considered as a model for other action plans. It is clear that the plan should on the one hand provide impetus for a change of thinking, and on the other illustrate actual solutions and strategies.

	Issue 1: Raising of awareness
Target 1	Communication of the content and targets of the UN Convention on the Rights of Persons with Disabilities
Target 2	Routine presentation of persons with disabilities in public-relations and communication activities
	Issue 2: Accessibility
Target 3	Further development of barrier-free communication
Target 4	Organization of an accessible environment
	Issue 3: Participation
Target 5	Participation by persons with disabilities
Target 6	Recruitment of persons with disabilities as peers
Target 7	Involvement of persons with disabilities in the quality standards
	Issue 4: Individualization and diversity
Target 8	Consolidation of individualization
Target 9	Consideration for diversity among persons with disabilities
	Issue 5: Living environments and inclusion
Target 10	Promotion of a diverse and inclusive world of work and education
Target 11	Strengthening of activities for an inclusive community
Target 12	Accessible services of the German Social Accident Insurance

Figure 4: Issues and targets of the DGUV Action Plan (source: DGUV 2011 [9])

Against the background of the study topic, particular importance is attached in this context to Issues 2 (Accessibility) and 5 (Living environments and inclusion).

One of the measures provided for in Issue 2 is described as follows:

"In the statutory accident insurance system, the area of preventive occupational safety and health has the objective of designing work premises in companies and educational establishments such as to be accessible. Workers with disabilities are to be enabled to carry out their work in a manner that is safe, ergonomic, and is associated with appropriate stress and strain." [9]

In Issue 5, the topic of inclusion is listed as one of the main principles of the UN CRPD; inclusion means avoiding persons with disabilities being placed in parallel worlds.

"The world of work must be inclusive. (...) The aim of the German Social Accident Insurance has always been that if at all possible, people should return to their workplace (...) after suffering an accident. (...) Living environments should be designed such that they can be used by people with and without disabilities at the same time. Services should if possible be sufficiently accessible for persons with disabilities and their families to be able to reach them from their living environments without unreasonable cost or effort..." [9]

For the area of work (see Article 273 of the UN CRPD), Target 10 of the DGUV Action Plan is as follows:

"Promotion of a diverse and inclusive world of work and education". To this end, the DGUV "endeavours to achieve safe and healthy working conditions for persons with as well as without disabilities. (...) In order to reach its targets, the DGUV will review and if necessary revise standards and regulations – in particular those lying within its own scope – with regard to how they address the specific needs of persons with disabilities; beyond that, it will lobby for the revision of acts, regulations and standards; it will use its presence on state committees to call for consideration to be given to the particular needs of persons with disabilities; and it will reinforce the consideration given to their perspectives in current and future activities, including those in the area of prevention and in new research projects." [9]

3 Content of the study

Against the background of the present study's topic and its character of a feasibility study, the following terms of reference were formulated as work packages:

1. **Identification/selection of example groups of products** that are to be used safely and ergonomically by persons with disabilities
2. **Development of example criteria** that can be used to evaluate the extent to which standards for the design of work equipment consider the OSH-related content of the UN CRPD
3. **Review of the drafted criteria** against the outcomes of ISO/TC 159/SC 1/WG 1, "Principles of ergonomics and ergonomic design"
4. Review of product standards possibly identified by (1) with regard to **any need for amendment of the product requirements** in order for the product also to be suitable for use by persons with disabilities with consideration for safety and health (including ergonomics etc.)
5. Summarized **evaluation of the work entailed** by review of OSH-related product standards for their satisfaction of the criteria in (2) in consideration of KAN's terms of reference

The task here is for criteria to be drafted that can be used to determine the extent to which product standards satisfy the content of the UN CRPD with a bearing upon product safety. The authors of the study propose that a **requirements-based list of criteria** be employed for this purpose. In order to determine the feasibility, three product groups were selected serving as examples, and selected safety and health-related standards analysed by use of the criteria list (see Section 5.6).

Based upon the results, recommendations (see Section 6.2) were formulated that can serve as a basis for estimation of the required resources and effort for KAN and/or other institutions involved in the process. Product safety standards are thus to be reviewed against the example list of criteria, with greater consideration being given to content of the UN CRPD with a bearing upon product safety.

As stated by its title, the aim of this feasibility study is to examine, with reference to selected examples, the contribution made by product and OSH-related standardization to the UN CRPD:

- What contribution does it already make?
- What contribution should it make in future?
- How can this be achieved?

4 Discussions with experts

In the first phase, standardization activity was analysed, and talks held in the first instance with individuals who were generally affected indirectly. The intention at this point was to consider and evaluate a range of perspectives.

4.1 Summary of the discussion results

Performance of the study was accompanied by several discussions with experts. The results are summarized below.

The following key questions were discussed:

- From your perspective and in consideration of your background, what **suggestions** are you able to make?
- What **importance** do your suggestions attach to standardization in the areas of product safety and of the safety and health of workers at work?
- What (additional) **input** if any would you like to see from standardization?
- Are you able to make suggestions for the **evaluation** and adaptation of work equipment **with reference to examples**?

Selected discussion results are summarized below:

- The **importance of standards** is regarded as high owing to the high level of support that they provide, and could be enhanced still further, for example by their use for certification purposes
- Reference is made to the DIN 18040 series of standards, **Construction of accessible buildings** – Design principles, barrier-free living
- Consideration where appropriate for stair lifts in addition to **passenger lifts**
- Consideration of **accessibility** as a basis for **inclusion**
- The integration offices, for example, are aware of examples of **technical solutions**, in some cases with before-and-after comparisons
- "**Strategies**": facility for height adjustment, two-senses principle, interfaces to and use of assistive devices
- "**Alarm cases**": two-senses principle, flashing lights and acoustic alarm, also on PCs
- Design as **sitting and standing workplaces, suitability for use** in both a standing and sitting position is important
- **Based on requirements** and not on specific groups of persons
- Basic documents: **DIN Technical Report 131** (intended for standards committees)
- **DIN Technical Report 124** (intended for authors of product standards and developers, manufacturers and suppliers of technical products)

- Possible **internationalization** of DIN Technical Report 124 via the TR 22411 series of standards
- Measures beneficial not only for persons with disabilities
- **Differentiation** according to different degrees of constraints upon ability
- Reference to "**niche markets**", such as: furniture manufacturers, two-wheeler technology, information technology ("Gigaset")
- Besides sheltered workshops, consideration also to be given to **integrative companies** and further developments on the **primary labour market** (software testing; simple tasks)
- Inclusion, **including with regard to innovation and commercial aspects**; global market developments offer significant potential
- Reference to the **REHADAT resources**: which assistive device is best suited to which standard equipment?

4.2 Remarks on standardization activities

Standards constitute recommendations, and are of great value to developers and designers not least owing to the fact that they are produced by consensus.

A search conducted by means of the NoRA OSH standards search tool⁵ for the German term "barrierefrei*" (accessib*) yielded a list of standards containing safety and health requirements with content specific to this aspect.

The results of an up-to-date search extend from **guidelines for standards committees**, through the design of acoustic, tactile and visual signals, to **specific requirements** concerning information technology, accessible construction, accessibility for e-learning, initial and further training, and the design and installation of lifts.

Definitions and general principles have already been described in DIN 32977-1 (1992) [10]. ISO/IEC Guide 71 (2001) [11], Guidelines for standards developers to address the needs of older persons and persons with disabilities, is intended for standards developers and contains guidance on considering aspects for persons with special needs. A revised version of the guidelines has been available since December 2014 (see [12]).

DIN-Taschenbuch 276 [13] contains a compilation of selected standards on **technical aids** for persons with disabilities. These include standards governing terminology, communication and orientation tools for blind persons and persons

⁵ <https://nora.kan-praxis.de>

with impaired vision, patient lifts, and vehicles for the transport of persons with impaired mobility.

International activities are mirrored at national level in NA 023-00-02 GA, Joint working committee: **Accessible design/Accessibility**.

In addition, the work of ISO/TC 159/SC 1/WG 1, **Principles of ergonomics and ergonomic design**, is mirrored in NA 023-00-01 GA, Joint working committee NAERG/NAM: Ergonomic principles. This concerns standards that were developed in the working committee and were thus given particular consideration during the study. These standards deal with fundamental aspects of the ergonomic design of machinery and work systems, and the usability and user-friendliness of products for everyday use.

4.3 Remarks on the contribution to ergonomics

From the outset, the focus of ergonomic product and job design has been upon human beings and the spectrum of their characteristics and abilities. The challenge is and continues to be that of developing strategies for addressing this diversity of characteristics and abilities in order for products and work equipment to be used in a manner conducive to safety and health.

Figure 5 shows selected examples for such strategies. The needs of both right-handed and left-handed persons can be taken into account by the observance of symmetry in products (refer also to [14]).

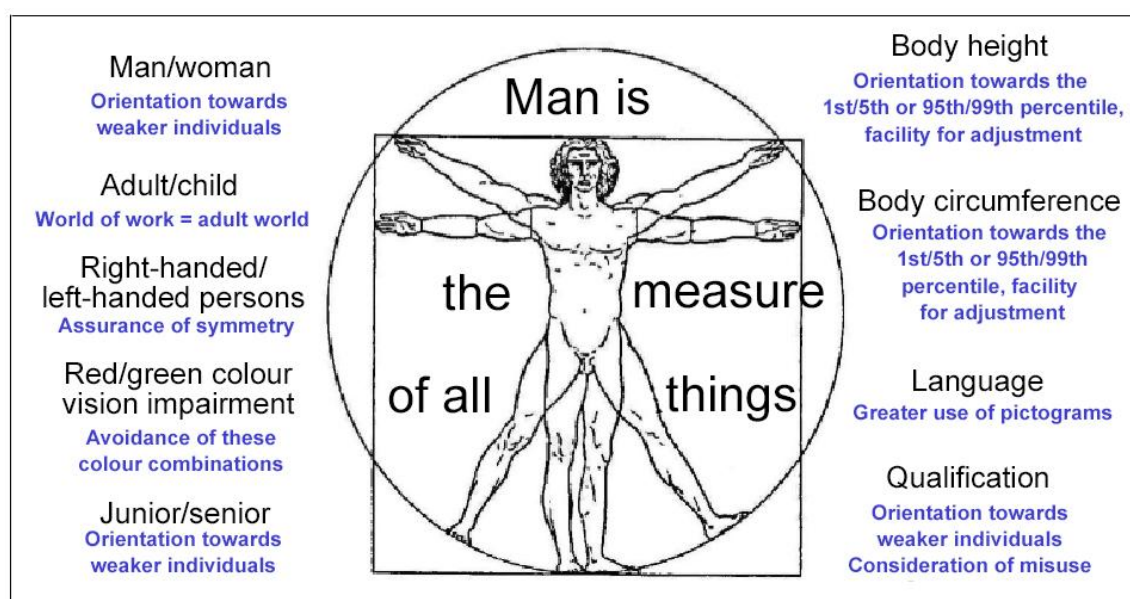


Figure 5: The human being at the centre of ergonomic product and job design: selected strategies

The use of percentiles has become standard practice for dealing with variation in anthropometric data and human physical forces. The increased use of meaningful pictograms makes allowance for differences in linguistic ability. Where the qualifications of users differ, particular consideration is to be given in product design to the aspects of foreseeable misuse of the product.

A brochure published in 1994 [15] by the (then) German Federal Institute for Occupational Safety describes means of designing workplaces for persons with disabilities and impaired performance, and – as indicated by its title – demonstrates that this form of design pays off for all users. The aim of the brochure was to provide an example implementation of the principles of DIN 32977-1 [10].

4.4 Example of DIN 32977-1

DIN 32977-1 (1992) [10], developed by the DIN Standards Committee Medicine (NAMed), contains a compilation of essential principles for accessible design (see Figure 6).

The principles below contain information on fundamental aspects of accessible design that are to be considered **irrespective of the type of product** or measure and irrespective of the form and severity of the functional impairment (disability). These principles, which are of a generic nature, must be expanded on a case-by-case basis. **Criteria for assessment of the quality** of accessible design can be developed and applied only with reference to a specific product or product group in conjunction with the relevant functional impairments.

- Accessible design considers the **particular characteristics, abilities, skills and needs** of persons with disabilities.
- It is based upon the use of findings from research into ergonomics and human factors.
- Accessible design should not only relate to specific individual cases of disability, but should also, where possible and reasonable, involve **the interests of one or more groups of people with disabilities** in planning and implementation.
- Accessible design must sustain and promote the **existing functions** of persons with disabilities. Where function
- For technical products, comprehensive information is to be provided on the **scope of use** and the maintenance regulations. **Instructions for use** must be unambiguous and comprehensible for the users.
- Wherever possible, a form of accessible design should be selected that **is not evidently a special measure**.
- **Persons without disabilities** should also be able to use the products and measures concerned without experiencing additional strain.
- During planning and performance of the measures, attention is to be paid to **comprehensive analysis** of the tasks

<p>has been lost, accessible design must assure and improve its substitution with alternative abilities.</p> <ul style="list-style-type: none">• Accessible design must also comply with the accident prevention regulations. Attention is to be drawn explicitly to borderline situations and risks for persons with disabilities.	<p>and problems and to close cooperation with all parties involved.</p>
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Figure 6: Guidelines for accessible design from DIN 32977-1 [10]

4.5 CEN ISO/TR 22411 (DIN SPEC 33421), supporting ISO/IEC Guide 71

CEN ISO/TR 22411, **Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities** [16], is one of the more recently developed standards and guides that address accessibility and/or particular groups of persons. It is identical with ISO/TR 22411 [17], which appeared in 2008 and was adopted in the European body of standards in 2011.

DIN SPEC 33421 was produced in accordance with the procedural rules for a technical report, and refers to the original version of ISO/IEC Guide 71 [11] published in 2001 with the title "Guidelines for standards developers to address the needs of older persons and persons with disabilities". In December 2014, a fully revised version of ISO/IEC Guide 71 appeared with the new title "Guide for addressing accessibility in standards" [12]. The new version of ISO/IEC Guide 71 reflects developments that have taken place since publication of the previous version in 2001, and also has a more comprehensive approach overall than its predecessor. For example, two strategies for the consideration of accessible design are described that can be summarized as follows:

- Orientation to **design targets**
- Orientation to **human abilities and characteristics**

For each of the human abilities and characteristics, the guide contains comprehensive design recommendations that are intended to eliminate barriers. Conversely, the revised version of the guide no longer contains tables of factors for assuring accessible design in relation to human abilities. The 2001 version of ISO/IEC Guide 71, containing the definition of the seven factors (areas of design) and of human characteristics and abilities, is therefore useful for simplification of reference to DIN SPEC 33421, but not absolutely essential for application and understanding of the technical report.

DIN SPEC 33421 extends, where possible, the scope of the users of products and services, and is not, as is often the case, limited to the 5th and 95th percentiles of the working population. In a total of 192 pages, the technical report sets out ergonomic data and provides guidelines for application of ISO/IEC Guide 71 during the development of standards with regard to consideration for the needs of older persons and persons with disabilities.

The content of DIN SPEC 33421 thus makes the following available

- **Ergonomic data and findings** on human abilities (sensory, physical and cognitive) and allergies
- A **guide to the accessible design** of products, services and environments

Each consideration or recommendation for design is based upon ergonomic principles that must be observed if products, services and environments are to be designed to be accessible for older persons and persons with disabilities.

The report is applicable to products, services and environments that are encountered in all areas of daily life, on the market for consumer goods and at the workplace.

4.6 REHADAT

The REHADAT website (see www.rehadat.info/en/) contains a database of assistive devices and resources for particular areas.

The area of the website concerning **work and training** contains the following introductory text:

This part of the website, concerning assistive devices, includes both custom-manufactured products suitable for the disabled, and series-production products such as ergonomic machines, tools and workplace furniture that can be used by any employee in a company. These occupational assistive devices can also be described as technical work equipment. The aim is for the working conditions to be adapted to the abilities of the employee, in order for their sustainable participation in vocational life to be attained and assured.⁶

The purpose of the REHADAT website is to support inclusion in vocational life. The criteria by which the resources were selected are therefore particularly important.

⁶ See www.rehadat-hilfsmittel.de/de/arbeitsplatz-ausbildung/

These criteria are listed below for specific areas:

Office and other equipment:

- Desks and chairs with facility for personal adjustment
- Glare-free and flicker-free lighting
- Mobile, user-friendly partition systems
- Easily operated electric hole punches and staplers

Transport devices and conveyors:

- Electric drives for reduction of the required physical force
- Height-adjustable handles for an upright body posture
- Drivers' seats for use by persons with impaired walking ability
- Ground controls for use by persons unfit to drive

Lifting and handling devices:

- Tilttable waste bin tippers
- Rolling workshop cranes
- Mobile handling devices

5 Example product groups studied

The normative and informative references within the product standards for the individual product groups, considered in the study as examples, of **presses, industrial trucks and convection steamers**, were used to identify further standards that deal in the broadest sense with the topic of "safety and health" or could be of relevance for persons with disabilities.

5.1 Comments on the procedure

The product standards relevant to the product group concerned were identified by searches for suitable search terms (such as "presses", "industrial trucks", "convection steamers", "ovens", "convection", "grill") in the following databases and search engines:

- Perinorm database (www.perinorm.com)
- NoRA OSH standards search tool (<http://nora.kan.de>)
- Google search engine (www.google.de)

The list of standards returned as hits was reduced to those that could potentially be relevant to particular groups of persons or users and to persons with disabilities. **Standards addressing purely technical aspects, such as material properties or test methods, were not considered further.**

All standards considered for the product group concerned were subjected to a full-text search for passages concerning particular groups of persons or users and/or persons with disabilities. Search terms such as "person", "disabled"; "disability", "barrier", "two-channel", "accessible", "group of persons", "older", "demographic", "deaf", "blind" were used for this purpose. Parts of words were used for the search in each case. The passages identified in this way were analysed for a possible link to "persons with disabilities", "older workers" or "particular groups of persons". Where such a context is found, excerpts from the relevant passages are shown.

The searches reflect the situation in standards as at June 2014. Where a draft standard was also available at the time of the searches besides a standard in force, the former was considered rather than the latter. Standards that had been withdrawn were not analysed further.

In accordance with EN ISO 12100 and CEN Guide 414/ISO Guide 78, standards concerning the safety of machinery and equipment are classified hierarchically as Type A, B and C standards. According to European Commission Communication

2014/C 220/01⁷, the standards listed within it can be assigned to these standard types. The standards developed by CENELEC are however not classified as Type A, B or C standards in this list.

Further assistance in the classification of product safety standards is provided by the standards indexes of the BAuA⁸. These indexes contain national and European standards and technical specifications containing product requirements for the assurance of safety and health that support the essential requirements of the relevant EU directives and the individual regulations under the German Product Safety Act (ProdSG) implementing these directives in German law.

In accordance with the available lists of standards, the standards used in this study were classified according to the standard types shown in Table 1.

Table 1: Classification of the standard types in this study

Standard type	Explanation
A, B, C	Standard type to EN ISO 12100 and CEN Guide 414/ISO Guide 78, listed as such in European Commission Communication 2014/C 220/01.
CENELEC	Standards developed by the European Committee for Electrotechnical Standardization (CENELEC), listed as such in European Commission Communication 2014/C 220/01. Standards developed by CENELEC are not classified as Type A, B or C standards.
7th GPSGV	Standards according to the German Gas Appliance Consumption Regulation (7th GPSGV), listed as such in the BAuA's indexes of standards, current 7th ProdSV.
n/h	Standards in the non-harmonized scope under the German Product Safety Act (ProdSG), listed as such in the BAuA's indexes of standards.

⁷ Official Journal of the European Union, Commission communication in the framework of the implementation of the Directive 2006/42/EC of the European Parliament and of the Council of 17 May 2006 on machinery, and amending Directive 95/16/EC (Publication of titles and references of harmonised standards under Union harmonisation legislation), 11 July 2014.

⁸ List of standards of the German Federal Institute for Occupational Safety and Health (BAuA) <http://www.baua.de/de/Produktsicherheit/Produktinformationen/Normenverzeichnisse.html>, accessed on 7 October 2014.

n/c	No classification: the standard cannot be classified; is not listed in any of the above indexes.
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Type A, B or C standard

In accordance with DIN Standards Committee NA 095, Safety Design Principles (NASG), standards governing the safety of machinery and equipment are classified as follows as Type A, B or C standards⁹:

Standards governing the safety of machinery and equipment are divided in accordance with EN ISO 12100 and CEN Guide 414/ISO Guide 78 into a hierarchy of three categories:

Type A standards (basic safety standards) deal with core terminology, principles of design and general aspects that can be applied equally to all machines ("horizontal standardization"). Owing to the generic character of this type of standard, a manufacturer or supplier whose machine satisfies the requirements of a Type A standard within the constraints of its scope may only partly assume that the essential health and safety requirements of the 2006/42/EC Machinery Directive are also met in full as a result ("indirect" presumption of conformity). In order for full conformity with the directives to be presumed, further harmonized Type B and/or Type C standards must also be referred to.

Type B standards (generic safety standards, group safety standards) address either safety aspects that affect an entire range of machines (Type B1 standards, for example governing safety distances, hazardous substances, noise, radiation, surface temperature, ergonomic design), or a particular type of protective equipment that can be used for various machines (Type B2 standards, for example governing two-hand controls, interlocks, pressure-sensitive protective equipment, guards, signals and actuators, controls, points for access to machines).

Should a product-specific standard not exist for a certain machine, or should such a standard exist but fail to cover hazards that need to be addressed, the provisions of relevant Type B standards have the purpose of specifying the essential requirements concerning a particular machine more closely.

⁹ Excerpt from the website of the NA 095 DIN Standards Committee Safety Design Principles (NASG), <http://www.nasg.din.de/cmd?cmstextid=56275&level=tpl-artikel>, accessed on 7 October 2014.

Type C standards (machine safety standards, product safety standards) address detailed safety requirements for a particular machine or group of machines ("vertical standardization"). Type C standards generally refer as far as possible to the provisions of the superordinate Type A and Type B standards. These provisions are supplemented by machine-specific provisions. Since the particular provisions of a Type C standard may deviate from those set out in relevant Type A and B standards for a larger group of machines, the provisions of a Type C standard always take precedence. Consequently, only Type C standards give rise to an unrestricted presumption of conformity with regard to satisfaction of the essential health and safety requirements of the 2006/42/EC Machinery Directive.

In the context of this feasibility study, the standards concerning the example product groups of presses, industrial trucks and convection steamers were also considered to the extent possible according to the relevant standard type.

The analysed standards governing the **presses** product group belong for the most part to the standards governing the safety of machinery and equipment, and can thus largely be classified according to standard types to EN ISO 12100 and CEN Guide 414/ISO Guide 78.

The machine safety standards/product safety standards upon which this study is based for the **industrial trucks** product group are also all classified as Type C standards. These product standards contain frequent normative and informative references to standards for earthmoving machinery, however. These in turn involve in some cases very particular, dedicated standards (refer for example to EN ISO 5353, Seat index point), which cannot be classified as any particular standard type.

Standards governing the **convection steamers/ovens/grills** product group are poorly suited to classification as Type A, B or C standards. In the "Equipment for commercial kitchens" series of standards however, the DIN Standards Committee Heating and Cooking Equipment (FNH) states that specified sections of these standards contain safety provisions in the sense of the former German Equipment Safety Act (GSG), now the German legislation concerning the placing of products on the market (German Product Safety Act, ProdSG). These standards lie within the non-harmonized scope under the ProdSG, but are nevertheless considered in this study as starting-points for searches for further relevant standards.

The tables below contain the results of these searches. They begin with an overview of the numbers of product standards identified for the selected product groups (see Table 2). The individual standards are listed in Chapter 8, "Annex", with statement of the references.

Overviews are provided for each product group; these briefly describe the content of the standards. They are followed by sections of relevance to the terms of reference of the project. Excerpts of the standards' current content are also reproduced.

Besides providing orientation regarding the standards with a bearing upon product safety for the selected product groups, the overviews also reproduce passages relevant to the terms of reference, in context.

Table 2: Overview of the standards analysed, by standard type. Further relevant standards were identified by way of the normative and informative references in the product standards for the product groups serving here as examples.

Standard type	Product group		
	Presses	Industrial trucks	Convection steamers
Product standards identified:	5	13	7
Type A, B, C – Standard type in accordance with EN ISO 12100 and CEN Guide 414/ISO Guide 78.	1	1	1
	30	9	6
	5	35	--
CENELEC – Standards developed by the European Committee for Electrotechnical Standardization (CENELEC).	7	2	5
7th GPSGV – Standards in accordance with the German Gas Appliance Consumption Regulation (7th GPSGV), the current seventh regulation under the German Product Safety Act.	--	--	2
n/h – Standards in the non-harmonized scope in accordance with the ProdSG (in the case of convection steamers, identical to the product standards).	2	--	7
n/c – No classification; the standard cannot be classified with reference to the available	8	54	9
Total (without 1st line):	53	101	30

5.2 Presses product group

The normative and informative references in Type C standards relevant to **presses** (see Table 3) were used to identify further standards that could be relevant for particular groups of persons and users and for persons with disabilities (see Annex 1: list of standards for the presses product group).

Table 3: Analysed **Type C standards** for the **presses** product group.

Document	Type	Date	Title of the standard
EN 692	C	2009-02	Machine tools – Mechanical presses – Safety
EN 693	C	2011-09	Machine tools – Safety – Hydraulic presses
EN 12622	C	2013-10	Safety of machine tools – Hydraulic press brakes
EN 13736	C	2009-02	Safety of machine tools – Pneumatic presses
EN 14673	C	2010-04	Safety of machinery – Safety requirements for hydraulically powered open die hot forging presses for the forging of steel and

Table 4: **Type A and Type B standards** for the **presses** product group. Standards highlighted in bold address, in the widest sense, different **groups of persons/users** and possibly explicitly **persons with disabilities**.

Document	Type	Date	Key phrase
EN 349	B	2008-06	Minimum gaps to avoid crushing of parts of the human body
EN 574	B	2008-06	Two-hand control devices
EN 614-1	B	2009-02	Ergonomic design principles
EN 614-2	B	2008-09	Ergonomic design principles
EN 626-1	B	2008-06	Hazardous substances
EN 842	B	2008-09	Visual danger signals
EN 894-1	B	2008-10	Displays and control actuators
EN 894-2	B	2008-10	Displays and control actuators
EN 894-3	B	2008-10	Displays and control actuators
EN 953	B	2009-03	Guards
EN 981	B	2008-09	Danger signals

EN 1005-1	B	2008-10	Human physical performance
EN 1005-2	B	2008-10	Human physical performance
EN 1005-3	B	2008-10	Human physical performance
EN 1005-4	B	2008-10	Human physical performance
EN 1037	B	2008-04	Prevention of unexpected start-up
EN 1088	B	2008-07	Guards
EN 1837	B	2009-09	Lighting
EN ISO 7731	B	2008-09	Danger signals
EN ISO 11161	B	2010-03	Integrated manufacturing systems
EN ISO 12100	A	2010-11	Risk assessment
EN ISO 13732-1	B	2008-09	Hot surfaces
EN ISO 13849-1	B	2008-06	Safety-related parts of control systems
EN ISO 13849-2	B	2012-10	Safety-related parts of control systems
EN ISO 13850	B	2008-06	Emergency stop
EN ISO 13857	B	2008-03	Safety distances
prEN ISO 14122-1	B	2013-11	Permanent means of access to machinery
prEN ISO 14122-2	B	2013-11	Permanent means of access to machinery
prEN ISO 14122-3	B	2013-12	Permanent means of access to machinery
prEN ISO 14122-4	B	2014-01	Permanent means of access to machinery
EN ISO 14738	B	2008-09	Anthropometric requirements

Table 5: Standards for the **presses** product group that are not classified in accordance with EN ISO 12100. Standards highlighted in bold address, in the widest sense, different groups of **persons/users** and possibly explicitly **persons with disabilities**.

Document	Type	Date	Keyword
ISO 3864-1	n/h	2011-04	Safety markings
DIN ISO 7000	n/c	2008-12	Graphical symbols
EN ISO 7010	n/c	2012-07	Graphical symbols
EN ISO 11064-1	n/c	2000-12	Control centres
EN 12464-1	n/c	2011-06	Lighting
EN 13861	n/c	2011-10	Ergonomics standards
EN 60073, VDE 0199	n/c	2002-07	Man-machine interfaces
DIN EN 60204-1, VDE 0113-1	CENELEC	2011-01	Electrical equipment

EN 60447, VDE 0196	n/h	2004-04	Man-machine interfaces
EN 61310-2, VDE 0113-102	CENELEC	2008-01	Indication, marking and actuation
EN 61310-1, VDE 0113-101	CENELEC	2008-02	Indication, marking and actuation
EN 61496-1, VDE 0113-201	CENELEC	2008-08	Electro-sensitive protective equipment
DIN EN 61496-2, VDE 0113-202	CENELEC	2011-05	Electro-sensitive protective equipment
CLC/TS 61496-3, VDE V 0113-203	CENELEC	2008-05	Electro-sensitive protective equipment
EN 61508-1, VDE 0803-1	n/c	2010-05	Safety of electronic systems
EN 61508-4, VDE 0803-4	n/c	2010-05	Safety of electronic systems
DIN EN 62061, VDE 0113-50	CENELEC	2013-02	Safety of electronic systems

The body of standards identified by searches as having a bearing upon the "presses" product group was subjected to full-text searches for content concerning particular groups of persons and users, older workers, and persons with disabilities. Standards containing such content are listed in Table 6, followed by excerpts from the passages concerned.

Table 6: Standards relevant to the **presses** product group that address, in the widest sense, different **groups of persons/users** and specifically **persons with disabilities** (refer to the sections stated)

Document	Title of the standard	Section
EN 349	Safety of machinery – Minimum gaps to avoid crushing of parts of the human body	Introduction
EN 614-1	Safety of machinery – Ergonomic design principles – Part 1: Terminology and general principles	Introduction 1 Scope 3.19 accessible design 4.2 Accessible design for people with special requirements 4.4 Taking account of people’s mental abilities 4.4.3 Signals and controls

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	4 Design principles for operators-task relationships
EN 894-2	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 2: Displays	6 Tactile displays
EN 894-4	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 4: Location and arrangement of displays and control actuators	5.1.2 Step 1.2: Determine the operators' relevant physical and cognitive characteristics
EN 953	Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards	4 Risk assessment
EN 1005-1	Safety of machinery – Human physical performance – Part 1: Terms and definitions	Introduction 3.6 general working population
EN 1005-3	Safety of machinery – Human physical performance – Part 3: Recommended force limits for machinery operation	1 Scope
EN ISO 11064-1	Ergonomic design of control centres – Part 1: Principles for the design of control centres	4.2 Principle 1: Application of a human-centred design approach
EN ISO 12100	Safety of machinery – General principles for design – Risk assessment and risk reduction	5.4 Hazard identification 5.5.3.1 Persons exposed 5.5.3.4 Human factors
EN 12464-1	Light and lighting – Lighting of work places – Part 1: Indoor work places	1 Scope

EN ISO 13732-1	Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces	1 Scope 5.5.2.1 General 5.5.2.2 Unintentional contact 5.5.2.3 Intentional contact 7.5 Setting of surface temperature limit value
EN ISO 13732-3	Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 3: Cold surfaces	B.1 Wider population
EN ISO 13857	Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs	Introduction
EN 13861	Safety of machinery – Guidance for the application of ergonomics standards in the design of machinery	Foreword B.2.1 User limits
prEN ISO 14122-1	Safety of machinery – Permanent means of access to machinery – Part 1: Choice of fixed means and general requirements of access	5.4 Choice among lift, ramp or stair

Excerpts from some of the passages listed in Table 6 and serving as examples are reproduced below in context. Statements concerning particular groups of persons/users, older workers or persons with disabilities that were identified directly by the full-text search are shown highlighted in bold.

<p>Excerpts from EN 614-1 Safety of machinery – Ergonomic design principles – Part 1: Terminology and general principles</p>
<p>Introduction</p> <p>Ergonomically designed work systems enhance safety, improve human working and living conditions and counteract adverse effects on human health. Also they usually improve the operator-machine system performance and reliability. In this European Standard the term "ergonomics" refers to a multidisciplinary field of science and its application. Applying ergonomics to the design of work systems,</p>

especially where the

design of machinery is concerned, ensures **that human capabilities, skills, limitations and needs are taken into account.**

1 Scope

[...]The ergonomic principles given in this European Standard **apply to all ranges of human abilities and characteristics** to ensure safety, health and well-being and overall system performance. Information will need to be interpreted to suit the intended use.

3.19 accessible design

Design focussed on principles of extending standard design to people with some type of performance limitation to maximize the number of potential customers who can readily use a product, building or service which may be achieved by

- designing products, services and environments that are readily usable by most users without any modification,
- by making products or services adaptable to different users (adapting user interfaces), and
- by having standardized interfaces to be compatible with special products for persons with disabilities

4.2 Accessible design for people with special requirements

Where it is required, the designer should take account of people with special requirements and apply ergonomic principles to accessible design and assistive technology in order to enable the use of machinery by people with special requirements.

NOTE Special needs includes sensory abilities like vision, tactile and acoustic input, physical abilities like dexterity, manipulation, movement, voice, strength and endurance, cognitive abilities like intellect, memory, language and literacy and allergies like contact allergy and respiratory allergy. For further information see CEN/CENELEC Guide 6.

4.4 Taking account of people's mental abilities

4.4.1 General

The machine and its associated elements (displays, signals, control actuators, instructions etc.) shall be designed to suit not only the physical but also the mental abilities of the expected population of operators. [...] Mental ability is associated with the operator's ability to control the machinery and perform the

required tasks.

NOTE: Poor compatibility between the operator's mental abilities and the requirements for use results in unsafe operation and leads to impairing effects on the operator's health and well-being. Poor compatibility is also an obstacle to learning and training.

4.4.3 Signals and controls

[...] NOTE 1 **The inclusion of people with hearing impairments should be taken as well into consideration.**

Excerpts from **EN 894-2**

Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 2: Displays

6 Tactile displays

Tactile displays are those which use the state of a surface, and the relief or contours of objects which can be touched (normally with the hands and fingers) to convey information. Tactile displays shall not be used for conveying primary information unless other types of display are inappropriate, or unless **tactile displays are used as a replacement display channel for people with sensory impairment (e.g. blindness).**

Excerpts from **EN 894-4**

Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 4: Location and arrangement of displays and control actuators

5.1.2 Step 1.2: Determine the operators' relevant physical and cognitive characteristics

The general principle as defined in EN 614-1, e.g. **strength, body size, visual acuity, skills, experience and disabilities**, shall be considered. Specific information on relevant physical characteristics for displays and control actuators is given in EN 894-2 and -3.

Excerpts from **EN ISO 11064-1**

Ergonomic design of control centres – Part 1: Principles for the design of control centres

4.2 Principle 1: Application of a human-centred design approach

[...] If **physically challenged people** are routinely assigned to work in a control centre, appropriate designs shall be employed to accommodate their specific needs.

Excerpts from **EN ISO 12100**

Safety of machinery – General principles for design – Risk assessment and risk reduction

5.4 Hazard identification

Unintended behaviour of the operator or reasonably foreseeable misuse of the machine. Examples include

[...]

- **behaviour of certain persons (for example, children, disabled persons).**

5.5.3.1 Persons exposed

Risk estimation shall take into account **all persons (operators and others)** for whom exposure to the hazard is reasonably foreseeable.

5.5.3.4 Human factors

Human factors can affect risk and shall be taken into account in the risk estimation, including, for example

[...]

- d) ergonomic aspects,
- e) the capacity of persons to be aware of risks in a given situation depending on their training, experience and ability,
- f) fatigue aspects, and

g) aspects of limited abilities (due to disability, age, etc.).

Excerpts from **EN ISO 13732-1**

Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces

1 Scope

[...] This part of ISO 13732 [...] is applicable to products used in any environment, e.g. in the workplace, in the home. It is applicable to hot surfaces of products that may be touched by healthy adults, children, elderly people and also by **people with physical disabilities**. It does not provide data for the protection against discomfort or pain.

5.5.2.1 General

From the results of the task analysis (5.3) it can be deduced a) whether a contact of the skin with a hot surface can occur unintentionally or intentionally, e.g. the touch of control elements, and b) which persons come or may come into contact with the hot surface:

- healthy adults
- children
- elderly people
- people with physical disabilities.

5.5.2.2 Unintentional contact

The ability of human beings to react to and terminate unintentional contact with a hot surface after a pain sensation depends on age and physical constitution. The contact period for unintentional contact thus differs from one individual to another.

- a) Healthy adults [...]
- b) Children [...]
- c) Elderly people**

For elderly people, Table B.1 applies. If the product is used mainly by elderly people, 1 s shall be selected as the minimum contact period. If touching of a hot surface and extended reaction time due to their age is to be expected, at least 4 s shall be selected.

d) People with physical disabilities

If people with physical disabilities could come into contact with a hot surface, special consideration shall be given to this contingency, taking into account the nature of the disability and the use of the product. It has to be decided whether Table B.1 is applicable, or if longer contact periods ought to be selected.

5.5.2.3 Intentional contact

[...] no contact period shorter than 4 s shall be used. In general, Table B.1 applies for healthy adults, children, **elderly people and people with physical disabilities**. It shall nevertheless be considered whether the product will be used by groups of people other than healthy adults where the task may take longer than the time specified in Table B.1. In that case, the contact periods shall be modified accordingly.

If products are specifically made for **people with physical disabilities**, then the nature of the disability shall be considered in detail and expert medical advice shall be taken.

7.5 Setting of surface temperature limit value

7.5.1 Contact period between 0.5 s and 1 min

When the procedure given in 7.4 is carried out, a burn threshold spread will be obtained as a result for a contact period of between 0,5 s and 1 min. The spread of values obtained shall be "fine tuned" taking the following factors into account.

- For healthy adults, **elderly people and people with physical disabilities**, a figure in the middle of the spread can be chosen.
- For children [...]

Excerpts from **EN 13861**

Safety of machinery – Guidance for the application of ergonomics standards in the design of machinery

Foreword

[...]During the development of this document the Technical Committee has referred to the recommendations made within **CEN/CENELEC Guide 6** to address the specific needs of **older persons and persons with disabilities**.

B.2.1 User limits

Characteristics of an intended user group (the population that will use the machine) related to gender, age, skills, experience, abilities or temporal changes of physical and mental capabilities, including:

- **younger, older and disabled persons**, hand dominance, limiting abilities (such as visual/hearing impairments, size, strength, endurance);[...]

Excerpts from prEN ISO 14122-1

Safety of machinery – Permanent means of access to machinery – Part 1: Choice of fixed means and general requirements of access

5.4 Choice among lift, ramp or stair

Different angles of the ramp are depending on the use:

- for hand carts or other manually transported wheeled vehicles, maximum angle 3°; (**particularly when likely to be used by handicapped persons**)

5.3 Industrial trucks product group

The machine safety standards and product safety standards for the **industrial trucks** product group upon which this feasibility study is based are also all classified as Type C standards. These product standards contain frequent normative and informative references to standards for earthmoving machinery, however. These in turn involve in some cases very particular, dedicated standards (refer for example to EN ISO 5353, Seat index point), which cannot be classified as any of the various standard types.

The normative and informative references in Type C standards relevant to industrial trucks (see Table 7) were used to identify further standards that may be relevant for particular groups of persons and users and for persons with disabilities (see Annex 2: List of standards for the industrial trucks product group).

Table 7: **Analysed Type C standards** for the industrial trucks **product group**

Document	Type	Date	Title of the standard
EN 1459	C	2012-02	Safety of industrial trucks – Self propelled variable reach trucks

prEN 1459-1	C	2013-03	Rough-terrain trucks – Safety requirements and verification – Part 1: Variable-reach trucks
prEN 1459-2	C	2013-10	Rough-terrain trucks – Safety requirements and verification – Part 2: Slewing variable-reach trucks
prEN 1459-3	C	2013-07	Rough-terrain trucks – Safety requirements and verification – Part 3: Interface between the variable-reach truck and the work platform
EN ISO 3691-1	C	2012-08	Industrial trucks – Safety requirements and verification – Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks
prEN ISO 3691-2	C	2006-02	Industrial trucks – Safety requirements and verification – Part 2: Self-propelled variable-reach trucks
prEN ISO 3691-3	C	2010-01	Industrial trucks – Safety requirements and verification – Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads
prEN ISO 3691-4	C	2006-03	Industrial trucks – Safety requirements and verification – Part 4: Driverless industrial trucks and their systems
prEN ISO 3691-5	C	2013-09	Industrial trucks – Safety requirements and verification – Part 5: Supplementary requirements for pedestrian-propelled trucks (updated version anticipated by 2014-6)
EN ISO 3691-6	C	2014-03	Industrial trucks – Safety requirements and verification – Part 6: Burden and personnel carriers
EN 16307-1	C	2013-01	Industrial trucks – Safety requirements and verification – Part 1: Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks
EN 16307-5	C	2013-03	Industrial trucks – Safety requirements and verification – Part 5: Supplementary requirements for pedestrian-propelled trucks
FprEN 16307-6	C	2013-05	Industrial trucks – Safety requirements and verification – Part 6: Supplementary requirements for burden and personnel carriers

Table 8: **Further Type C standards for the industrial trucks** product group the normative and informative references of which were however not pursued further

Document	Type	Date	Title of the standard
EN 1175-1, VDE 0117-1	C	2010-11	Safety of industrial trucks – Electrical requirements – Part 1: General requirements for battery powered trucks
EN 1175-2, VDE 0117-2	C	2010-11	Safety of industrial trucks – Electrical requirements – Part 2: General requirements of internal combustion engine powered trucks
EN 1175-3, VDE 0117-3	C	2010-11	Safety of industrial trucks – Electrical requirements – Part 3: Specific requirements for the electric power transmission systems of internal combustion engine powered trucks
prEN 1459-4	C	2013-12	Rough-terrain trucks – Safety requirements and verification – Additional requirements for variable-reach trucks handling freely suspended loads
EN 1755	C	2013-03	Safety of industrial trucks – Operation in potentially explosive atmospheres – Use in flammable gas, vapour, mist and dust
EN ISO 2860	C	2008-09	Earth-moving machinery – Minimum access dimensions
EN ISO 2867	C	2011-07	Earth-moving machinery – Access systems
EN ISO 3164	C	2013-05	Earth-moving machinery – Laboratory evaluations of protective structures – Specifications for deflection-limiting volume
EN ISO 3411	C	2007-07	Earth-moving machinery – Physical dimensions of operators and minimum operator space envelope
EN ISO 3449	C	2008-09	Earth-moving machinery – Falling-object protective structures – Laboratory tests and performance requirements
EN ISO 3457	C	2008-09	Earth-moving machinery – Guards – Definitions and requirements
EN ISO 3471	C	2008-08	Earth-moving machinery – Roll-over protective structures – Laboratory tests and performance requirements
ISO 5010	C	2010-04	Earth-moving machinery – Rubber-tyred machines – Steering requirements

EN ISO 6682	C	2008-09	Earth moving machinery – Zones of comfort and reach for controls
EN ISO 6683	C	2008-08	Earth-moving machinery – Seat belts and seat belt anchorages – Performance requirements and tests
EN ISO 7096	C	2008-09	Earth-moving machinery – Laboratory evaluation of operator seat vibration
EN 12053	C	2008-07	Safety of industrial trucks – Test methods for measuring noise emissions
prEN 12643	C	2012-01	Earth moving machinery – Rubber-tyred machines – Steering requirements
EN 13059	C	2008-08	Safety of industrial trucks – Test methods for measuring vibration
EN 15000	C	2008-9	Safety of industrial trucks – Self propelled variable reach trucks – Specification, performance and test requirements for longitudinal load moment indicators and longitudinal load moment limiters
EN 15830	C	2012-05	Rough-terrain variable reach trucks – Visibility – Test methods and verification

Table 9: **Type A and Type B standards** for the **industrial trucks** product group. Standards highlighted in bold address, in the widest sense, different **groups of users/persons** and possibly explicitly **persons with disabilities**.

Document	Type	Date	Key phrase
EN 349	B	2008-06	Minimum gaps to avoid crushing of parts of the human body
EN 894-1	B	2008-10	Displays and control actuators
EN 953	B	2009-03	Guards
EN ISO 4413	B	2010-11	Hydraulic fluid power
EN ISO 12100	A	2010-11	Risk assessment
EN 13490	B	2008-11	Mechanical vibration
EN ISO 13732-1	B	2008-09	Hot surfaces
EN ISO 13849-1	B	2008-06	Safety-related parts of control systems
prEN ISO 13850	B	2014-04	Emergency stop
EN ISO 13857	B	2008-03	Safety distances

Table 10: Standards for the **industrial trucks** product group that are not classified to EN ISO 12100. Standards highlighted in bold address, in the widest sense, different groups of **users/persons** and possibly explicitly **persons with disabilities**.

Document	Type	Date	Keyword
ISO 3287	n/c	2010-06	Powered industrial trucks – Symbols for operator controls
ISO 3795	n/c	1992-05	Burning behaviour of interior materials
ISO 5053	n/c	1987-11	Types of industrial trucks – terminology and classification
EN ISO 5353	n/c	1998-09	Earth-moving machinery, seat index point
ISO 6011	n/c	2003-11	Earth-moving machinery – Visual display of machine operation
ISO 6055	n/c	2004-09	Overhead guards
DIN ISO 7000	n/c	2008-12	Graphical symbols
ISO 9533	n/c	2010-07	Test methods for audible travel alarms and forward horns
ISO 10532	n/c	1995-12	Retrieval device
ISO 10968	n/c	2004-10	Operator's controls
ISO 11112	n/c	1995-12	Operator's seat
ISO 12508	n/c	1994-11	Bluntness of edges
ISO 12509	n/c	2004-12	Lighting, signalling and marking lights, and reflex-reflector devices on earth-moving machinery
ISO 13851	n/c	2002-03	Two-hand control devices
prEN ISO 14120	n/c	2013-08	Guards
EN ISO 21281	n/c	2005-02	Layout of pedals
ISO 24135-1	n/c	2006-10	Operator restraint systems, seat belts

The body of standards identified by searches as having a bearing upon the "industrial trucks" product group was subjected to full-text searches for content concerning particular groups of persons and users, older workers, and persons with disabilities. Standards containing such content are listed in Table 11.

Table 11: Standards relevant to the **industrial trucks** product group that, in the broadest sense, address different **groups of persons/users** and specifically **persons with disabilities** (refer to the sections stated).

Document	Title of the standard	Section
EN 349	Safety of machinery – Minimum gaps to avoid crushing of parts of the human body	Introduction
EN 894-1	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 1: General principles for human interactions with displays and control actuators	4 Design principles for operators-task relationships
EN 894-4	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 4: Location and arrangement of displays and control actuators	5.1.2 Step 1.2: Determine the operators’ relevant physical and cognitive characteristics
EN 953	Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards	4 Risk assessment
EN ISO 12100	Safety of machinery – General principles for design – Risk assessment and risk reduction	5.4 Hazard identification 5.5.3.1 Persons exposed 5.5.3.4 Human factors
EN ISO 13732-1	Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces	1 Scope 5.5.2.1 General 5.5.2.2 Unintentional contact
EN ISO 13857	Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs	Introduction
EN ISO 14120	Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards	4 Risk assessment 5.2 Human aspects

Excerpts from the passages concerned are provided below in context. Where the standards concerned have already been discussed with reference to the "presses" product group, reference is made to that chapter.

Excerpts from **EN 349**

Safety of machinery – Minimum gaps to avoid crushing of parts of the human body

Introduction

[...] One method of avoiding the hazard of crushing of parts of the human body is to make use of the minimum gaps in this standard.

In specifying minimum gaps a number of aspects have to be taken into consideration, such as

- accessibility of the crushing zones;
- anthropometric data, taking into account ethnic groups likely to be found in European countries;
- technical and practical aspects.

[...]

Excerpts from **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

4 Design principles for operator-task relationships

The overall principle which concerns human-machine systems is that the machine and its associated elements (displays, controls, instructions, etc) shall be suitable for the operator and the given task. In order to realise this general principle, the machine system shall be so designed that **human characteristics with respect to physical, psychological and social aspects are considered.** [...]

Excerpts from **EN 894-4**

Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 4: Location and arrangement of displays and control actuators

5.1.2 Step 1.2: Determine the operators' relevant physical and cognitive characteristics

The general principle as defined in EN 614-1, e.g. **strength, body size, visual acuity, skills, experience and disabilities**, shall be considered. Specific information on relevant physical characteristics for displays and control actuators is given in EN 894-2 and -3.

Excerpts from **EN 953**

Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards

4 Risk assessment

In order to select and design types of guards appropriate to particular machinery, it is important to assess the risk arising from the various hazards present at that machinery and the **foreseeable categories of persons at risk** (see EN ISO 12100-1:2003, Clause 5 and EN ISO 14121-1).

Excerpts from **EN ISO 12100**

Safety of machinery – General principles for design – Risk assessment and risk reduction

Refer to the passages in the chapter for the "presses" product group

Excerpts from **EN ISO 13732-1**

Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces

Refer to the passages in the chapter for the "presses" product group

Excerpts from **EN ISO 13857**

Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs

Introduction

[...] In specifying safety distances, a number of aspects have to be taken into consideration, such as:

- reach situations occurring when machinery is being used,
- reliable surveys of anthropometric data, taking into account population groups likely to be found in the countries concerned,
- biomechanical factors, such as compression and stretching of parts of the body and limits of joint rotation,
- technical and practical aspects, and
- additional measures for particular groups of persons (e.g. **persons with special needs**), which could be required due to a deviation from the specified body dimensions.

Excerpts from pr**EN ISO 14120**

Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards

4 Risk assessment

In order to select and design types of guards appropriate to particular machinery, it is important to assess the risk arising from the various hazards present at that machinery and the **foreseeable categories of persons who can be exposed to the hazard(s)** (see ISO 12100:2010, Clause 5).

5.2 Human aspects

Reasonably foreseeable aspects of human interaction with machinery (for example when loading, maintaining or lubricating) shall be given proper consideration in the design and construction of guards. [...]

5.4 Convection steamers product group

The analysed product standards governing the **convection steamers/ovens/grills** product group all fall within the non-harmonized scope under the German Product Safety Act, and cannot therefore be classified as Type A, B or C standards. In the "Equipment for commercial kitchens" series of standards however, the DIN Standards Committee Heating and Cooking Equipment (FNH) states that specified sections of these standards contain safety provisions in the sense of the former German Equipment Safety Act (GSG). These standards are assigned to the non-harmonized scope under the Product Safety Act.

The normative and informative references in product standards identified as being relevant to convection steamers (see Table 12) were used to identify further standards that may be relevant for particular groups of persons and users and for persons with disabilities (see Annex 3: list of standards for the convection steamers product group).

Table 12: Analysed standards for the convection steamers/ovens/grills product group (in all cases standards in the non-harmonized scope)

Document	Type	Date	Title of the standard
DIN 18852	n/h	2003-06	Equipment for commercial kitchens – Frying and grilling appliances – Requirements and testing
E DIN 18854	n/h	2014-01	Equipment for commercial kitchens – Multiple deck ovens – Requirements and testing

DIN 18858	n/h	2003-06	Equipment for commercial kitchens – Salamander broilers and giros grills – Requirements and testing
DIN 18862-1	n/h	2003-08	Equipment for commercial kitchens – Automatic units for grilling products; Requirements and testing – Part 1: Meat for short-time roasting
DIN 18862-2	n/h	2003-08	Equipment for commercial kitchens – Automatic units for grilling products; Requirements and testing – Part 2: Meat for long-time roasting
DIN 18863	n/h	2003-06	Equipment for commercial kitchens – Pressure steam cookers – Requirements and testing
DIN 18866	n/h	2003-06	Equipment for commercial kitchens – Convection ovens and convection steamers – Requirements and testing

Table 13: **Type A and Type B standards** for the **convection steamers/ovens/grills** product group. Standards highlighted in bold address, in the widest sense, different **groups of persons/users** and possibly explicitly **persons with disabilities**.

Document	Type	Date	Keyword
EN 547-1	B	2008-09	Body dimensions
EN 547-2	B	2008-09	Body dimensions
EN 547-3	B	2008-09	Body dimensions
EN 894-3	B	2008-10	Displays and control actuators
EN ISO 12100	A	2010-11	Risk assessment
EN ISO 13732-1	B	2008-09	Hot surfaces
EN ISO 13857	B	2008-03	Safety distances

Table 14: Standards for the **convection steamers/ovens/grills** product group that are not classified in accordance with EN ISO 12100. Standards highlighted in bold address, in the widest sense, different groups of **persons/users** and possibly explicitly **persons with disabilities** (no document in this table).

Document	Type	Date	Keyword
prEN 203-1	7th GPSGV	2012-04	Gas heated catering equipment

EN 203-2-2	7th GPSGV	2006-06	Gas heated catering equipment
EN ISO 7250-1	n/c	2010-03	Body dimensions
CEN ISO/TR 7250-2 (DIN SPEC 91279)	n/c	2011-04	Body dimensions
DIN 33402-1	n/c	2008-03	Body dimensions
EN 60335-1, VDE 0700 Part 1	CENELEC	2012-01	Household and similar electrical appliances
EN 60335-2-36, VDE 0700-36	CENELEC	2012-04	Household and similar electrical appliances
EN 60335-2-38, VDE 0700 Part 38	CENELEC	2008-04	Household and similar electrical appliances
EN 60335-2-42, VDE 0700-42	CENELEC	2012-04	Household and similar electrical appliances
EN 60335-2-48, VDE 0700 Part 48	CENELEC	2012-04	Household and similar electrical appliances

The body of standards identified by searches has having a bearing upon the "convection steamers" product group was subjected to full-text searches for content concerning particular groups of persons and users, older workers, and persons with disabilities. Standards containing such content are listed in Table 15.

Excerpts of the relevant passages are then reproduced in context, or reference is made to the relevant passages in the chapter for the "presses" product group.

Table 15: Standards relevant to the **convection steamers** product group that, in the broadest sense, address different **groups of persons/users** and specifically **persons with disabilities** (refer to the sections stated).

Document	Title of the standard	Section
EN ISO 12100	Safety of machinery – General principles for design – Risk assessment and risk reduction	5.4 Hazard identification 5.5.3.1 Persons exposed 5.5.3.4 Human factors
EN ISO 13732-1	Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces	1 Scope 5.5.2.1 General 5.5.2.2 Unintentional contact 5.5.2.3 Intentional contact 7.5 Setting of surface temperature limit value

EN ISO 13857	Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs	Introduction
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Excerpts from **EN ISO 12100**
Safety of machinery – General principles for design – Risk assessment and risk reduction

Refer to the passages in the chapter for the "presses" product group

Excerpts from **EN ISO 13732-1**
Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces

Refer to the passages in the chapter for the "presses" product group

Excerpts from **EN ISO 13857**
Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs

Refer to the passages in the chapter for the "presses" product group

5.5 Summary of the results of the standards searches for the product groups considered as examples

The standards governing the product groups of presses, industrial trucks and convection steamers, serving in this study as examples, differ widely in their structure.

The product standards for **presses** are all Type C standards (machine safety standards, product safety standards) to EN ISO 12100 and CEN Guide 414/ISO Guide 78, and address detailed safety requirements for this group of machines (hydraulic presses, pneumatic presses, press brakes, etc.). As is to be expected of Type C standards, they generally refer as far as possible to the provisions of the superordinate Type A and Type B standards. Whilst the references in the Type C standards governing presses also include references to standards in the non-harmonized scope, these standards are however primarily DIN/VDE standards from the area of electrical engineering, and thus tend to address purely technical aspects.

The machine safety standards/product safety standards governing the **industrial trucks** product group upon which this study is based are also all classified as Type C standards to EN ISO 12100. However, these product standards contain conspicuously frequent normative and informative references to further Type C standards rather than to the superordinate Type B standards. These Type C standards are often standards for earth-moving machinery, which in turn – particularly in the area of ergonomics, body dimensions, minimum dimensions and openings – refer in some cases to very particular standards.

The analysed product standards governing the **convection steamers/ovens/grills** product group all fall within the non-harmonized scope under the German Product Safety Act. The normative and informative references within the product standards also include very few references to Type B standards (n=7). In specified sections, the product standards for equipment for commercial kitchens contain safety provisions in the sense of the former German Equipment Safety Act.

Strategies for solutions for implementing the UN Convention on the Rights of Persons with Disabilities in standards relevant to OSH must be considered selectively owing to the differences in the standards' level of structuring. One possible approach of amendments to standards, in whatever form, for implementation of the UN Convention on the Rights of Persons with Disabilities in OSH-related standards would be the hierarchically superordinate Type A and Type B standards to EN ISO 12100 and CEN Guide 414/ISO Guide 78. The hierarchical structure would result in Type C standards automatically benefiting from such amendments.

Owing to their consistent Type A/B/C structure, this will be easier for standards governing **presses** than for example for standards governing **industrial trucks**, which by contrast are characterized more strongly by standardization governing earth-moving machinery.

In the case of product standards governing **convection steamers** for commercial kitchens, all of which are standards within the non-harmonized scope under the German Product Safety Act, possible amendments for adaptation of the standards to the UN Convention on the Rights of Persons with Disabilities are more likely to be necessary within these standards themselves.

Informative or normative references to the guides or DIN Technical Reports listed below concerning accessibility and particular groups of people, such as older persons or persons with disabilities, were not found in any of the analysed standards, with the exception of EN 614-1, Safety of machinery – Ergonomic design principles (2009) and EN 13861, Safety of machinery – Guidance for the application of ergonomics standards in the design of machinery (2012):

- **ISO/IEC Guide 71 [11]**
Guidelines for standards developers to address the needs of older persons and persons with disabilities (2001)
- **CEN/CENELEC Guide 6 [18]**
Guidelines for standards developers to address the needs of older persons and persons with disabilities (2002)
- **DIN Technical Report 131 [19]**
Guidelines for standards developers to address the needs of older persons and persons with disabilities (2003)
- **DIN Technical Report 124 [20]**
Products in Design for All (2002)
- **ISO/IEC Guide 71 [12]**
Guide for addressing accessibility in standards (2014-12)
- **DIN CEN ISO/TR 22411 (DIN SPEC 33421) [16]**
Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities (2014-12)

A full-text search was performed in all standards considered by the feasibility study for passages concerning particular groups of persons/users and/or persons with disabilities. The passages identified by this search exhibit a generally inconsistent picture with regard to the progress of implementation of the UN Convention on the Rights of Persons with Disabilities in OSH-related standardization. The standards governing the product groups considered here make reference at certain points to the requirements of particular groups of persons or of persons with disabilities; this is however the exception rather than the rule, and a consistent approach is not discernible.

EN 614-1, Safety of machinery – Ergonomic design principles, Part 1: Terminology and general principles, can be cited as a positive example. This standard explicitly requires consideration to be given to body dimensions, body postures, body movements and physical forces of persons/groups of persons. Mention is also made of design requirements in consideration of physical ability and influences of the physical working environment upon persons.

References to EN 614-1 are found in all of the analysed product standards governing presses (four normative references, one informative). No references to EN 614-1 are found however in the analysed standards governing industrial trucks and equipment for commercial kitchens.

EN ISO 13732-1, Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces, particularly addresses the interests and abilities of particular groups of persons such as children, older persons or persons with disabilities.

In the area of standardization of convection steamers, ovens and grills, reference is made to EN ISO 13732-1, but only once (in the draft of DIN 18854), and only informatively.

5.6 Formulation and trialling of a list of criteria for the review of standards with respect to implementation of the UN CRPD

DIN Technical Report 124 [20], Products in design for all, defines design for all as a "feature of a product which can be used as intended by as many people as possible of any age with different abilities largely under conditions of equality and without assistance".

In order to determine what characteristics and levels of ability are required for use of a product or item of work equipment, a requirements-based list of criteria was drawn up and trialled in this feasibility study with reference to the example of safety equipment/safety aspects. The list of criteria was based upon the human abilities listed in **DIN Technical Report 131 [19]**, Guidelines for standards developers to address the needs of older persons and persons with disabilities (the German version of CEN/CENELEC Guide 6 [18]/ISO/IEC Guide 71 (2001) [11]) .

A six-level scale was selected for the trials based upon the **IMBA method** (the German acronym stands for "integration of people with disabilities into the world of work") [21]. In this context, the profile value 0 stands for "none" and "1" for "very low", "2" for "low", "3" for "average", "4" for "high" and "5" for "very high" requirements/abilities.

The IMBA method [22] was developed as a third-party assessment method (profile comparison and documentation method based upon expert ratings) for the employment and occupational integration of persons with disabilities or impaired performance in a manner commensurate with their abilities. The method is widely used in Germany [21].

Human abilities can be broken down in accordance with DIN Technical Report 131 and CEN/CENELEC Guide 6 and ISO/IEC Guide 71 (2001) into the following categories:

- **Sensory** – sight, hearing, touch, taste/smell, sense of balance
- **Physical** – dexterity, manipulation, movement, strength, voice
- **Cognitive** – intellect/memory, language/literacy
- **Allergy** – contact, foods, breathing air

Table 1 — Factors to consider in clauses on information

The best designed products or services avoid the need for any explanatory information, signalling the way they should be used by form and appearance. Additionally, some users may not pay attention to any information provided. Nevertheless where information is supplied, in particular safety warnings, it needs to be available to all users of a product or service. ISO/IEC Guide 37:1995 provides general guidance; the following are ways of ensuring maximum accessibility to older persons and persons with disabilities.

Factors to consider in standards clauses on information (labelling, instructions and warnings)	Human abilities												
	9.2 Sensory					9.3 Physical					9.4 Cognitive	9.5 Allergy	
	Seeing 9.2.1	Hearing 9.2.2	Touch 9.2.3	Taste/smell 9.2.4	Balance 9.2.5	Dexterity 9.3.1	Manipulation 9.3.2	Movement 9.3.3	Strength 9.3.4	Voice 9.3.5	Intellect/memory 9.4.2/3	Language/literacy 9.4.4	Contact/food/respiratory
8.2 Alternative format													
8.3 Location/layout													
8.4 Lighting/glare													
8.5 Colour/contrast													
8.6 Size/style of font													
8.7 Clear language													
8.8 Symbols/drawings													
8.9 Loudness/pitch													
8.10 Slow pace													
8.11 Distinctive form													
8.12 Ease of handling													
8.13 Expiration date marking													
8.14 Contents labelling													
8.15 Surface temperature													
8.16 Accessible routes													

Figure 7: Excerpt from DIN Technical Report 131, Guidelines for standards developers to address the needs of older persons and persons with disabilities. Human abilities are correlated to factors that are to be considered during the communication/presentation of information.

Information and explanations regarding human abilities can be found in **DIN Technical Report 131** [19], Section 9, "Detail about human abilities and the consequences of impairment". Section 9 includes a definition and description of the abilities stated and information on the effects of ageing and physical constraints. Where appropriate, examples of hazards are stated that present a greater risk for older persons and persons with disabilities, owing to the limitations in these groups' functional performance. DIN Technical Report 131 thus offers useful information for standards committees on application of the requirements-based list of criteria.

Excerpts from **DIN Technical Report 131**, Guidelines for standards developers to address the needs of older persons and persons with disabilities. Human abilities – The example of **Hearing**

9.2.2 Hearing

9.2.2.1 Description

Hearing functions relate to sensing the presence of sounds and discriminating the location, pitch, loudness, quality and comprehension of sounds. Hearing loss can

range from a mild reduction in hearing to profound deafness.

9.2.2.2 Effects of ageing

The majority of people with hearing loss are older people. As people age, they tend to lose the ability to detect higher frequency sounds. Many older people use a hearing aid.

9.2.2.3 Design considerations

With or without a hearing aid, the level, frequency and clarity of any sound is important. Prelingually deaf people may have difficulty understanding written and spoken language.

Mit oder ohne Hörhilfe sind Lautstärke, Frequenz und Klarheit aller Geräusche wichtig. Menschen, die vor dem Spracherwerb ihr Gehör verlieren, können Schwierigkeiten beim Verstehen der geschriebenen und gesprochenen Sprache haben.

9.2.2.4 Risks and hazards

People with a hearing loss are at an increased risk if spoken announcements and warnings are not loud or intelligible enough for them, or if frequencies are too high to detect.

The following examples of requirements profiles attempt to describe the usability of the protective device/safety aspect under analysis with reference to the human abilities required for its use. In the case of protective devices, in particular, its primary function, i.e. protection of the user against hazards, is assured at much lower human abilities, or indeed requires no human abilities in order to fulfil its purpose. However, in order for example for a press safeguarded by a two-hand control to be used, the pushbuttons of the control must be recognizable as such, reachable and operable.

Table 16: Requirements profile (human abilities to DIN Technical Report 131, scaling according to the IMBA method), with reference to the example of **two-hand control devices to EN 574**. In order for a press safeguarded by a two-hand control to be used, the pushbuttons of the control must be recognizable as such, reachable and operable.

Two-hand control devices to EN 574		
Human abilities		Requirements concerning the abilities
	Sight	1: Very low

Sensory	Hearing	0: None
	Touch	1: Very low
	Taste/smell	0: None
	Sense of balance	0: None
Physical	Dexterity	1: Very low
	Manipulation	3: Average
	Mobility	0: None
	Force	1: Very low
	Voice	0: None
Cognitive	Intellect/memory	1: Very low
	Language/literacy	0: None
Allergies	Contact, foods, breathing air	0: None
Other	Particular remarks	./.

Table 17: Requirements profile (human abilities to DIN Technical Report 131, scaling according to the IMBA method), with reference to the example of **guards to EN 953**. Use of an installation/machine equipped with a guard also requires the guard to be opened and closed.

Guard to EN 953		
Human abilities		Requirements concerning the abilities
Sensory	Sight	1: Very low
	Hearing	0: None
	Touch	1: Very low
	Taste/smell	0: None
	Sense of balance	0: None
Physical	Dexterity	2: Low
	Manipulation	2: Low
	Mobility	2: Low
	Force	1: Very low
	Voice	0: None
Cognitive	Intellect/memory	1: Very low
	Language/literacy	1: Very low

Allergies	Contact, foods, breathing air	0: None
Other	Particular remarks	./.

Table 18: Requirements profile (human abilities to DIN Technical Report 131, scaling according to the IMBA method), with reference to the example of **avoidance of unexpected start-up to EN 1037**. The standard describes only technical measures, independent of human abilities.

Avoidance of unexpected start-up to EN 1037		
Human abilities		Requirements concerning the abilities
Sensory	Sight	0: None
	Hearing	0: None
	Touch	0: None
	Taste/smell	0: None
	Sense of balance	0: None
Physical	Dexterity	0: None
	Manipulation	0: None
	Mobility	0: None
	Force	0: None
	Voice	0: None
Cognitive	Intellect/memory	0: None
	Language/literacy	0: None
Allergies	Contact, foods, breathing air	0: None
Other	Particular remarks	./.

Table 19: Requirements profile (human abilities to DIN Technical Report 131, scaling according to the IMBA method), with reference to the example of **emergency-stop to EN ISO 13850**. Emergency-stop functions are by definition easy to use, but also necessitate basic knowledge of their function.

Emergency-stop to EN ISO 13850		
Human abilities		Requirements concerning the abilities
Sensory	Sight	1: Very low
	Hearing	0: None
	Touch	0: None
	Taste/smell	0: None
	Sense of balance	0: None
Physical	Dexterity	1: Very low
	Manipulation	1: Very low
	Mobility	1: Very low
	Force	1: Very low
	Voice	0: None
Cognitive	Intellect/memory	1: Very low
	Language/literacy	1: Very low
Allergies	Contact, foods, breathing air	0: None
Other	Particular remarks	./.

Table 20: Requirements profile (human abilities to DIN Technical Report 131, scaling according to the IMBA method), with reference to the example of **falling-object protective structures on earth-moving machinery to EN ISO 3449**. The standard describes only tests and technical requirements, independently of human abilities.

Falling-object protective structures on earth-moving machinery to EN ISO 3449		
Human abilities		Requirements concerning the abilities
Sensory	Sight	0: None
	Hearing	0: None
	Touch	0: None
	Taste/smell	0: None

	Sense of balance	0: None
Physical	Dexterity	0: None
	Manipulation	0: None
	Mobility	0: None
	Force	0: None
	Voice	0: None
Cognitive	Intellect/memory	0: None
	Language/literacy	0: None
Allergies	Contact, foods, breathing air	0: None
Other	Particular remarks	./.

Selective trialling of the requirements-based list of criteria with respect to **protective devices and safety aspects** shows that:

- The list of criteria can be estimated with reasonable effort.
- In some standards, the protective device/safety aspect is described with virtually no reference to human abilities.
- In other standards, use of the protective device/safety aspect described necessitates possession of at least some human abilities above the level of "very low".

Standards governing protective devices/safety aspects (Type B standards) generally address a closely defined technical facility. Application of a list of criteria according to human characteristics and abilities is comparatively easy in this case, even by (skilled) individuals who are not directly involved in the standards development process.

The situation is different for product safety standards (Type C standards), which comprehensively address more complex technical products. The study's authors propose that for standards of this type, criteria be classified suitably in conjunction with the relevant standards committees and/or experts from the staff of relevant product manufacturers who possess the necessary detailed knowledge.

Provided with this assistance, the manufacturer of a specific machine or product will be able to provide information on the human characteristics and abilities required for the machine or product to be used without endangering safety or health, provided it is used as intended, including in consideration of reasonably foreseeable misuse.

The IMBA method and its six-level scale for physical and informational properties and five-level scale for key qualifications can be used effectively only by experts who have received methodical training. For this reason, and based upon the results obtained in trials, the authors of the study propose a three-level scale comparable to the traffic-light model for the purpose considered here (right-hand column in Table 21)¹⁰.

Table 21: Scale of requirements for review of product standards with regard to the content of the UN Convention on the Rights of Persons with Disabilities with a bearing on occupational safety and health.

Requirements concerning the abilities (IMBA method)	Requirements concerning the abilities (review of standards with regard to the UN CRPD)
0: None	0: None to very low ➔ No action needed
1: Very low	
2: Low	1: Low ➔ Check need for action
3: Average	2: Average to very high ➔ Action needed
4: High	
5: Very high	

Product safety standards could in future also require manufacturers to draw up a requirements profile for their products with reference to human characteristics and abilities. Finally, a requirements profile of this type for products with reference to human characteristics and abilities could become a quality criterion for manufacturers of machinery and products.

¹⁰ Review of standards for the design of work equipment with regard to the extent to which they consider OSH-related content of the UN Convention on the Rights of Persons with disabilities.

6 Summary and recommendations

6.1 Review of product safety standards with respect to their implementation of the UN Convention on the Rights of Persons with Disabilities

The product safety standards governing the product groups of presses, industrial trucks and convection steamers, considered in this feasibility study as examples, differ widely in their structure.

The product safety standards for **presses** are all Type C standards to EN ISO 12100, and address detailed safety requirements applicable to this group of machines. As is to be expected from Type C standards, they refer as far as possible to the provisions of the superordinate Type A and Type B standards.

The machine safety standards/product safety standards governing the **industrial trucks** product group are also all classified as Type C standards to EN ISO 12100. However, these product standards contain conspicuously frequent normative and informative references to further Type C standards rather than to the superordinate Type B standards. These Type C standards are often standards for earth-moving machinery, which in turn – particularly in the area of ergonomics, body dimensions, minimum dimensions and openings – refer in some cases to very particular standards.

The analysed product standards governing the **convection steamers/ovens/grills** product group all fall within the non-harmonized scope under the German Product Safety Act. The normative and informative references within these product standards also include very few references to Type B standards.

For implementation of the UN Convention on the Rights of Persons with Disabilities, it would be advantageous for content to be added to standards, particularly to the superordinate Type A and Type B standards. Type C standards would then automatically benefit from this, owing to their subordinate position in the hierarchical structure.

Owing to their thorough Type A/B/C structuring, this can be achieved more easily in standards for **presses** than for example for the standards governing **industrial trucks**, which by contrast are characterized more strongly by standardization of earth-moving machinery. In the case of the standards governing **convection steamers** for commercial kitchens, all of which are standards within the non-harmonized scope under the German Product Safety Act, possible amendments for adaptation to the UN Convention on the Rights of Persons with Disabilities are more

likely to be necessary within these product standards themselves. This would result in correspondingly more work for the standards committees concerned.

None of the standards analysed were found to contain informative or normative references to the guides or DIN Technical Reports listed below and dealing with accessibility or particular groups of persons:

- **ISO/IEC GUIDE 71** (2001) [11] /**CEN/CENELEC Guide 6** (2002) [18]
Guidelines for standards developers to address the needs of older persons and persons with disabilities
- **DIN Technical Report 131** (2003) [19]
Guidelines for standards developers to address the needs of older persons and persons with disabilities
- **DIN Technical Report 124** (2002) [20]
Products in Design for All
- **ISO/IEC GUIDE 71** (2014) [12]
Guide for addressing accessibility in standards
- **DIN CEN ISO/TR 22411 (DIN SPEC 33421)** (2014) [16]
Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities

The standards analysed in the product groups considered here make reference at certain points to the requirements of particular groups of persons or of persons with disabilities; this is however the exception rather than the rule, and a consistent procedure is not discernible.

In order to determine what abilities are assumed to be present for use of a product or item of work equipment, a requirements-based list of criteria was drawn up in this feasibility study with reference to the example of protective devices and safety aspects and based upon the human abilities listed in DIN Technical Report 131. The abilities are as follows:

- **Sensory:** sight, hearing, touch, taste/smell, sense of balance
- **Physical:** dexterity, manipulation, mobility, force, voice
- **Cognitive:** intellect/memory; language/literacy
- **Allergy:** contact, foods, breathing air

A six-level scale based upon the IMBA method was selected for the trialling of this list of criteria:

- 0: None
- 1: Very low
- 2: Low
- 3: Average
- 4: High
- 5: Very high

The results showed that for the protective devices under consideration, its primary function, i.e. protection of the user against danger, is assured at much lower human abilities, or indeed requires no human abilities in order to fulfil its purpose. However, in order for example for a press safeguarded by a two-hand control to be used, the pushbuttons of the control must be recognizable as such, reachable and operable. This was taken into account in a suitable way during evaluation.

Application of the requirements-based list of criteria to the example of **protective devices and safety aspects** shows that:

- The list of criteria can be estimated with reasonable effort.
- In some standards, the protective device/safety aspect is described with virtually no reference to human abilities.
- In other standards, use of the protective device/safety aspect described necessitates possession of at least some human abilities above the level of "very low".

Standards governing protective devices/safety aspects (Type B standards) generally address a closely defined technical facility. Application of a list of criteria according to human characteristics and abilities is comparatively easy in this case, even by (skilled) individuals who are not directly involved in the standards development process.

The situation is different for product safety standards (Type C standards), which comprehensively address more complex technical products. The references made in these standards to the essential health and safety requirements for design and construction of the products differ widely. This had already become evident during the analysis of standards governing mechanical presses, pedestrian-operated industrial trucks, and convection steamers for commercial kitchens. In order to ascertain at this point what requirements profiles concerning human abilities are necessary, certain detailed knowledge is required in this area, particularly within the relevant standards committees, and of course among the experts on the staff of the manufacturers in the sectors concerned. The authors of the study propose that this be addressed by the creation of a suitable classification in conjunction with the relevant standards committees and/or experts at relevant product manufacturers.

In this regard, the authors of this feasibility study propose that in the medium term, a section should be added to product standards in which the protective

measures described are analysed with regard to the requirements upon human characteristics and abilities. As has already been described for protective devices and safety aspects, this analysis could for example take the form of tables.

This would assist manufacturers of a specific machine or product in providing information on the human abilities required for its use in a manner conducive to safety and good health when it is used as intended, including in consideration of reasonably foreseeable misuse. The advantage of this approach is that manufacturers are more strongly represented on the committees of product safety standards, and are thus involved directly in the process of the standards' development.

Standards developers could further formulate provisions in product safety standards requiring manufacturers to create **requirements profiles for their products with reference to human characteristics and abilities**. In the first instance, this could for example take the form of **non-binding provisions in the "user information" part of the standard**, and would place the focus upon the needs of persons with disabilities and require the manufacture to consider aspects of inclusion in relation to his product. Finally, a profile of this type for the human abilities required for use of a particular product could become a quality criterion for manufacturers of machinery and products.

6.2 Further recommendations

Product safety has a particularly important role in the context of society's desire – also expressed in the UN Convention on the Rights of Persons with Disabilities – to increase participation by persons with disabilities and thus to eliminate barriers and enhance accessibility. The use of products and work equipment is subject to their satisfying the essential health and safety requirements. This is therefore a condition for greater participation in working life, but not an adequate guarantee of it.

Product safety standards have an important function in this respect, since they are a key element in implementation of the essential health and safety requirements for the design and construction of products and work equipment.

This can be illustrated with reference to the safety of machinery. As a superordinate Type A standard, EN ISO 12100 for example stipulates that the risk analysis must give consideration to the target group, i.e. the users. The standard refers explicitly to constraints in ability (for example as a consequence of a disability or ageing). One challenge in this context is for this requirement to be implemented adequately in the subordinate Type B and C standards. Another challenge is that persons with disabilities are not a homogeneous group; the impairments exhibited by individuals within it differ widely. In order to reduce the numbers of non-standard systems

further in the medium term, the human characteristics and abilities that they address must be established and documented.

Based upon the results of the feasibility study described above, its authors make the following recommendations. These have the aim of according greater consideration to the model criteria developed for OSH-related content of the UN Convention on the Rights of Persons with Disabilities, and of facilitating the promotion of greater participation in working life within the sphere of product safety.

6.2.1 Raising of awareness of standards committees for ability profiles

The particular significance of product safety standards has already been demonstrated at several points, and was also evident in the discussions with experts.

Likewise, the example of protective devices showed clearly that requirements concerning human abilities can be derived in some cases from the description of a technical protective measure for assuring the safety and health of persons.

One means by which awareness can be raised is for the status review already launched to be carried forward and extended to other standards, in conjunction with the standards committees concerned.

Table 22, which was used within the feasibility study, enables the results to be documented for this purpose in suitable form, for example by shading in of the respective assessments.

Table 22: Documentation (draft) of the human abilities required for a subject of standardization/technical measure for assuring the safety and health of persons

Subject of standardization under consideration							
Human characteristics and abilities		Requirements concerning the characteristics and abilities (*)					
Sensory	Sight	0	1	2	3	4	5
	Hearing	0	1	2	3	4	5
	Touch	0	1	2	3	4	5
	Taste/smell	0	1	2	3	4	5
	Sense of balance	0	1	2	3	4	5

Physical	Dexterity	0	1	2	3	4	5
	Manipulation	0	1	2	3	4	5
	Mobility	0	1	2	3	4	5
	Force	0	1	2	3	4	5
	Voice	0	1	2	3	4	5
Cognitive	Intellect/memory	0	1	2	3	4	5
	Language/literacy	0	1	2	3	4	5
Allergies	Contact, foods, breathing air	0	1	2	3	4	5
Other, e.g. body dimensions	Particular remarks	0	1	2	3	4	5
(*) Scale of requirements upon human characteristics and abilities: 0 none 1 very low 2 low 3 average 4 high 5 very high							

The result is a requirements profile that illustrates who is included, i.e. which persons possess the necessary characteristics and abilities. It follows that the lower the required level of ability, the more persons are included. The result can for example be incorporated into the standard in the course of revision, in order to give manufacturers the opportunity to make reference to it when the standard is applied.

Based upon this status review, a process can be set in motion in which, during the design and construction of products and work equipment, technical protective measures for safety and health purposes are examined more closely with regard to the existence or scope for development of alternatives that impose lower demands upon the user (inherently safe design). For this purpose, Table 21 serves as guidance by referencing the scale to the need for action.

The procedure proposed is similar to that already being employed to good effect for energy consumption: addressing of the specific energy consumption has resulted in manufacturers lending greater consideration to this aspect during development, and consumers at purchase.

6.2.2 Increased consideration for existing recommendations for action

The documents listed below serve as a comprehensive existing resource for identifying strategies and options for reducing barriers and enhancing accessibility during the safety and health-conscious design and construction of products and work equipment.

- **ISO/IEC GUIDE 71** (2001) [11]/CEN/CENELEC Guide 6 (2002) [18]

Guidelines for standards developers to address the needs of older persons and persons with disabilities (2001/2002)

- **DIN Technical Report 131** (2003) [19]
Guidelines for standards developers to address the needs of older persons and persons with disabilities
- **DIN Technical Report 124** (2002) [20]
Products in Design for All
- **ISO/IEC GUIDE 71** (2014) [12]
Guide for addressing accessibility in standards
- **DIN CEN ISO/TR 22411 (DIN SPEC 33421)** (2014) [16]
Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities

It can be assumed that raised awareness for ability profiles will lead to a greater need for the use of these resources, and to the strategies described in detail in the following list increasingly being taken up and incorporated into the development of standards and products alike, not least for technical protective measures for the assurance of safety and health, during the design and construction of products and work equipment:

- Application of the two-channel principle
 - For the output of relevant information (particularly safety-related)
 - For the input of relevant information (particularly safety-related)
- Assurance of operability in a standing and seated position
- Assurance of the most intuitive use possible
- Low-stress use, e.g. with regard to operating forces and moments
- Provision of facilities for customization
- etc.

In this context, the authors propose that a sentence such as the following be added to product safety standards: "Principles and recommendations for the incorporation of inclusion aspects were considered during the development of this standard and, where possible and advantageous, actually incorporated."

A sentence of this kind would have consequences such as increasing the inclusion of ISO/IEC Guide 71 in references and assuring that the standards committees address the recommendations not least in the context of the essential health and safety requirements for the design and construction of products and work equipment. This in turn would also promote the process of eliminating barriers and enhancing accessibility.

In order to support this process further, "KAN recommendations for DIN standards committees" have been drafted in which these elements have been summarized. The recommendations can be found in Section 9).

6.2.3 Extension of the requirements to be met by the user information

The authors of the feasibility study recommend that manufacturers be called upon in product safety standards to create a requirements profile for their products with reference to human abilities. In the first instance, this could for example take the form of non-binding provisions in the "user information" section of the standard, and would thereby shift the focus more strongly to the potential user group. It is important for the philosophy of inclusion to be promoted in the form of positive statements and for manufacturers thereby to be urged to give greater consideration to inclusion aspects in their products. Finally, presentation in the form of a requirements profile relating to human abilities (see Table 22), applied to products and work equipment, could become a quality criterion for product manufacturers.

6.2.4 Process support

Appropriate process support should be put in place for the steps described above. This function could be assumed by KAN, whose secretariat possesses the relevant expertise and knowledge of standards and is familiar with the coordination function for the assessment of standards from the perspective of product safety and occupational safety and health. In addition, the social partners, the German government, the German Social Accident Insurance (DGUV) and DIN are represented in KAN, where they combine their specialist expertise concerning the national and international body of rules, regulations and standards.

Since this is a cross-sectional issue affecting the areas of "safety engineering" and "health protection and ergonomics" alike, process supervision requires the broadest possible skills base, placing the focus upon barrier-free design and the development of requirements profiles.

The instruments developed as examples in this feasibility study could be developed further in conjunction with standards committees and product manufacturers, and validated by further case studies.

6.2.5 Development of an ergonomics module concerning "accessible design and requirements profiles" and further recommendations for action

As part of process support, the authors of the study propose that an ergonomics module concerning "accessible design and requirements profiles" be developed. This module could supplement KAN's existing and recently updated ergonomics tuition modules (see <https://ergonomie.kan-praxis.de>), or be used as a standalone tuition unit for teaching, academic study and further training.

The stated focus upon barrier-free design and requirements profiles is intended to raise awareness for requirements profiles for human characteristics and abilities. At the same time, solutions should also be offered for the reduction of barriers during the design and construction of products.

These measures can be supplemented by further recommendations for action and potential solutions that lead to greater acceptance and to creative design, in order for the essential health and safety requirements for the design and construction of products to be developed as independently as possible of human characteristics and abilities.

6.2.6 Raising of awareness among manufacturers

The manufacturers of products and work equipment are to be made more aware of requirements profiles and the barriers that are revealed by them, not least in order for their products and work equipment to be used as widely as possible.

With the support of product safety standards, it can be expected that the strategies selected for solutions will increasingly be those necessitating lower abilities.

6.2.7 Increasing of research funding

Finally, the bodies funding research are also called upon to provide appropriate support for implementing the UN Convention on the Rights of Persons with Disabilities. On the one hand, this concerns innovative solutions for the design and construction of products and work equipment in a way that is conducive to safety and health and also largely independent of human characteristics and abilities; on the other, the focus must be broadened, by the according of greater consideration to innovative solutions for the elimination of barriers and for accessibility in general, and by the creation of suitable schemes for the world of work and leisure. Besides product safety, the safety and health of workers at work must be included in the considerations.

In this context, the instruments of hazard assessment, safety and health protection marking, user instruction, etc. in the area of the safety and health of workers at work, as well as the instruments of risk assessments, product marking, instruction manuals, etc. in the sphere of product safety, should be geared to the diversity of ability profiles, in order to permit greater inclusion of persons with disabilities in the world of work.

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8 Annex

The normative and informative references in product standards for the individual product groups, considered in the study as examples, of **presses, industrial trucks and convection steamers** were used to identify further standards that deal in the broadest sense with the topic of "safety and health" or could be of relevance for persons with disabilities.

The list of standards returned as hits was reduced to those that could potentially be relevant to particular groups of persons or users and to persons with disabilities. **Standards addressing purely technical aspects, such as material properties or test methods, were not considered further.**

Abbreviations of the standards types

Standard type	Explanation
A, B, C	Standard type to EN ISO 12100 and CEN Guide 414/ISO Guide 78, listed as such in European Commission Communication 2014/C 220/01.
CENELEC	Standards developed by the European Committee for Electrotechnical Standardization (CENELEC), listed as such in European Commission Communication 2014/C 220/01. Standards developed by CENELEC are not classified as Type A, B or C standards.
7th GPSGV	Standards according to the German Gas Appliance Consumption Regulation (7th GPSGV), listed as such in the BAuA's indexes of standards, the current seventh regulation under the German Product Safety Act.
n/h	Standards in the non-harmonized scope under the German Product Safety Act (ProdSG), listed as such in the BAuA's indexes of standards.
n/c	No classification: the standard cannot be classified; is not listed in any of the above indexes.

8.1 Annex 1: List of standards for the presses product group

Table 23: **Summary** of the normative (n) and informative (i) references (see middle columns) in the analysed product standards (Type C standards in all cases, highlighted in bold) for the **presses** product group. This list is limited to standards that deal in the broadest sense with the topic of "safety and health" and either to which frequent reference is made within the product standards, or which could be particularly relevant for persons with disabilities.

Document	Type	Date	EN 692	EN 693	EN 12622	EN 13736	EN 14673	Title of the standard
EN 349	B	2008-06	n	n	n	n	n	Safety of machinery – Minimum gaps to avoid crushing of parts of the human body
EN 574	B	2008-06	n	n	n	n		Safety of machinery – Two-hand control devices – Functional aspects – Principles for design
EN 614-1	B	2009-02	i	n	n	n	n	Safety of machinery – Ergonomic design principles – Part 1: Terminology and general principles
EN 614-2	B	2008-06					n	Safety of machinery – Ergonomic design principles – Part 2: Interactions between the design of machinery and work tasks
EN 626-1	B	2008-0609	n	n		i	n	Safety of machinery – Reduction of risk to health from hazardous substances – Part 1: Principles
EN 692	C	2009-02						Machine tools – Mechanical presses – Safety

Document	Type	Date	EN 692	EN 693	EN 12622	EN 13736	EN 14673	Title of the standard
EN 693	C	2011-09						Machine tools – Safety – Hydraulic presses
EN 842	B	2008-09	n	n	i	i	n	Safety of machinery – Visual danger signals – General requirements, design and testing
EN 894-1	B	2008-11			n		n	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 1: General principles for human interactions with displays and control actuators
EN 894-2	B	2008-10	i	n	n	n	n	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 2: Displays
EN 894-3	B	2008-10	i	n	n	n	n	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 3: Control actuators
EN 953	B	2009-03	n	n	n	n	n	Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards
EN 981	B	2008-09					n	Safety of machinery – System of auditory and visual danger and information signals
EN 1005-1	B	2008-10			n			Safety of machinery – Human physical performance – Part 1: Terms and definitions

Document	Type	Date	EN 692	EN 693	EN 12622	EN 13736	EN 14673	Title of the standard
EN 1005-2	B	2008-10	n	n	n	n		Safety of machinery – Human physical performance – Part 2: Manual handling of machinery and component parts of machinery
EN 1005-3	B	2008-10			n			Safety of machinery – Human physical performance – Part 3: Recommended force limits for machinery operation
EN 1005-4	B	2008-10		i	n	i		Safety of machinery – Human physical performance – Part 4: Evaluation of working postures and movements in relation to machinery
EN 1037	B	2008-04	n	n	n	n	n	Safety of machinery – Prevention of unexpected start-up
EN 1088	B	2008-17	n	n	n	n	n	Safety of machinery – Interlocking devices associated with guards – Principles for design and selection
EN 1837	B	2009-09			n	n	n	Safety of machinery – Integral lighting of machines
ISO 3864-1	n/h	2011-04					n	Graphical symbols – Safety colours and safety signs – Part 1: Design principles for safety signs and safety markings
ISO 7000	n/c	2008-12					n	Graphical symbols for use on equipment – Index and synopsis
EN ISO 7010	n/c	2012-07			i			Graphical symbols – Safety colours and safety signs – Registered safety signs

Document	Type	Date	EN 692	EN 693	EN 12622	EN 13736	EN 14673	Title of the standard
EN ISO 7731	B	2008-09					n	Ergonomics – Danger signals for public and work areas – Auditory danger signals
EN ISO 11064-1	n/c	2000-12					n	Ergonomic design of control centres – Part 1: Principles for the design of control centres
EN ISO 11161	B	2010-03	i	n	i			Safety of machinery – Integrated manufacturing systems – Basic requirements
EN ISO 12100	A	2010-11	n		n		n	Safety of machinery – General principles for design – Risk assessment and risk reduction
EN 12464-1	n/c	2011-06	i	i	i			Light and lighting – Lighting of work places – Part 1: Indoor work places
EN 12622	C	2013-10						Safety of machine tools – Hydraulic press brakes
EN ISO 13732-1	B	2008-09			n		n	Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces
EN 13736	C	2009-02						Safety of machine tools – Pneumatic presses
EN ISO 13849-1	B	2008-06			n		n	Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design

Document	Type	Date	EN 692	EN 693	EN 12622	EN 13736	EN 14673	Title of the standard
EN ISO 13849-2	B	2012-10			n			Safety of machinery – Safety-related parts of control systems – Part 2: Validation
EN ISO 13850	B	2008-06			n		n	Safety of machinery – Emergency stop – Principles for design
EN ISO 13857	B	2008-03			n		n	Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs
EN 13861	n/c	2011-10					n	Safety of machinery – Guidance for the application of ergonomics standards in the design of machinery
prEN ISO 14122-1	B	2013-11	i	i	n		n	Safety of machinery – Permanent means of access to machinery – Part 1: Choice of fixed means and general requirements of access
prEN ISO 14122-2	B	2013-11	i	i				Safety of machinery – Permanent means of access to machinery – Part 2: Working platforms and walkways
prEN ISO 14122-3	B	2013-12	i	i	n		n	Safety of machinery – Permanent means of access to machinery – Part 3: Stairs, stepladders and guard-rails
prEN ISO 14122-4	B	2014-01	i	i	n			Safety of machinery – Permanent means of access to machinery – Part 4: Fixed ladders

Document	Type	Date	EN 692	EN 693	EN 12622	EN 13736	EN 14673	Title of the standard
EN 14673	C	2010-04						Safety of machinery – Safety requirements for hydraulically powered open die hot forging presses for the forging of steel and non-ferrous metals
EN ISO 14738	B	2008-09			n			Safety of machinery – Anthropometric requirements for the design of workstations at machinery
EN 60073, VDE 0199	n/c	2002-07					n	Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators
EN 60204-1, VDE 0113-1	CENELEC	2011-01	n	n	n	n	n	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
EN 60447, VDE 0196	n/h	2004-04					n	Basic and safety principles for man-machine interface, marking and identification – Actuating principles
EN 61310-2, VDE 0113-102	CENELEC	2008-01	n	n	n	n	n	Safety of machinery – Indication, marking and actuation – Part 2: Requirements for marking
EN 61310-1, VDE 0113-101	CENELEC	2008-02					n	Safety of machinery – Indication, marking and actuation – Requirements for visual, acoustic and tactile signals
EN 61496-1, VDE 0113-201	CENELEC	2008-08	n	n	n	n	n	Safety of machinery – Electro-sensitive protective equipment – Part 1: General requirements and tests

Document	Type	Date	EN 692	EN 693	EN 12622	EN 13736	EN 14673	Title of the standard
EN 61496-2, VDE 0113-202	CENELEC	2011-05	n	n	n	n		Safety of machinery – Electro-sensitive protective equipment – Part 2: Particular requirements for equipment using active opto-electronic protective equipment
CLC/TS 61496-3, VDE V 0113-203	CENELEC	2008-05			n			Safety of machinery – Electro-sensitive protective equipment – Part 3: Particular requirements for Active Opto-electronic protective equipment responsive to Diffuse Reflection
EN 61508-1, VDE 0803-1	n/c	2010-05			i			Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: General requirements
EN 61508-4, VDE 0803-4	n/c	2010-05			i			Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 4: Definitions and abbreviations
DIN EN 62061, VDE 0113-50	CENELEC	2013-02			n			Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems

8.2 Annex 2: List of standards for the industrial trucks product group

Table 24: **Summary** of the normative (n) and informative (i) references (see middle columns) in the analysed product standards (Type C standards in all cases, highlighted in bold) for the **industrial trucks** product group. This list is limited to standards that deal in the widest sense with the topic of "safety and health" and either to which frequent reference is made within the product standards, or which could be particularly relevant for persons with disabilities.

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN 349	B	2008-06	n													Safety of machinery – Minimum gaps to avoid crushing of parts of the human body
EN 894-1	B	2008-10		i	i											Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 1: General principles for human interactions
EN 953	B	2009-03								i			n	n	n	with displays and control actuators Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards
EN 1175-1, VDE 0117-1	C	2010-11	n										n	n	n	Safety of industrial trucks – Electrical requirements – Part 1: General requirements for battery powered trucks

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN 1175-2, VDE 0117-2	C	2010-11	n												n	Safety of industrial trucks – Electrical requirements – Part 2: General requirements of internal combustion engine powered trucks
EN 1175-3, VDE 0117-3	C	2010-11	n												n	Safety of industrial trucks – Electrical requirements – Part 3: Specific requirements for the electric power transmission systems of internal combustion engine powered trucks
EN 1459	C	2012-02														Safety of industrial trucks – Self propelled variable reach trucks
prEN 1459-1	C	2013-03														Rough-terrain trucks – Safety requirements and verification – Part 1: Variable-reach trucks
prEN 1459-2	C	2013-10		i												Rough-terrain trucks – Safety requirements and verification – Part 2: Slewing variable-reach trucks
prEN 1459-3	C	2013-07		i	i											Rough-terrain trucks – Safety requirements and verification – Part 3: Interface between the variable-reach truck and the work platform

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
prEN 1459-4	C	2013-12		i	i											Rough-terrain trucks – Safety requirements and verification – Additional requirements for variable-reach trucks handling freely suspended loads
EN 1755	C	2013-03											n	n	n	Safety of industrial trucks – Operation in potentially explosive atmospheres – Use in flammable gas, vapour, mist and dust
EN ISO 2860	C	2008-09		n	n				n							Earth-moving machinery – Minimum access dimensions
EN ISO 2867	C	2011-07	n	n	n			n				n				Earth-moving machinery – Access systems
EN ISO 3164	C	2013-05	n	n	n											Earth-moving machinery – Laboratory evaluations of protective structures – Specifications for deflection-limiting volume
ISO 3287	n/c	2010-06	n				n	n			n	n				Powered industrial trucks – Symbols for operator controls and other displays
EN ISO 3411	C	2007-07						n				n				Earth-moving machinery – Physical dimensions of operators and minimum operator space envelope

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN ISO 3449	C	2008-09	n	n	n			n								Earth-moving machinery – Falling-object protective structures – Laboratory tests and performance requirements
EN ISO 3457	C	2008-09		n	n											Earth-moving machinery – Guards – Definitions and requirements
EN ISO 3471	C	2008-08	n	n	n			n								Earth-moving machinery – Roll-over protective structures – Laboratory tests and performance requirements
EN ISO 3691-1	C	2012-08						n	n	n			n	n/i		Industrial trucks – Safety requirements and verification – Part 1: Self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks
prEN ISO 3691-2	C	2006-02		i	i										i	Industrial trucks – Safety requirements and verification – Part 2: Self-propelled variable-reach trucks

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
prEN ISO 3691-3	C	2010-01					n							i		Industrial trucks – Safety requirements and verification – Part 3: Additional requirements for trucks with elevating operator position and trucks specifically designed to travel with elevated loads
prEN ISO 3691-4	C	2006-03												i		Industrial trucks – Safety requirements and verification – Part 4: Driverless industrial trucks and their systems
prEN ISO 3691-5	C	2013-09					n							i		Industrial trucks – Safety requirements and verification – Part 5: Supplementary requirements for pedestrian-propelled trucks (updated version anticipated by 2014-6)
EN ISO 3691-6	C	2014-03								n				i	n	Industrial trucks – Safety requirements and verification – Part 6: Burden and personnel carriers
ISO 3795	n/c	1992-05	n	n	n		n	n				n				Road vehicles, and tractors and machinery for agriculture and forestry – Determination of burning behaviour of interior materials

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN ISO 4413	B	2010-11		n	n											Hydraulic fluid power – General rules and safety requirements for systems and their components
ISO 5010	C	2010-04		n	n							n				Earth-moving machinery – Rubber-tyred machines – Steering requirements
ISO 5053	n/c	1994-08	n		i				n	n	n	n	n	n	n	Industrial trucks – Terminology and classification
EN ISO 5353	n/c	1999-03	n	n	n		n									Earth-moving machinery and tractors and machinery for agriculture and forestry – Seat index point
ISO 6011	n/c	2004-08		n	n											Earth-moving machinery – Visual display of machine operation
ISO 6055	n/c	2013-10	n				n									Industrial trucks – Overhead guards – Specification and testing
EN ISO 6682	C	2008-09		n	n											Earth moving machinery – Zones of comfort and reach for controls

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN ISO 6683	C	2008-08	n	n	n											Earth-moving machinery – Seat belts and seat belt anchorages – Performance requirements and tests
ISO 7000	n/c	2008-12		n	n											Graphical symbols for use on equipment – Index and synopsis
EN ISO 7096	C	2008-09		n	n											Earth-moving machinery – Laboratory evaluation of operator seat vibration
ISO 9533	n/c	2010-09	n	n	n		n									Earth-moving machinery – Machine-mounted audible travel alarms and forward horns – Test methods and performance criteria
ISO 10532	n/c	2009-09		n	n/i											Earth-moving machinery – Machine-mounted retrieval device – Performance requirements
ISO 10968	n/c	2005-02		n	n											Earth-moving machinery – Operator's controls
ISO 11112	n/c	2005-12	n	n	n											Earth-moving machinery – Operator's seat – Dimensions and requirements

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN 12053	C	2008-07	n	n	n								n		n	Safety of industrial trucks – Test methods for measuring noise emissions
EN ISO 12100	A	2010-11		n	n		n				n	n	i	i	i	Safety of machinery – General principles for design – Risk assessment and risk reduction
ISO 12508	n/c	2005-10		n	n											Earth-moving machinery – Operator station and maintenance areas – Bluntness of edges
ISO 12509	n/c	2005-10		n	n											Earth-moving machinery – Lighting, signalling and marking lights, and reflex-reflector devices
prEN 12643	C	2012-01						i								Earth moving machinery – Rubber-tyred machines – Steering requirements
EN 13059	C	2008-08	n	n	n								n		n	Safety of industrial trucks – Test methods for measuring vibration
EN 13490	B	2008-11											n		n	Mechanical vibration – Industrial trucks – Laboratory evaluation and specification of operator seat vibration

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN ISO 13732-1	B	2008-09		n	n											Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces
EN ISO 13849-1	B	2008-06	n	n	n		n	n		n		n				Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
pr EN ISO 13850	B	2014-04		n	n		n			n						Safety of machinery – Emergency stop – Principles for design
ISO 13851	n/c	2002-03							n							Safety of machinery – Two-hand control devices – Functional aspects – Principles for design
EN ISO 13857	B	2008-03		n	n						n					Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs
prEN ISO 14120	n/c	2013-08								n						Safety of machinery – Guards – General requirements for the design and construction of fixed and movable guards

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN 15000	C	2008-09	n	n	n											Safety of industrial trucks – Self propelled variable reach trucks – Specification, performance and test requirements for longitudinal load moment indicators and longitudinal load moment limiters
EN 15830	C	2012-05	n	n	n											Rough-terrain variable reach trucks – Visibility – Test methods and verification
EN 16307-1	C	2013-01											i			Industrial trucks – Safety requirements and verification – Part 1: Supplementary requirements for self-propelled industrial trucks, other than driverless trucks, variable-reach trucks and burden-carrier trucks
EN 16307-5	C	2013-03												i		Industrial trucks – Safety requirements and verification – Part 5: Supplementary requirements for pedestrian-propelled trucks
FprEN 16307-6	C	2013-05												i		Industrial trucks – Safety requirements and verification – Part 6: Supplementary requirements for burden and personnel carriers

Document	Type	Date	EN 1459	EN 1459-1	EN 1459-2	EN 1459-3	EN ISO 3691-1-1	EN ISO 3691-2	EN ISO 3691-3	EN ISO 3691-4	EN ISO 3691-5	EN ISO 3691-6	EN 16307-1	EN 16307-5	EN 16307-6	Title of the standard
EN ISO 21281	n/c	2005-02					n	n				n				Construction and layout of pedals of self-propelled sit-down rider-controlled industrial trucks – Rules for the construction and layout of pedals
ISO 24135-1	n/c	2006-10					n	n				n/i				Industrial trucks – Specifications and test methods for operator restraint systems – Part 1: Lap-type seat belts

8.3 Annex 3: List of standards for the convection steamers product group

Table 25: **Summary** of the normative (n) and informative (i) references (see middle columns) in the analysed product standards (highlighted in bold, in all cases standards within the non-harmonized scope) for the **convection steamers** product group. This list is limited to standards that deal in the widest sense with the topic of "safety and health" and either to which frequent reference is made within the product standards, or which could be particularly relevant for persons with disabilities.

Document	Type	Date	DIN 18852	E DIN 18854	DIN 18858	DIN 18862-1	DIN 18862-2	DIN 18863	DIN 18866	Title of the standard
prEN 203-1	7th GPSGV	2012-04	n	n	N	n	n	N	n	Gas heated catering equipment – Part 1: General safety rules
EN 203-2-2	7th GPSGV	2006-06		n						Gas heated catering equipment – Part 2-2: Specific requirements – Ovens
EN 547-1	B	2008-09	i	i	i	i	i	I	i	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	B	2008-09	i	i	i	i	i	i	i	Safety of machinery – Human body measurements – Part 2: Principles for determining the dimensions required for access openings
EN 547-3	B	2008-09	i	i	i	i	i	i	i	Safety of machinery – Human body measurements – Part 3: Anthropometric data

Document	Type	Date	DIN 18852	E DIN 18854	DIN 18858	DIN 18862-1	DIN 18862-2	DIN 18863	DIN 18866	Title of the standard
EN 894-3	B	2008-10	i	i	i	i	i	i	i	Safety of machinery – Ergonomics requirements for the design of displays and control actuators – Part 3: Control actuators
EN ISO 7250-1	n/c	2010-03	i	i	i	i	i	i	i	Basic human body measurements for technological design – Part 1: Body measurement definitions and landmarks
CEN ISO/TR 7250-2 (DIN SPEC 91279)	n/c	2011-04	i		i			i	i	Basic human body measurements for technological design – Part 2: Statistical summaries of body measurements from national populations
EN ISO 12100	A	2010-11		i						Safety of machinery – General principles for design – Risk assessment and risk reduction
EN ISO 13732-1	B	2008-09		i						Ergonomics of the thermal environment – Methods for the assessment of human responses to contact with surfaces – Part 1: Hot surfaces
EN ISO 13857	B	2008-03		i						Safety of machinery – Safety distances to prevent hazard zones being reached by upper and lower limbs

Document	Type	Date	DIN 18852	E DIN 18854	DIN 18858	DIN 18862-1	DIN 18862-2	DIN 18863	DIN 18866	Title of the standard
DIN 18852	n/h	2003-06								Equipment for commercial kitchens – Frying and grilling appliances – Requirements and testing
E DIN 18854	n/h	2014-01								Equipment for commercial kitchens – Multiple deck ovens – Requirements and testing
DIN 18858	n/h	2003-06								Equipment for commercial kitchens – Salamander broilers and giros grills – Requirements and testing
DIN 18862-1	n/h	2003-08								Equipment for commercial kitchens – Automatic units for grilling products; Requirements and testing – Part 1: Meat for short-time roasting
DIN 18862-2	n/h	2003-08								Equipment for commercial kitchens – Automatic units for grilling products; Requirements and testing – Part 2: Meat for long-time roasting
DIN 18863	n/h	2003-06							n	Equipment for commercial kitchens – Pressure steam cookers – Requirements and testing
DIN 18866	n/h	2003-06		n						Equipment for commercial kitchens – Convection ovens and convection steamers – Requirements and testing

Document	Type	Date	DIN 18852	E DIN 18854	DIN 18858	DIN 18862-1	DIN 18862-2	DIN 18863	DIN 18866	Title of the standard
DIN 33402-1	n/c	2008-03	i	i	i	i	i	i	i	Ergonomics – Body dimensions of people – Part 1: Terms and definitions, measuring procedures
EN 60335-1, VDE 0700 Part 1	CENELEC	2012-01	n	n	n	n	n	n	n	Household and similar electrical appliances – Safety – Part 1: General requirements
EN 60335-2-36, VDE 0700-36	CENELEC	2012-04		n						Household and similar electrical appliances – Safety – Part 2-36: Particular requirements for commercial electric cooking ranges, ovens, hobs and hob elements
EN 60335-2-38, VDE 0700 Part 38	CENELEC	2008-04	n			n	n			Household and similar electrical appliances – Safety – Part 2-38: Particular requirements for commercial electric griddles and griddle grills
EN 60335-2-42, VDE 0700-42	CENELEC	2012-04						n	n	Household and similar electrical appliances – Safety – Part 2-42: Particular requirements for commercial electric forced convection ovens, steam cookers and steam-convection ovens
EN 60335-2-48, VDE 0700 Part 48	CENELEC	2012-04			n	n	n			Household and similar electrical appliances – Safety – Part 2-48: Particular requirements for commercial electric grillers and toasters

9 KAN recommendations for DIN standards committees

An outcome of KAN Study 53: The contribution of OSH-related standardization to implementation of the UN Convention on the Rights of Persons with Disabilities – Feasibility study

One purpose of **product standards** is to create a basis for products that are safe and conducive to good health. From the perspective of inclusion, i.e. the avoidance of special systems for persons with disabilities, this objective is not always met. In the area of machine safety, for example, the generic EN ISO 12100 standard, Safety of machinery – General principles for design – Risk assessment and risk reduction (2011), requires a product's range of application to be stated, as a part of which consideration is to be given to user groups with impaired abilities. However, product standards frequently fail to address these user groups, and often lack information on the range of application.

The aim of this document is to raise awareness on standards committees for aspects of inclusion. Better incorporation of aspects of inclusion into standards would enable more strategies to be found for satisfying product safety requirements. This in turn would extend the range of application of products and work equipment, thereby enabling them also to be used by persons of impaired ability without endangering safety or health.

The table below shows **modules** that can assist in the incorporation of aspects of inclusion into product standards.

Module
<p>Make the content of the following documents known on product standards committees: DIN Technical Report 131, Guidelines for standards developers to address the needs of older persons and persons with disabilities; CEN/CENELEC Guide 6 (2003)/ISO/IEC Guide 71, Guide for addressing accessibility in Standards (2014); and examine possible implementation of the main principles during the development and revision of standards.</p>
<p>Make the content of the following documents known on product standards committees: DIN Technical Report 124, Products in Design for All, (2002) and DIN SPEC 33421, Ergonomics data and guidelines for the application of ISO/IEC Guide 71 to products and services to address the needs of older persons and persons with disabilities (2014); and examine possible implementation of the main principles during the development and revision of standards.</p>
<p>Examine and evaluate the content of the standards against the following criteria/abilities (results of this KAN study):</p> <ul style="list-style-type: none"> • Sensory (sight, hearing, touch, taste/smell, sense of balance)

- Physical (dexterity, manipulation, mobility, force, voice)
- Cognitive (intellect/memory; language/literacy)
- Allergies
- Other (e.g. body dimensions)

Model documentation for the purpose of examination, and information on evaluation with reference to the example of a two-hand control device for a press (requirements profile of human abilities) from the results of KAN Study 53

Subject of standardization under consideration							
Two-hand control device to EN 574							
Human characteristics and abilities		Requirements concerning the characteristics and abilities (*)					
Group	Characteristic/ability	0	1	2	3	4	5
Sensory	Sight		X				
	Hearing	X					
	Touch		X				
	Taste/smell	X					
	Sense of balance	X					
Physical	Dexterity		X				
	Manipulation				X		
	Mobility	X					
	Force		X				
	Voice	X					
Cognitive	Intellect/memory		X				
	Language/literacy	X					
Allergies	Contact, foods, breathing air	X					
Other, e.g. body dimensions	Particular remarks						
(*) Scale of requirements concerning human characteristics and abilities: 0 none 1 very low 2 low 3 average 4 high 5 very high							

In order for a press safeguarded by a two-hand control to be used, the pushbuttons of the control must be recognizable as such, reachable, and operable.

Measures following examination and evaluation

- A provision in the product standard that in his user information, the manufacturer must state the particular human abilities required in order for the product to be used without danger to safety or health.
- A clear provision in the product standard that aspects of inclusion have been examined, for example by inclusion of a sentence such as: *'Principles and recommendations for the incorporation of inclusion aspects were considered during the development of this standard and, where possible and beneficial, were also incorporated.'*