DRAFT INTERNATIONAL STANDARD

ISO/DIS 19353

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Safety of machinery — Fire prevention and protection

Sécurité des machines — Prévention et protection contre l'incendie

ICS: 13.110

ISO/CEN PARALLEL PROCESSING

This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 19353 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*, and by Technical Committee CEN/TC 114, *Safety of machinery* in collaboration.

This second edition cancels and replaces the first edition which has been technically revised.

Introduction

The safety of machinery against fire involves fire prevention and fire protection and fire-fighting. In general, as shown in Annex D, these include technical, structural, organizational, fire suppression measures. Effective fire safety of machinery can require the implementation of a single measure or a combination of measures.

Annex D gives an overview on fire risk reduction measures. This International Standard deals with the technical measures shown in Figure 1.

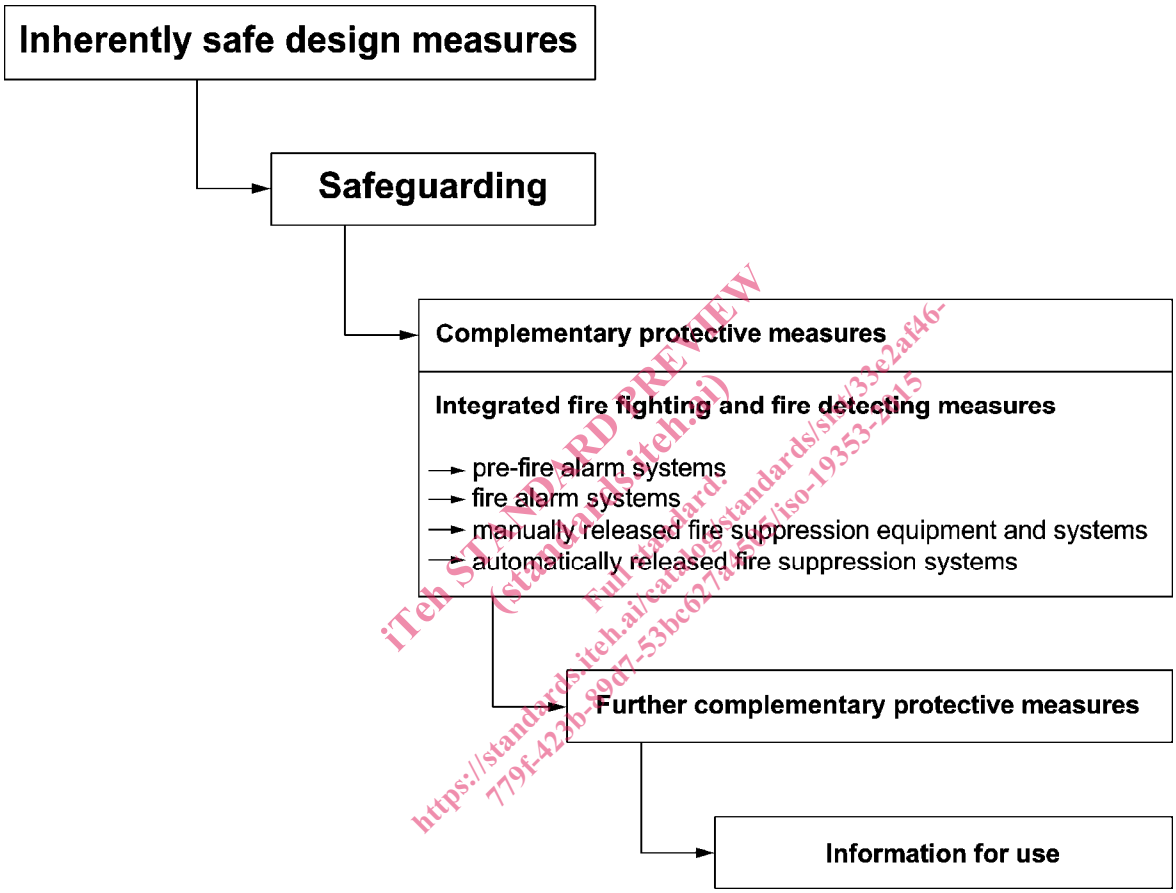


Figure 1 — Protective measures dealt with in ISO 19353

The structure of safety standards in the field of machinery is as follows.

a) **Type-A standards** (basis standards) give basic concepts, principle for design, and general aspects that can be applied to machinery;

b) **Type-B standards** (generic safety standards) dealing with one or more safety aspect(s), or one or more type(s) of safeguards that can be used across a wide range of machinery:

   — type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);

   — type-B2 standards on safeguards (e.g. two-hands controls, interlocking devices, pressure sensitive devices, guards);

c) **Type-C standards** (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

ISO 19353 is a type-B1 standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organisations, market surveillance etc.)

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e. g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

In addition, this document is intended for standardization bodies elaborating type-C standards.

The requirements of this document can be supplemented or modified by a type-C standard.

For machines which are covered by the scope of a type-C standard and which have been designed and built according to the requirements of that standard, the requirements of that type-C standard take precedence.

Safety of machinery — Fire prevention and fire protection

1 Scope

This International Standard specifies methods of identification of the fire hazard resulting from machinery itself and the methods for performance of a risk assessment.

This International Standard gives the basic concepts and methodology of technical measures for fire prevention and protection to be taken during the design and construction of machinery according to the intended use of the machine.

It provides guidelines for consideration in reducing the risk of machinery fires to acceptable levels through machine design, risk assessment and operator instructions.

This International Standard is not applicable to:

— mobile machinery;

— machinery designed to contain controlled combustion processes (e.g. internal combustion engines, furnaces), unless these processes can constitute the ignition source of a fire in other parts of the machinery or outside of this;

— potentially explosive atmospheres and explosion prevention and protection.

This document is not applicable to machinery or machinery components manufactured before the date of its publication.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13849-1, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and the following apply.

3.1
combustibility
property of a material capable of burning

Note 1 to entry: Accurate assessment of the combustibility characteristics of a material will depend on the operational conditions of the machinery and the form and physical state of the material (e.g. gaseous, liquid or solid; solids chopped to form shavings or dust, or not).

Note 2 to entry: On the basis of their combustibility, materials can be classified into non-combustible, hardly combustible, combustible and easily combustible materials. It is important not to mix up combustibility on the one hand, and flammability or ignitability on the other. Consequently, flash points and ignition points do not represent quantitative measures of combustibility.

3.2
combustible
capable of being ignited or burned

[SOURCE: ISO 13943:2008, 4.43]

3.3
combustion
exothermic reaction of a substance with an oxidizing agent

Note 1 to entry: Combustion generally emits fire effluent accompanied by flames and/or glowing

[SOURCE: ISO 13943:2008, 4.46]

3.4
damaging fire
fire which causes harm to people, buildings, machinery and/or environment

3.5
extinguishing opening
port in the machine housing, closed with a plug or flap which can be safely accessed with an extinguishing device

Note 1 to entry: As extinguishing device, e.g. a hose or lance can be used.

3.6
fire
general term for self-supporting combustion which can occur as controlled combustion or uncontrolled combustion

Note 1 to entry: Controlled combustion is deliberately arranged to provide an intended effect.

Note 2 to entry: Uncontrolled combustion is spreading uncontrolled in time and space.

Note 3 to entry: In case of a combustion control failure, controlled combustion can lead to uncontrolled combustion.

Note 4 to entry: The definition has been adjusted from ISO 13943:2008, 4.96 to 4.98.

3.7
fire alarm system
system which by the use of sensors detects the onset of fire and initiates a response

Note 1 to entry: Sensors can be designed to detect smoke, combustion gases, heat or flames.

3.8
fire extinguishing agent
agent which is appropriate to extinguish fire by cooling below ignition temperature and/or by reducing the oxidizer level

Note 1 to entry: The extinguishing agent can be gaseous, liquid or solid. Common extinguishing agents include water, carbon dioxide, nitrogen, argon, chemical powder or foam.

3.9
fire hazard
physical object or condition with a potential for an undesirable consequence from fire

[SOURCE: ISO 13943:2008, 4.112]

3.10
fire load
quantity of heat which can be released by the complete combustion of all the combustible materials in a volume, including the facings of all bounding surfaces

Note 1 to entry: Fire load can be based on effective heat of combustion, gross heat combustion or net heat combustion as required by the specifier.

Note 2 to entry: The word "load" can be used to denote force or power or energy. In this context, it is used to denote energy.

Note 3 to entry: The typical units are kilojoules (kJ) and megajoules (MJ)

[SOURCE: ISO 13943:2008, 4.114]

3.11
fire prevention
measures to prevent the outbreak of a fire and/or to limit its effects

[SOURCE: ISO 8421-1:1987, 1.21]

3.12
fire protection
measures such as design features, systems, equipment, buildings, or other structures to reduce danger to persons and property by detecting, extinguishing or containing fires

[SOURCE: ISO 8421-1:1987, 1.23, modified — "measures such as" added to the original definition]]

3.13
fire risk
probability of a fire combined with a quantified measure of its consequence

[SOURCE: ISO 13943:2008, 4.124]

3.14
fire suppression system
technical system to fight a fire and to reduce the damaging effects of flames and heat

Note 1 to entry: Additional devices might be required to extinguish the fire.

3.15
flame
rapid, self-sustaining, sub-sonic propagation of combustion in a gaseous medium, usually with emission of light

[SOURCE: ISO 13943:2008, 4.133]

3.16
flame retardant
substance added or treatment applied to a material in order to suppress or delay the appearance of a flame and/or reduce its propagation rate

[SOURCE: ISO 13943:2008, 4.139, modified — Note has been deleted and "..the flame-spread rate" replaced with "its propagation rate".]

3.17
flammability
ability of a material or product to burn with a flame under specified conditions

Note 1 to entry: Accurate assessment of the ignition characteristics of material will depend on the operational conditions of the machinery.

[SOURCE: ISO 13943:2008, 4.151]

3.18
glow
glowing combustion
combustion of a material in the solid phase without flame but with emission of light from the combustion zone

[SOURCE: ISO 13943:2008, 4.169, modified — "glow" has been introduced as the preferred term]

3.19
ignition
<general> initiation of combustion

[SOURCE: ISO 13943:2008, 4.187, modified — Deprecated synonymous term "sustained ignition" deleted.]

3.20
ignition energy
energy necessary to initiate combustion

3.21
ignition source
source of energy that initiates combustion

[SOURCE: ISO 13943:2008, 4.189]

3.22
low-emission metalworking fluid
metalworking fluid composed of low-evaporation base media and anti-mist additives

Note 1 to entry: Low-evaporation base media are base oils consisting of low-evaporation mineral oils, synthetic esters and/or special liquids.

3.23
overheating
uncontrolled temperature increase

3.24
pre-fire alarm system
system which detects conditions that can lead to the potential onset of fire and initiates a response

Note 1 to entry: A response can be a trigger of an alarm signal or can initiate an automatic reaction.

Note 2 to entry: Sensors for these systems can detect heat due to friction, hot surfaces, loss of inerting, abnormal changes of gas concentrations, failure of lubrication or cooling supply etc.

3.25
required performance level
PLr
performance level (PL) applied in order to achieve the required risk reduction for each safety function

[SOURCE: ISO 13849-1:2006, 3.1.24 modified — Reference on Figures 2 and A.1 deleted]

3.26
safety component
component of the machinery, provided that it is not interchangeable equipment, which fulfils a safety function when in use and the failure or malfunctioning of which endangers the safety or health of exposed persons

3.27
self-heating
<chemical> rise in temperature in a material resulting from an exothermic reaction within the material

[SOURCE: ISO 13943:2008, 4.287]

3.28
self-ignition
spontaneous ignition resulting from self-heating

3.29
smoke
visible part of fire effluent

Note 1 to entry: For definition of fire effluent see ISO 13943:2008, 4.105.

[SOURCE: ISO 13943:2008, 4.293 – modified, Note 1 to entry added.]

4 Fire hazard

4.1 General

A fire hazard occurs if combustible materials (fuel), oxidizer (oxygen) and ignition energy (heat) are available in sufficient quantities at the same place and at the same time. A fire is an interaction of these three components in the form of an uninhibited chemical reaction (see Figure 2).

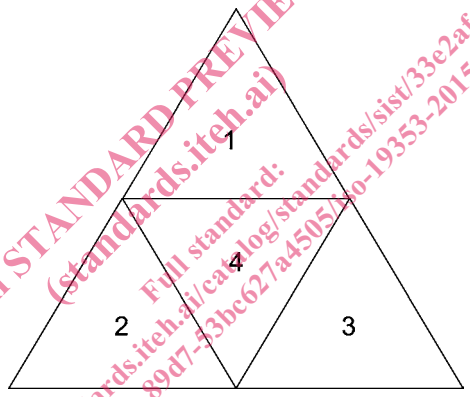
A fire can be prevented or suppressed by controlling or removing one or more of the components of the fire tetrahedron.

Certain materials are inherently unstable, extraordinary oxidizers or capable of self-heating. This affects the fire hazard.

Variation in oxygen concentration (e.g. oxygen enrichment) can also affect the fire hazard.

The fire hazard can arise from the material processed, used or released by the machinery, from materials in the vicinity of the machinery, or from materials used in the construction of the machinery.

NOTE An explosion hazard can exist in addition to the fire hazard.



Key

1 heat 3 fuel

2 oxygen 4 uninhibited chemical chain reaction

Figure 2— Fire tetrahedron

4.2 Combustible materials

It shall be determined whether combustible materials exist or can exist and in what quantity and distribution. Combustible materials can occur as solids, liquids or gases.

The ease of combustion of materials is affected by the size, shape and deposition of the materials. For example, small pieces of a material loosely collected together can be more easily ignited than a large piece of that material. Also the combination of materials can have an influence on the ignitability and the burning behaviour.

Consideration shall be given as to whether the properties of the materials can change over time or with use. Such changes can include the possibility of decomposition of the material releasing combustible gases and vapours. This can lead to an increased fire hazard.