INTERNATIONAL STANDARD

ISO 14123-1

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Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery —

Part 1:
Principles and specifications for machinery manufacturers

Sécurité des machines — Réduction des risques pour la santé résultant de substances dangereuses émises par des machines —

Partie 1: Principes et spécifications à l'intention des constructeurs de machines

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Contents

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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.

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.

International Standard ISO 14123-1 was prepared by the European Committee for Standardization (CEN) (as EN 626-1:1994) and was adopted, under a special "fast-track procedure", by Technical Committee ISO/TC 199, *Safety of machinery*, with its approval by the ISO member bodies.

ISO 14123 consists of the following parts, under the general title *Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery*:

— *Part 1: Principles and specifications for machinery manufacturers*

— *Part 2: Methodology leading to verification procedures.*

Annexes A and B of this part of ISO 14123 are for information only.

Introduction

This part of ISO 14123 has been produced to assist designers, manufacturers and other interested bodies to interpret essential safety requirements in order to achieve conformity with European Legislation on machinery safety.

ISO 14123-1 (EN 626-1) is one of a series of standards produced by CEN/CENELEC under mandates from CEC and EFTA. This series has been divided into several categories to avoid duplication and to develop a logical structure which will enable rapid production of standards and easy cross-reference between them.

The hierarchy of standards is as follows:

a) **Type A standards** (generic safety standards) giving basic concepts, principles for design, and general aspects that can be applied to all machinery.

b) **Type B standards** (group safety standards) dealing with one safety aspect or one type of safety-related device that can be used across a wide range of machinery:

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

— type B2 standards are safety related devices (e.g. two-hand controls, interlocking devices, pressure-sensitive devices, etc.).

c) **Type C standards** (machine safety standards) giving detailed safety requirements for a particular machine or group of machines defined in the scope of the standard.

This is a type B1 standard and its primary purpose is to give guidance to the writers of type C standards when machines are identified as emitting hazardous substances as a significant risk. This part of ISO 14123 may also be used as guidance in controlling the risk where there is no type C standard for a particular machine.

Safety of machinery — Reduction of risks to health from hazardous substances emitted by machinery —

Part 1:
Principles and specifications for machinery manufacturers

1 Scope

This part of ISO 14123 deals with principles for the control of risks to health due to hazardous substances from machinery. This part of ISO 14123 is not applicable to substances which are a hazard to health solely because of their explosive, flammable or radioactive properties or their behaviour at extremes of temperature or pressure.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 14123. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 14123 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/TR 12100–1:1992, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

3 Definitions

For the purposes of this part of ISO 14123, the following definitions apply:

3.1
intended use
[see ISO/TR 12100–1]

3.2
hazardous substance
any chemical or biological agent which is hazardous to health, e.g. substances or preparations classified as[1)] .

— very toxic;

— toxic;

— harmful;

— corrosive;

— irritant;

[1)] For EU countries, see also 67/548/EEC and its amendments.

— sensitizing;

— carcinogenic;

— mutagenic;

— teratogenic;

— pathogenic;

— asphyxiant.

4 Risk assessment

4.1 An identification of hazards and assessment of the foreseeable risks from substances hazardous to health shall be made by the machinery manufacturer. This shall cover, as far as possible, any potential danger arising from exposure of persons to the machine at any stage in its life.

NOTE Details of the methodology of risk assessment are given in ISO/TR 12100–1.

4.2 The level of risk depends on the hazardous properties of the substances, the likelihood that personal exposure will occur and the degree of exposure. The health effects of hazardous substances may be:

— short or long term;

— reversible or irreversible.

4.3 Hazardous substances can be in any physical state (gas, liquid, solid) and can affect the body by:

— inhalation;

— ingestion;

— contact with the skin, eyes and mucous membranes;

— penetration through the skin.

4.4 The hazardous substances may be generated from:

— any part of a machine;

— substances present in the machine;

— material arising directly or indirectly from articles and/or substances processed by the machine or used on the machine.

4.5 The stages in the life of a machine may include (see also ISO/TR 12100-1):

— construction;

— transport and commissioning;

— transport;

— installation;

— commissioning;

— use;

— operation, including start-up and shut-down;

— failure;

— setting or process changeover;

— cleaning;

— adjustment;

— maintenance and repair;

— decommissioning, dismantling and, as far as safety is concerned, disposal.

5 Types of emissions

5.1 Airborne emissions

5.1.1 Airborne emissions can represent significant sources of exposure to hazardous substances. Inhalation is usually the most significant of all the routes of entry (see 4.3). In addition, airborne emissions may enter the body by other routes, particularly when substances are deposited on a body surface or when they are ingested.

5.1.2 Airborne emissions may arise from various sources, including:

— machining, e.g. sawing, grinding, sanding, milling;

— evaporation and thermal convection, e.g. open tanks, crucibles, solvent baths;

— hot-metal processes, e.g. welding, brazing, soldering, profile-cutting, casting;

— material handling, e.g. hopper-charging, pneumatic conveying, sack-filling;

— spraying, e.g. painting, high-pressure cleaning;

— leaks, e.g. at pump seals, flanges;

— byproducts and effluents, e.g. gases from drosses, rubber vulcanization fumes;

— maintenance, e.g. emptying filter bags;

— dismantling processes, e.g. breaking of lead batteries, stripping of asbestos insulation;

— combustion of fuel, e.g. internal combustion engine exhausts;

— apparatus for mixing food;

— metalworking, e. g. nitrosamines from water-soluble metalworking lubricants.

5.1.3 Some examples of airborne hazardous substances are as follows:

— respiratory irritants, e.g. sulfur dioxide, chlorine, cadmium fumes;

— sensitizers, e.g. isocyanates, enzymes, colophon fumes;

— carcinogens, e.g. asbestos, chromium(VI), benzene, vinyl chloride monomer;

— fibrogenic dusts, e.g. free crystalline silica, asbestos, cobalt;

— asphyxiants, e.g. nitrogen, argon, methane;

— biological agents, e.g. *Legionella pneumophila*, dusts from mouldy hay;

— substances which affect specific parts of the body, e.g. mercury (nerve system, kidneys); lead (nerve system, blood); carbon tetrachloride (nerve system, liver); carbon monoxide (blood).

5.1.4 Airborne emissions may be subject to techniques of evaluation based on the measurement of concentrations of substances in the breathing zone of the persons involved. The results of such measurements are usually compared with suitable criteria .

5.1.5 There are many methods of sampling air and analysing the sample for airborne contaminants. Sampling methods and analytical techniques should be selected according to the nature of the airborne contaminant.

5.2 Non-airborne emissions

5.2.1 Non-airborne emissions can be significant sources of exposure to hazardous substances by ingestion, contact with skin, eyes or mucous membranes or penetration through the skin (see 4.3).

5.2.2 Non-airborne emissions may be produced in various circumstances, including:

— migration from open sources, e.g. splashing and evaporation/condensation leading to secondary emissions;

— opening machinery, e.g. for maintenance;

— entry into machinery, e.g. for inspection;

— material handling, e.g. charging, sampling, disposal;

— handling machinery parts, e.g. dismantling;

— incorrect operation, e.g. overfilling;

— leaks, e.g. at pump seals, flanges;

— ruptures.

5.2.3 Exposure to non-airborne emissions can cause ill health as a result of a variety of hazardous properties associated with different materials. Same examples of these materials include:

— corrosives, e.g. sulfuric acid;

— irritants, e.g. wet cement;

— sensitizers, e.g. chromium compounds, epoxy resins;

— carcinogens, e.g. used quenching oil, beryllium oxide, polycyclic aromatic hydrocarbons;

— biological agents, e.g. infected cutting oils, infected blood.

The ill health produced may be local at the point of contact or the result of effects elsewhere in the body (systemic or target organ). With some materials, both situations may occur, e.g. phenol.

5.2.4 Non-airborne emissions cannot be evaluated by measurements of concentration of substances in the air. Criteria based on these concentration cannot be used. Other criteria may be established, e.g. limits regarding microbial concentrations in cutting oils.

5.2.5 In some cases it can be relevant to carry out quantitative assessments of surface contamination. The criteria to be applied should be based on both toxicological and practical considerations. Techniques for measuring such contamination include:

— chemical analyses of wipes;

— use of fluorescent tracers;

— colorimetric indications;

— count of microorganisms.

6 Requirements and/or measures for elimination and/or reduction of risk

Risks of exposure to hazardous substances shall be reduced as far as practical, taking into account scientific and technical methods and limits relating to exposure and the external environment. In selecting the most appropriate methods of reducing risks, the manufacturer shall take measures to reduce the risks of exposure as close to the emission source as possible. The manufacturer shall apply the following principles, in the order given, taking into account the state of the art:

— design of machinery to eliminate or prevent risks of exposure;

— design of machinery to reduce risks that cannot be eliminated, in the following order of priority:

  1) reduction of emission;

  2) reduction by ventilation or other engineering means;

  3) reduction of exposure by machinery operation or segregation.

— information about the residual risks to the user and advice to the user on additional measures to reduce exposure.

NOTE A detailed list of possible measures is given in annex A.

7 Information for use and maintenance

7.1 Information for use

7.1.1 The manufacturer shall state in the instructions the intended uses of the machine, the hazardous substances which can arise from the machine (see 4.4) and the operating procedures. The manufacturer shall specify, when necessary, the level of competence to be achieved by training. The manufacturer shall give appropriate details in the instructions where setting and operating conditions of the machine can result in a reduction of risks.

7.1.2 When the machine is equipped with means of reducing the risks to health, the machinery manufacturer shall supply information on its correct use and factors that may adversely affect its performance.

7.1.3 When there is no such provision of means of reducing the risk to health, such methods of reduction and/or testing which are suitable and proven shall be specified by the manufacturer.

7.1.4 If leaks, spills or uncontrolled releases of a hazardous substance can be foreseen, the manufacturer shall provide information to limit the extent of risks to health and to regain adequate control as soon as possible. The information should cover, where appropriate, emergency procedures, safe disposal of the substance and suitable protective equipment to enable the source of release to be safely identified and repairs to be made.

7.1.5 The manufacturer shall provide information on the necessary personal protective equipment and hygiene arrangements.

7.2 Information for maintenance

The machinery manufacturer shall provide sufficient instructions for the maintenance of the machine without risk to health.

NOTE This may include the necessary maintenance to ensure the continuing effective reduction of emissions of hazardous substances. Implementation by the user may be achieved by a structured maintenance programme employing various functional and performance checks at suitable intervals as far as applicable.

EXAMPLE The elements of such a maintenance programme for the user of a mechanical vibrating screen may include regular checks on:

— the physical condition of the hardware, including screen covers, inspection hatches, etc. required to maintain the integrity of containment;

— gaskets and seals associated with covers and hatches, to ensure that they are intact and functional;

— flexible connectors on feed and product lines, to ensure that they are still connected and in good condition;

— extraction ventilation, including visual checks, routine mechanical inspection and ventilation performance testing;

— the accumulation of material.

8 Verification of safety requirements and/or measures

Methodology leading to verification procedures for the reduction of risks to health from hazardous substances emitted by machinery is described in ISO 14123-2.

Annex A
(informative)

Examples of measures for reduction of exposure to hazardous substances

NOTE These examples may either be incorporated into the machinery design or provided as information for the user.

A.1 Elimination and prevention of risks

Examples of measures for elimination and prevention of risks are listed below:

— elimination of the operation that causes the emission;

— selection of an alternative production process;

— selection of alternative operations;

— elimination of the use of the substance;

— substitution of hazardous materials by less hazardous alternatives, e.g. cadmium-free silver solder;

— use of totally enclosed processes and handling systems, e.g. enclosed pumps;

— use of remote controlled and automated processes.

A.2 Reduction of risks

A.2.1 Reduction of emission

Examples of measures for reduction of emission are listed below:

— use of vapour-return systems, e.g. piping of displaced air to supply tank;

— use of dust-reduced forms, e.g. pellets, granules, flakes or pastilles instead of powders;

— enclosed materials-handling systems;

— dust suppression by wetting;

— maintenance of valves, pumps and flanges;

— prevention of spills and leaks;

— use of liquids which are dust-free when dried out, e.g. use of an anti-stick soap solution on unvulcanized rubber;

— immersion of shafts and seals of reactive liquids to absorb leaks of hazardous substances, e.g. isocyanate pumps;

— fitting covers, flexible or rigid barriers or floating balls to contain emissions from e.g. conveyors, tanks;

— condensation of vapours, e.g. in solvent-degreasing tanks;