
**Safety requirements for dry-cleaning
machines —**

Part 1:
Common safety requirements

Exigences de sécurité pour les machines de nettoyage à sec —

Partie 1: Exigences générales de sécurité

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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 8230-1 was prepared by Technical Committee ISO/TC 72, *Textile machinery and accessories*, Subcommittee SC 5, *Industrial laundry and dry-cleaning machinery and accessories*.

This first edition of ISO 8230-1, together with ISO 8230-2:2008 and ISO 8230-3:2008, cancels and replaces ISO 8230:1997, of which it constitutes a technical revision.

ISO 8230 consists of the following parts, under the general title *Safety requirements for dry-cleaning machines*:

- *Part 1: Common safety requirements*
- *Part 2: Machines using perchloroethylene*
- *Part 3: Machines using combustible solvents*

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Introduction

This document is a type-C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document.

When requirements of this type-C standard are different from those which are stated in type-A or -B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

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Safety requirements for dry-cleaning machines —

Part 1: Common safety requirements

1 Scope

This part of ISO 8230 specifies common safety requirements for dry-cleaning machines.

It is applicable to dry-cleaning machines of all sizes intended for industrial and commercial use for the cleaning of articles made of textile, leather, furs and skins, using exclusively either perchloroethylene or combustible solvent as the cleaning medium.

It is not applicable to:

- machines placed at the disposal of the general public (self-service);
- barrier machines as defined in 3.1.5;
- transfer machines as defined in 3.1.4;
- ironing presses (see ISO 10472-1 and ISO 10472-6);
- ancillary equipment, e.g. room ventilation equipment, waste recuperation systems of the still, external water cooling systems or external systems for solvent recovery from the still sludge.

This part of ISO 8230 deals with all significant hazards arising from the use of the dry-cleaning machine, where “use of the dry-cleaning machine” comprises both intended use and foreseeable abnormal situations and includes commissioning, use and maintenance. It defines the common safety requirements for dry-cleaning machines and is intended to be used in conjunction with ISO 8230-2 and ISO 8230-3, as relevant. Specific requirements in those other parts of ISO 8230 take precedence over the respective requirements of this part of ISO 8230.

It does not deal with hazards caused by processing items that can create an explosive atmosphere (e.g. printers' wipers containing a low-flash solvent), nor with machines processing loads that can contain “foreign solvents”, which could lead to a change in a property (characteristic) of the cleaning solvent, e.g. cause foaming or make it carcinogenic.

This part of ISO 8230 applies to machines manufactured after the date of its issue.

2 Normative references

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

IEC 60204-1:2005, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements*

ISO 8230-1:2008(E)

IEC 61496-1:2004, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests*

ISO 3744:1994¹⁾, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane*

ISO 4871:1996, *Acoustics — Declaration and verification of noise emission values of machinery and equipment*

ISO 5232:1998, *Graphical symbols for textile machinery*

ISO 6178:1983, *Centrifuges — Construction and safety rules — Method for the calculation of the tangential stress in the shell of a cylindrical centrifuge rotor*

ISO 8230-2, *Safety requirements for dry-cleaning machines — Part 2: Machines using perchloroethylene*

ISO 8230-3, *Safety requirements for dry-cleaning machines — Part 3: Machines using combustible solvents*

ISO 8232:1988, *Closed-circuit dry-cleaning machines — Defining and checking of machine characteristics*

ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane*

ISO/TR 11688-1:1995, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*

ISO/TR 11688-2:1998, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design*

ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

ISO 13732-3:2005, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 3: Cold surfaces*

ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13850:2006, *Safety of machinery — Emergency stop — Principles for design*

ISO 13852:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

ISO 13855:2002, *Safety of machinery — Positioning of protective equipment with respect to the approach speeds of parts of the human body*

ISO 13856-1:2001, *Safety of machinery — Pressure-sensitive protective devices — Part 1: General principles for design and testing of pressure-sensitive mats and pressure-sensitive floors*

1) Under revision.

ISO 14119:1998, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

ISO 14120:2002, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

ISO 14122-1:2001, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of fixed means of access between two levels*

ISO 14122-2:2001, *Safety of machinery — Permanent means of access to machinery — Part 2: Working platforms and walkways*

ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails*

EN 378-1:2000, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria*

EN 378-2:2000, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 2: Design, construction, testing, marking and documentation*

EN 614-1:2006, *Safety of machinery — Ergonomic design principles — Part 1: Terminology and general principles*

EN 981:1996, *Safety of machinery — System of auditory and visual danger and information signals*

EN 983:1996, *Safety of machinery — Safety requirements for fluid power systems and their components — Pneumatics*

EN 61310-1:1995, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, auditory and tactile signals*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1 and the following apply.

3.1 Machine configuration

3.1.1

dry-cleaning machine

equipment in which articles made of textile, leather, fur or skin are cleaned, treated and dried

NOTE Equipment such as solvent recovery, inerting and distilling equipment can also be part of the dry-cleaning machine.

3.1.2

closed-circuit dry-cleaning machine

dry-cleaning machine in accordance with ISO 8232, in which reduction is carried out without any contact between the air in the drum and the air in the workroom

3.1.3

open-circuit dry-cleaning machine

dry-cleaning machine, in which the deodorization takes place by an intake of fresh air and evacuation of any solvent/air mixture out of the dry-cleaning machine, prior to the opening of the loading/unloading door

3.1.4

transfer machine

equipment where cleaning machine and tumbler are separated and where the load has to be transferred after extraction from the cleaning machine to the tumbler

3.1.5

barrier dry-cleaning machine

dry-cleaning machine designed in such a way that, for hygienic reasons, contact between clean articles and dirty articles is avoided by a partition

NOTE This is the case in particular with machines having two doors in which loading and unloading are carried out on opposite sides of the partition.

3.2 Machine components

3.2.1

drum

enclosure or container in which the cage rotates

3.2.2

cage

rotating perforated cylinder, enclosed by the drum, in which the load to be cleaned is placed

NOTE The capacity of the cage is defined in ISO 8232.

3.2.3

loading door

device for locking the cage and/or drum apertures for loading and unloading

3.2.4

tank

container used to store the solvent for the cleaning process

3.2.5

solvent filter

device for removing undissolved particles mechanically and/or dissolved particles by adsorption, from liquid solvent

3.2.6

button trap filter

device to protect the solvent pumps from solid objects during the cleaning phase

3.2.7

drying system

all parts comprising the circuit through which a current of air flows, in which the air flow is heated and cooled in fixed sequences in order to recover the solvent contained in the articles after the cleaning phase

3.2.8

drying condenser

device for cooling the air flow and condensing solvent vapour and water vapour

3.2.9

lint filter

device for removing lint and particles mechanically from the air during the drying phase

3.2.10

distilling equipment

all parts for regenerating solvent by vaporization and condensation, i.e. to separate dirt, chemicals (e.g. soap) and water

3.2.11

still

device of the distilling equipment for heating the dirty solvent and evaporating solvent and water, leaving in the still the dirt and chemicals (e.g. soap)

3.2.12**still condenser**

device of the distilling equipment which condenses and cools solvent vapour and water vapour

3.2.13**water separator**

device of the dry-cleaning machine and/or the distilling equipment which separates by gravity the solvent/water mixture coming from drying condensers

3.2.14**inspection device**

any device used for extraordinary maintenance or inspection of the dry-cleaning machine

3.2.15**safety spillage tray**

container placed below the dry-cleaning machine used to collect the solvent in case of spillage

3.2.16**refrigeration system**

equipment that can be part of the drying system, used to cool down and heat the air flow by means of a refrigerant in order to recover the solvent

NOTE It can also be used for solvent cooling or condensing solvent vapour and water vapour from the still.

3.3 Operating phases**3.3.1****working cycle**

procedure consisting of a cleaning, a drying and a reduction or a deodorization phase by processing of the load from the start until unloading

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3.3.2**cleaning phase**

procedure for removing dirt from the articles to be treated by means of solvent baths and mechanical action, including filtering of liquid solvent and final extraction of the solvent from the articles

3.3.3**drying phase**

procedure for removing and recovering the solvent contained in the articles after the cleaning phase

3.3.4**deodorization**

removal of air contaminated with solvent vapour from the dry-cleaning machine, after the drying phase but before unloading to eliminate solvent odour by an intake of fresh air into the drum

3.3.5**reduction**

reduction of solvent concentration in the articles and in the air within the dry-cleaning machine after the drying phase, exclusively within the closed circuit, and without any contact between the air in the drum and the air outside of the dry-cleaning machine

3.4 Miscellaneous**3.4.1****g-factor**

G

dimensionless quotient of the centrifugal acceleration at the outer cage diameter and the gravitational acceleration

NOTE It is obtained by the formula:

$$G = 5,6 \cdot \left[\frac{n}{1\,000} \right]^2 \cdot d$$

where

- n is the rotational frequency, in reciprocal minutes;
 d is the cage diameter, in centimetres.

3.4.2

solvent total charge

maximum permissible content of the tanks and filling capacity of filters as shown in the dry-cleaning machine manual

3.4.3

contact water

water recovered from the dry-cleaning machine process and that contains traces of solvent

3.4.4

maximum dry load

volume of load marked on the loading door, or the weight of the load indicated on the dry-cleaning machine plate, whichever is the lesser

3.4.5

static weight

sum of the weight of the dry-cleaning machine, the solvent total charge and the maximum dry load of the dry-cleaning machine, expressed in newtons

3.4.6

dynamic force

force generated by the unbalanced load

NOTE 1 It is calculated as follows:

$$F = k \cdot m \cdot r \cdot \omega^2$$

where

- F is the force, in N;
 k is the dimensionless factor;
 m is the maximum dry load, in kg;
 r is the cage radius, in m;
 ω is the angular velocity of the cage, in rad/s.

NOTE 2 The k -factor may range from 0,1 to 0,6 because it may depend on several factors, such as: machine structure (hard-mounted machines will have a high k -factor, whereas soft-mounted or machines with a balancing system will have a low k -factor); density of solvent (the lower the density, the lower the k -factor); motor control (with a frequency converter, the k -factor can be lower than without one).

3.4.7

total weight of the dry-cleaning machine

sum of the static weight and dynamic force

3.4.8

total specific weight of the dry-cleaning machine

value obtained when the total weight is divided by the supporting surface (length \times width of the dry-cleaning machine base)