INTERNATIONAL STANDARD

ISO 12499

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Industrial fans — Mechanical safety of fans — Guarding

Ventilateurs industriels — Sécurité mécanique des ventilateurs — Protecteurs

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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 12499 was prepared by Technical Committee ISO/TC 117 *Industrial fans.*

Annex A of this International Standard is for information only.

Introduction

This International Standard is intended to provide designers, users and installers with information on the safety aspects of fixed guards for use with industrial fans.

Since fans, by the nature of the function they perform, contain rotating parts, they present a mechanical hazard which has to be minimized or avoided. As a fan does not usually have to be accessible during "normal operation", a fixed guard can be applied. This can be removed during "ancillary operations" as necessary for servicing or maintenance.

As the scope of this International Standard covers a particular form of guarding as well as its design and use for a specific range of products, it is a type C standard, as defined by the European Committee for Standardization.

It complies with ISO/TR 12100-1, ISO/TR 12100-2 and EN 414, as well as ISO 13852.

Industrial fans — Mechanical safety of fans — Guarding

1 Scope

This International Standard specifies requirements for the mechanical guarding of industrial fans.

The circumstances under which safety measures shall be taken are described and information on how hazards can be reduced or eliminated is given, along with guidance on safety practices and information for use.

2 Normative references

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

ISO 3864:1984[1], *Safety colours and safety signs.*

ISO 13349: —[2], *Industrial fans — Vocabulary and definitions of categories.*

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

ISO 14120: —[2], *Safety of machinery — General requirements for the design and construction of guards (fixed, movable).*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 13349 and the following definitions apply.

3.1
industrial fan
any fan used for industrial purposes, including the ventilation of buildings and mines but excluding ceiling, pedestal and similar circulation type fans such as those commonly used for non- industrial purposes

3.2
normal operation
operation when the fan impeller is rotating and the fan is fulfilling its designed function of moving air

3.3
ancillary operation
operation when the fan impeller is stationary and all power to the fan has been disconnected to allow such activities as maintenance, cleaning, adjustment or troubleshooting to take place

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[1] To be revised, in parts.

[2] To be published.

3.4
windmilling
rotation of a fan impeller induced by flow across the impeller

3.5
hazard
source of possible injury or damage to health

3.6
hazardous situation
any situation in which a person is exposed to a hazard or to hazards

3.7
personal injury
hurt caused to or sustained by a person as a result of mechanical hazard

3.8
risk
combination of the probability and the degree of the possible injury or damage to health in a hazardous situation

3.9
danger zone
danger point
any zone or point at or near the fan where a person is exposed to risk of injury or damage to health

3.10
guard
guarding
mechanical means whereby mechanical hazards associated with industrial fans are minimized or avoided

3.10.1
fixed guard
guard kept in place by means of fasteners, making removal impossible without using tools

3.10.2
fixed distance guard
fixed guard which does not completely enclose a danger zone, but which prevents or reduces access by virtue of its physical dimensions and its distance from the hazard

3.11
safeguarding
safety measures consisting of the use of specific technical means called safeguards (guards, safety devices) to protect persons from hazards which cannot reasonably be removed or sufficiently limited by design

3.12
residual risk
risk remaining after specified safety measures have been taken during design or by the application of safeguarding

3.13
safe working practice
system of working which reduces or eliminates the risk of injury

3.14
information for use
safety measures consisting of communication links, such as text, words, signs, signals, symbols or diagrams, used separately or in combination, to convey information to the user

NOTE Information for use is directed to professional and/or nonprofessional users.

3.15
captive key interlock with timer
combination of a switch, with timer, and a lock secured to a fixed part of the machine with the operating key held captive in the access door

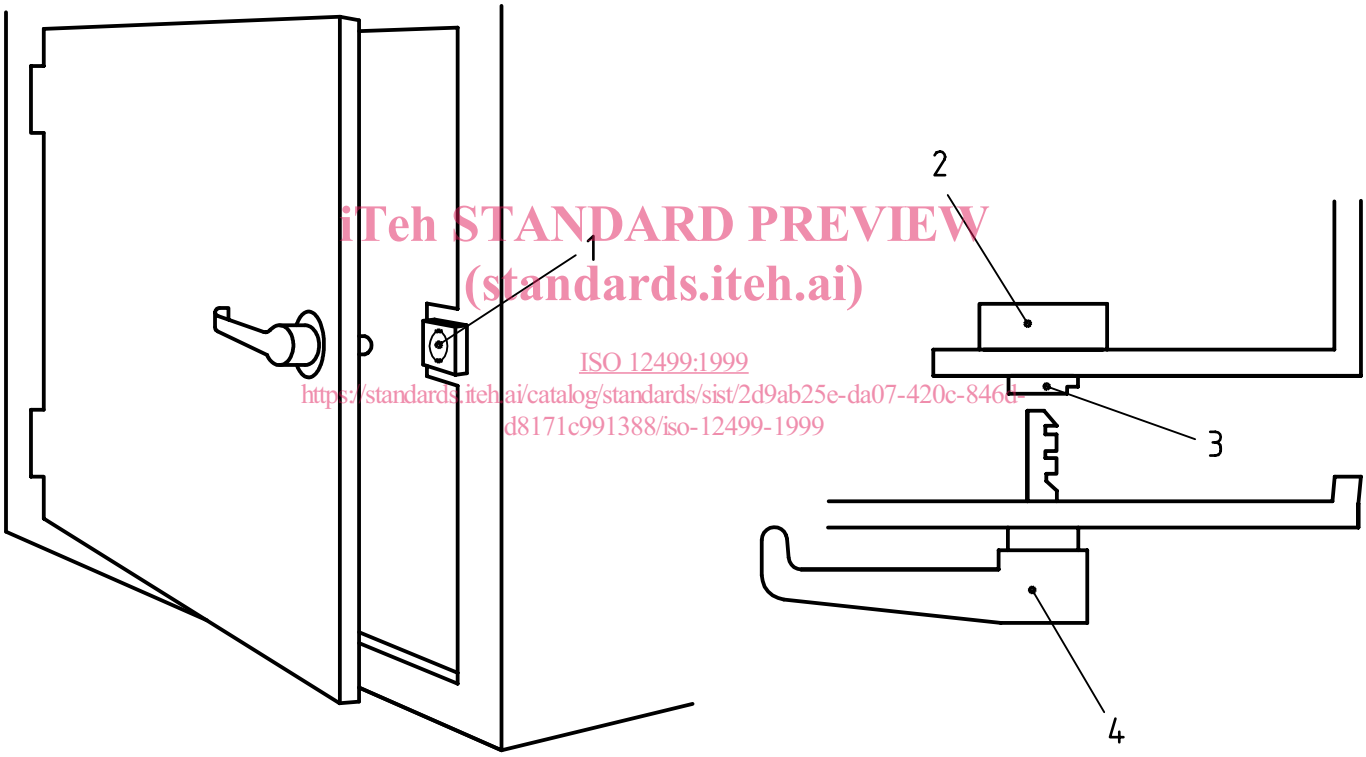
NOTE The sequence of operation is as follows:

— turn handle to switch off,

— after time delay, further turn to unlock access door, and

— open door (key disengages from lock).

A typical example is illustrated in figure 1.



Key

① Lock with switch

② Switch

③ Lock

④ Handle containing key

NOTE The captive key interlock ensures that the circuit-breaking element will be opened before the guard can be opened. It can be used when the guard can be removed completely. It is less suitable for sliding guards than for hinged and completely removable ones; it can be combined with a time-delay unit.

Figure 1 — Principle of captive key interlock

4 Hazards from fans

A person may be injured by a fan as a result of:

a) being trapped between a moving and stationary part, e.g. a fan impeller and casing or other fixed part of a fan;

b) being trapped between two moving parts, e.g. a belt and pulley;

c) being drawn into the fan inlet by air movement, resulting in contact with a rotating shaft or impeller;

d) coming into contact with a moving part, such as an impeller;

e) object being drawn into the fan inlet and ejected at high velocity at fan discharge or inlet;

f) structural failure of fan components;

g) contact with surfaces of the fan at extreme temperatures (i.e. less than −20 °C or greater than + 50 °C);

h) noise emission caused by safeguards;

i) even when a fan is switched off, the rotating parts can still be caused to windmill by air driven through the fan, either naturally or by fan(s) in other parts of the duct system connected to the fan; this could cause injury as the result of contact with a moving part, such as an impeller;

j) unauthorized opening of access doors provided in the fan or connecting ductwork, if done whilst the fan is operating, can cause injury as the result of being drawn into the fan inlet by air movement, resulting in contact with a rotating shaft or impeller, or contact with a moving part, such as an impeller.

NOTE Figure 2 illustrates typical mechanical hazards referred to in a) to d).

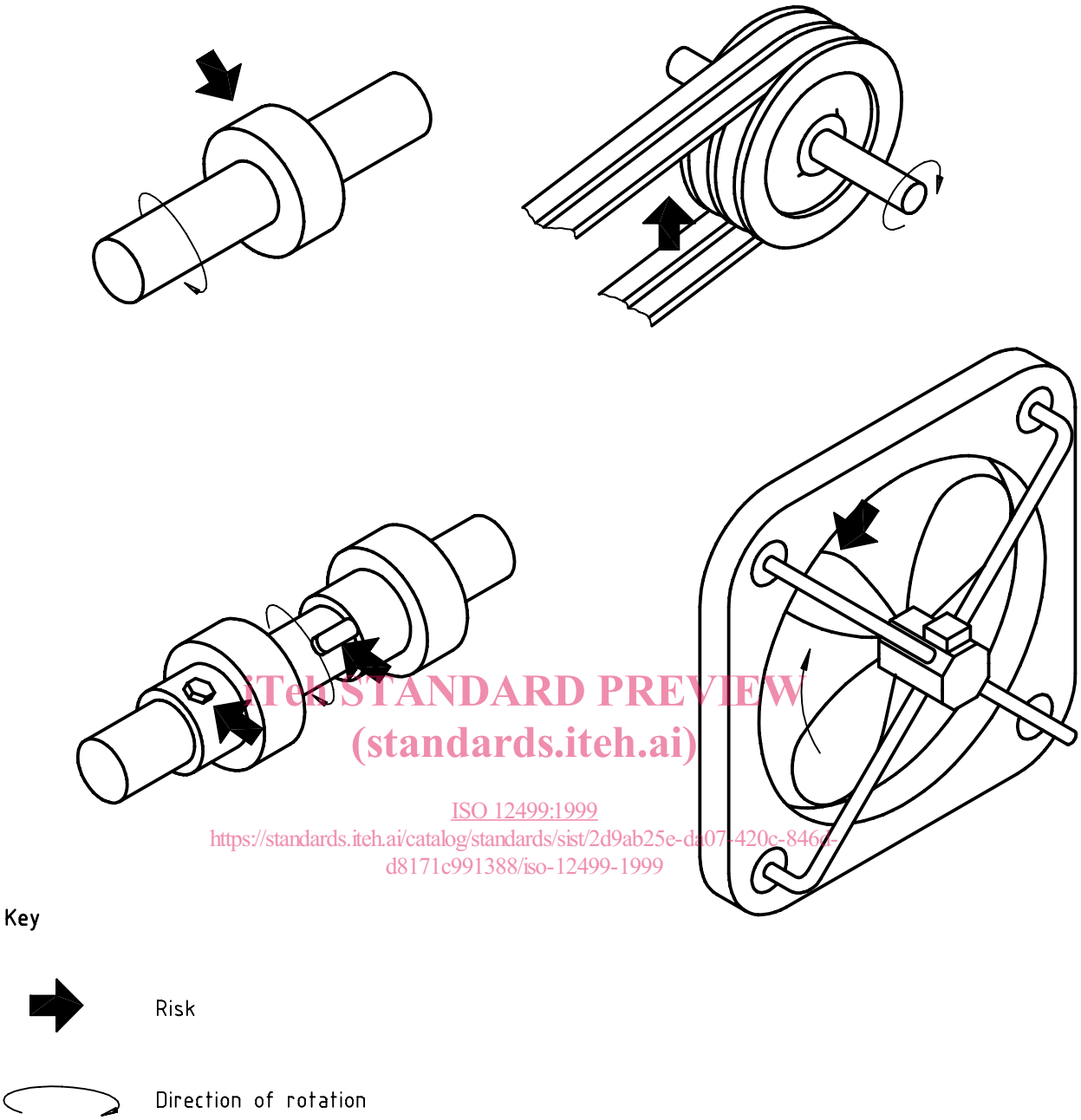


Figure 2 — Typical mechanical hazards from fans

5 Risk assessment

A qualitative assessment of the risk of injury from fans indicates that if no safeguarding measures are undertaken, this risk can be considerable and unacceptable.

Depending upon the power of the fan and the hazard involved, injury can be severe or even fatal.

Hazards in clause 4 a) to f) are judged to be those having the greatest potential for injury.

The conclusion is that safeguarding measures shall be undertaken to minimize the risk.

Where there is a residual risk, "safe working practices" shall be followed and the safety aspects of "information for use" shall receive particular attention.