INTERNATIONAL STANDARD

ISO 11161

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Safety of machinery — Integrated manufacturing systems — Basic requirements

Sécurité des machines — Systèmes de fabrication intégrés — Prescriptions fondamentales

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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 11161 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 11161:1994), which has been technically revised.

Introduction

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

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

b) Type-B standards (generic safety standards) dealing with one safety aspect or one type of safeguard 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-hand controls, interlocking devices, pressure sensitive devices, guards).

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

This International Standard is a type-B1 standard as stated in ISO 12100-1.

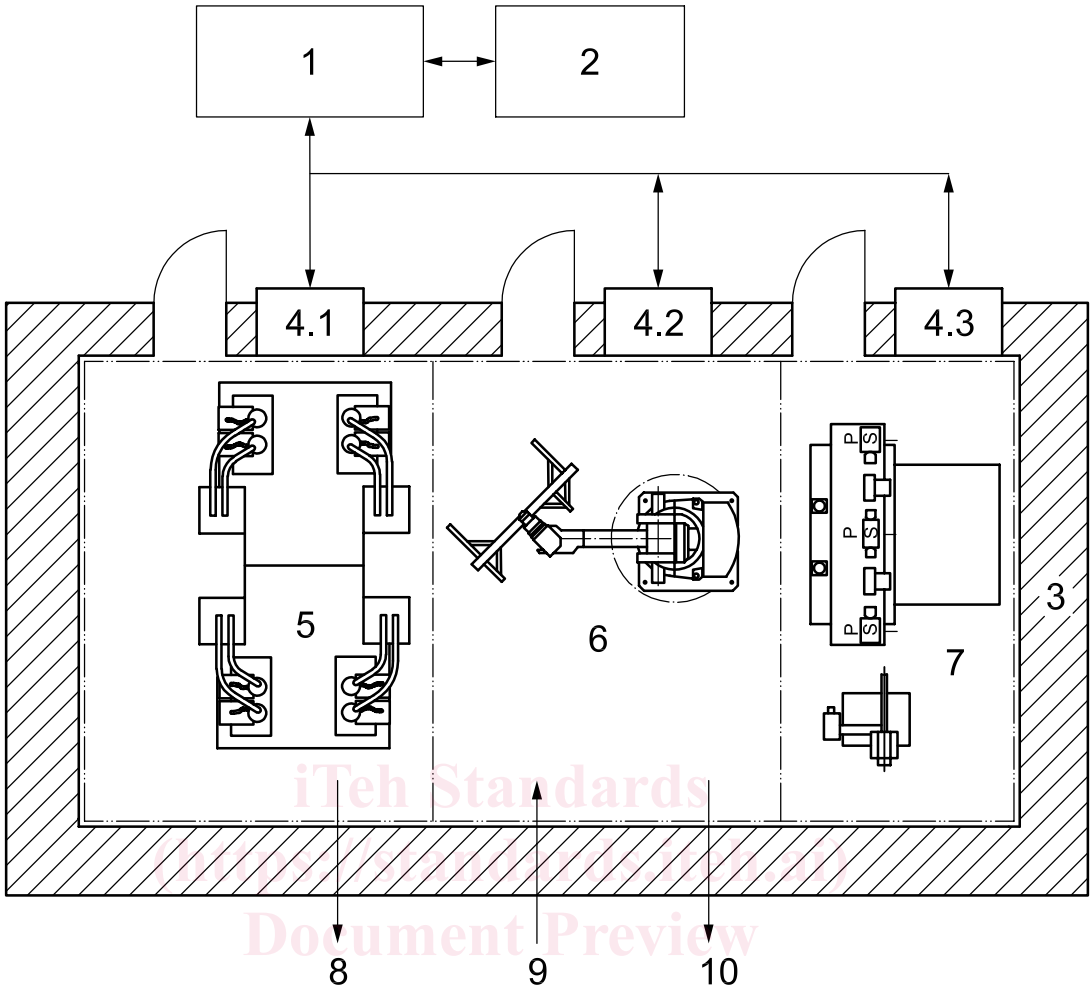
An integrated manufacturing system (IMS, see 3.1) can be very different in terms of size and complexity, and can incorporate different technologies that require diverse expertise and knowledge.

An integrated manufacturing system should be considered to be a whole new and different machine rather than simply its parts combined. The integrator (see 3.10) needs the cooperation of entities who individually know only a part of the whole. Where there are requirements for frequent manual interventions to parts of the IMS, e.g. inspections, maintenance, set-up, it can be impractical or unnecessary to stop the whole IMS. This International Standard gives requirements to provide for the safety of individuals who perform these tasks. Safeguarding for these tasks relates to the concept and use of “task zones”.

The aim of this International Standard is to describe how to apply the requirements of ISO 12100-1:2003, ISO 12100-2:2003 and ISO 14121 in this specific context.

A general configuration of an integrated manufacturing system is shown in Figure 1.

Some examples of integrated manufacturing systems are included in Annex A.



Key

1 control
2 operator pendant
3 safeguarded space
4 local controls
5 hazard zone A
6 hazard zone B
7 hazard zone C
8 scrap and expendables flow
9 raw material flow
10 finished goods

Figure 1 — Configuration of an IMS

Safety of machinery — Integrated manufacturing systems — Basic requirements

1 Scope

This International Standard specifies the safety requirements for integrated manufacturing systems (IMS) that incorporate two or more interconnected machines for specific applications, such as component manufacturing or assembly. It gives requirements and recommendations for the safe design, safeguarding and information for the use of such IMSs (see Figure 1 for the basic configuration of an IMS).

NOTE 1 In the context of this International Standard, the term *system* refers to an integrated manufacturing system.

NOTE 2 In the context of this International Standard, the term *machine* refers to the component machines and associated equipment of the integrated manufacturing system.

This International Standard is not intended to cover safety aspects of individual machines and equipment that may be covered by standards specific to those machines and equipment. Therefore it deals only with those safety aspects that are important for the safety-relevant interconnection of the machines and components. Where machines and equipment of an integrated manufacturing system are operated separately or individually, and while the protective effects of the safeguards provided for production mode are muted or suspended, the relevant safety standards for these machines and equipment apply.

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.

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

ISO 13849-2:2003, *Safety of machinery — Safety-related parts of control systems — Part 2: Validation*

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

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

ISO 14121:1999, *Safety of machinery — Principles of risk assessment*

ISO 14122-1:2001, *Safety of machinery — Permanent means of access to machinery — Part 1: Choice of a 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: Stairways, stepladders and guard-rails*

ISO 14122-4:2004, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders*

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

IEC 62061:2005, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

3 Terms and definitions

For the purposes of this document, the following definitions apply:

3.1
integrated manufacturing system
IMS
group of machines working together in a coordinated manner, linked by a material-handling system, interconnected by controls (i.e. IMS controls), for the purpose of manufacturing, treatment, movement or packaging of discrete parts or assemblies

NOTE See also Annex A.

3.2
detection zone
zone within which a specified test piece will be detected by the electro-sensitive protective equipment (ESPE)

[IEC/TS 62046:2004, 3.1.3]

3.3
emergency stop
function which is intended:

— to avert arising or to reduce existing hazards to persons, damage to machinery or to work in progress;

— to be initiated by a single human action

NOTE ISO 13850 gives detailed provisions.

[ISO 12100-1:2003, 3.37]

3.4
enabling device
additional manually operated device used in conjunction with a start control and which, when continuously actuated, allows a machine to function

NOTE IEC 60204-1:2005, 9.2.5.8 gives provisions on enabling devices.

[ISO 12100-1:2003, 3.26.2]

3.5
guard
physical barrier, designed as part of the machine, to provide protection

NOTE 1 A guard may act:

— alone; it is then only effective when it is “closed” for a movable guard or “securely held in place” for a fixed guard;

— in conjunction with an interlocking device with or without guard locking; in this case, protection is ensured whatever the position of the guard.

NOTE 2 Depending on its construction, a guard may be called e.g. casing, shield, cover, screen, door, enclosing guard.

NOTE 3 See ISO 12100-2:2003, 5.3.2, and ISO 14120 for types of guards and their requirements.

[ISO 12100-1:2003, 3.25]

3.6
harm
physical injury or damage to health

[ISO 12100-1:2003, 3.5]

3.7
hazard
potential source of harm

NOTE 1 The term hazard can be qualified in order to define its origin (e.g. mechanical hazard, electrical hazard) or the nature of the potential harm (e.g., electric shock hazard, cutting hazard, toxic hazard, fire hazard).

NOTE 2 The hazard envisaged in this definition:

— either is permanently present during the intended use of the machine (e.g. motion of hazardous moving elements, electric arc during a welding phase, bad posture; noise emissions; high temperature);

— or may appear unexpectedly (e.g. explosion, crushing hazard as a consequence of an unintended/unexpected start-up, ejection as a consequence of a breakage, fall as a consequence of acceleration/deceleration).

[ISO 12100-1: 2003, 3.6]

3.8
hazard zone
danger zone
any space within and/or around machinery in which a person can be exposed to a hazard

[ISO 12100-1:2003, 3.10]

3.9
hazardous situation
circumstance in which a person is exposed to at least one hazard

NOTE The exposure can immediately or over a period of time result in harm.

[ISO 12100-1:2003, 3.9]

3.10
integrator
entity who designs, provides, manufactures or assembles an integrated manufacturing system and is in charge of the safety strategy, including the protective measures, control interfaces and interconnections of the control system

NOTE The integrator may be a manufacturer, assembler, engineering company or the user.

3.11
interlocking device
interlock
mechanical, electrical or other type of device, the purpose of which is to prevent the operation of hazardous machine functions under specified conditions (generally as long as a guard is not closed)

[ISO 12100-1: 2003, 3.26.1]

3.12
local control
state in which the control of a task zone can only be performed at that task zone

3.13
muting
temporary automatic suspension of a safety function(s) by safety-related parts of control systems

[ISO 13849-1:2006, 3.1.8]

3.14
operator
person or persons given the task of installing, using, adjusting, maintaining, cleaning, repairing or transporting machinery

3.15
protective measure
measure intended to achieve risk reduction, implemented

— by the designer (inherently safe design, safeguarding and complementary protective measures, information for use) and

— by the user (organization: safe working procedures, supervision, permit-to-work systems; provision and use of additional safeguards; use of personal protective equipment; training)

[ISO 12100-1:2003, 3.18]

3.16
protective device
safeguard other than a guard

[ISO 12100-1:2003, 3.26]

3.17
risk
combination of the probability of occurrence of harm and the severity of that harm

[ISO 12100-1:2003, 3.11]