
**Safety of machinery — Emergency
stop — Principles for design**

Sécurité des machines — Arrêt d'urgence — Principes de conception

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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 13850 was prepared by Technical Committee ISO/TC 199, *Safety of machinery*, and Technical Committee IEC/TC 44, *Safety of machinery — Electrotechnical aspects*.

This second edition cancels and replaces the first edition (ISO 13850:1996), which has been technically revised. Notably, it incorporates the following significant changes:

- a) resetting of the emergency stop command is required to be manual (see 4.1.6);
- b) emergency stop devices are required to use mechanical latching (see 4.4.3).

Introduction

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

- a) Type-A standards (basis standards) give basic concepts, principles for design, and general aspects that can be applied to machinery.
- b) Type-B standards (generic safety standards) deal with one or more safety aspect(s) or one or more type(s) 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-hands controls, interlocking devices, pressure sensitive devices, guards).
- c) Type-C standards (machinery safety standards) deal with detailed safety requirements for a particular machine or group of machines.

This International Standard is a type-B2 standard as stated in ISO 12100-1.

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

Safety of machinery — Emergency stop — Principles for design

1 Scope

This International Standard specifies functional requirements and design principles for the emergency stop function on machinery, independent of the type of energy used to control the function.

It is applicable to all machinery except for:

- machines in which the provision of emergency stop would not lessen the risk;
- hand-held portable machines and hand-guided machines.

It does not deal with functions such as reversal or limitation of motion, deflection, shielding, braking or disconnecting, which can be part of the emergency stop function.

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*

IEC 60947-5-5:2005, *Low-voltage switchgear and controlgear — Part 5-5: Control circuit devices and switching elements — Electrical emergency stop device with mechanical latching function*

IEC 60417-DB:2002, *Graphical symbols for use on equipment* (on-line database)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

emergency stop

emergency stop function

function that is intended to

- avert arising, or reduce existing, hazards to persons, damage to machinery or to work in progress,
- be initiated by a single human action

NOTE 1 Hazards, for the purposes of this International Standard, are those which can arise from

- functional irregularities (e.g. machinery malfunction, unacceptable properties of the material processed, human error),
- normal operation.

NOTE 2 Adapted from ISO 12100-1:2003, definition 3.37.

**3.2
emergency stop device**

manually actuated control device used to initiate an emergency stop function

[IEC 60947-5-5:2005, definition 3.2]

**3.3
machine actuator**

power mechanism used to effect motion of the machine

[IEC 60204-1:2005, definition 3.36]

**3.4
safety function**

function of a machine whose failure can result in an immediate increase of risk(s)

[ISO 12100-1:2003, definition 3.28]

4 Safety requirements

4.1 General requirements

4.1.1 The emergency stop function shall be available and operational at all times and override all other functions and operations in all operating modes of the machine without impairing any facilities designed to release trapped persons. It shall not be possible for any start command (intended, unintended or unexpected) to be effective on those operations stopped by the initiation of the emergency stop function until the emergency stop function is manually reset.

When emergency stop devices can be disconnected (e.g. portable teaching pendants) or when machinery can be partially isolated, care should be taken to avoid confusion between active and inactive control devices.

4.1.2 The emergency stop function shall not be applied as a substitute for safeguarding measures and other safety functions but should be designed for use as a complementary protective measure. The emergency stop function shall not impair the effectiveness of protective devices or of devices with other safety functions.

NOTE For this purpose, it can be necessary to ensure the continuing operation of auxiliary equipment such as magnetic chucks or braking devices.

4.1.3 The emergency stop function shall be so designed that, after actuation of the emergency stop actuator, hazardous movements and operations of the machine are stopped in an appropriate manner, without creating additional hazards and without any further intervention by any person, according to the risk assessment.

An “appropriate manner” can include

- choice of an optimal deceleration rate,
- selection of the stop category (see 4.1.4), and
- employment of a predetermined shutdown sequence.

The emergency stop function shall be so designed that a decision to use the emergency stop device does not require the machine operator to consider the resultant effects.