ICS 13.110
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National Standard of the People's Republic of China

GB 16754—1997
eqv ISO/IEC 13850:1995

Safety of machinery—Emergency stop—Principles for design

Issued on 1997-03-06 Enforced on 1997-09-01

Issued by China State Bureau of Technical Supervision

Safety of machinery—Emergency stop—Principles for design

GB 16754—1997

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Printed by the Printing House of Standards Press of China

NUBN: 155066·7 – 14009

Domestic Price: 30.00

Foreword

This standard is equivalently transformed from ISO/IEC 13850:1995 *Safety of machinery—Emergency stop—Principles for design*, but differs from ISO/IEC 13850:1995 by the following:

1. The introductory wording of "Nomative reference" clause adopts the presentation of GB/T 1.1—1993. In the list of nomative documents given in the clause, two technical reports of ISO and two standards of IEC as nomative references of ISO/IEC 13850:1995 are replaced by corresponding national standards and all references in the technical nomative elements of this text are relevantly changed.

2. The note in 3.2 of ISO/IEC 13850(A standard dealing with electrical emergency stop device is being prepared by IEC/SC 17B) is removed.

Annex A is informative.

This standard is to be brought into effect from September 1, 1997.

This standard was proposed by the National Technical Committee for Standardization of Machinery Safety.

This standard is under charge of the National Technical Committee for Standardization of Machinery Safety.

This standard was mainly prepared by the following units: Machinery Standardization Institute, The Ministry of Machinery Industry of China; Beijing Construction Machinery Comprehensive Research Institute, the Ministry of Construction of China.

This standard was mainly drafted by Ma Xianzhi, Li Qin, Zhang Meijia and Guo Ding.

Foreword of ISO/IEC

1) The IEC (International Electrotechnical Commission) is a worldwide organization for Standardization comprising all national electrotechnical committees (IEC National Committees). The ISO (International Organization for Standardization) is a worldwide federation of nation standards bodies (ISO Member Bodies). The specific object of the IEC is to promote international cooperation on all questions concerning standardization in the electrical and electronic fields. In addition to other activities, the ISO and the IEC publish international standards. The preparation of international standards is entrusted to technical committees; any ISO Member Body or IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental, and non-governmental organizations liaising with the ISO or IEC also participate in this preparation. The ISO and the IEC collaborate closely in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the ISO and IEC on technical matters, prepared by technical committees on which all the ISO Member Bodies and the IEC National Committees having a special interest there in are represented, express, as nearly as possible, an international consensus of opinion on the subjects dealt with.

3) They have the form of recommendation for international use published in the form of standards, technical reports, or guidelines and they are accepted by the ISO Member Bodies and the IEC National Committees in that state.

4) In order to promote international unification, ISO Member Bodies and IEC National Committees undertake to apply ISO/IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the ISO/IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

International Standard ISO/IEC 13850 has been prepared by IEC Technical Committees 44: Safety of machiney—Electrotechical aspects and ISO Technical Committee 199: Safety of machinery. This standard is based on the document EN 418: 1992 which was prepared by CEN Technical Committees 114 and CENELEC Technical Committee 44X. CEN/TC 114-CLC/TC 44X/JWG 9 has been entrusted by CEN/TC 114 with the task of producing standards on emergency stop, prevention of unexpected start-up, isolation, and energy dissipation.

This standard has the status of a horizontal standard and may be used, e.g. as a reference standards by technical committees in ISO and IEC product family and/or dedicated product standards for machines. The requirements of this standard can also be applied by suppliers of machines for which no product family or dedicated product standard exists. Where a product family or a dedicated product standard exists, its requirements may take precedence.

In the United States, the use of non-engaging emergency stop device(s) with a separate reset device is accepted practice.

Annex A is informative.

The text is of this International Standard is based on the following documents:

DIS	Report on Voting
IEC 44(CO)XX	IEC 44(CO)XXX
ISO/TC 199 NYY	ISO/TC 199 NYYY

Full information on the approval of this standard can be found on the report on voting indicated in the above table.

National Standard of the People's Republic of China

Safety of machinery—Emergency stop—Principles for design

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1 Scope

This standard specifies functional requirements and design principles for emergency stop independent of the type of energy used to control the function.

This standard 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-handguided machines.

This standard dose not deal with functions such as reversal or limitation of motion, deflection. shielding, braking, or disconnecting, which may be part of emergency stop function.

2 Normative references

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

GB/T 15706.1—1995 Safety of machinery—Basic concepts, general principles for design—Part 1: Basic terminology, methodology

GB/T 15706.2—1995 Safety of machinery—Basic concepts, general principles for design—Part 2: Technical principles and specification

GB/T 5226.1—1996 Electrical equipment of in dustrial machines—Part 1: General requirement

GB 14048.5—1993 Low-voltage switchgear contrlgear—Control circuit devices and switching elements section one—Electromechanical control circuit devices

3 Definitions

For the purposes of this standard, the following definitions apply.

Approved by China State Bureau of Technical Supervision on 1997-03-06

Enforced on 1997-09-01

3.1 emergency stop (function)

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.

Hazards, for the purposed of this standard, are those which may arise from:

—functional irregularities (e.g. malfunctioning of the machinery, unacceptable properties of the processed material, human errors);

—normal operation.

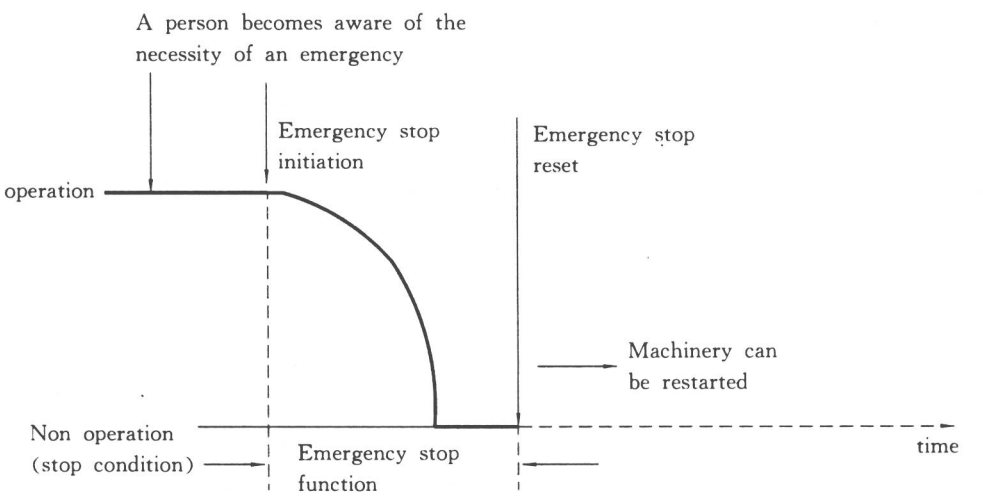


Figure 1 Graphical representation of emergency stop function

3.2 emergency stop device

A manually actuated control device used to initiate an emergency stop function.

3.3 machine actuator

A power mechanism used to effect motion of a machine.

4 Safety requirements

4.1 General requirements

4.1.1 The emergency stop function shall override all other functions 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 until the emergency stop function is reset.

NOTE: 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 for use as a substitute for safeguarding measures and other safety-critical functions but should be designed for use as a backup measure (e.g. in case of failure).

4.1.3 The emergency stop function shall not impair the effectiveness of protective devices or of devices with other safety-critical functions.

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

4.1.4 The emergency stop function shall be designed so that, after actuation of the emergency stop device, the operation of the machine is stopped in an appropriate manner, without creating additional hazards, according to the risk assessment.

NOTE: The statement "stopped in an appropriate manner" may include:
—choice of optimal deceleration rate;
—selection of the stop category (see 4.1.5);
—employment of predetermined shut down sequence.

4.1.5 The emergency stop shall function as either a category 0 or a category 1 stop (see 9.2.2 of GB/T 5226.1—1996).

NOTE: Category 0 and category 1 stops include the removal of the power source to the machine actuator(s). Examples of the removal of power include:
—switching off the electrical power to the electric motor;
—declutching the movable elements from the source of mechanical energy;
—blocking the fluid power supply to ram/slide.

The choice of the category of the emergency stop shall be determined by the risk assessment of

the machine (see also 9.2.5.4 of GB/T 5226.1—1996).

4.2 Specific requirements for electrical equipment

The specific requirements for electrical equipment of 9.2.2,9.2.5.4, and 10.7 of GB/T 5226.1—1996 apply.

4.3 Operating conditions, environmental influences

The components and elements used to achieve the emergency stop function (see annex A) shall be selected, assembled, interconnected and protected so as to be capable of operating correctly under the expected operating conditions and environmental influences. This process includes consideration of:

—the frequency of operation and the need for periodic testing in the case of infrequent operation and

—vibration, shock. temperature, dust. foreign bodies, moisture, corrosive materials, fluids, etc.

4.4 Requirements for emergency stop devices

4.4.1 The emergency stop device shall be designed for easy actuation by the operator and others who may need to operate it. Types of actuators that may be used include:

—mushroom-type push buttons;

—wires, ropes, bars;

—handles;

—in specific applications, foot-pedals without protective cover.

4.4.2 Emergency stop devices shall be located at each operator control station and at other locations where emergency stop is required. They shall be positioned for easy access and for non-hazardous operation by the operator and others who may need to operate them.

NOTE: Measures against inadvertent operation should not impair accessibility.

4.4.3 The emergency stop device shall apply the principle of positive mechanical action (see 3.5 of GB/T 15706.2—1995).

NOTE: An example of the application of this principle is an emergency stop device employing electrical contacts having positive operation. According to GB/T 14048.5—1993 (chapter 3,3.1.2), positive opening operation (of a contact element) is the achievement of contact separation as the direct result of a specified movement of the switch actuator through non-resilient members (e.g. not dependent upon springs).

4.4.4 After the emergency stop command has been generated during actuation of the emergency stop device, the command shall be maintained by engagement (latching-in) of the actuating means. the emergency stop command shall be maintained until the emergency stop device is reset (disengaged). It shall not be possible for the emergency stop device to engage without generating the stop command.

In case of a failure in the emergency stop device (engagement means included), generation of the stop command shall have priority over the engagement means.

4.4.5 Resting (disengaging) of the emergency stop device shall only be possible as the result of a manual action on the emergency stop device itself.

Resting the emergency stop device shall not by itself cause a restart command.

It shall not be possible to restart the machine until all emergency stop devices which have been actuated are reset.

4.4.6 The actuator of the emergency stop device shall be colored red. As far as a background exists behind the actuator and as far as it is practicable, it shall be colored yellow. When using wires or ropes, it may be useful to improve their visibility by using marker flags attached to them.

In certain circumstances, it may be useful to provide labels in addition:

NOTE: For electrical equipment, see also 10.2.1 of GB/T 5226.1—1996.

4.5 Additional requirements for wires and ropes, when used as actuators

4.5.1 Consideration shall be given to:

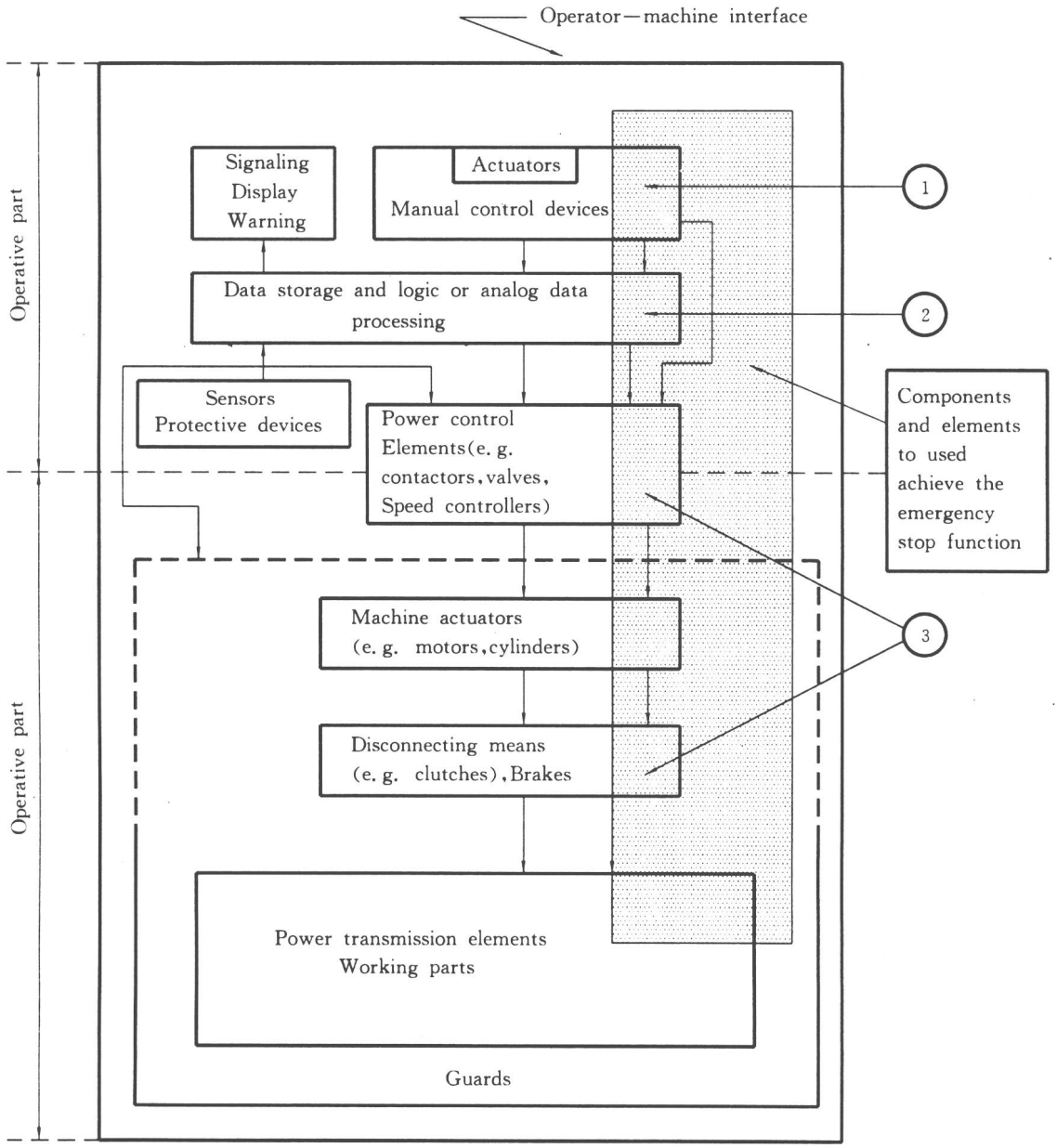
—the amount of deflection necessary for generating the emergency stop command;
—the maximum deflection possible;
—the minimum clearance between the wire or the rope and the nearest object in the vicinity;
—the force to be applied to the wire or rope in order to operate the emergency stop device;
—making wires or ropes visible for the operators (e.g. by use of marker flags).

4.5.2 An emergency stop command shall be generated automatically in the event of breaking or disengagement of a wire or a rope. In exceptional applications (e.g. in open cast mines) this requirement may be difficult to follow. In such cases, alternative safety measures may be required.

4.5.3 The means to reset the emergency stop device should be placed so that the whole length of the wire or rope is visible from the location of the resetting means.

If this is not practicable, the instructions for use should state that, after actuation and before resetting, the machinery should be inspected along the whole length of the wire or rope in order to detect the reason for activation.

Annex A
(informative)
Components and elements used to achieve the emergency stop function



① Emergency stop device(s)

② Part of the control system intended for the emergency stop command processing

③ Power control elements (contactors, valves speed controllers), disconnecting means (clutches, etc.), and brakes used for achieving emergency stop, even if they are also used for the normal operation of the machine.