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**BS 14100:2020**



**BSI Standards Publication**

## **Control of hazardous energy on machinery – Specification**

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### Summary of pages

This document comprises a front cover, and inside front cover, pages i to iv, pages 1 to 45, an inside back cover and a back cover.

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## Foreword

### **Publishing information**

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 29 February 2020. It was prepared by Technical Committee MCE/3, *Safeguarding of machinery*. A list of organizations represented on this committee can be obtained on request to its secretary.

### **Presentational conventions**

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

*Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.*

Requirements in this standard are drafted in accordance with *Rules for the structure and drafting of UK standards*, subclause **G.1.1**, which states, "Requirements should be expressed using wording such as: 'When tested as described in [Annex A](#), the product shall ...". This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

### **Contractual and legal considerations**

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

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## 0 Introduction

This British Standard provides requirements and guidance to users of machinery on how to control hazardous energy on machines for safe working during all types of interaction.

[Table 1](#) identifies five potential types of interaction on a machine, two for normal operation and three for maintenance, based on the risk profile of each interaction.

During normal operation of machines, fixed and interlocked guards are commonly provided to prevent access to dangerous parts. Maintenance tasks (which could include setting, process changeover, cleaning, unblocking as well as planned and unplanned maintenance), might require alternative methods and controls to prevent injury, as the risks could well be different, requiring different risk reduction measures. Organizations need to risk assess how workers interact with a machine to determine which interventions can be carried out while relying on interlocking and which interventions require isolation.

*NOTE* [Table 1](#) is not intended to be hierarchical and there is always be the need to assess the element of risk involved for any given interaction and an adequate level of risk reduction applied.

[Table 1](#) contains references to the clauses which give appropriate requirements and guidance on risk reduction measures for each type of interaction.

It is important to include all forms of hazardous energy in any risk assessment, e.g. electrical, pneumatic, hydraulic, and energy due to inertia or gravity.

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**Table 1** — Hazardous energy control

	Type of interaction	Typical examples	Typical risk reduction measures (See Note 1)	Necessary documents (See Note 2)	References
<b>During normal operation</b>	Producing goods as described in the safe operating procedure (SOP).	Normal production.	Fixed or interlocked guarding.	SOP	<a href="#">Clause 5</a>
	Working through an interlocked guard or protective device.	Clearing a jam, loading and unloading of material.	Safety controls to prevent unexpected start-up.	SOP	<a href="#">Clause 5</a> and <a href="#">Annex A</a>
	Localized intervention or maintenance.	Changing a motor.	Local isolation/lock-out, tag-out (LOTO).	Safe system of work (SSoW).	<a href="#">Clause 6</a>
<b>During maintenance</b>	Long-term maintenance. Whole machine cleaning.	Scheduled or unscheduled maintenance/cleaning.	Whole machine isolation; lock-out, tag-out (LOTO).	Maintenance procedures and SSoW.	<a href="#">Clause 6</a>
	Maintenance requiring machine to be wholly or partially energized.	Fault finding on live electrical equipment/teaching a robot/commissioning (see Note 3).	Partial isolation; hold to run controls; low energy; low voltage; low speed.	SSoW and permit to work (PtW).	<a href="#">Clause 7</a>
<i>NOTE 1 The competence of those carrying out the work needs to be determined, as this can be an important contribution to the risk reduction measures (see <a href="#">8.5</a>).</i>					
<i>NOTE 2 The Management of Health and Safety at Work Regulations 1999 [1] require employers and self-employed persons to assess risks to workers and others who might be affected by their work or business. See also HSE publication INDG163 [2] which gives advice on these regulations.</i>					
<i>NOTE 3 Live fault finding and commissioning can be particularly high risk activities (see <a href="#">Clause 7</a>). All activities could be applied during commissioning.</i>					



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## 1 Scope

This British Standard provides requirements for the control of hazardous energy whilst work is being carried out on machines.

This British Standard includes requirements for machinery in relation to electrical and mechanical hazards (i.e. moving parts, or parts that could move).

*NOTE 1 For requirements for other hazards, see, for example, BS EN ISO 4413 and BS EN ISO 4414, which provide guidance on hydraulic and pneumatic systems.*

*NOTE 2 For guidance on controlling electrical hazards, see The Electricity at Work Regulations 1989 (EWR) [3] and associated guidance HSR 25 "The Electricity at Work Regulations 1989 Guidance on Regulations" [4] and HSG85 "Electricity at work safe working practices" [5].*

This British Standard also provides requirements for fixed equipment, such as motors and pumps fed via plug and socket-outlets.

This British Standard does not apply to:

- a) machines fed at high voltage;  
*NOTE 3 High voltage is defined in BS 7671 as above 1 000 volts A.C. or 1 500 volts D.C.*
- b) material handling vehicles (e.g. forklifts, pallet trucks), rider operated vehicles, construction plant machinery, mobile elevated working platforms or road vehicles;
- c) transportable or portable work machine (including powered hand tools), although the basic principles can often be applied; and
- d) process plant equipment.

*NOTE 4 For general guidance on isolation of process equipment, see HSG253 [6].*

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## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document<sup>1)</sup>. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS EN 62061, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

BS EN ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

BS EN ISO 12100, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

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

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

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

BS EN ISO 13855, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body*

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<sup>1)</sup> Documents that are referred to solely in an informative manner are listed in the Bibliography.

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*upper and lower limbs*

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

BS EN ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

BS EN IEC 62046, *Safety of machinery — Application of protective equipment to detect the presence of persons*

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### 3 Terms and definitions

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

#### 3.1 duty holder

person responsible for compliance with health and safety requirements relating to hazardous energy control within a specific work area

*NOTE This can include isolation.*

#### 3.2 energy dissipation

dissipation (or restraint/containment) of any stored energy which might give rise to danger

*NOTE Examples of stored energy include:*

- a) mechanical parts which could continue to move through inertia;*
- b) mechanical parts liable to move by gravity;*
- c) springs;*
- d) capacitors, inductors or batteries; and*
- e) pressurized fluids.*

#### 3.3 isolation

procedure to securely disconnect and separate a machine from all hazardous energy sources

#### 3.4 isolator

device designed or intended to provide physical separation for a source of energy, capable of being secured in the isolated position

#### 3.5 lock-out, tag-out (LOTO)

isolation procedure involving disconnecting a machine from all energy sources, then secured by locking the equipment in the off position and attaching a tag (sign) to warn against re-energization

*NOTE 1 This term is commonly used by maintenance and production departments.*

*NOTE 2 Tag out alone without lock out is not considered sufficiently safe as a means of securing an isolation.*

#### 3.6 machine

installed machinery or equipment

*NOTE 1 Examples include those used in manufacturing and processing, filling and packing, utilities, laboratories, engineering workshops, warehouses, waste treatment.*

*NOTE 2 The associated tanks, silos, pipes and services can also be included.*