
Safety of woodworking machines — Edge-banding machines fed by chain(s)

*Sécurité des machines à bois — Machines à plaquer sur chant à
alimentation par chaîne(s)*





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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/TC 39, *Machine tools*, Subcommittee SC 4, *Woodworking machines*.

Introduction

This International Standard has been prepared to be a Harmonized Standard to provide one means of conforming to the Essential Safety Requirements of the Machinery Directive of the European Union and associated EFTA regulations.

This document is a type-C standard as defined in ISO 12100:2010.

The machinery concerned and the extent to which hazards, hazardous situations, and events are covered are indicated in the scope of this International Standard.

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

The requirements of this International Standard concern designers, manufacturers, suppliers, and importers of machines described in the Scope.

This International Standard also includes a list of informative items to be provided by the manufacturer to the user.

Common requirements for tooling are given in EN 847-1:2013 and EN 847-2:2013.

Safety of woodworking machines — Edge-banding machines fed by chain(s)

1 Scope

This International Standard deals with all significant hazards, hazardous situations, and events as listed in [Clause 4](#), which are relevant to edge banding machines fed by chains with manual loading and unloading and maximum work-piece height capacity of 100 mm, when they are used as intended and under the conditions foreseen by the manufacturer, including reasonably foreseeable misuse.

The work-piece is fed through the processing units by an integrated feed. Feeding chains also include “feeding belts”.

For the purpose of this International Standard, an edge banding machine fed by chains is hereinafter referred to as “machine”.

The machine is designed to process in one pass, one end (single end machine), or both ends (double end machine) panels of wood materials with similar physical characteristics as wood, as well as gypsum plaster boards.

Edges to be applied by the machine can be made of paper, melamine, plastic or composite materials, aluminium or light alloy, veneer or solid wood.

This International Standard also applies to machines fitted with the following:

- auxiliary devices essential for edge banding machines fed by chains (see [3.1](#));
- sanding belt units;
- fixed or movable workpiece support;
- automatic tool changing;
- automatic panel returner.

This International Standard also includes information to be provided by the manufacturer to the user.

This International Standard does not deal with any hazards relating to the following:

- a) systems for loading and unloading of the work-piece to a single machine other than automatic panel returner;
- b) single machine being used in combination with any other machine (as part of a line);
- c) wireless mobile control sets;
- d) additional equipment for grooving and for cutting by circular saw blade, installed out of the integral enclosure and/or whose tools protrude out of the integral enclosure;
- e) plasma unit, power laser unit, and hot-air-jet unit.

This International Standards applies to machines that are manufactured after the date of issue of this International Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4413, *Hydraulic fluid power — General rules and safety requirements for systems and their components*

ISO 4414:2010, *Pneumatic fluid power — General rules and safety requirements for systems and their components*

ISO 7960:1995, *Airborne noise emitted by machine tools — Operating conditions for woodworking machines*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13732-1:2006, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

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

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

ISO 14118:2000, *Safety of machinery — Prevention of unexpected start-up*

ISO 14119:2013, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

IEC 13856-2, *Safety of machinery — Pressure sensitive protection devices — Part 2: General principles for the design and testing of pressure sensitive edges and pressure sensitive bars*

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

IEC 60439-1, *Low-voltage switchgear and controlgear assemblies — Part 1: Type-tested and partially type-tested assemblies*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 61310-1:2007, *Safety of machinery — Indication, marking and actuation — Part 1: Requirements for visual, acoustic and tactile signals*

IEC 61496-2, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

EN 50370-1, *Electromagnetic compatibility (EMC) — Product family standard for machine-tools — Part 1: Emission*

EN 50370-2, *Electromagnetic compatibility (EMC) — Product family standard for machine-tools — Part 2: Immunity*

3 Terms and definitions

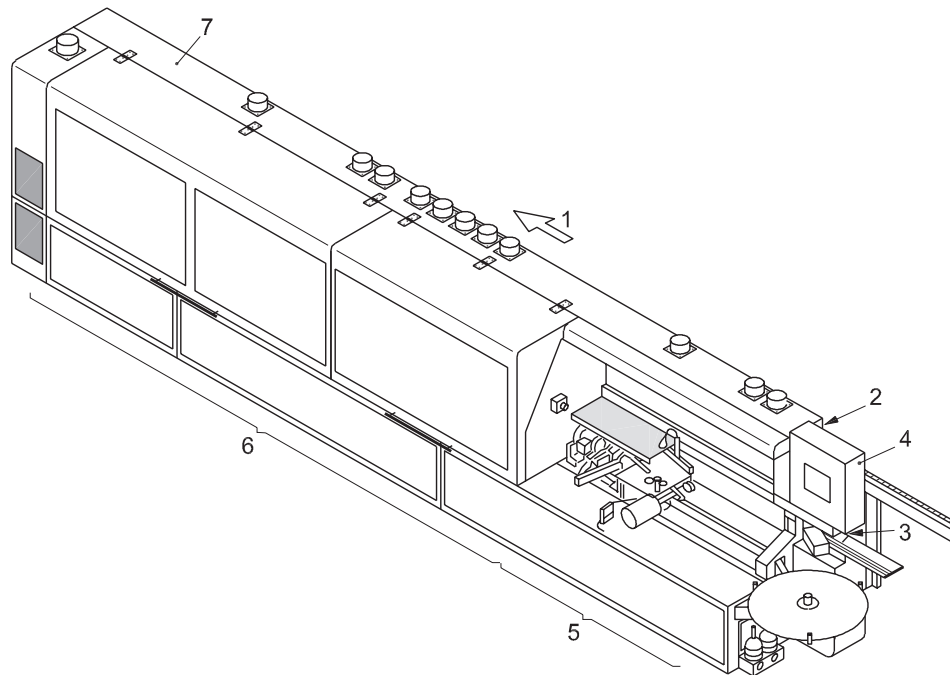
For the purposes of this document, the terms and definitions given in ISO 12100:2010 and the following apply.

3.1

edge banding machine fed by chains

machine designed for bonding in one pass the edge band on one end of the work-piece (single end edge banding machine) or on both ends of the work-piece (double end edge banding machine), consisting of an edge banding zone with various units (e.g. heating, bonding, and pressing for flexible or solid edges) and a zone for additional operations such as snipping, trimming, milling, sanding, polishing, chamfering, etc., where, in addition the edge banding zone, can be preceded by a sizing/profiling zone

Note 1 to entry: The main parts of a single end machine and a double end machine and their terminology are illustrated in [Figure 1](#) and [Figure 2](#), respectively.



Key

- 1 feed direction
- 2 top pressure beam
- 3 chain beam
- 4 controls
- 5 edge banding zone
- 6 additional operation zone
- 7 integral closure

Figure 1 — Example of a single end machine

3.2

material with similar physical characteristics to wood

wood-based material (e.g. chipboard, fibreboard, plywood) also when covered with plastic or light alloy laminates/edges; cork, bone, rigid rubber, or plastic

3.3

integrated feed

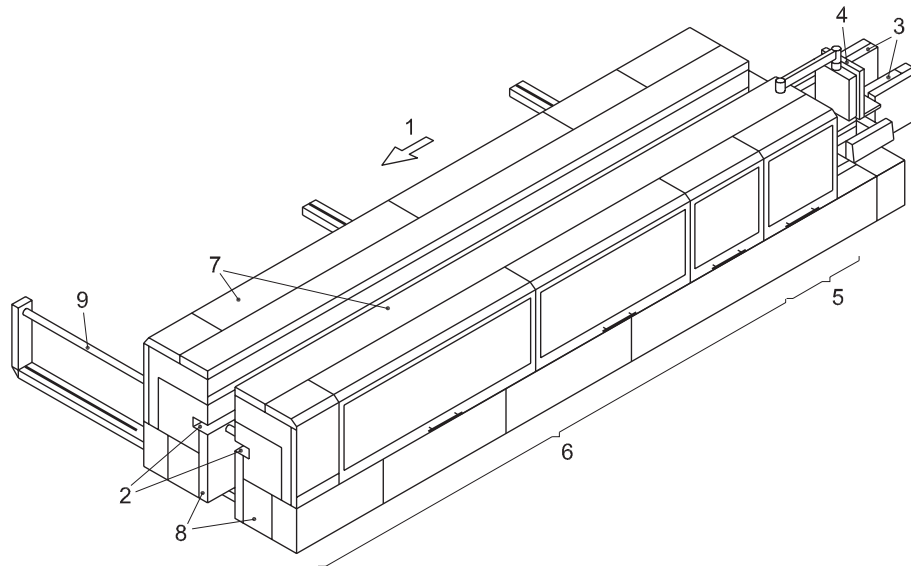
feed mechanism for the work-piece or tool which is integrated with the machine and where the work-piece or machine element with incorporated tool are held and controlled mechanically during the machining operation

**3.4
ejection**

unexpected movement of the work-piece or parts of it or part of the machine from the machine during processing

**3.5
run-up time**

time elapsed from the actuation of the start control device until the spindle reaches the intended speed



Key

- 1 feed direction
- 2 top pressure beam
- 3 chain beam
- 4 controls
- 5 edge banding zone
- 6 additional operation zone
- 7 integral closure
- 8 machine halves
- 9 feed cross drive shaft

Figure 2 — Example of a double end machine

**3.6
run-down time**

time elapsed from the actuation of the stop control device to spindle stand still

**3.7
machine actuator**

power mechanism used to effect the motion of the machine

**3.8
dynamic processing unit**

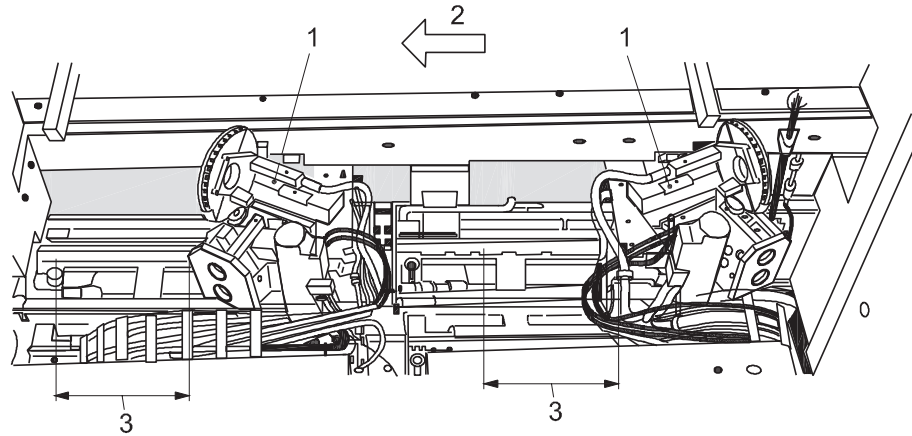
unit which moves with the work-piece during processing and returns to its starting position ready for the following (succeeding) work-piece

Note 1 to entry: An example of dynamic processing unit is shown in [Figure 3](#).

3.9 machine half

part of a machine consisting of a frame, chain beam, top pressure beam, and working units

Note 1 to entry: Each machine half processes one, different, end of the work-piece. One or both machine halves are capable of being moved to accept work-pieces of different dimensions.



Key

- 1 dynamic processing unit (e.g. sniper saw)
- 2 feed direction
- 3 movement zone

Figure 3 — Example of a dynamic processing unit

3.10 integral enclosure (double and single end machines)

guarding designed to fit close to the machine and provide a measure of sound attenuation and where certain setting adjustments may be available outside the enclosure

Note 1 to entry: Each machine half is provided with separate guarding and on the adjustable machine half/halves this guarding moves with it when adjustment is made for work-piece width.

3.11 displaceable machine

machine which is located on the floor, stationary during use and equipped with a device, normally wheels, which allow it to be moved between locations

3.12 automatic panel returner

Powered system that brings the panel from the machine end to the loading position

Note 1 to entry: See [Figure 5](#).

3.13 tele-service

machine diagnosis (including trouble-shooting), software update and tele-control from a remote service site

3.14
safety-related embedded software
SRESW
firmware
system software

software that is part of the system supplied by the control manufacturer and which is not accessible for modification by the user of the machinery

Note 1 to entry: Firmware or system software are examples of embedded software (ISO 13849-1:2006, 3.1.37).

Note 2 to entry: Manufacturer means manufacturer of the system.

Note 3 to entry: For example, the operating system of a speed monitoring device.

3.15
safety-related application software
SRASW

software specific to the application, implemented by the machine manufacturer, and generally containing logic sequences, limits, and expressions that control the appropriate inputs, outputs, calculations, and decisions necessary to meet the SRP/CS requirements

[SOURCE: ISO 13849-1:2006, 3.1.36]

3.16
safety-related part of a control system
SRP/CS

part of a control system that responds to safety-related input signals and generates safety-related output signals

Note 1 to entry: The combined safety-related parts of a control system start at the point where the safety-related input signals are initiated (including e.g. the actuating cam and the roller of the position switch) and end at the output of the power control elements (including, for example, the main contacts of the contactor).

[SOURCE: ISO 13849-1:2006, 3.1.1]

3.17
safety function

function of the machine whose failure can result in an immediate increase of the risk

[SOURCE: ISO 13849-1:2006, 3.1.20]

3.18
information from the supplier

statements, sales literature, leaflets, or other where a manufacturer (supplier) declares either the characteristics of e.g. a material or product or the compliance of the material or product to a relevant standard

3.19
performance level
PL

discrete level used to specify the ability of safety-related parts of control systems to perform a safety function under foreseeable conditions

[SOURCE: ISO 13849-1:2006, 3.1.23]

3.20
operational stop

stop control that does not cut off the energy supply to the actuators, where the stop condition is monitored and maintained

3.21**power-on control device**

control device that enables providing power to machines actuators

EXAMPLE Powering auxiliary circuit.

Note 1 to entry: Power-on is not intended as the main switch.

3.22**MODE 1: automatic mode**

condition for automatic processing, where all safeguards of the machine are in place and functional and some or all machine actuators are activated

3.23**MODE 2: adjustment mode**

condition for adjustment of tools and other processing units, where feed of the work-piece is possible under hold-to-run control only

3.24**MODE 3: fine adjustment mode**

condition for fine adjustment of tools and other processing units, where opening of parts of the peripheral enclosure is permitted for a limited period of time, while the tools, other processing units, and the feed are running

4 List of significant hazards

This Clause contains all significant hazards, hazardous situations, and events (see ISO 12100:2010) identified by risk assessment as significant for the machines, as defined in the scope and which require action to eliminate or reduce the risk. This International Standard deals with these significant hazards by defining safety requirements and/or measures or by reference to relevant standards.

These hazards are listed in [Table 1](#).

Table 1 — List of significant hazards

No	Hazards, hazardous situations, and hazardous events	ISO 12100:2010	Relevant subclause of this International Standard
1	Mechanical hazards related to — machine parts or workpieces:		
	a) shape;	6.2.2.1, 6.2.2.2, 6.3	5.3.2 , 5.3.3 , 5.3.7 , Annex B
	b) relative location;		5.2.2 , 5.2.5 , 5.3.5 , 5.3.6 , 5.3.7 , 5.4.5 , 6.3
	c) mass and velocity (kinetic energy of elements in controlled or uncontrolled motion);		5.2.7 , 5.3.7 , Annex B
	d) mechanical strength.		5.3.2 , 5.3.3
	— accumulation of energy inside the machinery:		
	e) liquids and gases under pressure	6.2.10, 6.3.5.4	5.3.3 , 5.4.7 , Annex B
1.1	Crushing hazard		5.3.6 , 5.3.7
1.2	Shearing hazard		5.3.6 , 5.3.7
1.3	Cutting or severing hazard		5.3.3 , 5.3.4 , 5.3.7
1.4	Entanglement hazard		5.3.3 , 5.3.4 , 5.3.6 , 5.3.7
1.5	Drawing-in or trapping hazard		5.3.7
1.6	Impact hazard		5.3.7
1.8	Friction or abrasion hazard		5.3.4
1.9	High pressure fluid injection or ejection hazard	6.2.10	5.3.4 , 5.4.11
2	Electrical hazards due to:		
2.1	Contact of persons with live parts (direct contact)	6.2.9, 6.3.5.4	5.4.4 , 5.4.14
2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	6.2.9	5.4.4 , 5.4.11
2.4	Electrostatic phenomena	6.2.9	5.4.9
3	Thermal hazards resulting in:		
3.1	Burns, scalds, and other injuries by a possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	6.2.4	5.4.13 , 5.4.14
3.2	Damage to health by hot or cold working environment	6.2.4	5.4.13 , 5.4.14
4	Hazards generated by noise , resulting in:		
4.1	Hearing loss (deafness), other physiological disorders (loss of balance, loss of awareness)	6.2.2.2, 6.3	5.4.2
4.2	Interference with speech communication, acoustic signals.	6.2.2.2, 6.3	5.4.2
7	Hazards generated by materials and substances (and their constituent elements) processed or used by the machinery		
7.1	Hazards from contact with or inhalation of harmful fluids and dusts	6.2.3, 6.2.4	5.4.3 , 5.4.14 , 6.3

Table 1 (continued)

No	Hazards, hazardous situations, and hazardous events	ISO 12100:2010	Relevant subclause of this International Standard
7.2	Fire hazard	6.2.4	5.4.1 , 5.4.3
8	Hazards generated by neglecting ergonomic principles in machinery design related to:		
8.1	Unhealthy postures or excessive effort	6.2.7, 6.2.8, 6.2.11.12, 6.3.5.5, 6.3.5.6	5.2.2 , 5.4.5 , 6.3
8.2	Hand-arm or foot-leg anatomy	6.2.8.3	5.2.2 , 5.4.5 , 6.3
8.4	Local lighting	6.2.8.6	5.4.6 , 6.3
8.6	Human error, human behaviour	6.2.8.1, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	5.4.12 , 6.3
8.7	Design, location, or identification of manual controls	6.2.8.7, 6.2.11.8	5.2.2
8.8	Design or location of visual display units	6.2.8.8, 6.4.2	5.2.2
9	Combination of hazards	6.3.2.1	5.2.6 , 5.2.7
10	Unexpected start up, unexpected overrun/overspeed (or any similar malfunction) from:		
10.1	Failure/disorder of the control system	6.2.11, 6.3.5.4	5.2.1 , 5.2.9
10.2	Restoration of energy supply after an interruption	6.2.11.4	5.2.8 , 5.4.7 , 5.4.10
10.3	External influences on electrical equipment	6.2.11.11	5.4.4 , 5.4.8
10.6	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities, see 8.6)	4.9 6.2.8, 6.2.11.8, 6.2.11.10, 6.3.5.2, 6.4	5.2.1 , 5.4.5 , 6.3
11	Impossibility of stopping the machine in the best possible conditions	6.2.11.1, 6.2.11.3, 6.3.5.2	5.2.2 , 5.2.5 , 5.2.7
13	Failure of the power supply	6.2.11.1, 6.2.11.4	5.2.8
14	Failure of the control circuit	6.2.11, 6.3.5.4	5.2.9
15	Errors of fitting	6.2.7, 6.4.5	5.4.12 , 6.3
16	Break-up during operation	6.2.3	5.3.2
17	Falling or ejected objects or fluids	6.2.3, 6.2.10	5.2.7 , 5.3.5 , 5.4.4 , 6.3 , Annex B
18	Loss of stability/overtipping of machinery	6.3.2.6	5.3.1
19	Slip, trip, and fall hazards in relationship with machinery (because of their mechanical nature)	6.3.5.6	6.3

5 Safety requirements and/or protective measures

5.1 General

The machine shall comply with the safety requirements and/or protective measures of [Clause 5](#).

In addition, the machine should be designed according to the principles of ISO 12100:2010 for hazards relevant but not significant, which are not dealt with by this International Standard (e.g. sharp edges of the machine frame).

See ISO 12100:2010, 6.2 for guidance in connection with risk reduction by design and see ISO 12100:2010, 6.3 for safeguarding measures.

5.2 Controls

5.2.1 Safety and reliability of control systems

For the design and implementation of any safety function, either realized in electric, pneumatic, hydraulic, or mechanic technology, the appropriate requirements of ISO 13849-1:2006 shall apply.

Machine safety functions are implemented and ensured through Safety-related Parts of the Control System (SRP/CS) that shall achieve a relevant minimum Performance Level (PL) required. This requirement is given for each safety function in the relevant subclause of [Clause 5](#).

[Table D.1](#) shows PL_r for each safety function at a glance. However, [Clause 5](#) subclauses text remains the sole proper normative reference for the full requirements and explanations, which might not be summarized enough to fit in [Table D.1](#).

Wherever in this International Standard PL is mentioned, the requirements for PL refer to ISO 13849-1:2006.

Verification: By checking the relevant drawings and/or circuit diagrams and inspection of the machine, evaluation of the achieved performance level according to ISO 13849-1:2008, 4.5.

5.2.2 Position of controls

The main electrical control devices of the machine for power-on, starting a tool spindle, other processing spindles, normal stopping, integrated feed, top pressure beam movement, machine half movement, and mode selection shall be located together and situated such that the loading position can be seen.

Additional control devices for starting, operational/normal stopping (if provided) may be duplicated/provided on mobile control sets with cable connection or wireless taking account of the requirements of [5.2.4.3](#) for emergency stop.

When a wireless control set loses its connection to the machine, a normal stop shall be automatically activated.

Hold-to-run control devices shall be located so that the operator, when actuating them, can see the controlled movements [see [5.2.6.2 c\)](#)].

No reset function control devices, no control devices for power-on, and no mode selection shall be positioned on mobile control sets.

Emergency stop controls shall be fitted at the following locations:

- a) on each mobile or fixed set of controls;
- b) at the loading and unloading positions of each machine half as long as there is no set of controls;
- c) not more than 0,5 m from each hold-to-run device;
- d) inside each enclosure where a mode selection switch is provided (see [5.2.6](#)) and positioned with a maximum distance of 2 m from each other;
- e) at the loading area for glue and edges when outside a specific enclosure.

NOTE A single emergency stop control can fulfil, by virtue of its installed position, the function of more than one of the above requirements. If two of the above locations can be reached from each other, only one emergency stop control can be provided.

As an exception to b), emergency stop control at the unloading position is not required on single-end machines with a maximum length of workpiece support of 2 m.

Verification: By checking the relevant drawings and/or circuit diagrams, inspection of the machine, and relevant functional testing of the machine.

5.2.3 Starting

A power-on control device shall be provided and protected against unintended actuation (e.g. shrouded).

Power-on activation in automatic mode shall only be possible when all safeguards are in place and functional. This is achieved by the interlocking arrangements described in 5.3.7.

NOTE 1 For power enabling in MODE 2 and MODE 3, see 5.2.6.

Process start or restart shall only be possible after power-on activation.

NOTE 2 No PL is required for process starting and restarting.

When power is supplied to a tool spindle drive motor and any other processing spindle drive motor, this shall be indicated permanently or through the request of the operator, e.g. by a light signal near to the start control or integrated in the start button, or by using a two position switch or through the operator interrogating the control computer.

In machines provided with MODE 2, it shall be possible to start each spindle drive and feed drive separately.

Closure of movable interlocked guards shall not lead to an automatic restart of hazardous movements.

The SRP/CS for power-on control shall achieve at least PL = c.

The SRP/CS for starting spindle drives and feed drive shall achieve at least PL = b.

Verification: By checking the relevant drawings and/or circuit diagrams, inspection, and relevant functional testing on the machine.

5.2.4 Stop controls

5.2.4.1 Normal stop

A stop control shall be fitted, which, when actuated, stops all machine actuators except glue heater and cuts power to them once stopping is complete, unless STO in accordance with EN 61800-5-2:2007 is used.

When STO is provided in accordance with EN 61800-5-2:2007, no disconnection by contactor is required.

NOTE For normal stopping of PDS(SR) (power drive system, safety-related), see EN 61800-5-2:2007, 4.2.2.2 for “safe torque off (STO)” and EN 61800-5-2:2007, 4.2.2.3 for “safe stop 1 (SS1)”.

For machine actuators stopped in stop category 0 according IEC 60204-1:2005, power shall be cut to these actuators except work-piece clamping (if fitted) unless STO according to EN 61800-5-2:2007 is used.

For machine actuators stopped in stop category 1, the stopping sequence shall be the following:

- cut power to these machine actuators except work-piece clamping (if fitted) unless STO according to EN 61800-5-2:2007 is used and actuate the brakes;
- cut power to brakes (if electrical brake is fitted) after tool spindle has come to rest, e.g. by using a time delay.

The SRP/CS for normal stopping initiation shall achieve at least PL = c.

The above requirements shall be satisfied at the level of the control circuits. If a time-delay device is used, the time delay shall achieve at least PL = c and shall at least be more than the maximum run-down time of the machine and either the time delay shall be fixed or the adjustment mechanism shall be sealed.

Verification: By checking the relevant drawings and/or circuit diagrams, inspection, and relevant functional testing of the machine.