

Safety of machinery — Safety requirements for the design and construction of printing and paper converting machines —

Part 2: Printing and varnishing machines including pre-press machinery

The European Standard EN 1010-2:2006 has the status of a
British Standard

ICS 37.100.10; 85.100

National foreword

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The UK participation in its preparation was entrusted by Technical Committee MCE/3, Safeguarding of machinery, to Subcommittee MCE/3/9, Paper and printing machines — Safety, which has the responsibility to:

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 56, an inside back cover and a back cover.

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Amendments issued since publication

Amd. No.	Date	Comments

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2006

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ISBN 0 580 48417 3

ICS 37.100.10; 85.100

English Version

Safety of machinery - Safety requirements for the design and construction of printing and paper converting machines - Part 2: Printing and varnishing machines including pre-press machinery

Sécurité des machines - Prescriptions de sécurité pour la conception et la construction de machines d'impression et de transformation du papier - Partie 2: Machines d'impression et de vernissage y compris les équipements de pré-press

Sicherheit von Maschinen - Sicherheitsanforderungen an Konstruktion und Bau von Druck- und Papierverarbeitungsmaschinen - Teil 2: Druck- und Lackiermaschinen einschließlich Maschinen der Druckvorstufe

This European Standard was approved by CEN on 17 January 2005.

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Management Centre: rue de Stassart, 36 B-1050 Brussels

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Foreword

This document (EN 1010-2:2006) has been prepared by Technical Committee CEN/TC 198 "Printing and paper machinery - Safety", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2006, and conflicting national standards shall be withdrawn at the latest by September 2006.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directives.

For relationship with EU Directives, see informative Annexes ZA and ZB, which are integral parts of this document.

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Introduction

This document is a type C standard as stated in EN ISO 12100-1:2003.

It defines additional safety requirements and/or deviations from the stipulations in EN 1010-1:2004.

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

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this 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 this type C standard.

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- *German Patent DE 103 10 236 B3*
- *PCT patent application*

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Intellectual Property R3
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Germany
Tel: +49-6221/92-3027
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Friedrich-König-Straße 4, 97080 Würzburg,
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1 Scope

This document applies to:

- Pre-press machinery (machinery and devices for the production of master copies and printing forms):
 - exposure equipment for the production of films and printing forms;
 - equipment for developing films and printing forms;
 - washing machines for printing forms;
 - machines for bending printing forms;
 - punching machines for film and printing forms;
 - cutting machines for film and printing forms;
 - machines for the production of gravure printing forms;
 - scanners.
- Printing and varnishing machines:
 - proofing presses;
 - sheet-fed printing presses and varnishing machines including digital printing presses;
 - web-fed rotary presses and varnishing machines including digital printing presses;
 - screen printing presses.
- Auxiliary devices:
 - cylinder and roller washing devices;
 - continuous flow drying devices;
 - powder spraying devices;
 - auxiliary devices on inking and damping units;
 - automatic plate clamping devices;
 - washing equipment for printing forms, rollers and scrapers;
 - pile turners;
 - measuring and control devices.

This document shall be used together with EN 1010-1:2004. Both parts together identify all significant hazards relevant to printing and varnishing machines including pre-press machinery and auxiliary devices, when they are used as intended and under the conditions foreseen by the manufacturer (see clause 4). The specific requirements specified in prEN 1010-2 take precedence over respective requirements in this standard.

This document does not deal with risks generated by noise emitted from the machines. These issues are fundamentally covered in EN 1010-1: 2004

This document does not apply to high-pressure cleaning devices and screen printing presses for textile substrates.

This document is not applicable to printing and varnishing machines including pre-press machinery which are manufactured before the date of publication of this document by CEN.

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.

EN 294:1992, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs.*

EN 349:1993, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body.*

EN 378-1:2000, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Basic requirements, definitions, classification and selection criteria.*

EN 954-1:1996, *Safety of machinery — Safety related parts of control systems — Part 1: General principles for design.*

EN 999:1998, *Safety of machinery — The positioning of protective equipment in respect of approach speeds of parts for the human body.*

EN 1010-1:2004, *Safety of machinery — Safety requirements for the design and construction of printing and paper converting machines — Part 1: General requirements.*

EN 1050:1996, *Safety of machinery — Principles for risk assessment.*

EN 1127-1:1997, *Explosive atmospheres — Explosion prevention and protection — Part 1: Basic concepts and methodology.*

EN 1539:2000, *Dryers and ovens, in which flammable substances are released — Safety requirements.*

EN 60204-1:1997, *Safety of machinery — Electrical equipment of machines — Part 1: General requirements (IEC 60204-1:1997).*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989).*

EN 60825-1:1994, *Safety of laser products — Part 1: Equipment classification, requirements and user's guide (IEC 60825-1:1993).*

EN 60950-1:2001, *Information technology equipment — Safety — Part 1: General requirements (IEC 60950-1:2001, modified).*

EN ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology (ISO 12100-1:2003).*

EN ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles (ISO 12100-2:2003).*

EN ISO 14122-4:2004, *Safety of machinery — Permanent means of access to machinery — Part 4: Fixed ladders (ISO 1422-4:2004)*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in EN ISO 12100-1:2003, EN 1010-1:2004 and the following apply.

3.1

alcohol dosing equipment

equipment for dosing the amount of alcohol in the damping water of offset printing presses

3.2

proofing presses

machines for printing a small number of copies, mostly used for assessing print quality before the printing form is mounted in the machine. Feeding and delivery is done manually

3.3

automatic plate clamping devices

devices for automatic or semi-automatic changing of printing plates

3.4

exposing equipment

machinery used for taking images by exposing photo-sensitive material, for example, as master copy or printing forms

3.5

sheet-fed printing presses and varnishing machines

machines for printing, numbering and/or varnishing of sheet-size substrates (paper sheets, board, film, sheet metal or similar material) including proofing presses. Numbering and varnishing machines may be integrated into printing presses or they may be used as stand-alone machines. The sheets may be fed by feeders or from sheeters attached to unwinding units

3.6

powder spraying devices

devices for spraying powder onto the printed material on the delivery side of sheet-fed printing presses

3.7

printing forms

base material which stores the image to be printed (pictures and/or text) and transfers ink on a substrate (such as printing plates, printing cylinders, screens), thus printing the image

3.8

washing equipment for printing forms

machines for washing printing forms outside the printing press (for example, screen washing equipment)

3.9

printing forms bending machines

machines for bending or folding printing forms before they are clamped in the printing press

3.10

printing tables

tables to hold the substrate to be printed during the printing process (as on certain types of screen printing presses)

3.11

master copy

copy from which the image is taken for preparing the printing form

3.12

continuous flow drying devices

devices built into printing presses for drying substrates after the printing process (for example, by hot air, IR or UV radiation)

3.13

digital printing presses

printing presses used in professional printing shops where the printing image is produced in the machine from data stored in digital form (for example, by exposing a photo-sensitive drum or film in the machine)

3.14

forms printing presses

machines for the production of continuous forms where paper webs printed with one or multiple colours are concertina-folded or wound onto a reel. In addition to the printing section, the machine normally consists of different devices for converting such as, for example, devices for punching, punching for traction feeding, cross perforation, longitudinal perforation and concertina-folding

3.15

pre-press machinery

machines and equipment for the production of master copies and/or printing forms

3.16

web-fed rotary printing presses and varnishing machines

machines for printing, numbering and/or varnishing of webs (for example webs of paper, films)

3.17

bypass function

bypass sequence

temporary, time-limited suppression or bypassing of one (or several) safety function(s) by safety-related parts of a control system

3.18

access height in the sheet-fed press delivery zone

maximum opening into the area below the sheet gripper, measured between access level (floor, fixed platform or footboard) and lower edge of fixed machine parts (e.g. fixed guard, fixed cover, fixed parts such as sheet stops); (see Figure 3)

3.19

screen printing presses

printing presses using printing forms with woven material (screens) which partially allow ink to penetrate through the material. A doctor blade is used to press the ink through the screen onto the underlying substrate. Ink will pass only through the „printing„ parts of the screen, thus creating the desired image. Screen printing may be applied to sheets, webs or solid substrates

Depending on the degree of automation of the individual steps of the printing process (feeding - flooding - printing - delivery), screen printing presses are defined as:

- semi automatic (manual feeding and manual delivery);
- three-quarter automatic (manual feeding, automatic delivery);
- fully automatic (automatic feeding and delivery).

Screen printing presses with flat screens are classified according to their design as:

- printing unit, hinged or with parallel or inclined withdrawal, fixed feeding table as printing basis (substrate is placed manually on the feeding table below the printing unit);

- short-stroke printing unit (substrate is placed on a movable feeding table as printing basis; substrate is placed on a fixed feeding table, transfer to the printing basis by means of gripper system);
- movable printing unit with fixed blade unit and counterpressure cylinder, feeding via gripper system (cylinder screen printing presses)

3.20**screen frames**

frames upon which printing screens are mounted

3.21**printing basis of screen printing presses**

counterpressure element taking up the substrate for printing. It can be a flat plate (printing table) or a rotating cylinder

3.22**doctor blade unit**

unit for pressing the screen printing form against the substrate with the blade forcing the printing ink through the open areas of the screen printing form onto the substrate and scraping excessive ink off the screen. It consists of the blade holder and the blade

3.23**printing unit of screen printing presses**

designation for the screen printing form and the doctor blade unit

3.24**pile turners**

devices for turning piles of substrate. They are associated with sheet-fed printing presses in order to turn piles of printed paper for further processing, for example, for back printing in a second run

3.25**engraving machines for gravure cylinders**

machines for cutting images on printing forms used for gravure printing where the engraved parts hold the ink for the printing process

3.26**newspaper printing presses**

machines which are designed and constructed primarily for printing newspapers

3.27**auxiliary devices for printing presses**

devices used for the production process which are either built in or attached to the printing press

3.28**enabling devices**

actuating devices which shall be operated in addition to at least one other actuator or enabling device in order to start a machine under hold-to-run control. The machine movement is stopped as soon as one of the hold-to-run controls or enabling devices respectively is released

3.29**roller/cylinder washing devices**

devices integrated into the printing press for washing cylinders and rollers, for example, ink rollers, blanket cylinders, printing cylinders, plate cylinders

3.30**cylinder screen printing presses**

sheet-fed screen printing presses where the substrate (sheet) is guided along the screen by a printing cylinder

3.31

ESPD

electro-sensitive protective device

3.32

knurl rollers

rollers with a pattern surface with indents less than 1 mm, without sharp or cutting edges.

4 List of significant hazards

This clause contains all the significant hazards (noise is fundamentally dealt with in EN 1010-1:2004), as far as they are dealt with in this standard, identified by the risk assessment significant for this type of machinery and which require action to eliminate or reduce the risk. When carrying out the risk assessment, the machine designer shall check whether the list of hazards in Table 1 is complete and applicable with respect to the particular machine.

4.2 It is of great importance that the users of this standard, i. e. the designer or manufacturer, take into account the following principal aspects in accordance with EN 1050:1996:

- the intended use of the machine including setting-up (make-ready), cleaning and maintenance, including foreseeable misuse;
- identification of the significant hazards.

Table 1 — Significant hazards, danger zones, safety measures

Significant hazards	Danger zone	Safety measures: reference to clauses in		
		this standard	EN ISO 12100-1:2003	EN 1050:1996 Annex A
Mechanical hazards crushing shearing cutting or severing entanglement drawing-in impacts	Pre-press machinery		4.2	1
	— inrunning nips on rollers and cylinders	5.2.8		
	— inrunning nips between engraving tools and form cylinder	5.2.9		
	— trapping hazards on chuck jaws of engraving machines	5.2.9		
	— printing forms bending devices	5.2.10, 5.2.11, 7.1.1.2		
	— printing forms punching devices	5.2.12		
	Sheet-fed printing presses and varnishing machines			
	— sheet gripping devices, rollers, cylinders, perforating tools, feed openings	5.3.1		
	— inrunning nips behind interlocking guards during cleaning and make-ready	5.3.2		
	— damping unit, varnishing unit, inking unit	5.3.4, 5.3.5		
	— sheet delivery	5.3.8 to 5.3.10, 7.1.2.2		
	— sheet delivery	5.3.11		
	— material feeding for board and plate printing	5.3.12, 7.1.2.4		
	— sheet stops, suction head on automatic format setting	5.3.13		
	— pile changing device	5.3.14		
	— powered movable guards	5.3.16		
	— upper and lower tool on offset proofing presses	5.3.17		
	Web-fed rotary printing presses and varnishing machines			
	— inrunning nips on rollers and cylinders, feed openings	5.4.2, 5.4.3		
	— inrunning nips behind interlocking guards during cleaning and make-ready	5.4.4		
	— powered movable guards	5.4.5		
	— damping unit, varnishing unit, inking unit	5.4.8, 5.4.9		
	— automatic format setting, area of turner bars	5.4.10, 7.1.3.1		
	— transport carriages for cylinders	5.4.12, 5.4.13		

Table 1 (continued)

Significant hazards	Danger zone	Safety measures: reference to clauses in		
		this standard	EN ISO 12100-1: 2003	EN 1050: 1996 Annex A
	<ul style="list-style-type: none"> — folding unit — material feeding — material webs — reel unwinding unit — forms printing with guards open — rollers, guide rollers — digital printing presses <p>Screen printing presses</p> <ul style="list-style-type: none"> — printing unit, printing basis — feeding table, gripper systems — doctor blade/screen frame — doctor blade/screen frame — feeding unit, delivery — screen frames on cylinder screen printing presses — pressure cylinder <p>Auxiliary devices for printing and varnishing machines</p> <p>Powder spraying devices</p> <p>Auxiliary devices on inking and damping units</p> <ul style="list-style-type: none"> — refrigerating devices <p>Plate clamping devices</p> <p>Pile turners</p> <ul style="list-style-type: none"> — load lifting device — hydraulic, pneumatic lifting device <p>Measuring and control devices</p>	<p>5.4.14</p> <p>5.4.15</p> <p>5.4.16</p> <p>5.4.17</p> <p>5.4.18, 7.1.3.3</p> <p>5.4.19</p> <p>5.4.21</p> <p>5.5.2, 7.1.4.5</p> <p>5.5.3</p> <p>5.5.4, 5.5.5</p> <p>5.5.6</p> <p>5.5.7</p> <p>5.5.8</p> <p>5.5.9</p> <p>5.6</p> <p>5.6.4</p> <p>5.6.5.3</p> <p>5.6.6</p> <p>5.6.8.1</p> <p>5.6.8.2</p> <p>5.6.8</p>		
Slipping, tripping, falling	<p>Sheet-fed printing presses and varnishing machines</p> <ul style="list-style-type: none"> — accessible floor plates with low slip resistance 	5.3.21	4.10	19
Ejection of parts	<p>Pre-press machinery</p> <ul style="list-style-type: none"> — safety screen on exposing equipment 	5.2.3		1.1.4
Thermal hazards Burns due to possible contact	<p>Continuous flow drying devices</p> <ul style="list-style-type: none"> — surface temperature 	5.6.3.6	4.4	3

Table 1 (continued)

Significant hazards	Danger zone	Safety measures: reference to clauses in		
		this standard	EN ISO 12100-1: 2003	EN 1050: 1996 Annex A
Electrical hazards Direct or indirect contact Thermal radiation (burns) Hazards generated by radiation UV radiation, laser	Pre-press machinery — electrical equipment	5.2.1	4.3	2
	Pre-press machinery — UV exposing equipment	5.2.4	4.7	6
	— laser exposing equipment	5.2.5		
	Sheet-fed printing presses and varnishing machines — laser exposing equipment	5.3.18		
	Web-fed rotary printing presses and varnishing machines — laser exposing equipment	5.3.15, 5.4.22		
	Continuous flow drying devices — UV radiation	5.6.3.7		
Hazards from substances and material used for processing, machine operation or which are emitted during the process Hazards resulting from contact with or inhalation of harmful fluids, gases, fumes, dusts	Pre-press machinery — charging and discharging of liquid substances	5.2.6	4.8	7.1
	— areas with solvents, solvent vapours, dust	5.2.7, 7.1.1.1		
	Sheet-fed printing presses and varnishing machines — powdered inks	5.3.19		
	— ink flyl	5.6.3.9, 7.1.6.3		
	Web-fed rotary printing presses and varnishing machines — paper dust	5.4.20		
	Cylinder and roller washing devices — washing device	5.6.2.2, 7.1.5.1		
	— replenishment openings on containers of washing agents	5.6.2.3		
	— washing devices	5.6.2.4		
	Continuous flow drying devices — UV dryers	5.6.3.8		

Table 1 (continued)

Significant hazards	Danger zone	Safety measures: reference to clauses in		
		this standard	EN ISO 12100-1: 2003	EN 1050: 1996 Annex A
	Auxiliary devices on inking and damping units — alcohol dosing equipment Washing equipment for printing forms, rollers and doctor blades	5.6.5.1, 5.6.5.2, 7.1.7.2 5.67.1		
Hazards from ignition and explosion	Web-fed rotary printing presses and varnishing machines — exhaust fans for paper dust removal Screen printing processes Cylinder and roller washing devices — washing device Continuous flow drying devices — continuous flow drying devices in connection with washing devices — integrated continuous flow drying devices — substrates Auxiliary devices on inking and damping units — alcohol dosing devices Washing equipment for printing forms, rollers and doctor blades	5.4.20 5.5.1, 7.1.4.1 5.6.2.1, 7.1.5.1 5.6.3.1, 5.6.3.2, 5.6.3.4, 7.1.6.1 5.6.3.3 5.6.3.5 5.6.5.2, 7.1.7.1 5.6.7.2, 5.6.7.3	4.8	7.2
Hazards generated by neglect of ergonomic principles in machine design unhealthy body postures	Sheet-fed printing presses and varnishing machines — hold-to-run control — stairs between units — installation and removal of heavy machine parts — catwalks, passageways, stairs, working platforms — accessible floor plates Web-fed rotary printing presses and varnishing machines — hold-to-run control — installation and removal of heavy machine parts — working platforms, catwalks, passageways, stairs — movable platforms	5.3.6 5.3.7 5.3.15, 7.1.2.1 5.3.20, 5.3.22 5.3.21 5.4.6 5.4.11 5.4.22 to 5.4.26 5.4.27	4.9	8

Table 1 (concluded)

Significant hazards	Danger zone	Safety measures: reference to clauses in		
		this standard	EN ISO 12100-1: 2003	EN 1050: 1996 Annex A
Failure, malfunction of control system Faults or failures in safety circuits	Pre-press machinery Sheet-fed printing presses and varnishing machines	5.2.2, 5.3.3, 5.3.9.1.2, 5.3.9.1.3, 5.4.7		10
	Web-fed rotary printing presses and varnishing machines	5.5.10		
	Screen oprinting presses Auxiliary devices on inking and damping units — alcohol dosing equipment	5.6.5.1		

5 Safety requirements and/or measures

5.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of EN ISO 12100:2003 for hazards relevant but not significant, which are not dealt with by this document (e. g. sharp edges of machine frame).

The common requirements of Part 1 shall also be satisfied.

5.2 Pre-press machinery

5.2.1 The electrical equipment of pre-press machinery shall satisfy the requirements of 5.2.5 of EN 1010-1:2004.

As a deviation from this requirement, for machinery which

- is used exclusively for the production of master copies, film and printing form exposure
- may fall within the scope of EN 60950:2001 and
- it is ensured that they are not used in areas where printing on paper or paper converting takes place,

it is permitted to design the electrical equipment so that electrical hazards (such as burns or shocks) are prevented in accordance with EN 60950-1:2001 and electrical equipment has degree of protection IP 23 according to EN 60529:1991.

As a deviation from 5.2.5.2 of EN 1010-1:2004, it is permitted to equip pre-press machinery with supply disconnecting devices according to 5.3.2 d) or e) of EN 60204-1:1997.

5.2.2 Parts of the electric/electronic control system of pre-press machinery shall comply with 5.2.6.1 of EN 1010-1:2004.

Parts of the electric/electronic control system of machines and equipment for the preparation of printing forms may be designed in accordance with category 1 of EN 954-1:1996 as a deviation from 5.2.6.1 of EN 1010-1:2004. The control systems of interlocking devices for safety devices that prevent access to laser

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radiation class 3B or 4, classified according to EN 60825-1:1994, shall be designed to comply with category 3 of EN 954-1:1996.

5.2.3 Exposing equipment where there is a risk of injury caused by bursting lamps shall be equipped with safety screens of heat-resistant material which shall be attached free of stress.

Safety screens are heat-resistant if they have an adequate mechanical strength at normal operating temperatures. Safety screens are "attached free of stress" if bursting of the screen is not to be expected even with the material expanding under increasing temperatures.

5.2.4 On UV exposing equipment, the limit values for UV radiation according to 5.2.16.2 of EN 1010-1:2004 shall be complied with.

5.2.5 On laser equipment, the limit values for laser radiation according to 5.2.16.1 of EN 1010-1:2004 shall be complied with.

5.2.6 Appropriate facilities shall be provided to ensure safe charging and discharging of developing and fixing liquid and arabic gum liquids. Appropriate facilities are, for example, suction pumps, filler sockets or funnels, valves for draining liquids, removable tanks with lips.

5.2.7 Pre-press machinery where hazards are to be expected shall be provided with appropriate facilities (for example, extraction devices) preventing hazards from contact with or inhaling hazardous substances such as solvents, solvent mist and dust. Any personal protection measures required shall be described in the instruction handbook.

For reference in the instruction handbook, see 7.1.1.1.

5.2.8 On pre-press machinery, inrunning nips on rollers and cylinders shall be safeguarded in accordance with 5.2.1.1 of EN 1010-1:2004. However, safeguarding is also considered adequate if the rollers are held in position only by their own force of 50 N maximum.

5.2.9 On engraving machines for gravure cylinders, the inrunning nip between gravure cylinder and engraving tool may be safeguarded by:

- enclosing the gravure cylinder by an interlocking guard;
- providing a fixed guard with a distance of 6 mm maximum between gravure cylinder and guard.

The trapping hazard caused by the rotation of the gravure cylinder shall be safeguarded. This may be done, for example, by:

- enclosing the gravure cylinder by an interlocking guard;
- using a cylinder with a smooth surface including cylinder fixtures and drive elements;
- enclosing individual trapping points by fixed or interlocking guards.

NOTE Trapping hazards can be caused by the chuck jaws, for example.

5.2.10 Risk of skin and eye injuries are created by copper swarf adhering to the hands. This residual risk shall be described in the instruction handbook.

For reference in the instruction handbook, see 7.1.1.2.

5.2.11 On printing form bending machines, the movement of the bending unit shall be safeguarded. This may be done by providing:

- guards in accordance with 5.2.1.1a) of EN 1010-1:2004 or
- two-hand control in accordance with 5.2.8.1, 5.2.8.2 and 5.8.4 of EN 1010-1:2004.

The control system of the machine shall comply with 5.2.6.1 of EN 1010-1:2004.

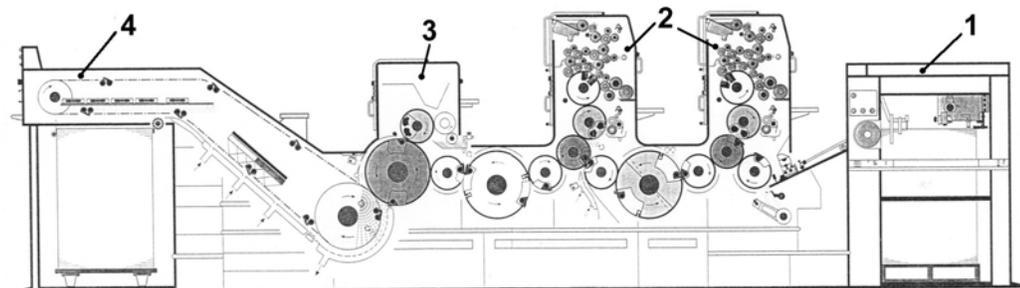
On printing form bending machines, safety check valves shall be provided directly on the lifting cylinders of the bending device if breakage of hoses or loss of pressure of the respective source of energy can create crushing hazards with a crushing force of at least 500 N.

5.2.12 On printing form punching devices, the movement of the punching tool shall be safeguarded. This may be done by:

- designing the opening width of fixed punching tools in accordance with EN 294:1992 ("Safe tools") and
- protecting the drive elements of the punching tools by guards in accordance with 5.2.1.1.a) of EN 1010-1:2004.

5.3 Sheet-fed printing presses and varnishing machines (except screen printing presses)

5.3.1 This clause applies to sheet-fed printing presses following the principle of offset, digital, gravure, flexo or letter press printing. The basic layout is illustrated in Figure 1. For screen printing presses, see 5.5.



Key

- 1 Feeder
- 2 Printing units
- 3 Varnishing unit (optional)
- 4 Delivery

Figure 1 — Basic layout of a sheet-fed printing press following the principle of offset, gravure, flexo or letter press printing

Inrunning nips on rollers, cylinders, numbering and perforating tools as well as drawing-in, crushing and shearing points on sheet gripping devices, sheet transport systems, exposing devices, measurement and control devices shall be safeguarded in accordance with 5.2.1.1 a) of EN 1010-1:2004. As a deviation, inrunning nips on smooth cylinders and rollers may be guarded in accordance with 5.2.1.1 b) of EN 1010-1:2004.

NOTE For the definition of "smooth" cylinders/rollers, see 3.13 of EN 1010-1:2004.

Interlocking with guard locking is required where the action of opening the guard when moving from its safeguarding position up to the position reached when the position detector is actuated (stopping the machine) is not in compliance with Table 2.

Table 2 — Limit values for interlocked safety devices

Safety distance "sr" between opening and danger point	Admissible opening width "e" of safety device when changing the position of the position detector
$sr < 80 \text{ mm}$	$e \leq 30 \text{ mm}$
$80 \text{ mm} \leq sr < 500 \text{ mm}$	$e \leq 40 \text{ mm}$
$500 \text{ mm} \leq sr < 850 \text{ mm}$	$e \leq 80 \text{ mm}$
$sr \geq 850 \text{ mm}$	$e \leq 160 \text{ mm}$

Interlocking with guard locking is also required where the hazardous movement cannot be stopped within at least 10 s after actuation of the position detector.

5.3.2 Where inrunning nips on cylinders in the vicinity of points on the machine that are directly accessible after the interlocking guards have been opened and where frequent interventions need to be carried out which cannot be done with the machine at standstill (such as cleaning and setting-up or changing of printing plates), trip devices in accordance with 5.2.10 of EN 1010-1:2004 shall be used as far as possible. For such trip devices, the requirements of category 3 of EN 954-1:1996 shall be satisfied and the interlocking system shall be designed such that the requirements for stopping paths specified in 5.2.10.2 of EN 1010-1:2004 are satisfied. Trip devices and cylinder gaps shall be designed such that cylinder gaps cannot be accessed behind trip devices, thus causing a risk of injury.

Use of trip devices is, for example, not possible on small-size offset presses where trip devices would impede access to the cylinder for plate changing, for example.

As a deviation, inrunning nips may be guarded according to 5.2.1.1.b) of EN 1010-1:2004 on smooth cylinders and rollers and on cylinders and rollers with cut-outs or elevations in the radial direction of 4 mm maximum and with axial gaps in the circumferential direction of 8 mm maximum, without sharp or cutting edges (see Figure 2). Cylinder gaps shall be as small as possible.

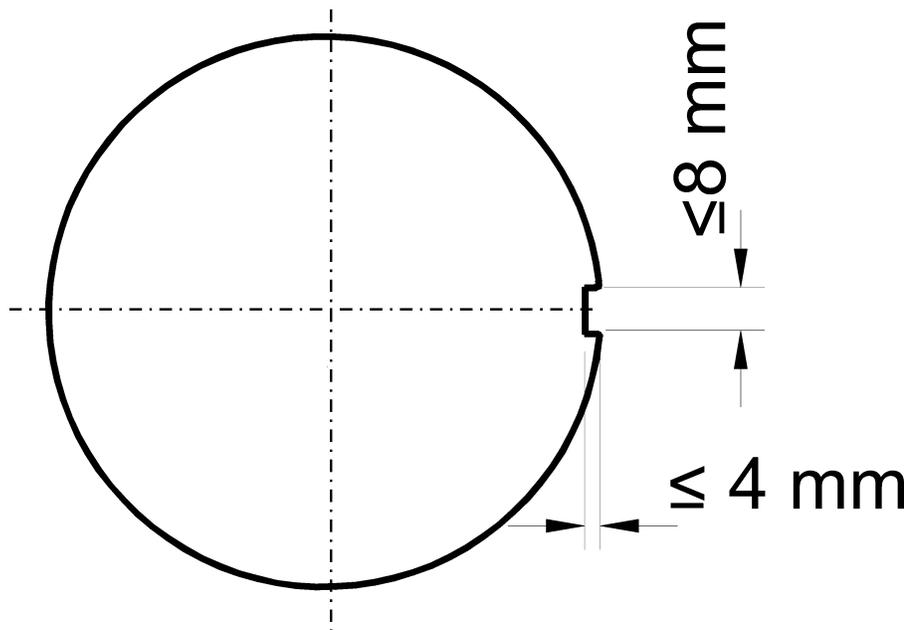


Figure 2 — Cylinders, rollers

Where not all danger points are safeguarded by trip devices or guards according to 5.2.1.1.b) of EN 1010-1:2004, sheet-fed printing presses and varnishing machines shall only be allowed to be started under hold-to-run control according to 5.2.3.3.a)1) of EN 1010-1:2004 with a limitation of displacement of 25 mm maximum or with a speed limited to 1 m/min maximum. As a deviation, the machines may be started under hold-to-run control according to 5.2.3.3.1.a)2) of EN 1010-1:2004 with a limitation of displacement of 75 mm maximum or with a speed limited to 5 m/min maximum if direct access to unprotected inrunning nips on cylinders or unprotected danger points on the sheet transport system is not possible. Starting for continuous runs shall not be possible.

Cylinders within the meaning of this standard are plate cylinders, blanket cylinders, impression cylinders or transfer cylinders. Ink rollers and damping water rollers, for example, are not considered cylinders within the meaning of this standard. Sheet transport systems are, for example, gripping systems, transport drums. Direct access is, for example, possible where inrunning nips can be reached after falling in or where nips are located in the immediate vicinity of places where setting-up or cleaning operations are to be carried out.

On small-size sheet-fed presses, movements can be non-powered.

Continuous run is starting the machine with a self-holding actuating element (other than hold-to-run), for example, for running the machine at a reduced speed or for cylinder positioning where the cylinder stops at a predetermined position.

5.3.3 The machine control system shall comply with 5.2.6.1 of EN 1010-1:2004.

5.3.4 Closing the interlocking guard on damping or varnishing devices may initiate the rotation of damping or varnish ductor rollers or dosing rollers if it is ensured that at this time no danger points can be accessed. This also applies to ink duct rollers on flexo printing presses. Closing the interlocking guard shall not cause the printing press to restart its operation.

Restarting the varnish, ink or damping ductor roller may be necessary in order to prevent malfunctions due to dried-up varnish or damping agents or ink on the flexo printing unit. Separate drives may be provided for ductor rollers and dosing rollers.

5.3.5 Emergency stop buttons shall be provided on each printing and varnishing unit where press motion controls are located and in the area of the operating position of feeder and delivery. Actuation of an emergency stop button shall not cause stopping of the ink, damping and varnish ductor roller where this is required for operational reasons and if all danger points are safeguarded, i. e.

- inrunning nips on the ink ductor roller even with the ink fountain swung down are not accessible or
- all inrunning nips on the damping and the varnish ductor are safeguarded by interlocking guards, possibly in combination with fixed guards.

This shall be mentioned in the instruction handbook.

5.3.6 Actuators shall comply with 5.2.7.1 of EN 1010-1:2004. Hold-to-run controls for forward and backward movement shall be designed such that erroneous actuation is prevented. This can be achieved, for example, by shrouding the "backward" control button or by using different surfaces.

5.3.7 On sheet-fed offset printing presses with a format width of 750 mm maximum, it is acceptable to provide, where required as a deviation from 5.2.12 of EN 1010-1:2004, a single step for access to the platform fitted between units (printing units, varnishing units, delivery units) under the following conditions:

- the difference in height between floor or catwalk and platform is not more than 750 mm and
- the depth of the step is at least 250 mm, the width at least 300 mm and
- the step is fitted half-way between floor or catwalk and platform and

— suitable handles are provided.

5.3.8 In the sheet delivery area, unintended access to the moving parts of the sheet gripper system from the top and from all sides shall be prevented by fixed or interlocking guards. Such guards shall reach down at least to the lower edge of the sheet gripper system. Residual risks due to the possibility of gaining access under the guards (for example, for test sheet removal or for inserting pile wedges) shall be mentioned in the instruction handbook (see 7.1.2.2).

5.3.9 On sheet deliveries, measures are required on all sides with possible access to prevent persons from entering the area of the circulating sheet gripper elements:

- where the access height h is 800 mm or more (see Figure 3) or
- where whole-body access is needed more than once a week. The necessity of whole-body access is restricted to cases where make-ready and cleaning can only be done by a person entering the area.

5.3.9.1 Safeguarding whole-body access by ESPDs for machines with a single access level.

5.3.9.1.1 The photoelectric beams of the ESPD shall be arranged as shown in Table 3.

NOTE For the arrangement of photoelectric beams on machines with several access levels, see 5.3.9.1.4.

The horizontal distance of photoelectric beams from the circulating gripper system elements, according to EN 999:1998, need not be taken into consideration because the primary safeguarding function is the prevention of an unexpected start-up of the machine. In addition, free access to the danger points is prevented or made difficult by the outline of the machine, by the delivery pile carrier and possibly by the pile itself so that the stopping time need not be taken into consideration.

For reference to residual risks in the instruction handbook, see 7.1.2.3.

Table 3 — Configuration of ESPDs in relation to access height h

Access height h	Configuration of ESPDs in relation to access height(s)		
	Light beam 1 ^a	Light beam 2 ^b	Light beam 3 ^c
$h \leq 1200$ mm	300 mm	not applicable ^d	400 mm below h ($h - 400$)
1200 mm $< h \leq 1500$ mm	300 mm	centred between beam 1 and beam 3	400 mm below h ($h - 400$)
$h > 1500$ mm	300 mm	700 mm	1100 mm

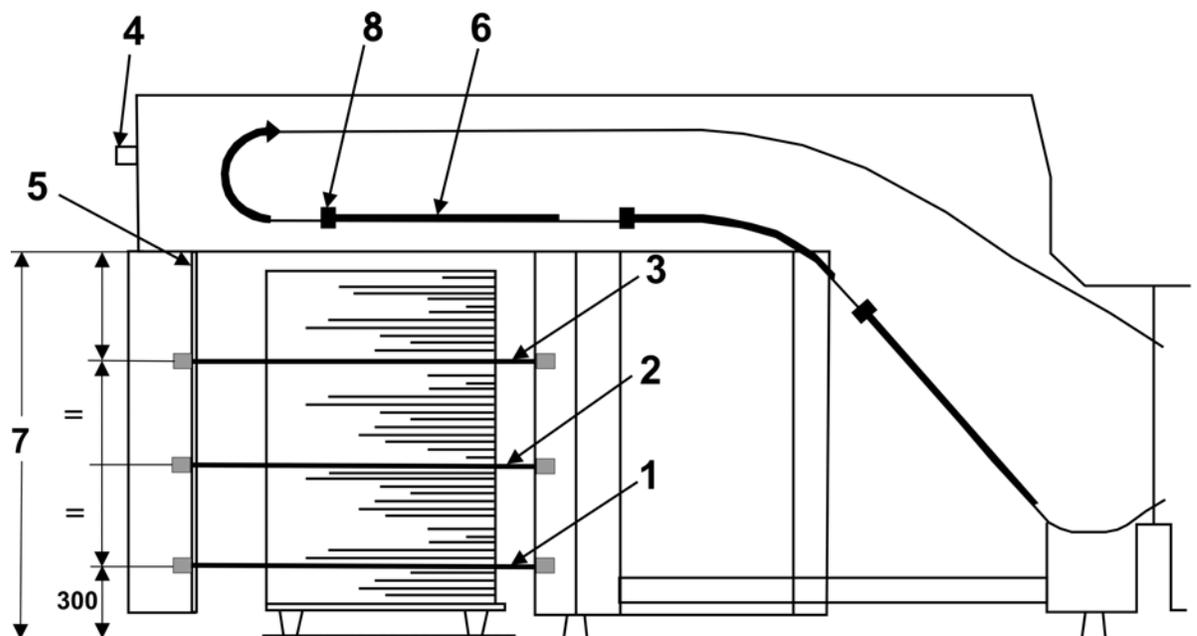
^a Measured from access level or from fixed or hinged platform; where required for spatial reasons, the admissible tolerance is ± 35 mm.

^b Light beam between beam 1 and beam 2 if clearance between beam 1 and 3 is > 500 mm

^c Maximum height 1100 mm

^d Some of the bypassing functions described under 5.3.9.1.2 require 3 light beams for safeguarding the access side. Where these bypassing functions are to be used, a third light beam shall be provided in the centre between the upper and the lower light beam also for access heights below 1200 mm.

Dimensions in millimetres

**Key**

- 1 Light beam 1
- 2 Light beam 2
- 3 Light beam 3
- 4 Reset button
- 5 Test sheet removal
- 6 Sheet
- 7 Access height h
- 8 Sheet gripper system

Figure 3 — Access height in delivery area

5.3.9.1.2 For removing test sheets, inserting pile wedges and aligning the pile, for pile travel and the entire process of pile removal including insertion of empty pallets and running in of auxiliary devices (such as forklift trucks), time-limited bypassing of one or more light beams is allowed only if the following conditions for individual bypassing functions are met. The duration of individual bypassing shall not exceed 20 s. After this time, the bypassed light beam shall be automatically reactivated.

Bypassing individual light beams shall be possible only under the conditions listed under 5.3.9.1.2.a) to e).

For reference in the instruction handbook, see 7.1.2.3.

a) Bypassing function for test sheet removal

Bypassing the top light beam (Figure 3, item 3) in the area of test sheet removal acting on the test sheet removal device shall be possible only

- during sheet transport and
- if the light beams on all other sides of access of the delivery are active.

For monitoring sheet transport and the test sheet removal device as well as related signal processing, only single-channel processing is required, for example, by means of an electronic control system.

b) Bypassing function for insertion of pile wedges and pile alignment

Bypassing one of the top light beams (Figure 3, item 3) by actuating a button provided on the respective side of access shall be possible only if

- there are 3 light beams provided for safeguarding the access side and
- the light beams on all other access sides are active.

With the bypassing function active and the main drive at standstill, start-up shall be prevented.

c) Bypassing function for insertion of empty pallets and handling of auxiliary devices

Bypassing one of the lowermost light beams (Figure 3, item 1) by means of a button provided on the respective access side shall be possible only if

- there are 3 light beams provided for safeguarding the access side and
- access to the danger zone is prevented by some kind of auxiliary device (for example, racks, blinds, barrier boards) or similar devices and
- on all access sides, all top and centre light beams and, on all other access sides, all lower light beams are active and
- the lifting height of the pile carrier plate is 120 mm maximum.

With regard to the above-mentioned light beams, requirements for electric interlocking are fulfilled if the auxiliary device or similar device is connected to a safety switch without a separate actuator such that the auxiliary device, when being run in, will automatically actuate the safety switch. The control system of the switch shall comply with category 3 of EN 954-1:1996.

NOTE As auxiliary devices may consist of metal bars or wooden boards which shall be removed from the machine and are possibly used on more than one machine, it is not possible to use encoded safety switches with separate actuators.

d) Automatic bypassing function for pile removal

Bypassing the light beams on the pile removal side shall be allowed only where the direction the pile is heading for, i.e. from the safeguarded area in the direction of the delivery area, can be detected.

Directional detection can be achieved by using a sensing device (ultrasonic device, light beams or similar devices), for example, which is located inside the delivery area, i.e. behind the ESPD. The sensing device shall not be easy to manipulate. This can be achieved by an adequate positioning of the sensing device or by checking signal plausibility. Linking to the control system may be on a single-channel basis, for example, by an electronic control system.

e) Manual bypassing function for insertion of empty pallets and running in auxiliary devices

Bypassing the light beams on the pile removal side by means of the "pile removal" button on the respective removal side shall be allowed only if

- the machine is in motion and
- the lifting height of the pile carrier plate is 120 mm maximum and
- since the most recent pile removal and the most recent triggering/malfunction, sheet transport has taken place and has been detected as such and

- there are 3 light beams provided for safeguarding the access side and
- all top, centre and lowermost light beams on all other access sides are active during the entire process.

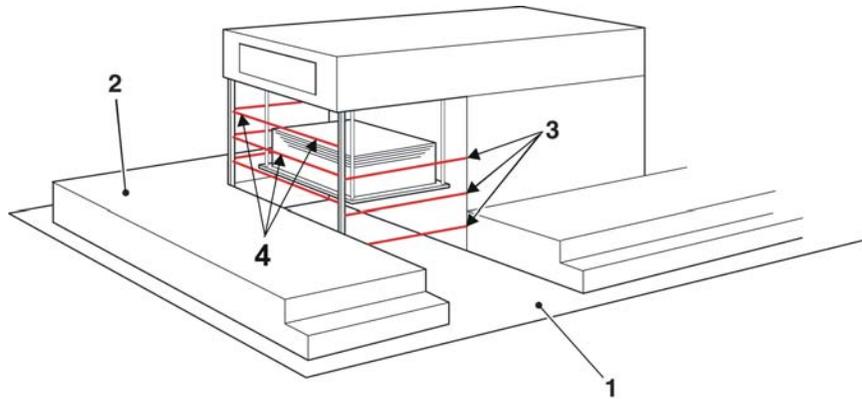
The bypassing function shall fulfil the following requirements:

- bypassing is restricted to the lowermost light beam (Figure 3, item 3) on the respective removal side for a maximum duration of 20 s;
- a sensing device capable of detecting the pile removal for the duration of this period is provided and the light beams on the removal side are bypassed for a duration of 20 s maximum;
- automatic reactivation of light beams 2 and 3 (Figure 3, items 2 and 3) is ensured after this time (20 s maximum);
- the lowermost light beam (Figure 3, item 1) is allowed to be bypassed for another 20 s maximum for insertion of the empty pallet;
- during this period (20 s maximum), the lowermost light beam shall only once be allowed to be muted for a second time (Figure 3, item 1) for another duration of 20 s maximum by repeated actuation of the "pile removal" button;
- automatic reactivation of the lowermost light beam (Figure 3, item) is ensured after the maximum bypassing period.

5.3.9.1.3 The bypassing function initiated (triggered automatically or by actuation of a button) shall be indicated by a yellow indicator lamp to warn the operator. The end of bypassing can be indicated by flashing the yellow light. Interruption of a light beam shall be indicated by a red warning lamp, active monitoring without bypassing the safeguarding function by a green indicator lamp. Indicator lamps shall be located on the respective access side. Linking to the control system may be on a single-channel basis, for example, by an electronic control system.

5.3.9.1.4 On machines with several access levels (for example, machines with movable platforms), the safety measures described under 5.3.9.1.1 to 5.3.9.1.3 shall apply to each access level (see Figures 4 and 5).

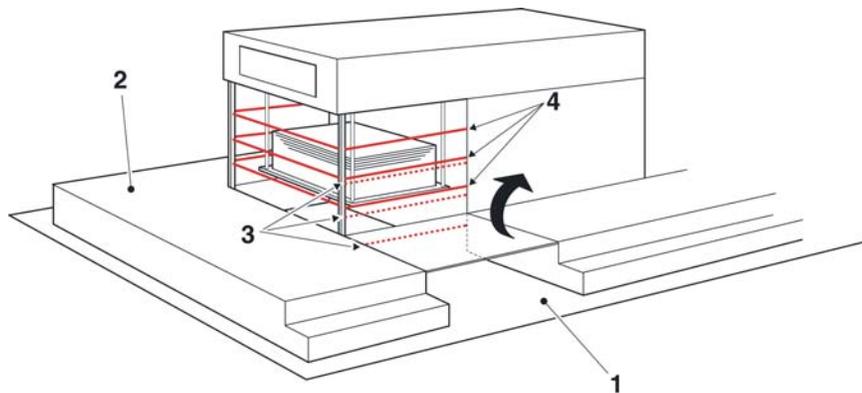
NOTE Figure 4 illustrates an example with two access levels, i.e. the floor and a platform. This would require light beams to be provided at adequate heights for the respective access side. Figure 5 illustrates a situation where a second access level may be created by the hinged platform. This would require an additional arrangement of light beams in order to safeguard all access levels on this side.



Key

- 1 Access level 1 (for example pile removal area)
- 2 Access level 2 (for example platform, catwalk)
- 3 Light beams of level 1
- 4 Light beam of level 2

Figure 4 — Several access levels without hinged platform



Key

- 1 Access level 1 (for example pile removal area)
- 2 Access level 2 (for example platform, catwalk)
- 3 Light beams of level 1
- 4 Additional light beams of level 2

Figure 5 — Several access levels with hinged platform

5.3.9.2 As an alternative to safeguarding by means of ESPDs in accordance with 5.3.9.1, safeguarding whole-body access can also be achieved by one of the following measures:

- fixed and interlocking guards;
- pressure-sensitive mats;
- laser scanners.

Whole-body access to sheet gripper systems is considered safe under the following operating conditions:

- while the delivery system is separated from the drive by means of clutches. Re-engaging the clutch and re-start shall not lead to hazardous movements;

- while, as a result of the pile carrier plates being in lifted position or auxiliary devices (such as) or similar devices being run in, the height of access to the danger zone of the sheet gripping system does not exceed 160 mm;
- while the machines runs with substrates with the pile carrier plate in the lifted position or auxiliary devices (racks, blinds, barrier boards) or similar devices run in and with an access height above the main or auxiliary pile carrier of 300 mm maximum. Pile carrier presence shall be detected either at the point of insertion under the gripper system or when a lowering path of 160 mm is reached at the latest. Restart from the standstill position shall not be possible without additional safety measures;
- restarting the machine from standstill can be prevented by providing horizontal light beams positioned below the gripping systems. The clearance between individual light beams shall not be more than 40 mm. Light grids shall comply with EN 999:1998, otherwise a safety device as specified under 5.3.9 is required.

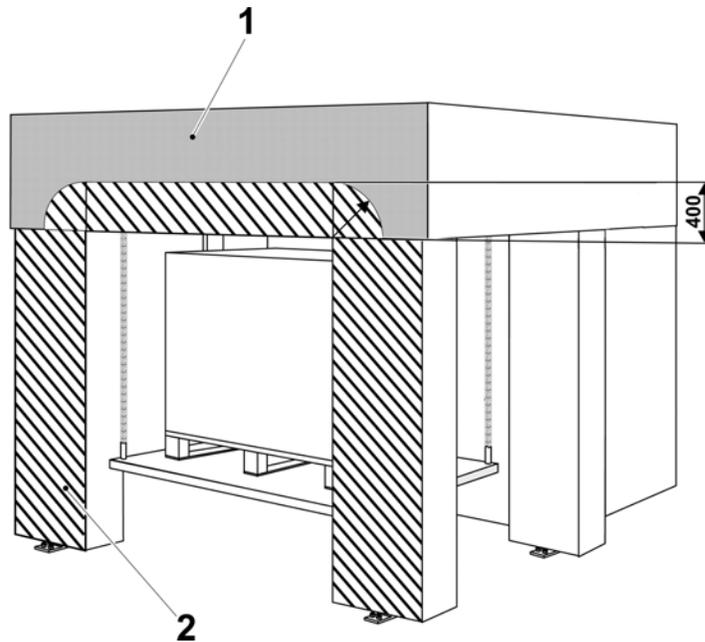
If none of the above conditions apply, it shall not be possible to operate the delivery without additional guards against access to the danger zones.

For example, if the auxiliary device has not been detected by position switches in a lowering path of 160 mm, access to the danger zones shall be safeguarded by alternative safety devices such as light beams or the movement of the gripper system shall be stopped.

5.3.9.3 Each time one of the safety devices for protecting whole-body access has been activated, hazardous movements shall be allowed to be restarted only by means of a reset button. The position of the reset button shall be such that the danger zone is in the view of the operator when actuating the reset button and that reaching the button from inside the danger zone is adequately prevented. This requirement is achieved if the reset button is located outside the danger zone at a distance of at least 400 mm from the lower edge of the delivery housing and not lower than the lower edge of the delivery housing (see Figure 6).

After switching on the ESPDs (for example when connecting the machine by means of the main power supply switch), machine start-up shall only be possible after actuating the reset button.

Actuating the reset button is not required where the type of safety device used safely ensures detection of persons inside the danger zone (for example, laser scanners).

**Key**

- 1 Area permitted for locating reset button
 2 Area not permitted for locating reset button

Figure 6 — Positions of reset button

Actuation of the reset button shall not automatically start the machine. The movements of the main and auxiliary pile carrier systems are allowed to be restarted by the reset button only if the entire danger area can be overlooked from the position of the reset button.

On machines with several levels of access (for example, machines mounted on a raised platform), where visibility of the danger zone cannot be ensured from any position, additional reset buttons shall be provided to allow the enabling function for respective danger zones.

5.3.10 On machines with an access height (on the delivery side) of more than 800 mm (according to 5.3.9) safeguarding shall be provided – in addition to safeguarding the pile carrier plate edge in accordance with 5.3.4.5 of EN 1010-1:2004 – also for the access to the area below the pile carrier plate and any other device used for lowering the pile on the delivery side. Safeguarding shall be achieved by guards or by safeguarding the danger zone by ESPDs as described in 5.3.9.1. Alternatively, for the arrangement of the beams, 5.2.9.4 of EN 1010-1:2004 shall be taken into account. Hold-to-run control is also considered as a suitable safety measure if the operator has adequate view of the danger zone. The bypass functions as described in 5.3.9.1.2 also apply for safeguarding the danger zone below the pile carrier systems.

5.3.11 On the delivery of sheet-fed printing presses and varnishing machines with pile carriages, where the pile weight does not exceed 500 kg and safeguarding in accordance with 5.3.4.5 of EN 1010-1:2004 cannot be done for operational reasons, the crushing hazards to the toes shall be safeguarded by ensuring a distance of 50 mm between the lower pile carrier plate edge and floor in accordance with EN 349:1993. It is also required that the lowering movement shall be possible only with the printing press operating in continuous mode or under hold-to-run control. For stability reasons, drive wheels shall be mounted as far as possible towards the centre of the pile carriage.

5.3.12 On sheet-fed printing presses which are used for printing on board, sheet metal or other inflexible materials, it may be that for production reasons EN 294:1992 cannot be applied in the feeding area. The height of the material feeding aperture shall be as small as possible, but shall not exceed 20 mm. The residual risk shall be specified in the instruction handbook (see 7.1.2.4).

On sheet-fed flexographic printing presses, the feed opening between the side lays and the sides of the machine shall be guarded by means of adjustable or self-adjustable guards.

5.3.13 Automatic format setting operations may be carried out without additional safety measures up to a setting speed of 0,5 m/min, however, if there is no crushing hazard to the head or the trunk of the body. Otherwise, format setting shall only be possible under hold-to-run control. The location of the hold-to-run control shall allow the operator to overlook the danger points.

Automatic format settings are used, for example, to adjust sheet side lays or positioning suction heads.

Additional safety measures are:

- fixed or interlocking guards;
- provision of trip devices;
- safety distances according to EN 294:1992 and minimum distances according to EN 349:1993;
- limitation of force.

5.3.14 Where the movement of pile changing devices causes a crushing hazard between any or all of the pile changing device, the pile lifting and lowering device, the paper pile and fixed machine parts, safeguarding shall be provided by one of the following measures:

- fixed or interlocking guards in accordance with 5.2.1.1.a) of EN 1010-1:2004;
- ESPDs in accordance with 5.2.9.1 of EN 1010-1:2004;
- safety distances in accordance with EN 349:1993;
- hold-to-run control in accordance with 5.2.3.3.a) 2 of EN 1010-1:2004;
- trip devices in accordance with 5.2.10 of EN 1010-1:2004.

For trip devices, the requirements of category 3 of EN 954-1:1996 shall be satisfied.

5.3.15 Where heavy machine parts with a lifting load of at least 25 kg per person need to be installed and removed regularly for operational reasons, appropriate load lifting devices shall be supplied.

Heavy machine parts are, for example, screen rolls and form cylinders. Lifting devices may even be required for lower loads if unfavourable body postures make lifting difficult.

For reference in the instruction handbook, see 7.1.2.1.

5.3.16 Powered movable guards shall not create danger points. In order to achieve this, the forces applied by the guard shall be restricted to:

- a) 50 N maximum for sharp-edged parts;
- b) 150 N maximum for flat parts.

5.3.17 On offset proofing presses, the inrunning nip between the movable upper unit and the fixed lower unit or printing table shall be safeguarded. This is achieved by the provision of trip devices or ESPDs.

Trip devices shall satisfy the requirements of 5.2.10 of EN 1010-1:2004 and category 3 of EN 954-1:1996.

ESPDs shall comply with 5.2.9.1 of EN 1010-1:2004. The safety device shall cause stopping of the upper unit in time not to cause any risk of injury. The hand approach speed specified in EN 999:1998 need not be complied with.

The inrunning nips on the inking and damping rollers on the movable upper unit and the fixed lower units shall be safeguarded in accordance with 5.2.1.1 of EN 1010-1:2004.

5.3.18 On laser exposing equipment, the limit values for laser radiation according to 5.2.16.1 of EN 1010-1:2004 shall be complied with.

5.3.19 Damage to health due to hazardous printing powders shall be prevented by restricting the intended use of the machine to the use of non-hazardous printing powders (toners). Where this is not possible and persons may be endangered, provisions shall be made for extraction systems with adequate dust separation equipment and filters or powders shall only be used in totally enclosed systems.

Printing powders (toners) are, for example, used in digital printing presses.

Any restriction in the use of the machine shall be indicated in the instruction handbook (see 7.1.2.6).

5.3.20 Requirements for platforms, passageways and catwalks shall comply with 5.2.12 of EN 1010-1:2004.

The usable width of machine catwalks shall be at least 0,5 m. For catwalks fitted at a height of more than 0,3 m, adequate means of access shall be provided.

Where the difference in height does not exceed 1,6 m, a toe board is not required if

- the respective level is not required for taking up auxiliary means required for production reasons and
- operational intervention below that level is not required under the intended use.

In such cases, the intermediate rail shall be centred between the hand rail and the platform floor.

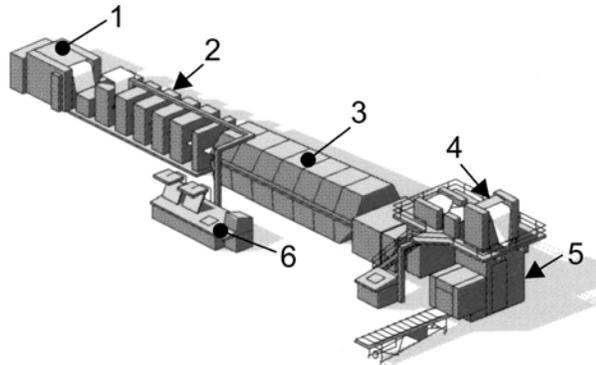
5.3.21 Plates of material with a low slip-resistance capability (for example, glass) fitted in access floors to allow the operator to observe the production process are permissible if they are fitted at a distance of at least 200 mm from the nearest fall-off edge (for example, access stairs) and the accessible area of such materials does not exceed 18 000 mm² with a maximum width of 90 mm. Calculations or tests shall be carried out to verify that a static load of 1 500 N applied to an area of (50 × 50) mm in the centre of such material will not lead to damage.

5.3.22 Where a passage height of 2 m cannot be provided for spatial reasons, the protruding parts shall be padded and provided with a danger marking.

5.4 Web-fed rotary printing presses and varnishing machines

5.4.1 General

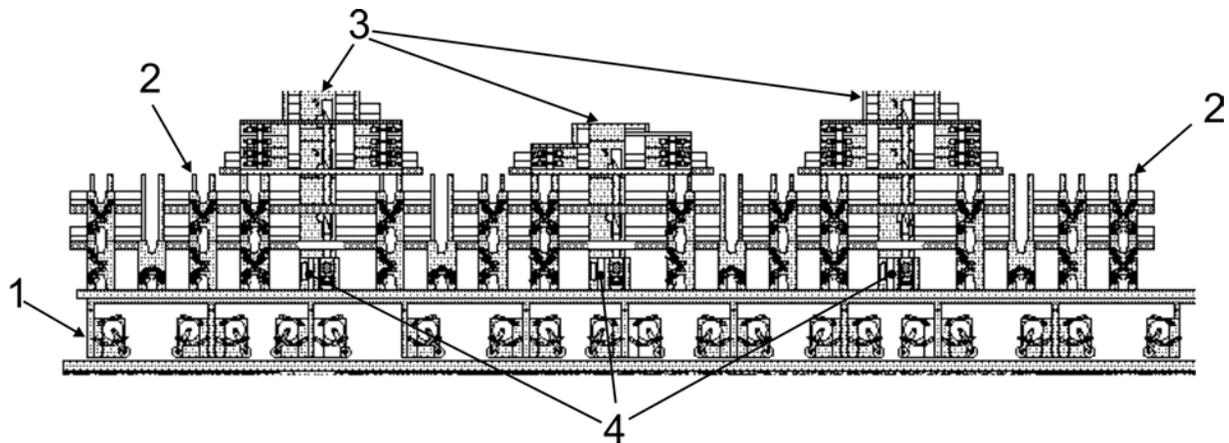
This clause applies to web-fed printing presses following the principle of offset, digital, gravure, flexo or letter press printing. The basic layout is illustrated in Figure 7.



Key

- 1 Unwinding unit
- 2 Printing units
- 3 Continuous flow dryer
- 4 Folding structure
- 5 Folding unit
- 6 Control panel

Figure 7 — Basic layout of a web-fed rotary offset printing press for commercial printing



Key

- 1 Unwinding unit
- 2 Printing units
- 3 Folding structure
- 4 Folding unit

Figure 8 — Offset printing press for printing newspapers

5.4.2 Inrunning nips on rollers and cylinders as well as drawing-in, crushing and shearing points on folding units, subsequent processing units, exposing devices, measurement and control devices as well as danger points on the side fixing and clamping elements of plate and blanket cylinders shall be safeguarded in accordance with 5.2.1.1.a) of EN 1010-1:2004.

Interlocking with guard locking is required where the opening width of the guard when moving out of its safeguarding position up to the position reached when the position detector is actuated (stopping the machine) is not in compliance with Table 2 (see 5.3.1).

Interlocking with guard locking is also required where the hazardous movement cannot be stopped within at least 10 s of the actuation of the position detector.

5.4.3 As a deviation from 5.4.2, inrunning nips may be guarded according to 5.2.1.1 b) of EN 1010-1:2004 on smooth cylinders and rollers, on knurled rollers and on cylinders and rollers with cut-outs or elevations in the radial direction of 4 mm maximum and with axial gaps in the circumferential direction of 8 mm maximum, without sharp or cutting edges (see Figure 2). Cylinder gaps shall be as small as possible.

This kind of safeguarding may also be used for newspaper offset printing presses (see Figure 8) with cylinder gaps of up to 19 mm. Efforts shall be made to limit cylinder gaps to 12 mm.

As a deviation from EN 1010-1:2004, the clearance between cylinder or roller and guard should be 4 mm maximum. Where the 4 mm clearance is not applicable on account of the format size (deflection of guards) or not technically feasible due to the impression ON and OFF movements of the cylinders or rollers, the clearance may be 6 mm.

5.4.4 After opening interlocking guards, the machine shall only be started under hold-to-run control in accordance with 5.2.3.2.a) of EN 1010-1:2004 unless all danger points are safeguarded by trip devices or guards according to 5.4.3. All danger points shall be within the view of the operator actuating the hold-to-run device.

Inrunning nips which are not in the view of the operators holding the hold-to-run controls depressed shall be safeguarded by the following measures:

- a guard in accordance with 5.2.1.1.b) of EN 1010-1:2004 or
- a sweep-on nip bar on the delivery side between the two blanket cylinders of a rotary offset printing press with electrical interlocking provided between the position of the nip bar and the backward motion.

On machines with varying web paths, where such measures for safeguarding the inrunning nip existing between blanket cylinders during the reverse movement are not feasible, the following measures are allowed for safeguarding the reverse movement under hold-to-run control:

- hold-to-run speed not exceeding 3 m/min and
- maximum movement of 1,2 cylinder revolutions and
- a stop control element with mechanical latch or an emergency stopping device in the immediate vicinity of the inrunning nip and
- a modified audible warning signal and
- a red flashing light that can be seen during the signal and release time and a red permanent warning light during operating time of the hold-to-run control as warning signal in the immediate vicinity of any inrunning nip that cannot be overlooked.

5.4.5 Powered movable guards shall not create danger points. In order to achieve this, the forces applied by the guard shall be restricted to:

a) 50 N maximum for sharp-edged parts;

b) 150 N maximum for flat parts.

5.4.6 Actuators shall comply with 5.2.7.1 of EN 1010-1:2004. Hold-to-run controls for forward and backward movement shall be designed such that erroneous actuation is prevented. This can be achieved, for example, by shrouding the "backward" control button or by using different surfaces.

5.4.7 The control system of the machine shall comply with 5.2.6.1 of EN 1010-1:2004.

5.4.8 Closing the interlocking guard on inking, damping or varnishing devices may initiate the rotation of damping or varnish ductor rollers or dosing rollers if it is ensured that at this time no danger points can be accessed. This also applies to ink ductor rollers on flexo printing presses. Closing the interlocking guard shall not cause the printing press to restart its operation.

Restarting the ink, varnish or damping ductor roller may be necessary in order to prevent malfunctions due to dried-up varnish, damping agents or ink on flexo printing units. Separate drives may be provided for ductor rollers and dosing rollers.

5.4.9 Emergency stop buttons shall be provided in the area of the unwinding unit, on each printing and varnishing unit where press motion controls are located, in the area of the folding unit, the sheeting unit and the cutting unit. Actuation of an emergency stop button shall not cause stopping of the ink, damping and varnish ductor roller and dosing rollers where their movement (rotation) is required for operational reasons and if all danger points are safeguarded, i. e.

- inrunning nips on the ink duct roller even with the ink fountain swung down are not accessible or
- all inrunning nips on the damping and the varnish ductor roller and the dosing roller are safeguarded by interlocking guards, possibly in combination with fixed guards.

Reference shall be made in the instruction handbook (see 7.1.3.2).

5.4.10 Automatic format setting operations may be carried out without additional safety measures up to a setting speed of 0,5 m/min, however, if there is no crushing hazard to the head or the trunk of the body. Otherwise, format setting shall only be possible under hold-to-run control. The location of the hold-to-run control shall allow the operator to overlook the danger points.

Additional safety measures are:

- fixed or interlocking guards;
- trip devices;
- safety distances in accordance with EN 294:1992 and minimum distances in accordance with EN 349:1993;
- force limitation.

In the turner bar area of the format setting device, a separate emergency stop device may be provided which will cause the automatic movement of the turner bars to stop. Stop buttons shall be identified as such.

5.4.11 Where heavy machine parts with a lifting load of at least 25 kg per person need to be installed and removed regularly for operational reasons, appropriate load lifting devices shall be supplied. Heavy machine parts are, for example, screen rolls and form cylinders. Lifting devices may even be required for lower loads if unfavourable body postures make lifting more difficult.

For reference in the instruction handbook, see 7.1.3.1.

5.4.12 Carriages for transporting cylinders shall be resistant against tilt and be secured against unintended travel (see 5.2.13.2 of EN 1010-1:2004). Where- carriages are moved manually, handles shall be provided.

Cylinders on the carriage shall be secured against falling by means of

- securing supports or
- safety stirrups.

When dismantling form cylinders, carriage travel beyond the deadend position shall be safely prevented by mechanical stops.

5.4.13 Where transport carriages are driven automatically and cylinders handled automatically, the danger points between fixed and movable parts shall be safeguarded by one of the following measures:

- trip devices and/or ESPDs;
- hold-to-run control as defined in 5.2.3.2 of EN 1010-1:2004 where danger points are within the operator's view from the location of the hold-to-run control;
- safeguarding the danger zone as described in 5.2.3.5 of EN 1010-1:2004.

5.4.14 On folding units, where access is required in the start-up phase of a production run for operational reasons (for example, for removing waste sheets), it is permitted for printing speeds up to 8 m/min to open the interlocking guard for a duration of 15 s maximum without stopping the machine as long as a hold-to-run button mounted close to the guard is held depressed. When releasing the hold-to-run button whilst the guard is still open, the hazardous movement shall be stopped with the shortest possible stopping path. This principle may also be applied to several guards on the condition that each is related to a separate hold-to-run button which is held depressed.

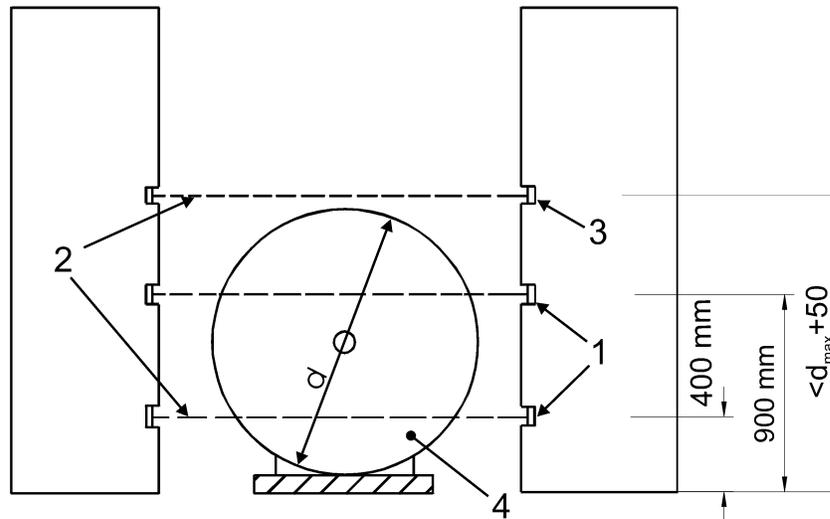
Signal processing of the button, the reduced printing speed and the time limitation shall comply with 5.2.6.1.1 of prEN 1010-2:2003.

5.4.15 If the requirements of EN 294:1992 cannot be met on web-fed rotary presses in the area where the web is fed into individual print units, a safety distance of 200 mm shall be observed for gaps with a width of more than 20 mm and less than 30 mm.

5.4.16 If web material runs over passageways, the height of passage shall be at least 2 m. If this is not possible for spatial reasons and there is a risk of injury to face and neck, web edges shall be safeguarded by a guard with black/yellow marking.

5.4.17 Where ESPDs in accordance with 5.3.5.11 of EN 1010-1:2004 are used for safeguarding the automatic reel loading area on unwinding units, the device may be muted (for muting see EN 61496-1:1997) while material reels or containers with unwound cores are transported through the area safeguarded by the ESPD on the following conditions:

- an additional ESPD (see Figure 9, item 3) is provided at a height of not more than 50 mm of the largest reel diameter that will cause immediate stopping of all hazardous movements on the unwinding unit whenever the beam of the ESPD is interrupted during insertion of the material reel or removal of unwound cores, caused, for example, by persons accessing the danger area (see Figure 9) and
- emergency stop controls shall be provided within easy reach on the unwinding unit that will also stop the automatic loading operation.

**Key**

- 1 ESPD
- 2 ESPD light beams
- 3 Additional ESPD
- 4 Reel

Figure 9 — Unwinding unit, automatic loading

5.4.18 On forms printing presses, starting the machine with guards open by two-hand control shall be possible with a speed higher than 10 m/min where this is required for production reasons and the following requirements are fulfilled:

- interlocking in according with 5.2.3.6 of EN 1010-1:2004;
- selector switch for this kind of operation;
- hold-to-run speed as low as possible under production circumstances.

For reference in the instruction handbook, see 7.1.3.3.

5.4.19 Rollers rotating the same direction do not create a hazardous inrunning nip if the rollers have the same surface characteristics and circumferential speeds (see Figure 10). Inrunning nips existing between the guide roller and fixed parts of the machine shall be safeguarded in accordance with 5.2.1.1 of EN 1010-1:2004.

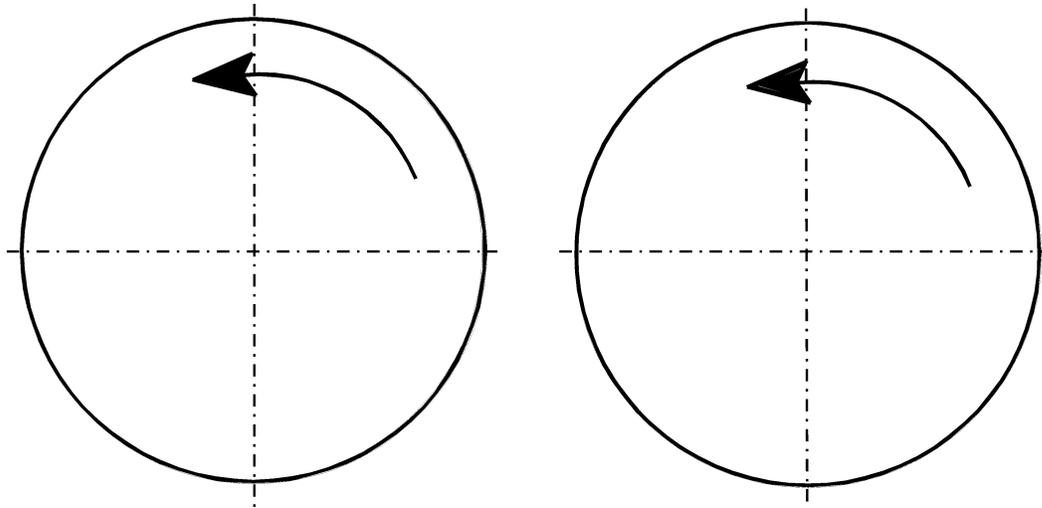


Figure 10 — Rollers with same direction of rotation

5.4.20 Exhaust fans for the removal of paper dust shall be fitted on the "clean" side, i. e. following the dust separator. A warning signal shall be provided to indicate the need for removal of the dust collector bin.

5.4.21 For digital presses for printing on web-type substrates, 5.3.15 to 5.3.17 similarly apply.

5.4.22 Requirements for platforms, passageways and catwalks shall comply with 5.2.12 of EN 1010-1:2004.

5.4.23 The usable width of machine catwalks shall be at least 0,6 m. For catwalks fitted at a height of more than 0,3 m, adequate means of access shall be provided.

Where the difference in height does not exceed 1,6 m, a toe board is not required if

- the respective level is not required for taking up any auxiliary means that are required for production reasons and
- operational intervention below that level is not required during the intended use.

In such cases, the intermediate rail shall be centred between the hand rail and the platform floor.

5.4.24 On stairs with several flights, the platform shall be at least 800 mm long. Where this is not possible due to spatial restrictions in old buildings at the user's site, it may be reduced to 600 mm as a minimum.

5.4.25 For access to infrequently used workplaces where access by means of stairs or stepladders is not possible, a fixed ladder may be used in accordance with 4.4.1.1 and 4.4.1.2 of EN ISO 14122-4:2004 if the access height does not exceed 2 m.

Such workplaces may dispense with toe boards and intermediate rails if they are located in front of, between or behind printing unit towers.

Hand rails shall be designed such that they can be swept to the inside or upwards in order to allow free access/exit.

5.4.26 Where a passage height of 2 m cannot be provided for spatial reasons, the protruding parts shall be padded and provided with a danger marking.

5.4.27 Mobile, hand-operated platforms provided between stationary machine units do not require any fall-off protection on the machine side if the clear distance between machine and platform does not exceed 200 mm

(see Figure 11). For platforms with a height of more than 1,5 m where the distance exceeds 70 mm, toe boards shall be provided as minimum protection.

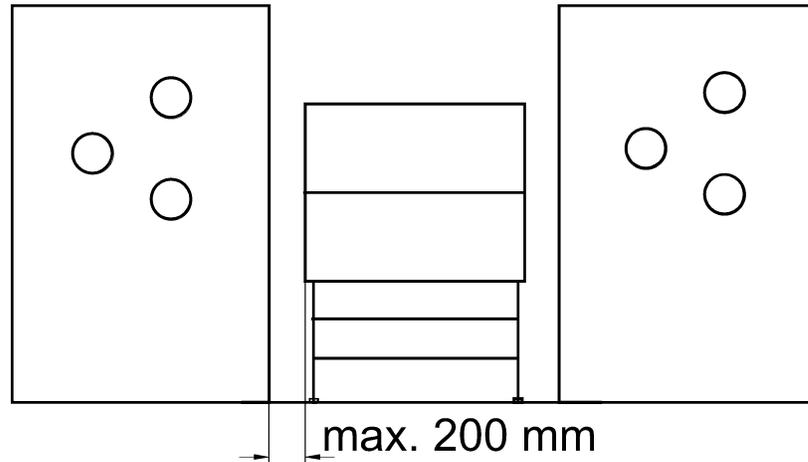


Figure 11 — Mobile platform

5.5 Screen printing presses

5.5.1 As a deviation from 5.2.4.2 of EN 1010-1:2004, explosion prevention and protection measures on screen printing presses are not required even when screen printing inks with a flash point of 40 °C to 55 °C are being used. The necessity to provide adequate air ventilation in the working area shall be pointed out in the instruction handbook (see 7.1.4.1).

Where the intended use of a machine allows the use of screen printing inks with a flash point below 40 °C, see 5.2.4 of EN 1010-1:2003.

Where the intended use of a machine allows the use of screen printing inks with a flash point below 40°C, see 5.2.4 of EN 1010-1:2004.

For reference in the instruction handbook, see 7.1.4.1

5.5.2 The crushing point between the printing unit and machine frame (table) or printing basis shall be safeguarded (see Figure 12). This can be done by:

a) Trip devices

Trip devices shall be arranged such that their operation is positively ensured each time the gap between screen printing frame and machine table is accessed. Hazardous reaching over the bar shall be prevented. The force to operate the bar shall be 300 N maximum (dynamic).

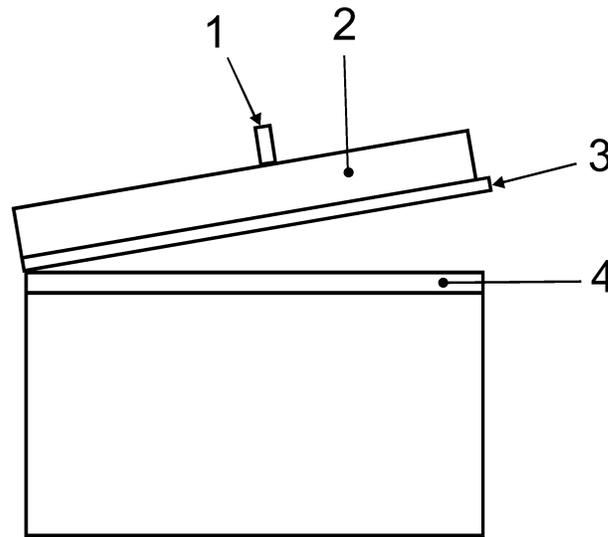
b) ESPDs

The arrangement of ESPDs shall take account of the hand approach speed as defined in EN 999:1998. Such devices shall be arranged so that it is not possible to access the machine between two adjacent beams or to defeat them.

- c) Limiting the closing force of the screen printing frame to a non-hazardous low level. An acceptable level is 300 N maximum, if there are no crushing hazards due to sharp edges.
- d) Fixed guards

Fixed guards can be provided, for example, on that side of the machine where access for feeding and ink replenishment is not required. EN 294:1992 shall be complied with.

Residual risks caused by the absence of the screen or when using smaller screens shall be described in the instruction handbook (see 7.1.4.5).



Key

- 1 Doctor blade
- 2 Screen printing frame
- 3 Trip device
- 4 Table

Figure 12 — Screen printing press (semi-automatic, with hinged printing unit)

5.5.3 On screen printing presses with a short stroke of the printing unit, additional safeguarding is required for the crushing, shearing and impact points created by the movable feeding table and the gripper system.

For safeguarding the impact hazard caused by the movable printing table, one of the following measures is required:

- interlocking device (for example nip bar) to prevent access to the danger zone (area of travel of the feeding table). The interlocking device shall be positioned such that it is easily disengaged when the table recedes into the final position. A distance of 120 mm minimum shall remain between table and bar;
- trip bar on the front of the movable printing basis, designed in such a way that the displacement is more than the stopping path of the printing basis;
- pressure-sensitive mats preventing or safeguarding presence in or access to the danger zone.

Crushing and shearing hazards between the machine frame and the printing table shall be safeguarded by one of the following measures:

- overlapping of printing table and machine frame;
- lining plate covers to prevent access (minimum distance between plate cover and lower edge of printing table of 6 mm maximum);
- minimum distances in accordance with EN 349:1993.

Crushing and shearing hazards between moving gripper elements and fixed machine parts shall be safeguarded by one of the following measures:

- minimum distances in accordance with EN 349:1993;
- guards;
- limitation of forces acting on movable parts of 150 N maximum.

5.5.4 The crushing point between doctor blade and screen printing frame shall be safeguarded. This can be done by adjusting the stop gauge such that a minimum distance of 25 mm between doctor blade and screen frame is ensured. Where various sizes of screen frames are used, the instruction handbook shall give advice on the proper adjustment of stop gauges (see 7.1.4.3).

5.5.5 Crushing hazards caused by the movement of the doctor blade shall be safeguarded. This can be done by using the safety distances defined in EN 294:1992 between doctor blade and fixed parts of the printing press. Where the descending doctor blade causes crushing points between doctor blade and printing table or printing cylinder respectively and where such crushing points cannot be safeguarded for operational reasons, the instruction handbook shall contain a warning of the residual risk existing, for example, when replenishing ink (see 7.1.4.4). The lifting path of the doctor blade shall be as short as possible.

The crushing point between doctor blade and printing table or printing cylinder on screen printing presses can generally not be safeguarded if ink replenishing is to be done manually.

5.5.6 Where access between screen printing frame and machine frame is required (for example, for cleaning the screen) a control element shall be provided in addition to the measures described under 5.5.2 which, when actuated, prevents unintended start-up of the machine.

The instruction handbook shall indicate that the control element shall be actuated before starting cleaning operations (see 7.1.4.2).

5.5.7 Automatic feeding and delivery systems on screen printing presses shall comply with the requirements of 5.3.4 of EN 1010-1:2004.

5.5.8 On cylinder screen printing presses, safeguarding is required for the crushing point between the movable screen frame and fixed machine parts (see Figure 13). This can be achieved by:

- minimum distances in accordance with EN 349:1993 or
- interlocking guards or
- ESPDs.

ESPDs shall be provided over the entire machine length (without feeding and delivery) on the drive as well as on the operating side. EN 999:1998 shall be complied with. The ESPD light beams shall be arranged such that reaching through, over and around is prevented. EN 294:1992 shall be complied with. For ink replenishment during production runs, time-limited muting (2 min maximum) of the ESPD shall be allowed (for muting, see EN 61496-1).

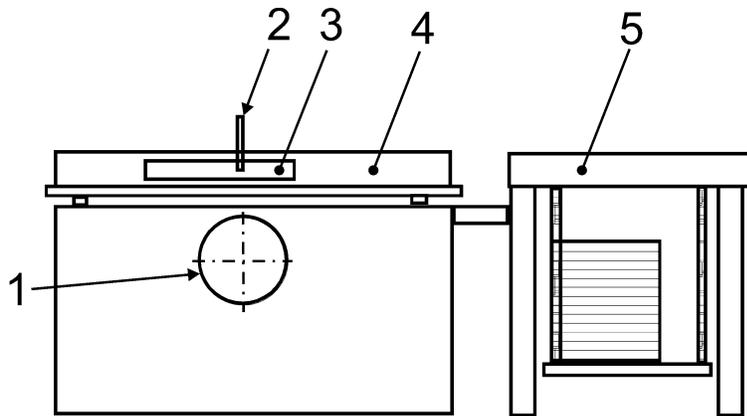
The residual risks existing when muting the ESPD shall be indicated in the instruction handbook (see 7.1.4.6).

5.5.9 On cylinder screen printing presses, the inrunning nip on the printing cylinder shall be safeguarded. This can be achieved by:

- interlocking guards or
- guarding by the printing form (screen).

Where the printing form is used as means of guarding, additional measures are required, for example, for lifting and removal of the printing form. Such additional measures can be electrical interlocking which allows cylinder rotations only under hold-to-run control according to 5.2.3.2 of EN 1010-1:2004 as long as the printing form is lifted.

5.5.10 The safety-related parts of the control system shall comply with at least 5.2.6.1 of EN 1010-1:2004. Trip devices shall comply with 5.2.10.1, sentence 1 and 2, and 5.2.10.2 of EN 1010-1:2004. Emergency stopping devices shall be on each operating position.



Key

- 1 Printing cylinder
- 2 Doctor blade
- 3 Screen frame
- 4 Fixed machine parts
- 5 Sheet feeder

Figure 13 — Cylinder screen printing press

5.5.11 As a deviation from 5.5.10, the following requirements shall be satisfied on screen printing presses where substrates are fed manually between printing form and printing table:

- 5.2.6.2 of EN 1010-1:2004 shall be satisfied for those of the safety-related parts of the control system that relate to the closing movement of screen frame and printing table;
- trip devices shall satisfy category 4 of EN 954-1:1996 in addition to the requirements in 5.5.8;
- ESPDs shall comply with 5.2.9.2 of EN 1010-1:2004.

Manual feeding of the substrate between printing form and printing table is used on several types of semi- and three-quarter automatic screen printing presses.

5.6 Auxiliary devices for printing and varnishing machines

5.6.1 General

Auxiliary devices that are built into printing and varnishing machines and prevent access to danger points in the built-in position shall be fitted so that they can be removed only by means of tools. However, where such devices are to be removed frequently or for make-ready (see 5.2.2.3 of EN 1010-1:2004), the guarding position of the device shall be electrically interlocked with any hazardous movement by means of position switches according to EN 1088.

NOTE Auxiliary devices preventing access to danger points in their built-in position can, for example, be continuous-flow drying devices on the delivery side of sheet offset printing presses where drying modules are inserted into the printing press from the side which, when removed, allow access to danger points on the sheet gripper system.

Where machines are also used without auxiliary devices, alternative safety devices shall be supplied by the manufacturer which shall be fitted in the absence of the auxiliary devices.

Where auxiliary devices are built into printing and varnishing machines, the buttons of the emergency stop controls of the printing and varnishing machine shall act upon the auxiliary device. Where provided, emergency stop controls on auxiliary devices shall stop the hazardous motion of the printing and varnishing machine.

As a deviation from 5.2.5.2 of EN 1010-1:2004, auxiliary devices for printing and varnishing machines may be equipped with supply disconnecting devices according to 5.3.2 d) or e) of EN 60204-1:1997.

The safety-related parts of the control system shall comply with at least 5.2.6.1 of EN 1010-1:2004. Trip devices shall comply with 5.2.10.1, sentence 1 and 2, and 5.2.10.2 of EN 1010-1:2004. Emergency stopping devices shall be provided at each operating position from which hazardous movements can be started.

5.6.2 Cylinder and roller washing devices

5.6.2.1 Where automatic cylinder and roller washing devices are fitted into printing presses, explosion prevention and protection measures otherwise required due to the washing solvent being used shall not be implemented because explosive concentrations cannot build up when spraying the solvent, if

— the flash point of the washing solvent is at least 55 °C and no mist occurs

or

— the flash point of the washing solvent is at least 40 °C and the amount of washing solvent used does not exceed 0,08 l per printing unit and washing cycle.

The instruction handbook shall indicate the importance of correct adjustment of washing parameters and the residual hazard (see 7.1.5.1).

5.6.2.2 It shall be possible to adjust washing equipment in such a way as to make sure that solvent vapours are prevented, thus avoiding contact and inhaling of solvent vapours.

The instruction handbook shall indicate the importance of correct adjustment of washing parameters and the residual hazard (see 7.1.5.1).

5.6.2.3 Safe replenishing of the washing agent in the tank shall be ensured. This requirement is satisfied if washing agent tanks are designed such as to allow one person handling the equipment properly to replenish the washing agent without the hazard of spilling or overflowing. Tank overflow when replenishing the washing agent can be avoided by providing the possibility of checking the filling level (tank full indicators, inspection glasses, adequate openings for filling).

5.6.2.4 Where washing devices are disconnectable by the user, the lines for supplying the washing agent that are to be shut off during removal shall be safeguarded against leakage of washing agents. This requirement is satisfied by providing self-locking hose couplings.

5.6.3 Continuous-flow drying devices

5.6.3.1 Where continuous-flow drying devices are fitted on printing presses together with automatic cylinder and roller washing devices, any risk of explosion when solvent vapours and mists set free during the washing process are heated up by the drying unit shall be avoided. This requirement is fulfilled

- where the design of the continuous-flow drying unit takes account of the solvent vapours and mists in accordance with 5.7.2 of EN 1539:2000 or
- by interlocking the washing and the drying devices so as to allow starting of the washing operation only if the dryer temperature is at a non-hazardous degree and to prevent starting of the drying device until there is no risk of explosion of the flammable solvent vapours or
- by sealing the feeding openings of the drying device in order to prevent solvent vapours from penetrating into the dryer or
- by providing, in accordance with 6.2.3.3 of EN 1127-1:1997, an exhaust in compliance with 5.2.4.5, 5.2.4.8, 5.2.4.11 and 5.2.6.1.1 of EN 1010-1:2004, which dilutes the vapour/air mixture below 50 % LEL, thus reducing the risk of explosion.

5.6.3.2 Where continuous-flow drying devices are fitted on printing presses together with automatic cylinder and roller washing devices, any risk of ignition due to leakage of the solvent in the washing device being heated up shall be avoided. This requirement is fulfilled if

- leakages according to 6.2.3.2 of EN 1127-1:1997 are avoided by providing hosing and connections of adequate endurance

or

- washing devices and hosing are positioned so that, if leakages occur, the solvent cannot reach the continuous flow drying device.

Hosing and connections of adequate endurance are, for example, permanently fitted, adequately dimensioned pipes of a material that is suitable for the solvent used.

The instruction handbook shall indicate that solvents shall be prevented from penetrating into the dryer area (see 7.1.6.2).

5.6.3.3 Continuous-flow drying devices built into printing and varnishing machines where flammable substances are set free during the drying and/or curing process of the ink or varnish shall satisfy the requirements 5.7.2 of EN 1539:2000. Emission of flammable substances, for example, shall not be expected where inks and/or varnishes are used for which the safety data sheet indicates that the explosion limit is "not applicable". Where the use of such inks and/or varnishes is required in order to comply with the requirements stated, this shall be indicated in the instruction handbook (see 7.1.6.1).

Emission of flammable substances from solvents in the ink during the drying process may, for example, be expected on gravure and screen printing presses, solvent-based flexo printing presses and heat set dryers. This will, however, not be the case when using commercial offset printing inks (for example, cold set inks) which are absorbed by the substrate.

5.6.3.4 On continuous-flow drying devices, any hazards from emission of flammable substances shall be avoided that are caused by the substrate transporting solvents out of the automatic cylinder and roller washing device.

This requirement is satisfied on a sheet-fed printing press by electrically interlocking the cylinder and/or roller washing device with the paper transport system so that paper transport during the washing process is prevented and can be restarted only after the cylinders are sufficiently dry.

On web-fed rotary printing presses with integrated continuous-flow drying devices where washing takes place with the web in the machine, blanket washing and/or other operations in which there is a controlled input, higher than normal operation input, of releasable flammable substances into the dryer/oven shall only be carried out where the forced-ventilation flow rate (exhaust flow rate) has been correctly adjusted to suit the maximum admissible concentration prior to the controlled input, higher than normal operation input existing (see 5.7.2.1.1 of EN 1539:2000).

5.6.3.5 Ignition of the substrate by the continuous-flow drying device shall be prevented. This can be achieved by reducing the dryer performance when the printing process is stopped and by ensuring that the substrate (for example, sheets) is adequately separated from the radiation source by air blades or deflectors.

5.6.3.6 The surface temperature of those parts of continuous-flow drying devices where access is possible from the outside shall not exceed the limit values in accordance with 5.2.14 of EN 1010-1:2004. Those parts of continuous-flow drying devices which are accessible after opening the interlocking device and where temperatures are in excess of limit temperatures shall be provided with a danger warning.

5.6.3.7 On UV continuous-flow drying devices, any hazards caused by the emission of UV radiation shall be prevented by satisfying the requirements of 5.2.16.2 of EN 1010-1:2004. In the sheet delivery area of sheet-fed printing presses, a maximum exposure time t_{exp} of 4 hours shall be taken as a basis for the calculation.

5.6.3.8 On UV continuous-flow drying devices, any hazards caused by the generation of ozone shall be prevented. This can be achieved by using devices with low ozone radiation or by providing exhaust systems. Such exhaust systems shall be designed such that they act on the source of radiation as directly as possible. UV lamps shall be operated only when the exhaust system is switched on.

The function of the exhaust system shall be monitored, i.e. failures in the exhaust system shall cause automatic stopping of the substrate feeding system (for example, feeders on sheet-fed printing presses) or printing shall be stopped (for example, on web-fed rotary printing presses). It shall be ensured that the drying device stops automatically after the drying of the substrate (for example, the last sheet) is finished. The control system for monitoring the function of the exhaust system shall satisfy at least category 1 of EN 954-1:1996.

5.6.3.9 On printing presses fitted with UV drying systems, hazards from ink mists shall be excluded in normal use. Where this is not possible, technical measures shall be provided such as ink mist exhaust systems.

For reference in the instruction handbook, see 7.1.6.3

NOTE The creation of ink mists depends on the properties of the printing ink used.

5.6.4 Powder spraying devices

Where print powder is dusted on, safe replenishing of the print powder during the printing process shall be ensured. This is achieved by locating the filling aperture such that danger points in the machine cannot be reached.

5.6.5 Auxiliary devices on inking and damping units

5.6.5.1 Alcohol-dosing devices as auxiliary devices on damping units shall be equipped with facilities to allow the user to limit the concentration of alcohol in the damping water to the percentage required for the printing process. Additional explosion prevention and protection measures in the dosing equipment and printing press area are not required if the dosing device is equipped such that maximum 15 % Vol. alcohol in the damping water cannot be exceeded under normal operating conditions. Any electric/electronic systems to control the maximum alcohol concentration in the damping water shall satisfy the requirements of 5.2.6.1 of

EN 1010-1:2004. It shall be ensured that, even in case of malfunction of the control system, the concentration of alcohol in the damping water does not exceed 20 % Vol.

5.6.5.2 On alcohol-dosing devices, leakage and overflow of concentrated alcohol into non-explosion-proof areas shall be prevented by adequate measures such as collecting tanks or by means of draining it into the damping water. Equipment, protective systems and components set up in areas that can be reached by concentrated alcohol in the case of leakage or overflow shall satisfy the requirements of 5.2.4.5, 5.2.4.8, 5.2.4.9 and 5.2.4.11 of EN 1010-1:2004. When setting up alcohol tanks, it shall be ensured that the tank cannot fall and the tank and hoses connecting the tank to the dosing device are safeguarded against damage. Where appropriate facilities for setting-up the tank cannot be supplied because of user-specific tanks being used on site, the instruction handbook shall contain instructions for the proper setting-up of tanks. Alcohol tanks are safeguarded against falling by placing them in closed cabinets.

The instruction handbook shall indicate that leaked alcohol shall be cleaned up immediately due to the risk of explosion (see 7.1.7.1). It shall also give information about the health risk involved from inhaling alcohol vapours (see 7.1.7.2).

5.6.5.3 Refrigerating devices of auxiliary devices in ink and damping units shall comply with EN 378-1:2000.

5.6.6 Plate clamping devices

Movements of automatic plate clamping devices shall be safeguarded. This can be achieved by one of the following measures:

- fixed or interlocking guards in accordance with 5.2.1.1.a) of EN 1010-1:2004;
- trip devices in accordance with 5.2.10 of EN 1010-1:2004;
- ESPDs in accordance with 5.2.9.1 of EN 1010-1:2004;
- limiting the operating force to a non-hazardous level;
- limiting the maximum clearance between movable and fixed parts to 4 mm maximum (see 5.2.1.3 of EN 1010-1:2004).

5.6.7 Washing equipment for printing forms, rollers and doctor blades

5.6.7.1 On external washing equipment for printing forms, rollers and doctor blades, hazards to operating personnel due to emission of washing agents shall be prevented. This can be done by one or several of the following measures:

- using non-hazardous washing agents as far as possible. Respective warnings shall be given in the instruction handbook;
- closed-type washing equipment;
- providing interlocking with guard locking for the charging doors so that the doors can be opened only after the drying process is finished;
- exhausting washing agent vapours.

Hazards to operating personnel are caused, for example, by hazardous substances and by potentially explosive atmospheres.

5.6.7.2 Where solvents with a flash point below 55 °C are used on external washing equipment for printing forms, rollers and doctor blades, and where explosion hazards exist due to spraying of the washing

agent, all parts inside the washing device shall be conductive and electrostatically grounded (resistance less than $10^6 \Omega$).

Where washing equipment can only operate with solvents above 55°C, this shall be indicated in the instruction handbook (see 7.1.8).

5.6.7.3 Where solvents with a flash point below 55°C are used on external washing equipment for printing forms, rollers and doctor blades, hazards from unintended escape of solvents, for example leakage or during pumping, shall be prevented in accordance with 6.2.3.3 of EN 1127-1:1997. Penetration into non-explosion-proof areas can be prevented by using catch tanks of adequate size.

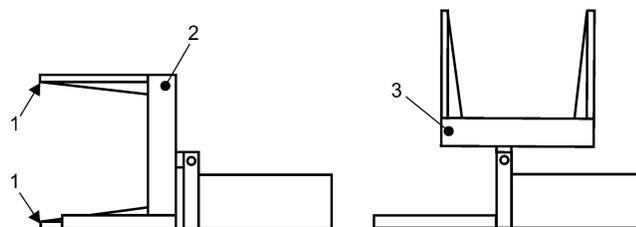
5.6.8 Pile turners

5.6.8.1 On pile turners (see Figure 14), the crushing point between floor and load lifting member (lifting fork, pile carrier plate, pallet) or paper pile shall be safeguarded.

- Where hold-to-run control is being adopted as safety measure, pile descent shall only be done in the hold-to-run control mode with a speed of 5 m/min maximum. Unintended access to the danger zone shall be prevented by providing a sufficient distance between hold-to-run control and load lifting member or by providing a foot guard. The danger point shall be in the operator's view from the location of the hold-to-run control. Danger points on the far side of the paper pile are considered to be in the operator's view if the pile height including load lifting member does not exceed 1,4 m in the lowest position.
- ESPDs used for safeguarding a danger zone with crushing points between floor and load lifting member shall satisfy the requirements of 5.2.9.1 and 5.2.9.4 of EN 1010-1:2004. Hand approach speeds according to EN 999:1998 shall not be taken into account where the descent speed is not more than 5 m/min.

5.6.8.2 On hydraulic and pneumatic lifting equipment of pile turners, a safety-rated check valve shall be provided directly on the lifting cylinder if there is the possibility of uncontrolled gravity falling or opening of the lifting device in the event of hose breakage or leakage.

5.6.8.3 Lifting devices are allowed to open only with the pile in vertical or horizontal position.



Key

- Pile carrier plate
- Lifting device
- Horizontal position of lifting device

Figure 14 — Pile turner

5.6.8.4 The load lifting device shall be designed and constructed such that it can withstand a static load of 1,25 times the maximum load capacity without permanent deformations or apparent defects. It shall be able to withstand a dynamic test with 1,1 times the maximum load under normal operating conditions. On pile lifting and lowering devices, the breaking strength of steel sprocket chains shall be at least 4 times the admissible static load. The maximum admissible load shall be indicated on the machine and in the instruction handbook (see 7.1.9).

5.6.8.5 On pile turners which are not operated exclusively in the hold-to-run control mode, an emergency stop button shall be provided on each operator control station.

5.6.9 Measuring and control devices

Crushing and shearing points between movable and fixed parts of control and measuring devices on printing and varnishing machines shall be safeguarded. This can be achieved by

- safety distances in accordance with EN 349:1993 or
- limiting the operating force to a non-hazardous level or
- ESPDs in accordance with 5.2.9.1 of EN 1010-1:2004 or
- guards in accordance with 5.2.1.1 b) of EN 1010-1:2004.

6 Verification of safety requirements and/or measures

Table 4 describes methods used to verify if the safety requirements and measures described in Clause 5 are complied with. It also contains references to the respective clauses of this standard.

Table 4 — Methods used to verify safety requirements and measures

Clause	Safety requirements and/or measures	A ^a	B ^b	C ^c	D ^d
5.1 General					
5.2 Pre-press machinery					
5.2.1	Requirements for electrical equipment	x	x		
5.2.2	Requirements for electrical/electronic control systems	x	x		x
5.2.3	Requirements for safety screens on exposing equipment	x	x		
5.2.4	Limit values for UV exposing equipment		x	x	
5.2.5	Limit values for laser exposing equipment		x	x	
5.2.6	Appropriate facilities for safe charging and discharging of developing and fixing liquid and arabic gum liquids	x	x		
5.2.7	Prevention of inhaling or contact with hazardous substances	x	x		
5.2.8	Safeguarding of inrunning nips on cylinders and rollers	x	x	x	
5.2.9	Safeguarding of inrunning nips on engraving machines for gravure cylinders	x	x	x	
5.2.10	Reference to residual risks from swarf				
5.2.11	Safeguarding of movements of form bending unit	x	x		
5.2.12	Safeguarding of movement of punching tool of printing forms punching device	x	x	x	
5.3 Sheet-fed printing presses and varnishing machines					
5.3.1	Safeguarding of inrunning nips, shearing and crushing points on sheet gripper elements, transport system, control systems	x	x		
5.3.2	Safeguarding of cylinder inrunning nips during cleaning and make-ready	x	x	x	
5.3.3	Control requirements	x	x		x
5.3.4	Safeguarding on damping and varnishing units	x	x		
5.3.5	Effect of emergency stopping on inking, damping and varnishing units	x	x		
5.3.6	Prevention of erroneous actuation of hold-to-run controls for forward and backward movement	x	x		
5.3.7	Requirements for steps	x	x	x	
5.3.8	Safeguarding sheet gripper system	x	x		
5.3.9	Safeguarding of access to the delivery	x	x	x	
5.3.9.1.1	Safeguarding by light beams	x	x	x	x
5.3.9.1.2	Requirements for bypassing	x	x	x	x

Table 4 (continued)

Clause	Safety requirements and/or measures	A ^a	B ^b	C ^c	D ^d
5.3.9.1.3	Bypassing indicators	x	x		
5.3.9.1.4	Measures for several levels of access	x	x		
5.3.9.2	Safeguarding by other measures				
5.3.10	Safeguarding the area below pile carrier plate for deliveries higher than 800 mm	x	x	x	
5.3.11	Safeguarding of crushing point between pile carriage and floor on deliveries	x	x	x	
5.3.12	Maximum width of material feeding aperture for board and metal plate printing	x	x	x	
5.3.13	Requirements for automatic format setting devices	x	x	x	
5.3.14	Safeguarding danger points on pile changing devices	x	x		
5.3.15	Appropriate load lifting devices for heavy machine parts			x	
5.3.16	Requirements for powered movable guards	x	x	x	
5.3.17	Safeguarding the inrunning nip between the movable upper unit and the fixed lower unit on offset proofing press	x	x	x	
5.3.18	Limit values for laser radiation			x	
5.3.19	Protection from printing powders	x	x	x	
5.3.20	Requirements for working platforms, access stairs, passageways, catwalks	x		x	
5.3.21	Maximum height of steps/steps in stairs	x	x	x	
5.3.22	Requirements for walk-on plates of platforms				
5.3.23	Padding with danger warning on passageways	x		x	
5.4 Web-fed rotary printing presses					
5.4.2	Safeguarding of inrunning nips on rollers and cylinders, crushing and shearing points	x	x	x	
5.4.3	Safeguarding of inrunning nips on smooth cylinders	x	x	x	
5.4.4	Requirements for hold-to-run control with guards open	x	x	x	
5.4.5	Requirements for powered movable guards	x	x		
5.4.6	Prevention of erroneous actuation of hold-to-run controls for forward and backward movement	x	x		
5.4.7	Control requirements	x	x		
5.4.8	Guards on ink, damping and varnishing units	x	x		
5.4.9	Effects of emergency stopping on ink, damping and varnishing units	x	x	x	
5.4.10	Requirements for automatic format setting	x	x	x	
5.4.11	Appropriate load lifting devices for heavy machine parts	x	x		
5.4.12	Requirements for cylinder transport carriages	x	x		
5.4.13	Requirements for automatic travel of transport carriages	x	x	x	
5.4.14	Requirements for hold-to-run operation of folder	x	x	x	

Table 4 (continued)

Clause	Safety requirements and/or measures	A ^a	B ^b	C ^c	D ^d
5.4.15	Maximum opening width and safety distance on material feed	x	x	x	
5.4.16	Safeguarding of material web edges in passageways	x	x	x	
5.4.17	Safeguarding of automatic loading of reel unwind	x	x	x	
5.4.18	Requirements for hold-to-run operation on form printing presses	x	x		
5.4.19	Safeguarding of inrunning nips between rollers and fixed machine parts	x	x	x	
5.4.20	Requirements for exhaust fans and dust separators	x	x		
5.4.21	Requirements for digital printing presses	x	x	x	
5.4.22	Requirements for working platforms, passageways, catwalks	x	x	x	
5.4.23	Requirements for machine catwalks	x		x	
5.4.24	Minimum platform length for stairs with several flights	x		x	
5.4.25	Maximum step height for stairs	x		x	
5.4.26	Padding and danger marking in passageways	x	x	x	
5.4.27	Requirements for movable platforms	x	x	x	
5.5 Screen printing presses					
5.5.1	Explosion prevention and protection	x		x	
5.5.2	Safeguarding of crushing point between screen frame/printing table	x	x	x ^e	x
5.5.3	Safeguarding of danger points on movable feed table and gripper elements	x	x	X	
5.5.4	Safeguarding of crushing point between doctor blade/screen frame	x	x	X	
5.5.5	Safeguarding danger points due to movement of doctor blades	x	x	X	
5.5.6	Prevention of unintended start-up	x	x		
5.5.7	Requirements for automatic feed and delivery systems	x	x	x	
5.5.8	Safeguarding of crushing point between screen frame and fixed parts of the cylinder screen printing machine	x	x	x	
5.5.9	Safeguarding of inrunning nips on screen cylinder	x	x		
5.5.10	Control requirements	x	x		x
5.5.11	Control requirements for manual feeding between printing form and printing table	x	x		x
5.6 Auxiliary devices for printing and varnishing machines					
	Requirements for devices built into printing and varnishing machines	x	x	x	
5.6.2 Cylinder and roller washing devices					
5.6.2.1	Explosion prevention and protection	x		x	x
5.6.2.2	Avoidance of solvent vapours	x	x		

Table 4 (continued)

Clause	Safety requirements and/or measures	A ^a	B ^b	C ^c	D ^d
5.6.2.3	Adequate design of solvent tanks	x	x		
5.6.2.4	Prevention of unintended emission of solvents	x	x		
5.6.3 Continuous flow drying units					
5.6.3.1	Explosion prevention and protection on cylinder and roller washing devices when heating	x	x	x	
5.6.3.2	Explosion prevention and protection in case of leakage	x	x		
5.6.3.3	Explosion prevention and protection in case of release of flammable substances	x			x
5.6.3.4	Explosion prevention and protection for solvents out of automatic cylinder and roller washing devices being transported on the substrate	x	x		
5.6.3.5	Safeguarding against ignition of the substrate	x	x	x	
5.6.3.6	Measures against contact with the hot parts	x	x	x	
5.6.3.7	Safety measure against UV radiation	x	x	x	
5.6.3.8	Safety measure against hazards from ozone	x	x	x	
5.6.3.9	Elimination of ink fly	x			
5.6.4 Powder spraying devices					
	Safe replenishment of powder	x	x		
5.6.5 Auxiliary devices on inking and damping units					
5.6.5.1	Explosion prevention and protection on dosing equipment	x	x	x	
5.6.5.2	Protection against leakage and overflow	x	x		
5.6.5.3	Requirements for refrigerating devices	x	x		
5.6.6 Plate clamping devices					
	Safeguarding of movements of clamping devices	x	x	x	
5.6.7 Washing equipment for printing forms, rollers and doctor blades					
5.6.7.1	Emission of washing agent	x	x	x	
5.6.7.2	Explosion prevention and protection	x		x	x
5.6.7.3	Safeguarding against leakage hazards	x	x		
5.6.8 Pile turners					
5.6.8.1	Safeguarding of crushing points between load lifting device and floor	x	x	x	
5.6.8.2	Safety check valve on hydraulic and pneumatic lifting devices	x	x		x
5.6.8.3	Safeguarding against opening of the load lifting device	x	x		
5.6.8.4	Requirements for load lifting devices, steel sprocket chain		x	x	
5.6.8.5	Arrangement of emergency stop buttons	x	x		
5.6.9 Measuring and control devices					
	Safeguarding crushing and shearing points	x	x	x	

Table 4 (continued)

Clause	Safety requirements and/or measures	A ^a	B ^b	C ^c	D ^d
	A: Visual inspection, B: Functional test, C: Measuring, D: Checking of drawings and calculations				
a	Inspection is a visual means of checking whether the characteristics and properties of the equipment and components supplied are appropriate for the specific application.				
b	The functional test will show whether the parts in question function in such a way as to satisfy the specific requirements.				
c	Verification by means of measuring instruments is used to check whether the requirements are fulfilled within the specified limits.				
d	Drawings and calculations are used to check whether the design characteristics of the components used satisfy the specific requirements.				
E	Force measurement: Measurement of peak value with a measuring device using a spring constant of 25 N/mm.				

7 Information for use

7.1 Instruction handbook

7.1.1 Pre-press machinery

7.1.1.1 The instruction handbook shall, wherever required, supply instructions for using respective personal protection equipment for adequate guarding against contact with solvent vapours or dust.

7.1.1.2 For engraving machines where the intended use allows engraving of copper cylinders, the instruction handbook shall warn the user of the hazards to skin and eyes caused by contact with copper dust.

Risks of eye injury exist, for example, when rubbing the eyes with hands that have been in contact with copper swarf.

7.1.2 Sheet-fed printing presses and varnishing machines

7.1.2.1 Where heavy machine parts with a lifting load of at least 25 kg per person are to be installed and removed regularly, the instruction handbook shall indicate the need for the user to provide adequate means of lifting and transport.

7.1.2.2 The instruction handbook shall warn the user of residual risks existing when gaining access under the guards in the sheet delivery area (for example, for test sheet removal or for inserting pile wedges).

7.1.2.3 Where ESPDs are used for safeguarding the delivery area, the residual risks shall be described in the instruction handbook. Information shall be given on the following:

- hazards from wilful misuse of bypassing phases;
- movement of persons present behind material;
- intended and unintended use of bypassing functions (upper/lower ESPDs);
- climbing over and under ESPDs;
- enabling/activating the area safeguarded by ESPDs although a person is present in the delivery area.

7.1.2.4 On sheet-fed printing presses which are also used for printing on board or metal sheet, the instruction handbook shall identify the residual risk existing where EN 294:1992 cannot be applied in the feeding area for production reasons.

7.1.2.5 Where actuation of the emergency stop button does not cause stopping of ink, damping and varnish doctor roller, this shall be indicated in the instruction handbook. Instructions shall be given for adequately stopping ink, damping and varnish doctor rollers.

7.1.2.6 On machines using powder inks (toners), where measures to prevent any hazards arising from such inks cannot be taken, the instruction handbook shall indicate that the intended use of the machine is restricted to the use of non-hazardous toner powders.

7.1.3 Web-fed rotary printing presses and varnishing machines

7.1.3.1 Where heavy machine parts with a lifting load of at least 25 kg per person are to be installed and removed regularly, the instruction handbook shall indicate the need for the user to provide adequate means of lifting and transport.

7.1.3.2 Where the operation of an emergency stop device does not cause stopping of the ink damping and varnish doctor roller, this condition shall be indicated in the instruction handbook. Instructions shall also be provided as to how to achieve stopping of the ink, damping and varnish doctor roller.

7.1.3.3 Where production reasons require the forms printing press to be started by two-hand control with interlocking guards open with a speed higher than 10 m/min, the instruction handbook shall contain the following warning:

The person operating the two-hand control shall make sure that there is no second person in the danger area before starting the hold-to-run operation.

7.1.4 Screen printing presses

7.1.4.1 The instruction handbook shall indicate the admissible inks, varnishes, washing liquids and solvents (admissible flash point) and shall also give instructions for adequate ventilation of the working area at the place of installation.

7.1.4.2 Instruction handbooks shall indicate that, before access is allowed between screen printing frame and machine frame (for example, for cleaning the screen), unintended start-up of the machine shall be prevented, for example, by actuation of a selector switch.

7.1.4.3 Where screens of different sizes are being used, the instruction handbook shall contain instructions for adjusting stop gauges so that the minimum distance between doctor blade and screen frame is 25 mm.

7.1.4.4 Where the crushing point between doctor blade and screen or machine table cannot be safeguarded for operational reasons, the instruction handbook shall mention the residual risks existing, for example, when replenishing inks.

7.1.4.5 The instruction handbook shall describe residual risks caused by the doctor blade being used without a screen or a screen of a smaller size being installed.

7.1.4.6 The instruction handbook shall give information about the residual risks caused by bypassing the ESPDs on cylinder screen printing presses for the purpose of replenishing varnish and ink.

7.1.5 Automatic cylinder and roller washing device

7.1.5.1 The instruction handbook shall specify the requirement to set the washing parameters such that, depending on the washing agent used, solvent vapours will not be created.

Such parameters can, for example, be pressure of washing liquid, speed of rotation of washing rollers and brushes, length of washing process. Solvent vapours may cause risks of explosion or damage to health, for example.

7.1.6 Continuous-flow drying devices

7.1.6.1 Where the use of inks and varnishes is restricted to certain types for avoidance of explosion risks, the instruction handbook shall contain relevant information.

7.1.6.2 The instruction handbook shall contain a warning that solvents are not allowed to be placed in the area of the continuous-flow drying device and that solvents shall not be present in the area of the drying device (for example, during manual washing of cylinders or rollers).

7.1.6.3 The instruction handbook of UV continuous dryers shall indicate the need to provide technical measures such as exhaust systems where hazardous ink misting from UV inks occurs.

7.1.7 Alcohol-dosing devices

7.1.7.1 Where appropriate facilities for setting-up alcohol tanks are not supplied because of user-specific tanks being used on site, the instruction handbook shall contain instructions for the proper setting up of tanks. The instruction handbook shall also indicate that alcohol spillage needs to be cleaned up immediately.

7.1.7.2 The instruction handbook shall give information about the health risks caused by inhaling spilled alcohol.

7.1.8 Washing equipment for printing forms, rollers and doctor blades

Where washing of printing forms, rollers and doctor blades with solvents with a flash point below 55 °C is not allowed, reference shall be made to this in the instruction handbook.

7.1.9 Pile turners

The instruction handbook shall clearly indicate the maximum load capacity.

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 98/37/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive machinery 98/37/EC amended by Directive 98/79/EC.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Annex ZB (informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 94/9/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 94/9/EC concerning equipment and protective systems intended for use in potentially explosive atmospheres.

Once this standard is cited in the Official Journal of the European Communities under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in table ZB confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Table ZB — Correspondence between this European Standard and Directive 94/9/EC

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 94/9/EC	Qualifying remarks/Notes: Other clauses for compliance in EN 1010-1:2004
5.4.17, 5.6.4.1	1.0.1 Principles of integrated explosion safety	5.2.4, Annex A (informative)
5.6.2.1, 5.6.2.2, 5.6.2.4, 5.6.4.2, 5.6.6.2	1.0.2 Design considerations	5.2.4, Annex A (informative)
5.6.2.3	1.0.4 Surrounding area conditions	
7.1.4.1, 7.1.5, 7.1.6.1, 7.1.8	1.0.6 Instructions	5.2.4.9 7.2.2, 7.2.4
	1.1 Selection of materials	5.2.4.1
5.6.2.3	1.1.1 Explosion avoidance	5.2.4
	1.1.3 Effects on predictable changes in materials characteristics	5.2.4.9, 5.2.4.10
	1.2 Design and construction	5.2.4
5.6.1.2, 5.6.1.3, 5.6.2.2, 5.6.2.4, 5.6.4.2, 5.6.6.3	1.2.3 Enclosed structures and prevention of leaks	
	1.2.4 Dust deposits	5.2.4.6

Table ZB (continued)

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 94/9/EC	Qualifying remarks/Notes: Other clauses for compliance in EN 1010-1:2004
	1.2.7 Protection against other hazards a) Injury	5.2.5.1
5.6.2.6	b) Surface temperatures	5.2.4.4, 5.2.4.5, 5.2.4.6
	c) Elimination of non-electrical dangers	5.2.4.4, 5.2.4.5, 5.2.4.6, 5.2.4.7
	1.2.8 Overloading of equipment	5.2.4.12
	1.2.9 Flameproof enclosure systems	5.2.4.12
	1.3 Potential ignition sources	5.2.4
5.6.2.5, 5.6.2.6, 5.6.4.2	1.3.1 Hazards arising from different ignition sources	5.2.4
5.6.6.2	1.3.2 Hazards arising from static electricity	5.2.4.8, 5.2.4.9, 5.2.4.10
5.6.2.1, 5.6.2.2, 5.6.2.5	1.3.4 Hazards arising from overheating	
	1.4.1 Safe functioning	5.2.6
5.6.4.1	1.5.1 Independent function of safety devices of measurement and control. Fail safe principles for electric circuits. Safety related switches independent of software and command	5.2.6.1.1
	1.5.2 Safety device failure	5.2.6.1.1
	1.5.3 Emergency stop controls	5.2.5.3
	1.5.8 Risks arising from software	5.2.6.1.1
	2.1 Requirements applicable to equipment in category 1 of equipment group II	5.2.4
	2.1.1 Explosive atmospheres caused by gases, vapours or hazes	5.2.4.3, 5.2.4.4
	2.1.1.1 Design and construction of equipment to prevent sources of ignition becoming active	5.2.4.3
	2.1.1.2 Stated maximum surface temperatures not to be exceeded	5.2.4.5
	2.1.2 Explosive atmospheres caused by air/dust mixtures	5.2.4.3, 5.2.4.4
	2.1.2.3 Surface temperatures to be kept below ignition temperatures of suspended dust	5.2.4.5
	2.2 Requirements applicable to equipment in category 2 of equipment group II	5.2.4
	2.2.1 Explosive atmospheres caused by gases, vapours or mists	5.2.4.3, 5.2.4.4

Table ZB (concluded)

Clause(s)/sub-clause(s) of this EN	Essential Requirements (ERs) of Directive 94/9/EC	Qualifying remarks/Notes: Other clauses for compliance in EN 1010-1:2004
	2.2.1.1 Design and construction of equipment to prevent ignition sources arising	5.2.4.3, 5.2.4.4
	2.2.2 Explosive atmospheres caused by air/dust mixtures	5.2.4.3, 5.2.4.4
	2.2.2.1 Design and construction of equipment to prevent ignition of air/dust mixtures	5.2.4.5, 5.2.4.6
	2.3 Requirements applicable to equipment in category 3 of equipment group II	5.2.4

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