INTERNATIONAL STANDARD

ISO 12643-2

Third edition
2023-11

Graphic technology — Safety requirements for graphic technology equipment and systems —

Part 2: Prepress and press equipment and systems

Technologie graphique — Exigences de sécurité pour les systèmes et l'équipement de technologie graphique —

Partie 2: Systèmes et équipement pour la préimpression et la presse

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Foreword

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

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 130, *Graphic technology,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 198, *Printing and paper machinery — Safety,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 12643-2:2010), which has been technically revised. The main changes compared to the previous edition are as follows:

— in 3.13, a definition for large-format inkjet digital printing machines has been added;

— in 6.2.2, the exemption for the maximum height of the feed opening has been deleted;

— in 6.2.3, new requirements in relation with in-running nips on anilox rollers (6.2.3.5) and cylinders/rollers in gravure printing presses (6.2.3.6) have been added;

— in 6.3, requirements for interlocks have been added;

— in 6.3, requirements for the movement of the inkjet heads when closing a protective device (6.3.4) have been added;

— in 6.6.1.3, the requirements for securing whole body access on deliveries have been adapted from the new requirements in ISO 12643-4:2023;

— in 6.6, the requirements for the protection of the pile carrier for heights above 800 mm have been deleted and newly regulated in ISO 12643-1:2023);

— in Clause 7, requirements for automatic and semi-automatic printing plate changing have been revised;

— in 8.2 and 8.3, the requirements for fire and explosion protection have been revised

— in 8.3.2, 8.3.3, 8.7.2, 8.7.3, 15.9 and B.6.2.2.2, flash point to Globally Harmonised System (GHS, flammable liquids 60 °C) have been adapted;

— addition of 8.12 and 15.11 with requirements for large-format inkjet digital printing machines (wide-format inkjet digital printing machines)

— a new subclause 8.13 on dust protection requirements for web offset printing presses has been added;

— a new subclause 8.14 on Emergency stop devices and stop/safe pushbuttons at stationary control stands of web offset printing presses has been added;

— the clause on alternative controls for stop/safe function on sheet-fed presses has been deleted;

— in 9.4, a requirement for inkjet printing systems in connection with emergency stop has been added;

— the clause on colours for manual controls has been deleted;

— the list of significant hazards has been moved to an informative Annex A;

— the annex on protection zones against explosion has been moved to ISO 12643-1:2023;

— in Annex B, the following have been adapted:

  — selected measurement locations for the measurement of emissions of ink mist, varnish mist, ammonia, VOC IPA, VOC hydrocarbon compounds;

  — the limit value for ammonia at measurement location 2;

  — the measurement conditions for VOC IPA (6 % IPA in dampening water), VOC hydrocarbon compounds (measurement during entire washing program).

This document is intended to be used in conjunction with ISO 12643-1:2023.

A list of all parts in the ISO 12643 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organisations, market surveillance, etc.)

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e. g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope and Clause 5 of this document.

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

The full set of requirements for graphic technology equipment and systems are those given in the part of ISO 12643 applicable to that type, together with the relevant requirements from ISO 12643-1:2023, to the extent specified in the Scope of the applicable part of ISO 12643.

This document supplements and modifies the general requirements of ISO 12643-1:2023. Where a requirement of this document conflicts with a requirement of ISO 12643-1:2023 the requirement of this document will take precedence.

Graphic technology — Safety requirements for graphic technology equipment and systems —

Part 2:
Prepress and press equipment and systems

1 Scope

This document provides safety requirements specific to prepress and press equipment and systems.

This document provides additional safety requirements for the design and construction of new prepress and press equipment, and the auxiliary equipment integrated into the press control system.

This document is not applicable to prepress and press equipment and systems manufactured before the date of its publication.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 5149-1:2014, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Definitions, classification and selection criteria*

ISO 5149-1:2014/Amd 1:2015, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Definitions, classification and selection criteria — Amendment 1: Correction of QLAV, QLMV*

ISO 5149-1:2014/Amd 2:2021, *Refrigerating systems and heat pumps — Safety and environmental requirements — Part 1: Definitions, classification and selection criteria — Amendment 2: Update of Annex A and the refrigerant tables*

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

ISO 12643-1:2023, *Graphic technology — Safety requirements for graphic technology equipment and systems — Part 1: General requirements*

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

ISO 13849-1:2023, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13855:2010, *Safety of machinery — Positioning of safeguards with respect to the approach speeds of parts of the human body*

ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 19353:2019, *Safety of machinery — Fire prevention and fire protection*

IEC 60079-10-1:2020, *Explosive atmospheres — Part 10-1: Classification of areas — Explosive gas atmospheres*

IEC/TS 60079-32-1:2013+AMD1:2017, *Explosive atmospheres — Part 32-1: Electrostatic hazards guidance*

IEC 60529:1989+AMD1:1999, *Degrees of protection provided by enclosures (IP Code)*

IEC 60825-1:2014, *Safety of laser products — Part 1: Equipment classification and requirements*

IEC 62061:2021, *Safety of machinery — Functional safety of safety-related electrical, electronic and programmable electronic control systems*

IEC 62368-1:2018, *Audio/video, information and communication technology equipment — Part 1: Safety requirements*

EN 1127-1:2019, *Explosive atmospheres — Explosion prevention and protection - Part 1: Basic concepts and methodology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12643-1:2023, ISO 13849-1:2023 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
access height
<sheet-fed press delivery zone> dimension of the maximum opening into the area below the sheet gripper, measured between the access level and the lower edge of fixed machine parts

Note 1 to entry: Examples for the access level are floor, fixed platform or footboard.

Note 2 to entry: Examples for fixed machine parts are fixed guard, fixed cover or fixed parts such as a sheet stop.

Note 3 to entry: See Figure 3.

3.2
alcohol dosing device
mechanism used to regulate the amount of alcohol in the dampening water of offset printing presses

3.3
automatic plate-clamping device
mechanism used to secure a printing plate during the automatic or semi-automatic changing of the plates

3.4
coating unit
coater
machine that applies a predetermined thickness of a liquid substance on substrates made of paper or a similar material

Note 1 to entry: Examples for liquid substances are glue, varnish or ink.

3.5
continuous-flow drying device
mechanism built into printing presses to dry and cure inks and coatings that have been applied to substrates

EXAMPLE Hot air, IR or UV radiation.

3.6
crawl speed
continuous movement at a steady slow speed, and initiated by a momentary contact control

3.7
cylinder screen printing press
sheet-fed machine in which the substrate to be printed is pressed against the screen by an impression cylinder

Note 1 to entry: The substrate can be a paper sheet, for example.

3.8
digital printing machine
machine used in commercial applications where the printing image is produced in the machine from data stored in digital form and transferred to the substrate without the use of a printing plate

Note 1 to entry: This includes digital printing presses and wide-format inkjet printing machines.

3.9
draw roller
power-driven roller that pulls a substrate

3.10
enabling device
mechanism that needs to be in a specified state or condition in order for a second actuator or device to start a machine under hold-to-run control, and which will stop machine movement as soon as one of the hold-to-run controls is released or the status of the mechanism changes

3.11
forms printing press
leporello printing press
machine for the production of continuous forms where paper webs printed with one or more colours are accordion-folded or wound onto a reel

Note 1 to entry: In addition to the printing section, the machine consists of devices for punching, remaliners (sprocket punching), cross-perforation, longitudinal perforation and leporello (zig-zag) folding.

3.12
gravure printing machine
machine consisting of a printing cylinder, an inking system, in which ink is applied to the printing cylinder by an ink roll or spray and the excess is removed by a doctor blade, and an impression cylinder covered with a rubber composition, which presses the substrate into contact with the ink in the cells of the printing cylinder

3.13
large-format inkjet digital printing machine
wide-format inkjet digital printing machine
digital printing machine for the production of large-format print products of different materials, such as paper, plastic films or foils, fabrics and flat structures in which an inkjet printing head arranged across the transport of the product produces print on the printing substrate line by line

Note 1 to entry: The substrate to be printed on can be sheets or webs.

Note 2 to entry: Generally, these machines have an image area wider than 600 mm.

3.14
pile turner
device provided in the vicinity of sheet-fed printing presses and used to turn piles of printed paper for further processing, such as back-printing on a second run

3.15
powder-spraying device
equipment used to spray powder onto the printed material on the delivery side of sheet-fed printing presses

3.16
prepress equipment
machines used in the first stage of the graphic technology workflow, prior to printing, that include all the operations necessary for the preparation of images and image carriers

[SOURCE: ISO 12637-1:2006, 58, modified — The original term was "prepress" and "machines used in the" has been added in the definition.]

3.17
press system
printing press and a series of machines that supply substrate into and through the printing press and guide or direct the substrate to a cutting, folding or delivery device that delivers the product to the last working station integrated with the printing press control system

3.18
printing plate
base material that stores the image to be printed and transfers ink onto a substrate, thus printing the image

Note 1 to entry: The printed image can include pictures, artwork and/or text.

3.19
printing table
supportive surface to hold the substrate to be printed during the printing process

EXAMPLE Printing tables can be found on certain types of screen printing presses, for example.

3.20
proofing press
machine with manual feeding and delivery used for printing a small number of copies for assessing print quality

Note 1 to entry: Proofing presses are generally used for assessing print quality before the *printing plate* (3.18) is mounted in the production machine.

3.21
reel turner
device used to turn reels of substrate for easier handling, for example for correct positioning of the reel when feeding webs to printing presses

3.22
screen frame
device for taking up the printing screen

3.23
screen printing press
printing press using semi-permeable printing forms consisting of fabric or steel mesh stretched over frames on which stencils are applied and through which ink or varnish is pressed to reproduce corresponding image areas onto a substrate

3.24
sheet-fed press
machine for printing sheet-size substrates, including proofing presses, in which sheets can be fed by automatic or manual feeders, or from sheeters attached to unwinding units

3.25
washing device
equipment integrated into the printing press for washing cylinders and rollers such as ink rollers, blanket cylinders, printing cylinders, plate cylinders, etc.

3.26
washing equipment for printing plates
machines for washing *printing plates* (3.18) outside the printing press

EXAMPLE Screen washing equipment.

3.27
web-fed press
press in which a substrate passes through the printing couple(s) in a continuous form, as fed from a roll

3.28
web material
web of paper, board, foil or similar material that is to be handled or processed

4 Significant hazards

For the list of significant hazards covered by this document, see Annex A.

5 Equipment subject to requirements and interrelation between this document and ISO 12643-1:2023

5.1 General

This document is applicable to the equipment listed in 5.2 to 5.4. This equipment can be used in a stand-alone configuration or in combination with other machines affected by an integrated control system. This can include combinations of the machines noted below.

NOTE This document is intended to include the wide range of equipment used in the printing process. The equipment listed in 5.2 to 5.4 provides examples of the more typical equipment covered by this document but is not all-inclusive.

Prepress and press equipment and systems conforms with the requirements of ISO 12643-1:2023, as far as not modified or replaced by the requirements of this document.

5.2 Prepress equipment

The following prepress equipment are covered by this document:

— exposure equipment for the production of films and printing formes;

— equipment for developing films and printing formes;

— washing machines for printing formes;

— machines for bending printing formes;

— punching machines for film and printing plates;

— cutting machines for film and printing formes;

— machines for the production of gravure printing formes;

— scanners.

5.3 Printing presses and coating/varnishing machines

The following are machines used for printing by various processes and are covered by this document:

— relief (letterpress, flexographic);

— offset (lithographic);

— sheet-fed printing presses, including coating/varnishing machines;

— web-fed rotary presses, including coating/varnishing machines and similar machinery;

— gravure (rotogravure, intaglio);

— screen printing;

— digital printing machines (electrostatic, inkjet, thermal, airbrush, etc.), including sheet-fed digital printing machines, web-fed digital printing machines, wide-format inkjet machines and similar machinery;

— proofing presses;

— combination presses (e.g. offset/flexo/screen).

5.4 Other equipment covered by this document

In addition to the equipment listed in 5.2, the following equipment are also covered by this document:

— washing equipment for cylinders and rollers;

— washing equipment for printing plates and scrapers;

— varnishing equipment;

— powder-spraying devices;

— alcohol dosing devices;

— imprinting/addressing/numbering equipment;

— automatic plate-clamping devices;

— automatic pile-handling equipment;

— washing equipment;

— inserting machines;

— pile turners, reel turners, elevators;

— dryers/pollution control, including continuous-flow drying devices, ultraviolet curing, infrared drying, electron beam, hot air, etc.;

— radiation equipment;

— in-line processing and finishing equipment;

— stackers;

— palletizers;

— bundlers;

— coaters;

— chilling systems;

— electrostatic equipment;

— humidifiers;

— accumulating or piling-off devices;

— conveyors;

— unwinding, rewinding, reel transport devices;

— measuring and control devices;

— auxiliary devices on inking and dampening units.

6 Safety requirements and/or protective measures

6.1 General

Machinery shall be in accordance with the safety requirements and/or protective measures of this subclause. In addition, machinery shall be designed according to the principles of ISO 12100:2010 for relevant but not significant hazards that are not dealt with by this document.

6.2 Guarding of significant hazards

6.2.1 General

Safeguarding, consistent with operation of the machine, shall be provided in those areas where it is recognized that operators are exposed to significant hazards. The safeguarding requirements of ISO 12643-1:2023, 5.3 and this document apply.

6.2.2 Guard openings

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-adjusting guards.

The hazard points outside the side lays on sheet-fed flexographic printing presses shall be safeguarded for every format size used.

NOTE This safeguarding can be achieved, for example, by using accordion-type bellows or by the use of additional guards.

For hazard points within side lays, residual pile monitoring that is also used as a safety device shall be in accordance with at least PL d of ISO 13849-1:2023 or SIL 2 according to IEC 62061:2021.

6.2.3 Guarding in-running nips

6.2.3.1 Guarding in-running nips on sheet-fed presses

If technically feasible, trip nip bars in accordance with ISO 12643-1:2023, shall be used where frequent access is required to the area during machine motion, and cylinders are directly accessible after the interlocking guard has been opened.

If it is not possible to use trip nip bars as described above, hold-to-run control speed limitations defined in ISO 12643-1:2023, 5.3.6 apply.

NOTE Use of trip nip bars is not possible, for example, on small-size offset presses where trip nip bars would impede access to the cylinder for activities such as plate changing.

Where cylinders have gaps that exceed those defined for smooth cylinders (see ISO 12643-1:2023, 3.69), trip nip bars in accordance with ISO 12643-1:2023, 5.7.7 should be used. Nip guards shall not be used with these cylinders. For such trip nip guards, the requirements of PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021 shall be satisfied and the interlocking system shall be designed such that the requirements for stopping paths defined in ISO 12643-1:2023, 5.7.7 are satisfied. Trip nip bars and cylinder gaps shall be designed such that cylinder gaps cannot be accessed behind trip nip bars, causing a hazard.

6.2.3.2 Guarding in-running nips on web-fed presses

In-running nips that are not in the operator's view from the position where the hold-to-run control or enabling device is operated shall be safeguarded by additional measures.

NOTE For example, such measures include:

— guarding;

— an electrically interlocked, movable nip bar on the outgoing side between the two blanket cylinders of a web offset printing press, that ensures that the bar is in position prior to reverse movement.

On machines with varying web paths where such measures for safeguarding the in-running nip existing between blanket cylinders during the reverse movement are not feasible, the following procedure using a hold-to-run with limited inch control is permitted, providing all of the following conditions are met:

— the speed shall not exceed 3 m/min;

— the movement shall not exceed 1,2 cylinder revolutions;

— a stop control element with mechanical latch (such as a stop/safe pushbutton) or an emergency stop device shall be in the immediate vicinity of the in-running nip;

— a distinctive audible warning signal, different from the audible warning signal used for forward inch, shall be used;

— a red flashing light shall be provided that can be seen during the warning and permissive periods, and a red warning light (steady burn, not flashing) shall be provided during operating time of the hold-to-run control in the immediate vicinity of any unguarded in-running nip that cannot be observed.

6.2.3.3 Guarding in-running cylinder nips on newspaper presses

In deviation from ISO 12643-1:2023, 5.3.4 nip guards may be used for web-fed newspaper printing presses on cylinder gaps of up to 19 mm circumferential slots. However, efforts should be made to limit cylinder gaps to 12 mm circumferential slots.

NOTE Some press cylinder lock-up devices, such as on newspaper presses, require gaps up to 19 mm, measured without the blanket. With the blanket in place, the gap is reduced significantly.

6.2.3.4 Guarding in-running nips on cylinder screen printing presses

On cylinder screen printing presses, the in-running nip on the printing cylinder shall be safeguarded.

NOTE This can be achieved, for example, by interlocking guards or guarding by the screen-printing forme.

Where the printing forme is used as a means of guarding, additional protective measures are required for lifting and removal of the printing forme.

Such additional measures can include electrical interlocking, which allows cylinder rotations only under hold-to-run control in accordance with ISO 12643-1:2023, 5.3.6 as long as the printing forme is lifted.

6.2.3.5 Safeguarding of the drawing-in point on anilox rolls of printing machines

As an exception to ISO 12643-1:2023, 5.3, complete safeguarding of drawing-in points at printing units during the continuous rotation of the anilox roll is not possible for process-related technical reasons and the safety distances according to ISO 13857:2019 cannot be met.

Continuous rotation of the anilox roll to prevent ink drying is permitted if all the following conditions are fulfilled.

— The distance between the plate cylinder and the anilox roll shall at least be 25 mm during the continuous rotation, for finger protection reasons.

— The anilox roll may only continue to rotate at a speed that is necessary for the process (to prevent drying of the surface of the anilox roller).

— An emergency-stop button shall be provided within easy reach.

— Actuation of the emergency stop shall stop continuous rotation as well as the printing ink circulation immediately.

Once an interlocking guard has been closed, the anilox roll may start rotating again automatically if it is ensured that the danger zone cannot be reached at this stage.

NOTE See also 6.3.3.

6.2.3.6 Guarding in-running nips on printing cylinders and inking rollers on gravure printing machines

As an exception to ISO 12643-1:2023, 5.3 complete guarding of the in-running nip between inking roller and printing cylinder on printing units of gravure printing machines (see Figure 1) is not possible during the continuous rotation of printing cylinders and inking rollers for process-related technical reasons and the safety distances according to ISO 13857:2019 cannot be met.

Continuous rotation of printing cylinders and inking rollers to prevent ink drying is permitted if all the following conditions are fulfilled.

— Inadvertent access is prevented.

— The printing forme may continue to run only up to the speed required for the technical process.

— An emergency stop button is within reach.

— Activation of the emergency stop causes an immediate end of the continuous rotation mode.

NOTE 1 During normal operation, the in-running nip is intrinsically safe due to the lubricating effect of the inks/cleaning agents.

NOTE 2 If the ink flow is interrupted or disrupted due to a fault, there is a risk of drawing in due to the changed friction properties.

Manual activities, may be carried out, when the printing unit is not in the production mode if all the following conditions are fulfilled.

— The nip shown in Figure 1, item 8 is safeguarded.

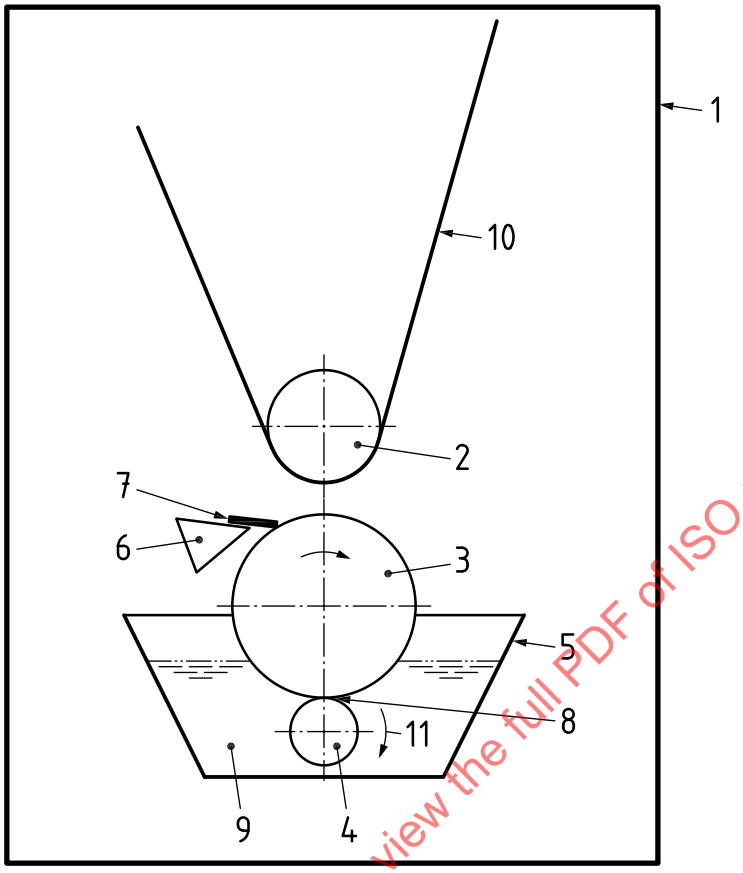
NOTE 3 Access from the side of the doctor blade is prevented by the doctor blade assembly.

— The setting operations are described in the instruction handbook.

— Potential residual risks are described in the instruction handbook.

NOTE 4 See also 6.3.3.

NOTE 5 Continuous rotation is sustained movement (idling) of inking rollers at a limited speed when the web is at standstill.



Key

1 sideframe
2 rubber roller
3 impression cylinder
4 inking roller
5 ink pan
6 doctor blade holder
7 doctor blade
8 nip point
9 ink
10 web
11 direction of rotation of inking roller during continuous rotation (no production mode such as standstill of machine)

Figure 1 — In-running nips at gravure print units

6.3 Interlocks

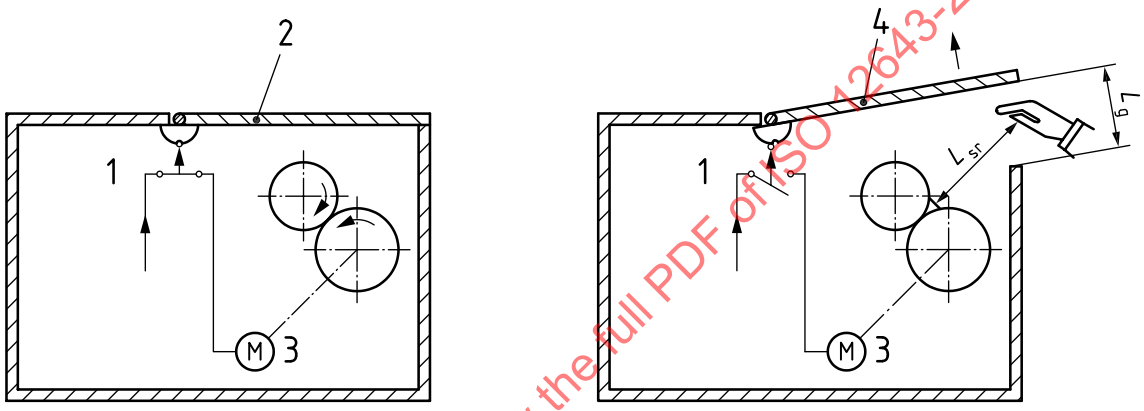
6.3.1 Interlocking with guard locking

Interlocking guards shall be designed so that the sensor (interlock) shall be activated within the limits specified in Table 1, depending on the distance to the hazard. Otherwise, guard locking shall be utilized.

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

Table 1 — Requirements for interlocking guards without guard locking

Safety distance[a], L_{sr}, between guard opening and hazard point mm	Maximum opening[a], L_g, of the guard while the detector changes its state mm
<80	≤30
≥80 and <500	≤40
≥500 and <850	≤80
≥850	≤160
[a] See Figure 2 for location of the measurements.	



a) Motor running **b) Motor stopped**

Key

1 failsafe limit switch
2 guard closed
3 motor
4 guard open
L_{sr} safety distance
L_g maximum opening

Figure 2 — Distances related to requirements for guard locking

6.3.2 Continuous motion at crawl speed with an interlocking guard open

As an exception to ISO 12643-1:2023, 5.3.2.1.1, the continuous machine motion at crawl speed with a guard open shall be permitted only if all in-running nips remain guarded by either a nip guard or a trip nip guard bar conforming to the requirements of ISO 12643-1:2023, 5.7.7. Maximum crawl speed is determined by the ability of the slowest acting trip nip guard bar to safeguard the hazard.

As an exception to ISO 12643-1:2023, 5.3.5.1, when one or more interlocking guard(s) is opened, moved or removed, and the only hazard in the area being protected by the relevant interlocking guard are in-running nips, which are safeguarded by trip nip bars as described in ISO 12643-1:2023, 5.7.7, and combined with a speed limitation to a maximum (surface) operating speed of 5m/min. machine motion can continue.

NOTE For example, during parallel manual washing of cylinders or rollers in different/several/more than one printing unit.

6.3.3 Closing an interlocking guard on dampening, flexo or inking devices

As an exception to ISO 12643-1:2023, 5.3.5.1 closing the interlocking guard on dampening, flexo (e.g. coating, precoating) or inking devices may initiate the rotation of dampening or coating ductor rollers or metering rollers or anilox rollers if it is ensured that, at this time, no hazard points can be accessed.

NOTE Restarting any independently driven dampening, coating, metering, or ink fountain rollers might be required in order to prevent malfunctions due to dried-up coating or dampening agents.

6.3.4 Closing an interlocking guard on inkjet printing devices

As an exception to ISO 12643-1:2023, 5.3.5.1, closing the interlocking guard on inkjet printing devices may initiate the motion of inkjet printing heads.

NOTE Restarting the motion of inkjet print heads can be required to position the inkjet printing heads above mist bath to prevent the desiccation of the ink nozzles.

6.4 Hold-to-run controls

6.4.1 Specific requirements for sheet-fed presses

When interlocking guards are opened and any exposed hazard point is not safeguarded, sheet-fed printing press systems shall only be allowed to be started under hold-to-run in accordance with ISO 12643-1:2023, 5.3.6.

When interlocking guards are opened and all hazards are protected, crawl speed is permitted under the provisions of 6.3.2.

When interlocking guards are opened and direct access to unprotected in-running nips on plate cylinders, blanket cylinders, and impression cylinders, or unprotected hazard points on the sheet transport system is possible, the machine may be started under hold-to-run control in accordance with ISO 12643-1:2023, 5.3.6 and if conditions of ISO 12643-1:2023, 5.3.6 a) are met.

NOTE 1 Sheet-fed presses usually have non-smooth cylinders with large gaps that are more hazardous than smooth cylinders on web presses.

NOTE 2 Examples of "sheet transport systems" include gripping systems and transport drums.

NOTE 3 For example, direct access is possible where such in-running nips can be reached in the event of a person inadvertently entering a hazardous area, or where nips are located in the immediate vicinity of places where setting-up or cleaning operations need to be performed.

6.4.2 Specific requirements for forms printing presses and leporello printing presses

As an exception from the requirements for hold-to-run controls specified in ISO 12643-1:2023, 5.3.6, on forms printing presses and leporello printing presses, starting the machine by two-hand control with guards open shall be possible with a speed higher than 10 m/min when this is required for production reasons and all of the following requirements are met:

— other interlocking guards that cannot be seen from the operating position shall be closed;

— a selector switch shall be used for this kind of operation;

— the hold-to-run speed shall be as low as possible under production conditions;

— a warning shall be provided in the instruction handbook (including a statement of the operator's responsibility and a description of safe working practices).

6.5 Automatic format-setting operations

Where a hazard exists, automatic format-setting operations may be performed at speeds up to, and including, 0,5 m/min without additional safety measures. However, if there is a crushing hazard for the head or trunk of the body, format setting shall be permitted only with a hold-to-run control as specified in ISO 12643-1:2023, 5.3.6.

NOTE Automatic format-setting devices include sheet side lays, suction heads, turner bars, compensators, slitters, etc.

If additional safety measures are needed in the area of the format setting device, personnel shall be protected from motion of the device(s) by one or more of the following methods:

— provision of trip devices;

— separate stop device that is not included in the emergency stop circuit of the printing press;

— zone control using the emergency stop circuit.

6.6 Additional safeguarding methods for machine devices and components

6.6.1 Delivery units (pile lifting and lowering devices)

6.6.1.1 Guarding sheet gripper from unintentional hand access

In the area of the sheet delivery, any unintentional access to movable parts of the sheet gripper system from above and from the side shall be prevented by fixed or interlocked protective devices. At the sides and in the area of the sample sheet removal, these protective devices shall reach down at least to the bottom edge of the sheet gripper system.

Any residual risk caused by reaching underneath protective devices (e.g. in order to remove sample sheets or to place wedges in the pile) shall be indicated in the instruction handbook (see ISO 12643-1:2023, 8.3).

6.6.1.2 Guarding rotating sheet gripper systems from full body access

In the area of rotating sheet gripper systems on sheet deliveries, measures for safeguarding the full body access of persons shall be in place on all access sides if the access height, *h*, is 800 mm or more (see Figure 3).

If an electric/electronic control system is used for safeguarding the full body access of persons, this control system shall satisfy the requirements of ISO 12643-1:2023, 5.10.1.2.

If the safeguarding is done via ESPDs, see additional requirements in ISO 12643-1:2023, 5.7.6.

6.6.1.3 Safeguarding full body access by electro-sensitive protective devices (ESPDs)

6.6.1.3.1 Arrangement of light beams of ESPDs for machines having a single access level

The light beams of the ESPD on machines having a single access level shall be arranged as specified in Table 2 and shown in Figure 3. For the arrangement of light beams of the ESPD on multi-level machines, see 6.6.1.3.3. The requirements of ISO 13855:2010 relating to the horizontal distance between the light beams and the rotating gripper systems do not have to be met.

NOTE The primary protective action lies in the prevention of unexpected start-up of the press. In addition, the basic shape of the printing press, the delivery pile carrier and the pile itself prevent or impede unhindered access to the hazard zone, making consideration of access time to the hazard unnecessary.

For information to be provided in instruction handbooks on the residual hazards of ESPDs, see 6.6.1.3.4 and ISO 12643-1:2023, 8.3.6.

Table 2 — Arrangement of the ESPD in relation to the access height

Dimensions in millimetres

Access height h	Arrangement of the ESPD in relation to the access level(s)		
	Light beam 1[a]	Light beam 2[b]	Light beam 3[c]
$h \leq 1\,200$	300	not required[d]	400 below h (h – 400)
$1\,200 < h \leq 1\,500$	300	in the centre between light beams 1 and 3	400 below h (h – 400)
$h > 1\,500$	300	700	1 100

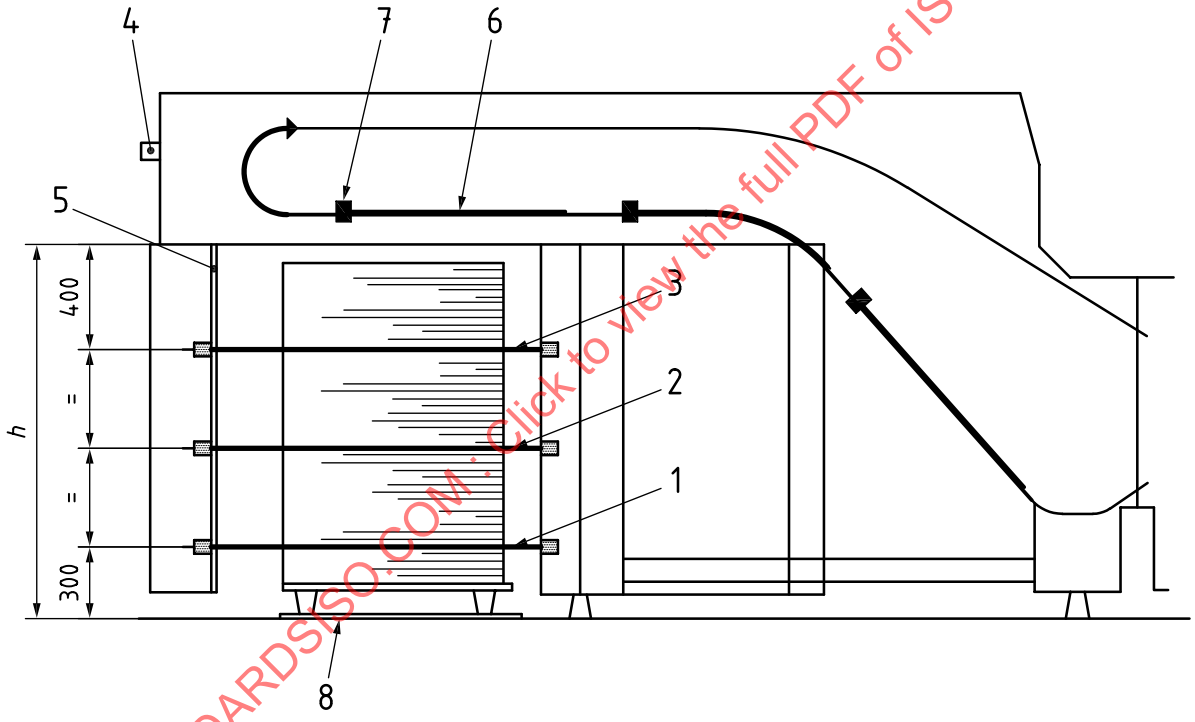
[a] Arrangement measured from the access level or from a fixed or swinging platform; due to the structural tolerances at the location of installation, the permissible tolerance for the arrangement is ±35 mm.

[b] Light beam between light beams 1 and 3, if the distance between light beam 1 and light beam 3 is greater than 500 mm.

[c] A maximum of 1 100 mm in height.

[d] Some of the bypassing functions described under 6.6.1.3.2 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 1 200 mm. See Figure 3.

Dimensions in millimetres



Key

1 light beam
2 light beam
3 light beam
4 reset button
5 sample sheet removal
6 sheet
7 sheet gripper system
8 access level
h access height

Figure 3 — Access height ≤1 500 mm in the delivery zone

6.6.1.3.2 Bypassing light beams

6.6.1.3.2.1 General

For the functions of sample sheet removal, insertion of wedges into the pile, correction of pile formation, exit of the pile, and complete pile removal (including insertion of empty pallets and moving in equipment, such as a hand forklift truck), a time-limited bypass of individual or several light beams is permissible only if the respective requirements for the individual functions are met under the conditions defined in 6.6.1.3.2.2 to 6.6.1.3.2.7.

The duration of the individual bypass sequences shall not exceed 20 seconds. After that time, the bypassed light beams shall be reactivated automatically.

The bypass function may be actuated by either a manual control or an automated sequence.

The bypass functions, as defined in the following clauses, also include safeguarding of the area beneath the pile support systems.

6.6.1.3.2.2 Bypass function for removing sample sheets

Bypassing only the top light beam (see Figure 3), in the area where sample sheets are removed by the sample sheet removal equipment, shall be permitted only if all of the following conditions are met:

— the machine is in paper run mode (sheets are being delivered);

— the light beams are active on all other access sides of the delivery.

The detection of the paper run mode, the sample sheet removal equipment and its individual signal processing shall meet the requirements of at least PL b of ISO 13849-1:2023 or SIL 1 of IEC 62061:2021.

6.6.1.3.2.3 Bypass function for inserting wedges and correcting the pile formation

Bypassing the top light beam (see Figure 3) shall be possible only if all the following conditions are met:

— the bypass control is a pushbutton positioned on the side being accessed;

— three light beams are installed for safeguarding the access side.

The simultaneous muting of the top beam for multiple sides is permitted as long as the pushbutton for the related side of the delivery is pressed.

When a bypass function is active and the main drive is at standstill, start-up shall be prevented.

6.6.1.3.2.4 Bypass function for inserting empty pallets and moving in equipment

Bypassing the light beam 1 (see Figure 3) on the side being accessed shall be possible only if all the following conditions are met:

— the bypass control is a pushbutton positioned on the side being accessed;

— three light beams are installed to safeguard the access side;

— the auxiliary pile support (e.g. forks/rake, wooden pile board, roller blind) or an equivalent device prevents access to the hazard zone;

— all top and middle light beams on all access sides and all bottom light beams on all other access sides are active; and

— the pile support plate is raised no more than 120 mm.

With regard to the above-mentioned light beams, requirements for electrical interlocking of the auxiliary pile support are fulfilled if the auxiliary pile support or similar device, is interlocked such that

the auxiliary device, when inserted, will automatically actuate the safety switch. The control system of the switch shall be in accordance with PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021.

Since metal rods and wooden boards, which need to be removed from the press and can be used for several presses, are used as auxiliary pile supports, it is not possible to use encoded safety position switches with separate actuators.

6.6.1.3.2.5 Manual bypass function for pile removal, including inserting empty pallets

Bypassing the light beams on the side where the pile is exiting shall be possible only if all the following conditions are met:

— the pile removal control is located on the side from which the pile exits the delivery zone;

— the machine is in press run mode;

— the pile support plate is no more than 120 mm above the floor;

— three light beams are arranged to safeguard the access side;

— all top, middle and bottom light beams on all other access sides are active during the entire process.

The bypass sequence shall meet all of the following requirements:

— bypass only the light beam 1 (see Figure 3) on the removal side for not more than 20 seconds;

— during this time, a sensor (e.g. ultrasonic sensor, laser sensor) is to be triggered, which detects the exit of the pile and switches off the light beams on the exit side for a maximum of 20 s;

— light beams 2 and 3 (see Figure 3) shall be reactivated automatically after this time (maximum of 20 s) has elapsed;

— the light beam 1 (see Figure 3) remains switched off for a further duration of maximum 20 seconds while inserting the empty pallet;

— during this period (maximum 20 s), it is possible to bypass the light beam 1 (see Figure 3) for only one additional period of 20 s by actuating the remove pile control again;

— the light beam 1 (see Figure 3) is automatically activated again after the expiration of its bypass time.

6.6.1.3.2.6 Automatic bypass function for pile removal

Bypassing the light beams at the side where the pile is moved out shall be possible only if there is a means of detecting the direction of the pile movement from the safeguarded area to a position outside the safeguarded area.

NOTE The press is in an automatic mode and needs to sense when the pile is full so that it can be removed. So that the pile can move outside the safeguarded area, the light beams require disabling to allow the press to continue running while the pile movement is occurring. Once the pile has moved past the plane of the light beams, the light beams are reactivated.

Pile removal may be detected by the use of one or more sensors (e.g. ultrasound, light beam, etc.), arranged inside the delivery zone, behind the ESPD.

As an exception to the requirements of ISO 12643-1:2023, 5.10.1.2, the sensor and the related control system shall meet the requirements of at least PL b of ISO 13849-1:2023 or SIL 1 of IEC 62061:2021.

6.6.1.3.2.7 Status lights

A yellow status light shall be used to indicate that the bypass function is actuated (released automatically or at the push of a button). The forthcoming end of the bypass duration may be indicated by the yellow

status light flashing. The status lights shall be placed on all access sides that are protected by light beams. The integration of the status lights into the control system may be single-channel, for example, via an electronic control system.

NOTE A green status light can be used to indicate that all light beams are activated and uninterrupted. The interruption of a light beam can be indicated by a red status light.

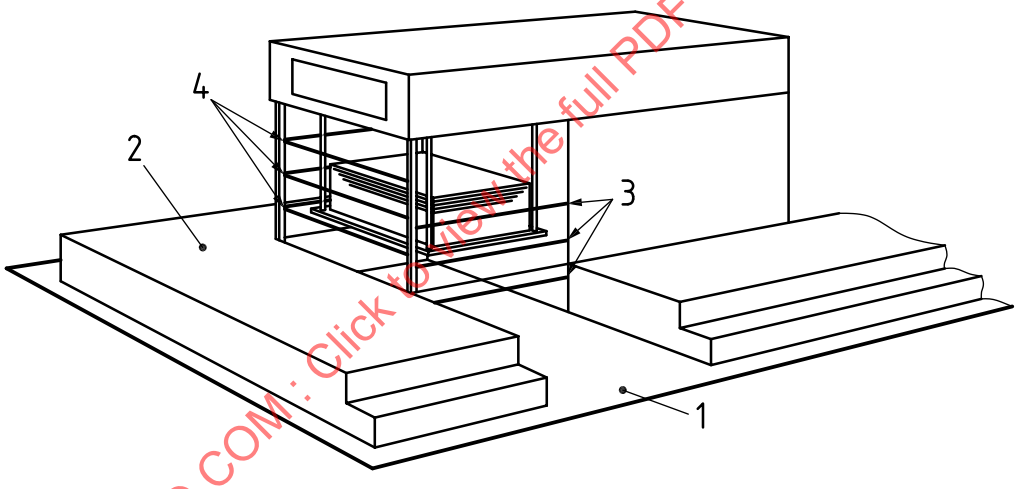
If green and red status lights are used they shall be positioned in such a way as to ensure that they cannot be confused with the optional personnel warning lights defined in ISO 12643-1:2023, 7.2.

6.6.1.3.3 Machines with multiple access levels

On machines with several access levels (e.g. with movable platforms), the protective measures described in 6.6.1.3.1 to 6.6.1.3.2.7 shall be provided on every access level (see Figures 3, 4 and 5).

Figure 4 shows two access levels, one for the ground and one for the platform. This requires a set of light beams on each side, positioned at a height appropriate for that access level. Figure 5 shows a situation in which a movable ramp can create an additional access level on that side and necessitates additional light beams to ensure that all access levels are considered.

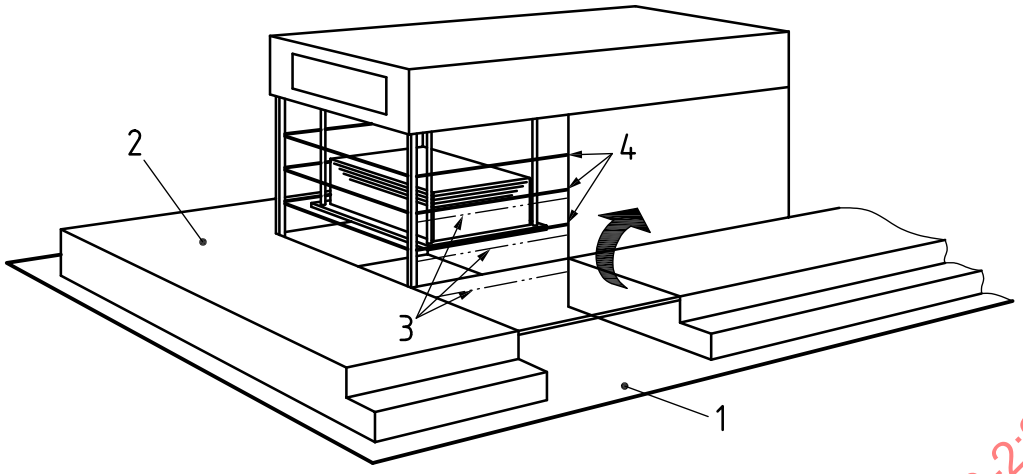
When the movable platform is raised, the light beams of the exiting side of access level 1 (Figure 5, item 3) shall be activated.



Key

1 access level 1 (e.g. pile exit)
2 access level 2 (e.g. platform, footboard)
3 light beams of level 1
4 light beams of level 2

Figure 4 — Multiple access levels without movable platform



Key

1 access level 1 (e.g. pile exit)
2 access level 2 (e.g. platform, footboard)
3 light beams of level 1
4 additional light beams of level 2

Figure 5 — Multiple access levels with movable platforms

6.6.1.3.4 Information on ESPDs in the instruction handbook

When using ESPDs to safeguard access to the delivery, residual risks, such as unintended contact with gripper bars while removing sample sheets, shall be indicated in the instruction handbook in accordance with ISO 12643-1:2023, 8.3.6.

6.6.1.4 Other methods of full body access safeguarding

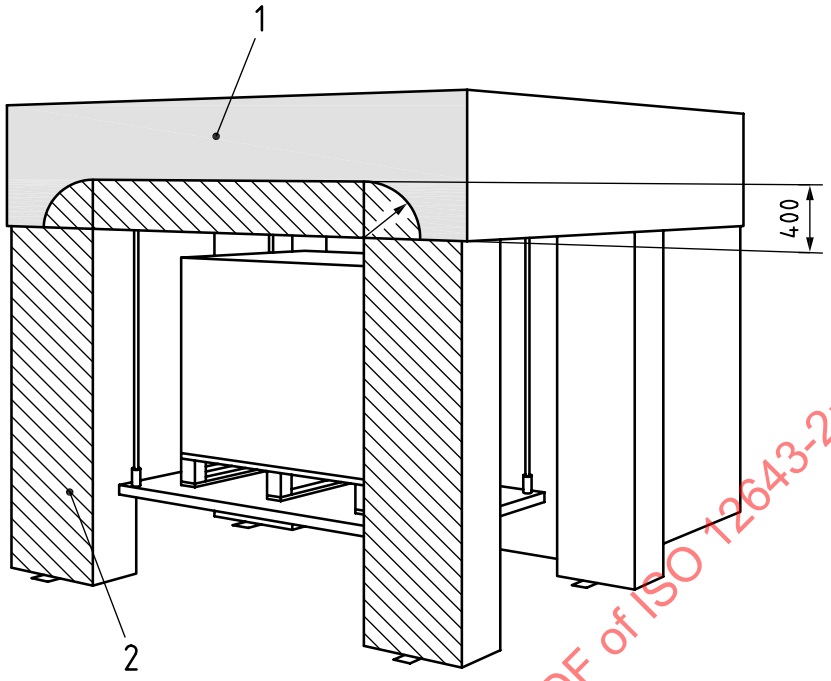
As an alternative to safeguarding in accordance with 6.6.1.3, full body access safeguarding can be achieved using one or more of the following methods, providing an equivalent level of safety is met:

— fixed or interlocking guards (see ISO 12643-1:2023, 5.3 for requirements);
— pressure-sensitive mats (see ISO 12643-1:2023, 5.7.7 for requirements);
— laser scanners;
— trip bars;
— light curtains.

6.6.1.5 Reset control for delivery units

The reset control shall be placed in a location from which the hazard area can be fully viewed and reaching the reset control from inside the hazard area is prevented. This requirement is met if the reset control is inside the permissible area at least 400 mm away from the lower edge of the delivery top structure (see Figure 6).

Dimensions in millimetres



Key

1 permissible area

2 not permissible area

Figure 6 — Permissible area for reset control location

On presses having several access areas where all hazard zones cannot be fully viewed from a single location, additional reset controls shall be provided. This is to ensure that the hazardous area affected by each of the reset controls can be viewed from the position of that reset control.

EXAMPLE Examples of presses having several access areas where all hazard zones cannot be fully viewed from a single location include elevated presses or presses with dual deliveries.

In the following circumstances, it is necessary to press the reset control before movement in the delivery area can be initiated using a separate control:

— after switching on the press at the main switch;

— after actuating the ESPDs;

— when the protective device that safeguards full body access to hazard areas has been tripped.

It is not necessary to press the reset control if persons inside the hazard area are safely detected due to the sensing capability of the protective devices (e.g. laser scanners).

Pressing the reset control shall not lead to an automatic start-up of machine motion.

As an exception to this requirement pressing a reset control may initiate motion of both the main pile and auxiliary pile system.

NOTE This is to allow the operator to quickly reset the pile system within the time period allowed before the machine stops.

The movements of the main and auxiliary pile carrier systems are allowed to be restarted by the reset button only if the entire hazard area can be seen from the position of the reset button.

6.6.1.6 Safeguarding the sheet gripper system

Acceptable risk for full body access to the sheet gripper system is achieved by one of the following risk reduction measures.

a) While the delivery is separated from the drive train using couplings, the coupling action and restart shall not cause any hazardous movements.

b) The opening above the pile carrier or the moved-in auxiliary pile support (e.g. forks/rake, wooden pile board, roller blind) or equivalent device shall be no greater than 160 mm.

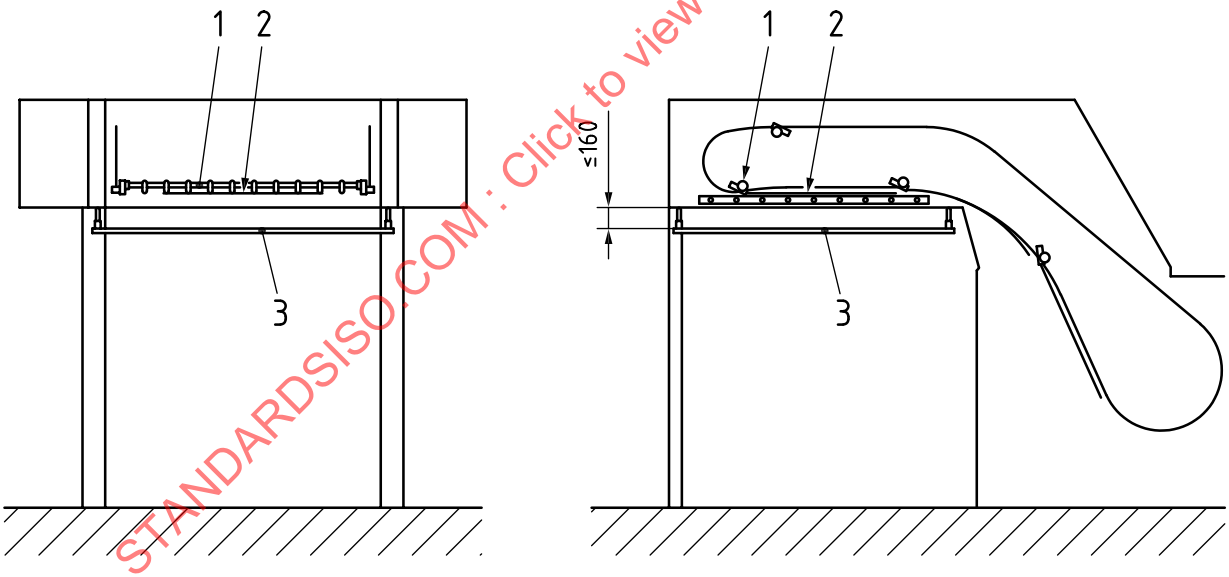
c) While the machine is delivering material to a raised pile support plate or to an auxiliary pile support (e.g. forks/rake, wooden pile board, roller blind) or equivalent device; and the presence of the pile support in use is detected either at insertion or by the time it has reached 160 mm below the access to the hazard; and the opening above the uppermost pile carrier shall be no greater than 300 mm; and no change of state of the main drive has occurred. Restart from the standstill position shall not be possible without additional safety measures.

d) Horizontal light beams underneath the gripper system if the requirements of ISO 13855:2010 are met.

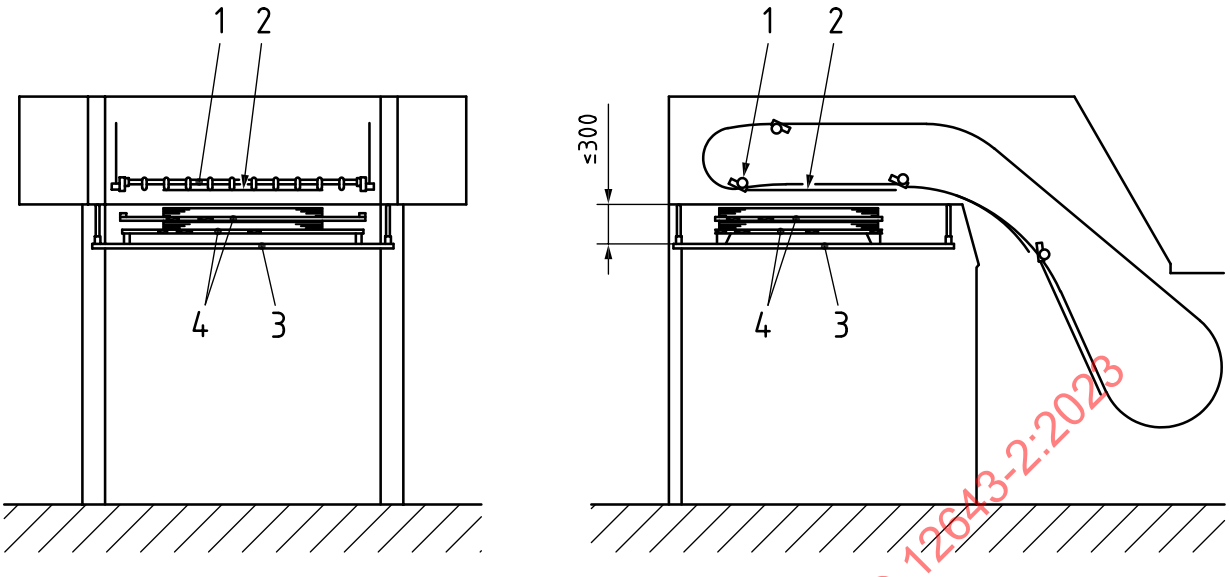
If none of the above conditions exist, the delivery shall not operate without the presence of additional safeguarding against entry into the hazardous area.

For example, if the pile support has not been detected by the time it has descended to a distance of 160 mm below the access to the hazard, the movement of the gripper systems shall either shut down or the hazardous area shall be protected by additional safeguarding, such as light beams, guards, etc.

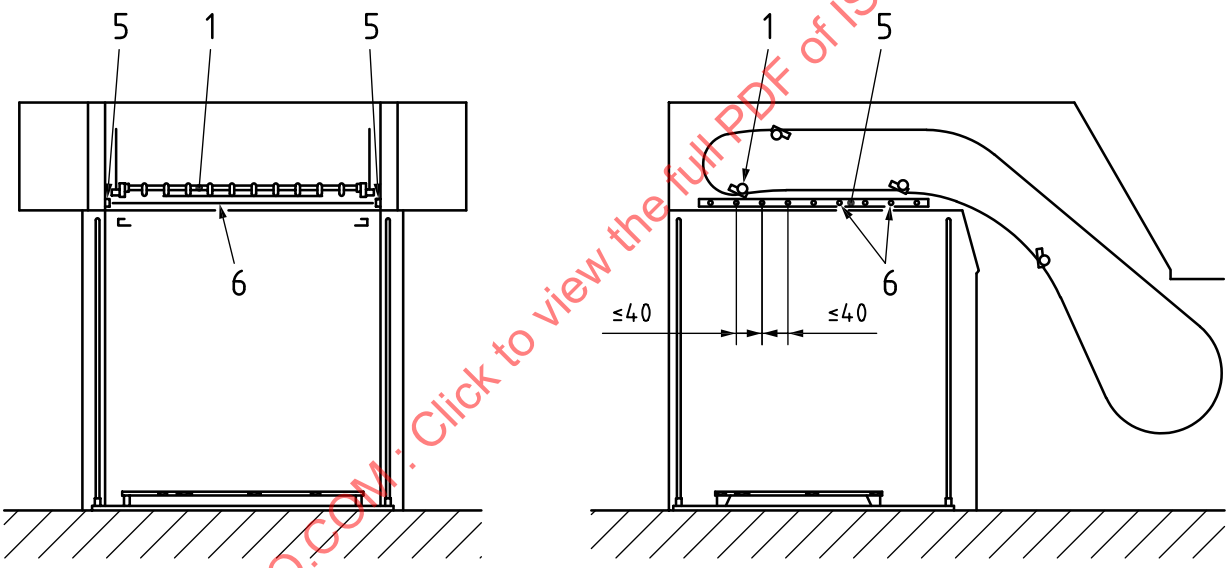
Dimensions in millimetres



a) Front and side views with pile carrier support in place (≤ 160 mm)



b) Front and side views with pile and pile carrier support in place (≤ 300 mm)



c) Front and side views with light beams (≤ 40 mm)

Key

1 sheet gripper system
2 sheet
3 pile carrier
4 pile support
5 sensor parts
6 light beams

Figure 7 — Guarding of sheet gripper system

6.6.2 Transport carriages

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

— trip devices and/or photoelectric curtains;

— hold-to-run control as defined in ISO 12643-1:2023, 5.3.6;

— safeguarding the hazard zone as described in 6.2 and ISO 12643-1:2023.

Carriages for transporting cylinders shall be resistant to tilt and shall be secured against unintended travel). 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 removing printing cylinders, hazardous overtravel on the transport carriage shall be prevented by the use of mechanical stops.

6.6.3 Guarding plate-clamping devices

Movements of automatic plate-clamping devices shall be safeguarded. Means of safeguarding include, but are not limited to, the following:

— fixed or interlocking guards in accordance with 6.2 and ISO 12643-1:2023, 5.3;

— trip nip bars in accordance with ISO 12643-1:2023, 5.7.7 (satisfying the requirements of PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021);

— ESPDs in accordance with ISO 12643-1:2023, 5.7.6;

— limiting operating force to a non-hazardous level;

— limiting maximum clearance between movable and fixed parts to 4 mm.

6.6.4 Continuous-flow drying devices on web presses

6.6.4.1 Surface temperature

The surface temperature of those parts of continuous-flow drying devices where access is possible shall not exceed the limit values specified in ISO 13732-1:2006.

6.6.4.2 Interlocking device open

Those parts of continuous-flow drying devices that are accessible after opening the interlocking device, and where temperatures are in excess of limit temperatures as specified in ISO 13732-1, shall be provided with a hazard warning.

6.6.5 Folders for web presses

6.6.5.1 Exception for folder set-up

Where access to the folder is required for folder set-up, speeds up to 8 m/min are permitted with the one or more guards open in accordance with the requirements of ISO 12643-1:2023, 5.3.5.

EXAMPLE For removing signatures under hold-to-run mode.

6.6.5.2 Exception for folder delivery guarding

In contrast to the requirements of ISO 12643-1:2023, 5.3.4, the distance between the guard and the delivery surface shall be no more than 75 mm, regardless of the distance between the unguarded access area and the hazard (see Figure 8).

The distance between the delivery fly (fan) and the enclosure that forms an in-running nip shall be a minimum of 120 mm (see Figure 8).

Dimensions in millimetres

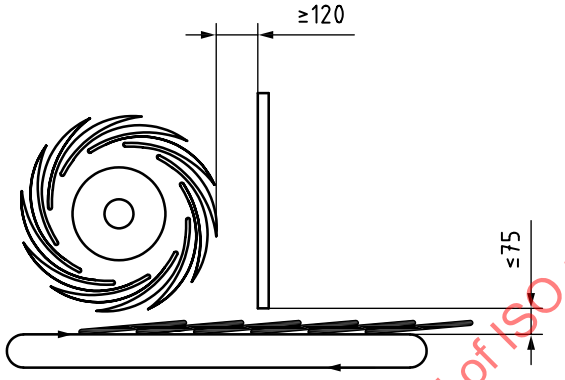


Figure 8 — Openings for folder guards

Folders shall be designed to allow observation of moving machine components or product flow, and to allow adjustments to folder operation with the guards closed.

NOTE 1 An example of a means of allowing adjustments with the guards closed would be the provision of a transparent guard or remote viewing system by which the necessary observation of moving machine components or product can be made.

If, for process-related reasons, moving machine components or the product flow at production speed should be observed in the area of the folder delivery with an interlocking guard open, the following alternative measures shall be taken.

— A mechanical key lock shall be provided adjacent to the access area. There shall be only one key for this lock. The key for this lock shall be accessible only by an authorized person.

— The key lock shall be interlocked with a timer that has a maximum capability of 4 min. See NOTE 2.

— When the key is inserted into the lock, the interlock on the guard is overridden for a maximum of 4 min, and the authorized person can access the area.

— The bypassing means shall meet the requirements of PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021.

— When adjustments are necessary, they shall be performed from outside the hazardous area.

— When the key is removed from the lock, the timer shall automatically stop and the interlock on the guard shall be automatically reactivated.

— If the guard remains open longer than the allotted time, the interlock on the guard shall be automatically reactivated and the press safety system shall stop machine motion.

— The instruction handbook shall point out that this activity shall only be performed by persons who have been appropriately trained and authorized. The respective residual risks shall also be indicated in the instruction handbook.

NOTE 2 An alerting mechanism can be helpful in warning the operator that the allotted period is about to elapse.

A safety sign shall be provided adjacent to the lock indicating the possible existing hazards with the guard open. The safety sign shall clearly indicate that when the key is in the lock, the adjacent guard is overridden.

If a machine is provided with this alternative safety measure, information regarding its safe use shall be contained in the instruction handbook.

Under no circumstances shall the guards in the cutting area of the folder be designed in such a manner that allows them to be open during machine motion at production speed.

6.6.6 Safety distances for web feed on web-fed presses

In the areas where the web on a web-fed press is fed through a webbing slot, if it is impossible to apply the safety distances specified in ISO 13857:2019 (as required by ISO 12643-1:2023, 5.3.4.1), a safety distance of 200 mm shall be observed for gaps with a width of more than 20 mm and less than 30 mm.

Where web material runs over passageways, the height of the passage shall be at least 2 m. If this is not possible for design reasons, and if there is a risk of injury to face and neck, web edges shall be safeguarded, for example by use of a guard with black and yellow markings.

As an exception to the requirements of ISO 12643-1:2023, 5.3.6, a maximum operating speed of 10 m/min is permitted for web-up on newspaper presses. Under this exception, to initiate machine motion at 10 m/min, a special web-up mode shall be added to the control system.

6.6.7 Screen printing presses

6.6.7.1 Crushing point between screen printing frame and machine frame

The crushing point between the screen printing frame (upper unit holding the screen printing stencil) and the machine frame (table) shall be safeguarded. This shall be accomplished by one or more of the following methods.

a) Using trip devices, which 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 device shall be prevented. The force to operate the device shall be a maximum of 300 N (dynamic). Where the material is manually fed directly between the screen printing frame and the machine table, and the stopping function of the device is being tripped by safety position switches, a trip device shall be arranged with redundant safety position switches to ensure initiation of the stopping operation, even in the event of a single switch failure.

b) Using ESPDs, the arrangement of which shall take account of the hand approach speed as defined in ISO 13855:2010. Such devices shall be arranged such 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. A non-hazardous level is a maximum of 300 N if there are no crushing hazards due to sharp edges.

d) Using fixed guards in accordance with ISO 13857:2019 that can be provided on that side of the machine where access for feeding and ink replenishment is not required.

6.6.7.2 Crushing point between doctor blade and screen printing frame

The crushing point between the doctor blade and screen printing frame shall be safeguarded.

NOTE This can be done, for example, by adjusting the stop gauge such that the minimum distance of 25 mm between the doctor blade and the 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.

6.6.7.3 Crushing hazards caused by the movement of the doctor blade

6.6.7.3.1 General

Crushing hazards caused by the movement of the doctor blade shall be safeguarded.

NOTE 1 This can be done, for example, by using the safety distances defined in ISO 13857:2019 between the doctor blade and fixed parts of the printing press.

Where the descending doctor blade causes crushing points between the doctor blade and the printing table or printing cylinder, and where such crushing points cannot be safeguarded for operational reasons, the instruction handbook shall contain a warning of the existing residual risk. The lifting path of the doctor blade shall be as short as possible.

NOTE 2 For example, the crushing point between the doctor blade and the printing table or printing cylinder on screen printing presses can generally not be safeguarded because ink replenishing needs to be done manually.

6.6.7.3.2 Protection during access between screen printing frame and machine frame

Where access between the screen printing frame and the machine frame is required (e.g. for cleaning the screen), a control device shall be provided, in addition to the measures described under 6.6.7.1, that, when actuated, prevents unintended start-up of the machine.

6.6.7.3.3 Protection between movable screen frame and fixed machine parts

On cylinder screen printing presses, safeguarding shall be provided for the crushing point between the movable screen frame and fixed machine parts.

NOTE This can be achieved, for example, by the use of safety distances in accordance with ISO 13854:2017, or interlocking guards.

7 Changing of printing plates

7.1 General

The handling and changing of printing plates shall be done with the help of appropriate means for lifting, and it shall be ensured, that the loading and unloading process will be performed under easy and safe conditions.

By automatic and semi-automatic printing plate changes, it shall be ensured, that the local used drive system for this process will not generate any hazard movements at other operating areas of the printing press.

7.2 Automatic printing plate changes

If the changing of printing plates is done by automatic operation, the hazard area shall be safeguarded by one or more of the following measures:

— use of guards in accordance with ISO 12643-1:2023, 5.3;

— use of ESPDs in accordance with ISO 12643-1:2023, 5.7.6; The approach reaction time shall be in accordance with ISO 13855:2010. If the approach reaction time of ISO 13855:2010 cannot be met, additional measures depending on the hazards shall be considered (e.g. trip devices, pressure-sensitive mats).

— use of safety devices with approach reaction (e.g. trip devices, pressure-sensitive mats).

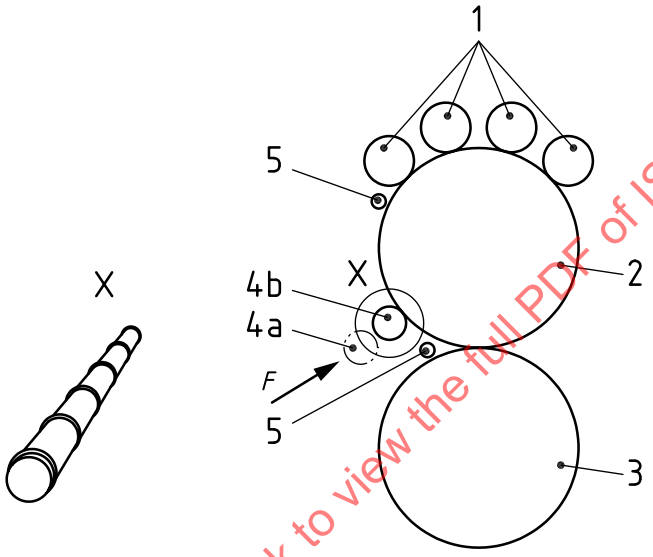
7.3 Semi-automatic printing plate changes

If the changing of printing plates is done by semi-automatic operation (i.e. an operator needs to assist when mounting the plate to the cylinder, and the cylinder is not rotated by automatic means), the hazard points between the cylinder and fixed machine parts (machine frame) shall be safeguarded by one or more of the following measures:

— use of guards in accordance with ISO 12643-1:2023, 5.3;

— limitation of the force to 100 N if automatically operating pressure rollers used for removing or pressing on the printing plates in the clamping device and where the likely contact surface is a blunt edge or projection and there is no risk of cutting or stabbing injuries through sharp edges;

NOTE Pressure rollers can be discontinued (partitioned roller). See Figure 9.



Key

1 ink form rollers
2 plate cylinder
3 blanket cylinder
4a position of inactive segmented pressure roller
4b position of segmented pressure roller during plate change
5 finger protection spindle
F pressing force max = 100 N

Figure 9 — Discontinued pressure roller (partitioned roller) at plate changing devices

— use of hold-to-run function with at least PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021;

— use of a foot pedal (designed as a hold-to-run control in accordance with ISO 12643-1:2023, 5.3.6) if the operator requires the use of both hands when mounting printing plates.

8 Requirements for protection against other hazards

8.1 General

In addition to the requirements for protection against other hazards in ISO 12643-1:2023, 8.2 to 8.14 shall apply.

See Annex A for a list of hazards associated with printing press systems.

8.2 Fire and explosion protection

8.2.1 Protection against fire and explosion in continuous-flow drying devices

8.2.1.1 General

The general requirements for explosion and fire protection specified in ISO 12643-1:2023, 5.4.2 also apply to continuous-flow drying devices.

The manufacturer shall define the intended use of the continuous-flow drying device, including the permitted/authorized materials and their quantities.

In particular, the fixed and movable components (including thermal insulation) shall not be sources of ignition and shall not increase the risk of fire.

Condensate formation must be avoided in all dryer areas.

The design of continuous-flow drying devices shall take into account the maximum permissible throughput of combustible substances (components of printing inks/coatings, washing solutions, solvents) at the maximum dryer temperature.

In continuous-flow drying devices, it shall be ensured that the solvent concentration is safely below the LEL (lower explosion limit) under all reasonably foreseeable operating conditions and also in the event of a malfunction.

When washing systems are installed in the printing press, the operation of which can lead to an inflow of washing solution in the continuous-flow drying device, it shall be verified that the solvent concentration is safely below the LEL (lower explosion limit) under all reasonably foreseeable operating conditions and also in the event of a malfunction.

NOTE Different standards can apply depending on the country or region to continuous-flow drying devices built into printing and coating units where flammable substances are released during the drying and/or curing process of the ink or coating. For example, EN 1539:2019[17] in the CEN members state and NFPA 86[10] in the United States.

8.2.1.2 Interface with automatic cylinder and roller washing devices

8.2.1.2.1 Substrate transporting solvents

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

This requirement is fulfilled:

a) on a sheet-fed printing press

   1) where the design of the continuous-flow drying unit takes account of the solvent transported by the substrate in accordance with existing standards (see 8.2.1.1, NOTE); or

   2) where the cylinder and/or roller washing device is electrically interlocked with the sheet transport system, so the sheet transport during the washing process is prevented and can be restarted only after the cylinders are sufficiently dry;

b) on a web-fed rotary printing press, where the design of the continuous-flow drying unit takes account of the solvent in accordance with existing standards (see 8.2.1.1, NOTE), including a combination of:

   1) design-stage calculations of maximum solvent flow;

2) commissioning-stage testing of the blanket wash system, usually done by qualified personnel or a qualified agent of the wash system manufacturer, to verify the calculations and to determine the safety of the wash system (part of the testing procedure is the measurement of solvent concentrations inside the dryer and exhaust duct using an analyser, such as a total hydrocarbon analyser equipped with a flame ionization detector, or other equivalent analyser, at worst-case design conditions of solvent flow).

8.2.1.2.2 Vapours and mists

On printing presses, where continuous-flow drying devices are fitted on one press together with automatic cylinder and roller washing devices, any risk of ignition, where solvent vapours and mists released during the washing process are heated up by the drying unit, shall be prevented.

This requirement is fulfilled by one or more of the following:

a) by designing the continuous-flow drying unit to take into account the solvent vapours and mists in accordance with existing standards (see 8.2.1.1, NOTE);

b) by providing an exhaust unit between the washing and the drying unit, thus reducing the risk of ignition;

c) the control systems of the washing and drying devices shall be in accordance with PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021 by interlocking the washing and the drying devices to allow the start of the washing operation only if the dryer temperature is in a non-hazardous condition, and to prevent the start of the drying device until there is no risk of ignition of the flammable solvent vapours.

NOTE One means of accomplishing this is by the use of a flammable vapour sensor that monitors the level of solvent vapours and prevents the flammable concentration of vapour levels.

8.2.1.2.3 Leakage and spillage of solvents

The risk of ignition due to leaks of the solvent from the washing device shall be prevented.

EXAMPLE Such risks on web presses would be solvent leaking onto the substrate running into the drying device; on sheet-fed presses, they would be solvent leaking onto the drying device, or spillage during the filling process.

This requirement is fulfilled by one or more of the following:

a) when the solvent reservoir and washing device are fixed and sealed, by providing hose and connections which are permanently fitted, adequately dimensioned and of materials that are suitable for the solvent used;

b) by positioning the washing devices and hoses so that, in case of leakage, neither the liquid solvent nor its vapours can reach the continuous-flow drying device;

c) by monitoring the area surrounding the continuous-flow drying device so that the device is disabled in the event of spillage/leakage.

8.2.1.3 Ignition of substrate

Ignition of the substrate by the continuous-flow drying device shall be prevented. This can be achieved, for example, by reducing the dryer temperature when the printing process is stopped, or by separating the substrate from the radiation source by use of air knives (air curtain) or deflectors.

8.2.1.4 Exhaust systems of drying devices

When exhaust systems are provided as a safety ventilation system to prevent hazards of fire and explosion, their function shall be monitored. Failures in the exhaust system shall cause the substrate feeding system to stop automatically. For example, on sheet-fed printing presses, failure in the dryer

exhaust system causes both the feeders and the drying system to stop automatically. On rotary web presses, failure in the dryer exhaust system causes automatic stopping of the solvent dispensing areas (for example ink plate rollers on units, or automatic blanket washing devices).

The control system for monitoring the safety function of the exhaust system shall satisfy PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021.

8.2.2 Fire protection on web-fed rotary gravure presses and web-fed rotary flexo presses

8.2.2.1 General requirements

For web-fed rotary gravure presses and web-fed rotary flexo presses where combustible/flammable materials are used or where permanent combustible/flammable dust deposits can form, fire hazards shall be prevented in accordance with ISO 12643-1:2023, 5.4.2.2 and in accordance with 8.2.2.

8.2.2.2 Inherently safe design measures

In addition to the requirements of ISO 19353:2019, 5.6.2.6, ink incrustations in larger quantities shall be avoided by design measures.

EXAMPLE By using spray shields.

NOTE A larger amount of ink incrustation can lead to an enlargement of machine parts which cause friction when moving in contact with other machine parts. These frictional contacts lead to heating of the machine parts and can cause fires.

Suitable measures shall ensure that discharges of the material web to machine parts are effectively prevented.

Examples of suitable measures are:

— Sufficient distances between the material web and conductive machine parts, so that the formation of sparks is avoided;

— Discharging devices to reduce the electrostatic charge of the material web.

8.2.2.3 Supplementary protective measures

In deviation from ISO 19353:2019, 5.6.4 and 6.2, web-fed rotary gravure presses and web-fed rotary flexo presses should also be integrated into the user's fire extinction system and fire protection concept.

In the case of integration into the user's fire extinction system, the manufacturer shall provide the necessary interfaces to the press control system. These interfaces must be described in the instruction handbook.

If portions of the machine are totally enclosed and the user's fire protection concept foresees the use of hand-held fire extinguishers by the operator, risks due to backfire (backdraft) must be avoided by constructive measures. The safe handling of these constructive measures must be described in the instruction handbook.

EXAMPLE Constructive measures to avoid backdrafts are small openings in the enclosure.

8.3 Explosion protection exceptions

8.3.1 General

In addition to the requirements for explosion protection specified in ISO 12643-1:2023, 5.4.2, the exceptions specified in 8.3.2 and 8.3.3 apply.

8.3.2 Exceptions for screen printing presses

Explosion protection measures on screen printing presses need not be provided, when using screen printing inks with a flash point of 40 °C to 60 °C, if sufficient ventilation in accordance with IEC 60079-10-1:2020, 6.4.3 , ensures that no explosive atmosphere occurs in the working area. The requirement to provide adequate air ventilation shall be indicated in the instruction handbook.

Where the intended use of a machine allows the use of screen printing inks with a flash point below 40 °C, requirements of ISO 12643-1:2023, 5.4.2 shall be fulfilled.

8.3.3 Exceptions for automatic washing devices

Where automatic cylinder washing (e.g. impression or blanket) and roller washing devices are attached to printing presses, explosion protection measures otherwise required due to the washing solvent being used are not required if all of the following conditions are met:

— the flash point of the washing solvent is greater than 60 °C, 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 solvent does not heat up to a temperature in excess of the flash point (for example due to heating equipment or waste heat from motors);

— explosive concentrations cannot build up when applying the solvent.

8.4 Spillage from washing devices

Safe replenishing of the washing agent shall be ensured.

EXAMPLE 1 The following are examples of ways to satisfy this requirement:

— designing washing agent tanks to allow one person handling the equipment to replenish the washing agent without the hazard of spilling or overflowing;

— avoiding tank overflow when replenishing the washing agent by use of devices that check the filling level ("tank full" indicators, inspection glasses, adequate openings for filling, etc.).

When the washing device is disconnected by the user, provision shall be made to prevent leakage of washing agents from the lines.

EXAMPLE 2 An example of a means to prevent leakage is the use of self-locking hose couplings.

8.5 Working platforms, access stairs, passageways and raised workplaces

8.5.1 General

Working platforms, access stairs, passageways and raised workplaces shall meet the requirements of ISO 12643-1:2023, 5.4.4.

8.5.2 Exception for sheet-fed presses

As an exception to ISO 12643-1:2023, 5.4.4 on sheet-fed offset printing presses with a format width of no more than 750 mm, it is acceptable to provide a single footstep for access to the platform fitted between units (printing units, coating units, delivery units) if all the following conditions are met:

— the difference in height between floor or gangway and platform is not more than 750 mm;

— the depth of the footstep is at least 250 mm, and the width at least 300 mm;

— the footstep is fitted half way between the floor or gangway and the platform; and

— suitable handles are provided.

8.6 Electrostatic toner dust

Where electrostatic toners are used as printing substances (such as in digital printing presses), it shall be ensured that persons are not endangered by toner dust.

NOTE This can be achieved, for example, by the following:

— using the least hazardous toners needed for the process;

— providing totally enclosed systems; and

— providing adequate dust separation equipment and filters.

8.7 Washing equipment for printing plates, rollers and doctor blades

8.7.1 Hazards due to emission of washing agents

Personnel shall be protected from hazards from emissions of washing agents used in external washing devices for printing plates, rollers, and doctor blades.

NOTE One or more of the following safety measures could be used to protect personnel from such hazards:

— using non-hazardous solvents when possible (with respective warnings given in the instruction handbook);

— using closed-type washing equipment, equipped with an interlocking guard for the charging doors, so that the doors can be opened only after the drying process is finished, and a means of exhausting solvent vapours;

— exhausting solvent vapours.

8.7.2 Grounding of washing equipment

Where solvents with a flash point below 60 °C are used on external washing equipment for printing plates, rollers and doctor blades, or where explosion hazards exist due to spraying of the washing agent, the containers and fixtures used to hold all parts loaded into a washing device shall be electrostatically grounded/bonded to the device (resistance less than $1*10^6$ Ω) in accordance with IEC/TS 60079-32-1:2013+AMD1:2017:2013, 6.2.3, 7.7 and 13.1 to 13.4. The design of the washing system shall be in accordance with the principles of EN 1127-1:2019 as a stand-alone system.

8.7.3 Unintended escape of solvents

Where solvents with a flash point below 60 °C are used on external washing equipment for printing plates, rollers and doctor blades, hazards from unintended escape of solvents (e.g. leakage or during pumping) shall be prevented.

NOTE 1 Penetration into non-explosion-proof areas can be prevented, for example, by using catch tanks of adequate size.

NOTE 2 For further information on fire and explosion protection, see 8.2.

8.8 Alcohol dosing devices

8.8.1 Concentration

Alcohol dosing devices as auxiliary devices on dampening units shall be equipped with means that limit the concentration of alcohol in the dampening water to the percentage required for the printing process.

Additional explosion protection measures in the dosing equipment and printing press area are not required if the dosing device is equipped such that a maximum of 15 % by volume of alcohol in the dampening water for normal operation cannot be exceeded.

In addition, if an electric/electronic control system is used to control the alcohol concentration in the dampening water, this system shall satisfy the requirements of ISO 12643-1:2023, 5.10.1.2, to ensure that a failure of the primary control system shall not allow the alcohol in the dampening water to exceed 20 % by volume.

8.8.2 Prevention of leakage and overflow

Adequate measures for alcohol dosing devices shall be provided to prevent leakage and overflow of concentrated alcohol into non-explosion-proof areas. Adequate measures include the use of collecting tanks or means of draining the alcohol into the dampening recirculator.

Alcohol dosing devices shall be designed such that the tank cannot fall, and that the tank and the hoses connecting the tank to the dosing device are safeguarded against damage (e.g. by placing the tanks in closed cabinets).

The instruction handbook shall contain instructions for the proper setting-up of the tanks.

8.9 Refrigerating devices in ink and dampening units

Refrigerating devices of auxiliary devices in ink and dampening units shall be in accordance with ISO 5149-1:2014.

NOTE Different regulations can apply to refrigerating devices of auxiliary devices depending on the country or region.

8.10 Powder-spraying devices

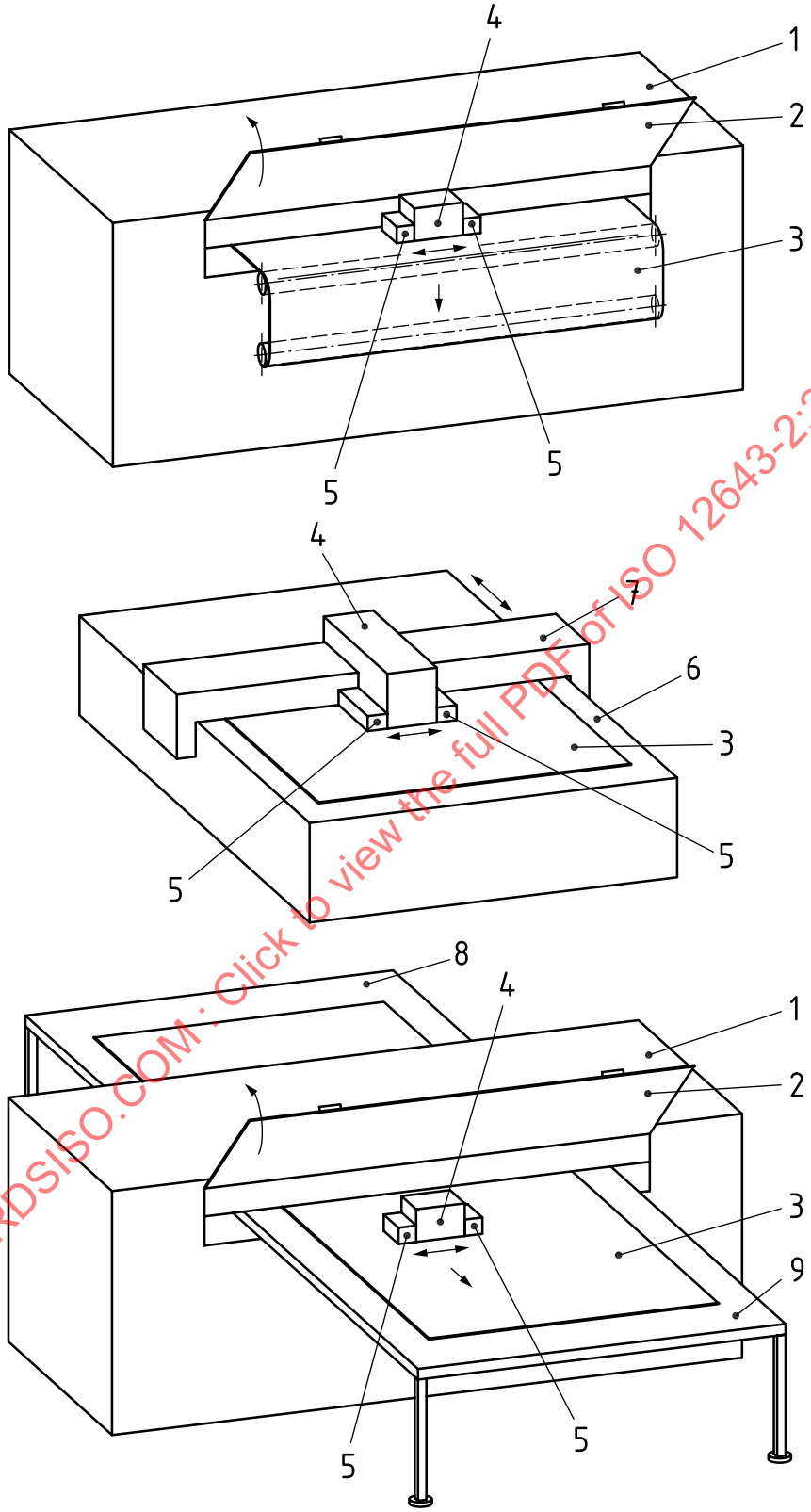
Safe replenishing of anti-setoff powder used during the printing process shall be ensured.

8.11 Hazardous emissions of sheet-fed presses

For measurements of hazardous emissions of sheet-fed presses, refer to Annex B.

8.12 Large-format inkjet digital printing machines (wide-format inkjet digital printing machines)

This subclause applies to digital printing machines using the inkjet method. These devices might have a movable printing head(s) and might use UV or other curing and drying systems. Examples of basic designs can be seen in Figure 10.



Key

1	cabinet	4	printing head	7	portal
2	interlocked guard	5	UV drying unit	8	feeding table
3	web/ substrate	6	vacuum table	9	delivering table

Figure 10 — Examples of large-format (wide-format) inkjet digital printing machines

Where inkjet digital printing machines utilize solvent-containing inks, risk-reduction measures shall be provided in order to prevent hazards caused by contact with or the inhaling of hazardous substances, for example, solvents or solvent vapours.

NOTE 1 This can be achieved by the use of exhaust equipment.

Any hazardous movement of the printing head shall be safeguarded in accordance with ISO 13857:2019 or shall not exceed a force of 50 N.

As an exception to ISO 12643-1:2023, 5.3.4, safeguarding of in-running nips at cylinders and rollers is not required if the force exerted is limited to 50 N and if the cylinders and rollers are able to move apart.

Start of operation of inkjet digital printing machines while interlocked guards are open or the opening of interlocked guards during operation for fault finding may only be possible if the following requirements are fulfilled:

— all hazardous areas shall be visible from the point of activation according to ISO 12643-1:2023, 5.3.5,

— an operating mode selector switch that enables the bypass-mode shall be installed where the guard has to be bypassed,

A visual signal can be used to indicate that the machine is in bypass-mode as well as time expiration.

NOTE 2 The selector can be replaced by another selection method which restricts the use of certain functions of the machinery to certain categories of operator.

— the speed shall be as slow as possible under production requirements.

If the interlocked safety guard is not closed within one minute, the machine shall stop.

NOTE 3 This is necessary to evaluate print quality or clear faults during operation.

The related monitoring control system shall satisfy at least PL d or SIL 2.

NOTE 4 The one-minute time limitation can be achieved by a single-channel system.

See 15.11 for information for use.

8.13 Dust protection requirements on web offset printing presses

Web offset printing presses shall be equipped with provision for connection to a functioning centralized or decentralized dust extraction system for the removal of paper dust at the slitting devices.

8.14 Emergency stop devices and stop/safe pushbuttons at stationary control stands of web offset printing presses

When control stands are positioned in a control room that is insulated in a way that allows limited visual and acoustic contact to the operator of machines, then at least one emergency stop device shall be located in the control room.

This does not eliminate the need for emergency stop device or stop/safe pushbutton at individual units of the machine as determined by the risk assessment.

9 Additional requirements for functions, operations, colours and mechanical specifications of manual control devices

9.1 General

In addition to the requirements of ISO 12643-1:2023, 5.7.2, the requirements of 9.2 to 9.6 apply.

9.2 Emergency stop device and ink, dampening, metering, flexo or fountain rollers

Actuation of an emergency stop device or stop/safe pushbutton need not cause the motion of the ink, dampening, metering, flexo (e.g. coating, precoating) or fountain rollers to stop, where continuing motion is required for operational reasons and all hazard points are safeguarded; i.e.:

— in-running nips between the ink fountain roller and the ductor roller are not accessible, even when the ink fountain is in the open position; or

— all in-running nips on the dampening and the coating fountain roller and metering roller are safeguarded by fixed guards.

If interlocking guards are used, hazardous motion related to the guard shall stop when the guard is opened.

9.3 Emergency stop devices on auxiliary draw nips

Actuation of an emergency stop device or stop/safe pushbutton need not cause the motion of the draw roller to stop, where continuing motion is required for operational reasons, provided that all nip points created by draw rollers are safeguarded.

NOTE Motion includes zero speed.

If interlocking guards are used, motion protected by the guard shall stop when the guard is opened.

9.4 Emergency stop device and inkjet printing heads

Actuation of an emergency stop device or stop/safe pushbutton need not cause the motion of the inkjet printing heads to stop, where motion is required for technological reasons and all hazard points are safeguarded; i.e.

— crushing and shearing points between the moving inkjet printing heads and fixed machine parts are not accessible; or

— all hazards of the moving inkjet printing heads are safeguarded.

If interlocking guards are used, hazardous motion related to the guard shall stop when the guard is opened.

NOTE An example for a motion which is required for technological reason is to position the inkjet printing heads above mist bath to avoid the desiccation of the ink nozzles.

9.5 Ready pushbutton

If a ready pushbutton is used it shall be a maintained-contact pushbutton, mechanically interlocked with the associated stop/safe pushbutton. When depressed, it shall release the associated stop/safe pushbutton and may place the machine in the ready condition.

NOTE A ready pushbutton is for unlatching the stop/safe pushbutton.

9.6 Plate position control

If all hazards are protected, actuating a plate position control shall initiate press motion and rotate (index) the press cylinders to stop at a predefined position (a new plate position) for ease of mounting a printing plate. Successive depressions of the control during the permissive period may initiate indexing to the next plate position. The plate position control may be a momentary-contact control.

When an interlocking guard is open and hazard points are unprotected, actuating the plate position control shall initiate the press motion only in accordance with hold-to-run conditions as defined in ISO 12643-1:2023, 5.3.6.

NOTE A plate position control device is not used for registration purposes.

10 Control systems for screen printing presses

The following requirements shall be satisfied on screen printing presses where substrates are fed manually between the screen printing frame and the printing table:

— safety-related parts of the control system that relate to the closing movement of the screen printing frame and the printing table shall be in accordance with ISO 12643-1:2023, 5.10.1.2;

— trip devices shall satisfy PL e of ISO 13849-1:2023 or SIL 3 of IEC 62061:2021 in addition to the requirements of ISO 12643-1:2023, 5.7.7;

— ESPDs shall be in accordance with ISO 12643-1:2023, 5.7.6.

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

11 Safety requirements for prepress equipment

11.1 Electrical equipment of prepress machinery

As an exception to ISO 12643-1:2023, 5.4.3, for prepress machinery that is used for the production of master copies, film and printing plate exposure, and that falls within the scope of IEC 62368-1:2018, and is not used in areas where printing on paper or paper converting takes place, the electrical equipment may be designed so that electrical hazards (such as burns or shocks) are prevented in accordance with IEC 62368-1:2018, and the equipment has the degree of protection IP2X or IP23, where appropriate, in accordance with IEC 60529:1989+AMD1:1999+AMD2:2013.

Prepress machinery may be equipped with a supply-disconnecting device meeting the requirements for supply-disconnecting devices specified in ISO 12643-1:2023, 5.4.3.2.

11.2 Electric/electronic control systems of prepress machinery

The control systems of an interlocking device for safety devices that prevent access to laser radiation class 3R, 3B or 4, as classified in IEC 60825-1:2014, shall be designed to be in accordance with PL d of ISO 13849-1:2023 or SIL 2 of IEC 62061:2021.

11.3 Exposing equipment

Exposing equipment that poses a risk of injury caused by bursting lamps shall be equipped with safety screens of heat-resistant material.

11.4 Safeguarding the discharge of liquids

Appropriate facilities shall be provided to ensure safe filling and emptying of developing and fixing chemicals and gum arabic liquids.

11.5 Safeguarding in-running nips on engraving machines

On engraving machines for gravure cylinders, the in-running nip between gravure cylinder and engraving tool shall be safeguarded by one of the following:

— enclosing the gravure cylinder by an interlocking guard;

— providing a fixed guard with a maximum gap of 6 mm between the gravure cylinder and the guard.

The trapping hazard caused by the rotation of the gravure cylinder shall be safeguarded.

NOTE 1 This can be done, for example, by means such as:

— enclosing the gravure cylinder by an interlocking guard;

— using a cylinder with a smooth surface including cylinder fixture and drive elements;

— enclosing an individual trapping point by fixed or interlocking guards.

NOTE 2 Trapping hazards can be caused by the chuck jaws, for example.

11.6 Safeguarding bending unit on printing plate bending machines

On printing plate 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.

11.7 Safeguarding printing plate punching devices

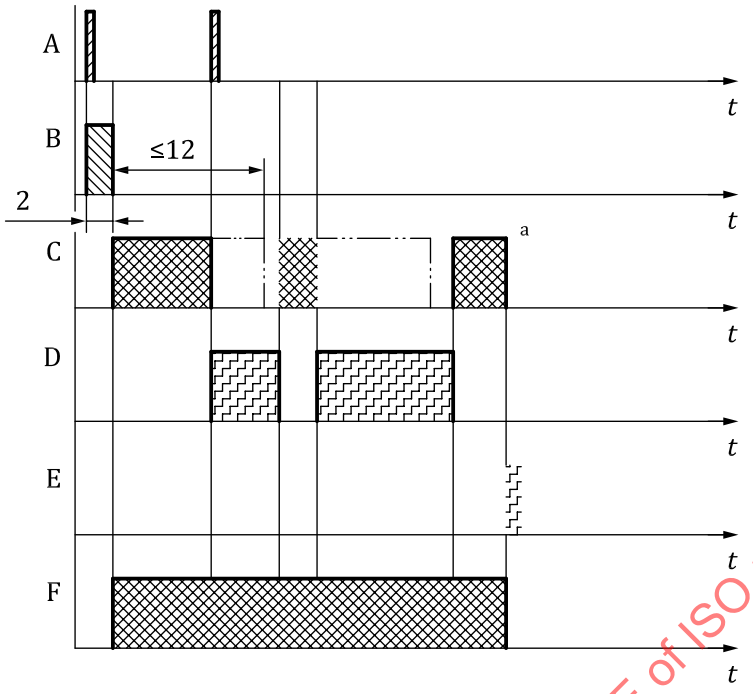
The movement of the punching tool shall be safeguarded by designing the opening of fixed punching tools in accordance with the requirements specified in ISO 13857:2019.

12 Signals and warning devices for automatic machine mode with double-push sequence

As an exception to the requirements of ISO 12643-1:2023, 7.2.3, for technological reasons, a permissive period of no more than 12 seconds is permitted with the addition of a flashing light or an audible signal (or both) in the hazardous area(s) (e.g. in the delivery area). The additional signal F (see Figure 11) shall cycle throughout the entire permissive period and automatic machine motion.

NOTE This is needed for example for automatic plate changing or folder mode change.

A change in direction of machine motion within the same permissive period is permitted without the initiation of a new warning period (see Figure 11).



Key

t time, s
A automatic start button
B warning period and audible alarm
C permissive period
D machine motion
E stop, stop/safe, breaking of safety circuit
F flashing light and/or audible signal in the hazardous area(s)
[a] Cancellation of the permissive period.

Figure 11 — Audible warning system for automatic machine mode with double-push sequence

13 Control zones for web presses having multiple folders

As an exception to the requirements of ISO 12643-1:2023, 5.6.3, for control zones on a web press system having multiple folders, the emergency stop device shall stop the printing units and associated operating equipment on both sides of the unit where the emergency stop device was actuated.

14 Verification of safety requirements and/or protective /risk reduction measures

Table 3 describes the methods used to verify if the safety requirements and/or measures described in Clauses 6 to 13 are complied with.

Table 3 — Verification of safety requirements and/or protective/risk reduction measures

Subclause number	Title	a) Calculation	b) Visual inspection	c) Measurement	d) Testing
6.2	Guarding of significant hazards				
6.2.2	Guard openings		x	x	x
6.2.3	Guarding in-running nips				
6.2.3.1	Guarding in-running nips on sheet-fed presses		x	x	x
6.2.3.2	Guarding in-running nips on web-fed presses		x	x	x
6.2.3.3	Guarding in-running cylinder nips on newspaper presses		x	x	x
6.2.3.4	Guarding in-running nips on cylinder screen printing presses		x	x	x
6.2.3.5	Safeguarding of the drawing-in point on anilox rolls of printing machines		x	x	x
6.2.3.6	Guarding in-running nips on printing cylinders and inking rollers on gravure printing machines		x	x	x
6.3	Interlocks				
6.3.1	Interlocking with guard locking		x	x	x
6.3.2	Continuous motion at crawl speed with an interlocking guard open		x		x
6.3.3	Closing an interlocking guard on dampening, coating or inking devices		x		x
6.4	Hold-to-run controls				
6.4.1	Specific requirements for sheet-fed presses		x	x	x
6.4.2	Specific requirements for forms printing presses and leporello printing presses		x	x	x
6.5	Automatic format-setting operations		x	x	x
6.6	Additional safeguarding methods for machine devices and components				
6.6.1	Delivery units (pile lifting and lowering devices)				
6.6.1.1	Guarding sheet gripper from unintentional hand access		x		x
6.6.1.2	Guarding rotating sheet gripper systems from full body access		x	x	
6.6.1.3	Safeguarding full body access by electro-sensitive protective devices (ESPDs)	x	x	x	x
6.6.1.4	Other methods of full body access safeguarding		x		x
6.6.1.5	Reset control for delivery units		x	x	x
6.6.1.6	Safeguarding the sheet gripper system	x	x	x	x
6.6.2	Transport carriages		x		x
6.6.3	Guarding plate-clamping devices		x	x	x
6.6.4	Continuous-flow drying devices on web presses				
6.6.4.1	Surface temperature			x	
6.6.4.2	Interlocking device open		x		
6.6.5	Folders for web presses				
6.6.5.1	Exception for folder set-up		x	x	x
6.6.5.2	Exception for folder delivery guarding		x	x	
6.6.6	Safety distances for web feed on web-fed presses		x	x	
6.6.7	Screen printing presses				
6.6.7.1	Crushing point between screen printing frame and machine frame	x	x	x	x
6.6.7.2	Crushing point between doctor blade and screen printing frame		x	x	
6.6.7.3.1	Crushing hazards caused by the movement of the doctor blade		x	x	
6.6.7.3.2	Protection during access between screen printing frame and machine frame		x		x
6.6.7.3.3	Protection between movable screen frame and fixed machine parts		x	x	x
Clause 7	Changing of printing plates				
7.1	General		x		
7.2	Automatic printing plate changes	x	x		x

Table 3 *(continued)*

Subclause number	Title	a) Calculation	b) Visual inspection	c) Measurement	d) Testing
7.3	Semi-automatic printing plate changes	x	x		x
Clause 8	Requirements for protection against other hazards				
8.2	Protection against fire and explosion				
8.2.1	Protection against fire and explosion in continuous-flow drying devices				
8.2.1.1	General		x		
8.2.1.2	Interface with automatic cylinder and roller washing devices		x	x	
8.2.1.2.1	Substrate transporting solvents		x	x	
8.2.1.2.2	Vapours and mists		x	x	
8.2.1.2.3	Leakage and spillage of solvents		x		
8.2.1.3	Ignition of substrate		x		
8.2.2	Fire protection on web-fed rotary gravure presses and web-fed rotary flexo presses				
8.2.2.1	General requirements		x		
8.2.2.2	Inherently safe design measures		x	x	
8.2.2.3	Supplementary protective measures		x		
8.2.1.4	Exhaust systems of drying devices		x		
8.3	Explosion protection exceptions				
8.3.2	Exceptions for screen printing presses		x		
8.3.3	Exceptions for automatic washing devices	x	x	x	
8.4	Spillage from washing devices			x	x
8.5	Working platforms, access stairs, passageways and raised workplaces				
8.5.1	General		x	x	
8.5.2	Exception for sheet-fed presses		x	x	
8.6	Electrostatic toner dust		x		
8.7	Washing equipment for printing plates, rollers and doctor blades			x	
8.7.1	Hazards due to emission of washing agents			x	
8.7.2	Grounding of washing equipment			x	
8.7.3	Unintended escape of solvents		x		x
8.8	Alcohol dosing devices				
8.8.1	Concentration			x	
8.8.2	Prevention of leakage and overflow		x		x
8.9	Refrigerating devices in ink and dampening units		x		
8.10	Powder-spraying devices		x		
8.11	Hazardous emissions of sheet-fed presses			x	
8.12	Large-format inkjet digital printing machines (wide-format inkjet digital printing machines)		x	x	x
8.13	Dust protection requirements on web offset printing presses		x		
8.14	Emergency stop devices and stop/safe pushbuttons at stationary control stands of web offset printing presses		x		x
Clause 9	Additional requirements for functions, operations, colours and mechanical specifications of manual control devices				
9.2	Emergency stop device and ink, dampening, metering, flexo or fountain rollers		x		x
9.3	Emergency stop devices on auxiliary draw nips		x		x
9.4	Emergency stop device and inkjet printing heads		x		x
9.5	Ready pushbutton		x		x

Table 3 *(continued)*

Subclause number	Title	a) Calculation	b) Visual inspection	c) Measurement	d) Testing
9.6	Plate position control		x		x
Clause 10	Control systems for screen printing presses		x		x
Clause 11	Safety requirements for prepress equipment				
11.1	Electrical equipment of prepress machinery		x		
11.2	Electric/electronic control systems of prepress machinery		x		
11.3	Exposing equipment		x	x	
11.4	Safeguarding the discharge of liquids		x		
11.5	Safeguarding in-running nips on engraving machines		x	x	
11.6	Safeguarding bending unit on printing plate bending machines		x	x	
11.7	Safeguarding printing plate punching devices		x	x	
Clause 12	Signals and warning devices for automatic machine mode with double-push sequence		x	x	
Clause 13	Control zones for web presses having multiple folders		x		x

15 Contents of instruction handbook

15.1 General

In addition to the requirements of ISO 12643-1:2023, 8.3, the requirements of 15.2 to 15.11 apply.

15.2 Sheet-fed printing press systems

15.2.1 Residual risk from ink ducts

The instruction handbook shall provide a warning to the user of any residual risk existing when ink ducts are swung down.

NOTE For example, there can be in-running nips between ink ducts and ductor roller.

15.2.2 Residual risks in sheet delivery area

The instruction handbook shall provide a warning regarding the residual risks existing when gaining access under the guards in the sheet delivery area.

NOTE For example, access can be needed for removing sample sheets or for inserting pile wedges.

15.2.3 Sheet-fed presses used for printing on board or metal sheet

The instruction handbook shall provide a warning regarding the residual risk existing where the requirements of ISO 13857:2019 cannot be applied in the feeding area for production reasons on sheet-fed printing presses that are also used for printing on board or metal sheet.

15.2.4 Rollers

If actuation of the emergency stop device does not stop ink, dampening, metering, flexo or fountain rollers, the instruction handbook shall provide information on how these rollers are to be stopped.

EXAMPLE For example, by operation of the main supply switch.

15.2.5 Powders (anti-setoff powders)

The instruction handbook shall provide specifications on the use of the least hazardous powders needed for the process.

15.3 Web-fed printing press systems

15.3.1 Rollers

If actuation of the emergency stop device does not stop ink, dampening, metering, flexo or fountain rollers, the instruction handbook shall provide instructions describing how these rollers are to be stopped.

EXAMPLE For example, by operation of the main supply switch.

15.3.2 In-running nips

The instruction handbook shall identify hazards that exist when operations are carried out in the vicinity of areas where in-running nips could be generated under hold-to-run control and where such areas cannot be observed from the point of operation of the hold-to-run control. In addition, the handbook shall describe safe working practices.

EXAMPLE For example, operation of a stop control with mechanical latch or emergency stop device before beginning operation in the hazardous area.

15.3.3 Operation by two-hand control with guard open

Where production reasons require the printing press to be started by two-hand control with guards open and a speed higher than 10 m/min, the instruction handbook shall provide a warning that the person operating the two-hand control shall make sure that there is no second person in the hazardous area before starting the hold-to-run operation.

15.4 Screen printing presses

15.4.1 Ventilation and admissible liquids

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

15.4.2 Access between screen printing frame and machine frame

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

15.4.3 Use of different size screens

Where screens of different sizes are being used, the instruction handbook shall provide instructions for adjusting stop gauges so that the distance between doctor blade and screen frame is no less than 25 mm.

15.4.4 Crushing point between doctor blade and screen or machine table

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

15.4.5 Residual risks related to doctor blade

The instruction handbook shall provide a warning regarding residual risks caused by the doctor blade being used without a screen, or a screen of smaller size being installed.

15.5 Automatic cylinder and roller washing device

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

EXAMPLE Parameters such as pressure of the washing liquid, speed of rotation of washing rollers and brushes, length of the washing process, etc.

NOTE Solvent vapours can cause risks of explosion or damage to health.

15.6 Continuous-flow drying devices

15.6.1 General instructions

The instruction handbook shall contain information for installation, putting into operation and use, together with instructions for the general maintenance of the dryer and the intended use as determined by the manufacturer. It shall be indicated that the information in the safety data sheets shall be observed.

15.6.2 Inks and coatings

The instruction handbook shall provide relevant information indicating where the use of inks and coatings is restricted to certain types to avoid the risk of explosion in accordance with 8.2.2 and ISO 12643-1:2023, 5.4.2. The handbook should also include the suggested maximum flow rate, at a specific lower explosive limit, of ink, coating and wash solvents into the dryer.

15.6.3 Solvents

The instruction handbook shall provide a warning that, to avoid an explosive hazard, solvents not be placed in the area of the continuous-flow drying device (e.g. during manual washing of cylinders or rollers).

15.6.4 Mist of UV inks and UV coatings

The instruction handbook for UV continuous-flow drying devices shall note that the use of some types of UV inks or UV coatings might result in an inhalation hazard due to the build-up of mists, and that exhaust equipment might be required.

15.6.5 Solvents for manual washing

The instruction handbook shall provide information that, when washing cylinders and rollers by hand (manually), rather than with an automatic washing device, solvent ignition within the drying device should be avoided by one or more of the following means:

— removing the web from its operating position (threaded through the drying device) before starting the washing;

— using cleaning material (solvents) that has a safety data sheet indicating that the explosion limit is "not applicable" at the expected operating temperature of the drying device;

— using user-created "standard operating procedures" for press operators so that the flow rate of solvents into the drying device is limited to that rate producing a harmless solvent concentration,

NOTE Different regulations can apply to drying devices depending on the country or region. Examples are EN 1539:2015[17] in the CEN members state and NFPA 86[10] in the United States.

15.7 Oxidizers, incinerators and thermal cleaning plants

The instruction handbook shall provide information on methods for reducing the following residual risks:

— inlet concentration of flammable substances not limited to established maximum design concentration standards;

— flammable condensate and deposits on internal duct surfaces;

— insufficient forced ventilation;

— insufficient oxygen, process space temperature, mixing, residence time, and catalyst function (if applicable) for oxidation of flammable substances;

— uncontrolled ignition sources such as electrical and mechanical sparks, static electricity, and flashback;

— overheating caused by failure of temperature control, heater failure and insulation failure.

15.8 Alcohol dosing devices

The instruction handbook shall indicate that alcohol spillages need to be removed immediately.

15.9 Washing equipment for printing plates

The instruction handbook shall indicate that washing equipment for printing plates, rollers and doctor blades is intended to use washing solvents with a flash point above 60 °C

15.10 Prepress machinery

The instruction handbook shall provide instructions for using personal protection equipment for adequate guarding against contact with solvent vapours, dust or copper swarf.

15.11 Large–format inkjet digital printing machines

If the machine uses solvents, the instruction handbook shall provide information, regarding the use of personal protective equipment to provide sufficient protection against hazards from solvents and solvent vapours.

Where interlocked guards shall be opened for fault finding with the machine is operated in the hold-to-run mode, a residual risk exists. The instruction handbook shall provide information about this residual risk. The handbook shall state that the person opening the guard and carrying out the work observing is required to ensure that there are no other persons in the hazard area.

15.12 Handling of encraved cylinders

If operators handle encraved cylinders (e.g. in gravur printing) the risk of skin and eye injuries created by the potential for copper swarf to adhere to the hands shall be described in the instruction handbook.

15.13 Fire protection on printing machines

In addition to the requirements in ISO 12643-1:2023, 8.3.2 and ISO 19353:2019, Clause 7, the instruction handbook shall contain the following:

— information on fire hazards (e.g. from open fire, smoking) and on organisational measures to avoid them;

— instructions for avoiding ignition hazards due to cleaning supplies;

EXAMPLES

- Use of cleaning cloths made of cotton;
- use of cleaning buckets made of dissipative material (resistance less than 10^6 Ω);
- necessity to include cleaning buckets in the equipotential bonding system;

— advice on regular and timely removal of ink incrustations;

— if the machine is integrated into the user's fire protection and extinction system, a description of the interface between the press control system and the extinction system should be provided;

— information on the type of hand-held fire extinguishers/portable extinguishing devices should be provided.

Annex A
(informative)

List of significant hazards

Table A.1 lists significant hazards that can be encountered in printing press systems. When performing risk assessment for an individual piece of equipment, this list can assist the manufacturer in identifying the risks on their piece of equipment. The manufacturer should be aware that there can be other hazards not included in this list that need to be identified during the risk assessment process.

NOTE Additional information on risk assessment is given in ISO 12100:2010.

Table A.1 — Significant hazards and hazard zones

Group	Example of hazard	Hazard zone	Clause/subclause of this document
Mechanical hazards	— crushing; — shearing — cutting or severing; — entanglement; — drawing-in; — trapping; — impacts.	Production area: — between rollers, cylinders, drums — short linear movements — wheels for floor travel — revolving handwheels — guards — make-ready, cleaning, maintenance operations and trouble-shooting (hold-to-run) — impact hazards in passageways, access ways — loss of stability; — stationary knives — rotary tools — transport of hazardous tools — on feeding and delivery units (pile lifting and lowering devices) — unwinding and rewinding units for web material	6.6.2