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Part 4: Converting equipment and systems

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

Partie 4: Systèmes et équipement de façonnage

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO 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).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents. ISO shall not be held responsible for identifying any or all such patent rights.

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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 second edition cancels and replaces the first edition (ISO 12643-4:2010), which has been technically revised.

The main changes are as follows:

- in [Clause 3](#), terms and definitions, in particular concerning corrugated board machinery, have been added;
- a new [Clause 4](#) has been added and subsequent clauses have been renumbered;
- throughout the document, requirements related to hazards dealt with in ISO/FDIS 12643-1:2023 have been deleted (e.g. Safeguarding automatic reel loading in [6.2](#));
- in [Clause 6](#), the requirements for machinery for the production of corrugated board, e.g. terminological amendments, has been revised;
- [Figure 14](#) has been updated;
- in [6.3.3](#), the description of measures to safeguard the movable splicer module have been revised;
- in [6.8.2](#), an exception to the continued running of glue rollers in the gluing unit in case of an emergency stop has been added;
- in [6.16.1](#), limitation of the speed of the conveyor belt to 45 m/min, if access is required for production reasons, has been specified;

- [Clause 7](#) has been revised;
- in [Clause 8](#), the requirement to safeguard entry into the pile carrier plate with ESPDs has been amended;
- in [9.2.4](#), requirement for residual pile monitoring as safety device set to PL d / SIL 2, and a figure showing the safeguarding of hazard points outside the sidelays on feeders has been added;
- in [Clause 10](#), requirements on safeguarding the delivery on automatic flatbed die-cutting machines (sheet gripper system, analog ISO/FDIS 12643-2:2023) have been added;
- in [Clause 13](#), a subclause on requirements for interlocks has been added;
- [Clause 14](#), which is also applicable to machinery for the production of interfolded facial tissues, has been added (taken and adapted from EN 1010-5);
- a new [Clause 15](#) has been added;
- in [Clause 16](#), a table on the verification of the safety requirements and/or protective/risk reduction measures has been added;
- a new [Annex A](#) with a list of significant hazards has been added;
- in [Annex B](#), an example of noise declaration for paper converting machines has been added.

This document is intended to be used in conjunction with ISO/FDIS 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.

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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 organizations, 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 the 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 of this document.

The purpose of this document is to reduce the risk of injury to operating personnel working on converting equipment.

During the development of this document, existing relevant standards of other countries were taken into consideration. In cases where it was known that there is a national requirement that differs from this document, that has been noted.

This document was developed to harmonize the following US and European safety standards:

- ANSI/PMMI B155.1^[8]
- EN 1010 4^[9]
- EN 1010-5^[10]

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/FDIS 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/FDIS 12643-1:2023. Where a requirement of this document conflicts with a requirement of ISO/FDIS 12643-1:2023 the requirement of this document will take precedence.

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

Part 4: Converting equipment and systems

1 Scope

This document deals with all significant hazards, hazardous situations or hazardous events relevant to converting equipment and systems used in the corrugated board, package printing, converting and graphic technology industries (see [Clause 5](#)), when it is used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

This document is applicable to converting equipment not covered by other parts of ISO 12643.

This document is not applicable to the machinery or machinery components 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 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

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

ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

ISO 13850:2015, *Safety of machinery — Emergency stop function — Principles for design*

ISO 13854:2017, *Safety of machinery — Minimum gaps to avoid crushing of parts of the human body*

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

ISO 14122-3:2016, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard-rails*

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

IEC 61496-1:2020, *Safety of machinery — Electro-sensitive protective equipment — Part 1: General requirements and tests*

IEC 61496-2:2020, *Safety of machinery — Electro-sensitive protective equipment — Part 2: Particular requirements for equipment using active opto-electronic protective devices (AOPDs)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100, ISO/FDIS 12643-1:2023 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

<automatic flatbed die-cutting machine 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 27](#)

3.2 bridge

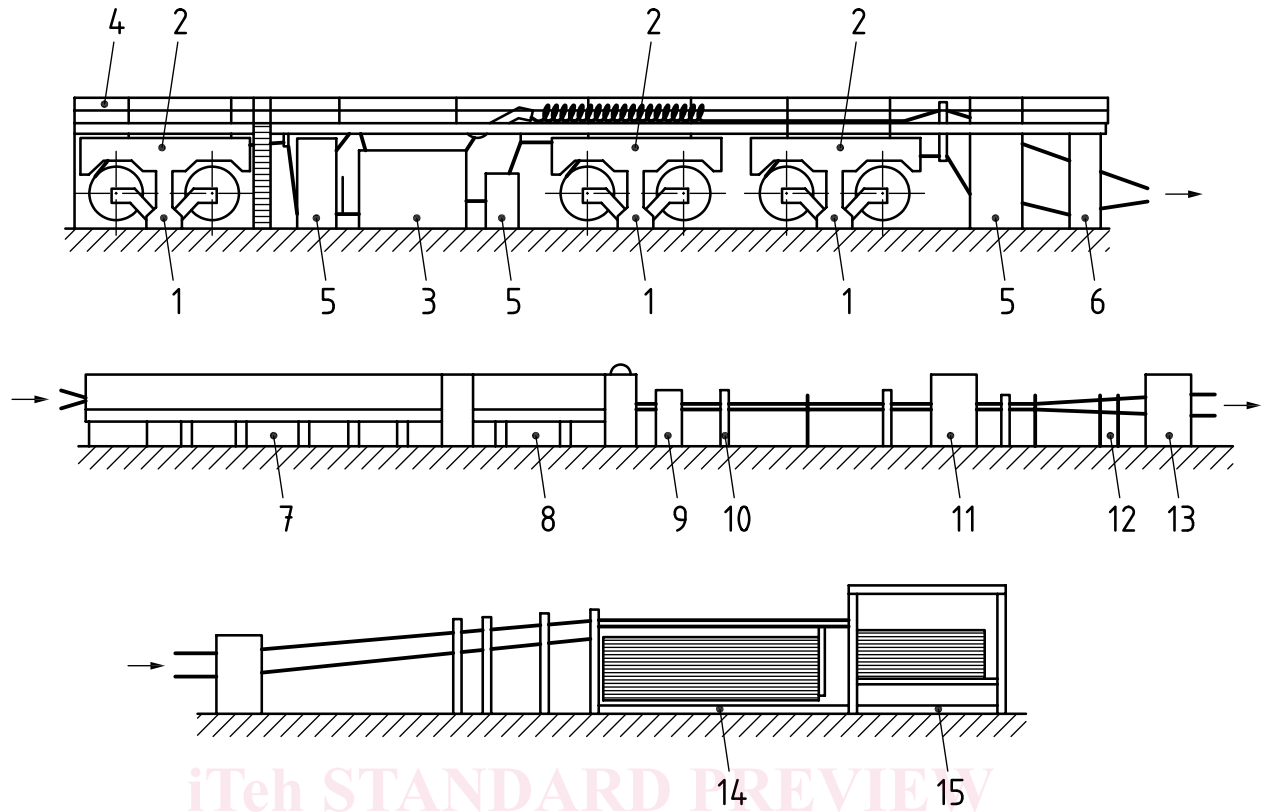
transport system positioned in an upper level (e.g. above the single facer, splicer or gluing unit) serving as storage facility

Note 1 to entry: The inclined belt conveyor feeds the single faced corrugated board to the bridge where it is deposited in loops and subsequently fed to the following machines

3.3 corrugating machine corrugated board machinery

machinery which produces board consisting of one or more layers of fluted paper glued to one or more layers of flat paper or board and which produces the fluted web to be glued in-line by means of two corrugating rollers

Note 1 to entry: An example of a corrugating machine is shown in [Figure 1](#).



Key

- | | | | |
|---|-----------------|----|---------------------|
| 1 | unwind | 9 | rotary shear |
| 2 | splicer | 10 | pulling unit |
| 3 | single facer | 11 | slitter-scorer unit |
| 4 | bridge | 12 | web diverter |
| 5 | preheater | 13 | cut-off |
| 6 | gluing machine | 14 | upstacker |
| 7 | heating section | 15 | downstacker |
| 8 | pulling section | | |

Figure 1 — Example of a machine for the production of corrugated board

3.4

cut-off

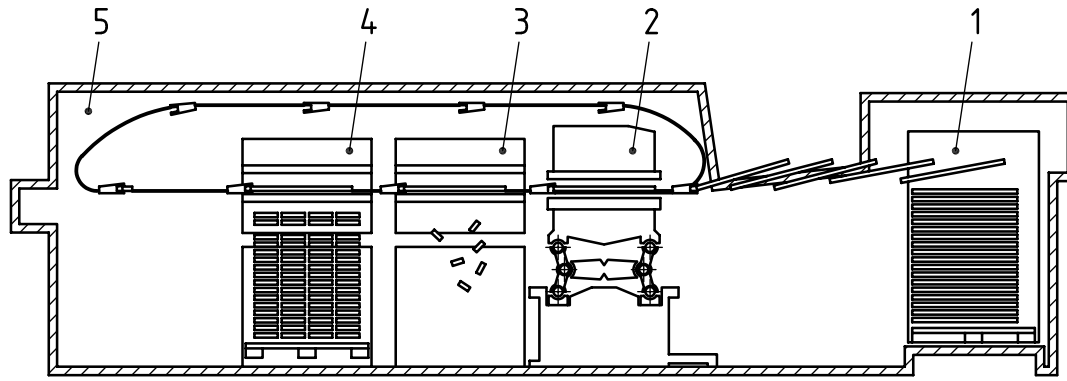
machine which cuts the material to a pre-determined length

3.5

die-cutter

flatbed die-cutting machine

machine which cuts and/or creases the material and/or strips the waste from the material



Key

- 1 feeder
- 2 punching section
- 3 breaking section
- 4 blank separating section, delivery
- 5 trimming of gripper edge, delivery

Figure 2 — Example of an automatic flatbed die-cutting machine

**3.6
downstacker
auto-piler**

stacking device on corrugated board machines where the position of the feeding conveyor remains unchanged and the pile is created by the lowering movement of the pile carrier

**3.7
folding section**

part of a folder gluer which folds the substrate to its required position

**3.8
gluing machine**

separate machine for applying an even layer of glue onto the top of the corrugations of one or more single faced board webs

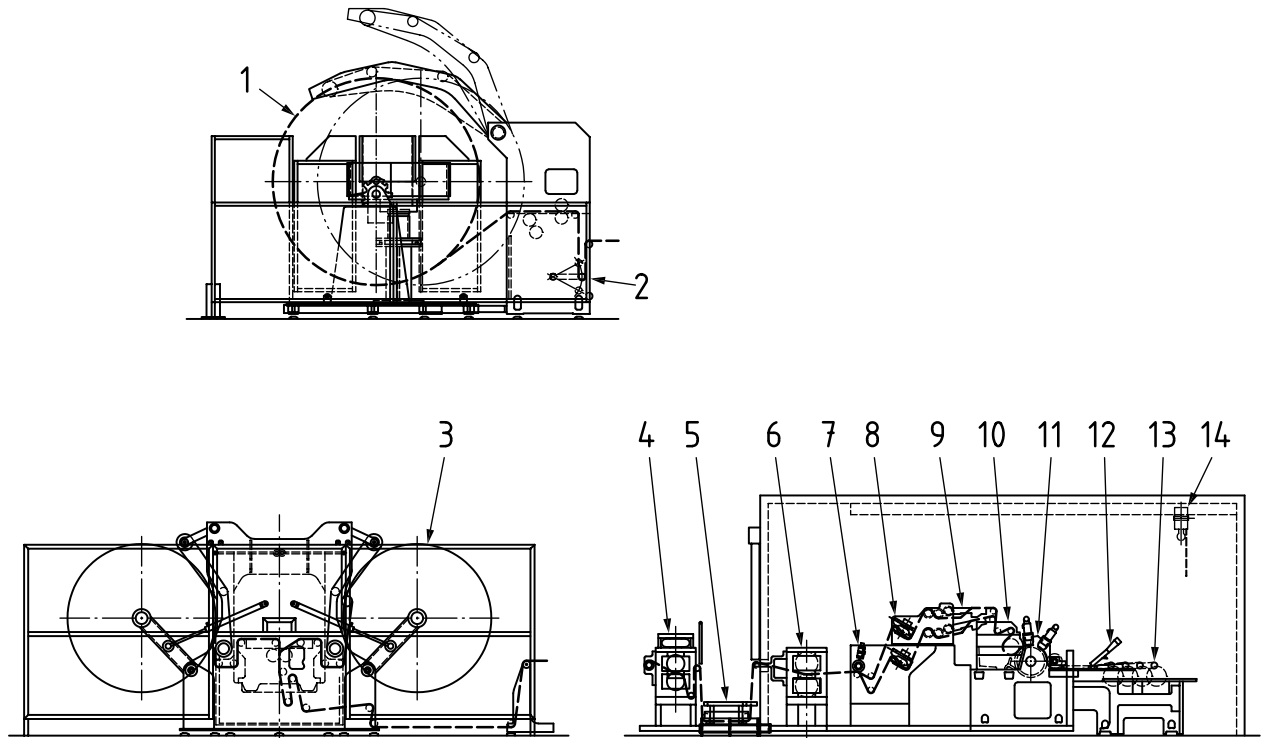
**3.9
gluing unit**

part of a *single facer* (3.19) or *gluing machine* (3.8) which applies a layer of adhesive to the fluted board peaks

**3.10
handkerchief machine**

machine for the in-line production of tissue-based handkerchiefs, which includes calendaring, embossing, folding and cutting

Note 1 to entry: An example of a handkerchief machine is shown in [Figure 3](#).

**Key**

- | | | | |
|---|------------------------------|----|-------------------------------|
| 1 | star-type unwinding | 8 | aligning section |
| 2 | dancer roller | 9 | longitudinal folding section |
| 3 | unwinding device | 10 | sheeter cylinder |
| 4 | smoothing section | 11 | cross folding cylinder |
| 5 | web guide control | 12 | waste suction device |
| 6 | embossing section | 13 | counting and transfer section |
| 7 | longitudinal cutting section | 14 | noise hood |

Figure 3 — Machine for the production of handkerchiefs

3.11**inclined belt conveyor**

transport system for feeding the single-faced corrugated board onto the *bridge* (3.2)

3.12**inclined belt conveyor side**

that side of a *single facer* (3.19) where the corrugated board is delivered and fed onto the *bridge* (3.2) by the inclined *belt conveyor* (3.11)

3.13**in-line machine**

machine for processing board and corrugated board, consisting of a number of units such as a feeding unit, one or more printing units, slitter-scoring unit, rotary die-cutter, gluing unit, folding unit, stitching unit, taping unit

Note 1 to entry: Depending on the type of machine, one or more of the units listed may be missing.