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

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

Reference number
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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.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 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;

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— 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 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 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 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.

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

ISO 13849-1:2023, *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)*

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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 12100:2010, ISO 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.

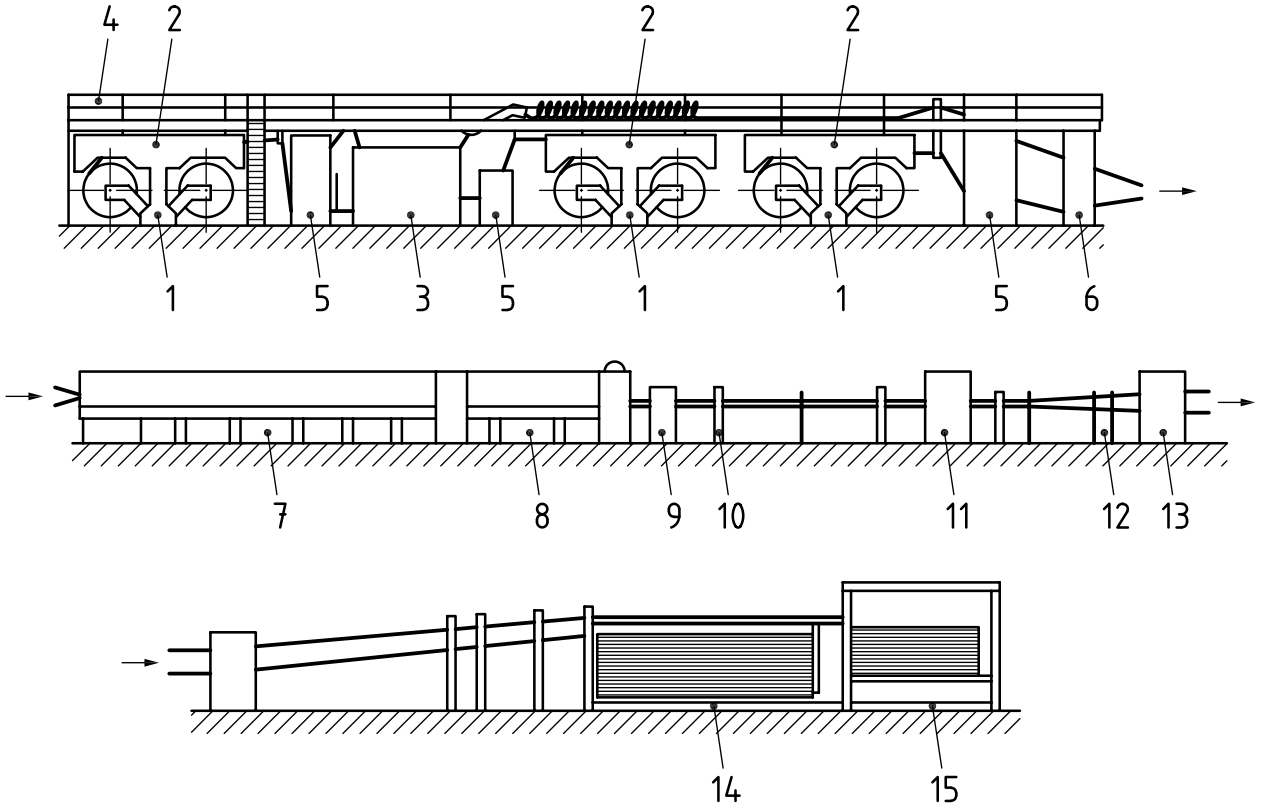
3.2
bridge
transport system positioned in an upper level (e.g. above the single facer, splicer or gluing unit) serving as storage facility

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.

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Key

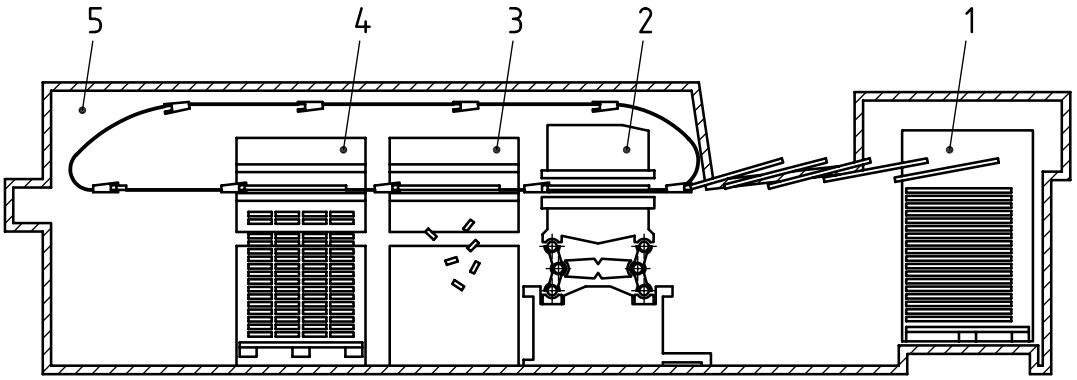
1	unwind	9	rotary shear
2	splicer	10	pulling unit
3	single facer	11	slitter-scorer unit
4	bridge	12	web diverter
5	preheater	13	cut-off
6	gluing machine	14	upstacker
7	heating section	15	downstacker
8	pulling section		

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

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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

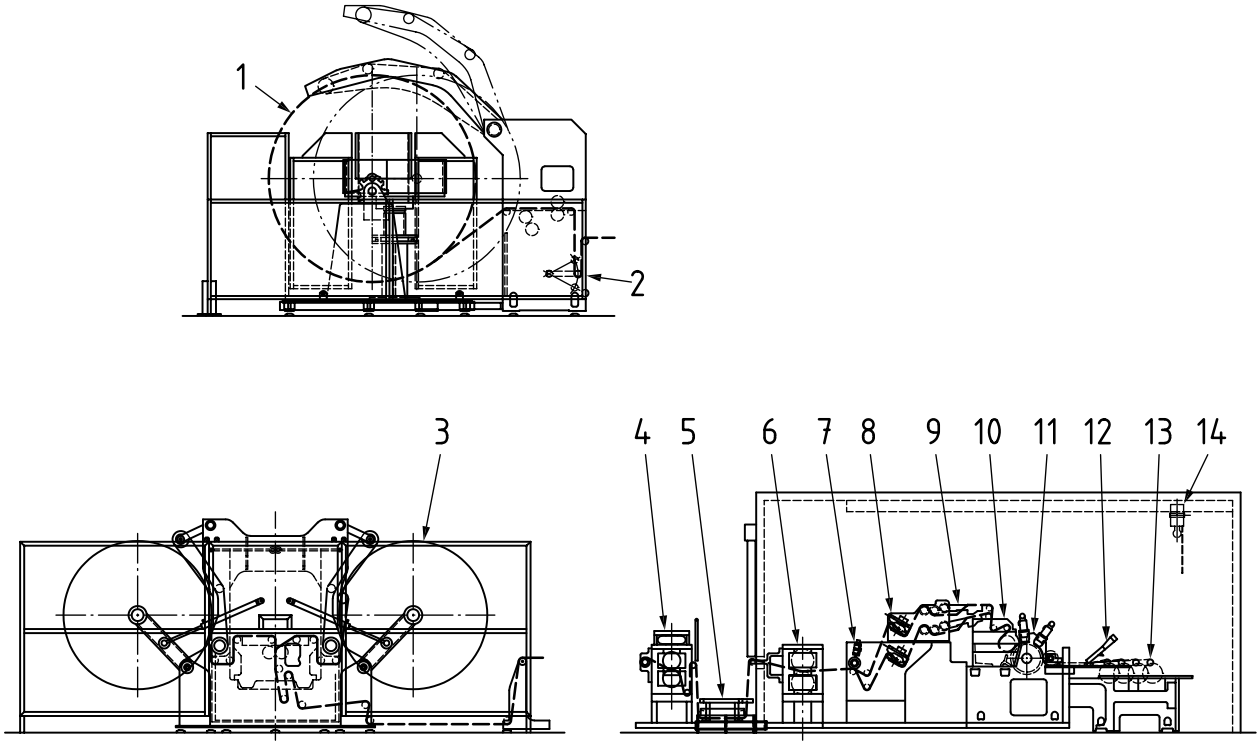
3.8
gluing machine
separate machine for applying an even layer of glue onto the top of the corrugations of one or more single faced board webs

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.

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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

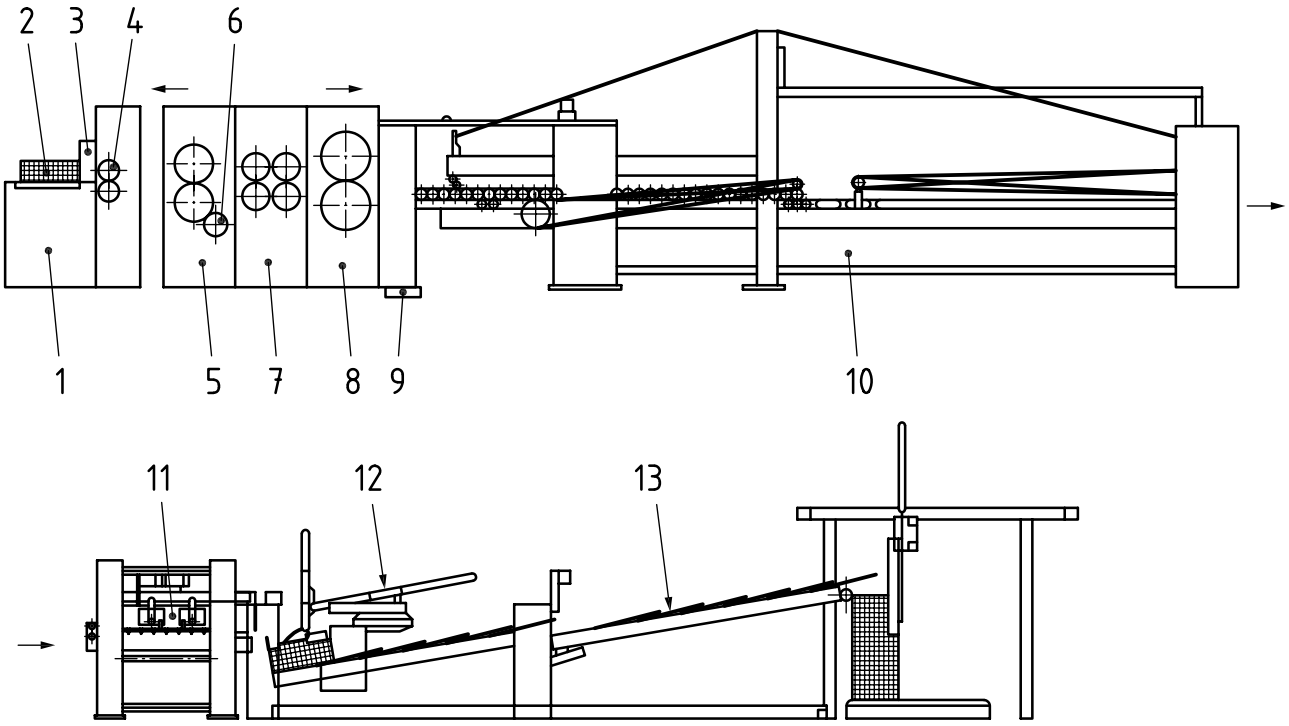
3.11
inclined belt conveyor
transport system for feeding the single-faced corrugated board onto the *bridge* (3.2)

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-scorer 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.

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Key

1	feeding unit	8	rotary die-cutter
2	blank pile	9	waste discharge conveyor belt
3	side alignment	10	folding unit
4	feed rollers	11	stitching unit
5	printing unit	12	counter-ejector and squaring unit
6	ink roller	13	delivery
7	slitting and scoring unit		

Figure 4 — In-line machine

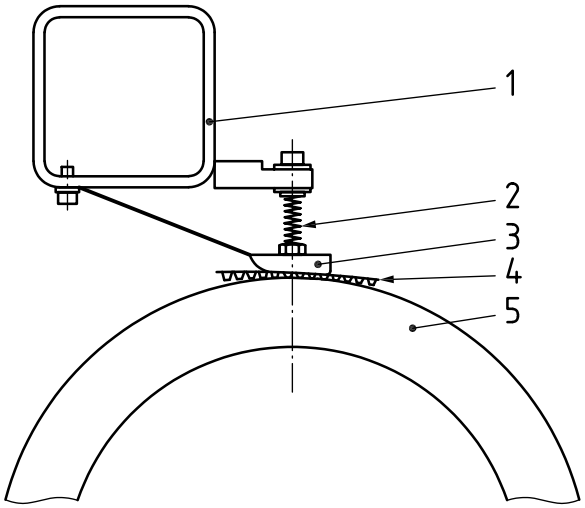
3.14
pile turner
machine that is used to turn over/rotate material

Note 1 to entry: Can be part of a *pre-feeder* (3.15).

3.15
pre-feeder
system that provides material to the feed of the machine

3.16
pressing device
part of a gluing machine of a corrugating machine, that ensures that the single faced web is evenly immersed into the glue film

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Key

1 cross beam/support
2 load spring
3 single faced web
4 pressing shoe
5 applicator roll

Figure 5 — Pressing device with spring-loaded design

3.17
rotary shear
rotary cutter for cutting the traveling corrugated cardboard web across the working width in the event of format change and for removing waste material

Note 1 to entry: Rotary shears are necessary for the cross-cutting of the corrugated board web, when the format is changed, or waste are removed.

3.18
separator
part of machine which separates the die cut material

3.19
single facer
equipment where corrugations are embossed into a paper web by using two corrugating rollers and where a liner is glued onto one side

3.20
slitter-scorer
machine which slits and scores material to a pre-determined depth

3.21
upstacker
stacking device on corrugated board machines where the position of the pile carrier remains unchanged and the pile is created by the upward movement of the conveyor belt

3.22
web diverter
system of movable elements for diverting and feeding the slit webs delivered from the slitting and scoring unit into the sheeter

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3.23
weighting device
assembly of a corrugating machine which controls the degree of drying in the heating and pulling section

Note 1 to entry: The more heating plates are in contact with the web and thus with the heating plate the higher is the degree of drying.

4 Significant hazards

The list of significant hazards covered by this document is given in Annex A.

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

5.1 General

This document covers a variety of equipment used in printing plants and converting operations. Those used primarily in a converting operation are listed in 5.2, while those that may be used in a printing operation covered in other parts of ISO 12643 are listed in 5.3.

Converting equipment and systems used in the corrugated board, package printing, converting and graphic technology industries complies with the requirements of ISO 12643-1:2023, as far as not modified or replaced by the requirements of this document.

5.2 Machines used primarily in a converting operation

Machines used primarily in a converting operation include the following:

— machinery for the production of envelopes;

— handkerchief machines;

— machinery for the production of interfolded facial tissues;

— machinery for the production of corrugated board;

— folding-box gluer machines;

— in-line machines;

— automatic flatbed punching machines;

— tube-winding machines;

— box-making machines;

— finishing/window equipment;

— hole punching machines;

— laminating machines/laminators;

— pre-feeding/stack-turning machines.

5.3 Machines used in both printing and converting processes

Examples of machines used in both printing and converting processes include the following:

— label printing machines (see also ISO 12643-1:2023 and ISO 12643-2:2023);

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