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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

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This draft has been developed within the International Organization for Standardization (ISO), and processed under the **ISO lead** mode of collaboration as defined in the Vienna Agreement.

This draft is hereby submitted to the ISO member bodies and to the CEN member bodies for a parallel five month enquiry.

Should this draft be accepted, a final draft, established on the basis of comments received, will be submitted to a parallel two-month approval vote in ISO and formal vote in CEN.

To expedite distribution, this document is circulated as received from the committee secretariat. ISO Central Secretariat work of editing and text composition will be undertaken at publication stage.



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 12643-4 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This second edition of ISO 12643-4 cancels and replaces the first edition (ISO 12643-4:2010). Significant changes incorporated into this second edition include, but are not limited to the following:

- addition of Clause 14, Verification of safety requirements and/or protective measures;
- addition of Annex A listing significant hazards and hazard zones; and
- reorganization of clauses to align with requirements in ISO Guide 78, *Safety of machinery – Rules for drafting and presentation of safety standards*.

It is the intent of ISO/TC 130 that there be a transition period between the first and second editions of ISO 12643-4. The user of this part of ISO 12643 is referred to Clause 4 of this standard for guidance in this area.

As from 201x-01-01, ISO 12643-4:2014 will cancel and replace ISO 12643-4:2010. Accordingly, as from 2014-01-01, only ISO 12643-1:2014 will be applicable to new equipment manufactured.

ISO 12643 consists of the following parts, under the general title *Graphic technology — Safety requirements for graphic technology equipment and systems*:

- Part 1: General requirements
- Part 2: Prepress and press equipment and systems
- Part 3: Binding and finishing equipment and systems
- Part 4: Converting equipment and systems
- Part 5: Stand-alone platen presses

Introduction

This part of ISO 12643 is a type-C standard as stated in ISO 12100^[1].

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 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 purpose of this part of ISO 12643 is to reduce the risk of injury to operating personnel working on converting equipment.

This part of ISO 12643 provides requirements for the design and construction of converting equipment used in the package printing, converting and graphic technology industries. It covers equipment not addressed by the other parts of ISO 12643. It is intended to be used in conjunction with ISO 12643-1 and provides additional requirements that are specific to converting equipment.

During the development of this part of ISO 12643, existing relevant standards of other countries were taken into consideration. An effort has been made to take into consideration the requirements of many countries, recognizing that national standards or laws may dictate national requirements. Cases where a national requirement was known to differ from this part of ISO 12643 have been noted.

This part of ISO 12643 was developed to harmonize the following US and European safety standards:

ANSI/PMMA B155.1, *Safety Requirements for Packaging Machinery and Packaging-Related Converting Machinery*
<https://standards.iteh.ai/catalog/standards/sis/659565ca-d472-49dc-9926-1810edc65005/iso-dis-12643-4>

EN 1010-4, *Safety of machinery — Safety requirements for the design and construction of printing and paper converting machines — Part 4: Bookbinding, paper converting and finishing machines*

EN 1010-5, *Safety of machinery — Safety requirements for the design and construction of printing and paper converting machines — Part 5: Machines for the production of corrugated board and machines for the conversion of flat and corrugated board*

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

Part 4: Converting equipment and systems

1 Scope

This part of ISO 12643 provides safety requirements for the design and construction of converting equipment used in the package printing, converting and graphic technology industries. It is applicable to converting equipment not covered by other parts of ISO 12643. It is intended to be used in conjunction with the general requirements given in ISO 12643-1.

2 Normative references

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

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

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

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

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

ISO 13855, *Safety of machinery — Positioning of protective equipment with respect to the approach speeds of parts of the human body*

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

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

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

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

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

EN 619, *Continuous handling equipment and systems — Safety and EMC requirements for equipment for mechanical handling of unit loads*

3 Terms and definitions

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

4 Conformity with this part of ISO 12643

In order to claim conformity with this part of ISO 12643, all equipment manufactured as of 201x-01-01 shall be in accordance with this second edition of ISO 12643-4 rather than ISO 12643-4:2010.

NOTE Although this second version of ISO 12643-4 cancels and replaces the first edition (ISO 12643-4:2010), a transition period might be necessary for equipment manufactured prior to 2014-01-01. To meet this need, it is noted that both versions of ISO 12643-4 can be purchased from ISO and its National Bodies.

5 Equipment covered by this part of ISO 12643

5.1 General

This part of ISO 12643 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.

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;
- 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

Machines used in both printing and converting processes include the following:

- label printing machines (see also ISO 12643-1 and ISO 12643-2^[2]);
- coating machines (see also ISO 12643-3^[3]);

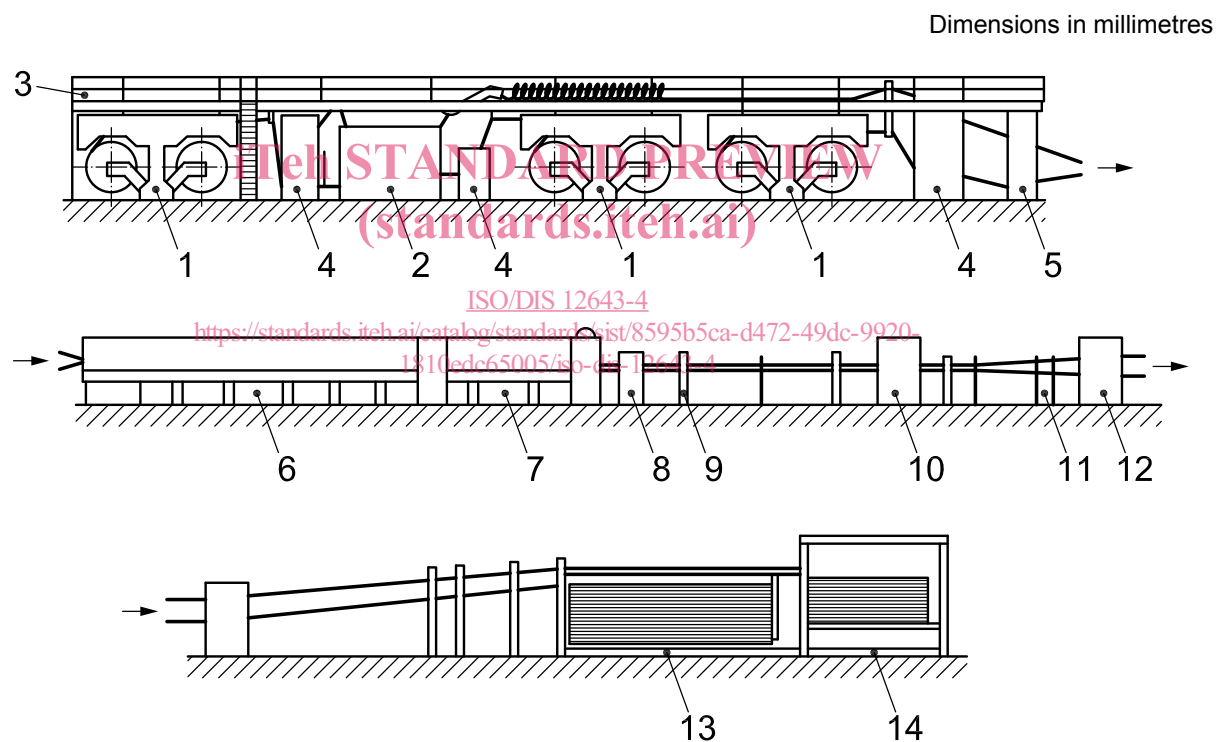
- curing and drying machines (see also ISO 12643-2^[2]);
- cutters, creasers and die-cutters (see also ISO 12643-3^[3]);
- rewinding/roll equipment/slitting and rewinding equipment (see also ISO 12643-1);
- embossing equipment (see also ISO 12643-2^[2] and ISO 12643-5^[4]);
- tension control equipment (see also ISO 12643-1).

6 Machinery for the production of corrugate board

6.1 All machines

6.1.1 General

An example of a corrugating machine is shown in Figure 1.



Key

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

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

6.1.2 Emergency stop

Emergency stop devices shall be provided on each motion control station. Emergency stop devices shall be no more than 15 m apart.

Emergency stop devices shall stop the motion of the entire machine.

EXCEPTION — The glue rollers of the gluing unit may continue running if the hazard points on the gluing unit are safeguarded by guards.

6.1.3 Zone control with stop/safe devices

Where stop/safe devices are provided, the following requirements apply:

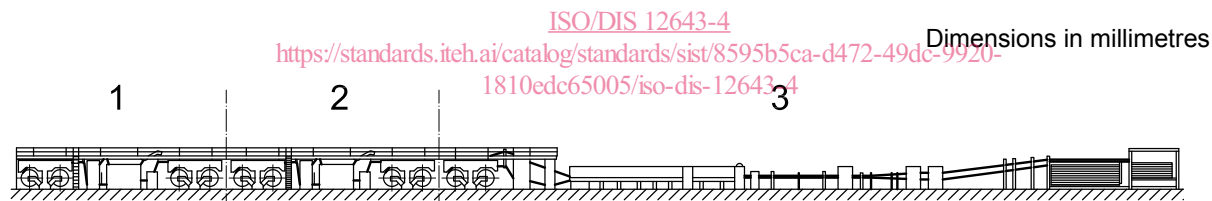
- stop/safe actuators shall be marked such that they clearly indicate the section to which they apply;
- safety related parts of the control system shall comply with at least ISO 13849-1, PL d or IEC 62061, SIL 2 ..

Where the machine is configured into control zones, they shall be as follows (see Figure 2):

- one control zone for each single-facer group (unwind of liner with preheater, single facer, unwind of corrugated web);
- one control zone for the liner unwind before heating up to stacker device.

At minimum, one stop/safe device shall be provided in each control zone.

NOTE Control zones may overlap



Key

- 1 first control zone for first single-facer group
- 2 second control zone for second single-facer group
- 3 third control zone for liner unwind up to stacker device

Figure 2 — Example of control zones

6.1.4 Access stairs and walkways

Access stairs and walkways shall comply with ISO 12643-1.

6.1.5 Steam pipes

Steam pipes that can be accessed from any working level shall be insulated up to a height of 2,70 m from the working level for protection against contact with hot parts.

6.1.6 Guarding access points between system components

Accessible areas between system components shall be guarded by means of fixed or interlocking guards in accordance with ISO 12643-1 if a hazard point can be reached, e.g. the area between a gluing machine and a heating and pulling section.

6.1.7 Audible start-up warning

Corrugating machines shall have an audible warning system that complies with ISO 12643-1.

6.2 Unwinding stations

6.2.1 General

Means shall be provided to ensure that reel cores, which might be stuck to a reel cone, can be safely removed, e.g. using an automatic reel core ejector that pushes the core away from the cone.

6.2.2 Safeguarding automatic reel loading

The area where automatic reel loading takes place shall be safeguarded in accordance with ISO 12643-1.

See Figure 3 for an illustration of the positioning of electro-sensitive protective devices (ESPDs) for this equipment in accordance with the requirements of ISO 12643-1.

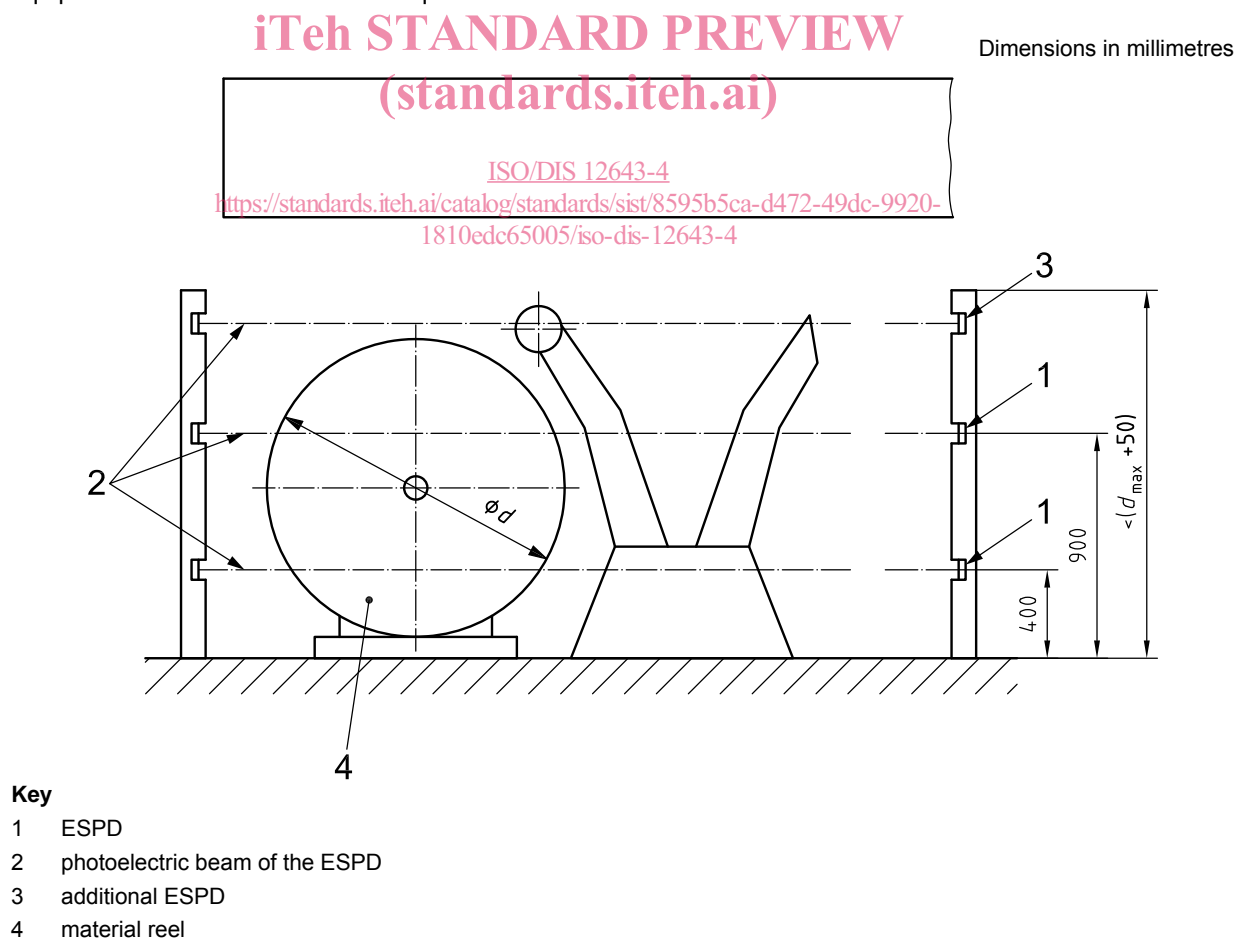


Figure 3 — Unwinding station, automatic reel loading

6.2.3 Chucking cones and lifting arms

The hold-to-run speeds for inserting the chucking cones and moving the lifting arms may be increased to 15 m/min maximum if the hold-to-run buttons are located at a minimum distance of 850 mm from the lifting arms.

6.2.4 Braking systems

The blowers for the braking systems on unwinding stations shall have at least the degree of protection IP 23, as specified in IEC 60529. Accumulation of inflammable dust in the brakes shall be prevented.

NOTE The accumulation of inflammable dust in the brakes can be reduced if the louvres provided in the ventilator housing open to the bottom while the lifting arms are in operating position.

6.3 Splicers

6.3.1 Guarding hazard points

On splicers, any hazard points between the dancer roller carriage and guide rollers, and between the dancer roller and fixed parts of the machine shall be avoided by design measures or be safeguarded (see Figure 4).

If safeguarding by distance, the following requirements apply:

- a minimum distance of 25 mm if the hazard points are at a height greater than 2,20 m;
- a minimum distance of 120 mm if the hazard points are at a height less than or equal to 2,20 m.

Safeguarding may also be achieved by the use of guards in accordance with ISO 12643-1 or safety devices with approach reaction (e.g. trip devices, pressure-sensitive mats, electro-sensitive devices).

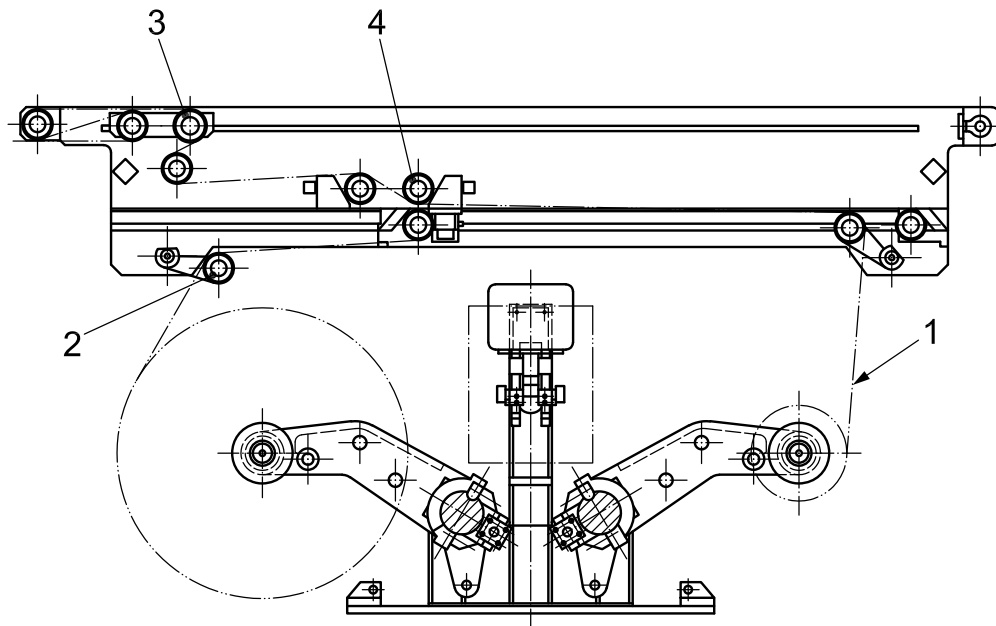
6.3.2 Dancer roller

<https://standards.iteh.ai/catalog/standards/sist/8595b5ca-d472-49dc-9920-1810edc65005/iso-dis-12643-4>

The movement of the dancer roller into position for web threading shall be safeguarded.

Where hold-to-run control is used for safeguarding, the hold-to-run speed shall not exceed 15 m/min.

The in-running nips on the dancer roll carriage wheels shall be safeguarded by fixed guards that meet the requirements of ISO 12643-1.

**Key**

- 1 paper web
- 2 guide rollers
- 3 dancer roller
- 4 gluing unit

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Figure 4 — Splicer

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6.3.3 Splicers <https://standards.iteh.ai/catalog/standards/sist/8595b5ca-d472-49dc-9920-1810edc65005/iso-dis-12643-4>

On splicers, hazard points between the movable suction bar and fixed machine parts shall be prevented by safety measures or be safeguarded (see Figure 4). Safeguarding can be achieved by one or more of the following measures:

- providing a minimum distance of 25 mm for hazard points above 2,20 m and of 120 mm for heights less than or equal to 2,20 m;
- a hold-to-run control meeting the requirements of ISO 12643-1, if it is possible to observe the hazard points and hazard zones from the point of operation of the hold-to-run control;
- limiting the force of the movable glue bar to 300 N and the travel speed of the carriage to 15 m/min.

The control panel for operating the glue bar shall be provided with an emergency stop button.

6.3.4 Knife

The cutting edge of the knife shall be safeguarded in the rest position.

6.3.5 Pneumatic and hydraulic control systems

Where pneumatic or hydraulic control systems are used for starting the cutting cycle, a safety-rated check valve shall be supplied to ensure that the knife remains in the safe position in case of leakage or hose breakage.

6.3.6 Frame edges

Where the machine frame of the splicer is lower than 2 m at the sides (as measured from the floor), frame edges shall be provided with black-yellow padding for protection against impacts.

6.3.7 Splicers in elevated positions

If adjustment or setup of the movable suction bar cannot be accomplished from floor level, safe access shall be provided.

6.3.8 Warning lights

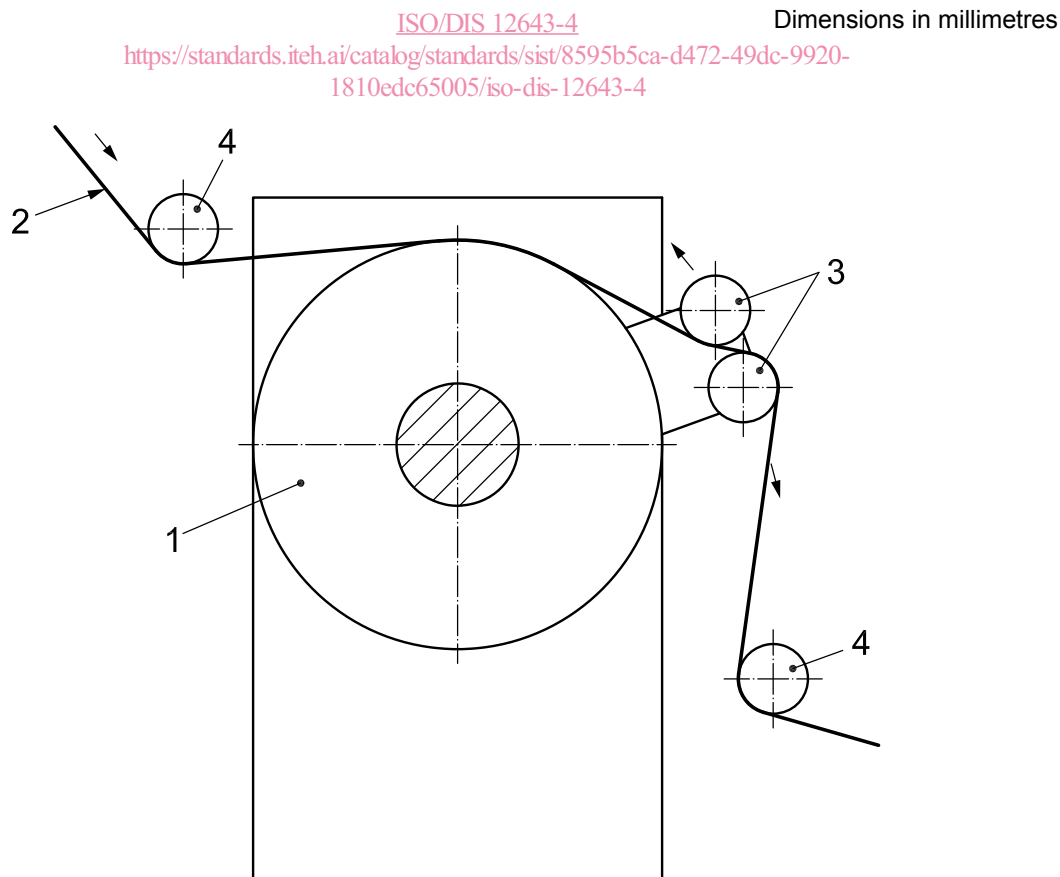
A red or yellow warning light shall flash for 2 s prior to the initiation of the automatic splicing operation and during the entire period of automatic motion. The integration of the status lights into the control system may be single-channel, e.g. via an electronic control system.

6.4 Preheater

6.4.1 In-running nips

The in-running nips between the wrap roller and the preheating cylinder, and between the wrap roller and fixed machine parts or guide rollers (see Figure 5), shall be safeguarded by one or more of the following measures:

- using the minimum distance of 120 mm;
- guarding in accordance with ISO 12643-1.



Key

- 1 preheating cylinder
- 2 paper web
- 3 wrap roller
- 4 guide roller

Figure 5 — Preheater, side view**6.4.2 In-running nips between preheating cylinder and cross beams**

The in-running nips between the preheating cylinder and any cross beam shall be safeguarded by maintaining a minimum distance of 300 mm.

6.4.3 Wrap roller and wrap arms

The drives for the wrap roller shall be safeguarded by fixed guards completely enclosing the drives.

Rotating wrap arms (see Figure 6, item 2) shall be designed such that any openings in the wrap arms do not create a shearing hazard.

The distance (see Figure 6, *d*) between the preheating cylinder and the rotating arm shall be 6 mm or less or 30 mm or more.

The hazard point between the rotating arms and the machine side frame shall be safeguarded (see Figure 6, items 2 and 4) by one or both of the following measures:

- a hold-to-run control of at least ISO 13849-1, PL c or IEC 62061, SIL 1.;
- a minimum distance of 120 mm and designing the rotating arm or machine side in such a way that parts of the body are deflected by the arm when rotating at its maximum circumferential speed of 5 m/min.

