BS EN ISO 14890:2013

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# Conveyor belts — Specification for rubber- or plastics-covered conveyor belts of textile construction for general use

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This British Standard is the UK implementation of EN ISO 14890:2013. It is identical to ISO 14890:2013. It supersedes BS EN ISO 14890:2003, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PRI/67, Conveyor belts.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

# Conveyor belts - Specification for rubber- or plastics-covered conveyor belts of textile construction for general use (ISO 14890:2013)

Courroies transporteuses - Spécification pour courroies transporteuses recouvertes de caoutchouc ou de plastique à structure textile, d'usage général (ISO 14890:2013)

Fördergurte - Anforderungen an Textilfördergurte mit Gummi- oder Kunststoff-Deckplatten für allgemeine Anwendungen (ISO 14890:2013)

This European Standard was approved by CEN on 21 January 2013.

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# Foreword

This document (EN ISO 14890:2013) has been prepared by Technical Committee ISO/TC 41 "Pulleys and belts (including veebelts)" in collaboration with Technical Committee CEN/TC 188 “Conveyor belts” the secretariat of which is held by SNV.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2013, and conflicting national standards shall be withdrawn at the latest by August 2013.

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**Endorsement notice**

The text of ISO 14890:2013 has been approved by CEN as EN ISO 14890:2013 without any modification.

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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.

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ISO 14890 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 3, *Conveyor belts*.

This second edition cancels and replaces the first edition (ISO 14890:2003), of which it constitutes a minor revision. It also incorporates Technical Corrigendum ISO 14890:2003/Corr.1:2006.

# Introduction

In the preparation of this International Standard, consideration has been given to the work of ISO Technical Committee ISO/TC41/SC3, and the following International Standards for conveyor belts have been followed as closely as possible:

— ISO 251;

— ISO 252;

— ISO 282;

— ISO 283;

— ISO 433;

— ISO 583;

— ISO 703.

# Conveyor belts — Specification for rubber- or plastics-covered conveyor belts of textile construction for general use

## 1 Scope

This International Standard specifies requirements for rubber and/or plastics covered conveyor belting of textile construction for general surface use on flat or troughed idlers.

This International Standard is not suitable or valid for light conveyor belts as described in ISO 21183-1.

Items that are not requirements of this International Standard, but need to be agreed between the manufacturer and the purchaser, are included in Annex A.

A list of the details intended to be supplied by the purchaser of belting with an enquiry is given in Annex B.

## 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 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 252, *Conveyor belts — Adhesion between constitutive elements — Test methods*

ISO 282, *Conveyor belts — Sampling*

ISO 283, *Textile conveyor belts — Full thickness tensile strength, elongation at break and elongation at the reference load — Test method*

ISO 583, *Conveyor belts with a textile carcass — Total belt thickness and thickness of constitutive elements — Test methods*

ISO 703, *Conveyor belts — Transverse flexibility (troughability) — Test method*

ISO 4649, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 10247, *Conveyor belts — Characteristics of covers – Classification*

ISO 16851, *Textile conveyor belts — Determination of the net length of an endless(spliced) conveyor belt*

EN 12882, *Conveyor belting for general purpose use — Electrical and flammability safety requirements*

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

**3.1**
**tensile strength**
greatest measured force during the tensile test divided by the width of the test piece

NOTE It is expressed in newton per millimetre (N/mm).

**3.2**
**reference force**
**reference load**
one tenth of the nominal tensile strength in the longitudinal direction multiplied by the width of the test piece in millimetres

NOTE It is expressed in Newton.

EXAMPLE

Nominal tensile strength = 1 600 N/mm;

reference force = 160N/mm;

reference force for 25 mm test piece = 25mm × 160 N/mm = 4 000 N.

**3.3**
**slab belting**
conveyor belting made in wide widths and long lengths for subsequent slitting and cutting into narrower widths and shorter lengths to suit individual conveyor installations

**3.4**
**solid woven belting**
conveyor belting consisting of a carcass of more than one ply, the plies being interlocked in the weave or bound together by binding threads in the course of weaving

**3.5**
**mono-ply belting**
conveyor belting with a carcass consisting of one ply of woven textile fabric

**3.6**
**duo-ply belting**
conveyor belting with a carcass consisting of two plies of woven textile fabric, bonded together by an intermediate layer of elastomer of sufficient thickness to allow the incorporation of a tension element in the joint

**3.7**
**multi-ply belting**
conveyor belting with a carcass of two or more plies of woven textile fabric, the adjacent plies being bonded together by an intermediate layer of elastomer

**3.8**
**primary yarn**
load carrying yarn that contributes more than 50 % of the tensile strength

**3.9**
**secondary yarn**
load carrying yarn that contributes less than 50 % of the tensile strength

## 4 Designation

### 4.1 Belting designation

Belting is designated by reference to the following conveyor belt characteristics:

a) a reference to this International Standard, i.e. ISO 14890;

b) the required length, in metres;

c) the required width, in millimetres (see Table 4);

d) the fibre type of the carcass, in both the warp and weft directions, e.g. polyester (E) (warp) and polyamide (P) (weft) (EP) (see Table 1);

e) the full thickness tensile strength, in newton per millimetre, of belt width (see Table 8);

f) the number of plies or belt type (see Clause 3);

g) the top cover thickness, in millimetres;

h) the bottom cover thickness, in millimetres (where relevant, see Clause 5);

i) the cover classification (see Table 5), where appropriate;

j) the safety category in accordance with EN 12882.

## 4.2 Examples for ordering

The following are examples for ordering.

a) EXAMPLE 1Multi-ply belt

A 400 m long belt, 1 200 mm wide, textile material in the longitudinal direction of polyester (E) and in the transverse direction of polyamide (P), having a minimum full thickness tensile strength of 1 000 N/mm belt width, with five plies and a top cover thickness of 4 mm, a bottom cover thickness of 2 mm, a cover classification of H in accordance with Table 5, and complying with the safety requirements of category 1 of EN 12882.

**Example 1 — Designation**

| ISO | Length | Width | Textile material | | Tensile strength | No. of plies | Cover gauge mm | | Cover class | Safety category in accordance with EN 12882 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14890 | m | mm | Warp | Weft | N/mm | | Top | Bottom | | |
| | 400 | 1 200 | E | P | 1 000 | 5 | 4 | 2 | H | 1 |

b) EXAMPLE 2Duo-ply belt

A 200 m long belt, 1 000 mm wide, textile material in the longitudinal direction of polyester cotton (EB) and in the transverse direction of polyamide cotton (PB), having a minimum full thickness tensile strength of 800 N/mm, with two plies and a top and bottom cover of 1,5 mm, complying with the safety requirements of category 2A of EN 12882.

**Example 2 — Designation**

| ISO | Length | Width | Textile material | | Tensile strength | No. of plies | Cover gauge mm | | Cover class | Safety category in accordance with EN 12882 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14890 | m | mm | Warp | Weft | N/mm | | Top | Bottom | | |
| | 200 | 1 000 | EB | PB | 800 | 5 | 1,5 | 1,5 | N/A | 2A |

c) EXAMPLE 3Mono-ply

A 150 m long, 1 200 mm wide Mono-ply belt, having a polyester warp (E) and a polyamide weft (P), a full thickness tensile strength of 630 N/mm belt width and a top cover thickness of 6 mm, a bottom cover thickness of 2 mm, and a cover classification of D in accordance with Table 5, complying with safety requirement of category 1 of EN 12882.

**Example 3 — Designation**

| ISO | Length | Width | Textile material | | Tensile strength | No. of plies | Cover gauge mm | | Cover class | Safety category in accordance with EN 12882 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14890 | m | mm | Warp | Weft | N/mm | | Top | Bottom | | |
| | 150 | 1 200 | E | P | 630 | 1 | 6 | 2 | D | 1 |

d) EXAMPLE 4 Solid woven belt

A 300 m long, 1 600 mm wide Solid Woven belt having a combined polyester and polyamide warp (EP) and a polyamide cotton weft (PB) and an integrally woven cotton (B) warp pile, having a minimum tensile strength of 1 250 N/mm belt width and 1,5 mm top and bottom covers, complying with safety requirement of category 3A of EN 12882.

**Example 4 — Designation**

| ISO | Length | Width | Textile material | | Tensile strength | No. of plies | Cover gauge mm | | Cover class | Safety category in accordance with EN 12882 |
|---|---|---|---|---|---|---|---|---|---|---|
| 14890 | m | mm | Warp | Weft | N/mm | | Top | Bottom | | |
| | 300 | 1 600 | EP(B) | PB | 1 250 | SW(1) | 1,5 | 1,5 | N/A | 3A |

**Table 1 — Code designation of yarn**

| Code letter | Yarn |
|---|---|
| B | Cotton |
| Z | Staple rayon |
| R | Rayon |
| P | Polyamide |
| E | Polyester |
| D | Aramid |
| G | Glass |
| If a fabric contains a secondary yarn, its identity shall be indicated by the use of characters in parentheses to designate the yarn type. | |

## 5 Construction

The carcass shall consist either of one or more plies of woven fabric or of solid woven fabric and shall be impregnated or coated with a rubber or plastics mix.

Where a breaker consisting of open mesh fabric, or cord fabric or cord layer, is placed between the cover and carcass, or is embedded in the cover for the purpose of carcass protection, such a layer shall be considered part of the cover thickness and shall not be counted as a fabric ply.

If a fabric pile is integrally woven with the carcass on either one or both of the surfaces of the carcass, it shall be considered part of the carcass thickness.

NOTE The external surfaces of the conveyor belt generally consist of a defined thickness and quality of elastomeric material. Belting can also be supplied with one or both surfaces consisting of bare or coated fabric, as appropriate for the conveyor design and intended duty.

## 6 Length

**6.1** Belting that is ordered to an open-ended length shall be supplied subject to the tolerances specified in Table 2.

**6.2** The length of belting supplied in the spliced endless form shall be described by the term “net endless length”. The net endless length shall be supplied subject to the tolerances specified in Table 3 when measured in accordance with ISO 16851.

It is recommended that purchasers, where placing orders for belting, specify a length of belting which includes the lengths required for testing and any additional lengths necessary for vulcanized joints.

**Table 2 — Tolerances on open-end lengths of belting**

| Belt delivery condition | Maximum permissible difference between delivered length and ordered length | |
|---|---|---|
| Slab belting | ±5 % | |
| As one length | + 2,5 % 0 | |
| In several lengths | For each single length | For the sum of all lengths |
| | ±5 % | + 2,5 % 0 |

**Table 3 — Tolerances on endless lengths of belting**

| Length of belt | Tolerance |
|---|---|
| Up to and including 15 m | ±50 mm |
| Over 15 m and up to and including 20 m | ±75 mm |
| Over 20 m | ±0,5 % |

## 7 Width

The width of the belting and its associated tolerance shall be one of those given in Table 4.

**Table 4 — Widths and tolerances on width of conveyor belting**

| Nominal width of belting<br>mm | Tolerance on width |
|---|---|
| 300 | ±5 mm |
| 400 | |
| 450[a] | |
| 500 | |
| 500 | |
| 600 | ±1 % of width |
| 650 | |
| 750[a] | |
| 800 | |
| 900[a] | |
| 1 000 | |
| 1 050[a] | |
| 1 200 | |
| 1 350[a] | |
| 1 400 | |
| 1 500[a] | |
| 1 600 | |
| 1 800 | |
| 2 000 | |
| 2 200 | |
| 2 250[a] | |
| 2 400 | |
| 2 500[a] | |
| 2 600 | |
| 2 750* | |
| 2 800 | |
| 3 000 | |
| 3 200 | |

a These widths should only be used for replacement belting in existing installations and should not be used as a basis for future new designs.

## 8 Rubber cover

NOTE see Table 5.

**8.1** If the rubber cover is designated as type H, D or L category it shall comply with the appropriate requirements of Table 5, and, after ageing for 168 h at 70 °C in accordance with ISO 188, the values obtained for tensile strength and elongation at break shall not vary from the original unaged values by more than 25 % of those values.

**8.2** If the thickness of the rubber cover, as measured by the method described in ISO 583, is between 0,8 mm and 1,6 mm, the thickness of the test piece shall be the maximum obtainable and a tolerance of −15 % shall be permitted on the tensile strength and elongation values given in Table 5.

**Table 5 — Classification of conveyor belt rubber covers**

| Cover class | Minimum tensile strength of rubber cover<br>$N/mm^2$ | Minimum elongation at break<br>% | Maximum abrasion loss in relative volume<br>$mm^3$ |
|---|---|---|---|
| H | 24 | 450 | 120 |
| D | 18 | 400 | 100 |
| L | 15 | 350 | 200 |
| Method of test | ISO 37 | ISO 37 | ISO 4649 method A |

NOTE 1 The values in this table help to determine the appropriate cover compound for the application or for the materials carried. Other values, such as tear resistance, may be considered if required. Reliable assessment of the behaviour of the covers in services for wear and cut resistance cannot be determined from tensile strength, elongation and abrasion values alone. The conveyor belt cover grades H, D and L are in accordance with ISO 10247.

NOTE 2 Where other cover materials or qualities are required for a particular application (e.g. safety, oil resistance or heat resistance), the cover properties need to be agreed between the customer and the manufacturer.

## 9 Tolerances on total belt thickness and cover thickness

### 9.1 Tolerance on total belt thickness

If the mean of the 3, 5 or 8 values of total belt thickness, when measured by the method in ISO 583, is 10 mm or less, the maximum permissible difference between the maximum thickness and the minimum thickness shall be not greater than 1 mm. For solid woven belting the maximum permissible difference shall be not greater than 1,5 mm.

If the mean of the 3, 5 or 8 values of the total belt thickness, when measured by the method in ISO 583, is greater than 10 mm, the maximum permissible difference between the maximum thickness and the minimum thickness shall be not greater than 10 % of the mean value. For solid woven belting, the maximum permissible difference shall be $< 15$ %.

### 9.2 Tolerance on cover thickness

When measured by one of the methods described in ISO 583, the mean value of the cover thickness shall not be less than the specified thickness by more than the amounts given in Table 6.

**Table 6 — Tolerance on cover thickness**

| Property | Requirements |
|---|---|
| Maximum permissible deviation of the specified thickness of each cover | plus: no limit |
| | minus: 0,2 mm if the specified thickness is equal to or less than 4 mm |
| | minus: 5 % of the specified thickness if it is greater than 4 mm |

## 10 Transverse fabric joints in multi-ply belting

### 10.1 General

Transverse joints shall be at an angle of between 45° and 70° to the centre line of the belt.

### 10.2 Outer plies

Neither outer ply shall have more than one transverse joint per 100 m length of belt.

### 10.3 Inner plies

No inner ply shall have more than two transverse joints per 100 m length of belt.

### 10.4 Adjacent plies and non-adjacent plies

Transverse joints in adjacent plies and non-adjacent plies shall be not less than 3 m apart.

### 10.5 Joints in the same ply

Transverse joints in the same ply shall be 5 m apart or more.

### 10.6 Mono-ply, duo-ply and solid woven belting

Transverse joints are not permitted in mono-ply, duo-ply or solid woven belting.

## 11 Longitudinal fabric joints in multi-ply belting and duo-ply belting

### 11.1 Spacing of joints

Longitudinal joints shall be at least 100 mm from the edge of the carcass. Each longitudinal joint shall be at least 100 mm from the joints in the other plies. The longitudinal joints in one ply of any piece of belting shall be separated by at least 300 mm where the width of the belting permits two joints in the same ply.

### 11.2 Number of joints

The maximum number of longitudinal joints in the plies shall be as given in Table 7.

**Table 7 — Maximum number of longitudinal joints**

| Width of belt<br>mm | External plies | Internal plies |
|---|---|---|
| ≤1 200 | 0 | 1 |
| >1 200 ≤ 1 600 | 1 | 2 |
| >1 600 ≤ 2 000 | 2 | 2 |
| >2 000 | 2 | 3 |
| NOTE This table does not apply to folded-edge constructions. | | |

## 12 Longitudinal fabric or carcass joints in solid woven and mono-ply belting

Longitudinal fabric or carcass joints are not permitted in solid woven or mono-ply belting.

## 13 Elongation

The elongation of the finished belting in the longitudinal direction at the reference force (see 3.2) when tested by the method described in ISO 283 shall be not greater than 4 %.

## 14 Full thickness tensile strength

The value of full thickness tensile strength (see Clause 3) in the longitudinal direction of the finished belting, in newton per millimetre belt width, when determined by the method described in ISO 283, shall be not less than the value given in Table 8 for the designated belt type (see Clause 4).

**Table 8 — Minimum full thickness tensile strength**

| **Designated belt type** N/mm | 160 | 200 | 250 | 315 | 400 | 500 | 630 |
|---|---|---|---|---|---|---|---|
| | 800 | 1 000 | 1 250 | 1 600 | 2 000 | 2 500 | 3 150 |

## 15 Adhesion

The adhesion strengths when determined by the method described in ISO 252, shall be not less than the value given in Table 9 or Table 10, as appropriate.

**Table 9 — Minimum adhesion strength of belts with synthetic filament carcass**

| **Value** | **Minimum adhesion between adjacent plies** N/mm | **Minimum adhesion between covers and carcass** | |
|---|---|---|---|
| | | **Covers 0,8 to 1,5 mm thick** N/mm | **Covers greater than 1,5 mm thick** N/mm |
| Mean value of results | 4,5 | 3,2 | 3,5 |
| Lowest graphically recorded peak value in all tests | 3,9 | 2,4 | 2,9 |
| In no case should the highest recorded peak value in all the tests exceed 20 N/mm in order to avoid difficulties in preparing the belt end for splicing. | | | |

**Table 10 — Minimum adhesion strength of belts with textile carcass containing natural fibres**

| **Value** | **Minimum adhesion between adjacent plies** N/mm | **Minimum adhesion between covers and carcass** | |
|---|---|---|---|
| | | **Covers 0,8 to 1,5 mm thick** N/mm | **Covers greater than 1,5 mm thick** N/mm |
| Mean value of results | 3,2 | 2,1 | 2,7 |
| Lowest graphically recorded peak value in all tests | 2,7 | 1,6 | 2,2 |
| In no case should the highest recorded peak value in all the tests exceed 20 N/mm in order to avoid difficulties in preparing the belt end for splicing. | | | |

## 16 Troughability

When tested in accordance with the method described in ISO 703, the minimum values for the ratio $F/L$ shall be in accordance with those shown in Table 11, relative to the values for the angle of inclination shown.

**Table 11 — Minimum troughability**

| Angle of inclination of side rollers | Minimum value for the ratio $F/L$ |
|---|---|
| up to and including 20 | 0,08 |
| 25 | 0,10 |
| 30 | 0,12 |
| 35 | 0,14 |
| 40 | 0,16 |
| 45 | 0,18 |
| 50 | 0,20 |
| 55 | 0,23 |
| 60 | 0,26 |
| $F$ is the vertical deflection in the test piece, in millimetres, corrected for the belt thickness; $L$ is the length of the test piece, in millimetres, when laid flat. It is equivalent to the installed width of the conveyor belt. | |

## 17 Sampling

Sampling shall be conducted in accordance with ISO 282.

## 18 Identification

It shall be possible to identify the name of the manufacturer of the conveyor belt, the fact that it conforms to this International Standard, its safety category in accordance with EN 12882, and the date of manufacture. The manner in which these data are identified shall be decided by the manufacturer or by agreement with the purchaser.

Where it is decided to mark the conveyor belt using impression moulding, the depth of the impression should not exceed 1,5 mm and the characters should be between 20 mm and 80 mm high, repeated at longitudinal spacing of approximately 15 m. In the case of slab belting, the marks may be in the transverse direction.

# Annex A
(informative)

## Items to be agreed between the manufacturer and purchaser

The following items should be agreed between the manufacturer and the purchaser:-

a) For long haul conveyors: for certain long haul conveyors, the maximum elongation at the reference force.

b) For plastic belts: the identification of plastic belts.

c) For testing: if testing is not to be carried out by the manufacturer, this should be agreed between the manufacturer and the purchaser when the order is placed.

d) Conditions of use: a statement of whether or not the conveyor belting is not for conventional use.

e) Any particular characteristics not specified by this International Standard.

# Annex B
(informative)

# Helpful information to be supplied by the purchaser

## B.1 Applicability

When ordering belting, purchasers should define their requirements by making reference to Clause 4 (designation).

NOTE This annex is informative and, therefore, not a (mandatory) requirement of this International Standard.

## B.2 Replacement belting

Where the belt is to be replaced on an existing conveyor, the following information should be supplied:

a) details of existing belt;

b) belt width, in millimetres;

c) belt speed, in metres per second;

d) pulley diameters, in millimetres, indicating any that are crowned;

e) method of take-up and amount available;

f) type of drive, including coupling and configuration of drive;

g) whether drive pulleys are lagged or bare;

h) pitch and angle of carrying idlers, including transition distances;

i) profile sketch, indicating position of drive, take-up, tripper and vertical curve radii;

j) belt length, in metres;

k) type of belt joint;

l) motor power installed;

m) type of start;

n) safety category required in accordance with EN 12882, i.e. 1, 2A, 2B, 3A, 3B, 4, 5A, 5B or C.

## B.3 Additional information for a new installation

Where applicable, the following additional information should, if possible, be supplied:

a) material to be conveyed;

b) conditions, i.e. :

   1) wet, dry, sticky, greasy or abrasive;

   2) if hot or cold;

   3) temperature (if known) or description of conditions;

4) whether or not cleaners are required;

c) bulk density of material;

d) size, in millimetres, of largest lumps (three dimensions);

e) average size, in millimetres, of materials;

f) approximate screen analysis of material (see ISO 7806 and ISO 9045);

g) method of handling the material immediately prior to feeding the belt;

h) whether the feed is to be regulated and type of feeder preferred;

i) conveyor duty in terms of mass per hour per day, stating day length in hours;

j) method of discharging conveyor;

k) amount of lift or fall;

l) initial length (centres of head and tail pulleys);

m) ultimate length (centres of head and tail pulleys);

n) position of drive;

o) contour sketch of proposed installation;

p) preferred idler arrangement and troughing angle;

q) environmental conditions;

r) any special features or test requirements;

s) safety category required in accordance with EN 12882, i.e. 1, 2A, 2B, 3A, 3B, 4, 5A, 5B or 5C.

# Annex C
(informative)

# Lateral drift — Straight running

The conveyor belting, when running on a correctly aligned conveyor and loaded centrally, should not deviate from the central track by more than ±40 mm for a belt width up to and including 800 mm, or by more than ±5 % (±75 mm max.) of the belt width for widths of over 800 mm.

# Bibliography

[1] ISO 251, *Conveyor belts with textile carcass — Widths and lengths*

[2] ISO 433, *Conveyor belts — Marking*

[3] ISO 7806, *Industrial plate screens — Codification for designating perforations*

[4] ISO 9045, *Industrial screens and screening — Vocabulary*

[5] ISO 21183-1, *Light conveyor belts — Part 1: Principal characteristics and applications*

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