

INTERNATIONAL STANDARD



4330

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Photography — Determination of the curl of photographic film

Photographie — Détermination de l'incurvation des films photographiques

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Descriptors : photographic film, tests, stability tests, flatness, test specimens, test equipment.

Photography — Determination of the curl of photographic film

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies methods for determining and expressing quantitatively the curl characteristics of unprocessed and processed photographic film as supplied in sheet, roll, or strip forms.

This International Standard specifies three measuring methods. Method A involves the determination of curl when the specimen is held in a vertical position, methods B and C with the specimen in a horizontal position. Values for the three methods are not comparable because of the differences in specimen configuration and size.

These methods are not intended for use in determining the curl characteristics of films during processing or drying.

2 DEFINITIONS

For the purpose of this International Standard, the following definitions apply :

2.1 curl : The departure from physical flatness and, for purposes of this standard, characterized with respect to curl direction (L, T, or D); curl sign (+ or -) and curl value. This flatness defect is evident by a tendency of film to coil into a cylindrical shape.

2.2 curl direction : The means of identifying by letters L, T, or D the direction of curl about a specific axis of a film specimen corresponding to that of the sample from which it is taken. (Figure 1).

L represents "lengthwise curl" about the axis perpendicular to the length or machine direction of the sample for roll film¹⁾ or to the longest specimen dimension for sheet film.

T represents "transverse curl" about the axis parallel to the length or machine direction of the sample.

D represents "diagonal curl" about the diagonal of the specimen.

2.3 curl sign : The mathematical signs, + or -, used to indicate the direction of curl which, if toward the emulsion (sensitized) side (emulsion - in) is + or, if toward the

base (emulsion - out), is -. The sign is always plus for materials sensitized on both surfaces.

3 SAMPLING AND CONDITIONING

3.1 Selection of samples

Film intended for curl tests should exhibit no obvious physical defects, be representative of the whole of the samples being tested, be handled in the same manner as in actual use, and be treated uniformly. When different films are to be compared, they should preferably have been subjected to the same conditioning history. In the case of square or circular specimens, the machine direction shall be indicated, if known.

3.2 Handling of specimens

Prepare specimens under controlled conditions, and then separate them into groups which are subjected to different atmospheric conditions. Wear cotton or other suitable gloves while handling. Moisture from hands or fingers will reduce accuracy of test data. The operator shall take care not to breathe on the specimens.

3.3 Conditioning of specimens

Condition specimens until practical moisture equilibrium has been reached. In most instances, this time will be about 2 h, but actual times will vary due to access of the conditioning air, etc. Conditioning time shall not exceed 8 h.²⁾ Suspend the specimens freely by means of a hook or a rod through a hole in the centre of one end near the edge, and separate enough to prevent contact with each other. Hang square specimens with the axis of curl vertical to avoid producing distortion. An alternative method of support is to place specimens horizontally on net-covered or screen-covered racks spaced so that there is free circulation of the air.

3.4 Test conditions

A temperature of $23 \pm 2^\circ\text{C}$ is specified. Relative humidities of 15, 30, 50, 70 and 85 % are suggested but are not mandatory.²⁾ Tests may be conducted in rubber glove boxes or in conditioned rooms.

1) An alternative approach when the machine direction is not known is to reference the curl direction to a film notch, if present.

2) At relative humidities of 70 % and above, films sometimes undergo an irreversible change in curl with time. For this reason, the conditioning time must be standardized for comparison purposes.

6.2 Sample size

Test samples in standard distribution microfiche or sheet sizes. Select at least three specimens from each sample to be tested.

6.3 Procedure

Place the sheets to be measured concave side upward on a table at the end of the conditioning period and without removing them from the conditioned atmosphere. Measure the distance between the edge of the specimen and the table in millimetres to the nearest millimetre. Measurements should be made on both opposite edges and the average calculated.

7 TEST REPORT

7.1 Test data

The test report shall include the following particulars :

- a) sample name and number;
- b) material type and thickness;
- c) conditioning time, temperature, and relative humidity;

d) test method (method A, B, or C);

e) average curl value, curl sign, and curl direction (length, transverse or diagonal);

f) position in the roll for roll and motion-picture film or dimensions of specimen for sheet film.

7.2 Significance

Values obtained by methods A, B, and C cannot be compared. Curl is very dependent upon the sample dimensions and these differ for each method. Moreover, method A is read vertically and is not affected by gravity. Consequently, it represents a measure of the inherent property of the film. Methods B and C are read horizontally and are influenced by gravity and the film stiffness. Since method C is used for film in sheet form which may have large dimensions, the specimens may show more distortions than observed in methods A and B. Because of these distortions and the possible large effect of gravity, the film curl in method C may not assume the arc of a circle and consequently curl is not expressed in units of $1/R$.

Whether or not the curl values determined by this International Standard are considered high for a given type of photographic film depends on the particular application. The acceptable value may also depend on the camera, processing machine, or viewer used, as well as on the size of the sample and whether it is raw or processed.

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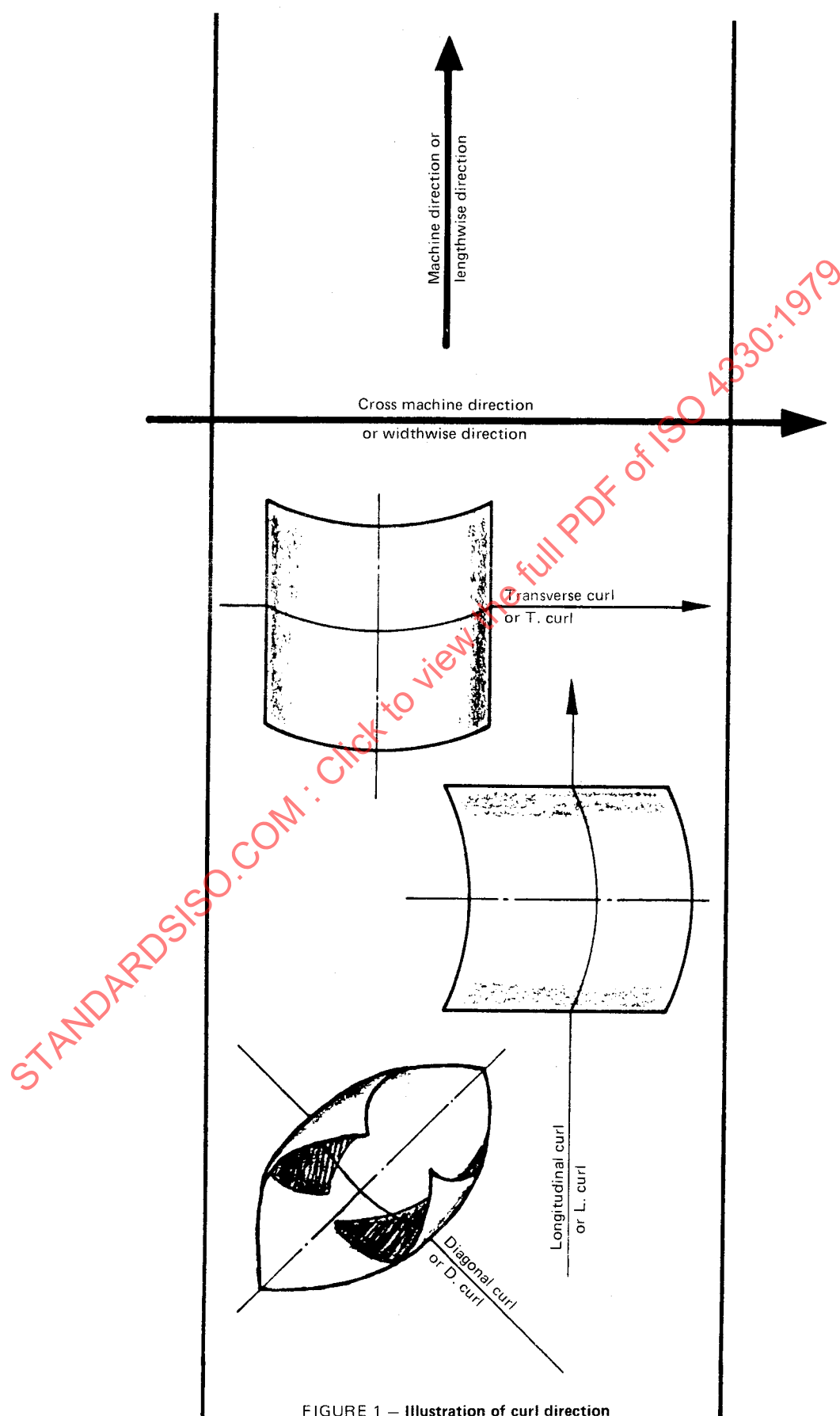


FIGURE 1 — Illustration of curl direction