INTERNATIONAL STANDARD

ISO 15360-2

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Recycled pulps — Estimation of Stickies and Plastics —

Part 2: Image analysis method

Pâtes recyclées — Estimation des matières collantes et des matières plastiques —

Partie 2: Méthode par analyse d'image

Reference number
ISO 15360-2:2001(E)

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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 3.

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 part of ISO 15360 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15360-2 was prepared by Technical Committee ISO/TC 6, *Paper, board and pulps*, Subcommittee SC 5, *Test methods and quality specifications for pulps*.

ISO 15360 consists of the following parts, under the general title *Recycled pulps — Estimation of Stickies and Plastics*:

— *Part 1: Visual method*

— *Part 2: Image analysis method*

Annexes A and B form a normative part of this part of ISO 15360.

Introduction

This part of ISO 15360 is complementary to ISO 15360-1, which concerns estimation of Stickies and Plastics in recycled pulp by visual examination. ISO 15360-2 is particularly useful for pulps having a high content of Stickies or Plastics or both where visual inspection is very time-consuming to carry out.

Two alternatives are given for the estimation of Stickies, while there is only one procedure for the estimation of Plastics.

Recycled pulps — Estimation of Stickies and Plastics —

Part 2:
Image analysis method

1 Scope

This part of ISO 15360 specifies a method to estimate Stickies and Plastics in all grades of recycled pulp. It applies the principles for the separation of Stickies and Plastics described in ISO 15360-1. The visualization and counting techniques described in that standard are replaced here by image analysis.

This part of ISO 15360 permits the use of different laboratory screening devices as well as screens of different sizes when applying the specified method. It is impracticable to define more closely the equipment or screen sizes to be used, because of the wide range of Stickies and Plastics found in recycled pulps, and the various screening devices which are being successfully used for their measurement.

NOTE This method will only estimate those Stickies and Plastics which are tacky and which are retained on the screen of a given slit size under the temperature and pressure conditions of this test method. It should be noted that this will probably not be the total amount of Stickies and Plastics that are actually present in a given pulp sample.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 15360. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 15360 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 638, *Pulps — Determination of dry matter content*

ISO 4119, *Pulps — Determination of stock concentration*

ISO 5263, *Pulps — Laboratory wet disintegration*

ISO 5269-2, *Pulps — Preparation of laboratory sheets for physical testing — Part 2: Rapid-Köthen method*

ISO 7213, *Pulps — Sampling for testing*

ISO 8486-1, *Bonded abrasives — Determination and designation of grain size distribution — Part 1: Macrogrits F4 to F220*

DIN 54516:1985, *Testing of paper and board — Determination of plybond resistance*

TAPPI T 541 om-89, *Internal bond strength of paperboard (z-direction tensile)*

3 Terms and definitions

For the purposes of this part of ISO 15360, the following terms and definitions apply.

3.1
Stickies
diverse group of materials that are retained on a laboratory screen of given slit aperture (100 μm or 150 μm) and which adhere to objects that they touch

NOTE 1 Stickies can adhere to objects at ambient conditions or they can adopt adhesive characteristics when subjected to elevated temperature, elevated pressure or change of pH.

NOTE 2 The following is a non-exhaustive list of Stickies: products derived from residues of materials such as inks, tars, hot melts, waxes, and multivalent metal ion soaps or different types of pressure-sensitive adhesives (tapes).

NOTE 3 A Stickie particle can be a composite of adhesive material together with non-adhesive plastic fragments and cellulosic fibres.

3.2
Plastics
non-adhesive polymers that are retained on a laboratory screen of a given slit aperture (100 μm or 150 μm), but excluding cellulosic materials

NOTE The following is a non-exhaustive list of Plastics: polymeric materials derived from such sources as polyethylene, polypropylene, polyester, UV-cured coatings and polystyrene.

4 Principle

A sample of pulp in disintegrated form is washed through a laboratory screen of a given slit aperture until the filtrate is clear. The material is removed and transferred to a filter paper. The Stickies are marked either with white aluminium oxide powder or by particles of coating that they pull out from a special coated paper. The Plastics are highlighted by dyeing the filter paper black and hiding the Stickies with black silicon carbide powder. The Stickies and Plastics are measured using an image analyser. The total numbers of Stickies and Plastics are determined and reported. Other report formats are possible, including the numbers of Stickies and Plastics of various areas, or a histogram showing the area distribution.

5 Apparatus and equipment

5.1 Disintegrator as specified in ISO 5263.

5.2 Laboratory screening equipment, fitted with a screen complying with the specification as described in annex A.

NOTE For the purpose of this method, a screen is that part of the laboratory screening equipment which separates the Stickies and Plastics from the cellulose fibre. Various laboratory screening equipment may use different terminology to describe the separating medium (e.g. “slots” instead of “slits”).

5.3 An **image analyser system** for illuminating, viewing, and detecting images. The image analyser system used shall be capable of scanning or viewing the total area of the filter paper upon which the Stickies or Plastics are collected (20 cm diameter or larger). The image analyser system incorporates the following components.

5.3.1 Specimen stage, generally consisting of a flat plate on one side of which the specimen illuminant and detector are located. The specimen stage shall be shielded to prevent influence from ambient light. The prepared specimen is a piece of filter paper upon one side of which the Stickies and Plastics have been collected. The side of the prepared specimen upon which the Stickies and Plastics have been collected faces the illuminant and image detector. The exact configuration of the specimen stage will depend upon the image detector used.

5.3.2 Image detector, either a scanner or camera based image detector, with at least 256 grey levels of sensitivity and a physical pixel resolution below 50 μm/pixel such that four contiguous pixels will have a combined area of 0,01 mm^2 or less. The image detector shall view the specimen normal to its surface.

5.3.3 Illuminant, un-polarized with wavelength concentrated in the visible portion of the spectrum, such that 95 % of the light reflected from a white surface will be between 380 nm and 750 nm. As a minimum, the illuminant shall

consist of two members providing illumination at an incident angle of $45^\circ \pm 5^\circ$. The illumination from the two members shall oppose each other at an angle of 180°. A preferred illuminant consists of four members each providing incident illumination at $45^\circ \pm 5^\circ$, placed such that the four members oppose one another at angles of 90°. The most preferred illuminant provides illumination that is diffuse or axially symmetric with an incident angle of $45^\circ \pm 5^\circ$. The uniformity of illumination over the area of the specimen stage before any software corrections shall be within $\pm$ 4 %.

5.3.4 Image analysis software, capable of determining the average intensity ("grey level") of a detected image, for example, a Stickie or piece of Plastic, as well as the average background intensity surrounding the speck when examining the picture elements of a digitized Stickies or Plastics speck using a "centre-surround" filtering technique [1] to [4]. The normal size of the software filter is a 1,0 mm^2 area centred on the Stickie or Plastic. The software shall be capable of adjusting this area as required to completely surround the detected image of a Stickie or Plastic. The detection threshold is 10 % of the 100 % contrast scale on the comparison chart (annex B). The detection threshold is applied between the contrary and the average background intensity as defined by the centre surround filter.

5.4 Calibration chart as shown in annex B. The chart is a film with a series of black and grey spots of different shapes, areas and contrasts. The chart is used for checking the performance of the image analyser system.

5.5 Büchner funnel with a sintered glass filtering base of 20 cm diameter or larger. The funnel may be substituted by a Rapid-Köthen sheet former (ISO 5269-2).

5.6 White or black filter paper, comprised of 100 % cellulose fibres, qualitative, medium fast grade, to fit the funnel or sheet former (5.5).

5.6.1 White filter paper for marking the Stickies by metallic powder.

5.6.2 Black filter paper for marking the Stickies by coating particles pulled out from a coated paper.

5.7 Release paper, silicone coated.

5.8 Oven, capable of maintaining a temperature of 105 °C $\pm$ 2 °C.

5.9 Heated press capable of applying a pressure of 95 kPa $\pm$ 5 kPa at 94 °C $\pm$ 4 °C for 10 min. A Rapid-Köthen sheet dryer operated at these conditions is suitable (ISO 5269-2).

5.10 Shallow glass dish, approximately 25 cm $\times$ 20 cm. The exact size of the glass dish is unimportant, provided the smaller dimension is greater than the diameter of the filter paper.

5.11 Metal plates, the top plate of which is circular with a diameter of 28 cm $\pm$ 1 cm and a mass of 6,0 kg $\pm$ 0,1 kg (5.6.1), and the bottom plate of which is the same size as the top plate or larger. The bottom plate may be of any convenient shape, for example circular with a minimum diameter of 28 cm, square with a minimum length of 28 cm, or other shape as desired.

5.12 Filter washing device (see 10.4.2) to wash the filter with a gentle stream of water at a pressure of about 0,1 MPa (1 bar), flow rate of about 10 ml/min and distance of delivery tip from filter of about 180 mm.

5.13 Water resistant black felt pen.

6 Reagents

6.1 For marking the Stickies by metallic powder adhering to the Stickies

6.1.1 White powdered aluminium oxide, purified Al_2O_3 with a grain size distribution of F220 according to ISO 8486-1

6.1.2 Aqueous solution of a black dye which is substantive to cellulose. Commercial black inks have been found suitable.

6.1.3 Black powdered silicon carbide, SiC, with a grain size distribution of F220 according to ISO 8486-1.

6.2 For marking the Stickies by coating particles pulled out from a coated paper

6.2.1 Coated paper as specified in the following: wood-free sized base paper, grammage about 70 g/m^2 to which is added a coating consisting of calcium carbonate and a synthetic binding material on one side of 50 g/m^2 to 55 g/m^2, brightness (ISO) 85 % ± 3 %, plybond resistance of coating 2,0 kN/m ± 0,5 kN/m tested according to DIN 54516 or 5,5 kPa ± 1,5 kPa tested according to TAPPI T 541 for a total sheet grammage of 120 g/m^2 to 125 g/m^2, size large enough to completely cover the black filter paper carrying the Stickies. When placed in contact with Stickies under the temperature and pressure specified in 5.9, the coating adheres to the Stickie particle, causing it to appear white in colour. To verify coating plybond resistance under the conditions of this test, the coated sheet may be processed according to 10.4.1 but without any Stickies on the filter paper, in which case no white particles shall be removed from the coated paper. Similarly, processing a trial sample of material containing Stickies shall cause the Stickies to be fully visualized as white areas on the black filter paper.

7 Sampling

If the estimation of the Stickies and Plastics is to represent the Stickies and Plastics in a lot of pulp, the number of samples to be tested and their selection shall be in compliance with ISO 7213. If the test is made on another type of sample, report the source of the sample and if possible the sampling procedure used.

From the sample received, select specimens so that they are representative of the whole sample.

8 Adjustment and calibration of the image analysis system

Activate the image analyser (5.3) according to the manufacturer's instructions, and allow it to warm up.

Calibrate the image analyser system software using the calibration chart (5.4) and the manufacturer's instructions for the software used. Use the chart to verify that the image analysis system correctly measures the size of the spots at 100 % contrast to within ± 5 %. If this criterion is not met, correct the calibration by consulting the calibration instructions accompanying the image analyser (5.3).

Set the image analysis software to separate the particles into classes based upon their measured area. The bottom limit for the smallest class will depend upon the size of the opening of the screen used. The number of particle size classes can be varied based on the information desired. The largest class size shall have no upper limit, so that all the particles present will be reported. The software will generally have several calculation capabilities such as counting the total number of Stickies in the various size classes chosen, determining the total physical area of the Stickies measured and plotting of histograms and frequency distributions.

9 Pretreatment of the sample

Determine the dry matter content according to ISO 638.

Soak air-dried pulp samples for at least 4 h in water (tap water may be used), but a wet lap pulp may be disintegrated immediately. Pulp stock with a concentration of 10 % or less need not be disintegrated.

Using the procedure described in ISO 5263, disintegrate a sample of pulp appropriate to the screening equipment used. The exact amount of pulp which must be processed may be varied based upon the level of Stickies and Plastics present. A total amount of 50 g oven-dried pulp shall be used for recycled pulps such as deinked pulp where Stickies and Plastics levels are moderately low. In pulps with higher levels of Stickies or Plastics the quantity may be reduced to 10 g oven-dried pulp.

When necessary, determine the concentration of the pulp stock, according to ISO 4119.

Run the analysis in triplicate. Thus for a complete examination of Stickies and Plastics, approximately 150 g of pulp are generally required.

10 Procedure

10.1 Processing the sample through the screening device

Following the relevant instructions from the manufacturer of the screening device used, process the prepared pulp stock (clause 9) until a clear filtrate is obtained. Note the processing time.

10.2 Distribution of the separated Stickies or Plastics on the filter paper

Some commercially available laboratory screening devices automatically transfer the separated Stickies and Plastics to a filter paper, in which case this step is omitted.

For laboratory screening devices where the separated Stickies and Plastics remain on the screen, proceed as follows.

Remove the screen from the screening device and stand it vertically in a suitable container. Wash the screen slits first from the underside and then from the topside of the screen with a fine jet of high pressure water. Be careful that all the material removed from the screen remains in the container. Use the minimum amount of water required to remove all of the screen rejects.

Retain the screen for subsequent visual examination.

Place a white filter paper (5.6.1) onto the filtering surface of a Büchner funnel (5.5). Filter the wash solution containing the Stickies and Plastics through the filter paper under vacuum until all free water is removed. Ensure a uniform distribution of Stickies and Plastics on the filter paper by using care in adding the suspension to be filtered. In those cases where the level of collected particles is so high that they touch or overlap on the filter paper, several filter papers may be required, or the analysis can be performed using a smaller mass of pulp. When the collected particles are divided among several filter papers, examine the total area of all of the filter papers in the image analyser system.

NOTE A Rapid-Köthen sheet former may be substituted for the Büchner funnel.

When all the suspension has been filtered, examine the screen for remaining Stickies and Plastics. If any remain, transfer them to the filter paper.

10.3 Determination of Stickies by marking with metallic powder

10.3.1 Heat setting

Remove the filter paper from the collection device and cover the top side (the side where the Stickies and Plastics have been deposited) with the siliconized side of a silicone coated release paper (5.7). Place the filter paper and siliconized sheet with the filter paper on the bottom in a heated press (5.9) at a pressure of 95 kPa $\pm$ 5 kPa and 94 °C $\pm$ 4 °C for 10,0 min $\pm$ 0,5 min.

10.3.2 Dyeing

Remove the siliconized sheet retaining the Stickies and Plastics on the filter paper. Examine the collected particles visually. Remove any metal filings, or other non-cellulosic extraneous material obviously not a Stickie or Plastic as defined in clause 3. In removing these extraneous materials, make certain that Stickies or Plastics particles, including those which may be adhering to extraneous materials, are not removed. Shives and wood fibres need not be removed, as they will be dyed black and will not interfere.

Add a solution of an aqueous cellulose substantive black dye (6.1.2) to a shallow glass dish (5.10) to a depth of about 15 mm.

Pull the filter paper through the dye so that all of the surface of the filter paper is totally wetted and the cellulose fibres in the filter paper are dyed black, leaving the Plastics and Stickies undyed.

Place the wet, black-dyed filter paper on a sheet of chemical pulp or blotter paper with the particles upper most. After the excess dye is removed, place the black-dyed filter paper on a new blotter paper and again place a piece of siliconized paper onto the top side of the sheet. Place a blotter or filter paper on top of the siliconized paper to protect the drying equipment from being contaminated with dye.

Repeat the heat pressing step in 10.3.1.

10.3.3 Recording of Stickies

After completion of the drying step, remove the blotters and the siliconized sheet. Dust the filter paper carefully, thoroughly and uniformly with a thick layer of white aluminium oxide (6.1.1). Replace the siliconized sheet and two pieces of blotter paper and dry in an oven (5.8) at 105 °C ± 2 °C at a pressure of about 950 Pa for 10,0 min ± 0,5 min. The required pressure is achieved by placing the sheets between metal plates (5.11). These plates shall remain in the oven so that they are at the required temperature for the entirety of the specified drying period.

Remove the blotters and remove excess fused aluminium oxide by holding the sample vertically and brushing without applying pressure using a small soft (cosmetic) brush.

Examine the sheet visually. The Stickies will be coated by the aluminium oxide, and will appear as white masses on a black background. Remove any non-Stickies materials present using a tweezers. Occasionally, small pieces of white plastic will be seen. They may be removed or coloured black with a black marker (5.13) so they will not be detected in the image analyser.

Place the prepared sheet with the white coated Stickies against the stage of the image analyser (5.3). Operate the apparatus according to the manufacturer's instructions. Make measurements on the total area of the sheet upon which the Stickies are collected. Print out the data.

10.4 Determination of Stickies by marking with white coating particles

10.4.1 Heat setting

After filtering, place a coated paper (6.2.1) on top of the moist black filter paper (10.2) and then sandwich the combination between two blotters. Dry the sandwich by placing it between the lower and upper heated plates of the heated press (5.9) or in a Rapid-Köthen sheet dryer (5.9).

10.4.2 Filter paper washing

After heat setting the Stickies, remove the coated paper from the black filter paper. Wash off the flakes, shives, grit and other non-tacky contaminants as well as fibres in the washing device (5.12) under controlled conditions with a flat spray nozzle for 20 s to 25 s. Use a water pressure of about 0,1 MPa (1 bar) at a flow rate of about 10 l/min. Use a distance between the nozzle and the filter paper of about 180 mm.

10.4.3 Drying

Cover the washed black filter paper with a release paper (5.7) and dry the combination in the heated press (5.9) for about 5 min or in a Rapid-Köthen sheet dryer (5.9) at a pressure of 95 kPa and a temperature of 94 °C ± 4 °C.

10.4.4 Recording of Stickies

Remove the release paper. The white coating pigments mark the Stickies against the black filter paper background.

Examine the sheet visually. If any light coloured non-tacky residues (fibres, contaminants) remain on the black filter paper, remove them or use a black felt pen (5.13) to dye them black.

Place the prepared sheet with the white coated Stickies against the stage of the image analyser. Operate the apparatus according to the manufacturer's instructions. Make measurements on the total area of the sheet upon which the Stickies are collected. Print out the data.

10.5 Determination of Plastics

For the determination of Plastics, proceed as in 10.3.1 and 10.3.2.

After completion of the second drying step, remove the blotters and the siliconized sheet. Dust the sheet carefully, thoroughly, and uniformly with a thick layer of black silicon carbide powder (6.1.3). Replace the siliconized sheet and two pieces of blotter and dry in an oven at 105 °C $\pm$ 5 °C at a pressure of about 950 Pa for 10 min $\pm$ 0,5 min. The required pressure is achieved by placing the sheets between metal plates (5.11) These plates shall remain in the oven so that they are at the required temperature for the entirety of the specified drying period.

Remove the blotters. Remove excess silicon carbide powder by holding the sample vertically and brushing without applying pressure using a small soft (cosmetic) brush.

The Stickies will be coated black, and will not be visible on the black dyed filter paper. The particles which are not coated black with the silicon carbide powder will appear as contrasting lighter coloured specks on the black background.

Place the prepared sheet against the stage of the image analyser. Operate the apparatus according to the manufacturer's instructions. Make measurements on the total area of the sheet upon which the Plastics are collected. Print out the data.

10.6 Calculation of Stickies and Plastics

If the determination of Stickies and Plastics is required on the same recycled pulp sample, this can be done as follows:

— Determine the Plastics as described in 10.5.

— Determine the Stickies as described in 10.3.3, but without removing the white plastic pieces, or colouring them black. The image analysis result in 10.3.3 will be the combined Stickies and Plastics.

— By subtracting the result of 10.5, the result for Stickies only is obtained.

11 Calculations

11.1 Number of Stickies and Plastics

Record separately the number of Stickies and Plastics (10.3.3 and 10.5, or 10.6).

Calculate separately the total number of Stickies and Plastics per kilogram of pulp using the formula:

$$Y = \frac{a}{m}$$

where

Y is the total number of Stickies or Plastics, as relevant, per kilogram of oven-dried pulp;

a is the observed total number of Stickies or Plastics, as relevant;

m is the oven-dried mass of the pulp, screened, in kilograms.

11.2 Area of Stickies and Plastics

Calculate separately the total area of Stickies and Plastics per kilogram of pulp using the formula:

$$X = \frac{A}{m}$$

where

X is the total area of the Stickies or the Plastics, expressed in square millimetres per kilogram;

A is the total area of the Stickies or Plastics, in square millimetres;

m is the oven-dried mass of the pulp, screened, in kilograms.

Calculate the average value of three parallel determinations, then calculate the standard deviation of these values.

12 Precision

The precision of test results obtained in accordance with this part of ISO 15360 depends upon the type, number, size and geometry of the Stickies or Plastics present as well as the separation and visualization technique used. The mass of oven-dried pulp to be taken for recycled pulps such as recycled deinked pulps with moderately low levels of Stickies and Plastics, or for pulps with higher Stickies levels are stated in clause 9. The minimum mass of oven-dried pulp to provide results within specified confidence limits can be determined using standard statistical techniques. Those interested in further information on this matter should consult references [5] and [6] of the Bibliography.

The results shown in Table 1 were obtained by applying the procedure in 10.4 to two samples of mixed office waste (MOW) and one sample of old corrugated containers (OCC) in a single laboratory.

Table 1 — Test results for determination of Stickies by marking with white coating particles

Trial No.	Stickies area, mm^2/kg		
	Sample A	Sample B	Sample C
1	1 518,0	1 537,4	3 466,2
2	837,8	1 889,6	3 346,0
3	1 489,8	2 146,4	3 810,8
4	1 162,8	2 373,8	3 218,8
5	1 106,6	1 918,2	2 572,4
6	1 411,6	1 677,6	3 723,8
7	1 381,2	1 693,8	2 924,0
8			3 392,6
Average	1 272,5	1 891,0	3 306,8
Standard deviation	247,4	291,1	406,3
Coefficient of variation %	19	15	12

The results shown in Table 2 were obtained by applying the procedure in 10.3 to three different samples of recovered paper pulp in a single laboratory.

As the mass of pulp tested increases, data precision is generally improved, as described in references [5] and [6]. Because of the wide variation in types, sizes and geometry of Stickies and Plastics found in recycled pulps, a more precise statement regarding precision than that provided in Table 2 is impracticable.

Table 2 — Test results for determination of Stickies in recovered paper pulps by marking with metallic powder

Trial No.	Stickies area, mm^2/kg		
	Sample A	Sample B	Sample C
1	29 054	23 057	963
2	26 156	22 567	1 109
3	28 100	16 211	822
4	27 321	23 114	658
5	30 054	25 030	773
6	26 776	24 148	725
7	28 599	18 846	1 040
8	29 033	22 997	826
Average	28 137	21 996	865
Standard deviation	1 306	2 950	158
Coefficient of variation %	4,6	13,4	18,2

13 Test report

The test report shall give the following information:

a) all information for complete identification of the sample;

b) reference to this part of ISO 15360;

c) date and place of testing;

d) the average number and standard deviation of Stickies or Plastics or both, per kilogram of oven-dried pulp, and their areas expressed as square millimetres per kilogram;

e) any other information about size of the Stickies size groups, as agreed between interested parties;

f) the mass of pulp inspected;

g) full details regarding the type of commercial screening equipment used (make, model, together with number of slits, slit aperture and configuration of the screen, and compliance to tolerances specified in annex A), type of reagent for marking the Stickies, the image analyser equipment used and the software program used for the calculations;

h) duration of the screening process;

i) any particular points observed during the work;

j) any departure from this part of ISO 15360, or any other circumstances or factors regarded as optional, that could have affected the results.

Annex A
(normative)

Laboratory screening equipment

The laboratory screening equipment shall be fitted with a screen with a slit width of either 100 μm or 150 μm. The average slit width shall be within ± 5 μm of the specified slit width. No individual slit width shall be more than 15 μm from the average of all slit widths.[1)]

In certain applications, other slit widths such as 80 μm or 200 μm may be used. This is not in conformity with this part of ISO 15360.

The responsibility of ensuring that the screen slits are within the prescribed tolerances is usually that of the manufacturer of the screening equipment, who shall provide evidence that this has been carried out. The screen should be returned to the manufacturer or other competent body at agreed intervals to check that the slits remain within the required tolerances.

The width of the screen slits is paramount in this test method. The screen shall be kept clean and the slits shall be examined at regular intervals during use with the aid of a magnifying glass to ensure that there is no deterioration of the edges of the slits, or any damage causing enlarging of the slits.

It should be noted that different laboratory screening equipment may give different results. Furthermore, screening equipment of the same style fitted with different style screens complying with annex A may also give different results because of the difference in the distribution of the slit sizes within the screen.

1) The Somerville Fractionator and the Plumac Masterscreen are examples of suitable models of screening instruments available commercially. This information is given for the convenience of users of this part of ISO 15360 and does not constitute an endorsement by ISO of these models. Other laboratory screening instruments may be used provided it can be demonstrated that they meet the necessary tolerance requirements.

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Annex B
(normative)

Comparison chart

This chart is identical with the charts included in ISO 15319 and ISO 15755.

For the purpose of this part of ISO 15360 only the spots of 100 % contrast are used.

Use the chart shown in Figure B.1.

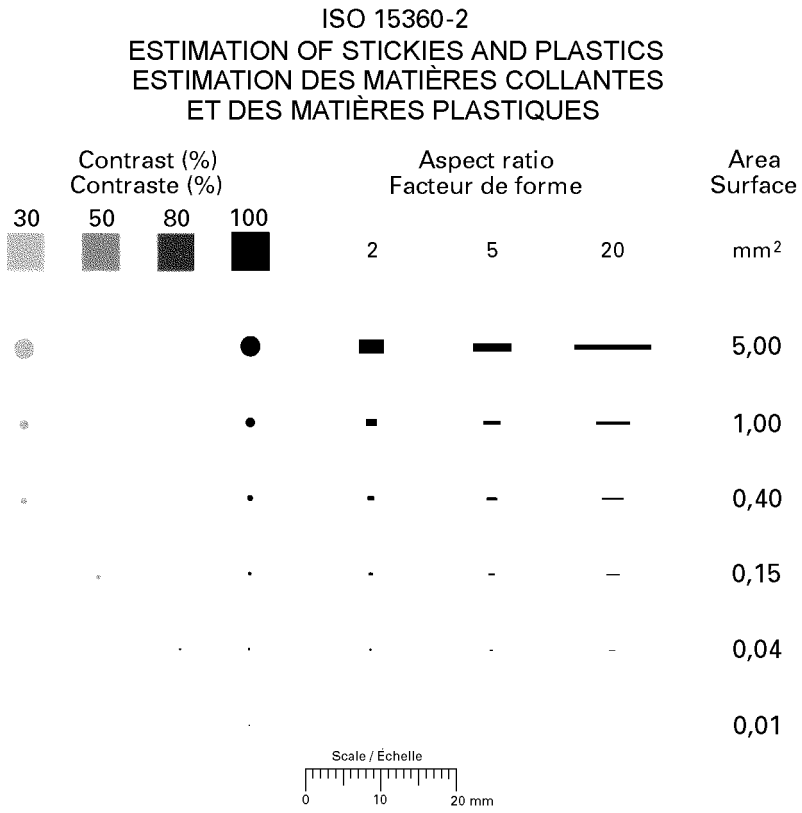

Figure B.1 — Estimation of particle size — Comparison chart

Do not use a photocopy of the chart in any inspection, because reproduction may change the size and contrasts of the spots.

Copies of this International Standard printed by ISO include a comparison chart reproduced on transparent film. Users having only an electronic copy, or a printed copy reproduced from an electronic copy, may obtain an original transparent film comparison chart from the ISO Central Secretariat (price code: A).

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