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Rubber- or plastics-covered rollers — Specifications —

Part 2 : Surface characteristics

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Cylindres revêtus de caoutchouc ou de plastique — Spécifications —

Partie 2 : Caractéristiques de surface

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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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6123-2 was prepared by Technical Committee ISO/TC 45, *Rubber and rubber products*.

This second edition cancels and replaces the first edition (ISO 6123-2 : 1983), which has been expanded to include an additional section on surface roughness (sub-clause 4.3) and an annex giving information on the relationship between surface treatment and surface roughness.

ISO 6123 consists of the following parts, under the general title *Rubber- or plastics-covered rollers — Specifications* :

- *Part 1 : Requirements for hardness*
- *Part 2 : Surface characteristics*
- *Part 3 : Dimensional tolerances*

Annex A of this part of ISO 6123 is for information only.

Introduction

Covered rollers are cylindrical cores, generally of metal, with a cover of rubber or plastics for a particular use. They are manufactured in a wide variety of sizes and hardness grades depending on the intended use.

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Rubber- or plastics-covered rollers — Specifications —

Part 2 : Surface characteristics

1 Scope

This part of ISO 6123 establishes a classification of rubber- or plastics-covered rollers according to surface quality or imperfections and surface finish. A test method for the determination of surface roughness is also described.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 6123. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 6123 are encouraged to investigate the possibility of applying the most recent editions of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 471 : 1983, *Rubber — Standard temperatures, humidities and times for the conditioning and testing of test pieces.*

ISO 3274 : 1975, *Instruments for the measurement of surface roughness by the profile method — Contact (stylus) instruments of consecutive profile transformation — Contact profile meters, system M.*

ISO 4287-1 : 1984, *Surface roughness — Terminology — Part 1 : Surface and its parameters.*

ISO 4288 : 1985, *Rules and procedures for the measurement of surface roughness using stylus instruments.*

3 Surface quality

3.1 General

The manufacturing process and the raw materials used in the manufacture of rubber- or plastics-covered rollers may cause sporadic imperfections, in the form of holes and foreign matter, in the surface of the roller covers. The number, size and location of permissible surface imperfections shall be agreed between the interested parties.

The type of surface finish (see clause 4) shall be observed when selecting the grade of imperfections.

3.2 Grades

The rollers may be graded according to the permissible numbers and sizes of imperfections as follows :

Grade x/y

This means that

imperfections up to and including $x \text{ mm}^2$ in area are acceptable;

not more than two imperfections each having an area between $x \text{ mm}^2$ and $y \text{ mm}^2$ inclusive are permissible in any $0,1 \text{ m}^2$ of cover area;

roller covers showing imperfections larger than $y \text{ mm}^2$ in area shall be rejected.

The values of x and y shall be agreed between the interested parties.

If no requirements for surface quality are necessary, the rollers shall be designated "grade N".

Example : A medium grade of surface quality can be described by the designation :

Grade 0,5/2

This means that

imperfections up to and including $0,5 \text{ mm}^2$ in area are acceptable;

not more than two imperfections each having an area between $0,5 \text{ mm}^2$ and 2 mm^2 inclusive are permissible in any $0,1 \text{ m}^2$ of cover area;

roller covers showing imperfections larger than 2 mm^2 in area shall be rejected.

NOTE — If agreement between the interested parties, or special provisions in national standards, are intended, the required quality should be chosen from the grades given below :

grade 0,1/0,3
grade 0,3/1
grade 0,5/2
grade 2/5
grade 5/10
grade N

4 Surface finish

The surface finish of a roller cover is dictated by the intended use. It shall be characterized either as a type of surface treatment (see 4.1) or as the maximum value of surface roughness (see 4.3), as agreed between the interested parties.

4.1 Methods of surface treatment — terms and classification

Table 1 shows the generally employed principal methods of surface treatment, by means of which the roller surfaces are classified (see 4.2). The type of surface finish, and the structure or texture which can be achieved, are dependent upon the hardness and composition of the roller cover.

Table 1 — Surface finishes

Type	Surface treatment
1	Polishing
2	Grinding, fine
3	Grinding, standard
4	Turning
5	Unground finish

4.2 Description by surface treatment — types

The surface structures described for types 1 to 4 are produced by regular treatments and have a roughness without preferential direction.

The type required shall be chosen by agreement between the interested parties.

4.2.1 Type 1 — polished finish

In soft elastomers, the surface is velvet-like; in hard rubber (ebonite) or plastics, it is smooth.

Grinding marks and scratches shall not be visible to the naked eye. Sporadic grinding blemishes are permissible.

Not all qualities permit this finish.

4.2.2 Type 2 — fine grinding finish

Slight grinding and feed marks are visible to the naked eye, but are not noticeable when touching the roller.

4.2.3 Type 3 — standard grinding finish

Grinding marks and grinding feed are visible and just noticeable when touching the roller.

4.2.4 Type 4 — turned finish

The surface is solely turned, with as little feed of the turning tool as practicable. Turning grooves are visible and noticeable when touching the roller.

4.2.5 Type 5 — unground finish

The surface of the roller is without any treatment or dressing, for example a cloth-marked roller surface as it comes from the vulcanization process or a rough-cast plastics-covered roller.

4.2.6 Type S — special treatment

This applies to surface finishes other than those in 4.2.1 to 4.2.5, for example a fine-cast plastics-covered roller, or to a finish for specific applications with a special structure as defined by agreement between the interested parties.

4.3 Characterization by surface roughness

4.3.1 Requirement

The surface finish of rubber- or plastics-covered rollers shall be quantitatively expressed in one of the following units, as agreed between the interested parties :

- a) arithmetical mean deviation of the profile R_a (see ISO 4287-1 : 1984, sub-clause 5.10), in micrometres;
- b) ten point height of irregularities R_z (see ISO 4287-1 : 1984, sub-clause 5.7), in micrometres.

The roughness of the cover surface shall appear visually uniform.

4.3.2 Method of testing

4.3.2.1 Test instrument : profile meter

a) General

The determination of surface roughness shall be carried out by using a contact profile meter, system M, as specified in ISO 3274. Unless specified below, the basic parameters and metrological characteristics of the instrument shall be those specified in ISO 3274.

The instrument shall be equipped with a suitable support for use on curved surfaces.

The contact stylus shall be calibrated at the indicated measurement values, for example by use of a reference surface of known roughness.

b) Stylus

- Stylus angle : 1,57 rad (90°)
- Radius of stylus tip : 5 µm max.
- Static measuring force at mean level of stylus : 4 mN max.

c) Sampling length, evaluation length and cut-off

The sampling length l and the evaluation length l_n shall be as specified in ISO 4288.

NOTE — For rubber- or plastics-covered rollers, the following values of cut-off λ_B , sampling length l and evaluation length l_n will be encountered in practice.

Table 2 — Parameters for specified R_a

R_a μm	λ_B mm	l mm	l_n mm
> 0,1 up to 2	0,8	0,8	4,0
> 2 up to 10	2,5	2,5	12,5

Table 3 — Parameters for specified R_z

R_z μm	λ_B mm	l mm	l_n mm
> 0,5 up to 10	0,8	0,8	4,0
> 10 up to 50	2,5	2,5	12,5

4.3.2.2 Test conditions**a) Temperature**

The test shall be carried out, whenever possible, at a standard temperature ($23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ or $27\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$) in accordance with ISO 471. The covered roller shall be brought to the test temperature prior to testing to ensure temperature equilibrium.

The test temperature shall be recorded.

b) Cover surface

Before measurements are made, the cover surface shall be cleaned carefully to remove dust and other contaminants which have collected during storage. The cleaning shall not damage the surface.

NOTE — Wiping the surface with isopropyl alcohol has been found suitable.

4.3.2.3 Test procedure**a) Measuring areas**

For rollers having a cover up to 2,5 m long, the roughness shall be measured in five areas :

- three areas, each 120° apart, around the circumference in the middle of the roller;
- one area at each end, at a distance of 10 % of the cover length from the end.

For rollers having a cover over 2,5 m long, the roughness shall be measured in nine areas :

- three areas, each 120° apart, around the circumference in the middle of the roller;
- three areas at each end, each 120° apart, around the circumference, and each at a distance of 10 % of the cover length from the end.

b) Operation

Firmly locate the roller to be tested with its longitudinal axis horizontal and with the area in which the surface roughness is to be measured uppermost. Place the measuring equipment on the roller and adjust the pick-up so that the correct static measuring force at the mean level of the stylus is exerted on the surface.

Make one measurement in each measuring area with the stylus traverse line parallel to the axis of the roller.

The sampling length for each measurement shall be the evaluation length plus the pre-measuring and the post-measuring lengths.

4.3.3 Expression of results

For each measuring area specified in 4.3.2.3 a), the arithmetical mean deviation of the profile, R_a , or the ten point height of irregularities, R_z , respectively shall be measured as defined in ISO 4288.

The roughness of the roller cover surface shall be reported as the average of all readings taken as specified in 4.3.2.3 a).

4.3.4 Repeatability and reproducibility

The difference between two single test results obtained on identical test material under the repeatability conditions specified for a particular determination will exceed 20 % on average not more than once in 20 cases in the normal and correct operation of the method.

The difference between two single and independent test results obtained by two operators working under the specified reproducibility conditions in different laboratories on identical test material will exceed 50 % on average not more than once in 20 cases in the normal and correct operation of the method.

Annex A

(informative)

Relation between surface treatment and surface roughness

As agreed between the interested parties, the surface finish may be specified either by treatment (see 4.1 and 4.2) or by roughness (see 4.3). The relation to be expected between the type of treatment and the surface roughness obtained is given in table A.1.

It should be noted that the same treatment generates different roughness values on covers not only of different hardnesses but to some extent also of different polymers or compounds.

Table A.1 — Values of R_a and R_z as a function of surface treatment

Cover hardness									
IRHD Shore A		< 50		50 to 70		> 70 to < 100		≈ 100	
Pusey and Jones		> 120		120 to 70		< 70 to 10		9 to 0	
Surface finish		Roughness value (μm), max.							
Type	Treatment	R_a	R_z	R_a	R_z	R_a	R_z	R_a	R_z
1	Polishing	5	31,5	3,15	20	1,6	10	1	6,3
2	Grinding, fine	6,3	40	4	25	2,5	16	1,6	10
3	Grinding, standard	10	63	6,3	40	4	25	2,5	16
4	Turning	Not available							
5	Unground finish	Not available							

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