BS 2634-1:2010

BSI Standards Publication

Roughness comparison specimens

Part 1: Specification for turned, ground, bored, milled, shaped and planed specimens

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Contents

Summary of pages
This document comprises a front cover, an inside front cover, pages i to ii, pages 1 to 6, an inside back cover and a back cover.

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Foreword

Publishing information

This part of BS 2634 is published by BSI and came into effect on 30 September 2010. It was prepared by Subcommittee TDW/4/9, *Technical product verification*, under the authority of Technical Committee TDW/4, *Technical product realization*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This part of BS 2634 supersedes BS 2634-1:1987, which is withdrawn.

Relationship with other publications

BS 2634 is published in two parts:

- Part 1: *Specification for turned, ground, bored, milled, shaped and planed specimens*;
- Part 2: *Specification for spark-eroded, shot-blasted, grit-blasted and polished specimens*.

Information about this document

BS 2634-1:1987 was dual numbered with ISO 2632-1:1985, which was withdrawn in 1997.

This is a full revision of BS 2634-1:1987, and introduces the recalibration of roughness comparison specimens after a period of use.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

1 Scope

This part of BS 2634 specifies the characteristics of roughness comparison specimens of turned, ground, bored, milled, shaped and planed surfaces. These are intended for tactile and visual comparison with workpiece surfaces of similar lay that have been produced by similar machining methods.

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.

BS EN ISO 4287:1998+A1:2009, *Geometrical product specification (GPS) – Surface texture – Profile method – Terms, definitions and surface texture parameters*

3 Terms and definitions

For the purposes of this part of BS 2634, the terms and definitions given in BS EN ISO 4287:1998+A1 and the following apply.

3.1 roughness comparison specimen
specimen having a known surface roughness parameter representing a particular machining or other production process for the purpose of comparison with workpiece surfaces

NOTE A roughness comparison specimen is often used to give design personnel guidance on the feel and appearance of a particular production process and the roughness grade. It can also help workshop personnel to evaluate and control workpiece surfaces through tactile and visual comparison with the surface of the roughness comparison specimen.

3.2 lay
direction of the predominant surface pattern

NOTE This is ordinarily determined by the process used in producing the surface.

3.3 master surface
machined surface which a roughness comparison specimen is created to replicate

4 Methods of manufacture

Roughness comparison specimens shall be manufactured:

a) by creating positive replicas of master surfaces which replicate the feel and appearance of the master surface, for instance by electro-forming; or

b) by individually machining the roughness comparison specimens.

NOTE Individually machining a roughness comparison specimen involves directly applying the production process, which the roughness comparison specimen is intended to represent, to its surface.

5 Surface characteristics

Master surfaces intended for reproduction, their replicas and individually machined roughness comparison specimens (see Clause **4**) shall exhibit only the characteristics resulting from the machining process which they are intended to represent. They shall not have uncharacteristic surface irregularities that are visible by normal or corrected sight.

NOTE Uncharacteristic surface irregularities can occur when debris gets into the machining process, for example.

6 Surface roughness values

Surface roughness values shall be in accordance with Table 1.

Table 1 **Surface roughness values of roughness comparison specimens**

Machining methods							
Grinding		Turning and boring		Milling		Shaping and planing	
Arithmetical mean deviation *Ra*							
µm	µin	µm	µin	µm	µin	µm	µin
0.025	1	—	—	—	—	—	—
0.05	2	—	—	—	—	—	—
0.1	4	—	—	—	—	—	—
0.2	8	—	—	—	—	—	—
0.4	16	0.4	16	0.4	16	—	—
0.8	32	0.8	32	0.8	32	0.8	32
1.6	63	1.6	63	1.6	63	1.6	63
3.2	125	3.2	125	3.2	125	3.2	125
—	—	6.3	250	6.3	250	6.3	250
—	—	12.5	500	12.5	500	12.5	500
—	—	—	—	—	—	25.0	1 000

NOTE Low values are included primarily to give design office personnel an idea of the differences that can be detected (between, for example, 0.025 µm, 0.05 µm and 0.1 µm) by visual means.

7 Sampling length

The sampling length to be used when measuring *Ra* on a roughness comparison specimen should be selected from Table 2, according to the machining method and roughness grade of the specimen.

For repetitive profiles, the length of the sampling length shall be rounded-up to include the nearest whole number of profile cycles.

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Table 2 **Sampling lengths**

Arithmetical mean deviation *Ra*		**Machining methods**							
		Grinding		Turning and boring		Milling		Shaping and planing	
		Sampling length							
µm	µin	mm	in	mm	in	mm	in	mm	in
0.025	1	0.25	0.01	—	—	—	—	—	—
0.05	2	0.25	0.01	—	—	—	—	—	—
0.1	4	0.8	0.03	—	—	—	—	—	—
0.2	8	0.8	0.03	—	—	—	—	—	—
0.4	16	0.8	0.03	0.8	0.03	0.8	0.03	—	—
0.8	32	0.8	0.03	0.8	0.03	0.8	0.03	0.8	0.03
1.6	63	0.8	0.03	0.8	0.03	2.5	0.1	0.8	0.03
3.2	125	2.5	0.1	2.5	0.1	2.5	0.1	2.5	0.1
6.3	250	—	—	2.5	0.1	8.0	0.3	2.5	0.1
12.5	500	—	—	2.5	0.1	8.0	0.3	8.0	0.3
25.0	1 000	—	—	—	—	—	—	8.0	0.3

8 Calibration of a roughness comparison specimen

8.1 Initial calibration

8.1.1 Readings shall be taken perpendicular to the direction of lay of the surface of the roughness comparison specimen.

8.1.2 Readings shall be taken at a sufficient number of locations evenly distributed over the measuring area of the roughness comparison specimen to meet the target uncertainty, as specified by the user.

8.1.3 Readings shall only be taken from areas that are representative of the machining method.

NOTE Areas in the surface that are not representative of the machining method are sometimes found in rougher grades of milled, turned, or bored surfaces.

8.1.4 The mean value of the readings shall be in accordance with the tolerances given in Table 3.

8.1.5 The standard deviation from the mean value shall be not greater than the percentage of the effective value given in Table 3.

8.1.6 Where numbers of sampling lengths other than those given in Table 3 are included in the evaluation length, the value for the acceptable maximum of the standard deviation derived from the readings shall be calculated from the formula:

$$\sigma_n = \sigma_s \sqrt{\frac{5}{n}}$$

where:

σ_s is the standard deviation from Table 3 for five sampling lengths;

n is the number of sampling lengths in the evaluation length under consideration.

Table 3 **Tolerances on roughness values for roughness comparison specimens**

Specimen type	Tolerance on mean value (percentage of nominal value)		Standard deviation (percentage of effective value) for evaluation length comprising:			
	%		3 sampling lengths	4 sampling lengths	5 sampling lengths	6 sampling lengths
			%	%	%	%
Ground	+12	–17	12	10	9	8
Turned	+12	–17	5	4	4	4
Bored	+12	–17	5	4	4	4
Milled	+12	–17	12	10	9	8
Shaped	+12	–17	4	3	3	3
Planed	+12	–17	4	3	3	3

NOTE The standard deviation for five sampling lengths in the evaluation length has been used for calculating the standard deviation for three, four and six sampling lengths in the evaluation length.

8.2 Re-calibration after a period of use

Re-calibration readings shall not be taken from surface areas of a roughness comparison specimen that have become visibly scratched, dented or otherwise marked.

Where the surface area of a roughness comparison specimen is not of a sufficient size to be assessed or to be representative of the machining process due to visible scatches, dents and marks on its surface, then the roughness comparison specimen shall be replaced and not re-calibrated.

9 Minimum roughness comparison specimen size

Each side shall be:

a) a minimum of 20 mm in length for *Ra* values between 0.025 µm and 6.3 µm; or

b) a minimum of 30 mm in length for the *Ra* value of 12.5 µm; or

c) a minimum of 50 mm in length for the *Ra* value of 25 µm.

NOTE It is important that roughness comparison specimens are of a size that permits initial and periodic verification.

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10 Lay

The roughness comparison specimen shall be designed such that the measurement direction runs parallel to the longest side. The general direction of the lay shall be parallel to the shortest side.

NOTE For the lay characteristics for roughness comparison specimens, see Annex A.

11 Marking

11.1 The measuring area of the roughness comparison specimen shall not be marked.

11.2 Roughness comparison specimens, or their mounting, shall be marked, as a minimum, with the following:

a) the number and date of this British Standard, i.e. BS 2634-1:2010; [1)]

b) the nominal *Ra* value, expressed in micrometres (µm), and, where required, in microinches (µin); and

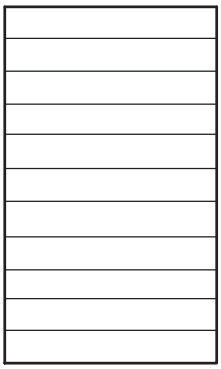
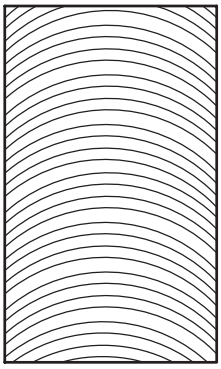
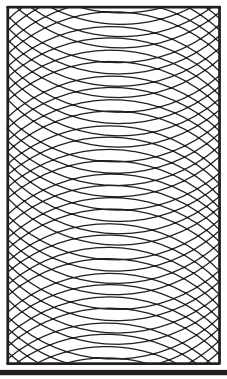
c) the name of the machining process which the roughness comparison specimen represents, e.g. ground, turned or milled.

[1)] Marking BS 2634-1:2010 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

Annex A (informative) Lay characteristics

The lay characteristics of roughness comparison specimen surfaces are given in Table A.1.

Table A.1 **Lay characteristics of roughness comparison specimens**

Lay description	Production process represented	Form of specimen	Stylized representation of lay characteristics
Straight lay	Peripheral grinding	Flat	
		Cylindrical convex	
	Cylindrical turning	Cylindrical convex	
	Boring	Cylindrical concave	
	Peripheral (horizontal) milling	Flat	
	Shaping	Flat	
	Planing	Flat	
Arcuate lay	End milling	Flat	
	Face turning	Flat	
Crossed arcuate lay	End milling	Flat	
	Side wheel (vertical) grinding	Flat	
	Cup-wheel grinding	Flat	

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