International Standard 2632/III

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

Roughness comparison specimens — Part III : Cast surfaces

Échantillons de comparaison viso-tactile de rugosité — Partie III : Surfaces moulées

First edition — 1979-07-01

UDC 620.179.118 **Ref. No. ISO 2362/III-1979 (E)**

Descriptors : products made with metal, castings, surface condition, roughness, viso-tactile comparison specimens, test specimen conditioning.

Price based on 4 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

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.

International Standard ISO 2632/III was developed by Technical Committee ISO/TC 57, *Metrology and properties of surfaces*, and was circulated to the member bodies in March 1978.

It has been approved by the member bodies of the following countries :

Australia	France	Romania
Austria	Germany, F. R.	South Africa, Rep. of
Belgium	Hungary	Spain
Brazil	Japan	Switzerland
Bulgaria	Mexico	Turkey
Canada	Netherlands	USA
Chile	New Zealand	USSR
Czechoslovakia	Poland	Yugoslavia

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Sweden
United Kingdom

Printed in Switzerland

Roughness comparison specimens — Part III : Cast surfaces

1 Scope and field of application

This International Standard specifies the characteristics of specimens of cast metallic surfaces which are intended for tactile and visual comparison with workpiece surfaces produced by similar casting methods and which have been cleaned by an appropriate treatment, for example shot blasting, grit blasting, or tumbling.

It is complementary to ISO 2632/I, *Roughness comparison specimens* — Part I : *Turned, ground, bored, milled, shaped and planed,* and to ISO 2632/II, *Roughness comparison specimens* — Part II : *Spark-eroded, shot blasted and grit blasted, and polished.*

2 References

ISO/R 468, *Surface roughness.*

ISO 1302, *Technical drawings — Method of indicating surface texture on drawings.*

ISO 1880, *Instruments for the measurement of surface roughness by the profile method — Contact (stylus) instruments of progressive profile transformation — Profile recording instruments.*

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

3 Definitions

3.1 roughness comparison specimen : A specimen surface of known average roughness height (R_a) representing a particular casting process. The specimen is used to give design personnel guidance on the feel and appearance representative of the particular casting process and roughness grade, and to enable workshop personnel to assess and control workpiece surfaces by tactile and visual comparison with the specimen surface.

Note — There is usually no predominant lay on the surfaces of cast specimens.

Other terms used to describe surface characteristics or measurement are defined in ISO/R 468.

4 Methods of manufacture

The specimens shall be manufactured as follows :

4.1 By electroforming positive replicas of master surfaces.

4.2 By making positive replicas, in plastics, of master surfaces; the feel and appearance of the natural cast metallic surface should be represented by a coating or by other means.

4.3 By making positive replicas of master surfaces in other materials and by other methods ensuring that the feel and appearance of the natural cast metallic surface are represented.

4.4 By direct application of the casting process which the specimen is intended to represent (individually cast specimens).

5 Surface characteristics

Master surfaces for reproduction, their resultant electro-formed and plastics replicas, and individually cast specimens (see 4.1, 4.2, 4.3 and 4.4) shall exhibit only the characteristics resulting from the natural action of the casting process (including shot blasting or grit blasting or other appropriate cleaning treatment) which they are intended to represent. They shall not contain other surface irregularities, such as occasional defects, waviness or effects caused by abnormal conditions, which may be acceptable on actual workpieces.

6 Ranges of roughness grades

The ranges of roughness grades shall be as given in table 1.

7 Sampling

The sampling lengths given in table 2 shall be used in evaluating the specimens.

8 Calibration

Sufficient readings shall be taken across the surface at evenly distributed positions to enable the mean value and the standard deviation to be determined. Twenty-five readings have been found sufficient for many engineering surfaces but this number may be increased to meet excessive scatter of results.

The mean value of the readings should not vary from the nominal value by an amount greater than the percentage of the nominal value given in table 3.

The standard deviation from the mean value should not be greater than an amount equal to the percentage of the effective value given in table 3.

The figures are to be based on readings obtained with an instrument working correctly in accordance with ISO 1880 and ISO 3274. If the instrument used for a determination has a known or assumed error, this error should be taken into consideration. If other numbers of sampling lengths are included in the evaluation length, the value for the acceptable maximum of the standard deviation so derived from the 25 readings shall be calculated from the formula :

$$\sigma_n = \sigma_5 \sqrt{\frac{5}{n}}$$

where

σ_5 is the standard deviation from table 3 for five sampling lengths;

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

9 Minimum specimen size

Comparison specimens shall be of a size adequate to permit initial and periodic verification. No side shall be shorter than 20 mm for R_a values of 0,2 to 6,3 µm; 30 mm for the R_a value of 12,5 µm; 50 mm for R_a values of 25 µm and over.

TABLE 1 — **Ranges of roughness grades of roughness comparison specimens**

Values in micrometres

Arithmetical mean deviation R_a												
Ferrous castings					**Non-ferrous castings**							
Steel			**Iron**		**Aluminium alloy**			**Copper alloy**			**Magnesium and zinc alloy**	
Sand cast	Shell moulded	Precision cast	Sand cast	Shell moulded	Sand cast	Gravity die cast	Pressure die cast	Sand cast	Gravity die cast	Pressure die cast	Sand cast	Pressure die cast
							0,4*					0,2*
												0,4*
		0,8*				0,8*	0,8*					0,8
	1,6*	1,6*		1,6*		1,6*	1,6			1,6*		1,6
	3,2*	3,2	3,2*	3,2*	3,2*	3,2	3,2		3,2*	3,2*	3,2*	3,2
	6,3	6,3	6,3*	6,3	6,3*	6,3	6,3	6,3*	6,3*	6,3	6,3*	6,3
12,5*	12,5	12,5	12,5	12,5	12,5	12,5	12,5	12,5*	12,5	12,5	12,5	12,5
25 *	25		25	25	25	25	25	25	25	25	25	25
50	50		50		50	50		50	50	50	50	
100			100		100			100	100		100	
200			200		200						200	
400												

NOTE — Users of comparison specimens should note that the values marked with an asterisk are intended to be used as minimum limit values only, in accordance with ISO 1302. They should not be used as upper limit values on drawings.

TABLE 2 – **Sampling lengths**

Lengths in millimetres

Mean arithmetic deviation R_a µm	Sampling length												
	Ferrous castings					Non-ferrous castings							
	Steel			Iron		Aluminium alloy			Copper alloy			Magnesium and zinc alloy	
	Sand cast	Shell moulded	Precision cast	Sand cast	Shell moulded	Sand cast	Gravity die cast	Pressure die cast	Sand cast	Gravity die cast	Pressure die cast	Sand cast	Pressure die cast
0,2													0,25
0,4								0,8					0,8
0,8			0,8				0,8	0,8					0,8
1,6		0,8	0,8		0,8		0,8	0,8			0,8		0,8
3,2		2,5	2,5	2,5	2,5	2,5	2,5	2,5		2,5	2,5	2,5	2,5
6,3		2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
12,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
25	2,5	2,5		2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5	2,5
50	8	8		8		8	8		8	8	8	8	
100	8			8		8			8	8		8	
200	25			25		25						25	
400	25												

TABLE 3 – **Tolerance values for roughness comparison specimens**

Casting process	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
Ferrous castings						
– sand	+ 10	– 20	26	22	20	18
– shell-moulded	+ 10	– 20	26	22	20	18
– precision	+ 10	– 20	19	17	15	14
Non-ferrous castings	+ 10	– 20	19	17	15	14

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.

10 Marking

Each specimen, or its mounting, shall be marked with the following :

a) The mark "ISO" together with, where applicable, the roughness number (see table 4).

b) The nominal R_a value, expressed in micrometres, and the corresponding value of the sampling length, expressed in millimetres.

c) The casting process represented by the specimens, taken from the following list :

Sand cast steel
Shell-moulded steel
Precision cast steel

Sand cast iron
Shell-moulded iron

Sand cast aluminium
Gravity die cast aluminium

Sand cast copper alloy
Gravity die cast copper alloy
Pressure die cast copper alloy

Sand cast magnesium and zinc alloy
Pressure die cast magnesium and zinc alloy.

NOTES

1 Consideration will be given to the inclusion of requirements for the additional marking of other parameters as these are defined and adopted.

2 Marking should not be applied to the reference surface of the specimen.

TABLE 4 — **Nominal values and related roughness numbers of roughness comparison specimens**

Roughness number*	Nominal values of R_a	
	µm	µin
N 4	0,2	8
N 5	0,4	16
N 6	0,8	32
N 7	1,6	63
N 8	3,2	125
N 9	6,3	250
N 10	12,5	500
N 11	25	1 000
N 12	50	2 000
**	100	4 000
**	200	8 000
**	400	16 000

* ISO 1302.

** No roughness number is allocated to this R_a value.