

ISO

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

ISO RECOMMENDATION R 1302

TECHNICAL DRAWINGS

METHOD OF INDICATING SURFACE TEXTURE ON DRAWINGS

1st EDITION

January 1971

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BRIEF HISTORY

The ISO Recommendation R 1302, *Technical drawings – Method of indicating surface texture on drawings*, was drawn up by Technical Committee ISO/TC 10, *Drawings (General principles)*, the Secretariat of which is held by the Association Suisse de Normalisation (SNV).

Work on this question led to the adoption of Draft ISO Recommendation No. 1302, which was circulated to all the ISO Member Bodies for enquiry in August 1967. It was approved, subject to a few modifications of an editorial nature, by the following Member Bodies :

Austria	Iran	Romania
Brazil	Israel	South Africa, Rep. of
Canada	Italy	Spain
Czechoslovakia	Japan	Sweden
Denmark	Korea, Rep. of	Switzerland
Finland	Netherlands	Thailand
Germany	New Zealand	U.A.R.
Greece	Norway	United Kingdom
Hungary	Poland	U.S.S.R.
India	Portugal	

The following Member Bodies opposed the approval of the Draft :

Australia
Belgium
France
U.S.A.

This Draft ISO Recommendation was then submitted by correspondence to the ISO Council, which decided to accept it as an ISO RECOMMENDATION.

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TECHNICAL DRAWINGS

METHOD OF INDICATING SURFACE TEXTURE ON DRAWINGS

1. SCOPE

This ISO Recommendation specifies the symbols and additional indications of surface texture to be indicated on technical drawings.

NOTE. - For uniformity all figures in this ISO Recommendation are in first angle projection (Method E). It should be understood that the third angle projection (Method A) could equally well have been used without prejudice to the principles established.

2. SYMBOLS USED FOR INDICATION OF SURFACE TEXTURE

2.1 The basic symbol consists of two legs of unequal length inclined at approximately 60° to the line representing the considered surface as shown in Figure 1.

This symbol alone has no meaning except as in clauses 4.4 and 4.6.

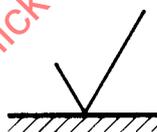


FIG. 1

2.2 If the removal of material by machining is required, a bar is added to the basic symbol, as shown in Figure 2.

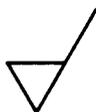


FIG. 2

2.3 If the removal of material is not permitted, a circle is added to the basic symbol, as shown in Figure 3.



FIG. 3

2.4 The symbol in Figure 3 may also be used in a drawing relating to a production process to indicate that a surface is to be left in the state resulting from a preceding manufacturing process, whether this state was achieved by removal of material or otherwise.

In this case none of the indications given in section 3 are added to the symbol.

2.5 When special surface characteristics have to be indicated (see clause 3.2) a line is added to the longer leg of any of the above symbols, as shown in Figure 4.

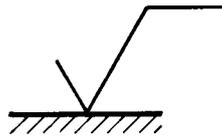


FIG. 4

3. INDICATIONS ADDED TO THE SYMBOLS

3.1 Indication of surface roughness

3.1.1 The value or values defining the principal criterion of roughness (see clause 3.1.5) are added to the symbols given in Figures 1, 2 and 3, as shown in Figures 5, 6 and 7.

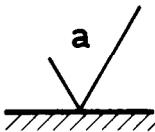


FIG. 5

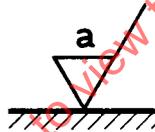


FIG. 6

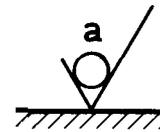


FIG. 7

3.1.2 A surface texture specified

- as in Figure 5 may be obtained by any production method;
- as in Figure 6 must be obtained by removal of material by machining;
- as in Figure 7 must be obtained without removal of material.

3.1.3 When only one value is specified it represents the maximum permissible value of surface roughness.

3.1.4 If it is necessary to impose maximum and minimum limits of the principal criterion of surface roughness, both values should be shown as in Figure 8, with the maximum limit (a_1) above the minimum limit (a_2).

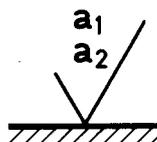


FIG. 8

3.1.5 The principle criterion of roughness R_a may be indicated by the corresponding roughness grade number shown in the table below.

This is to avoid misinterpretation of numerical values, which may be indicated in different units (micrometre or microinch).

Roughness values R_a		Roughness grade numbers
μm	μin	
50	2000	N 12
25	1000	N 11
12.5	500	N 10
6.3	250	N 9
3.2	125	N 8
1.6	63	N 7
0.8	32	N 6
0.4	16	N 5
0.2	8	N 4
0.1	4	N 3
0.05	2	N 2
0.025	1	N 1

3.2 Indication of special surface texture characteristics

3.2.1 In certain circumstances, for functional reasons, it may be necessary to specify additional special requirements concerning surface texture.

3.2.2 If it is required that the final surface texture be produced by one particular production method, this method should be indicated in plain language on an extension of the longer arm of the symbol given in Figure 4, as shown in Figure 9.

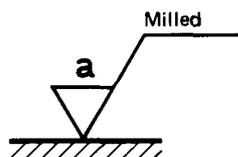


FIG. 9

3.2.3 Also on this extension line should be given any indications relating to treatment or coatings.

Unless otherwise stated, the numerical value of the roughness applies to the surface texture after treatment or coating.

If it is necessary to define surface texture both before and after treatment, this should be explained in a suitable note or in accordance with Figure 10.

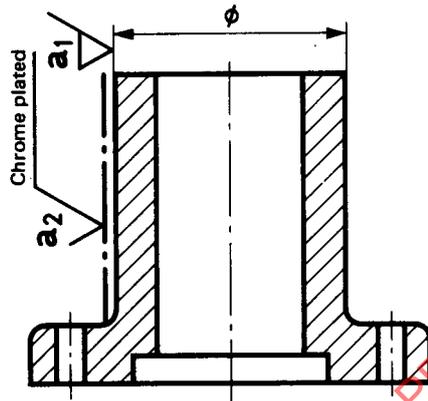


FIG. 10

3.2.4 If it is necessary to indicate the sampling length, it should be selected from the series given in ISO Recommendation R 468, *Surface roughness*, and be stated adjacent to the symbol, as shown in Figure 11.

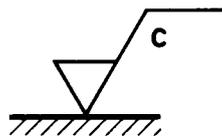


FIG. 11

3.2.5 If it is necessary to control the direction of lay, it is specified by a symbol (see clause 3.3) added to the surface texture symbol as shown in Figure 12.

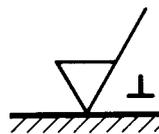
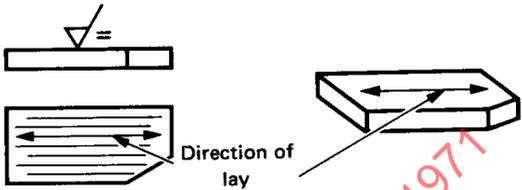
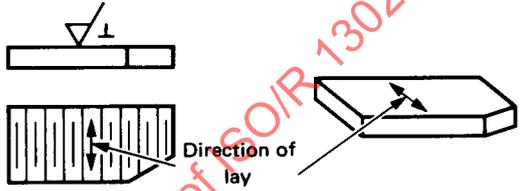
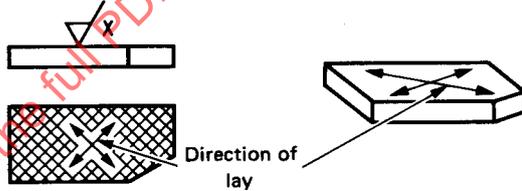
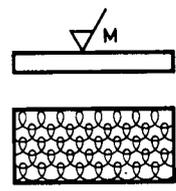
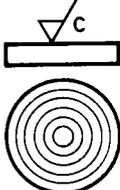
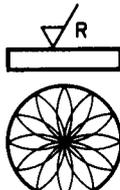


FIG. 12

NOTE. - The direction of lay is the direction of the predominant surface pattern, ordinarily determined by the production method employed.

3.3 Symbols for the direction of lay

The following series of symbols specifies the common directions of lay.

Symbol	Interpretation
<p style="text-align: center;">=</p>	<p>Parallel to the plane of projection of the view in which the symbol is used.</p> 
<p style="text-align: center;">⊥</p>	<p>Perpendicular to the plane of projection of the view in which the symbol is used.</p> 
<p style="text-align: center;">X</p>	<p>Crossed in two slant directions relative to the plane of projection of the view in which the symbol is used.</p> 
<p style="text-align: center;">M</p>	<p>Multi-directional.</p> 
<p style="text-align: center;">C</p>	<p>Approximately circular relative to the centre of the surface to which the symbol is applied.</p> 
<p style="text-align: center;">R</p>	<p>Approximately radial relative to the centre of the surface to which the symbol is applied.</p> 

NOTE. - Should it be necessary to specify a direction of lay not clearly defined by these symbols then this must be achieved by a suitable note on the drawing.

3.4 Indication of machining allowance

Where it is necessary to specify the value of the machining allowance, this should be indicated on the left of the symbol as shown in Figure 13. This value should be expressed in millimetres or inches, according to the general system used for dimensioning the drawing.

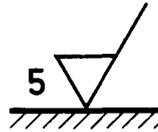


FIG. 13

3.5 Position of the specifications of surface texture in the symbol

The specifications of surface texture should be placed relative to the symbol as shown in Figure 14.

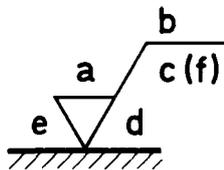


FIG. 14

- a = Roughness value R_a in micrometres or microinches
or
Roughness grade number N1 to N12
- b = Production method, treatment or coating
- c = Sampling length
- d = Direction of lay
- e = Machining allowance
- f = Other roughness values (in brackets)

4. INDICATIONS ON DRAWINGS

4.1 In conformity with ISO Recommendation R 129, *Engineering drawing - Dimensioning*, the symbol, as well as the inscriptions, should be orientated so they may be read from the bottom or the right-hand side of the drawing (see Fig. 15).

If it is not practicable to adopt this general rule, the symbol may be drawn in any position, but only provided that it does not carry any indications of special surface texture characteristics or of machining allowances (as given in clauses 3.2 to 3.4). Nevertheless, in such cases the inscription defining the value of the principal criterion of roughness (if present) must always be written in conformity with the general rule (see Fig. 16).

If necessary, the symbol may be connected to the surface by a leader line terminating in an arrow.

The symbol or the arrow should point from outside the material of the piece, either to the line representing the surface, or to an extension of it (see Fig. 15).

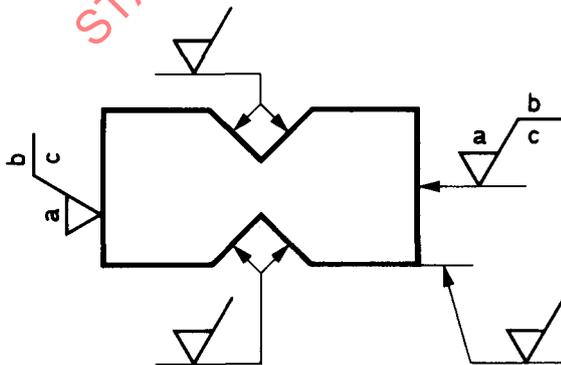


FIG. 15

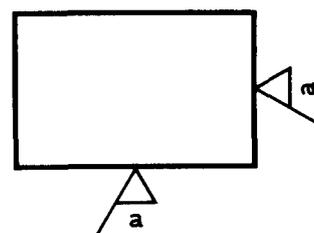


FIG. 16

4.2 In accordance with the general principles of dimensioning, the symbol is only used once for a given surface and, if possible, on the view which carries the dimension defining the size or position of the surface (see Fig. 17).

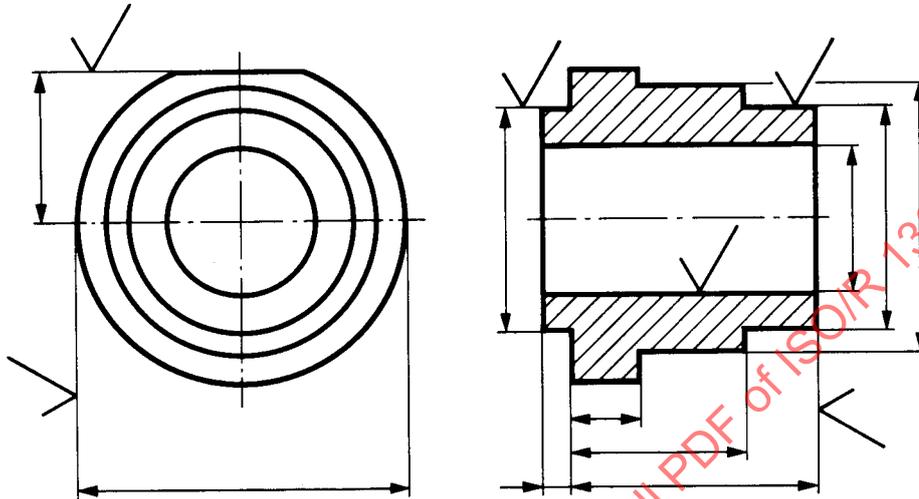


FIG. 17

4.3 If the same texture is required on all the surfaces of a part, it is specified

- either by a note near a view of the part (Fig. 18), near the title block, or in the space devoted to general notes;
- or following the part number on the drawing (Fig. 19).

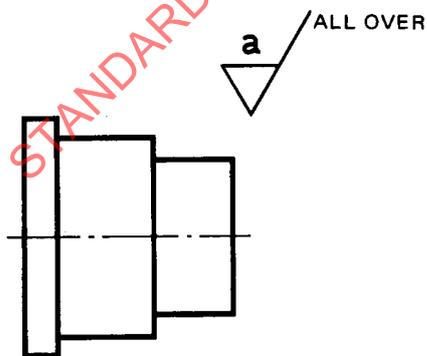


FIG. 18

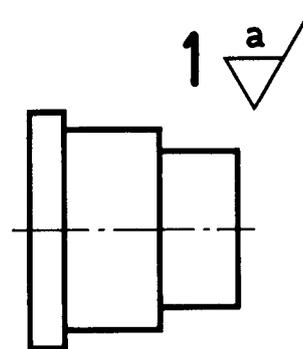


FIG. 19

4.4 If the same surface texture is required on the majority of the surfaces of a part, it is specified as in clause 4.3 with the addition of

- the notation "Except where otherwise stated" (Fig. 20);
- or a basic symbol (in brackets) without any other indication (Fig. 21);
- or the symbol or symbols (in brackets) of the special surface texture or textures (Fig. 22).

The symbols for the surface textures which are exceptions to the general symbol are indicated on the corresponding surfaces.

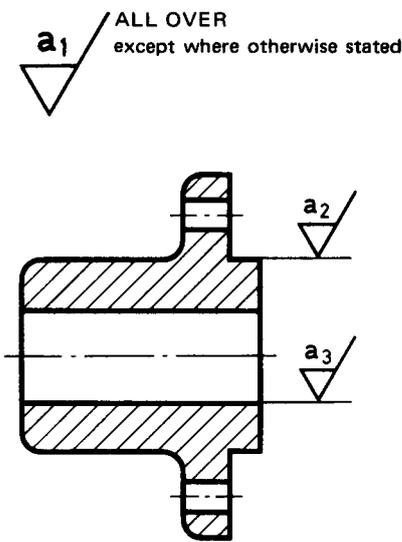


FIG. 20

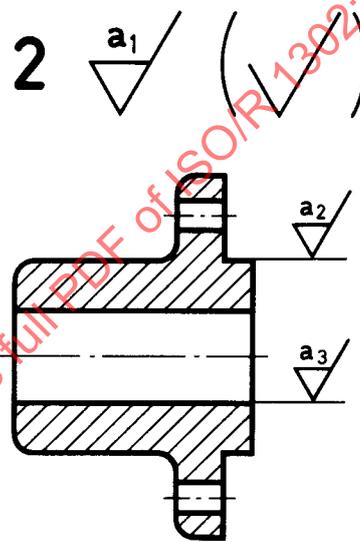


FIG. 21

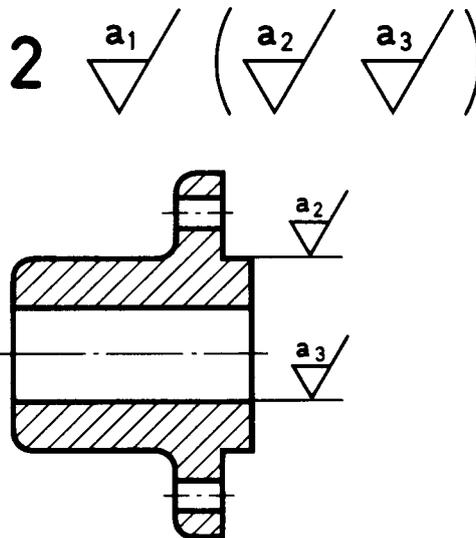


FIG. 22