

# INTERNATIONAL STANDARD

**ISO**  
**8512-2**

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**Surface plates —**

**Part 2:**  
Granite

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*Marbres de traçage et de contrôle —*

*Partie 2: Marbres en roche*  
ISO 8512-2:1990

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Reference number  
ISO 8512-2:1990(E)

## 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 voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 8512-2 was prepared by Technical Committee ISO/TC 3, *Limits and fits*.

ISO 8512 consists of the following parts, under the general title *Surface plates*:

- Part 1: *Cast iron*
- Part 2: *Granite*

Annexes A, B, C, D and E of this part of ISO 8512 are for information only.

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## Introduction

Surface plates, for many practical purposes, serve the user as a plane or datum surface.

Surface plates are made usually of cast iron or granite; other materials may be used provided that they comply with the requirements for quality and accuracy specified in this International Standard.

For convenience of presentation ISO 8512 comprises two parts, each complete in itself, dealing with cast iron and granite surface plates respectively.

The choice between cast iron and granite surface plates depends on the conditions of use; some general information about care and use, testing, and moderation in loading of plates is given in annex A, annex B and annex C, respectively.

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# Surface plates —

## Part 2: Granite

### 1 Scope

This part of ISO 8512 specifies requirements for rectangular or square granite surface plates ranging from 160 mm × 100 mm to 2 500 mm × 1 600 mm, as preferred sizes, in four grades of accuracy 0, 1, 2 and 3.

NOTE 1 "Granite" is a commonly used description; a more specific description is given in clause 4.

This part of ISO 8512 applies to new granite surface plates, granite surface plates in use and those re-conditioned according to their grade.

### 2 Definition

For the purposes of this part of ISO 8512, the following definition applies.

**deviation from flatness of the working surface:** The minimum distance separating two parallel planes between which the working surface can just be contained.

### 3 Nomenclature

For the purposes of this part of ISO 8512, the nomenclature shown in figure 1 applies.

### 4 Material

Surface plates complying with this part of ISO 8512 shall be made from stable, workable rock presenting a wear-resistant surface which does not tend to scratch steel surfaces. Igneous rocks such as diabase, gabbro and various other granites have been found suitable; they are commonly referred to

as "granite" for the purposes of this part of ISO 8512.

Rock used for surface plates shall be close-grained and of uniform texture, sound and free from flaws and fissures and from inclusions of softer materials. Repair of defects in the top surface is not permitted.

The colour of the granite, which is dependent on the mineral composition, is of no importance, but the colour of any individual plate shall be uniform.

NOTE 2 Some of the physical properties of granite used for surface plates are given in annex E.

### 5 Preferred sizes

The preferred sizes for granite plates are given in table 1. If plates of other sizes are required, the requirements of this part of ISO 8512 shall nevertheless apply.

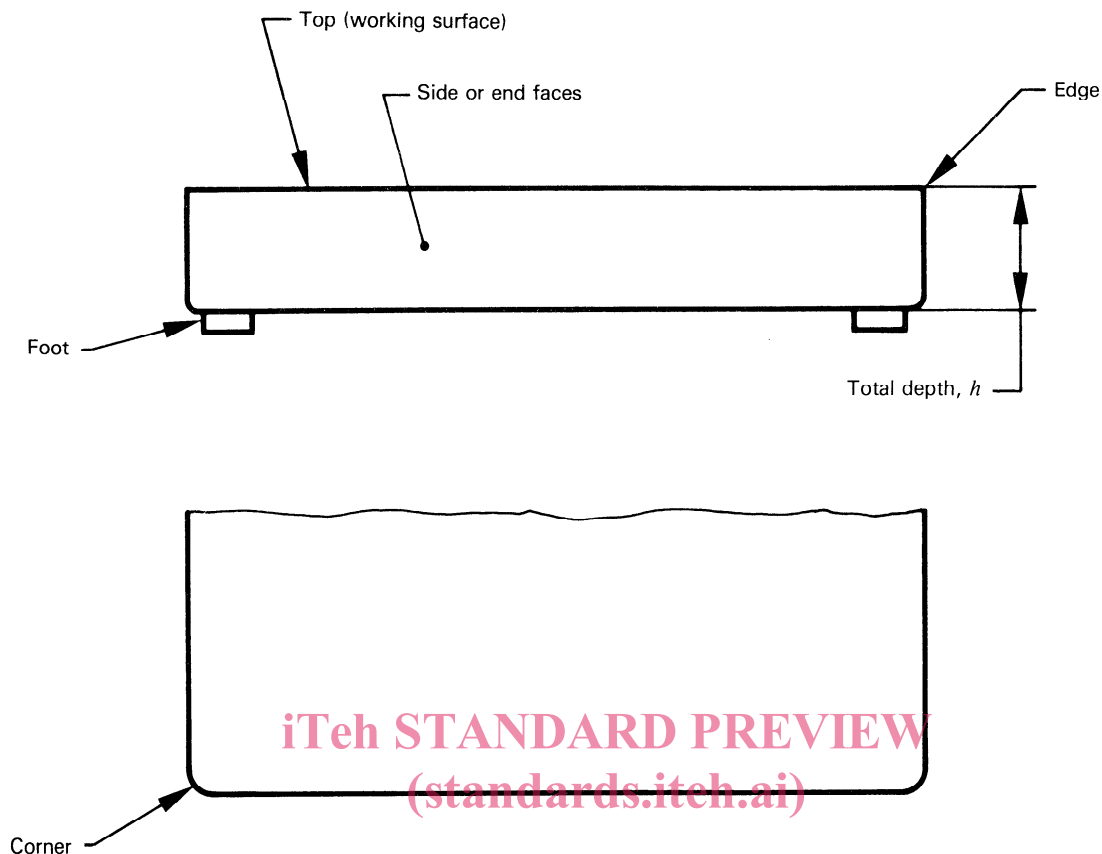
The lengths of faces of plates shall be within  $\pm 5\%$  of the nominal size.

NOTE 3 It will be seen that the nominal lengths of faces, with one exception, are taken from the R5 series of preferred numbers; one plate, size 2 000 mm × 1 000 mm, is included because it is an established and widely used size, although 2 000 is not an R5 preferred number.

### 6 Rigidity

The thickness of granite surface plates shall be such that when a concentrated load is applied about the centre of the plate, the loaded area shall not deflect below the remaining area of the plate by more than  $1\ \mu\text{m}/200\ \text{N}$ . The limiting value for deflection applies to surface plates of size 400 mm × 250 mm and larger.

NOTE 4 A test method is given in annex B.



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**Figure 1 — Nomenclature**

## 7 Finish of the working surface

The top (working surface) of grades 0 and 1 plates shall be finished by lapping, whereas grades 2 and 3 plates may be finished by lapping or left as ground. However, an item placed on it shall not wring to the surface of the plate.

## 8 General features

### 8.1 Supporting feet of surface plates

All surface plates shall be supported on three feet. Plates larger than size 1000 mm × 630 mm shall have safety feet. Feet shall be positioned within the boundary of the working surface to minimize deflection.

**NOTE 5** The setting of adjustable feet may affect the deviation from flatness of the working surface; specific instructions for adjusting the feet are given in footnote 3 to table 1.

The feet shall be smoothly machined, but machining of the supporting feet into a plane parallel to the working surface is optional.

### 8.2 Projection of top

If the purchaser so requires, the top of each plate may extend beyond the faces by at least 20 mm on plates of diagonal length up to 400 mm and by at least 25 mm for larger plates. The underside of the projecting surface shall be reasonably flat for accommodating clamps.

### 8.3 Surfaces other than the working surface

If the purchaser requires the faces to be finished straight, mutually parallel and square, the tolerances shall be specified in the purchasing order.

Side and end faces shall be finished smooth. All edges and corners shall be rounded with a radius of at least 2 mm. Alternatively, the edges and corners may be chamfered at an angle of approximately 45° using the value given above.

## 8.4 Handling

Granite plates shall not be supplied with handles.

NOTE 6 Handling may be facilitated by providing a projecting surface on the top (see 8.2).

## 8.5 Clamping methods (i.e. tapped holes or slots)

The use of tapped inserts in the plate for clamping purposes can cause distortion of the working surface if high clamping pressures are applied, and metal inserts in granite plates can cause distortion due to differential expansion. The onus is on the purchaser whether or not tapped holes or slots in plates are to be provided.

If ordered, tapped inserts shall be fixed before the working surface is finished.

NOTE 7 As a measure of protection, it is recommended that the size of tapped holes should not exceed M8.

## 9 Accuracy — Flatness tolerances

### 9.1 General

Two flatness tolerances are applied, one for the working surface overall and one for any local area of 250 mm × 250 mm of the working surface.

A border zone, the width of which shall not exceed 2 % of the shorter side with a maximum of 20 mm, may be excluded from these requirements for accuracy provided that no point on the border zone projects higher than the remainder of the working surface of the plate.

### 9.2 Flatness of the working surface overall

The flatness deviation of the working surface overall shall not exceed the appropriate tolerance for size and grade of accuracy specified in table 1.

NOTE 8 Test methods are given in annex B.

In the case of sizes which differ from those in the preferred range, the tolerance on deviation from flatness overall should be calculated in accordance with annex D.

### 9.3 Flatness of any local area of the working surface

The flatness deviation of any local area of 250 mm × 250 mm of the working surface shall not exceed

- 3,5 µm for plates of grade 0;
- 7 µm for plates of grade 1;

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Table 1 — Tolerances on deviation from flatness overall

Dimensions in millimetres; tolerances in micrometres

Size of plate	Diagonal length (approx.)	Border zone	Tolerance on deviation from flatness overall <sup>1) 2)</sup> for plates of grade			
			0	1	2	3
<b>Rectangular</b>						
160 × 100	188	2	3	6	12	25
250 × 160	296	3	3,5	7	14	27
400 × 250	471	5	4	8	16	32
630 × 400	745	8	5	10	20	39
1 000 × 630	1 180	13	6	12	24	49
1 600 × 1 000 <sup>3)</sup>	1 880	20	8	16	33	66
2 000 × 1 000 <sup>3)</sup>	2 236	20	9,5	19	38	75
2 500 × 1 600 <sup>3)</sup>	2 960	20	11,5	23	46	92
<b>Square</b>						
250 × 250	354	5	3,5	7	15	30
400 × 400	566	8	4,5	9	17	34
630 × 630	891	13	5	10	21	42
1 000 × 1 000 <sup>3)</sup>	1 414	20	7	14	28	56

1) The bases of the tolerances specified are given in annex D.

2) Tolerances on deviation from flatness overall are expressed to the nearest

0,5 µm for plates of grade 0,

1 µm for plates of grades 1, 2 and 3.

3) These plates are supplied with more than three feet. Typically, after the plate has been carefully levelled by the three primary levelling screws, then the remaining supports may be adjusted either so that they are just in contact without disturbing the setting of the level or to give a minimum deviation from flatness. The tolerance applies after the supports have been adjusted and set in the manner agreed between the purchaser and manufacturer. These plates should be checked regularly to ensure that the setting has not been disturbed.

- c) 15  $\mu\text{m}$  for plates of grade 2;
- d) 30  $\mu\text{m}$  for plates of grade 3.

NOTES

9 The tolerances specified above are the same as those applied to the flatness overall of a 250 mm  $\times$  250 mm surface plate (see table 1).

10 Plates with a diagonal length smaller than 354 mm do not permit a 250 mm  $\times$  250 mm search area and in these cases the test on flatness overall serves to reveal local deviations from flatness.

## 10 Cover

Each plate of grade 0 or 1 shall be supplied with a suitable cover to protect both the working surface and the side and end faces of the plate.

## 11 Marking

Each plate shall bear a designation plate attached to one face; the following information, in characters not less than 3 mm high, shall be included:

- a) the manufacturer's name or trade-mark;
- b) the number of this part of ISO 8512;
- c) the grade of accuracy.

### DESIGNATION EXAMPLE

**X & Co. ISO 8512-2 Grade 0**

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## Annex A (informative)

### Use and care of granite surface plates

**A.1** A surface plate should be located in a circulated atmosphere under constant temperature and humidity control. Accordingly it should be protected from direct sunlight or draughts; in particular, it is important that these should not cause a vertical gradient of temperature such that the working surface and underside of the plate are at different temperatures. For example, if there is a persistent difference of 1 °C between the working surface and underside of a plate 1 000 mm long and 250 mm thick, there can be a distortion of about 1 µm: this is 16 % of the total manufacturing tolerance in a 1 000 mm × 630 mm plate of grade 0.

NOTE 11 The substantial thickness of a granite surface plate and its low thermal conductivity make acclimatization slow when the ambient temperature returns to uniformity.

**A.2** The plate should be supported firmly and levelled. Stands should be located on a stable foundation.

**A.3** Attention is drawn to the procedure for setting surface plates (see footnote 3 to table 1).

**A.4** Clause 6 and clause B.3 refer to the rigidity of a surface plate; care should be taken not to overload a plate. Suggestions regarding reasonable loading are given in annex C.

**A.5** Point contact to surface plates is not permissible because of local irregularities of the surface.

Contact should be made through either an intermediate precision gauge block, preferably not more than 10 mm high, or a similar precision distance piece.

**A.6** Use should be made of the available area of the plate and should not always be concentrated in one area.

**A.7** The surface plate is a datum and should be protected against damage. The top should be frequently wiped clean from dust and other particles. When measurements are being made, a wiping cloth should be spread on the plate for small tools and gauge blocks.

**A.8** A common sign of damage is cuts in the surface. When the plate is not in use the top should always be kept covered.

**A.9** Plates wear as a result of use. The user can detect evidence of wear by rubbing the plate with a superior grade plate and studying the rubbed appearance and/or by checking straightness along lines on the plate and/or by using the datum gauge (see the tests described in annex B).

**A.10** Users are advised to take advantage of the specialist services of surface plate manufacturers to have plates reconditioned.