INTERNATIONAL STANDARD

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Anodized aluminium and aluminium alloys — Rating system for the evaluation of pitting corrosion — Chart method

Aluminium et alliages d'aluminium anodisés — Système de cotation de la corrosion par piqûres — Méthode reposant sur des images-types

Reference number
ISO 8993 : 1989 (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 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 8993 was prepared by Technical Committee ISO/TC 79, *Light metals and their alloys*.

International Organization for Standardization

Anodized aluminium and aluminium alloys — Rating system for the evaluation of pitting corrosion — Chart method

1 Scope

This International Standard specifies a chart rating system based on standard charts that provides a means of defining levels of performance of anodic oxide coatings on aluminium and its alloys that have been subjected to corrosion tests.

This rating system is applicable to pitting corrosion resulting from

- accelerated tests;
- exposure to corrosive environments;
- practical service tests.

It takes into account only pitting corrosion of the basis metal resulting from penetration of the protective anodic coating.

2 Definitions

For the purposes of this International Standard, the following definitions apply.

2.1 significant surface : The part of the surface covered by the anodic coating that is essential to the appearance or serviceability of the article.

NOTE — The edges of the article are not normally included in the significant surface.

2.2 corrosion pit : A surface corrosion defect at which the anodic oxide coating is penetrated.

NOTE — Decolouration or other surface defects which do not penetrate the coating do not count as corrosion pits.

3 Procedure for rating

3.1 Sample preparation

Use one of the following methods to remove corrosion products or deposits on the surface so that corrosion pits may be clearly discerned :

a) wipe with a slurry of fine pumice to abrade away corrosion products and dirt, then rinse in clear water and air dry;

or

b) dip for 5 min to 10 min in 30 % (m/m) nitric acid, prepared by diluting 1 volume of concentrated nitric acid (ϱ 1,40 g/ml) with 1 volume of water at 20 °C to 25 °C; rinse and dry as indicated in a);

or

c) dissolve the anodic coating itself in a hot phosphoric-chromic acid mixture; rinse and dry as indicated in a) so that pitting in the aluminium substrate may be discerned.

NOTES

1 ISO 2106 : 1982, *Anodizing of aluminium and its alloys — Determination of mass per unit area (surface density) of anodic oxide coatings — Gravimetric method*, describes the preparation and use of this reagent for the purposes of dissolution of the anodic oxide coating.

2 Method c) is particularly useful for dark-coloured anodic coatings.

3.2 Determination of rating

Select an area of at least 5 000 mm^2 on the significant surface of the sample.

NOTE — A mask with an opening of 50 mm × 100 mm may be used to define the area to be evaluated.

Compare the size and frequency of corrosion pits on the cleaned significant surface with the rating charts given in figures 1 to 7. The rating designation will be the chart designation which most closely resembles the corroded specimen, for example, B2 or C5. Disregard effects on the edges of samples. A rating of A indicates no visible corrosion and a rating of H indicates the greatest degree of corrosion covered by this International Standard.

A conversion of chart rating designation into percentage area of the significant surface covered by corrosion pits is indicated in table 1.

Table 1 — Conversion of chart rating designation into percentage area covered by corrosion pits

Rating	Percentage of area of defects
A	No defect
B1 B2 B3 B4 B5 B6	⩽ 0,02
C1 C2 C3 C4 C5 C6	> 0,02 and ⩽ 0,05
D1 D2 D3 D4 D5 D6	> 0,05 and ⩽ 0,07
E1 E2 E3 E4 E5 E6	> 0,07 and ⩽ 0,10
F1 F2 F3 F4 F5 F6	> 0,10 and ⩽ 0,25
G1 G2 G3 G4 G5 G6	> 0,25 and ⩽ 0,5
H1 H2 H3 H4 H5 H6	> 0,5

4 Test report

The test report shall contain the following particulars :

a) a reference to this International Standard;

b) a description of the test specimens including, but not limited to, alloy, dimensions, shape, and source of material;

c) the processes used, for example, pretreatments, anodizing methods, thickness of anodic coatings, sealing procedure;

d) the method of sample preparation used (see 3.1);

e) the number of test specimens for each process variable;

f) the nature and location of outdoor exposure sites or the laboratory accelerated test used;

g) the duration of exposure;

h) the rating method used, e.g. whether the rating has been done visually or electronically. In case of evaluation by an electronic method, the specification of the test apparatus shall be given also;

i) the chart rating designation.

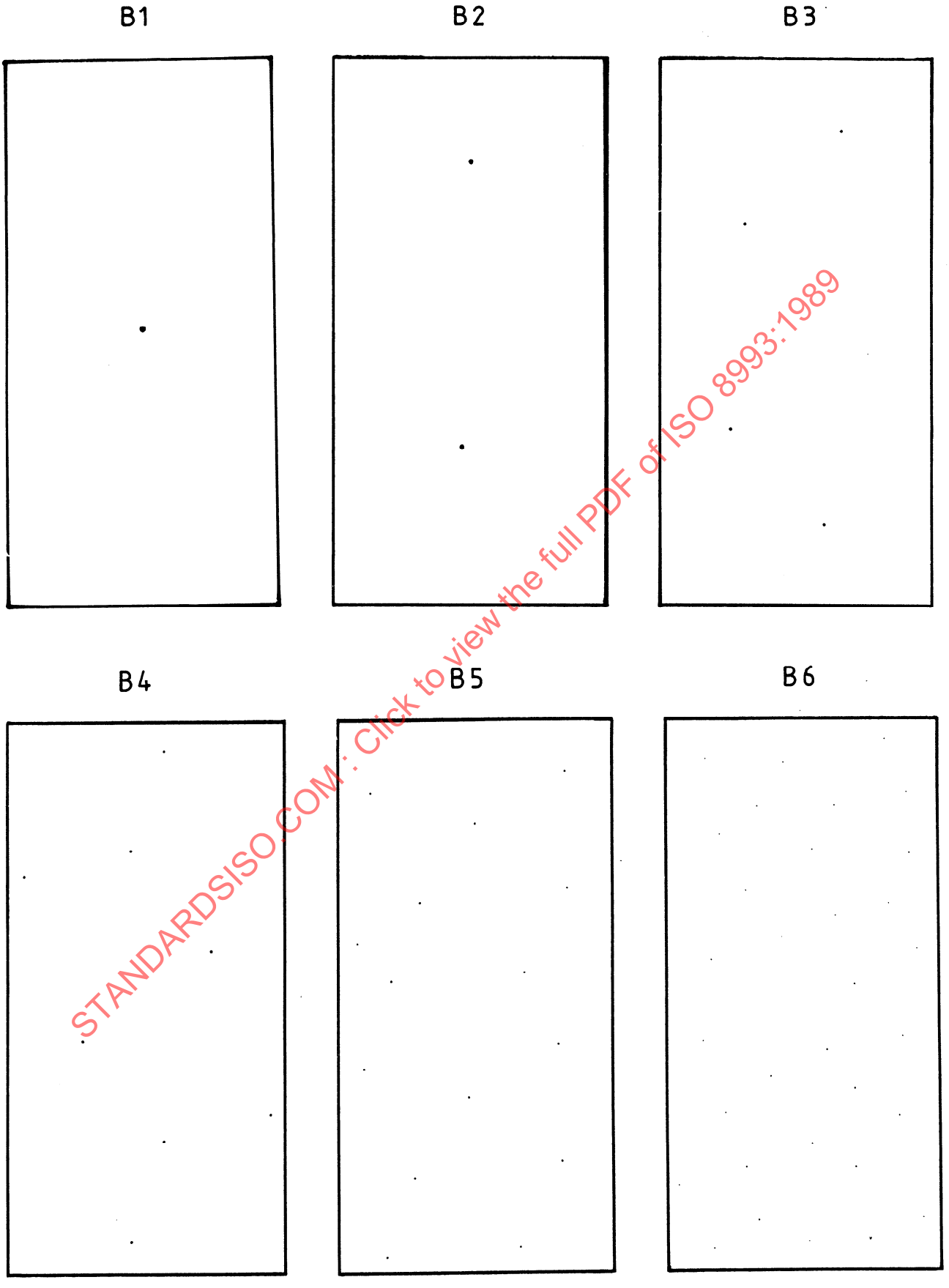

Figure 1 — Standard charts for rating designation B
(Area of defects ⩽ 0,02 %)

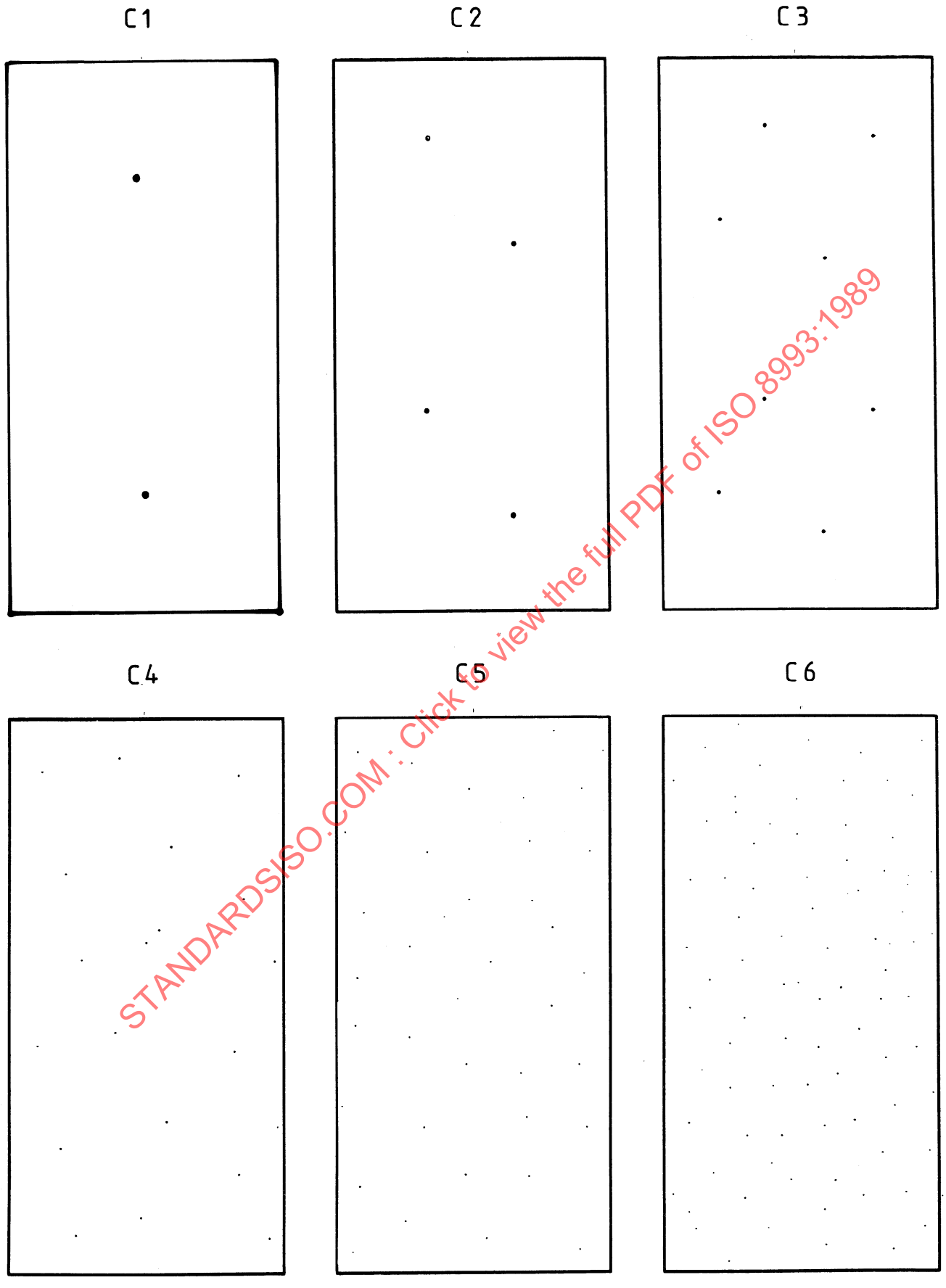

Figure 2 — Standard charts for rating designation C
(Area of defects > 0,02 % and ⩽ 0,05 %)

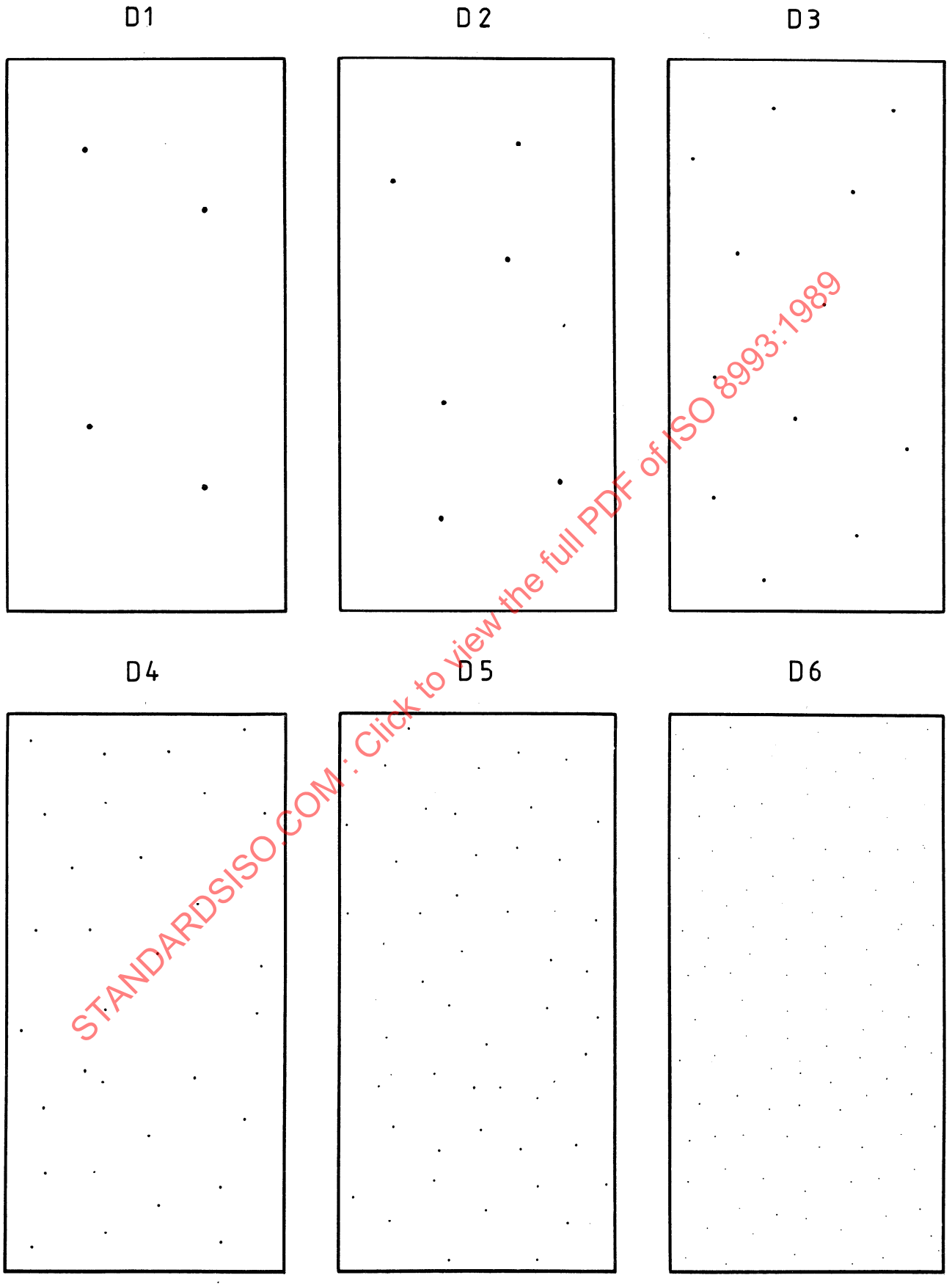

Figure 3 — Standard charts for rating designation D
(Area of defects > 0,05 % and ⩽ 0,07 %)

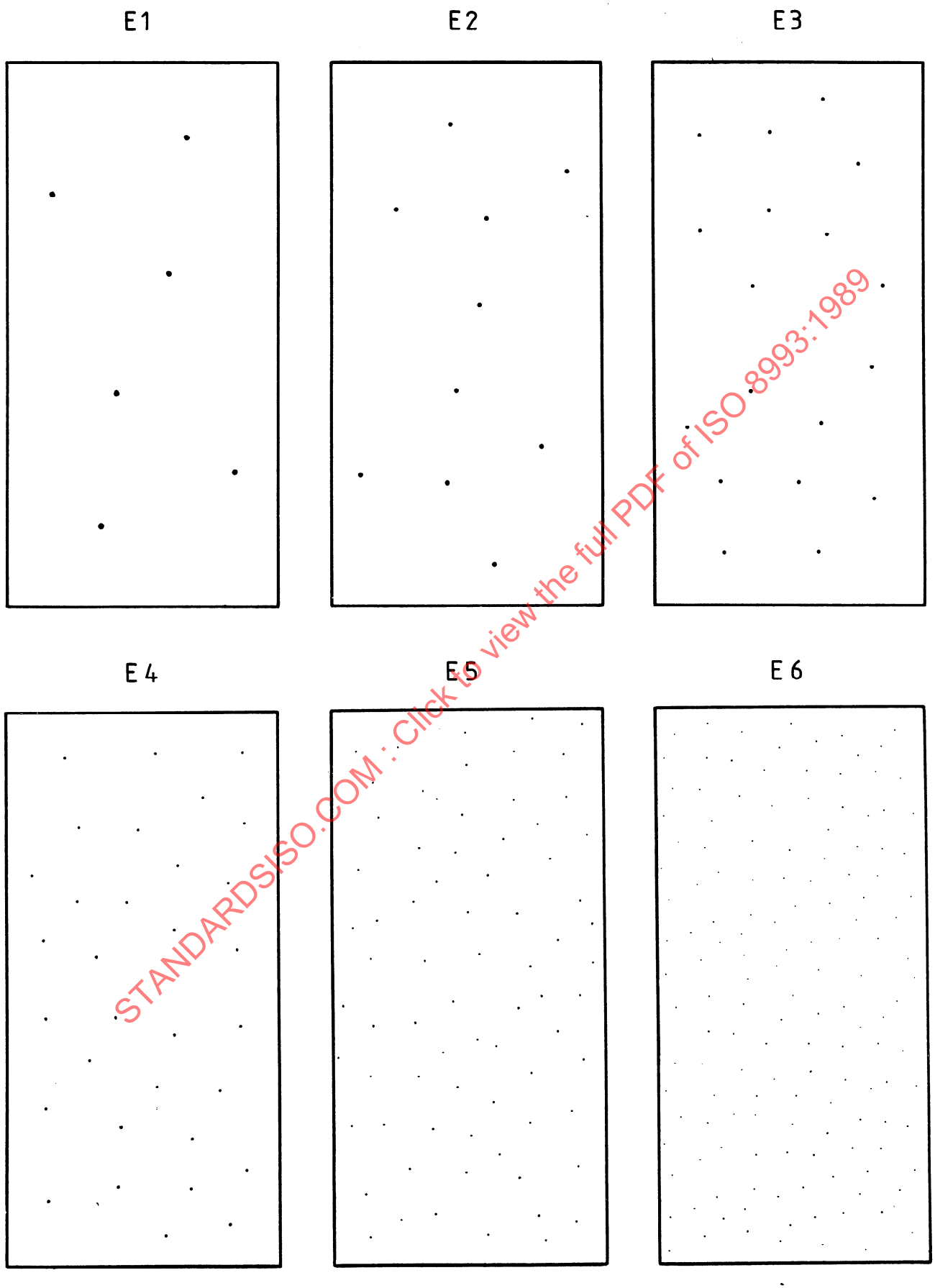

Figure 4 — Standard charts for rating designation E
(Area of defects > 0,07 % and ⩽ 0,10 %)

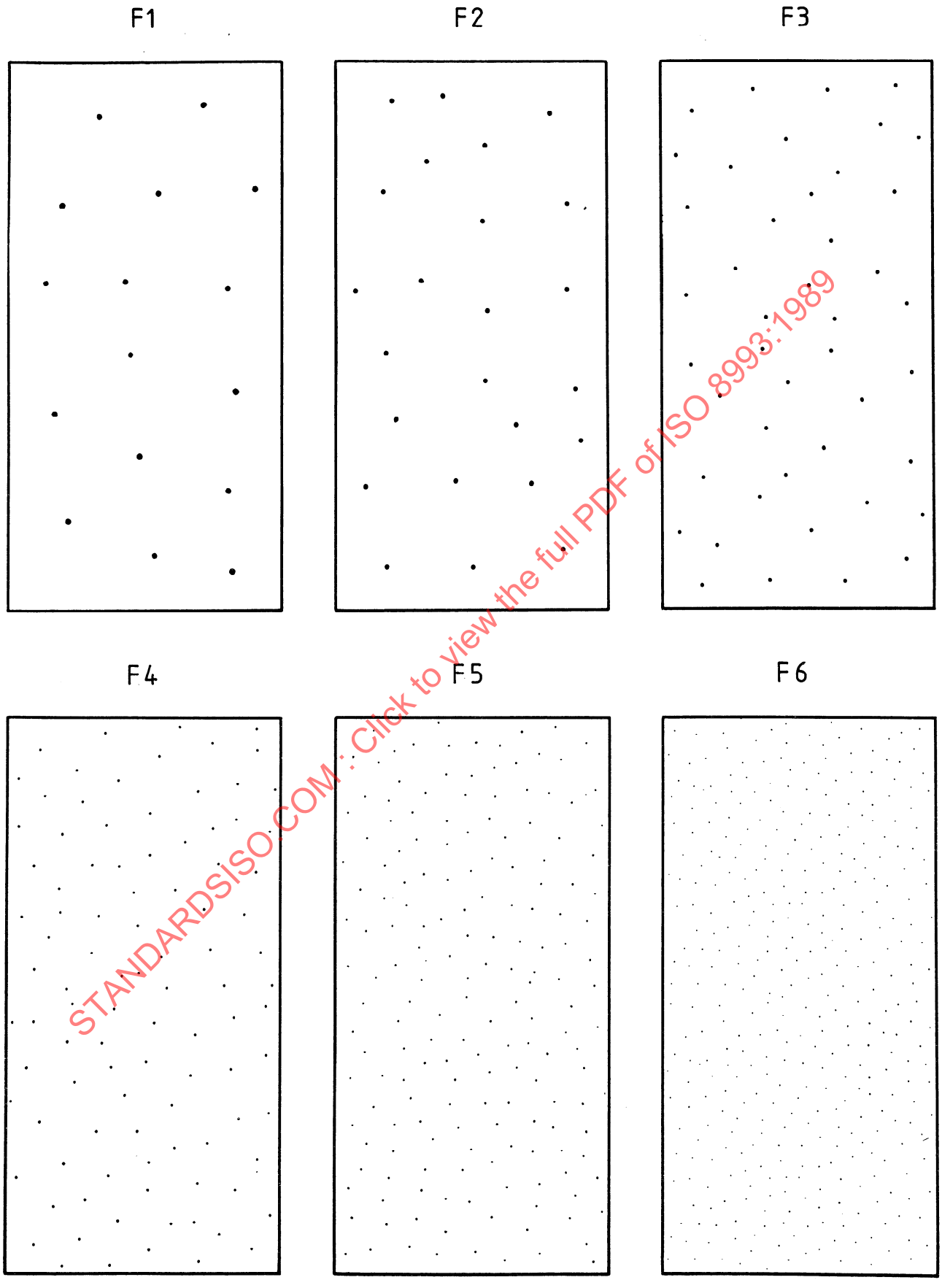

Figure 5 — Standard charts for rating destignation F
(Area of defects > 0,10 % and ⩽ 0,25 %)