INTERNATIONAL STANDARD

ISO 11844-3

Second edition
2020-01

Corrosion of metals and alloys — Classification of low corrosivity of indoor atmospheres —

Part 3: Measurement of environmental parameters affecting indoor corrosivity

Corrosion des métaux et alliages — Classification de la corrosivité faible des atmosphères d'intérieur —

Partie 3: Mesurage des paramètres environnementaux affectant la corrosivité des atmosphères d'intérieur

Reference number
ISO 11844-3:2020(E)

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Published in Switzerland

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 156, *Corrosion of metals and alloys*.

This second edition cancels and replaces the first edition (ISO 11844-3:2006), which has been technically revised. The main changes compared with the previous edition are as follows:

— the normative references have been updated;

— a reference to ISO 16000 in Clause 5 has been added;

— the detection limits in 7.3.1 and 7.3.2 have been updated;

— a new Clause 9 has been added.

A list of all parts in the ISO 11844 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document deals with environmental parameters for the characterization of indoor atmospheres and methods of measurement.

The environmental parameters for the characterization of indoor atmospheres include more airborne contaminants than are normally used for the characterization of the outdoor environment.

Measurement of environmental parameters is a way of characterizing the corrosivity of the indoor atmosphere and will always be required if it is necessary to consider measures for reducing the corrosivity.

Corrosion of metals and alloys — Classification of low corrosivity of indoor atmospheres —

Part 3: Measurement of environmental parameters affecting indoor corrosivity

1 Scope

This document specifies methods for measuring the environmental parameters used to classify the corrosivity of indoor atmospheres on metals and alloys.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 7708, *Air quality — Particle size fraction definitions for health-related sampling*

EN 12341, *Ambient air — Standard gravimetric measurement method for the determination of the PM_{10} or $PM_{2,5}$ mass concentration of suspended particulate matter*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Principle

Different combinations of parameters affect the corrosivity of indoor atmospheres. Knowledge about possible sources of environmental effects shall be obtained before decisions regarding the type of measurements needed are taken. The characterization of indoor atmospheric corrosivity using environmental parameters is more complicated than measuring the corrosivity with metal specimens. However, in many cases, the measurement of environmental parameters can give a good indication of how to establish the corrosivity of an environment and will, in combination with the information given in ISO 11844-1, give a good indication of the corrosivity categories for the materials in the selected environment.

5 Environmental parameters

In indoor atmospheres, corrosion processes are characterized by a more complex group of parameters than in outdoor atmospheres. In general, three groups of parameters should be measured:

a) humidity and temperature;

b) airborne contaminants, such as gases and particles, which in turn are affected by c);

c) dry deposition velocity and air flow.

Fluctuation in temperature and humidity, particularly at higher humidity levels, can cause condensation on cooler surfaces. The frequency and time of condensation is an important factor for indoor corrosion.

The corrosion effects from these groups of parameters are usually interdependent. A particular level of humidity is needed before corrosion begins, and this can vary for different contaminants. Combinations of contaminants can accelerate the corrosion processes.

Methods for sampling and analysis of various air pollutants in indoor atmospheres are described in the ISO 16000 series. Of specific relevance is ISO 16000-1, which describes a general measurement strategy for measuring indoor air pollution and specific standards for measuring selected compounds such as volatile organic compounds (see ISO 16000-5) and nitrogen dioxide (see ISO 16000-15).

NOTE ISO 16000 (all parts) is mainly devoted to compounds hazardous to human health and the environment and not to compounds resulting in high corrosivity of the environment.

6 Humidity and temperature parameters

6.1 Relative humidity

Use continuous measuring devices, such as hygrographs, thermohygrographs or logging hygrometers.

The measuring period is preferably one year, to cover seasonal variations. If shorter measuring periods are needed, select a measuring period where large variations in the relative humidity are expected. The period shall be at least one month per season.

The data shall be reported as monthly values. The average, maximum and minimum values for each month shall be reported.

The calculation of time with relative humidity in given intervals represents useful information.

6.2 Temperature

Use continuous measuring devices, such as thermohygrographs or logging thermometers.

The measuring period is preferably one year, to cover seasonal variations. If shorter measuring periods are needed, select a measuring period where large variations in the temperature are expected. The period shall be at least one month per season.

The data shall be reported as monthly values. The average, maximum and minimum values for each month shall be reported.

The calculation of time with temperature in given intervals represents useful information.

6.3 Temperature–humidity complex

Continuous measurements of temperature and humidity give data for the calculation of frequency and time with condensation.

7 Airborne gas contaminants

7.1 Principle

The gas concentration or deposition can be measured by several techniques:

— continuous gas concentration measuring instruments;

— average gas concentration with an active sampler and air pump;

— average gas concentration with a passive sampler;

— average gas-deposition equipment.

The results from concentration measurements are typically given in $\mu g/m^3$ and for deposition measurements as mg/m^2d. The results obtained from the two types of measurements can be difficult to compare but give complementary information, see Clause 9. Reagents used for both passive and active samplers are given in Annex A.

7.2 Placing of measuring equipment

7.2.1 General

The corrosivity of the indoor atmosphere can vary dramatically from one point to another in a room. Cooler areas can have moisture condensation with a high corrosion effect. Corners often have higher contaminant concentrations and lower air circulation than the rest of the room. If the problem is located in a specific area, measurements shall be performed in that location. If the problem is more general, then measurements should be made in a central open area in the room.

7.2.2 Continuous gas-measuring instruments

The instrument shall be placed so it is protected from unauthorised people. Polyethylene or polytetrafluoroethylene (PTFE) tubing can be used to collect the air sample from the selected area of the room. The length of the tubing should not exceed 2 m.

7.2.3 Active sampler

The active sampler shall be placed according to the same rules as the continuous gas-measuring instrument.

7.2.4 Passive sampler

The passive sampler shall be placed in a part of the room where there is free movement of air. The sampling device shall be placed with the open end facing downward.

7.2.5 Gas-deposition equipment

The equipment shall be placed in a part of the room where there is free movement of air. The equipment shall be sheltered from settling particles that can interfere with the analyses of the gases.

7.3 Measuring methods and duration

7.3.1 Continuous measurement

The measurements should be carried out for one year to record the seasonal variation of the gas pollutants. The data from continuous measuring instruments shall be reported as monthly average values, together with the maximum and minimum values of the month.

Standard instruments have detection limits in the 10^{-9} (volume fractions) range. Specially designed instruments may have detection limits of one-tenth of these values.

7.3.2 Measurement and calculation with the active sampler

The methods are based on pumping air through an absorption unit with a reactive surface or liquid, with subsequent laboratory analysis of the amount absorbed. The result will be given as an average