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Glass in building — Electrochromic glazings — Accelerated ageing test and requirements

Verre dans la construction — Vitrages électrochromes — Essai de vieillissement accéléré et exigences

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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.

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 160, *Glass in building*, Subcommittee SC 1, *Product considerations*.

This second edition cancels and replaces the first edition (ISO 18543:2017), which has been technically revised.

The main changes compared to the previous edition are as follows:

— the document has been restructured;

— the acceptance criteria for the two classes has been revised;

— fast switching products have been taken into account;

— the concept of photopic transmittance ratio has been abandoned in favour of the one of 85 % of the dynamic range;

— other types of lamps have been allowed provided that they simulate correctly the solar irradiation.

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.

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Introduction

Electrochromic glazings perform several important functions in a building envelope, including

— minimizing the solar energy heat gain,

— providing for passive solar energy gain,

— controlling a variable visual connection with the outside world,

— enhancing thermal comfort (controlling heat gain), energy efficiency performance, illumination, and glare control, and

— providing for architectural expression.

Therefore, it is important to understand the relative serviceability of these glazings.

This document is intended to provide a means for evaluating the durability of electrochromic glazings.

The test procedures covered in this document includes:

a) rapid but realistic cycling between high and low light transmission states;

b) environmental parameters that are typically used in weatherability tests such as simulated solar exposure and high temperature, which are realistic for the intended use of electrochromic glazings.

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Glass in building — Electrochromic glazings — Accelerated ageing test and requirements

1 Scope

This document specifies the accelerated ageing test and requirements for electrochromic glazings intended to either control direct or indirect solar transmission, or both. The electrochromic glazings can be assembled as insulating glass unit, laminated glass or combination of both.

The test method described in this document is only applicable to chromogenic glazings that can be switched between different transmission states using an electrical stimulus. This test method is not applicable to other chromogenic glazings such as photochromic and thermochromic glazings, which do not respond to electrical stimulus.

This test method is applicable to any electrochromic glazing fabricated for use in buildings such as in doors, windows, skylights, exterior wall systems and glazing exposed to solar radiation. The materials used for constructing the electrochromic glazing and for electrochromically changing its optical properties can be inorganic or organic materials.

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 9050, *Glass in building — Determination of light transmittance, solar direct transmittance, total solar energy transmittance, ultraviolet transmittance and related glazing factors*

ISO 12543 (all parts), *Glass in building — Laminated glass and laminated safety glass*

ISO 20492 (all parts), *Glass in buildings — Insulating glass*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
chromogenic glazing
glazing that has the ability to reversibly change either its visible or solar transmission, or both, in response to an external stimulus such as electrical voltage or current, solar radiation or temperature

Note 1 to entry: Active components can be films, coatings, glasses or a combination of them.

3.2
electrochromic glazing
chromogenic glazing (3.1) in which an applied voltage or current is used to reversibly modify either visible or solar transmission characteristics, or both

Note 1 to entry: Active components are usually films, coatings or a combination of them.

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3.3
highest transmission state
highest visible light transmittance achieved by the *electrochromic glazing* (3.2)

3.4
lowest transmission state
lowest visible light transmittance achieved by the *electrochromic glazing* (3.2)

3.5
switching time
time taken for *electrochromic glazing* (3.2) to transition to or from the highest and *lowest transmission states* (3.4)

Note 1 to entry: The time to go from the *lowest transmission state* (3.4) to the *highest transmission state* (3.3) can be different from the time needed for the reverse transition.

3.6
switching cycle
transition in light transmittance between two defined light transmittance values starting and ending back at the same point

3.7
lateral uniformity
degree of variation in the amount of irradiance in the x and y directions in the test plane used for exposing *electrochromic glazing* (3.2)

4 Symbols

$V(\lambda)$	spectral luminous efficiency for photopic vision defining the standard observer for photometry (see ISO 23539:2005[1])
τ	visible light transmittance
τ_H	visible light transmittance in the highest transmission state
τ_L	visible light transmittance in the lowest transmission state
t_L	switching time to reduce the transmittance of the glazing
t_H	switching time to increase the transmittance of the glazing
t_{cycle}	total cycle time

Subscripts:

i	initial stage, prior to accelerated ageing
f	final stage, after accelerated ageing
85	related to 85 % of the difference between the highest transmission state and the lowest transmission state

5 Principle of the test

This test method compares light transmittance before and after artificial ageing.

The electrochromic glazings shall be exposed to simulated solar radiation during 5 000 h in a temperature-controlled chamber at specimen temperatures as defined in Table 1. During this exposure, the sample shall be switched to at least 85 % of its dynamic range, i.e. the difference between the

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