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Health and safety in welding and allied processes — Transparent welding curtains, strips and screens for arc welding processes

Hygiène et sécurité en soudage et techniques connexes — Rideaux, lanières et écrans transparents pour les procédés de soudage à l'arc

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 44, *Welding and allied processes*, Subcommittee SC 9, *Health and safety*.

Health and safety in welding and allied processes — Transparent welding curtains, strips and screens for arc welding processes

1 Scope

This International Standard specifies safety requirements for transparent welding curtains, strips, and screens to be used for shielding of work places from their surroundings where arc welding processes are used. They are designed to protect people who are not involved in the welding process from hazardous radiant emissions from welding arcs and spatter.

Welding curtains, strips, and screens specified in this International Standard are not intended to replace welding filters. For intentional viewing of welding arcs other means of protection are used.

This International Standard is not applicable for welding processes where laser radiation is used.

NOTE Darker welding curtains or screens are advisable for mutual separation of adjacent work places for reasons of comfort.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 4007:2012, *Personal protective equipment — Eye and face protection — Vocabulary*

ISO 11664-2:2007, *Colorimetry — Part 2: CIE standard illuminants*

EN 167, *Personal eye-protection — Optical test methods*

EN 168, *Personal eye-protection — Non-optical test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4007 and the following apply.

3.1
transparent
characteristic of welding curtains, strips, and screens that admit visibility to the working place without implying to be glass clear

3.2
hazard level
G
dimensionless number representing the risk exposition to visible and near IR radiations

4 Requirements

4.1 General

For transparent welding curtains, strips, and screens consisting of different materials, all requirements for the whole material combination shall be met.

For optical test methods, see EN 167.

After preparation, the test specimens shall be maintained at a temperature of (23 ± 5) °C and relative humidity of (65 ± 10) % for a minimum of 16 h before testing.

4.2 Transmittance

The luminous transmittance, *r*, based on the spectral distribution of CIE standard illuminant A according to ISO 4007 shall be greater than 1×10^{-6} scattered light diffused within 1° to the direction of the incident radiation shall be included in the measurement.

The spectral transmittance in the wavelength range between 210 nm and 313 nm shall be less than 2×10^{-5}, in the wavelength range between 313 nm and 400 nm less than 3×10^{-2}.

In the wavelength range from 400 nm to 1 400 nm the hazard level *G* shall be less than 1.

The hazard level is defined by

$$G = \frac{1}{C} \sum_{\lambda_i=400}^{1400} G(\lambda_i) \cdot \tau(\lambda_i) \cdot \Delta\lambda \quad (1)$$

where

λ_i is the individual wavelength, expressed in nanometers (nm);

$\tau(\lambda_i)$ is the spectral transmittance of the wavelength λ_i;

$\Delta\lambda$ is the wavelength step for the summation, expressed in nanometers (nm);

$G(\lambda_i)$ is the spectral risk factor at the wavelength λ_i;

C is a constant equal to 1 000 nm.

The values of the spectral individual risk factors are given by Formula (2):

$$g(\lambda_i) = G(\lambda_i) \times D \quad (2)$$

where

$g(\lambda_i)$ is the spectral individual risk factor at the wavelength λ_i, expressed in nanometers (nm)

$G(\lambda_i)$ is the spectral risk factor at the wavelength λ_i;

D is a constant equal to 1×10^{-3} nm.

These values are given for $\Delta\lambda = 10$ nm in Table 1. If a larger step width is used (e.g. 20 nm), the intermediate values can be omitted. For other wavelengths the risk factors can be calculated as follows:

— For $\lambda \geq 600$ nm, $g(\lambda_i) = 0{,}001\ 5$ nm;

— For $\lambda < 600$ nm, $g(\lambda_i) = 2{,}25 - 0{,}003\ 75\lambda$, where λ is the wavelength, expressed in nanometers (nm).

Table 1 — Wavelength dependence of the spectral individual risk factor

Wavelength, λ_i, nm	Spectral individual risk factor $g(\lambda_i)$ nm
400	0,750 0
410	0,712 5
420	0,675 0
430	0,637 5
440	0,600 0
450	0,562 5
460	0,525 0
470	0,487 5
480	0,450 0
490	0,412 5
500	0,375 0
510	0,337 5
520	0,300 0
530	0,262 5
540	0,225 0
550	0,187 5
560	0,150 0
570	0,112 5
580	0,075 0
590	0,037 5
600 to 1 400	0,001 5

NOTE To separate close welding places it is recommended to use translucent welding curtains.

4.3 Reflectance

When measured with an Ulbricht sphere, the spectral reflectance between 230 nm and 400 nm shall be less than 10 %. The luminous reflectance shall be less than 10 % (based on the spectral distribution of CIE standard illuminant A according to ISO 11664-2).

4.4 UV-Stability

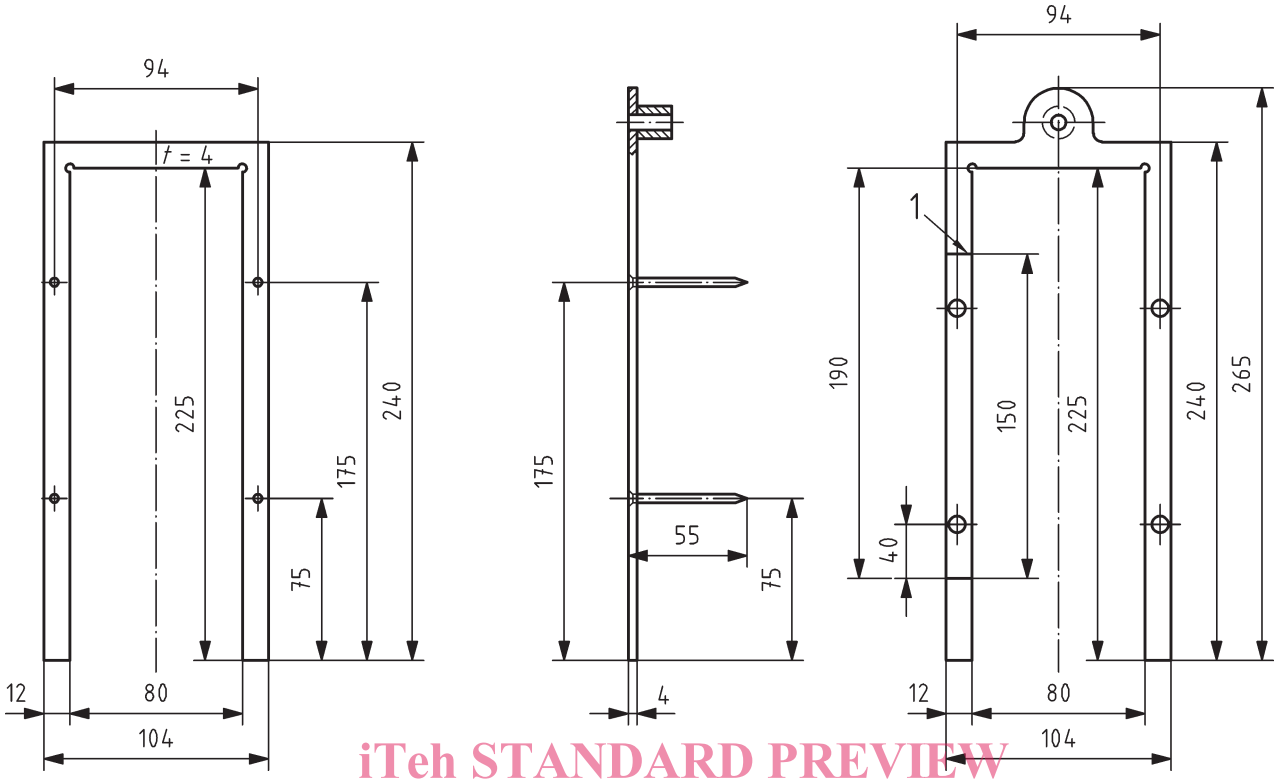
The relative change of the luminous transmittance due to the test in EN 168 shall not be greater than ± 20 %. Exceedance is allowed unless the level of hazard G of 1 according to 4.2 is not reached or exceeded.

4.5 Resistance to ignition

4.5.1 Testing shall be done at (23 ± 5) °C.

4.5.2 3 samples, 190 mm long and 90 mm wide, are cut from the welding curtain, strip, or screen. The samples are put in the sample holder (see Figure 1). The lower end of the sample shall be 40 mm above the lower end of the sample holder.

Dimensions in millimetres



Key

1 test mark

t thickness of sample holder

NOTE All dimensions have tolerances of ± 0,1 mm.

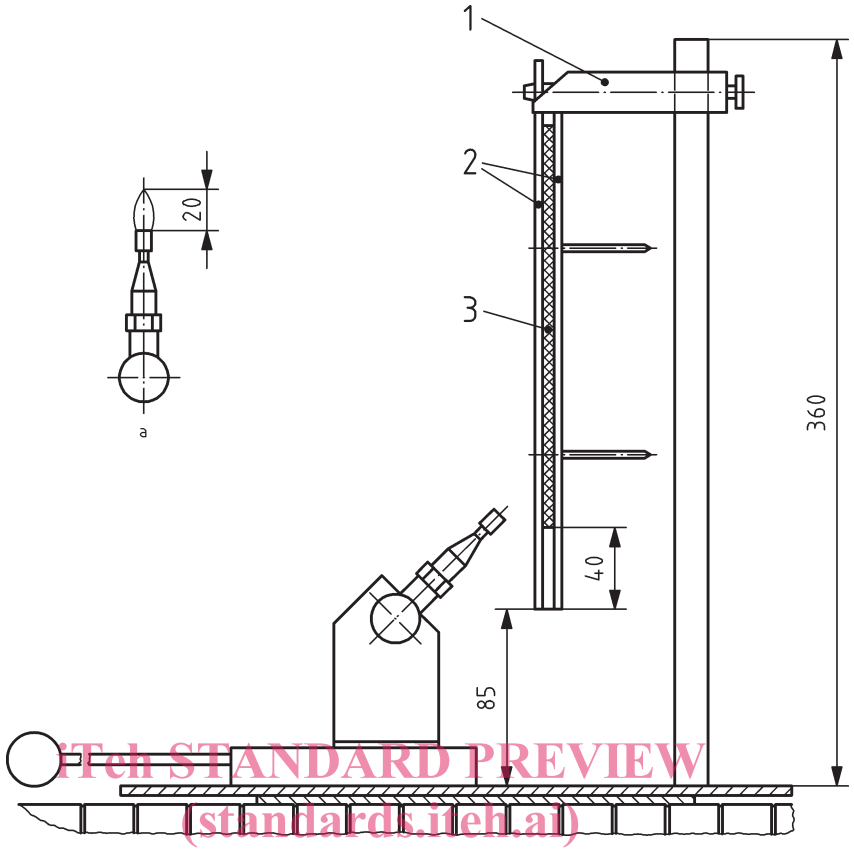
Figure 1 — Sample holder

4.5.3 A propane burner, having a flame height of 20 mm when put in upright position (see Figure 2), is used. The burner has to burn for at least 1 min. Then it is turned by an angle of 45°.

4.5.4 The burner is directed at the bottom of the sample so that the tip of the flame hits the sample in the geometric centre of the lower edge. The surrounding area shall be free from draughts when the test is carried out (see Figure 2).

4.5.5 After 15 s remove the burner and observe whether the flame self-extinguishes and the material ceases to glow within $3\ ^{0}_{-0,5}$ s. Then carry out a visual inspection to see if the flame has reached the test mark 150 mm above the lower end of the sample (see Figure 2) according to 4.5.6.

Dimensions in millimetres



Key

1 mounting device
2 frame
3 sample
a position of the burner when setting the length of the flame

NOTE All dimensions have tolerances of ± 0,1 mm.

Figure 2 — Burner and testing setup

4.5.6 The welding curtain, strip, or screen material is considered to be satisfactory, if for all 3 samples

— the flame does not reach the test mark with the burner in position,

— the flame self-extinguishes after removal of the burner, and

— the material does not continue to glow for more than $3\,^{0}_{-0,5}$ s after removal of the burner.

4.6 Eyelet strength

4.6.1 General

In case of the use of eyelets, the described test specifies a method for assessing the seam and eyelet strength of welding curtains, strips, and screens. Specimens of materials used for welding curtains, strips, and screens have a weight suspended to them and any damage is noted.