SLOVENSKI STANDARD
SIST EN 169:1996

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Osebno varovanje oči - Filtri za varilne in sorodne tehnike - Zahteve prepustnosti in priporočena uporaba

Personal eye-protection - Filters for welding and related techniques - Transmittance requirements and recommended utilisation

Persönlicher Augenschutz - Filter für das Schweißen und verwandte Techniken - Transmissionsanforderungen und empfohlene Verwendung

Protection individuelle de l'oeil - Filtres pour le soudage et les techniques connexes - Spécifications de transmission et utilisation recommandée

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English version

Personal eye-protection - Filters for welding and related techniques - Transmittance requirements and recommended utilisation

Protection individuelle de l'oeil - Filtres pour le soudage et les techniques connexes - Spécifications de transmission et utilisation recommandée

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

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Foreword

This European Standard was drawn up by the Technical Committee CEN/TC 85 "Eye protection equipment", the secretariat of which is held by AFNOR.

The international standard ISO 4850 'Personal eye-protectors for welding and related techniques - Filters - Utilisation and transmittance requirements' drawn up by the ISO/TC 94/SC 6 'Personal eye protection' was used as a basis for this European Standard.

This European Standard supersedes EN 169:1986.

In accordance with the Common CEN/CENELEC Rules, the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by April 1993, and conflicting national standards shall be withdrawn at the latest by April 1993.

1 Object and field of application

This European Standard specifies the scale numbers and transmittance requirements for filters intended to protect operators performing work involving welding, braze-welding, arc gouging and plasmajet cutting. The other applicable requirements for these types of filters are given in EN 166. Guidance on the selection and use of these filters are given in Annex A.

The specifications for welding filters with switchable luminous transmittance and welding filters with dual luminous transmittance are given in EN 379.

2 Normative references

EN 165 Personal eye-protection - Vocabulary
EN 166 Personal eye-protection - Specifications
EN 167 Personal eye-protection - Optical test methods
EN 379 Personal eye-protection - Specification for welding filters with switchable luminous transmittance and welding filters with dual luminous tansmittance
ISO 4063 Welding, brazing, braze welding and soldering of metals - List of processes, for symbolic representation on drawings
CIE 17 International lighting vocabulary

3 Designation and identification

The complete table of numbering of filters is given in clause 5 of EN 166.

The tables concerning the identification of oculars and frame form the subject of clause 9 of EN 166.

The scale number of these filters comprises only the shade number corresponding to the filter, from 1.2 to 16 (see table 1).

4 Transmittance requirements

4.1 General requirements

The definitions of transmittance are given in EN 165.

The determination of luminous transmittance is described in clause 6 of EN 167.

The transmittance requirements for filters used in welding and related techniques are given in table 1.

Table 1. Transmittance requirements

Scale number	Maximum spectral transmittance in the ultraviolet $\tau(\lambda)$		Luminous transmittance τ_v		Maximum mean spectral transmittance in the infra-red τ_A
	313 nm %	365 nm %	maximum %	minimum %	780 nm to 1400 nm %
1.2	0,0003	50	100	74,4	69
1.4	0,0003	35	74,4	58,1	52
1.7	0,0003	22	58,1	43,2	40
2.0	0,0003	14	43,2	29,1	28
2.5	0,0003	6,4	29,1	17,8	15
3	0,0003	2,8	17,8	8,5	12
4	0,0003	0,95	8,5	3,2	6,4
5	0,0003	0,30	3,2	1,2	3,2
6	0,0003	0,10	1,2	0,44	1,7
7	0,0003	0,050	0,44	0,16	0,81
8	0,0003	0,025	0,16	0,061	0,43
9	0,0003	0,012	0,061	0,023	0,20
10	0,0003	0,006	0,023	0,0085	0,10
11	0,0003	0,0032	0,0085	0,0032	0,050
12	0,0003	0,0012	0,0032	0,0012	0,027
13	0,0003	0,00044	0,0012	0,00044	0,014
14	0,00016	0,00016	0,00044	0,00016	0,007
15	0,000061	0,000061	0,00016	0,000061	0,003
16	0,000023	0,000023	0,000061	0,000023	0,003

Additional requirements:

(a) For 210 nm < $\lambda \leq$ 313 nm the spectral transmittance shall not exceed the value permitted for 313 nm.

(b) For 313 nm < $\lambda \leq$ 365 nm, the spectral transmittance shall not exceed the value permitted for 365 nm.

(c) For 365 nm < $\lambda \leq$ 400 nm, the spectral transmittance shall not exceed the luminous transmittance τ_v.

(d) For 400 nm < $\lambda \leq$ 480 nm the spectral transmittance shall not exceed the value observed at 480 nm.

NOTES.

1. Luminous transmittance values are based on the spectral distribution of illuminant A of the IEC (see IEC 17).

2. Minimum and maximum values of luminous transmittance may be exceeded by taking into account the limits of 'relative uncertainty' given in table 1 of EN 167.

3. The IR transmittance values are determined by integration of the spectral data.

4.2 Special requirement for filters for gas welding with a flux

The filters which fulfill, in addition to general requirements given in 4.1 (see table 1), the following requirement for the wavelengths 589 nm and 671 nm shall be marked with an 'a':

The spectral transmittance of these filters, for the wavelengths mentioned above, shall be less than:

0,4 % for scale number 4a
0,1 % for scale number 5a
0,05 % for scale number 6a
0,01 % for scale number 7a.

Annex A. Guidance on selection and use (Informative)

A.1 General

Many factors are involved in selecting the scale number of a protective filter which is suitable for welding or related techniques:

– For gas welding and related techniques such as braze-welding and plasma jet cutting, this standard refers to the flow rate through the burners.

However, in light alloy welding, account should be taken of the characteristics of the fluxes, which influence the spectral composition of the light emitted.

– For arc welding, arc gouging, and plasma jet cutting, the current is an essential factor in making an accurate choice possible.

In addition, for arc welding, the type of arc and the type of parent metal are also to be taken into consideration.

Other parameters have a significant influence, but it is difficult to evaluate their effect. These are, in particular:

– the position of the operator in relation to the flame or the arc. For example, depending on whether the operator leans over his work or adopts an arm's length position, a variation of at least one scale number may be necessary;

– local lighting;

– the human factor.

For these various reasons, this standard only gives those scale numbers which confirmed practical experience has shown to be valid in normal circumstances for the personal protection of operators with normal sight, carrying out work of a specified type.

The scale number of the filter to be used can be read from the tables, at the intersection of the column, corresponding to the gas flow rate or the current, and the line, specifying the work to be carried out.

These tables are valid for average working conditions, in which the distance from the welder's eye to the pool of molten metal is approximately 50 cm and the average illuminance is approximately 100 lx.

A.1.1 *Scale numbers to be used for gas welding and braze welding*

The scale numbers to be used for gas welding and braze welding are given in table 2.

NOTE. When a flux is used in gas welding the light emitted by the source is often very rich in monochromatic light of one or more wavelengths, which makes it very difficult to see the molten metal and discriminate it from the molten flux that floats on the surface of the molten bath. This is true, for example, of light from sodium which is rich in λ = 589 nm radiation, or lithium, which is rich in λ = 671 nm radiation.

It is recommended that filters, or combinations of filters, with a sufficient absorption at wavelengths of 589 nm and 671 nm, be used in order to eliminate the inconvenience caused by this abundant emission of monochromatic radiation. (Filters indicated in table 2 by the letter 'a'.)

A.1.2 *Scale numbers to be used for oxygen cutting*

The scale numbers to be used for oxygen cutting following a line on the workpiece are given in table 3.

Table 2

Scale numbers [1] to be used for gas welding and braze welding

Work	q = flow rate of acetylene, in litres per hour			
	$q \leq 70$	$70 < q \leq 200$	$200 < q \leq 800$	$q > 800$
Welding and braze welding of heavy metals[2]	4	5	6	7
Welding with emittive fluxes (notably light alloys)	4a	5a	6a	7a

[1] According to the conditions of use, the next greater or the next smaller scale number can be used.

[2] The term 'heavy metals' applies to steels, alloy steels, copper and its alloys, etc.

Table 3

Scale numbers [1] to be used for oxygen cutting

Work	q = flow rate of oxygen, in litres per hour		
	$900 \leq q \leq 2000$	$2000 < q \leq 4000$	$4000 < q \leq 8000$
Oxygen cutting	5	6	7

[1] According to the conditions of use, the next greater or the next smaller scale number can be used.

A.1.3 ***Scale numbers to be used for plasma jet cutting***

The scale numbers to be used for plasma jet cutting following a line on the workpiece are given in table 4.

A.1.4 ***Scale numbers to be used for electric arc welding or arc gouging***

The scale numbers to be used for electric arc welding or arc gouging are given in table 4.

The following abbreviations are used according to ISO 4063:

– the symbol MIG corresponds to metal arc welding with inert gas shield;

– the symbol MAG corresponds to metal arc welding with non-inert gas shield;

– the symbol TIG corresponds to tungsten inert gas;

– arc-air gouging corresponds to the use of a carbon electrode and a compressed air jet used to remove the molten metal.

Table 4

Scale numbers[1)] and recommended use for arc welding

Welding process or related techniques | Current in amperes: 0,5 – 1 – 2,5 – 5 – 10 – 15 – 20 – 30 – 40 – 60 – 80 – 100 – 125 – 150 – 175 – 200 – 225 – 250 – 275 – 300 – 350 – 400 – 450 – 500

Welding process or related techniques	Scale numbers (in order of increasing current)														
Covered electrodes	(hatched)	9	10	11	12	13	14								
MIG on heavy metals[2)]	(hatched)	10	11	12	13	14									
MIG light alloys	(hatched)	10	11	12	13	14	15								
TIG on all metals and alloys	(hatched)	9	10	11	12	13	14	(hatched)							
MAG	(hatched)	10	11	12	13	14	16								
Arc-air gouging	(hatched)	10	11	12	13	14	15								
Plasma jet cutting	(hatched)	11	12	13	(hatched)										
Microplasma arc welding	2,5	3	4	5	6	7	8	9	10	11	12	13	14	15	

[1)] According to the conditions of use, the next greater or the next smaller scale number can be used.

[2)] The term 'heavy metals' applies to steels, alloy steels, copper and its alloys, etc.

NOTE. The hatched areas correspond to the ranges where the welding operations are not usually used in the current practice of manual welding.