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Non-destructive testing — Industrial radiographic illuminators — Minimum requirements

Essais non destructifs — Négatoscopes utilisés en radiographie industrielle — Exigences minimales

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Foreword

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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.

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INTERNATIONAL STANDARD ISO 5580-1985 (E)

Non-destructive testing — Industrial radiographic illuminators — Minimum requirements

1 Scope and field of application

This International Standard specifies the minimum requirements for industrial illuminators used for viewing radiographs.

The function of the illuminator is to allow the viewing of radiographs.

The illuminator shall guarantee the same safety of personnel as an electric apparatus with maximum voltage, insulation and earthing which is required by corresponding safety standards of electrotechnics in each country where these are applied.

2 Characteristics of radiographic illuminators

2.1 Mechanical construction

An illuminator consists of the housing with one of the sides being the viewing screen illuminated from the inside. This screen can itself be the diffusing screen. This housing may also contain a system for thermal protection of the radiographs; this system may or may not be ventilated.

For the viewing of wet radiographs, the illuminator shall be so designed as to prevent penetration of the liquid if the radiograph comes into contact with the screen.

2.2 Viewing screen

The screens shall be easy to clean and shall be made of a material which is resistant to scratching during cleaning processes recommended by the manufacturer and during film viewing.

NOTE — The screen may be a combination of elements, all of which should be resistant to heat in terms of deformation and discoloration.

The size of the screens shall allow the viewing of a radiograph without excessive glare reaching the eyes of the operator. Should the illuminator be used for viewing radiographs of different sizes, a system of covering masks shall be provided.

2.3 Luminance

The screen luminance required depends on the density of the radiographs. The following luminance levels are recommended for the perception of information at various density levels.

The luminance (or brightness) of the illuminated radiograph shall be not less than :

— 30 cd/m^2 for film densities $\leqslant$ 2,5

— 10 cd/m^2 for film densities $>$ 2,5

and, wherever possible, approximately 100 cd/m^2 or higher. These minimum values require the following screen luminance :

Film density	Minimum screen luminance cd/m^2
1	300
1,5	1 000
2	3 000
2,5	10 000
3	10 000
3,5	30 000
4	100 000
4,5	300 000

NOTE — The illuminator may be provided with a device for continuous control of screen luminance.

2.4 Colour of light

The colour of the light used to illuminate the radiograph is normally white. However, in the case of a film with an emulsion type yielding a monocoloured image, light with adapted colours may be used if they have been recommended by the film manufacturers.

2.5 Diffusion of light

If the illuminator has a diffusing screen, the light shall be sufficiently divergent so that both eyes of the observer receive rays from all parts of the screen. The diffusion factor σ' shall exceed 0,7 (see 3.1).

2.6 Uniformity of illumination

The screen shall be uniformly illuminated, the uniformity factor g being higher than 0,5 (see 3.2).

2.7 Disturbing light

The housing, blinds and covering masks shall be constructed in such a manner that no disturbing light hinders the viewing of the radiographs (see clause 3).

2.8 Anti-glare device

Each illuminator shall be fitted with an anti-glare device which, by manual or automatic operation, prevents the operator from being subjected to excessive glare when the radiograph is removed.

2.9 Heating

Appropriate precautions shall be taken to ensure that the temperature of the housing does not exceed 60 °C at the usual contact surfaces after 1 h of intermittent operation (50 % switched on with maximum of 15 s duration at an ambient temperature of 20 °C). Further precautions shall be taken to ensure that a radiograph of density 2 does not warp after a continuous viewing time of 1 min and 1 h of intermittent operation of the illuminator.

3 Determination of certain characteristics

All photometric measurements shall be carried out in a dark room. The luminance meter has to be used in the middle part of its measuring scale. Moreover, light escaping from the illuminator even when the viewing screen is completely masked shall not affect the measurements.

3.1 Divergence and dispersion of light (of diffusing screens)

The luminance shall be measured on a semi-circle, the centre of which is the centre of the screen and the diameter of which is approximately the same as the maximum dimension of the screen, but at least 50 cm. The luminance shall be measured with the aid of an appropriate luminance meter, the sensitive surface of which is a tangent to the curve of the circle (see the figure).

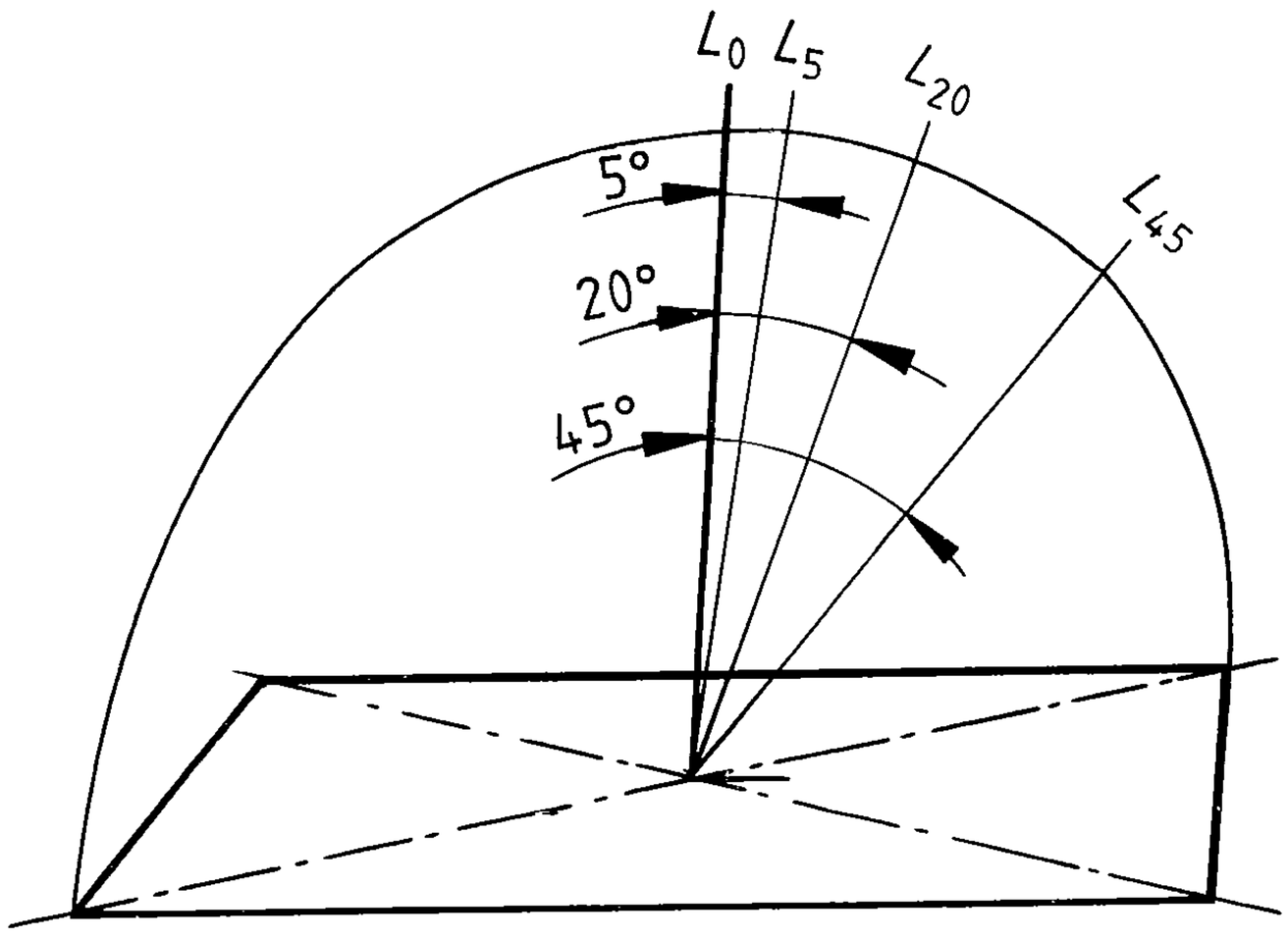

Figure — Light luminance measurement

These measurements shall be made at angles of 45° (L_{45}), 20° (L_{20}) and 5° (L_5) related to the normal. The diffusion factor σ' shall be calculated according to the formula

$$\sigma' = \frac{L_{45} + L_{20}}{2\,L_5}$$

The measurements shall be made successively in both senses of rotation.

3.2 Uniformity of screen luminance

The measurements shall be made with the aid of an illumination photometer or other suitable instrument. If the screen is rectangular, it shall be divided into squares, each side of the squares measuring 3,5 cm, the luminance of each being measured separately. If the screen is circular, the same basic procedure shall be followed. In both cases, the network of the squares shall be so arranged that the middle square is centred in the middle of the screen.

The average of the four highest and the average of the four lowest results shall be found, which give the average arithmetical values of the luminance L_{max} and L_{min}. The uniformity factor g shall then be calculated according to the formula

$$g = \frac{L_{min}}{L_{max}}$$

3.3 Nominal power consumption

The nominal power consumption is the number of watts being consumed by the illuminator after it has been in continuous operation at full luminance for a minimum period of 30 min.

4 Marking

A plate which is attached to the illuminator shall give the following information :

a) nominal operating voltage or permissible voltage range;

b) nominal main frequency or permissible frequency range;

c) whether for use with both direct and alternating current or only with one or the other;

d) nominal power consumption;

e) maximum luminance in candelas per square metre.

5 Recommendations for use

Operating instructions shall be provided with each illuminator to indicate :

a) the operation of the apparatus;

b) instructions for the mounting and replacement of lamps and screens;

c) care and maintenance;

d) safety precautions;

e) frequency of checking luminance levels.