

Recommendations for

Measurement of the veiling glare index of lenses and optical systems

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Flat Glass Manufacturers' Association	Sira Institute
Illuminating Engineering Society	Individual experts

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Foreword

This British Standard has been prepared under the authority of the Instrument Industry Standards Committee. It is based on work carried out by an Image Quality group administered by Sira Institute.

The aim is to establish an objective procedure for use when measuring the veiling glare characteristics of an optical system. The measure of veiling glare adopted in this British Standard is the ratio of the minimum illumination in the image of a black area at the centre of an extended uniformly illuminated field to the illumination of the same area of the field when the black area is removed.

The number resulting from such a measurement is referred to as the veiling glare index. This is not an absolute quantity, in the sense that the result of such a measurement depends on the exact conditions of the test, (e.g. size of the extended field and that of the black area etc.) and the results obtained under one set of conditions cannot necessarily be used to predict those obtained under a different set of conditions. Equally the veiling glare index defined in this way cannot in general be used to predict specifically the effect of veiling glare on the imaging characteristics of the optical system. Attention is also drawn to Appendix B.

The main advantage of this technique is that it gives a single figure of merit and requires relatively simple and inexpensive equipment for its measurement.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 9 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard adopts veiling glare index (bright field) (VGI) as a measure of the veiling glare characteristics of an optical system. Laboratory techniques for measuring VGI are described in general terms and recommendations are made regarding the performance of the main sub-units of the equipment.

Standard methods of specifying conditions of test and of expressing the results are given, while to assist in the intercomparison of VGI figures, four standard test conditions are specified. It is also the purpose of this standard to give guide lines for the operation of VGI measuring equipment such that accurate results may be achieved.

2 Definitions

For the purposes of this British Standard, the following definitions apply:

2.1

veiling glare

unwanted light in the image plane, resulting from scatter and/or unwanted reflections

2.2

veiling glare index (VGI)

the ratio of the minimum illumination scattered into the image of the black area to the illumination of the same area of the field when the black area is removed. The number obtained will depend upon the position of the black area in the field. For the purposes of this British Standard, VGI is taken to be with the black area in the centre of the field

NOTE 1 The measurement is made under specified conditions of the illuminated field size, black area size, and the proportion of black area image area used for measurement.

NOTE 2 If an integrating sphere is used to represent the extended illuminated field and the black area is not easily removed, the equivalent result may be obtained by turning the lens through a small angle so as to include an equivalent illuminated area not containing the black area.

3 Preferred conditions

In general, the VGI will depend on the dimensions of the black area and the illuminated field, the area over which the illumination in the image of the black area is measured, and the conjugates at which measurements are made. These must therefore be specified when giving a figure for the VGI. To help in specifying test conditions, four different test conditions are defined in Clause 4.

In view of the wide range of optical systems and the wide range of conditions of their use, it is necessary to try to limit the number of possible combinations of instruments and conditions of test for veiling glare. In addition, practical problems of feasibility can arise, for instance that of arranging for an extended field of illumination for a system working at longer distances.

4 Test conditions for the measurement of veiling glare index

4.1 Test condition A (see Figure 1)

This is defined as:

Extended uniformly illuminated field subtending 180° at the entrance pupil of the optical system under test.

Circular black area producing an image of diameter equal to $1/10\text{th} \pm 20\%$ (actual figure is to be stated) of the image format diagonal.

Measuring aperture with the diameter not greater than $1/5\text{th}$ the diameter of the image of the black area. If too small a diameter is used, this could give rise to instrumental difficulties.

Object conjugate greater than $\times 5$ the focal length of the optical system under test.

4.2 Test condition B (see Figure 1)

This is defined as:

Extended uniformly illuminated field of such shape and size as to fill the image format of the system under test.

Circular black area producing an image of diameter equal to $1/10\text{th} \pm 20\%$ of the image format diagonal.

Measuring aperture with the diameter not greater than $1/5\text{th}$ the diameter of the image of the black area. If too small a diameter is used this could give rise to instrumental difficulties.

Object conjugate greater than $\times 5$ the focal length of optical systems designed for infinite conjugate applications, and at the relative design value for optical systems designed for object conjugates less than $\times 5$ focal length.

4.3 Test condition C1 (see Figure 2)

This is defined as:

Extended uniformly illuminated field effectively located at infinity by the use of a collimator, the field being circular in shape and of size slightly larger than the field of the instrument or optical system under test.