

DIGITAL IMAGING WORKSPACE

You now have a profiled monitor that conforms to measured international standards as below. White Point: D65 or 6500 Kelvin, Gamma: 2.2, Luminance:120 to 140 cd/m²

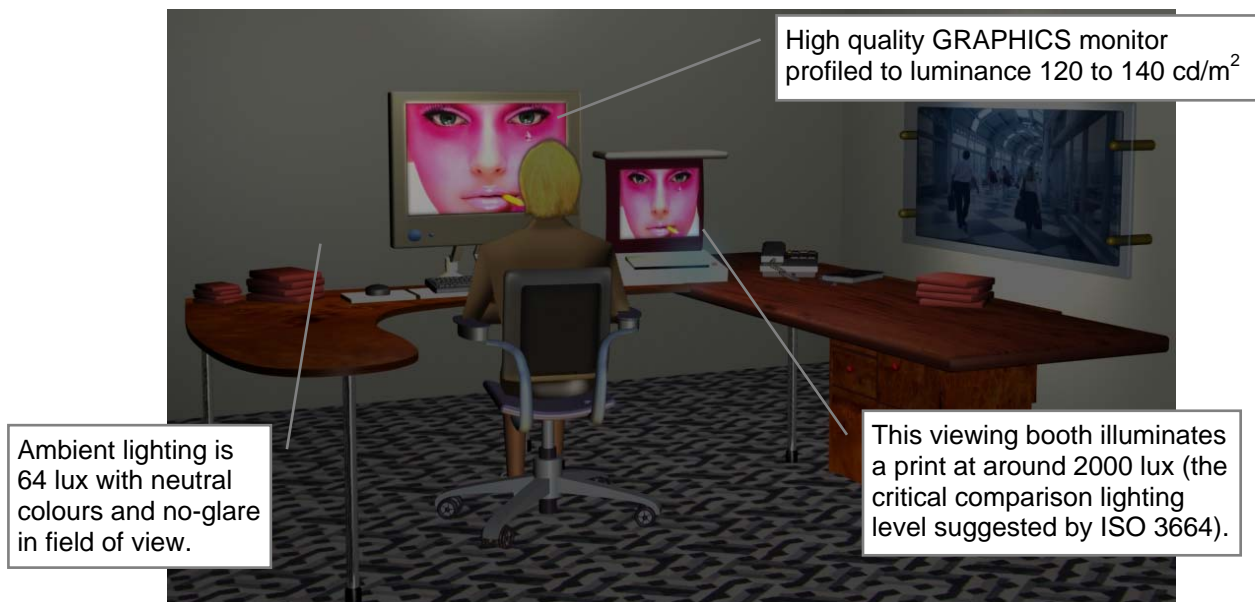
But that isn't going to be much good to you unless you get your digital workspace (also called your digital darkroom) to also conform to international standard ISO 3664. Use a measuring instrument like XRite i1 Display 2 to measure the ambient lighting.

If you wish to compare your profiled monitor to a print, you will need to illuminate the print with daylight-balanced lighting of around 2000 lux intensity (without causing glare on the monitor).

SUMMARY OF IDEAL AMBIENT CONDITONS (AS DEFINED BY ISO 3664)

(see ISO 3664 extract below for more detail)

- The brightest thing in your field of view must be your monitor.
- There should be no strong colours, glare, etc. in your field of view
- The ambient room lighting should be no greater than 64 Lux



To convert Lux, see table below or the Illumination Converter <http://tinyurl.com/37zqzjv>

Lumen per square metre	641
Lumen per square centimetre	0,06
Foot-candle	59,55
Phot	0,06
Nox	641000

ISO 3664 EXTRACT

4.5.4 Ambient illumination

When measured at the face of the monitor, with a cosine corrected photometer and with the monitor switched off, the level of ambient illumination shall be less than, or equal to, 64 lx and should be less than, or equal to, 32 lx. These limits must also be achieved when measured in any plane between the monitor and the observer. The correlated colour temperature of the ambient illumination shall be less than or equal to that of the monitor white point.

NOTE The level of ambient illumination needs to be significantly lower than the luminance level of the monitor white point. This is partly to ensure that the observer is reasonably adapted to the monitor but primarily to ensure that the full contrast range of the monitor is not significantly reduced by the effects of veiling glare. For these reasons, given the luminance levels currently available with monitors whose white point is set to D65, the level of ambient illumination needs to be less, and preferably much less, than 64 lux.

This is particularly significant where low- luminance monitors are employed. If the level of ambient illumination approaches the higher level specified in this subclause, the chromaticity of the illumination should be approximately the same as the white point of the monitor, in order to minimize chromatic adaptation complications.

4.5.5 Surround condition

The area immediately surrounding the displayed image and its border shall be neutral, preferably dark grey or black to minimize flare, and of approximately the same chromaticity as the white point of the monitor. The luminance of the border should be 20 % of the white point luminance, or less, and preferably 3 % of the white point luminance, or less.

NOTE When the monitor is being used to visualise images which will be reproduced as hardcopy the recommended lightness of any border displayed around the image will depend upon the comparison. In general, for comparison to prints, which may well be reproduced with a white border consisting of unprinted substrate, the border of the image should be light to simulate this substrate; for comparison to transparencies it should be dark. However, it is generally preferable that any such border be no more than 1 cm to 2 cm wide, even if it would normally be wider on the hardcopy reproduction.

4.5.6 Environmental conditions

The monitor shall be situated so there are no strongly coloured areas (including clothing) directly in the field of view or which may cause reflections in the monitor screen. Ideally all walls, floors and furniture in the field of view should be grey and free of any posters, notices, pictures, wording or any other object which may affect the vision of the viewer.

4.5.7 Glare

All sources of glare should be avoided since they significantly degrade the quality of the image. The monitor shall be situated so that no illumination sources such as unshielded lamps or windows are directly in the field of view or are causing discernible reflections from the surface of the monitor.

SUMMARY: VIEWING CONDITIONS SPECIFIED IN ISO 3664

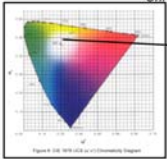

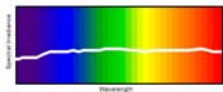
Table A.1 is deemed to be informative since it is included for convenience and introduces no new specifications. It simply summarizes the main normative requirements specified throughout this International Standard.

Table A.1 Summary of ISO viewing conditions ISO viewing condition	Reference illuminant and chromaticity tolerance ^a	Illuminance/ luminance	Colour rendering index (according to CIE 13.3)	Metamerism index (according to CIE 51)	Illumination uniformity (min:max)	Surround luminous reflectance/ luminance/ illuminance
Critical comparison Prints (P1) Transparencies Direct viewing (T1)	CIE Illuminant D ₅₀ (0,005) CIE Illuminant D ₅₀ (0,005)	2 000 lx ± 500 lx (should be ± 250 lx) 1 270 cd/m ₂ ± 320 cd/m ₂ (should be ± 160 cd/ m ₂) ^b	General index: \$ 90 Special indices for samples 1 to 8: \$ 80 General index: \$ 90 Special indices for samples 1 to 8: \$ 80	Visual: C or better (should be B or better) UV: < 4 Visual: C or better (should be B or better)	For surfaces up to 1m x 1m \$ 0.75 For surfaces greater than 1m x 1m \$ 0.6 \$ 0.75	< 60 % (neutral and matt) 5 % - 10 % of the luminance level (neutral and extending at least 50mm on all sides)
Practical appraisal of prints (P2)	CIE Illuminant D ₅₀ (0,005)	500 lx ± 125 lx	General index: \$ 90 Special indices for samples 1 to 8: \$ 80	Visual: C or better (should be B or better) UV: < 4	\$ 0,75	< 60 % (neutral and matt)
Transparencies Projection viewing (T2)	CIE Illuminant D ₅₀ (0,005)	1 270 cd/ m ₂ ± 320 cd/ m ₂	General index: \$ 90 Special indices for samples 1 to 8: \$ 80	Visual: C or better (should be B or better)	\$ 0,75	5 % - 10 % of the luminance level (neutral and extending at least 50 mm on all sides)
Colour monitors	CIE Illuminant D ₆₅ (0,025)	> 75 cd/ m ₂ (should be > 100 cd/ m ₂)	Not applicable	Not applicable	Not applicable	Neutral, and dark grey or black ^c
<p>^a This specifies the relative spectral power distribution of the reference illuminant, except for colour monitors in which case it specifies the chromaticity of the white point of the monitor. Permitted tolerances in chromaticity, from that of the reference illuminant, are given in parentheses. These are specified at the plane of viewing, according to the 1976 u^*_{10}, v^*_{10} UCS system. ^b When comparing a transparency to a print, the ratio of the luminance of the transparency illuminator to the equivalent illuminance of the print viewing surface shall be 2 (± 0.2):1. ^c The ambient illumination for colour monitors should be less than or equal to 32 lx and shall be less than or equal to 64 lx.</p>						

SUMMARY OF VIEWING STANDARD ISO 3664

The standard is a technical document which is written with engineers and lighting design companies in mind. It is not a road map for users who wish to build or set up their own viewing area, rather it is a highly technical set of specifications which enables lighting manufacturers to design, test, and certify color viewing systems. The standard specifies a set of five conditions which ALL must be present in order to assure the benefits of the standard. The five conditions include:

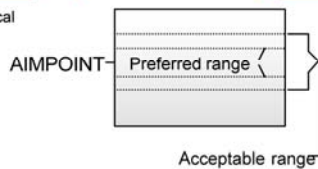
Color Quality

<p>chromaticity</p> <p>Chromaticity aimpoint $u'_{10} = .2102, v'_{10} = .4889$</p>  <p>Tolerance of .005 radius around aimpoint</p> <p>The apparent color of a light source is specified by its chromaticity coordinates. The aimpoint and tolerance are specified in CIE color space. When two viewing systems are plotted, the closer the plot, the greater the visual agreement between the viewers color appearance.</p>	<p>color temperature*</p> <p>5000K</p>  <p>* Correlated color temperature is the correlation between the color emitted by a black body radiator when heated to a specific temperature. It is measured in Kelvins.</p>	<p>spectral power distribution</p> <p>approximate CIE D_{50}</p>  <p>The true "fingerprint" of a light source. The spectral power distribution is the key factor in how a light source renders colors. The closer a light source's spectral power distribution is to D_{50}, the more consistent and accurate it is. CRI and CIE51 tests are used to insure that your light source closely approximates D_{50}.</p>
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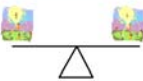

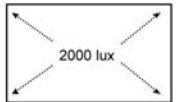
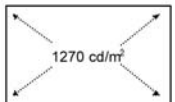
Light Intensity

Consistent light intensity is critical to consistent image rendition. The standard provides a target intensity designed to allow full tonal visibility of shadow detail without washing out highlights. Part 2 "practical appraisal" specifies a lower light intensity (500 lux) for tone reproduction evaluation.

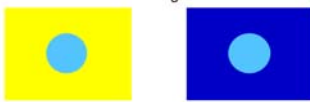
<p>prints & proofs</p> <p>2000 lux</p> <p>preferred (should be) tolerance +/- 250 lux</p> <p>required (shall be) tolerance +/- 500 lux</p>	<p>transparencies</p> <p>1270 cd/m²</p> <p>preferred (should be) tolerance +/- 160 cd/m²</p> <p>required (shall be) tolerance +/- 320 cd/m²</p>
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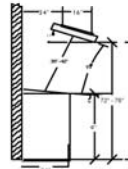
Evenness

<p>Even light intensity across image assures correct interpretation of print / reproduction quality</p> 	<p>Intensity differences across image cause incorrect interpretation of print / reproduction quality</p> 	<p>prints & proofs</p> <p>within 60% of nominal</p>  <p>at least 1200 lux (60% of 2000) intensity at all points on viewing surface</p>	<p>transparencies</p> <p>within 75% of nominal</p>  <p>at least 953 cd/m² (75% of 1270) intensity at all points on viewing surface</p>
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Surround

<p>simultaneous color and brightness contrast</p>  <p>Surround color and reflectance affect color appearance. The two light blue dots above left appear different in both hue and brightness due to the differences in the background field. In order to assure consistent color appearance and tonal range, the surround condition is specified</p>	<p>prints & proofs</p> <p>neutral and matte surround with luminous reflectance of between 10% and 60%.</p> <p>note: 60% reflectance is comparable to existing viewing systems using Munsell N8/ gray.</p>	<p>transparencies</p> <p>5%-10% luminance level 50mm on all sides</p>
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Geometry

<p>Improper geometry excessive glare</p> 	<p>Proper geometry minimal glare</p> 	<p>Light source, image, and observers eyes positioned such that specular reflectance (glare) is minimized.</p> <p>The presence of excessive glare can be very distracting to press operators, QC personnel, and others attempting to make critical color judgements. As illustrated by the images to the left, glare can hide reproduction detail and potentially cause very costly errors. While the standard does not explicitly specify lighting geometry, GTI has tested nearly all techniques and found that there is an optimal geometry for each installation (see example to right).</p> 
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