DESIGNED ARCHITECTURAL LIGHTING

LED SPOTLIGHT

Tate Britain, London

DESIGNED ARCHITECTURAL LIGHTING

Designed Architectural Lighting, founded in 1983, has steadily established itself as one of Britain's leading independent companies in the design and manufacture of luminaires. DAL's philosophy is one of constant improvement. Our aim is to design, develop and manufacture products of the highest standard whilst working closely with clients and their needs.

The range of products presented in this catalogue is the result of Designed Architectural Lighting's experience in integrating the requirements of architects, designers and engineers with the best in LED technology and materials. All luminaires are supplied with the latest developments in control gear ensuring the best in energy efficiency. DAL continually tracks and reviews the development of LEDs and offers the best and most reliable products available at the time.

Company procedures ensure that a consistency of product quality and respect for the environment is maintained by constant monitoring. This is recognised by DAL obtaining the ISO 9001 quality mark and ISO 14001 accreditation.

Designed Architectural Lighting products are designed and built in the United Kingdom to conform to the requirements EN 60598-1.

The primary purpose of the Waste Electrical and Electronic Equipment Regulations is to 'Reuse', 'Recycle' and 'Recover', and DAL is fully committed to the WEEE Directive. DAL is an established member of the Lumicom Producer Compliance Scheme, which has been approved by the Environment Agency. Via this scheme, DAL is doing the utmost to keep the costs of recycling to a minimum so that the benefits are passed on to you, the client, and society as a whole. DAL registration number WEE/EA0290TY.

LUMICOM MEMBER

ISO 14001 REGISTERED FIRM

ISO 9001 REGISTERED FIRM

Whilst every effort is made to give up-to-date information, the manufacturer reserves the right to amend any specification herein detailed without prior notice. Descriptions contained within this publication shall not form part of any contract. Orders accepted for DAL products are subject to our standard condition of sale. When products are made specially to customer's requirements, we cannot make subsequent alteration or accept cancellation or return without making a charge.

It is essential that the correct LED/lamp type must be used. Incorrect LEDs/lamps may affect the operation of the luminaire and in some cases seriously overheat the luminaire. All fittings in this brochure are supplied with LEDs. Dimensions are shown in mm.

For full Terms and Conditions please contact us.

The Baltic Story

The Baltic spotlight range was developed with the needs of art gallery, museum and exhibition curators and designers in mind; those planning lighting levels and lit effects; those installing and aiming spotlights whilst high up ladders or scaffold towers. With the cooperation and input of experienced gallery and exhibition lighting designers many things were discussed and considered. Not every work of art should have the same level of light or the same lit effect, was there a way of interchanging the components so a large quantity of different beam angle spotlights was not necessary? Spotlights can be treated harshly, they needed to be particularly robust. Sometimes components fail mid exhibition build-up, was there a way of addressing this possibility? Once aimed, it would be good to lock the spotlight in position. Dimming was a must.

With this information a design brief was outlined, which included the following features:
Light distribution: A choice of reflector beam angles
Spotlight flexibility: Reflectors had to be easily accessible and interchangeable without tools
Aiming angles: 360 degree horizontal, 0-90 degree vertical. A stout, easily gripable, tilt angle lock
Light level control: Integral dimming control gear with an on-board dimmer and rotary switch
Repairable: A fixture that was simple to take apart, the internal components accessible and easy to change
Robustness: The main body to be cast metal of graspable proportions

The original Baltic was designed for low voltage tungsten halogen capsule lamps. Now, with the advances of solid state technology the Baltic spotlight has all the advantages that LEDs can offer.

The Baltic spotlight was named after the first gallery it was specified for, the Baltic Gallery, Gateshead. Since then the Baltic has lit many galleries and exhibitions.

Some completed LED projects:

The Beaney House of Art and Knowledge, Canterbury
Tate Modern
Tate Britain
Nottingham Castle Museum
National Portrait Gallery, London
Kirkby Suite, Liverpool

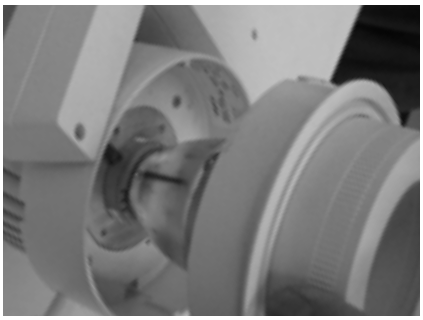
Tungsten Halogen Projects:
Arts Council England
Berlin Gallery Germany
The Baltic, Gateshead
Compton Verney
The Courtauld, London
De Vuyst Gallery, Belgium
Grundy Art Gallery, Blackpool
Karsten Schubert, London
Leeds Art Gallery
Moderna Museet, Stockholm
National portrait Gallery, London
Museo Nacional de Bellas Artes, Santiago, Chile
Plymouth City Museum
Roemer und Pelizaeus-Museum, Hildesheim
The White Cube, London
Timothy Taylor Gallery
Yeovil Art Gallery

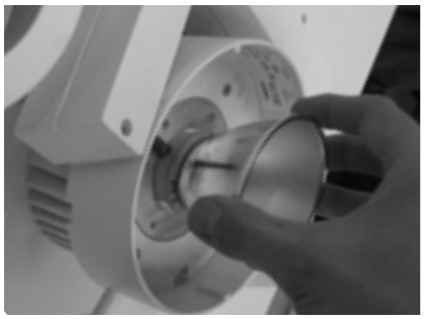
CONTENTS BALTIC SPOTLIGHT

DESIGN FEATURES

- 360 degree rotation
- Lockable vertical tilt angle
- Adjustment lever
- Integral 1-10v dimmable driver
- Rotary on-board dimmer
- Low and High output LED
- Choice of Xicato or GE Infusion modules
- Choice of colour appearance (colour temperature) - K
- Choice of colour rendering - Ra
- Designed to withstand heavy use and regular positioning
- Robust aluminium construction
- Cast aluminium housing
- Integral heat sink
- Interchangeable Reflectors
- All lens/reflector combinations give a smooth beam pattern and soft graduation and no edge effect
- A Eutrac 3 circuit adaptor is supplied as standard. Other track adaptors can be supplied on request

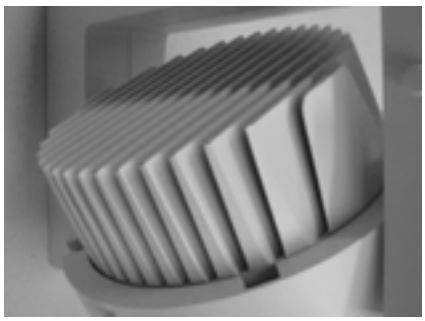
BALTIC X Construction detail for Xicato XSM LED





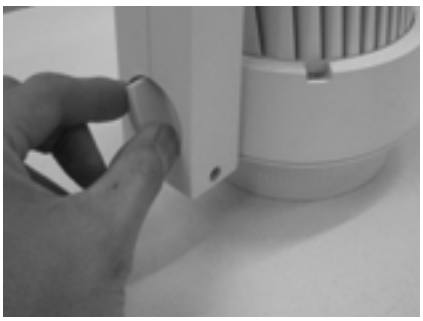
Baltic X - Method of changing the XSM reflectors

- Twist off reflector holder
- Remove reflector and swap
- Push in alternative reflector
- Replace reflector holder



- Robust aluminium construction
- Cast aluminium housing
- Engineered heat sink to ensure cool operation of the light engine

- Rotary on-board dimmer
- Integral 1-10v dimmable driver



- Tilt angle locking device

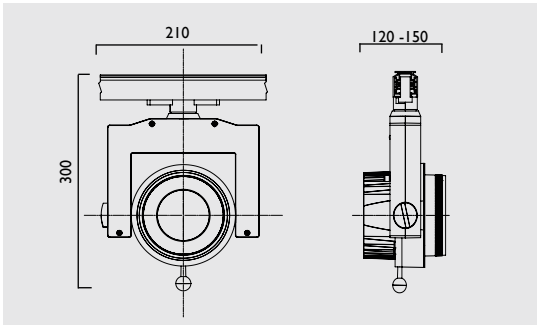
BALTIC X

XICATO

Baltic X adjustable LED spotlight with Xicato LED light engine, interchangeable reflectors, integral 1-10v dimmable driver, rotary on-board dimmer and finished white (RAL 9010). Suitable for track mounting, universal 3 circuit type adaptor comes as standard. IP20.

To specify Baltic X both the Product Number and the Engine number are needed. Choose the required Series, Colour Temperature (K) and Colour Rendering Index (CRI - Ra). Then choose the reflector beam angle.
Reflector holder Type A comes as part of the body assembly and has interchangeable reflectors as shown. One reflector comes with the spotlight and is the clients choice. Additional reflectors can be ordered separately.

Examples:
D1000/142510 plus D3100 is Baltic X Artist series, 4000K, Ra95 with 24° medium beam reflector.
D1100/200210 plus D3400 is Baltic X Standard series, 2700K, Ra80 with 80° washer beam reflector.
D1200/142310 plus D3300 is Baltic X Vibrant series, 3000K, Ra95 with 67° wide flood reflector.



Xicato XSM LED Modules

XSM Standard Series ≥ Ra80
2 step MacAdam, 2000 lumens, 28.8W

Product and Engine Number	Colour Temperature
D1100 / 200210	2700K
D1100 / 200310	3000K
D1100 / 200410	3500K
D1100 / 200510	4000K

XSM Artist Series ≥ Ra95
2 step MacAdam, 1420 lumens, 27.7W

Product and Engine Number	Colour Temperature
D1000 / 142210	2700K
D1000 / 142310	3000K
D1000 / 142410	3500K
D1000 / 142410	4000K

XSM Vibrant Series ≥ Ra80
2 step MacAdam, 2000 lumens, 28.8W

Product and Engine Number	Colour Temperature
D1200 / 200310	3000K

XSM Vibrant Series ≥ Ra95
2 step MacAdam, 1420 lumens, 27.7W

Product and Engine Number	Colour Temperature
D1300 / 142410	3000K

The latest Xicato XTM LED modules will soon be available but can be specified as below. Please contact us for availability.

XTM Standard Series ≥ Ra80
2 step MacAdam, 2000 lumens, 19.5W

Product and Engine Number	Colour Temperature
D1400 / 20A210	2700K
D1400 / 20A310	3000K
D1400 / 20A410	3500K
D1400 / 20A510	4000K

XTM Artist Series ≥ Ra95
2 step MacAdam, 2000 lumens, 26.4W

Product and Engine Number	Colour Temperature
D1500 / 20G210	2700K
D1500 / 20G310	3000K
D1500 / 20G410	3500K
D1500 / 20G510	4000K

XTM Vibrant Series ≥ Ra80
2 step MacAdam, 2000 lumens, 19.5W

Product and Engine Number	Colour Temperature
D1600 / 20H310	3000K

XTM Vibrant Series ≥ Ra95
2 step MacAdam, 2000 lumens, 26.4W

Product and Engine Number	Colour Temperature
D1700 / 20J310	3000K

DESIGNED ARCHITECTURAL LIGHTING **T** +44 (0) 1708 381999 **F** +44 (0) 1708 381585 **E** sales@dal-uk.com **www.dal-uk.com**

Reflector holder Type A

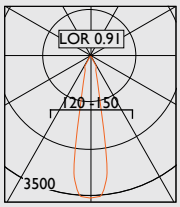
Reflectors

Medium
XSM LED - D3100

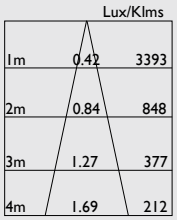
Wide
XSM LED - D3200

Flood
XSM LED - D3300

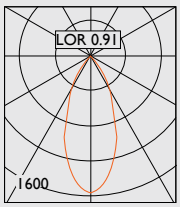
Photometric data for XSM LEDs



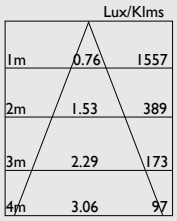
Intensity values in cds per 1,000 lumens.



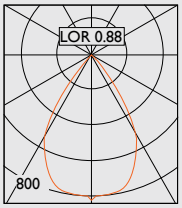
24° Beam diameter to 50% of E max



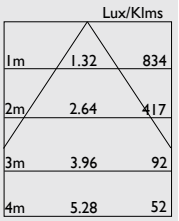
Intensity values in cds per 1,000 lumens.



42° Beam diameter to 50% of E max



Intensity values in cds per 1,000 lumens.

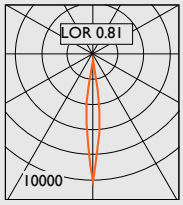


67° Beam diameter to 50% of E max

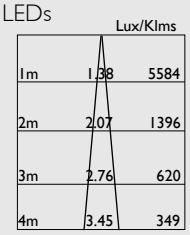
Reflector holder Type B complete with reflector

Narrow
XSM LED - D3000

Photometric data for XSM LEDs



Intensity values in cds per 1,000 lumens.

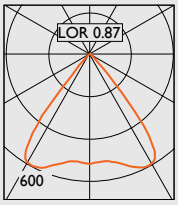


10° Beam diameter to 50% of E max

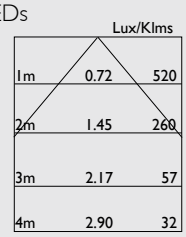
Reflector holder Type C complete with reflector

Washer
XSM LED - D3400

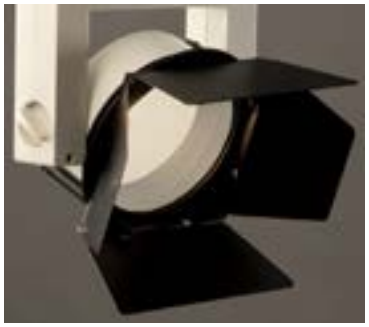
Photometric data for XSM LEDs



Intensity values in cds per 1,000 lumens.



80° Beam diameter to 50% of E max



Attachments

Product No	Description
D3700	Barn Doors

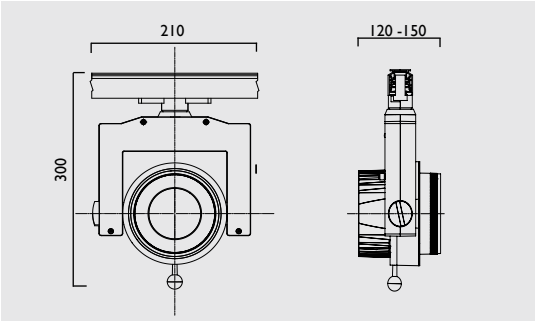
Barn Doors D3700, only suitable for reflector holder Type A

BALTIC G

GE Infusion

Baltic G adjustable LED spotlight with GE Infusion light engine, interchangeable reflectors, integral 1-10v dimmable driver, and finished white (RAL 9010). Suitable for track mounting, universal 3 circuit type adaptor comes as standard.

To specify please choose the required Colour Temperature (K) and Colour Rendering Index (CRI - Ra). Then choose the reflector beam angle.
Reflector holder Type A comes with the body assembly and has interchangeable reflectors as shown. One reflector comes with the spotlight and is the clients choice.
Additional reflectors can be ordered separately.



Examples:
D4000/188310 plus D5000 is Baltic G 4000K, Ra95 with 15° narrow beam reflector.
D4500/214210 plus D5200 is Baltic G 2700K, Ra80 with 36° wide beam reflector.

Product No	Engine No	Luminous Flux (lms)	Colour Temp	CRI	Power (w)	IP
2 step MacAdam						
D4000 /	188310	1885	3000K	Ra87	27	20
4 step MacAdam						
D4500 /	214210	2140	2700K	Ra80	27	20
D4500 /	229310	2295	3000K	Ra80	27	20
D4500 /	245510	2455	4000K	Ra80	27	20

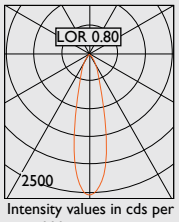
BALTIC G construction

Reflector holder Type A

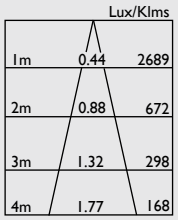
Medium
D5100

Wide
D5200

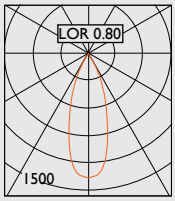
Flood
D5300



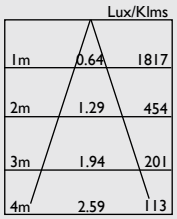
Intensity values in cds per 1,000 lamp lumens.



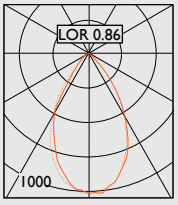
25° Beam diameter to 50% of E max



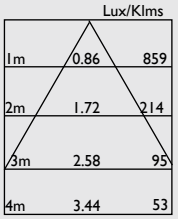
Intensity values in cds per 1,000 lamp lumens.



36° Beam diameter to 50% of E max



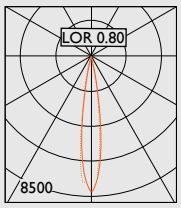
Intensity values in cds per 1,000 lamp lumens.



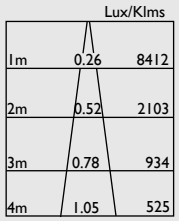
65° Beam diameter to 50% of E max

Spot reflector complete with reflector holder

D5000



Intensity values in cds per 1,000 lamp lumens.



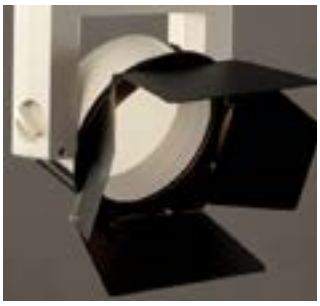
15° Beam diameter to 50% of E max

Reflector Options

Product No	Beam Angle	Reflector
D5000	15°	Narrow
D5100	25°	Medium
D5200	36°	Wide
D5300	65°	Flood

Attachments

Product No	
D3700	Barn Doors



Barn Doors, D3700 only suitable for reflector holder type A

DISPLAY LIGHT AND VISUAL EFFECTS

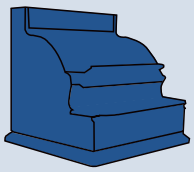
There are many things to consider when lighting paintings or displays, not just the amount of light, (as discussed in the section: Conservation) but also the type of object and how it is to be exhibited. The amount of light needed to make a noticeable, significant or a dramatic difference will depend on the surrounding, ambient level of light. A candle's flame will look bright and illuminate the surroundings in a darkened room but will be barely perceptible in a bright, day lit environment. Also, the colour and reflective properties of the object will affect its perceived brightness (luminance).

The photographs illustrate, simply, how the angle of light can reveal or hide the form of an object or add interest.

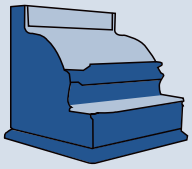
Guide to lighting ratios for highlighting objects.

Object illuminance : ambient/background lighting

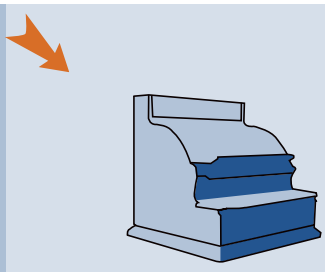
2:1	A perceptible difference
5:1	Distinct and noticeable difference
15:1	Dramatic and strong effect



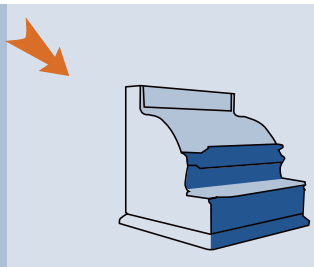
An even array of wallwashers provides the ambient lighting by reflecting light from the white wall behind with a small amount of incidental light illuminating the cash register. The eye is drawn more to the wall than to object which appears brown and flat.



The ambient lighting is created by high level wall scalloping with spill light hitting the top of the cash register revealing the texture, and adding more interest.

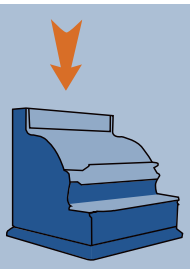


The ambient lighting is created by the same wall scalloping and spill light. More detail is revealed with the addition of a 24 degree beam Baltic spotlight lighting from the left. More texture is revealed, also sparkle. It also adds a shadow to the display.

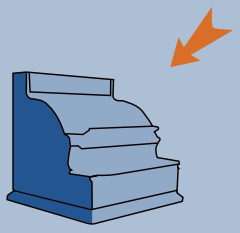


If the distribution of the Baltic spotlight is changed to a 12 degree beam the light intensity is higher. More detail is revealed but is also less subtle. The shadow becomes sharper.

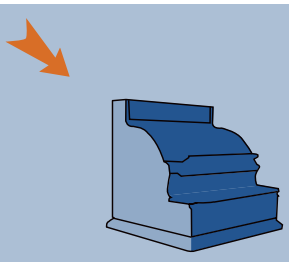
The lit effect of the object is also influenced by the surrounding reflective surfaces. With the back ground changed from white to black and no preferential wall lighting the viewer is drawn more immediately to the cash register. The plinth is white, and reflects light back onto the object. Four simple examples of how the direction of light can reveal the cash register's shape, detail and construction are presented. The beam angle is 24 degrees.



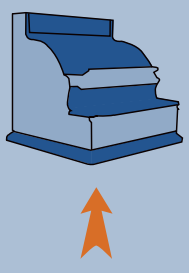
A single spotlight is positioned directly above, pointing straight down, adds drama by putting the side into shadow. The side becomes a silhouette, emphasising its form.



The spotlight is now to the right hand side, at approximately 45 degrees, and slightly in front. It now grazes light across the top the object, which flattens the decorative detail. However, the tabs within the cash register's glass mechanism are now revealed. Much of the side is still in silhouette..



The spotlight is now positioned on the left side. It lights the top and side, revealing more of the intricate side detail, but loosing the previously revealed tabs. Perhaps reducing the overall interest.



This time the cash register is lit from below. Perhaps not an obvious or easy thing to do but it creates a lot of drama. With much of the object in shade it is the detailed shadow rising behind that is interesting and intriguing.

CONSERVATION

There is much to know and consider when planning a lighting layout. Although, some of the techniques of lighting objects in retail lighting and gallery and museum lighting are similar, there are some major differences that have to be addressed.

When considering what sort of light and how much light to use it is the conservation of the art works and antiquities that should be the prime consideration. The deterioration of paintings and fugitive artworks is affected by a number of environmental factors including ultra-violet radiation, visible radiation and infra-red radiation. The extent of damage caused by a particular light source to an exhibit of given sensitivity depends on three main factors: the amount of light received by the painting (illuminance); the length of time it's exposed to light; the spectral distribution of the light source, which ranges from infrared (heat) to ultraviolet (fabric and skin damaging radiation).

There are currently considered to be four classifications for exhibits depending on the material and its level of responsivity (sensitivity) to light. Highly responsivity objects, moderate responsivtiy objects, low responsivity objects and irresponsive objects. For each classification there is a recommended illuminance and the amount of hours it is exposed over a year. For fuller explanations and recommendations there are several reference books and guides, in particular please refer to the CIBSE/Society of Light and Lighting - Lighting for Museums and Art Galleries, L.G.8.

LEDs are now of a high enough quality to provide a good solution. They are free of ultra violet radiation and very low infra-red radiation. They do, like all light sources, generate heat as energy but is not in the form of spectral radiation. Also, LEDs have colour constancy when dimmed, unlike tungsten halogen.

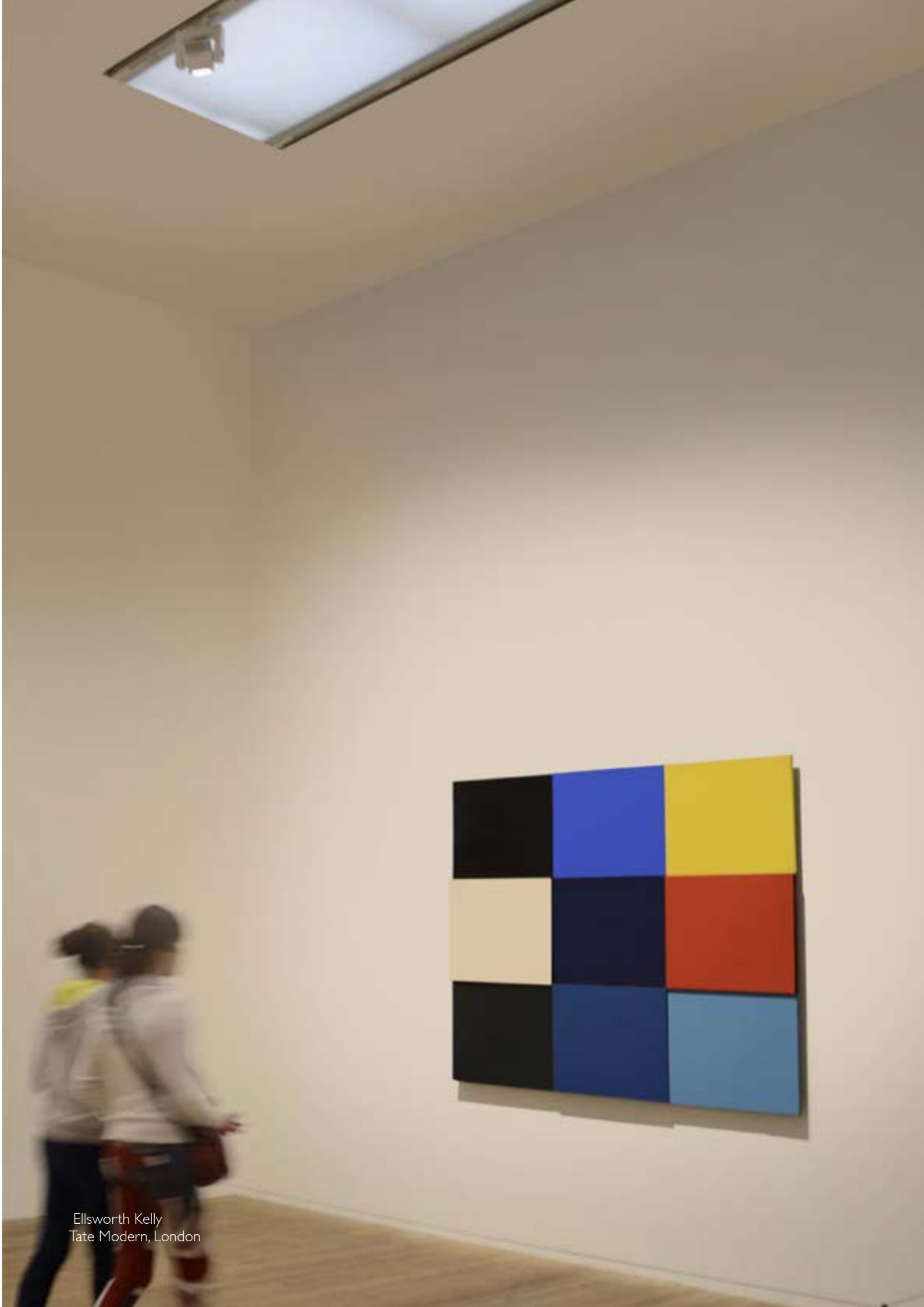
ENERGY USE

Energy comparisons

It is usual to see the major selling point of LEDs being energy saving. As an example, we can compare low voltage tungsten halogen, the traditional light source for spotlighting in galleries and museums, with Xicato and GE Infusion LEDs.
Using the latest figures and the most significant information it is easy to see an immediate reduction in energy.

Lamp Type	Lumen Output (Flux)	Power Consumption (W)	Efficacy (lms/W)
12V Tungsten Halogen QT12	1600	75	21
LED Xicato Artist Series	1420	27.7	51
LED Xicato Standard Series	2000	29	69
GE Infusion	1885	27	70

The table is a simple illustration using figures at the time of print.



Ellsworth Kelly
Tate Modern, London

LED TECHNOLOGY

The historical development of Light Emitting Diodes. (LEDs)

It was the discovery of electroluminescence in 1907, which laid the foundation for the development of LED technologies. However, it wasn't until the 1960s that the first commercial light sources were produced; LEDs we might recognise as small red indicator panel-lights. Over the next few decades other saturated colours were developed and semiconductor chip fabrication started being used in the manufacturing process. It wasn't until the 1990s that LED technology progressed to powerful blue and white LEDs, with the high quality light sources we now have becoming readily available within the last few years.

An LED is solid-state electronic technology which can be defined as: 'devices built entirely from solid materials and in which the electrons, or other charge carriers, are confined entirely within the solid material; they work by flowing electrical energy through a semi-conductor'. Instead of emitting light from a filament of heated metal in a vacuum, like an incandescent lamp does, or by means of gases and phosphors as fluorescent lamps do, solid-state devices convert electrical energy directly into light by the process of electroluminescence.

How do LEDs create white light?

White light LEDs are created in several different ways. In the early days of commercial LED lighting they were a combination of green, blue and red LED chips, the colours mixing together, creating white light. Now, the most common way is a combination of blue LED chips and a phosphor coating. Different phosphor coatings will produce different hues of white colour – warm white like tungsten through to cool white like daylight. They will also produce different qualities of colour rendering. LEDs, as well as being free of Ultraviolet radiation, have very low infrared radiation in the beam.

LEDs now

The wide use of LEDs in art gallery and museum lighting design has been hindered until recently, by the poor quality of white light and their low light output. Now significant advances in LED lighting technology have been made, enabling Designed Architectural Lighting to develop the Baltic spotlight with confidence.
With many years of experience in the design, development and manufacture of all types of luminaires Designed Architectural Lighting is a respected member of the lighting industry, affording them access to LEDs and control products from many specialist companies. DAL is not constrained to a single brand or type of LED technology, and uses the most appropriate LED for the application.
Unlike many other lamps (compact fluorescent, HID, tungsten halogen) the luminaire, driver and LED components are not interchangeable with other manufacturers' products. This is because, for optimum performance of the LED, good heat management is essential; this ensures the correct operating characteristic of the LED. Conventional lamps emit most of their heat through radiation. LEDs transfer their heat by conduction, and if the heat is not adequately dispersed light output and life will be adversely affected. Various methods can be used to transfer heat and the most simple and reliable way is a well designed heat sink (passive cooling).

In order to achieve the best display lighting product Designed Architectural Lighting works with two major LED manufacturers: Xicato and GE. For in depth LED product specification please contact us.

Early development panel indicator type LEDs

A typical GE Lighting Infusion® module

A typical Xicato module Corrected Cold Phosphor Technology®

Advantages of LEDs Include:

Long life resulting in low maintenance costs
Cool beams of light
No ultraviolet
Low infrared
Mercury free / Lead free
Low energy compared to tungsten halogen
High luminous efficacy (lumens/watt)
Colour stability
Instant light
High performance
Precise optical control
Emergency options
Dimmable

LED information

LEDs (Light-emitting diodes) generate light using the special electronic properties of crystalline semiconductors and solid state technology.
As well as being free of Ultraviolet radiation, LEDs have very low Infrared radiation in the beam.
Because the thermal operation is crucial, the LED is supplied as an integral part of the DAL luminaire.
LEDs are sometimes known as Light Engines, Pucks or Modules.
LED control gear is known as a Driver.

LED Life and Lumen Maintenance

During its operating life the amount of light from a light source decreases. Calculated as a percentage of the original light output, the amount of light emitted from the source at a specific time in the future is referred to as its lumen maintenance. In general, LEDs have better lumen maintenance than any other light source. It is usual to see quoted Lumen Maintenance figures of 70% or higher after 50,000 hours of use. However, good lumen maintenance and consistent colour are also dependent on the correct thermal operating conditions of the LED, so the correct heat sink and luminaire design is fundamental.

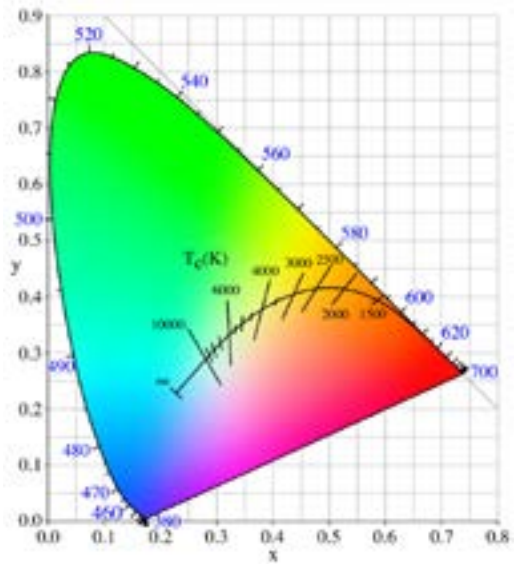
LED COLOUR TECHNOLOGY

Colour Temperature

Light and Colour is a huge topic, much bigger than can be explained here, but obviously it is a major characteristic of artificial light, with a lamp's colour temperature playing a major part in lighting design, affecting how warm or cool an interior or object will appear. So, being informed about the colour properties of light sources, such as LEDs is very important.

The colour temperature of all light sources, from candle light to daylight, is measured in units of absolute temperature - Kelvin (K), using the scientific laws of the black body radiator. But, because, LED manufacturers produce different colours of white light by adding various phosphors to blue light LEDs, there is an allowable tolerance (+/-) and the colours are specified by correlated colour temperature (CCT).

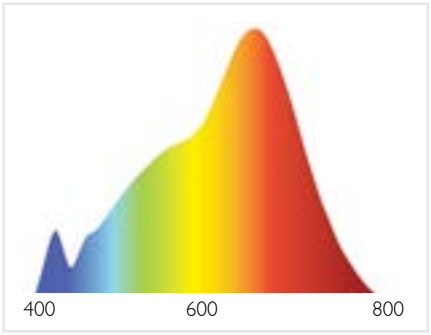
The CIE 1931 x,y chromaticity space, diagram illustrates where the black-body curve defines white light. It also shows the chromaticities of black body light sources of various temperatures and lines of constant Correlated Colour Temperature. The CCT is the colour temperature at a point on a black-body radiator (Planckian locus) which most closely matches the colour of the light emitted from the light source. The most commonly used colour temperatures in interior lighting design range from 2700K through to 4000K, with the lower the number being warmest and the higher the number being coolest.



A CIE x,y chromaticity space diagram illustrates where the black body locus defines white light. It also shows black-body light sources of various temperatures and lines of constant correlated colour temperature.

Colour Rendering Index (CRI)

Just as significant as choosing an LED for its color appearance is its colour rendering properties, and CRI is an indicator of its ability to realistically reproduce the colour of an object.
The colour rendering properties of a light source are illustrated by its spectral distribution in the form of a curve. However, more commonly used is the CIE colour rendering index. This classifies how true a colour surface will appear when lit by an artificial light source. The higher the colour rendering index (on a scale of 0 to 100) of the source, the more accurate it is.
The CIE classifies colour rendering in two ways: Colour Rendering Groups 1- 4 and the general Colour Rendering Index Ra ≥20 to Ra ≥ 95. These however, are based on 8 pastel colours and do not take into account all 15 CIE test colours so closer reading of LED manufacturers' literature maybe needed.
Wherever accurate colour matching is required sources in Group 1A, Ra ≥ 95 should be specified. When slightly less accuracy is needed Group 1B, Ra ≥ 80 should be sufficient. It should be noted, with LEDs, as with other sources using phosphors, the higher the CRI luminance efficacy (the amount of light for the amount of energy used) will be reduced.

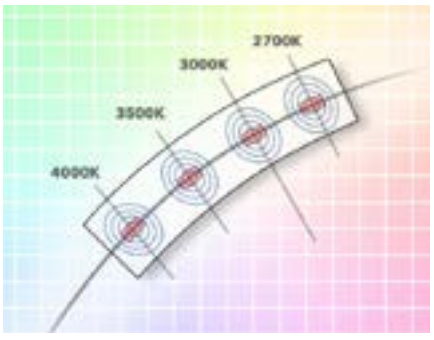


Typical spectral power distribution of a 3000K phosphor coated LED.

MacAdam Ellipses

MacAdam ellipses are also quoted as method by which a specifier can ensure consistence in colour. MacAdam ellipses describe the colour distances on the xy coordinates in the form of steps around target points. Again, this it to do with manufacturing tolerances and perceptible difference. These are certain target points on the CIE diagram, which lamp and LED manufacturers endeavour to meet. Whilst industry standard LED binning structures allow for colour points in a 7 step MacAdam ellipse, it is recognised that this is too large a tolerance leading to perceptible colour variation. An LED of 3 step MacAdam is considered very high quality and 2 steps even higher.

As an LED ages it can have colour shift, so if they are manufactured within a small MacAdam Step it is likely to keep to an imperceptible difference.



Corrected Cold Phosphor Technology® Xicato XSM modules perform to less than a 2 step MacAdam Ellipse as illustrated.

Gilbert and George, the Tate Modern, London

The Beaney House of Art and Knowledge, Canterbury

The Beaney House of Art and Knowledge, Canterbury

Leeds Art Gallery


Museo Nacional de Bellas Artes, Santiago, Chile


Tate Britain, London


Tate Modern, London


Roemer und Pelizaeus-Museum, Hildesheim, Germany


Baltic Centre for Contemporary Art, Gateshead

National Portrait Gallery, London

(Front Cover)
The Beaney House of Art and Knowledge, Canterbury

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