YOUR
GUIDELINE FOR
LIGHTING
SELECTION

alrouf
LIGHTING TECHNOLOGY CO. Ltd.

LED

شركة الروف
لتقنية الإنارة المحدودة

LIGHTING HANDBOOK

What's Special about **alrouf LED?**

I take immense pleasure in introducing to you Al Rouf Lighting Technology Company, a Saudi well established company in the business of importing, exporting, supplying and installation of LED lighting Fixtures. We understand today's global focus on power saving which reflects directly on the survival of natural resources, therefore we concentrated our scope of work on well manufactured high-efficient LED products.

Supported by a well known partners such as Philips, Pelsan, Dialight and Fiberli. We undertake bulk operations of street lighting, factories, warehouses, offices, schools, airports and all kinds of construction projects. Keeping and carrying out a truecommitment to improve and lead the lighting business in the Kingdom. We will be honored to arrange a personal introductory session to further emphasize on our company's capabilities whenever it is needed.

www.alroufled.com sales@alroufled.com

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Our Services

Quality characteristics of lighting

Light colour

The light colour describes the colour appearance of the light

Light colour	Colour temperatur	Appearanc	Associatio
ww (warm white)	up to 3300 K	Reddish	Warm
nw (intermediate white	3300–5300 K	White	Neutral
tw (cool white	from 5300 K	Bluish	Cool

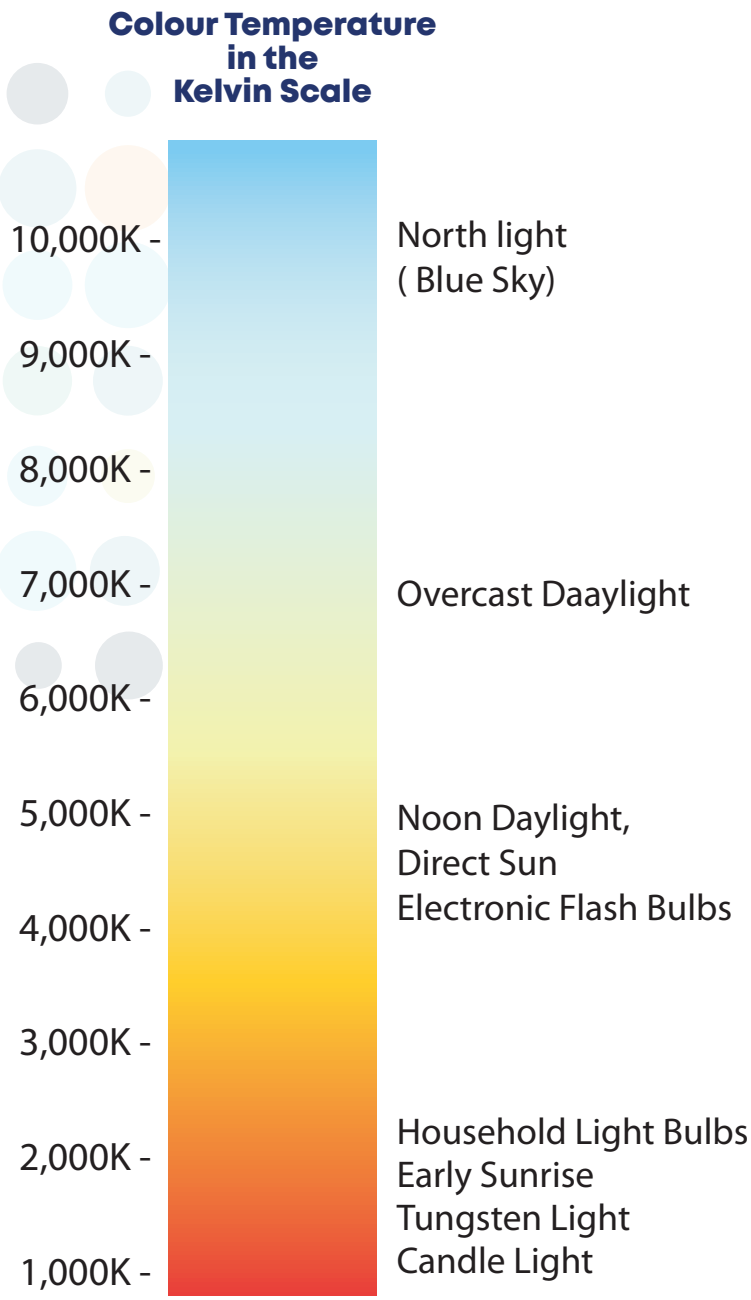
Colour rendering

Colour rendering is the ability of a light source to reproduce surface colours (8 test colours R1 to R8) as faithfully as possible compared to a reference light source. It is identified by the colour rendering index (CRI). The best colour rendering is Ra = 100. Light sources are divided up into colour rendering levels:
Ra > 90 very good colour rendering
Ra > 80 good colour rendering

Colour rendering of less than 80 should not be selected at workplaces. If light sources with a colour rendering index below 80 are used in exceptional cases, it has to be ensured that safety colours can be recognised without any problems.

In addition to the colours of the surfaces, it is also the light colour that determines a room's basic atmosphere! Please refer to Chapter 4 – Technology for light colours of light sources and changes to the light colour.

The saturated test colours R9 to R14 are also used occasionally to describe special functions of a light source. The reproduction of these colours is then quoted separatel.



IP Rating Chart

Protection of persons and protection of equipment indicated by the IP code.

Protection Provided by enclosures for electrical equipment is indicated by the IP codes two:

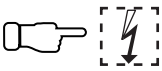
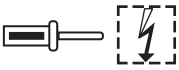
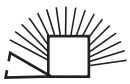
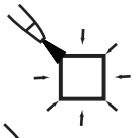
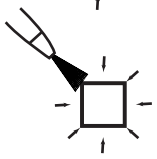
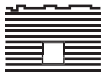
CHARACTERISTIC NUMERALS

IP

The first numeral indicates protection of persons against access to hazardous parts, and protection of equipment against ingress of solid foreign objects, (see AS 1939, Clause 5)

The second numeral indicates protection of equipment against harmful ingress of water. (see AS 1939, Clause 6)

The "flash" symbol indicates hazardous parts (Bve or Moving)

	First numeral	Second numeral
	**X** Protection unspecified (untested)	**X** Protection unspecified (untested)
	0 Non-protected	**0** Non-protected
	1 Protection of the back of the hand against accidental access to hazardous parts. and protection of equipment against objects larger than 50mm.	 **1** Protection against drop of water falling vertically
	**2** Protection of fingers against access: to hazardous parts, and protection of equipment against objects larger than. than 12,5mrm,	 **2** Protection against drops of water falling vertically when the object is tilted up to 15f from its normal position {in any direction}
	**3** Protection of persons holding tools of wires (larger than 2.5mm diameters), and protection of equipment against objects larger than 2.4mm (e-g. ball bearings)	 **3** Protection against spraying water at up to 60fl from the vertical.
	**4** Protection of persons holding small tools or wires {larger than Tm diameter}, and protection of equipment against objects l rger than Tm. (e.g. ball bearings)	 **4** Protection against splashing and spraying water from all practicable directions.
	**5** Protection against entry of dust in sufficient quantity to interfere with satisfactory operation of equipment.	 **5** Protection against low pressure jets of water from all practicable directions.
	**6** Complete protection against entry of dust.	 **6** Protection against heavy seas or a strong jet of water from all practicable directions.
		 **7** Protection against temporary immersion.
		 **8** Protection against continuous submersion (tests subject to agreement, but no less severe than second numeral 7)

Basic parameters used in lighting

Luminous flux – Luminous intensity – Illuminance – Luminance

Luminous flux Φ

Lumen [1m]

$I = \frac{\Phi}{\Omega}$

Luminous intensity I

Candela [1m/sr]=[cd]

$E = \frac{\Phi}{A}$

Illuminance E

Lux [1m/m2]=[lx]

Luminance L

[1m/sr*m2]=[cd/m2

$L = \frac{I}{A_L} \cdot \cos e$

$L = \frac{E \cdot \rho \neq}{\pi}$

Ω = solid angle into which luminous flux is emitted

A = area hit by luminous flux

AL · cos = visible areas of light source

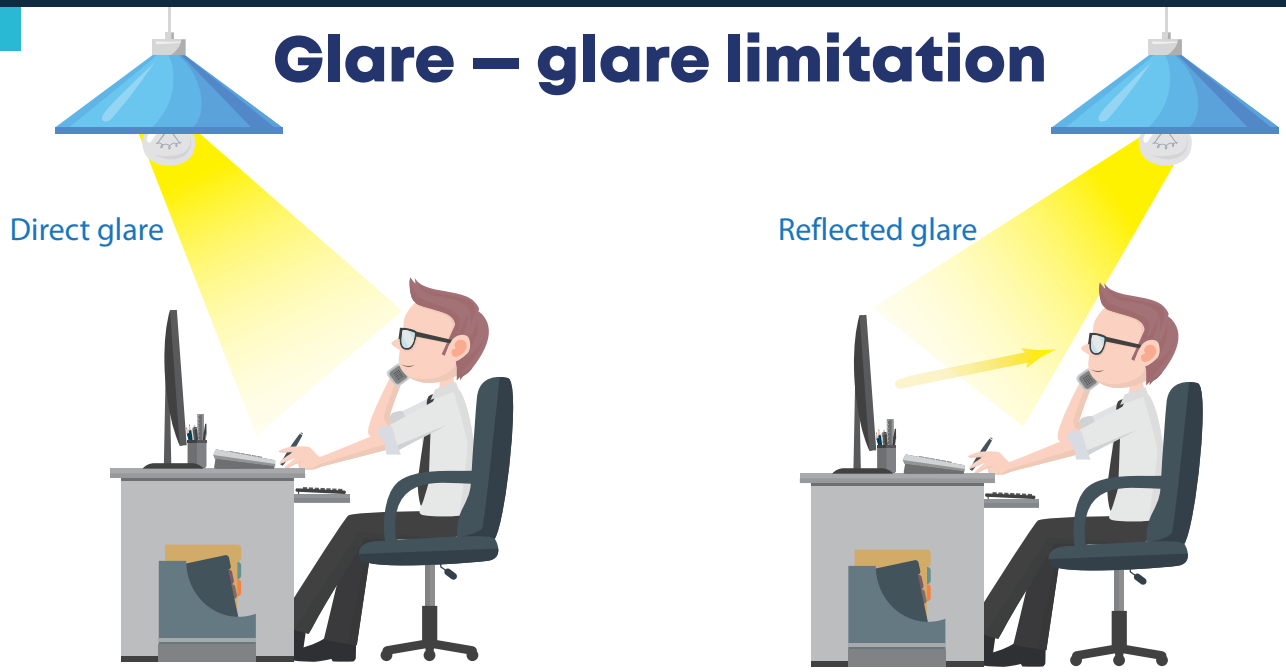
ρ = reflectance of area

π = 3.14

* = for diffuse surface area

Quality characteristics of lighting

Glare – glare limitation



Cause
- Luminaires without glare control
- Very bright surfaces

Effect
- Loss of concentration
- More frequent mistakes
- Fatigue

Remedy
- Luminaires with limited luminance levels
- Blinds on windows

The evaluation of glare
The glare of all luminaires that are in the room regularly can be evaluated with the UGR method, as specified in the standard EN 12464-1 "Lighting of indoor workplaces". However LED luminaires with very bright light points, which can be perceived individually, are crucial.

Cause
- Reflective surfaces
- Incorrect luminaire arrangement
- Incorrect workstation position

Effect
— Loss of concentration
— More frequent mistakes
— Fatigue

Remedy
- Matching luminaire to workstation (layout)
- Indirect lighting - Matt surfaces

Classic VDU workstation luminaires
The standard requires the luminance of the luminaire to be below 3000 or 1500 cd/m2 at an angle of 65°

The UGR method

The standardised UGR method (unified glare rating) is used to assess (psychological) glare.

The UGR value is calculated with a formula.

This takes into account all of the luminaires in the system that contribute to the impression of glare. The UGR values for luminaires are determined using the table method pursuant to CIE 117. Alrouf quotes both a UGR reference value for a reference room and the UGR tables for other room sizes for the majority of luminaires in its data sheets and on their website.

The UGR tables are available for each luminaire via the respective photometric data sheet: Select a product > Photometry > Select a layout

The values are hereby used for a classification on a glare level. A comparison of individual values does not allow any statement Example: 18.5 is < 19 (level) but not better than 19.0 (same glare level < 19).

Note: the glare value RG is used outdoors. It is explained in the standard EN 12464-2.

UGR limits (UGRL) that must not be exceeded:

- **≤ 16** Technical drawing
- **≤ 19** Reading, writing, training, meetings, computer-based work
- **≤ 22** Craft and light industries
- **≤ 25** Heavy industry
- **≤ 28** Railway platforms, foyers

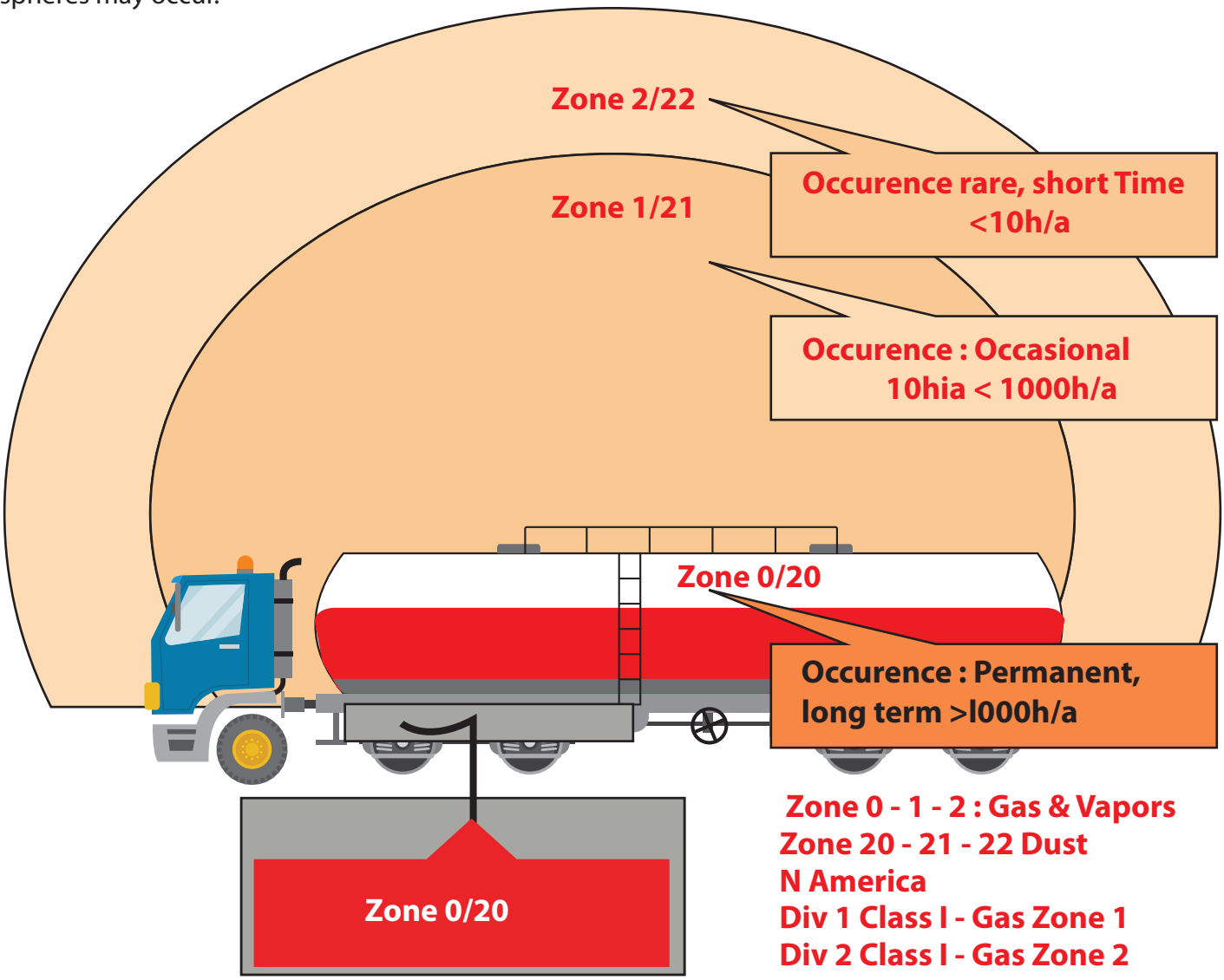
$$UGR = 8 \log \underbrace{\left(\frac{0{,}25}{L_b}\right)}_{(1)} \underbrace{\sum \frac{L^2 \Omega}{\rho_2}}_{(2)}$$

Note: the glare value RG is used outdoors.It is explained in the standard EN 12464-2.

Zone Classification

What is Zone Clasification ?

Zone classification is a method of analysing and classifying the environment where explosive gas atmo-spheres may occur.



Hazardous areas are classified into zones based on an assessment of the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:

Zone 0

An area in which an explosive gas atmosphere is present continuously or for long periods;

Explosive atmosphere for more than 1000h/yr.

Zone 1

An area in which an explosive gas atmosphere is likely to occur in normal operation;

Explosive atmosphere for more than 10, but less than 1000 h/yr

.Zone 2

An area in which an explosive gas atmo-sphere is not likely to occur in normal operation and, I if it occurs, will only exist for a short time; Explosive atmosphere for less than 10h/yr, but still sufficiently likely as to require controls over ignition sources.

The UGR method

Luminous flux

The luminous flux describes the quantity of light emitted by a light source.
The luminous efficiency is the ratio of the luminous flux to the electrical power consumed (lm/W). It is a measure of a light source's economic efficiency.
Abbreviation: 41) Phi Unit: lm Lumen

Luminous intensity

The luminous flux describes the quantity of light emitted by a light source.
The luminous intensity describes the quantity of light that is radiated in a particular direction. This is a useful measure ment for directive lighting elements such as reflectors. It is represented by the luminous intensity distribution curve (LDC).
Abbreviation: I Unit: cd Candela

Luminance

Luminance is the only basic lighting parameter that is perceived by the eye.
It describes on the one hand a light source's impression of brightness, and on the other, a surface and therefore depends to a large extent on the degree of reflection (colour and surface).
Abbreviation: D Phi Unit: lm Lumen

Illuminance

Illuminance describes the quantity of luminous flux falling on a surface. Relevant standards specify the required illuminance (e.g. EN 12464 "Lighting of indoor workplaces").

$$\text{Illuminance: } E(1x) = \frac{\text{luminous flux (1m)}}{\text{area (m}^2\text{)}}$$

Outdoor lighting

The following aspects have to be taken into account for the illumination of squares and parks, buildings and facades:

- Targeted illumination of the areas to be visualised, both horizontal and vertical
- Creation of a three-dimensional perception of the room through different brightness levels and shades
- Balanced brightness distribution
- Avoidance of strong dark-light contrasts
- Limitation of the glare effect for residents and passers-by
- Choose matching light colour and colour rendering
- No unused stray light
- When illuminating horizontal areas:
  - no light emission in the upper half of the room
- Darkness has to be respected at night

Outdoor lighting

In order to restrict the interfering effect, EN 12464-2 specifies the luminous intensities and luminances quoted in the table for outdoor spaces:

Maximum permissible interference effects of outdoor lighting systems

Light at the Place of immission		Luminous intensity of the luminaire		Share of light pointing upwards	Luminance	
E_v		I		R_{UL}	L_B	L_s
1_X		cd		%	cd/m^2	cd/m^2
Environmental zone	before enforcement time*	after enforcement time	before enforcement time*	enforcement time		after Building facade	Signs
El	2	0	2500	0	0	0	50
E2	5	1	7500	500	5	5	400
E3	10	2	10,000	1000	15	10	800
E4	25	5	25,000	2500	25	25	1000

E 1 Dark areas such as national parks or protected places

E 2 Areas with little local brightness, such as industrial or residential areas in rural surroundings

E 3 Areas with moderate local brightness, such as industrial or residential areas in suburbs

E 4 Areas of high local brightness, such as city centres and commercial centres

E_v is the maximum vertical luminous intensity at the place of immission in %

I is the luminous intensity of each individual light source in the potential direction of interference in cd

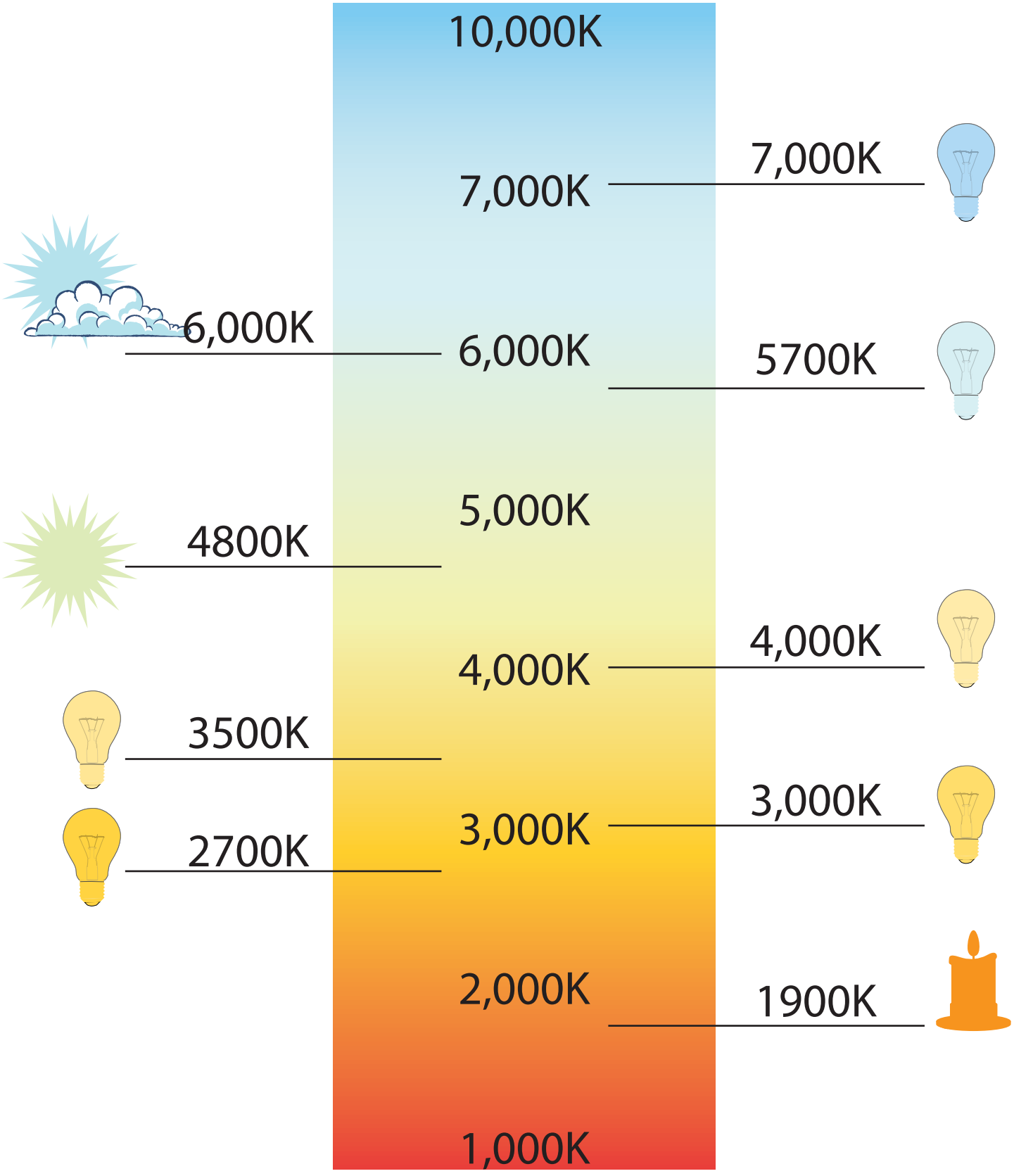
R_{UL} is the share of the light output of the luminaire(s) radiated above the horizontal plane with the luminaire(s) in its/their installed position and location in %

L_b is the highest mean luminance of a building's facade in cd/m2

L_8 is the highest mean luminance of signs in cd/m2

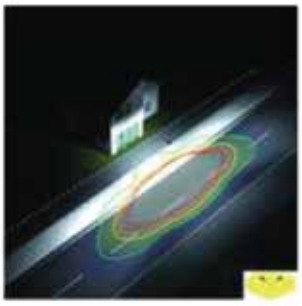
* In the event that there is no enforcement time, the higher values may not be exceeded and the lower values should preferably be taken as limit values

Kelvin Colour Temperature Scale Chart

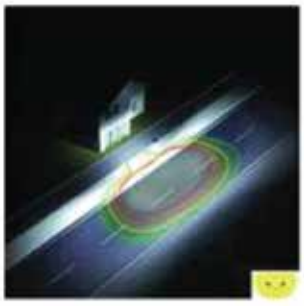


Lighting Distributions Types

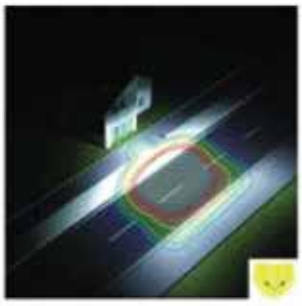
The appropriate amount of light can relieve the stress. If we take an excessive amount of light or encounter frequent light disturbances, it can create an accumulated frustration and stress to human. Good lighting design should be considered to the distribution type to have a first check before installation what is a good choice for that area. Especially in the lighting project of main road that may drive faster than the secondary road. Please note that too little or too much light can cause an accident.
Alrouf LED provides a wide variety of optical light distributions suitable for all architectural, roadway and area lighting applications, for example, VN: very narrow, N: narrow beam, M: medium beam, W: wide beam, VW: very wide beam: E: elliptical beam, plus Type II, III, IV and ME classification from IESNA/EN.



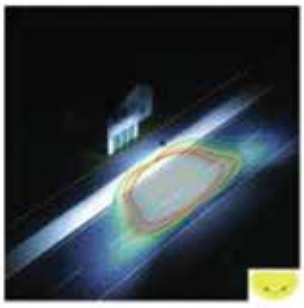
T2 — Ideal for wider walkways, entrance, roadways, bike paths and other long and narrow lighting appli-cation. Intended to be located near the side of a roadway.



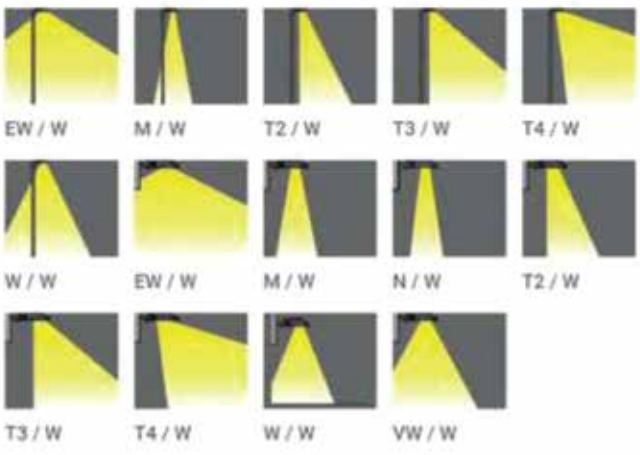
T3 — Ideal for road ways, general park-ing, and other light-ing application.



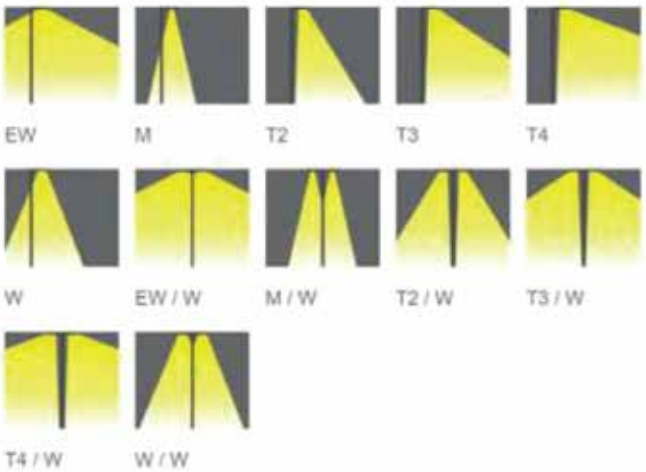
T4 — Especially suited for wall mounting or area applications and for illuminating the perimeter of parking areas.



ME — For motorized vehicles on traffic routes.



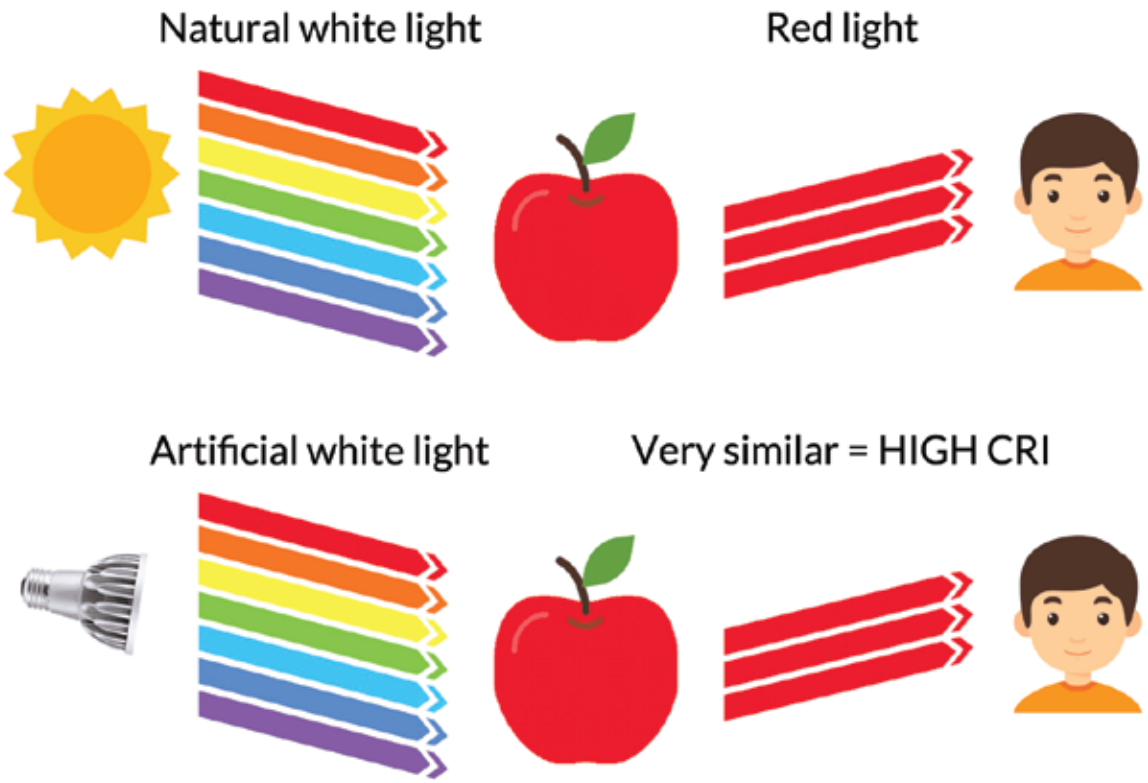
Adjustable column-mounted area floodlight. Powerful, flexible and cost-effective family with a vast array of technical optic choices.



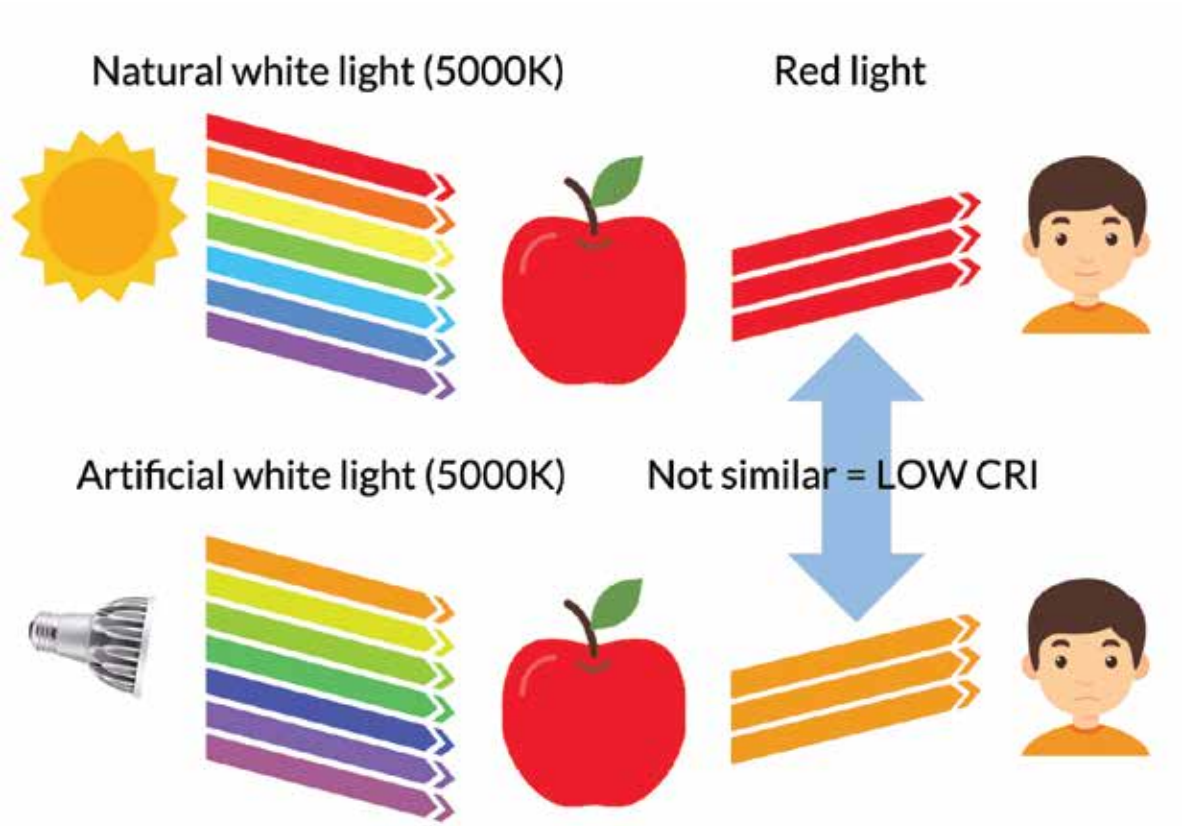
Slim, adjustable area-lighting column fixture family. Sharp, sleek profile hides copious precise beam options coupled with added adjust ability.

CRI Comparison

High CRI



Low CRI



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LIGHTING TECHNOLOGY CO.Ltd.

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لتقنيـــة الإنـــارة المحـــــدودة

Imprint

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