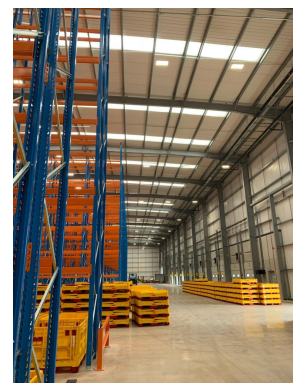




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LED Lighting Buyer's Guide

Essential Information for all Buyers of LED Lighting





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Whether you're buying LED lighting for your home or business, it's likely that your reason for buying it is to save money long term, isn't it?

That being the case, would it surprise you to hear that the cheapest products on the market rarely represent the best value for money?

Our aim in this guide is to give you some of the background information that rarely appears in online sales pitches, but is essential to making an informed decision when buying your lighting.

- Introduction
 - Chips
 - Drivers
 - Lumens
- Life—How long is Life?
 - Warranties
 - Summary



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Introduction

It's become common practice when buying anything to "Google it", which is fine if you're comparing apples with apples, but imagine if you didn't know what an apple looks like, or what the difference is between a Golden Delicious, a Pink Lady or a Granny Smith? That's very often the case with buyers of LED Lighting, and the first and biggest pitfall is that a lot of LED lights look the same on the outside, but what's inside can be dramatically different, and the saying about getting what you pay for is probably more true of LED Lighting, than any other category of consumer product I've come across, which is what inspired me to write this.

The internet is great for many things, but remember that when you look to search a "Product" such as an LED Light fitting, the vast majority of search results will be someone selling something, so information and advice isn't always impartial.

The similarity of LED fittings is down to a thing in China called "Communal Tooling", which simply means, that there are companies who own sets of moulds which they hire out to different lighting manufacturers to produce components like bodies, diffusers etc. So, where traditional UK lighting manufacturers in the past would own their own moulds, and their fittings looked unique to them, in the modern Chinese lighting industry, multiple companies will use the same, or similar moulds, to produce components with varying qualities of plastic, but they all look the same.

Would it surprise you to know that there's no industry standard way of presenting key data like Lumen outputs, or Life? Well, bizarre as it seems, it's true, and I'll show you when we come to talk about these, how to compare products from the data they do give.



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Chips

So let's talk chips, not the kind you put salt & vinegar on, LED chips. The main thing to understand here is a process called binning, this is where the differences in what's inside your light fittings starts.

Binning is the name for the process of sorting the LED chips during manufacture. Essentially, every chip undergoes a series of tests, such as Lumen Output, Colour Temperature Appearance, voltage etc, and are sorted into different bins, depending on how closely they meet the tolerances.

This process usually results in the manufacturers selling their higher quality chips at a premium price, and the poorer quality ones to the manufacturers of lower quality fittings. If you see a light fitting which says "Single Bin Chips", it's usually an indication of high quality LEDs.

One of the most common outcomes with low quality LED light fittings is colour temperature variation; over the years I've lost count of the jobs I've heard of where someone has installed cheap LED fittings, and even though they all say 4000k on the box, what ends up on the ceiling is visibly 3 or 4 different colours. This is what you can expect where the LEDs don't meet the tight tolerances of the High Quality ones during the binning process, and are sold off cheap.

The LED Chip is one of the key components in any light fitting, so if you're shopping on price, don't expect high quality LEDs, and when you understand the binning process, you'll realise that even the biggest name manufacturers can sell cheap chips.



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Drivers

LED lighting is different from traditional lighting, such as fluorescent and tungsten in many ways, and one of the biggest differences is in the ways that LEDs can be driven.

Back in the day, a limited number of manufacturers produced a limited number of light sources, known variously as “lamps”, “Bulbs” etc, but they and any gear required to run them, were pretty much universal. So you could take anybody’s 5 ft tube, and use anybody’s 5ft control gear, make a fitting, and it would work.

Unfortunately, the way LEDs work, you could give the same LED chip to 100 light fitting manufacturers, and end up with 100 different results. There is no standard way to drive an LED chip! The harder you drive it, the more light you get, and the less life you get, the opposite is also true, drive it less hard and you’ll get more life, and less light, and there’s a 1000 shades of grey in between.

The importance of this is, that it means that a manufacturer of cheap fittings, can use fewer chips driven harder to make a light fitting, which will obviously not last as long as a fitting where the chips aren’t driven as hard.

I’m sure this is all getting pretty confusing by now, but stick with me, once I’ve shown you all the variables, and why they matter, I’ll give you a couple of simple rules to follow to make an informed decision.



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Lumens

You may remember me saying that there's no industry standard way of presenting data, well this is one of them; Lumen Output.

Essentially, there's only two sources of this data, testing the LED chips, or testing the finished fittings, these are commonly known as "Chip" or "Board" lumens, and "Luminaire" Lumens. So, what's the difference, and why does it matter?

Well if you think back to our conversation about binning, all the chips are tested at manufacture for lumen output, so that gives us the "Chip" or "Board" lumens. Acquiring the "Luminaire" lumens is a bit more difficult, this involves testing the finished light fitting in a Photometer to measure, not just how much light a fitting emits, but also how it distributes it, and it produces the Photometry which allows us to do lighting calculations.

So, why does it matter for this conversation? Firstly, because testing costs money, manufacturers of cheap light fittings, won't test their fittings, it's one of the easiest ways for them to save money, but the issue is a bit deeper than just that!

The biggest issue, particularly for buyers of Commercial or Industrial lighting, is that the difference between Chip Lumens and Luminaire Lumens can be vast! Let me explain, when you put any light source inside a fitting, you get less light out than you started with. Back in the days of fluorescent fittings etc, every fitting was tested and had a Light Output Ratio, or LOR, which was the %age of light that actually came out the fitting. Anything with a diffuser on it, like a bulkhead, or modular fitting, would typically lose 35-40% of the light, and fittings in general could have an LOR anywhere from 40 odd % to 90 odd %.

If you put 2000 Lumens of LED Chips in a bulkhead or LED panel, you'll only get 1200-1300lumens out, if you want get 2000 lumens out, you need to put over 3200lumens in, which obviously has a cost implication.

Manufacturers who have tested their fittings, and have photometry available for doing lighting designs, will be quoting "Luminaire" lumens, manufacturers of cheap fittings which haven't been tested, and can't offer photometry, can only be quoting "Chip" lumens, and there's no rules against this.

The net result is that using cheaper fittings, invariable means that you'll either get significantly lower lighting levels than quality fittings, or require significantly more to get the same light levels.

This factor alone is why you should never use a lighting design and buy cheap alternatives, if they can't offer a design to prove lighting levels, don't buy their fittings.



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Life—How Long is Life?

You may remember me saying that there's no industry standard way of presenting data, well this is another of them; Life.

For years the life of traditional light sources like fluorescents, tungsten, and Metal Halide lamps was measured to destruction. The way it was measured was relatively unscientific; they plugged in 100 lamps, and started the clock, and when the 50th one went out, they stopped the clock, and that was what they quoted as the "Average Rated Life." The life of most of these lamps varied so much, that some could last a week, others might last 20 years.

So how does this relate to LED, well, most decent quality LEDs could run for 20-30 years, even when on 24/7, so the above system isn't practical. As all lighting degrades over time and LED is a bit more linear in the way it degrades, a new system was developed, specifically for LEDs.

The LED fittings are tested until the output degrades by a known percentage, and that time period is what is quoted for the life of the fittings, well sometimes, but more on that in a minute. The manufacturers will test the fittings until they've degraded to 90%, 80% or 70% of their original output, and quote the number of Hours as L90, L80 or L70 to represent this.

You'll also see a second figure, such as B10 or B50 often quoted, this tells you the %age of chips in the fitting that were below the desired level, so 50,000 Hrs L90B10 means that the fitting will take 50,000 Hrs to degrade to 90% of its original output, and 10% of the LEDs will be below 90%, similarly 50,000hrs L70B50, means that it will take 50,000 Hrs for that fitting to degrade to 70% of its original output, and 50% of the LEDs will be below 70%.

Generally speaking, only the really high quality fittings will quote an L90 or L80 figure, most decent run of the mill fittings will quote an L70 figure, and not always with a B figure after it.

Remember I said that testing costs money, and a minute ago I said "Well sometimes"? The test process above is what the companies who spend the money on testing do, if you see a lamp or a fitting quoting a number, but not saying L70, L80 or L90, the possibility exists that they haven't actually tested it, and the figure quoted is an estimate. After all, if they've tested it, why wouldn't they quote it? Very often it will say "Life expectancy >50,000 Hrs, or >30,000 Hours.

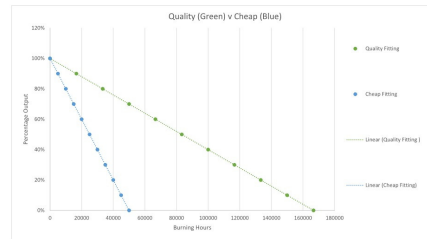
This is a common misunderstanding of buyers who are unaware of this, because if you have one fitting quoting "Life Expectancy" and another quoting a life to L70, you're clearly not comparing apples with apples. So, how do you compare the two? Simple, as the L70 figure represents the time to degrade by 30%, take the life expectancy figure and multiply by 0.3.

So this is where it gets interesting, because many buyers of cheap LED fittings just look at the numbers, but, let's look at it a little closer.



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Life—How Long is Life?



Let's assume you have 2 fittings, Fitting 1 is quoting 50,000 Hours to L70 (the time it takes to degrade to 70% of original output, or to put it another way, the first 30% of it's Whole Life), and Fitting 2 is quoting a life expectancy (Whole Life) of 50,000 hours.

As you see, the figure of 50,000 hours represents a different measure in each case, therefore cannot be directly compared.

There are two ways to compare apples with apples:-

The first method is to calculate the L70 figure for Fitting 2, the fitting quoting a "Life Expectancy".

Take the "Life Expectancy" number, (which remember, represents that fittings entire life) and multiply by 0.3 (to calculate the hours it will take to degrade by 30%), so in our example $50,000 \times 0.3 = 15,000$ hours to L70!

Now we can compare the two L70 figures, Fitting 1—50,000 Hrs L70, Fitting 2—15,000 Hrs L70!

The second method is to calculate the life to expiry of the "L70" fitting, Fitting 1.

As the L70 figure of 50,000 Hours represents the life until the fitting has degraded by 30%, divide the L70 hours by 3, and multiply by 10; $50,000/3 \times 10 = 166,666$ Hours.

Comparing the 2 Whole Life figures —Fitting 1 = 166,666 hours, Fitting 2 = 50,000 hours

This is demonstrated in the graph above, where you can clearly see that Fitting 1 (Green) will last over 3 times longer than Fitting 2 (Blue)

My personal preference is to use the first method; most people will replace fittings when degraded by about 50%, so if all your calculations are based on 30% degradation, you still have a lot of life left beyond.

We'll talk a bit more about this in our summary, but for the moment, let this sink in; it's the single largest reason that buying the cheapest LED fittings is rarely the best value for money!



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Warranties

What is a Warranty, and What is it not? A manufacturer's Warranty is your protection against manufacturing faults in the components, or assembled product. What it's not, is a guarantee that the fitting will last that long, and it's not a guarantee against end of life! It's also not a guarantee that a fitting with a long warranty will be better than a fitting with a shorter warranty!!

So, what do I mean by all that? Well firstly, let's get warranties into perspective, for any electrical/electronic products, the two most common types of failure under warranty are dry solder joints, and failure of an electronic component, such as a resistor, triac or capacitor etc, and by their very nature, 90% of those types of faults will usually occur in the first couple of hundred hours after a load is applied to them. This means that the vast majority of faults covered under a warranty, usually show up in the first 6 months of use!

My advice is to read the small print, it's common that cheaper LED fittings may have a restriction on the burning hours per day, or things that aren't covered by the warranty, or you may need to register the project to get the full warranty.

To give you an idea, here's a couple of examples.

I lost a job a couple of years ago for 200 LED panels for a hospital waiting room & corridors, my fittings were "too expensive". So the contractor duly fitted the cheap fittings, and lo and behold, after 2-3 months, they started failing. He called the supplier, to be told, that the fittings weren't suitable for being used 24/7, the max was 12 hours use per day, therefore, not covered by the warranty! My fittings, however were suitable for use 24/7, and wouldn't have failed in the first place.

Secondly, I got asked to look at a shopping centre a couple of years ago, where the client had installed 500 LED panels approx. 18 months before, and all the diffusers on the fittings were discolouring, and he'd called the manufacturer to make a claim against the 5 year warranty, to be told, that as none of the fittings had failed, he didn't have a warranty claim!

Sometimes the facts are staring people in the face, but they're sucked in by cheap prices. I've seen a number of cheap LED High Bay fittings for example, which quote a "Life Expectancy" of 30,000 hours, and a warranty of 5 Years! So, what would happen if you installed said fittings in a factory or warehouse running 24/7? Well, $24/7 = 8736$ Hours per year, so they'd last roughly 3.4 years! Without looking I'll bet there's a restriction on the running hours in the small print!



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Summary

Most of you are probably bamboozled by all this, but the main thing to take from it all is that a cheap fittings are rarely a bargain, and it's worth doing a little digging to get the LED fittings that are the best value for money for you.

How important all this is to you will likely depend on your circumstances, and why you're buying the lighting in the first place; if you 're just buying a few fittings for the house it's probably not going to be that important to you, but if you're buying a significant amount of lighting, or perhaps a commercial or industrial user, then the significance can be massive.

My personal opinion is that every commercial/Industrial client should be doing a decent amount of homework.

The first reason for this is that in all workplaces there's a legal obligation to provide the correct lighting levels for the people who work there, so test data, and doing lighting designs to make sure you're getting the right levels, should be a given.

That rules out buying cheap fittings that don't have test data, but consider the second reason, your research will likely confirm that the cheap fittings that didn't have test data to do a lighting design, were also quoting a "Life Expectancy" , so the better quality fittings will likely last 2-3 times longer, and only cost you 20% more, by now I hope you're seeing that that is better value for money than just buying cheap?

In summary, the test data, whether it be for lighting designs, or life of the fittings, are crucial things to look for, do the sums on the life, if a quality fitting lasts 3 times longer than a cheap fitting, but costs less than 3 times the price, it will likely be better value for money, and don't be sucked in by long warranties, a long warranty without all the other signs of a quality fitting is usually a warning to steer clear.

Every night on the news there's stories about global warming and the environment, buy the best LED fittings you can afford, they'll usually last the longest and consume the least power, and the cheapest ones are in truth, little more than tomorrow's landfill.