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http://wolfstone.halloweenhost.com/Lighting/litinc_IncandescentLampSpecs.html

Incandescent Lamp Specifications

All incandescent lamps operate on the same basic principle: an electric current is forced through a wire filament that resists the flow of electricity. As the current fights the resistance, heat is generated. When the filament gets very hot, it glows with "black body radiation" and becomes "incandescent".

This page is devoted to the many different ways that this principle can be put into practice.



Introduction

Even the simply "light bulb" lamp has many variations.

Such lamps can be specified by their many characteristics:

- Performance characteristics, such as:
 - Voltage
 - Wattage
 - Brightness
 - Color
 - Lifetime
- type and size of the base (electrical connector), which can be indicated several ways:

- common name (such as "candelabra")
- diameter of the base in inch fractions
- the letter "E" and the diameter of the base in millimeters (e.g. E26 is a base 26mm in diameter)
- size and shape of the glass envelope, which can be indicated several ways:
 - An, e.g. A19
 - PARn, e.g. PAR38
 - Rn, e.g. R30
 - MR-n, e.g. MR-16
 - Gn, e.g. G30
 - Cn, e.g. C9
- maximum overall length (often in inches)

For example, the common household "light bulb" in the United States uses an E26 screw base, with an A19 envelope.

Performance Characteristics

Voltage

All incandescent lamps have a rated operating voltage.

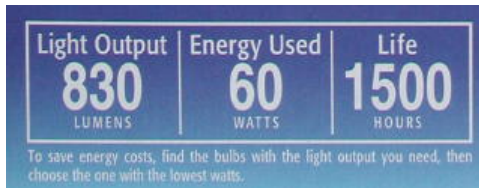
- If you feed the lamp with electricity at a lower voltage, the lamp will be dim, the light will be more yellow in color, and the lamp might last a little longer.
- If you feed the lamp a voltage slightly higher than the rating, the light will be brighter, whiter, and the lamp will not last as long as it should.
- If you give the lamp considerably more voltage than it is rated for, it will fail, probably burning out in one brief flash of light.

Wattage

Wattage indicates the amount of *power consumed* by a lamp.

Wattage is often used as a substitute for the brightness of a lamp, but it is a poor substitute. Usually, a 100 Watt lamp will burn brighter than a 50 Watt lamp. But just because the larger lamp is using twice as much power, doesn't mean it is putting out twice as much light. It could be that the 100 Watt lamp is very inefficient at turning electricity into light, and the 50 Watt lamp is much more efficient.

Brightness



To find out how bright a lamp truly is, check the rating in lumens.

This panel is printed on a box of Philips lamps.

Color

Since filament lamps rely on "incandescent" "black body radiation", their output is broad in spectrum. This is usually a good thing when it comes to good color rendition. But if you want to approximate daylight, you need to specify a lamp that outputs light more to the blue end of the spectrum. [If you don't take special precautions, incandescent light tends to look yellowish, compared to daylight.]

And if you don't care about daylight, lamps are available in a variety of party and decorator colors.

This is probably a good place to mention that some lamps have completely clear glass envelopes, so that the glowing filament can be seen inside. Others have a frosted glass envelope to diffuse the light and soften it somewhat.

Beam Pattern

A common "light bulb" broadcasts light in all directions. Some lamps have built-in reflectors and/or lenses that let them throw a beam with predictable characteristics.

Lifetime

The anticipated lifetime of a lamp can be quite important.

- Consider a light at the top of a high stairwell, where it is difficult to replace the lamp. It might be worth an extra dollar for a long-lasting lamp, so you don't have to get the ladder out again.
- Consider the lamp in a movie projector. If it burns out in the middle of a show, patrons will be upset.
- Failure of an indicator lamp in a medical machine could mean the death of a patient.
- Failure of an indicator lamp in an industrial safety application could mean a new patient.
- One of the most common failures in old VCRs is the lamp that is used to sense the end of the tape. The replacement lamp probably costs less than a dollar, but the tech will have to charge a minimum service fee of \$30 or so.

Lamp Base

The "base" of the lamp provides both mechanical attachment and electrical connection.

Most incandescent lamps have screw bases.

Automotive lamps tend not to use screw-base lamps because vibration can cause them to unscrew themselves. Many automotive lamps use bayonet bases or some form of lugs or blades.

Screw Base

Most incandescent lamps have screw bases, with a right hand thread.



Different sizes are distinguished by the outside diameter of the lamp base threads.

The diameter of the base may be specified in several ways:

- common name (e.g. "candelabra")
- diameter of the base in inch fractions (e.g. 1 1/16")
- the letter "E" and the diameter of the base in millimeters (e.g. E26 is a base 26mm in diameter)

Here's a table of various screw base sizes:

name	inch diameter	metric diameter	use
	7/32 inch		hobby applications (model railroads); series-wired Christmas lights (early 1960's)
miniature	3/8 (12/32) inch		flashlights, instrument panels, series-wired Christmas lights (early 1940's and 1950's; C6)
candelabra	15/32 inch	E12	decorative lighting, chandeliers, parallel-wired Christmas lights (C7-1/2), night lights
European		E14	
intermediate	21/32 inch	E17	decorative lighting, chandeliers, parallel-wired Christmas lights (C9-1/2)

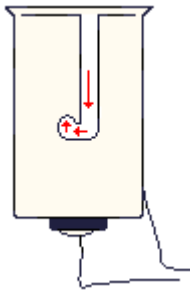
medium	1 1/16 (34/32) inch	E26	standard household lamps in United States
mogul	1 9/16 (50/32) inch		mercury, metal halide, sodium lamps; incandescent lamps > 300W

Bayonet

Automotive turn signal, backup, and marker lights tend to use bayonet bases because they don't unscrew themselves when vibration is present.



Notice the small metal nubs sticking out of each side of the lamp base.



The bayonet socket has a J-shaped slot on each side, made to guide the nubs on the base.



The bayonet socket is spring-loaded. You push the lamp down, then twist slightly to engage the nubs in the hook of the J-shaped slot. When you release the lamp, spring pressure pushes the lamp nubs up into the hook.

This automotive lamp has two filaments, for high and low intensity. The bayonet base has two electrical connections on the bottom. The nubs on the side are at different heights, so that the lamp will only fit in the socket one way.

Pins



Some lamps simply have a couple of metal pins sticking out the back. The MR-n (e.g. MR-16) type are examples.

Lugs or Blades

Some lamps have metal lugs or blades for electrical connections.



This is a headlight from my Mitsubishi Montero. A molded plastic connector pushes onto the blades to make contact.

T3

I have seen the "T3" designation used for tubular halogen lamps used in torchier fixtures and "trouble" lights.

The lamps are held by spring-loaded pins that press against the dimples in the ends of the lamp. The pins also provide electrical contact.

The base designation of "T3" probably refers to the diameter of the lamp. In order to figure out what size you really need, you also need a length measurements. Some values are: 78mm, 118mm, 145mm, 192mm, 257mm.

Glass Envelope

By "envelope", I mean the bulbous part of the lamp that contains the filament. And sometimes it isn't really glass.

But either way, the size and shape of the envelope is often used to distinguish one lamp from another.

An, e.g. A19

The "A" terminology refers to lamps with bulbous pear-shaped envelopes. The number after the "A" gives the diameter of the widest part of the lamp envelope in units of 1/8 of an inch. Thus an A19 lamp has a diameter of 19 times 1/8", or 2 3/8".

PARn, e.g. PAR38

"PAR" stands for Parabolic Aluminized Reflector. This is a type of sealed-beam lamp with built-in reflector and often a fresnel lens pressed into the glass. The number after the "PAR" gives the diameter of the lamp envelope in units of 1/8 of an inch. Thus a PAR38 has a diameter of 4 3/4".

Small PAR lamps tend to use low voltages, and often have a transformer built into the fixture. Medium-sized PAR lamps use line voltage, and screw bases on the lamps. Larger PAR lamps tend to line voltage and ceramic connectors that push on to the lamps.

Some sizes are: PAR36, PAR46, PAR56.

Rn, e.g. R30

The "R" terminology refers to lamps with built-in reflectors. The number after the "R" gives the diameter of the lamp envelope in units of 1/8 of an inch. Here are some Reflector lamp sizes:

<i>name</i>	<i>inch diameter</i>
R14	1 3/4"
R16	2"
R20	2 1/2"
R30	3 3/4"
R40	5"

All of the "R" lamps that I have seen use screw bases.

MR-n, e.g. MR-16

The "MR" terminology refers to miniature reflector lamps. I think that the number after the "MR" refers to the diameter of the widest part of the lamp, in millimeters.

I have seen MR-11 and MR-16. Others probably exist.

These tend to be halogen lamps with bi-pin connections.

Gn, e.g. G30

The "G" terminology refers to lamps with a spherical "globe" envelope. The number after the "G" refers to the diameter of the globe, in millimeters.



Globe lamps are popular in vanity mirrors and various displays.

As of Christmas 2003, colored globes frosted for a diffused look, seem to be popular for decoration.

Some popular "Mini-Globe" sizes are G9, G12, G16 1/2. Some popular "Globe" sizes are G16, G25, G30, G40.

The smaller globes tend to use a candelabra base.

Cn, e.g. C9

I have seen frequent reference to lamp sizes C7 and C9, usually in conjunction with Christmas lights or night lights.

This appears to be a specification of the glass envelope size, and doesn't necessarily correspond to the base size.

Some common combinations are:

<u>envelope</u>	<u>base</u>
C6	miniature; 3/8 (12/32) inch
C7	candelabra; E12
C7 1/2	candelabra; 15/32 inch; E12
C9	intermediate; E17
C9 1/2	intermediate; 21/32 inch; E17
C15	candelabra; E12
C15	medium; E26

Obtained from
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