Technology

Lamp holders

According to the biblical story of creation, God created light on the first day. This illustrates the fundamental significance of light to mankind. Today, life without lighting technology would be almost unimaginable and the lighting technologies in use in a region can be considered as a measure of its level of industrialization.

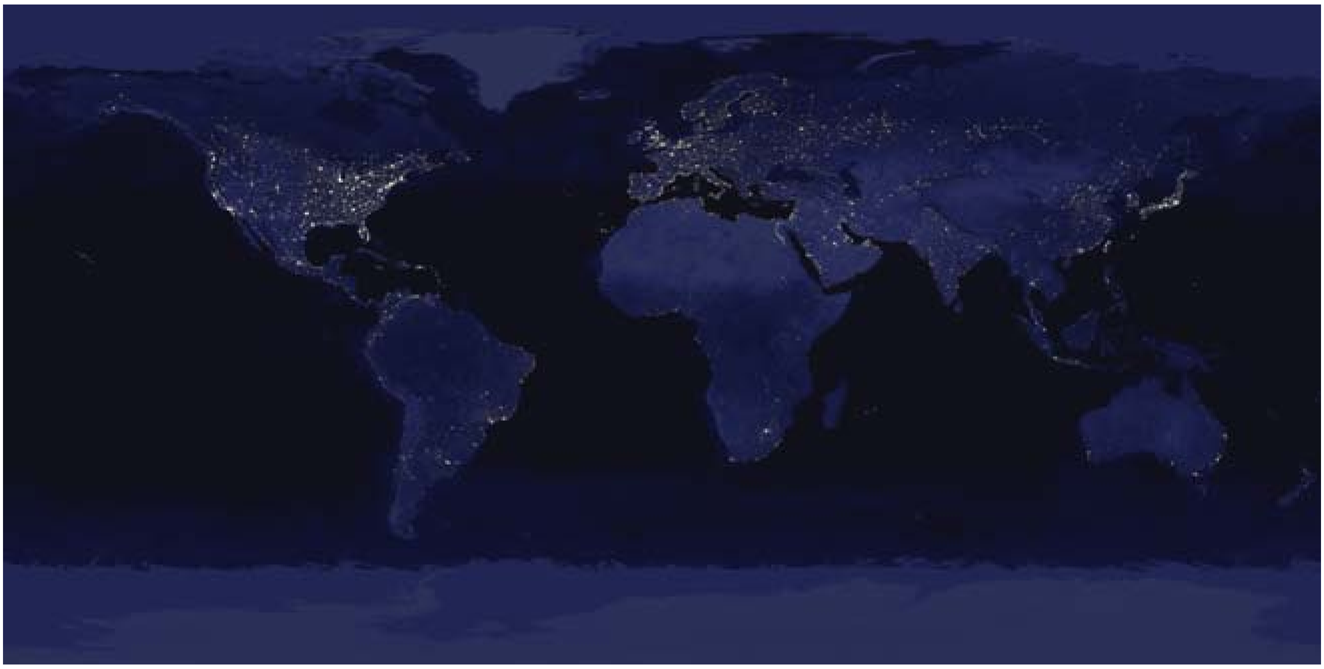

Figure 1 Source: NASA, DMSP

Light sources

Artificial sources of light can be classified amongst others as:

- Incandescent lamps
- Halogen incandescent lamps
- Fluorescent lamps
- Compact fluorescent lamps
- High-pressure discharge lamps
- LED systems

Incandescent lamps

The incandescent lamp works as a thermal radiator. The tungsten filament is heated to the point of incandescence by an electric current.

In this form of light generation, only about 5 percent of the applied energy is converted into light. The remainder is lost in the form of heat.

Halogen incandescent lamps

Conventional incandescent lamps are converted to halogen lamps by the introduction of halogens. The luminous intensity of halogen lamps is considerably higher, being up to 100 percent brighter than conventional incandescent lamps. Furthermore, the service life of a halogen lamp is considerably longer than that of a conventional incandescent lamp.

Fluorescent lamps

The fluorescent lamp is a gas-discharge lamp that is coated internally with a fluorescing material. The bulb contains active media in the form of mercury vapor and argon. When the fluorescent lamp is switched on, a high ignition voltage is applied which causes the gases to ionize. This creates plasma which emits mainly ultraviolet light, which is converted by the luminescent coating into visible light. Fluorescent lamps generate a considerably higher light output than incandescent lamps and as a result are over 75 % more energy efficient. However, there is a time lag before the maximum light output is reached.

Compact fluorescent lamps

Compact fluorescent lamps produce light in the same way as fluorescent lamps. By bending the tube several times the form of the lamp is space-saving and is compatible with conventional Edison threads. Compact fluorescent lamps have a high light output and are over 75 % more energy efficient than incandescent lamps. Fluorescent lamps and compact fluorescent lamps are low-pressure discharge lamps.

High-pressure discharge lamps

The functional principle of high-pressure discharge lamps is based on arc-discharge. Continuous arcing occurs between the two electrodes causing the gas inside the bulb to fluoresce. Floodlighting systems use high-pressure discharge lamps charged with mercury, metal halogen or sodium vapor. The best color reproduction comes from Xenon lamps, followed by the considerably more cost-effective metal halogen gas discharge lamps.

LED systems

Light emitting diodes are not thermal radiators; they generate light using diode technology. The semiconductor components in an LED form a diode. When an external voltage is applied, electrodes migrate to the recombination layer (p-n transition zone). The emission of light rays takes place in this recombination layer, whereby the wavelength depends on the material used, e.g. gallium phosphide (green) or aluminum gallium arsenide (red). With the continuing improvement of light output, LED systems have now established themselves over a wide range of applications, for example in traffic lights.

Holders

Depending on requirements, lamp holders can be manufactured using metals, ceramics, thermosetting plastics or thermoplastics. Holders made from metal or ceramics can be used where high temperatures are encountered. One disadvantage of metal holders is their susceptibility to corrosion. Ceramic holders have low impact resistance and high abrasiveness. Holders made from thermosetting plastics and thermoplastics can be used in low-temperature applications. Some advantages are offered by the cost-effective process of injection molding. Amongst other things, the choice of material will depend on the temperature range in service. This is subdivided into T classes, of which some of the more common examples are:

T class	Test temperature	Suitable materials
110	140 °C	PBT, PC
140	170 °C	PBT
180	220 °C	PBT
210	250 °C	PET
240	280 °C	PPS
270	310 °C	LCP, Ceramic
300	340 °C	Ceramic

Table 1 Subdivision of T classes

The general requirements for holders are that they are designed and constructed for the purpose for which they will be used, that they are reliable and do not represent a hazard to the user or the environment. This should be guaranteed by complying with the test standards.

These test standards are:

- Protection against electric shock
- Determination of contact force
- Protection against dust and water

- Insulation resistance and dielectric strength
- Durability
- Mechanical strength
- Leakage path and clearance in air
- Heat, fire and leakage current resistance
- Resistance to stress cracking and rust

For plastic lamp holders, this test catalog identifies specific requirements for the plastic materials. These are itemized in Table 2. The LANXESS product group Pocan® (PBT), with its B 4215, B 4225, B 4235 and the corresponding BF types as well as KU 2-7209, features suitable materials for the manufacture of fluorescent and compact fluorescent lamp holders.

Holder	Standards	Test	Parameters	Material
Fluorescent and compact fluorescent lamp holders	EN60400	Temperature resistance	T140 [1]	Pocan® B42xx, BF42xx, KU 2-7209
		Ball indentation test	T140, 2 mm [2]	
		Glow wire test	650 °C [3]	
		Needle flame test	pass	
		Leakage current test	PTI175 [4]	
		Voltage level V (out)	500 V	
	EN60598	Dielectric strength	4000 V	
Fluorescent lamp holders (UL)	UL496	CTI	175 V	Pocan® B42xx, BF42xx, KU 2-7209
		RTI	90 °C	
		UL94	V-2	
Low-voltage and high-voltage halogen lamp holders	EN60838	Temperature resistance	T300 [5]	LCP Ceramic
		Ball indentation test	T300, 2 mm [6]	
		Glow wire test	650 °C [3]	
		Needle flame test	pass	
		Leakage current test	PTI175 [4]	
Discharge lamp holders	EN60838	Temperature resistance	T300 [5]	LCP Ceramic
		Ball indentation test	T300, 2 mm [6]	
		Glow wire test	650 °C [3]	
		Needle flame test	pass	
		Leakage current test	PTI175 [4]	

Table 2 Plastic lamp holders and requirements of the materials

[1] T 140: 168 hours at 170 °C, no changes which could impair function

[2] at 170 °C a steel ball 5 mm in diameter is pressed against the surface with a force of 20 N; the deformation must not exceed 2 mm

[3] for use in domestic appliances in accordance with IEC 60335: GWIT 775 °C, GWFI 850 °C

[4] for use in domestic appliances in accordance with IEC 60335: PTI 250

[5] T 300: 168 hours at 340 °C, no changes which could impair function

[6] at 340 °C a steel ball 5 mm in diameter is pressed against the surface with a force of 20 N; the deformation must not exceed 2 mm

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