

Induction Lighting

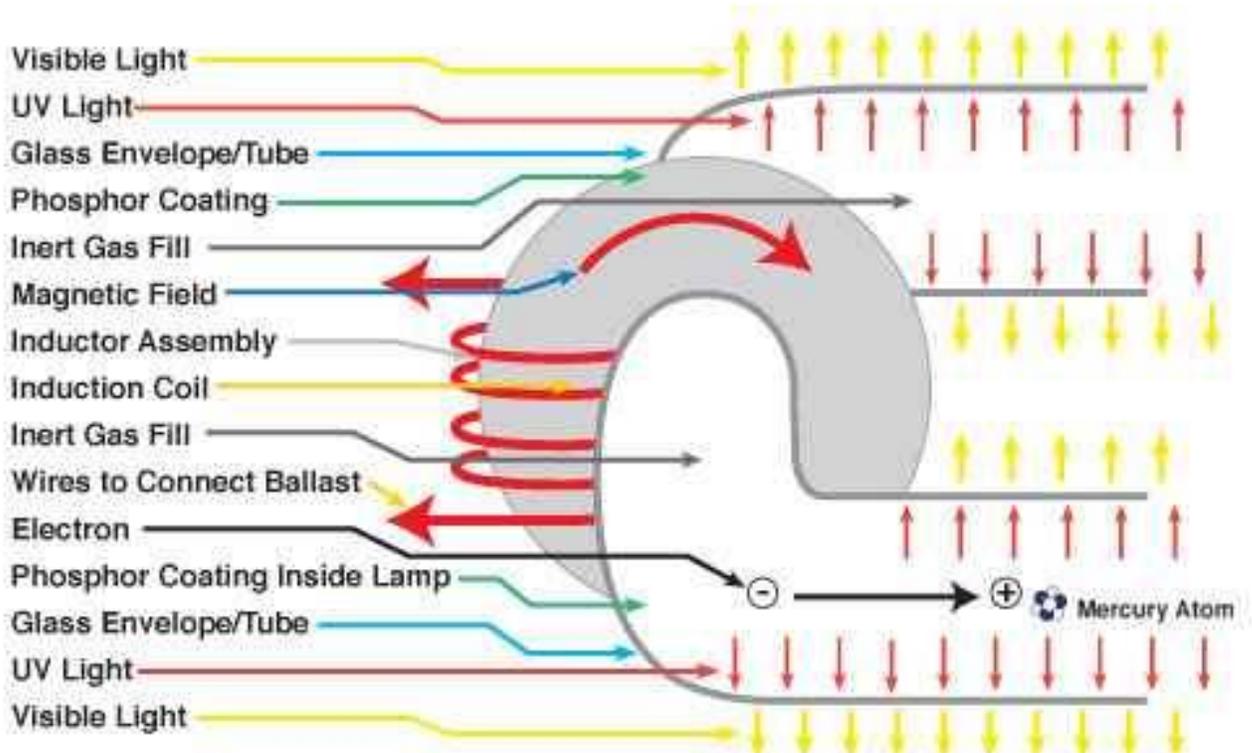
Dr. Mohamed H. Helal

Induction Lighting is a hybrid fluorescent lamp technology that eliminates the need for electrodes and filaments. The light is generated by high frequency transmission of energy combined with gas discharge that produces UV light then transformed to visible light when it touches the surface of phosphors coated. The combination of different phosphor percentages will allow to control the visible light color (Kelvin). Unlike the conventional fluorescent tubes the induction lamps will not suffer from failures caused by filament erosion, vibration, or seal breach.

Induction lamps have 2 main categories

- 1) External Induction
- 2) Internal Induction

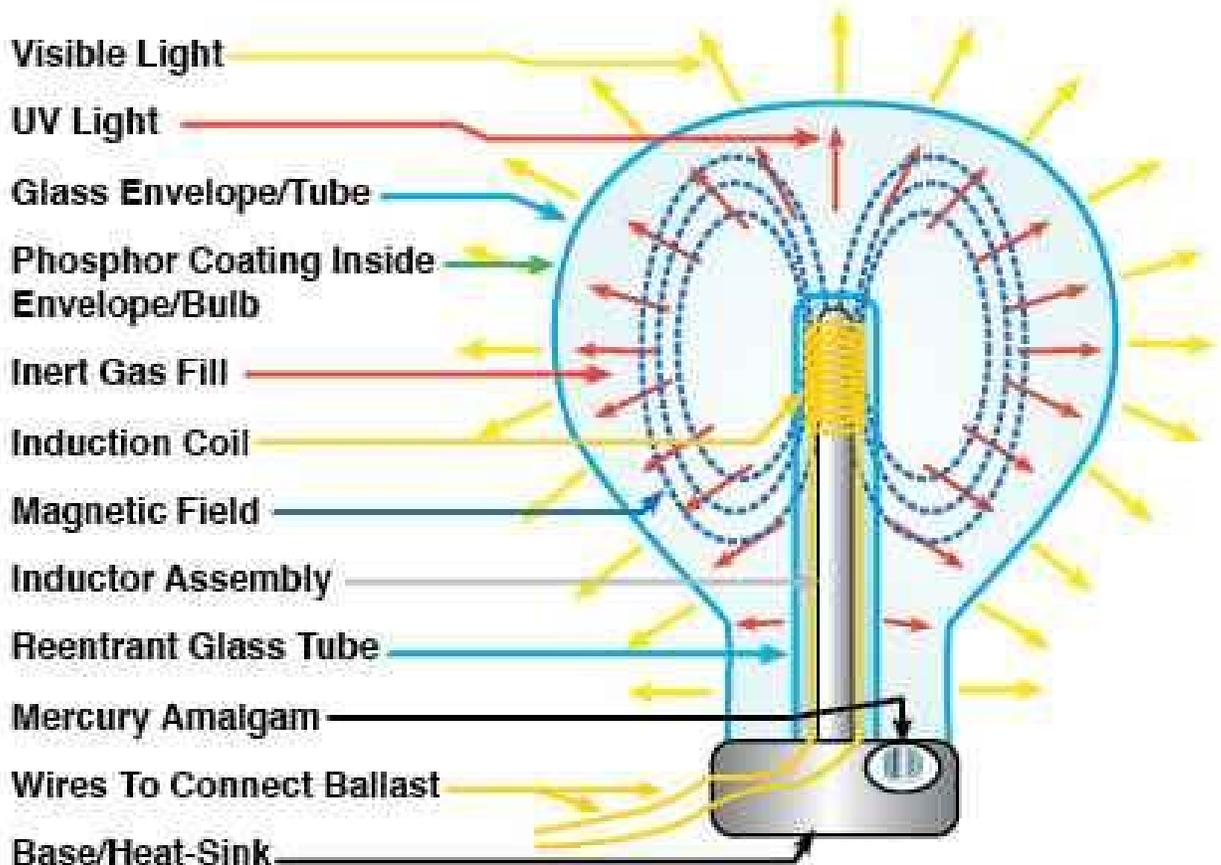
1) EXTERNAL INDUCTOR LAMPS



External magnetic induction lamps are essentially fluorescent lamps with electromagnets wrapped around a section of the lamp tube. High frequency energy, from the electronic ballast (generator), is sent through wires, which are wrapped in a coil around the ferrite inductor, creating a powerful magnet.

The induction coil produces a very strong magnetic field which travels through the glass and excites the mercury atoms in the interior which are provided by a pellet of amalgam (a solid form of mercury). The mercury atoms emit UV light and, just as in a fluorescent tube, the UV light is up-converted to visible light by the phosphor coating on the inside of the tube. The system can be considered as a type of transformer where the inductor is the primary coil while the mercury atoms within the envelope/tube form a single-turn secondary coil.

2) INTERNAL INDUCTOR LAMPS



In a variation of this technology, Internal magnetic induction lamps use a light bulb shaped glass lamp, which has a test-tube like re-entrant central cavity. This cavity is coated with phosphors on the interior, filled with inert gas and a pellet of mercury amalgam. The induction coil is wound around a ferrite shaft which is inserted into the central test-tube like cavity. The inductor is excited by high frequency energy provided by an external electronic ballast (generator) causing a magnetic field to penetrate the glass and excite the mercury atoms, which emit UV light, that is converted to visible light by the phosphor coating.

External induction lamps typically have a longer life (80k Hrs-100k Hrs) than internal induction lamps (60k Hrs-80k Hrs). External induction lamps manage heat either by convection through the air or conduction into the fixture. Internal induction lamps operate with a higher internal temperature and must cool by conduction to the base heat sink and by radiation through the glass walls. With both lamp types a small percentage of mercury ions are absorbed by the phosphor coating over time; once the mercury ions inside the envelope are depleted, the lamp emits only a very dim light and has to be replaced.

Electronic Ballasts (generators) are warranted for five years. (Actual life expectancy can be significantly longer with proper thermal management.)