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Electronic Control Gear

Electronic Control Gear

Electronic control gear is a device intended to limit the amount of current in an electric circuit.
Ballasts vary greatly in complexity. They can be as simple as a series resistor as commonly used with small neon lamps or light-emitting diodes (LEDs). For higher-power installations, too much energy would be wasted in a resistive ballast, so alternatives are used that depend upon the reactance of inductors, capacitors, or both. Electronically-controlled ballasts may incorporate a microprocessor to form a so-called "digital ballast".

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Digital HID ballasts

A Digital HID lamp ballast is an electronic ballast that uses a microprocessor to control and regulate a discharge lamp. The firmware can provide control algorithms to provide varying lamp current for dimming or to optimize lamp output as the lamp ages.

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Electronic ballasts

A2 Class Electronic ballast for 2 pcs of 58W fluorescent lamps
Electronic ballast of a compact fluorescent lamp
An electronic lamp ballast uses solid state electronic circuitry to provide the proper starting and operating electrical condition to power one or more fluorescent lamps and, more recently, HID lamps. Electronic ballasts usually change the frequency of the power from the standard mains (e.g., 60 Hz in U.S.) frequency to 20,000 Hz or higher, substantially eliminating the stroboscopic effect of flicker (a product of the line frequency) associated with fluorescent lighting (see photosensitive epilepsy). In addition, because more gas remains ionized in the arc stream, the lamps actually operate at about 9% higher efficiency above

approximately 10 kHz. Lamp efficiency increases sharply at about 10 kHz and continues to improve until approximately 20 kHz.[1] Because of the higher efficiency of the ballast itself and the improvement of lamp efficiency by operating at a higher frequency, electronic ballasts offer higher system efficiency. In addition, the higher operating frequency means that it is often practical to use a capacitor as the current-limiting reactance rather than the inductor required at line frequencies. Capacitors tend to be much lower in loss than inductors, allowing them to more closely approach an "ideal reactance".
Electronic ballasts are often based on the SMPS topology, first rectifying the input power and then chopping it at a high frequency. Advanced electronic ballasts may allow dimming via pulse-width modulation and remote control and monitoring via networks such as LonWorks, DALI, DMX-512, DSI or simple analog control using a 0-10V DC brightness control signal.

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Fluorescent lamp ballasts Instant start
An instant start ballast starts lamps without heating the cathodes at all by using high voltage (around 600 V). It is the most energy efficient type, but gives the least number of starts from a lamp as emissive oxides are blasted from the cold cathode surfaces each time the lamp is started. This is the best type for installations where lamps are not turned on and off very often.

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Rapid start
A rapid start ballast applies voltage and heats the cathodes simultaneously. Provides superior lamp life and more cycle life, but uses slightly more energy as the cathodes in each end of the lamp continue to consume heating power as the lamp operates. A dimming circuit can be used with a dimming ballast, which maintains the heating current while allowing lamp current to be controlled.

Programmed start

A programmed-start ballast is a more advanced version of rapid start. This ballast applies power to the filaments first, then after a short delay to allow the cathodes to preheat, applies voltage to the lamps to strike an arc. This ballast gives the best life and most starts from lamps, and so is preferred for applications with very frequent power cycling such as vision examination rooms and restrooms with a motion detector switch