

Ballasts

What are some commonly used Ballast and Electrical terminology?

GENERAL INFORMATION

Ballast Types: There are three types of lighting ballasts.

- 1) Magnetic: an inefficient device that uses a core and coil assembly transformer to perform the minimum functions required to start and operate the lamp.
- 2) Hybrid or "low frequency electronic": essentially a magnetic ballast with a few electronic components that switch off voltage to the lamp coil once the lamp has started. A minimal increase in efficiency is obtained via more expensive magnetic core material and the absence of power to the lamp coils during operation.
- 3) High frequency electronic: a ballast that operates lamps at frequencies above 20,000 Hz. Maximum efficiency is obtained through the use of electronic circuitry and optimum lamp operating characteristics.

Ballast Basics: Ballasts have two primary functions:

- 1) start the lamp and
- 2) control operation of the lamp once it has started.

High frequency electronic ballasts operate lamps more efficiently (30-40% at equivalent light output) and eliminate the hum and visible flicker normally associated with standard magnetic ballasts. Electronic ballasts also typically have better power quality than magnetic ballasts (higher power factor and lower THD).

Where's the Watts?: OSRAM SYLVANIA's two-lamp FO32T8 electronic instant start ballast has an input of 59 watts. This number is comprised of lamp wattage plus ballast losses (the power that is dissipated as heat instead of being converted to light). Each FO32T8 lamp is rated for 100% light output at 32 watts low frequency rapid start, but only 28 watts when operated on high frequency electronic instant start ballasts (due to the fact that lamps operate more efficiently at high frequency). Therefore, each of the two lamps operates at 28×0.90 ballast factor = 26 watts per lamp. The other seven watts in this system are the ballast losses.

"Squiggle": The "sine wave" graphic logo of the Electronic Control Systems division of OSRAM SYLVANIA. Signifies the transition from old technology to the high frequency, high technology electronic ballasts of the future.

American National Standards Institute (ANSI): An organization that develops voluntary product performance standards for several industries. ANSI C82.11 applies to electronic ballasts.

Performance Certification: The OSRAM SYLVANIA Test and Measurement Laboratory holds accreditation for testing of Energy Efficient Lighting Products under the National Voluntary Laboratory Accreditation Program (NVLAP). This is the same organization that certifies other various test facilities and programs such as ETL, CBM, etc. This assures that our measurements meet strict guidelines for precision and accuracy.

Quality Assurance: All OSRAM SYLVANIA production facilities are ISO 9002 certified, and all production is subject to incremental quality control, assuring the highest quality and reliability. Customer feedback and field reliability data have shown exceptional performance of OSRAM SYLVANIA electronic ballasts.

MTBF - Mean Time Between Failures: A calculation of ballast life based on thermal conditions, component values, and circuit characteristics used to develop relative predictions of ballast life. OSRAM SYLVANIA uses a methodology that typically provides a 1:10 actual life prediction based on MTBF calculations.

Safety: Ballasts should be installed and operated in compliance with the National Electric Code (NEC), Underwriters Laboratories Inc. (UL) requirements, and all applicable codes and regulations. As it is possible to come in contact with potentially hazardous voltages, only qualified personnel should perform ballast installation. All installation, inspection, and maintenance of lighting fixtures should be done with the power to the fixture turned off.

Grounding: The ballast case and fixture must always be grounded. The grounding helps assure safety, proper lamp starting, and acceptable EMI/RFI performance. Install ballast in accordance with national and local electrical codes.

Fusing: All OSRAM SYLVANIA QUICKTRONIC® ballasts contain inherent electrical protection. Although there is no need to externally fuse the ballast, should code or regulation require one, 3 amp slow blow fuses are recommended.

Fluorescent Lamp: An electric discharge device in which ultraviolet energy excites the lamp's phosphor coating and transforms that energy into visible light. Diameter is measured in eighths of an inch (T8 lamp equals one inch diameter).

Socket Wiring/Lamp Connections: Proper connection to good quality sockets, wired according to the diagram shown on the product label is essential. As some applications may not require the use of all the ballast output leads, unconnected leads should be capped individually and insulated to at least 600 volts.

BALLAST OPERATING CHARACTERISTICS

PROStart® (PS): A programmed method of starting fluorescent lamps where cathode heat is applied prior to lamp ignition, then removed or reduced once the lamp has ignited (except dimming models which optimize cathode heat). PROStart ballasts maximize the number of lamp starting cycles while maintaining energy efficiency. This is the

preferred mode of lamp starting for applications with occupancy sensors and several on/off cycles per day. Additionally, the lamps will strike reliably in cold conditions down to 0° F.

Rapid Start (RS): Rapid start ballasts apply a low filament voltage to preheat the cathodes. Simultaneously, a starting voltage (lower than that used in instant start) is also applied to strike the arc. When the cathodes are hot enough, the lamp will strike. The filament voltage continues to be applied throughout the operation of the lamp. Rapid start ballasts appear to have a slight turn on delay compared to instant start. They will typically not be able to start lamps reliably under 50° F.

Instant Start (IS): Instant start ballasts apply high voltage across the lamp with no preheating of the cathode. This is the most energy efficient starting method for fluorescent lamp ballasting. IS ballasts use 1.5 to 2 watts less per lamp than rapid start ballast. Other IS ballast benefits typically include parallel lamp circuitry, longer remote wiring distance, easier installation due to less complicated wiring, and capability to start lamps at 0° (versus 50° F for rapid start).

Instant Start (IS) vs. Rapid Start (RS): Instant start (high voltage is applied across the lamp with no preheating of the cathode) is the most energy efficient starting method for fluorescent lamp ballasting. IS ballasts use 1.5 to 2 watts less per lamp than rapid start ballasts (low voltage is applied to the cathodes prior to lamp ignition and is maintained throughout operation). Other IS ballast benefits typically include parallel lamp circuitry, longer remote wiring distance, easier installation due to less complicated wiring, and capability to start lamps at 0°F (versus 50°F for rapid start).
Glow to Arc Transition: In order to achieve full rated lamp life, a ballast should start a lamp so that the time from when the lamp begins to glow to the time the lamp arc strikes should be short as possible. OSRAM SYLVANIA instant start ballasts typically accomplish this task within 50 msec.

Parallel vs. Series: Wiring configurations for ballasts. Ballasts with parallel lamp circuitry have the benefit of companion lamps remaining lit, even if one of the lamps operated by the ballast should fail. Systems with series lamp wiring (magnetic ballasts and many rapid start and programmed rapid start electronic types) result in all lamps operated on the ballast going out if one should fail.

Lamp Current Crest Factor (LCCF): The ratio of peak lamp current to the RMS (average) lamp current. Lamp manufacturers require a LCCF of less than 1.70 in order to achieve full lamp life. Values less than 1.70 do not achieve higher than rated lamp life.

Lamp Flicker: High frequency electronic ballasts provide a minimal level of lamp flicker. Lamp flicker from magnetic ballasts can cause eye fatigue for some people.

Power Factor: A measure of the effectiveness with which an electrical device converts voltamperes to watts; devices with power factors (>0.90) are “high power factor” devices.

Total Harmonic Distortion (THD): A measure of the distortion of an electrical wave form. Excessive THD (defined by ANSI as greater than 32%) may cause adverse effects to the electrical system. <20% THD ballasts are fine for most applications. However, in buildings with neutral problems caused by high THD loads such as computers, printers, DC supplies, etc., the <10% THD products can help reduce the overall % of Total Harmonic Distortion. K-Factor: A measurement that quantifies the effect of non-linear equipment, such as lighting ballasts, on an electrical system. Lighting systems should be designed so that the transformer rating is sufficient for the ballasts used (typically K-Factor <4). All OSRAM SYLVANIA ballasts meet this specification.

EMI/RFI (electromagnetic interference/radio frequency interference): Electronic Ballasts contain circuits that limit electrical noise conducted onto the power line or radiated through the air, otherwise referred to as EMI/RFI. OSRAM SYLVANIA ballasts comply with FCC 47 CFR Part 18, non-consumer limits for commercial applications. Ballasts for residential applications must meet consumer limits. OSRAM SYLVANIA has magnetic ballasts and new QTR electronic ballasts for residential use.

Transient Protection: OSRAM SYLVANIA ballasts meet ANSI 62.41 Category A. This helps ensure immunity to electrical disturbances such as power line transients temporary line voltage dropouts, surges and sags.

Ballast Losses: Power consumed by a ballast that dissipates as heat instead of being converted into light. Electronic ballasts operate more efficiently than magnetic or hybrid ballasts. A typical ballast loss for a standard two lamp magnetic ballast is 20 watts, while an electronic equivalent would be only 7 watts.

Ballast Factor (BF): Relative light output as compared to a reference ballast (i.e. BF of 0.90 would yield 90% of a lamp's rated lumens). OSRAM SYLVANIA offers T8 systems in three ranges of light output: Normal: (0.85-1.0) BF; Low Power (LP): (0.74-0.80) BF; and High Light Output (PLUS): (1.15-1.20) BF.

Ballast Efficacy Factor (BEF): Relative light output (ballast factor) divided by input power (watts). Used to measure the level of efficiency of similar ballast models. For example, the OSRAM SYLVANIA QT2X32IS which has ballast factor of 0.90 and input watts of 59 (BEF = 1.53), is more efficient than competitors' electronic ballasts with ballast factor of 0.875 and input watts of 62 (BEF = 1.41).

Maximum Case Temperature: All OSRAM SYLVANIA electronic ballasts have a maximum allowable case temperature of 70°C or ____°C. Applications in which the case temperature exceeds this maximum void all warranties.

Potting Compound: Some OSRAM SYLVANIA ballasts are encapsulated with potting compound. This ensures thermal as well as structural integrity. Ballasts without potting compound may lower maximum allowable case temperature and if not properly thermally designed may shorten ballast life.

Ballast Life: OSRAM SYLVANIA ballasts are designed to have a life expectancy of 60,000 hours. To maximize life, ambient temperature should be kept as low as possible. It is also important to maintain effective dissipation of heat using the lighting fixture as a heatsink for the ballast enclosure.

Enclosure Size: OSRAM SYLVANIA ballasts typically have an enclosure size the same as the magnetic type in which it is intended to retrofit. In an effort to aid fixture designers in their ability to create more efficient fixtures, the industry trend is towards narrower and shallower enclosures.

High Voltage Integrated Circuit (HVIC): Proprietary microprocessor control that is featured in selected QUICKTRONIC® ballasts. Replaces over one-third of the components used in conventional ballasts while providing enhanced features such as higher efficiency, improved lamp starting, end-of-lamp-life sensing, circuitry to limit in-rush current, and constant light output over a wide range of input voltages.

Audible Noise (Sound): All fluorescent lamp ballasts produce some noise. OSRAM SYLVANIA brand ballasts are sound rated A (up to 75% quieter than magnetic types) and are acceptable for most applications. Care should be taken when mounting the ballast to reduce vibration.

Polychlorinated Biphenyls (PCBs): This material, formerly used in ballast capacitors, is now considered hazardous and disposal is regulated. A ballast should be assumed to contain PCBs unless stated otherwise on the ballast label (contact manufacturer for confirmation). OSRAM SYLVANIA ballasts do not contain PCBs.

SYSTEM CONSIDERATIONS

SYSTEM SOLUTION: Optimum choice when planning the lighting system for a lighting retrofit or new construction. In the case of OSRAM SYLVANIA, the same manufacturer supplies both lamp and ballast, assuring combinations that have been specifically designed to provide optimal system performance. OSRAM SYLVANIA is the only company in the world that makes its own ballasts and lamps, and has its own lighting services division.

QUICKSENSE®: Patented technology that utilizes “dynamic power sensing” to detect end-of-life for lamps of T5 and less diameter. Dynamic sensing minimizes incidence of false shutdowns and ensures maximum system safety even in low and high line input voltage conditions. If gone unchecked, the heat generated by small diameter lamps at end of lamp life can melt lamp sockets and cause the lamp glass wall to crack and break.

QUICK 60+®: The first and most comprehensive system warranty in the industry. QUICK 60+ offers the end user coverage for both lamp and ballast. This eliminates the common occurrence of “finger pointing” between lamp and ballast manufacturers over whose product failed and which party is responsible. One phone call by the end user

to OSRAM SYLVANIA provides problem resolution and customer satisfaction.

FIXTURESIDE ASSISTANCE®: There are three options for the end user to choose from to service the QUICK 60+® system warranty. OSRAM SYLVANIA is the first lighting company to offer “FIXTURESIDE ASSISTANCE”, an option where OSRAM SYLVANIA will send a service technician to the installation and perform the necessary replacements. Other options include coordinating a contractor of the end user’s choice to perform the required service, or reimbursing the end user for labor incurred during service.

Light Level: Light output from a system is a function of rated lamp lumens, ballast factor, fixture efficiency, and ambient temperature. All of these factors must be considered when designing or retrofitting a lighting system.

Fixture Watts: The input wattage shown in the ballast specifications is measured as per ANSI specification (ballast and lamps are measured while placed on benchtop at room temperature). Actual operation in an enclosed fixture, due to the ambient heating of the lamps, is approximately 1.5 watts less per lamp than the ANSI input wattage specification.

SYSTEM LP/ISL: Designed to operate OCTRON® T8 lamps at lower power levels, when reduced light output is acceptable. SYSTEM 32 LP is ideally suited to retrofit 34W T12 magnetic ballast systems because it provides equivalent light output at energy savings of 30%.

SYSTEM PLUS/ISH: For applications where maximum light output is desired (i.e. retail, manufacturing, display, etc.), PLUS systems are ideal. A ballast factor of 1.20 offers 30% more light output than standard T8 and T12 systems, while maintaining full rated lamp life. Applications with eight-foot lamps that require higher light levels can use 59PLUS and the standard FO96 T8 lamp, simplifying inventory and minimizing cost. All PLUS systems operate standard OCTRON T8 lamps, achieve full rated lamp life, and are covered by the QUICK 60+ comprehensive system warranty.

Low Temperature Starting: OSRAM SYLVANIA QUICKTRONIC® instant start and programmed start electronic ballasts have the capability to start fluorescent lamps at temperatures down to 0°F providing the following conditions are met:

1. The ballast is operated at rated nominal line voltage.
2. Ballast cannot be tandem/remote wired for low temperature starting applications.

Please note, starting time may increase at 0°F ambient temperatures. Enclosed fixtures are recommended as fluorescent lamps have reduced light output at cooler ambient temperatures. (See specifications for each model’s starting temperature rating.)

Lamp Seasoning:

1. Low Temperature Applications - For optimal performance, fluorescent lamps may require seasoning for up to 100 hours prior to low temperature starting.
2. Dimming Applications - For optimal dimming performance, fluorescent lamps may require seasoning for up to 100 hours before dimming to lowest light levels. Please consult the lamp manufacturer to obtain specific requirements for low temperature or dimming applications.

In-Rush Current: When a lighting system is energized, a momentary surge of current occurs called "in-rush". This current must be limited so that it does not harm auxiliary lighting controls. Most electronic ballasts rated at <20% THD contain a passive front end inductor that typically results in lower levels of in-rush. Ballasts that have <10% THD typically use active power factor correction and, unless limiting circuitry is included, can have 40 amps or more of in-rush current. This may damage mechanical switches and contacts. In-rush current should be considered when designing or retrofitting a lighting system.

Remote Wiring Capability: QUICKTRONIC T8 instant start systems can be mounted remotely from the lamp sockets at a distance up to 18 feet. (See ballast specifications for each model.)

Connectors: QUICKTRONIC ballasts with push-in/poke-in/wire trap connectors require use of 18 AWG solid copper wire only.

Infrared Interference: Some infrared controls may be susceptible to interaction with fluorescent systems. This is due to infrared energy from the lamps. Either increasing the distance between the fluorescent lamp and the infrared receiver, or shielding the infrared receiver from the lamp, can alleviate this interaction.

Powerline Carriers: Schools, institutions and some industrial installations utilize powerline carrier control systems (to control time clocks, alarms, etc.) on the same circuit panel as the lighting system. Some electronic ballasts are incompatible with these powerline carriers and inhibit their performance (the electronic circuitry blocks or alters the carrier signal characteristics). OSRAM SYLVANIA offers a full line of compatible T8 electronic ballasts for installations using powerline carrier control systems. (See ballast specifications for each model.)

