

Safety, reliability and standards

1- Enhanced operational safety

Electronic ballasts from FUTEK enhance the operational safety of luminaries as they can be relied on to switch off in response to abnormal operating statuses such as short circuiting, no load operation and lamp breakdown.

2- Enhanced fire protection

Owing to their low housing temperatures, electronic ballasts are also suitable for use on highly inflammable building materials such as wood. These units meet the requirements of DIN VDE 0710.

They are marked or and maybe fitted amongst other things to furniture for the luminaries manufacturer, the temperature advantage Means that he can obtain the fire protection marks or for lamps equipped with P family ballasts from FUTEK .

FT-IN ballast family that uses instant start ballast are also suitable for use in explosion –protected luminaries as they only use a single lamp electrode.

3- Regulations and standards

All electronic ballasts from FUTEK conform to international regulations and standards:

Safety (EB)	EN 60928
Function (EB)	EN 60929
Immunity to Interference	EN 61547
Mains harmonics	EN 61000-3-2

Luminaries manufacturers are subject to further regulations. FUTEK ballast has already been protested in conventional luminaries in accordance with these standards.

Luminaries	EN 60598
Emergency lighting	VDE 0108
RFL-suppression	EN 55015

4-CE identification

CE identification is not identification issued by a test institute indicating conformity with a standard, in fact it documents the fulfillment of the basic requirements of the standards cited in EU directives , it must be applied by the manufacturer to the product the packaging or both and has no effect on any other marks of conformity .since 01.01.1996 this identification has been compulsory in conjunction with the EMC (Electromagnetic Compatibility) directive 89/336/EEC and since 01.01.1997 in conjunction with the low voltage directive 73/23/EEC the manufacturer himself is responsible for CE identification which, unlike the VDE or ENEC symbols, does not require testing by a test institute.

However, the manufacturer is obliged to furnish the conformity declarations for the various products as well as test and protection documents.

FUTEK electronic ballasts bear the CE identification conformity declarations and manufacture documents are available for inspection this documents that all luminaries equipped with FUTEK electronic ballast comply with the regulation on RFI-suppression, interference immunity and mains harmonic limits, subject to the provision that the assembly instructions are adhered to.

5-Marks of conformity

The ENEC sign (European Norms of Electrical Certification) is a mark of conformity and certification for luminaries (and also for luminaries components as of March, 1995) which is valid in 22 European countries. This mark documents that a current production is monitored by inspectors of the test institute. The ENEC mark is displayed with the identification number of the national test institute and frequently combined with its logo. FUTEK electronic ballast are VDE tested and ENEC certification is in preparation.

6-Reliability

The reliability of electronic ballast depends largely on appropriate steps being taken during the development phase in this context it is essential that the reliability parameters are theoretically determined on the basis of the latest findings (MTBF time ,MIL standards ,etc) FUTEK analyzes the weak points of critical components such as electrolytic capacitors and semi-conductors furthermore the failure rate can be reduced by employing high grade components temperature and durability tests in the development and pilot phases lay the foundations for a long service life of the equipment in all applications.

FUTEK carries out heat measurements and voltage tests in its own state of the art test facilities and operates its own Spectrum Analyzer Test laboratory that tests and analyzes performance of Ballasts with electric line and with lamps cathodes and filaments to insure best possible longer service life of tubes . In production, defective materials are detected and protection faults avoided with the aid of systematic quality assurance measure such as incoming goods controls with conformity to ISO 9001 / 2000.

Quality is documented in in-circuit and function tests of all the subassemblies burn in tests prevent premature failure by ensuring the examination of all functions under high temperature loads and thus contribute towards high reliability, test is performed to 100% production units.

Efficient Luminaries Production (Few Components)

The use of electronic ballast considerably reduces the effort needed in component assembly and wiring , in addition to the savings of time and costs in production there also advantages in terms of logistics and warehousing due to reductions in the number ,volume and weight of the individual components over conventional ballasts.

Number of components

Taking the example of a 4* 18 W luminaries

Conventional ballast	Electronic ballast
4 conventional ballast	1 electronic ballast
8 screws	2 screws
8 lamp holders	8 lamp holders
8 cable holders	8 cable holders
4 starter	1 terminal block
4 starter holder	
1 RFI-suppression capacitor	
1 compensation capacitor	
1 capacitor holder	
1 terminal block	
40 components	20 components

IDC-terminals

All FUTEK electronic ballasts for T lamps are equipped with VDE- tested IDC-terminals this proven wire connection system has facilitated highly efficient automation thanks to its excellent connection quality rapid contacting reduction in conductor lengths and simple final luminaries inspection conventional plug connection terminals are also fitted

Advice on fitting electronic ballasts in luminaries

In order to ensure trouble free operation and long services life of the control gear it is important to observe the relevant regulations and the detailed assembly instructions the following points demand special attention

Wiring instructions

The ballast should be wired with conductors of the prescribed specification refer to the installation instructions to determine whether rigid or flexible conductors can be employed FUTEK electronic ballast are usually designed for automatic luminaries wiring with IDC terminals and for manual wiring with plug connection terminals

Thermal conditions

The maximum permitted temperature which is given on the external upper surface at a marked point must not be exceeded in normal operation at the rated voltage or at the maximum value of the rated voltage range as a result the following points must be observed during installation:

- * The lamp electronic ballast must be effectively thermally separated
- * The electronic ballast should be fitted as far away as possible from lamps and other heat sources
- * For effective heat conduction the electronic ballast must rest against a firm and flat surface
- * Installation on protruding surfaces should be avoided

Advice on RFI-suppression

The RFI-level depends essentially on the design of the luminaries and its wiring.

- **In the case of electronic ballasts with metal housings, make sure there is a good electrical contact between all metal parts such as the electronic ballast, lamp housing, louvers and reflector.**

Earthed metal surfaces improve shielding.

- **Cables between the electronic ballast and lamp should be kept as short as possible. The hot, marked HF conductors must be kept as short as possible in order to minimize interference emission.**

- **In order to prevent the injection of interference into the supply network, the distance between the mains cables and lamp conductors should be as large as possible.**

- **Mains cables should be kept short and not laid parallel to the electronic ballast and lamp.**

- **Automatic wiring with the automatic**

Luminaries production system ensures reproducible conductor routes.

According to EN 55015, luminaries operated with electronic ballasts must be tested for compliance with the RFI-suppression limits.

Installation advice for luminaries with electronic ballasts

For the installation of luminaries with electronic ballasts in lighting systems, the relevant regulations and detailed installation instructions must be observed.

This applies particularly to the following points.

Dimensioning of circuit breaker

Luminaries with conventional ballasts are ignited in a staggered pattern when the lighting installation is switched on. By comparison, lamps equipped with electronic

Ballasts are ignited almost simultaneously.

The smoothing capacitors in the electronic ballast are charged by a high current pulse. A high inrush current is the result. From this it is possible to derive the maximum number of luminaries which may be connected (depending on the response behavior of the circuit breaker).

FUTEK electronic ballasts with inrush current limitation increase the possible number of luminaries. Details given in the installation instructions are in practice often influenced by system-related factors, e.g. by the circuit impedance of power feed.

3-phase connection of electronic ballast luminaries to prevent damage to the electronic components of the electronic ballasts, the following points must always be observed before initial operation of the lighting system:

- **Make sure that the mains voltage complies with the mains voltage range (AC, DC) of the electronic ballasts.**
 - **All luminaries must be accurately connected to the neutral conductor as otherwise impermissible over voltages may occur.**
 - **Conductors may only be connected and disconnected in a de-energized state.**
 - **Never disconnect the neutral conductor first or by itself.**
 - **The isolation resistance test with 500 V DC voltages may only be carried out between external conductors L and Earth. No connection must exist to the neutral conductor. On completion of the test make sure that neutral has been reconnected.**
- Leak currents**

On electronic ballasts operated with RFI-suppression capacitors, inrush and low continuous currents occur via the protective earth. Consequently circuit breakers may respond. It is therefore advisable

- **to assign the luminaries to the phases L1, L2 and L3;**
- **To employ 3-phase circuit breakers;**
- **If permissible, to install a circuit-breaker with a leak current of 30 mA.**
- **To connect a maximum of 30 EBs.**

Interference with infrared systems

Fluorescent lamps generate emissions in the wavelength range also used by infrared systems. The emitted light is modulated at twice the frequency of the electronic ballasts. To prevent interference with remote controls, sound transmissions, ripple control systems and paging Systems, these installations should operate with a high carrier frequency.