



*Federation of National Manufacturers Association for
Luminaires and Electrotechnical Components for
Luminaires in the European Union*

**CELMA position paper
T5 and T8 Fluorescent Lamp and LED Lamp/Module Adaptors
"Retro-fit Conversion Units" for T8, T10 & T12 Luminaires**

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Introduction

If you want to improve the energy efficiency of your lighting installations, the most effective way, which will also improve the lighting quality whilst reducing maintenance and operating costs, is by the installation of a new high efficiency lighting installation.

However, there may be reasons* why the lighting installation is not replaced with a new high efficiency installation on every occasion when some upgrading is necessary. Therefore when existing luminaires have their lives extended e.g. by the fitting of new control gear and lamps, considerations need to be made as to how these modifications are made to the existing luminaires.

*Note: These may include: luminaires which are installed in hard-to-access ceilings where the cost of replacement would be excessive; or upgrading the control gear to reduce energy consumption in luminaires that have some design features that particularly suit the space; or to change the light distribution to suit new task requirements in the space and hence, extend the life of the installation.

Changes to the existing luminaires may be simple "add-ons" (adaptors) which allow the fitting of a low energy control gear and a new light source, through to complete replacement of the internal components of the luminaire. Sometimes these modifications would be made off site but more often they are made in situ. The simple "add-ons" create great concern in view to the safety and the product performance.

With the following document, CELMA highlights the risks and gives recommendations to avoid any danger.

Original Luminaire

A new luminaire will have been designed and manufactured to meet the safety and performance requirements of the relevant standards and will have been photometrically tested to enable the lighting scheme designer to calculate the correct number of luminaires and their location to meet the task requirement. In addition, each and every luminaire will have been tested at the end of the production line to ensure that it is electrically safe. The manufacturer then affixes the CE mark to the luminaire to confirm that this product meets the essential requirements of the relevant Directives. This is a legal requirement!

Adaptors

These types of adaptors replace the original T8, T10 or T12 fluorescent lamps operated by switch start or SRS magnetic control gear or high frequency electronic control gear in an already installed luminaire. They are marketed on the basis that they reduce the energy consumption of the installed luminaire. There are a number of different versions of such adaptors including the following:

- 1) Replacement of the existing lamp with a new “luminaire” which may use a T5 lamp or LED lamp/module that plugs into the existing lamp holders. Some versions provide alternative fixings in case the original lampholders cannot cope with the weight of the adaptor. The existing luminaire is then re-wired to provide mains voltage onto the original lamp holders or via a cable passed through the vacant starter switch hole in the body of the original luminaire to the adaptor. With respect to some types of fluorescent and LED lamp/module adaptors, it is known that the bi-pin at the end of the “adaptor” may be “live” when the other end is inserted into the lamp holder. This is not covered by the safety standards – only under the LVD which requires products to be “SAFE”. This means that there is an “unsafe” situation can occur at the time when these fluorescent and LED lamp/modules are installed;

OR

- 2) By the addition of an electronic control gear that plugs onto one end of the new T5 lamp whilst a spacer plugs onto the other end of the lamp. This trio of components plugs into the existing lamp holders. The existing starter has to be removed and a bridging device installed. In addition, the power factor correcting capacitor and RF capacitor (if fitted) have to be removed from the circuit;

OR

- 3) By the addition of a very long electronic control gear that plugs onto one end of the new 6 ft T8 lamp to fill the space between the lamp holders of 8ft T12 lamped luminaires;

OR

- 4) Other adaptor type products not referred to here that may be on the market today or come onto the market in the future.

These modifications to the original luminaire may compromise the safety and performance of the original luminaire and concerns have been raised in many quarters (internationally and domestically) as to how to address the safety and performance aspects of the adapted luminaires.

NOTE: Similar problems affecting safety and performance may apply to other types of lamp adaptor not considered here.

International Considerations

*“The international committee of IEC SC34D MT LUMEX confirms that there are NO component standards by which these components can be tested to ensure their safety or performance in use. It is only possible to ensure the safety and performance in use of the components when they are tested with the luminaires they are intended to convert and comply fully with the requirements of IEC 60598-1 and any other relevant standards.”^{*1}*

^{*1} See IEC document 34D/891/INF

The reasons behind this decision were based on the following safety and other concerns:

Experts examined a number of "retro-fit conversion units" (referred to in future as "adaptors") which are intended to be retro-fitted to existing T8, T10 or T12 fluorescent lamp luminaires and found the following safety and other concerns regarding the samples examined:

Safety

- ❖ There may be adverse changes to the thermal characteristics of the original luminaire?
- ❖ Are the lamp holders of the original luminaire over stressed by the weight of the adaptor units?
- ❖ Do the dimensional tolerances of the "plug on" adaptors exceed the tolerances permitted between the original lamp holders?
- ❖ Do the converted luminaires comply with the requirements of the luminaire safety standard EN 60598-1?

- ❖ Most components used in luminaires are able to be tested to their own standards. In the case of these adaptors, there are no specific standards covering their safety or performance?
- ❖ As a result of the above points there is a possibility that the converted luminaires may not comply with the requirements of the luminaire safety standard EN 60598-1. The only way to confirm their safety in use is to fully comply with the requirements of EN 60598-1. This must be carried out for each type of luminaire to be converted – not generically.
- ❖ For these types of adaptors, there are currently no product safety standards and the compatibility with the luminaire has to be checked against the essential requirements of the Low Voltage Directive (LVD). One example of a requirement not covered by any standard is the risk of electric shock in case of insertion of only one end of a lamp into the lampholder. EN 60598-1 does not assure protection against electric shock in case of insertion of one end of the lamp into a G5/G13 lampholder leaving the other accessible because this is not a problem when inserting a normal fluorescent lamp. In the case of an adaptor with electrical continuity between the two ends the risk of electric shock may easily occur. Another requirement to be evaluated according to LVD is the possibility that the user can insert again a tubular fluorescent lamp in a converted luminaire. In some cases this can cause short circuits or a dangerous situation.

Compatibility with Maintained Emergency Lighting Luminaires

- ❖ Are the adaptor units suitable for fitting to emergency lighting versions of mains luminaires?
- ❖ The adaptors are not suitable for fitting to maintained emergency lighting versions of mains luminaires. Reason: The new electronic components are placed between the new lamp and the original lamp holders i.e. directly in the circuit between the emergency lighting control gear and the lamp. The emergency lighting control gear is designed to operate directly to the T8, T10 or T12 lamp, for which they were designed, and not through an additional electronic circuit and new lamp(s) of different circuit characteristics.
- ❖ Many lighting installations utilise one of the lamps in a luminaire to operate in an emergency when the normal mains supply fails. If this lamp has been replaced by one of the adapted units, they will not operate in an emergency when:
 - 1) The emergency luminaire is self-contained i.e. the battery and emergency control gear are inside the luminaire
 - 2) The emergency supply is from a central supply and it is not 230V ac sinusoidal. (Central supplies may be dc or 110V ac in which case the lamp will not work).

Lamp Operation

- ❖ Are the new lamps operated in accordance with the safety and performance standards relevant to the lamp type?
- ❖ Are the end-of-life conditions of the lamp safeguarded by the new adaptors?
- ❖ Operation of the new lamp in accordance with its safety and performance standards can only be assured when fully tested in the luminaires in which they will be used. The lamp manufacturer's warranty will be void if the adapted luminaires do not comply with lamp safety and performance standards.

EMC

- ❖ What are the EMC characteristics of the converted luminaire? Do they comply with the limits of electromagnetic compatibility specified in EN 55015 and required by the EMC Directive?
- ❖ It is not possible to measure the EMC compliance of the "adaptors" independently from the luminaire. Therefore, the only way to confirm that they comply with the limits of electromagnetic compatibility of the relevant IEC standards is to test each type of luminaire converted.

OTHER CONSIDERATIONS

Environmental Considerations

- ❖ Waste Electrical and Electronic Equipment Legislation (WEEE). It is possible that the legal obligation of the original producer under WEEE may be moved to the converter of the luminaires following any modification to the original luminaires. Only a test case in law will prove this.
- ❖ Restriction of Hazardous Substances (RoHS). The adaptor will need to comply with the National requirements of this legislation.

Legal Marking

- ❖ Legal liabilities are placed on the manufacture of the original luminaire (CE Marking) which will become void when an adaptor is fitted. The original manufacturer's mark should be removed or obliterated and new markings applied to identify the converter company who now takes on the legal responsibilities for the converted luminaires.

Illuminance

- ❖ The original lighting installation should have been designed to comply with the lighting specification to meet the demands of the visual task. There may be legal requirements covering the lighting design of the original installation. These should be met by the converted installation unless there is a change of use and the “new” installation designed to meet these new requirements.
- ❖ The lumen output of the luminaire may change. The replacement T5, T8 or LED lamp(s) may have a lower lumen output than the T8, T10 or T12 lamp it replaces. Therefore, the converted installation may not provide the same level of maintained illuminance as the designed installation.

Light Distribution

- ❖ Has the converted luminaire been photometrically tested? This will be required in order to calculate the illuminance distribution of the converted installation and compare it with the original design.
- ❖ Will the installation still provide the required maintained illuminance for the tasks?
- ❖ Will the installation comply with EN 12464-1 Lighting of indoor workplaces?
- ❖ The lumen output will change. Have additional luminaires been added to the installation to ensure that there is sufficient illuminance for the visual tasks?
- ❖ The light centre of the lamp may be displaced. Some units move the lamp axis and this will affect the light distribution. Those units retaining the same axis will still have a modified light distribution when used with specular reflector systems due to the change in diameter of the lamp in the case of T5 fluorescent lamps, but will be totally different in the case of LED units using multiple LEDs.
- ❖ Will the original Glare Index (and currently the Unified Glare Rating) still comply for the installation? The Unified Glare Rating may not now comply for the installation.
- ❖ The T5 lamp has a higher luminance (surface brightness of the lamp) than the T8, T10 or T12 lamp it replaces. It is questionable whether the luminance limits of the luminaire will still comply for usage with Display Screen Equipment. Similar considerations would also cover LED units.
- ❖ It is questionable whether the installation will continue to meet its original design parameters.

Energy Efficiency

- ❖ Do the adaptors comply with the requirements of the Ballast Directive which have been integrated into the EuP legislation?
- ❖ Has the energy efficiency of the adaptor been measured in compliance with EN 50294 which can only be carried out in the luminaire when it is being converted?
- ❖ The Ballast Directive specifies energy efficiency requirements for lighting control gear. The only way to confirm that the adaptors comply with the requirements of this legislation is to test the converted luminaires.

Summary and Conclusion

In assessing the suitability of any specific product or installation the user must make his own judgement and/or take appropriate advice. Whilst it is the responsibility of each individual organization or person converting luminaires by incorporating these adaptors, to determine how best to do that, the opinion of CELMA based on the points identified above is that best practice should at least incorporate the following:

The post modification of installed luminaires should be carried out by a competent engineer. The original installation should be surveyed to ensure that the luminaires to be converted are suitable i.e. no emergency luminaires.

A selection of each type of luminaire should be modified and tested to all relevant safety and performance standards. This includes the photometric tests.

The original lighting design parameters need to be determined and compared with the planned modifications to ensure that the original lighting design is maintained. Any shortfall in the lighting requirements should be corrected to meet the requirements of the work places.

Only when compliance is achieved in all respects should the modifications proceed.

Following modification of a luminaire, it should be tested for electrical safety equivalent to the "end of line test" for a new one.

All relevant information related to the above should be kept in a Technical File for the required period of at least 10 years following modification of the original luminaire.

It should be noted that the organisation modifying a luminaire by the use of these types of adaptors will normally be taking over the full future responsibility for the luminaire with respect to Safety, EMC, Photometric, Environmental, and other Legal Responsibilities. This responsibility remains even if the luminaire is subsequently returned to its original condition (removal of the adaptor), since damage to the original luminaire may have occurred.

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