



# Downlighters and fire safety

This guide provides a quick reference for installers on the appropriate selection and installation of downlighters in domestic premises, and on how to prevent them from becoming a fire hazard.

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# 1. Introduction

Poorly installed downlighters (recessed luminaires) are the cause of a significant number of fires in homes every year. This guide provides a quick reference for installers on the appropriate selection and installation of downlighters in domestic premises, and on how to prevent them from becoming a fire hazard.

## 2. Why are downlighters a fire risk?

- Under normal operating conditions, the surface temperature of tungsten halogen lamps can exceed 200 °C, which is above the ignition temperature of many combustible materials.
- Without adequate ventilation to permit safe heat dissipation, downlighters not designed to be covered by thermal insulation, or installed too close to combustible materials (such as roof timbers) can cause fires or harmful thermal effects to their surroundings.
- Even when insulation is not present, there is a risk that dust, debris and other potentially combustible materials could ignite if they come into contact with the hot lamp.
- Overheating can occur where thermal insulation is laid over existing downlighters and any associated transformers that are not designed to operate safely under these conditions.
- The bases of the most common types of push-fit extra-low voltage lamps (with aluminium or dichroic reflectors) are identical (see section 4 for diagrams). However, most types of downlighter are not designed to operate safely with both types of lamp. Consequently, lamps can be fitted inadvertently that exceed the maximum rating of the luminaire or which reflect heat in the wrong direction.



## 3. Downlighters explained

### Operating voltage

Downlighters operate at mains voltage (230 Volts), or are powered via a transformer at extra-low voltage (12 Volts). Extra-low voltage (ELV) downlighters are often incorrectly described as “low voltage” on product packaging.

### Fire performance

Downlighters may also be described as ‘Fire rated’. This means they have in-built fire protection that completely seals the downlighter in the event of fire in the room below, to prevent the spread of fire and smoke into other areas.

It is important that the fire performance of ceiling structures that have a fire containment function or are required to carry load for a prescribed period of time are not compromised by the installation of downlighters.

For **ALL** downlighters installed in ceilings, the Electrical Safety Council recommends the use of 'fire rated' downlighters fitted with 'aluminium' reflector lamps to help ensure that any fire in the space below is kept out of cavities and that the heat build-up above and within the fitting is minimised.

Typical fully closed back 'fire rated' downlighter



Typical standard open back downlighter



In situations where a selected design or style of downlighter is not available with integral fire protection, additional protection may be fitted at the time of installation in the form of a purpose made 'fire hood', an insulated fire protection box, or similar.

Detailed guidance on the selection of suitable types of downlighter for particular applications is given in the Electrical Safety Council's Best Practice Guide 5 – *Electrical installations and their impact on the fire performance of buildings*. This guide can be viewed and downloaded free from the Council's website at: [www.esc.org.uk](http://www.esc.org.uk).



### Mounting on normally flammable surfaces

Downlighters are classified according to whether or not they are suitable for direct mounting on normally flammable surfaces. 'Normally flammable' materials are those which have an ignition temperature of at least 200 °C and which will not deform or weaken at this temperature. Examples are, wood and wood-based materials of more than 2 mm thickness.

Where a downlighter is suitable for direct mounting on non-combustible surfaces only, either of these warning symbols should be marked on the fitting.



### Covering with thermal insulating materials

To avoid the risk of fire (as well as reduced lamp and service life) caused by overheating, downlighters and any associated transformers must not be covered by thermal insulation and need to be protected against potential or future covering, unless they are specifically designed to operate safely in this condition. Particular care must be taken where loose-filled insulation is present, as this can be moved easily by drafts, vermin, etc, and may then come into contact with the downlighter.



## Downlighters marked with



**ARE SUITABLE** for covering with thermal insulation



**MUST NOT** be covered with thermal insulation

Building Regulations do not prohibit the leaving of a small area around downlighters free from thermal insulation where this is necessary to permit the dissipation of heat they generate. However, due allowance for this should be made in the overall thermal and acoustic performance of the premises. Alternatively, where access to the space above the downlighter can be achieved, a proprietary insulation support box or similar cover (as shown below) will, in most cases, ensure sufficient air space around the downlighter to prevent overheating.

### Typical insulation support box



### Loft cover



### Manufacturer's instructions

In all cases, the manufacturer's instructions supplied with the downlighter must be followed. The manufacturer should specify, amongst other things, the amount of space to be left around the back of the downlighter, its fire rating, whether the fitting can be covered with thermal insulation, and the type/wattage of lamps that can be fitted.

### Ingress protection (IP) rating

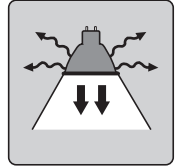
Downlighters should be selected with the correct IP rating for the location in which they are to be installed. For example, those located in bathrooms should have an IP rating based on the zone they are installed in. In all cases, account must be taken of the requirements given in the current version of *BS 7671 (Requirements for Electrical Installations, IEE Wiring Regulations 17th Edition)*, the national standard for the safety of electrical installations.

## 4. Downlighter lamps explained

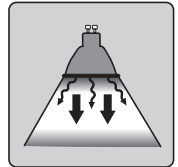
The most widely available types of tungsten halogen lamp are manufactured with either a dichroic-coated (cool beam) reflector or an aluminium reflector. The reflector type determines the way in which most of the heat generated by the lamp is reflected.

### Reflector types

**Dichroic (cool beam) lamps** reflect visible light forwards while allowing most of the radiated heat to pass out of the back of the lamp – **WARNING:** these lamps must only be used in downlighters specifically designed for their use, otherwise overheating can occur.



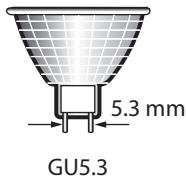
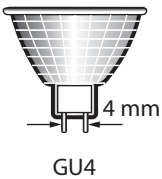
**Aluminium lamps** reflect the visible light and most of the heat forwards out of the front of the lamp. However, consideration must be given to the positioning and intended use of downlighters fitted with aluminium reflector lamps to prevent excessive heating of lighted objects.



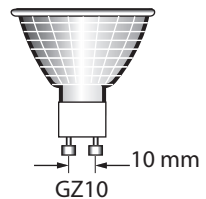
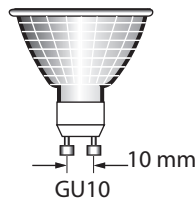
### Lamp bases

The most common tungsten halogen lamps for use in downlighters are push fit (GU4 or GU5.3) for ELV, or twist and lock (GU10 or GZ10) for mains voltage types.

#### ELV lamp bases



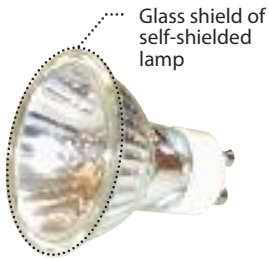
#### Mains voltage lamp bases



Although lamp bases are different in design to prevent ELV lamps being used in mains voltage fittings, GU4, GU5.3 and GZ10 lampholders will accept both aluminium and dichroic reflector lamps. **The use of dichroic reflector lamps in downlighters designed for use with aluminium reflector lamps only could create excessive heat within the luminaire leading to an unsafe situation and risk of fire.**

Downlighters marked with this warning symbol **MUST NOT** be fitted with dichroic reflector lamps.





## Protective shield

Tungsten halogen lamps must be shielded to ensure that particles from a shattered lamp cannot cause harm. This can be achieved by fitting a glass plate in front of the halogen filament, or by using a 'self-shielded' lamp.

## 5. Safety symbols, information and markings

The relevant product standards relating to luminaires and associated control equipment specify safety information that manufacturers must mark on downlighters, lamps and associated transformers, or their packaging.

A recent revision of the product standard relating to luminaires (*BS EN 60958-1*) has resulted in some symbols and markings having been changed to align with current international (IEC) standards. All the provisions of the revised '2008 edition' of *BS EN 60958-1* are required to be implemented by April 2012. As a result of the transitional arrangements, downlighters may be sold and marked with both old and/or new symbols and information.

The table opposite provides guidance on the new and old markings that may be found on downlighter products.

## 6. When fitting replacement lamps:

- Read and follow the manufacturer's instructions
- Check the packaging and the fitting for details of correct replacement lamps and do not exceed the rated wattage
- Always switch off the electricity before changing a lamp.
- Don't fit a dichroic reflector lamp unless the fitting is specifically designed for use with that type of lamp – if in doubt, fit aluminium reflector lamps only
- If the downlighter is damaged, scorched or corroded, recommend a replacement.

## 7. Checking existing downlighters

- Check for visible markings on downlighters indicating lamp wattage and lamp type
- Check downlighters and their surroundings for signs of overheating such as curled labels and discolouration or scorching
- Ensure that downlighters installed in ceiling cavities have sufficient space around them
- Ensure that downlighters (and associated transformer where fitted) are not in contact with or covered by loft insulation or other combustible material, unless they are designed to operate safely in those conditions.

Rated wattage (W) and voltage (V)	As indicated on the downlighter, lamp or transformer	
Warning against the use of cool beam (dichroic reflector) lamps		
Protective shields incorporated in downlighters that need to be replaced if damaged		
Minimum distance from lighted objects (to prevent fire risks)		
Rated maximum ambient temperature	<b>ta.....°C</b>	
Downlighter designed to be used only with self-shielded tungsten halogen lamps (The majority of halogen lamps have a protective shield that also blocks UV (ultraviolet) radiation.		
Lamps must be operated only in a downlighter supplied with a protective shield		
Downlighters <b>NOT</b> suitable for direct mounting on normally flammable surfaces		
Downlighter suitable for direct mounting on normally flammable surfaces		Not specified
Downlighter not suitable for covering with thermal insulating material	Not specified	
Downlighter suitable for covering with thermal insulating material		Not specified
Lamp (or transformer) is not suitable for use with a dimmer switch.		
Thermally protected transformer		

- Check that downlighters are not installed too close to furniture, curtains or similar combustible items
- If dichroic (cool beam) lamps have been fitted in downlighters designed for use with aluminium reflector lamps only, replace them with the correct type - look for the symbol indicating no use of 'cool beam' lamps:



## 8. Alternatives to tungsten halogen lamps

- Consider fitting low energy lamps, such as CFL (compact fluorescent), or LED lamps, as they produce less heat than traditional tungsten halogen lamps and so reduce the risk of fire. They also use less electricity.

## 9. Safe disposal of lamps

Some downlighter lamps, such as energy efficient compact fluorescent lamps displaying the crossed-out 'wheelie bin' symbol, must not be disposed of in general household waste. Take the lamps to a recycling facility that accepts electrical products. Check with your Local Authority for your nearest recycling centre.



## Need Help?

For further information on downlighter safety, please visit:

[www.esc.org.uk](http://www.esc.org.uk)

## Acknowledgements

Surrey Fire and Rescue Service  
 The Lighting Association  
 CE Compliance Solutions  
 Tenmat Ltd  
 'Click' Scolemore International Ltd.



[www.direct.gov.uk/firekills](http://www.direct.gov.uk/firekills)

### The Electrical Safety Council

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The Electrical Safety (ESC) is an independent charity committed to reducing deaths and injuries caused by electricity.