

# Lamps, LEDs and Circuits

When installing cables care should be taken to ensure that the minimum-bending radius quoted by the manufacturer for the cable is not exceeded, otherwise damage to the insulation and also the sheathing in multicore cables may occur. If a bend occurs close to the cable entry point into electrical equipment the cable should be firmly secured by the entry point to ensure that it is straight when passing through the cable entry gland, and that no strain is being put on the gland due to the cable bend.

For electrical connections to emergency services such as emergency luminaires powered from central battery systems or luminaires with external battery packs, the wiring from the batteries to the luminaire should be with fire survival cables in separate or segregated circuits to minimise the risk of the loss of emergency lighting. Fire survival cables are defined by their resistance to fire; to fire with water and to fire with mechanical shock.

## 8.18 Fault detection

The following lists give common reasons for the failure of a lighting installation to perform to the expected level, or the failure of a luminaire to operate correctly. Note that whilst some checks do not require any specific qualifications most of these tests should only be performed by a qualified and competent person such as a commissioning engineer or where electricity is involved an appropriately qualified electrician. Lighting circuits can generate extremely high and potentially fatal voltages and access to a lighting installation may be difficult or require specialist equipment and training.

When measuring lamp voltages it is essential that they are measured using a true RMS meter, as due to waveform distortion other meters may give false readings. Be aware that high intensity discharge circuits incorporating an ignitor may generate 25kV pulses at the lamp holder and that components within the ignitor can operate up to 18kV. For these circuits it is important to isolate the supply before changing the ignitor and to discharge capacitors by touching all exposed metal parts and terminals to earth using an insulated probe before commencing any examination of the circuit and components.

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When faced with an inoperative luminaire it is usual first to replace the lamp with a new one. If the lamp has shattered or a fuse has blown it is advisable to inspect the ballast and wiring for incorrect installation or signs of overheating or damage before inserting a second lamp.

Certain types of lamp must be operated with the front glass of the luminaire in position, as a possible catastrophic failure mode may cause the lamp to explode. Always check the lamp type and manufacturers recommendations before operating the lamp without the luminaire fully assembled.

## Lighting installation does not perform to the expected level

### General

Have the correct luminaires and attachments been installed compared to the specification?	Yes / No
Are the luminaires installed at the correct mounting height?	Yes / No
Are the luminaires installed at the correct mounting position?	Yes / No
Are the luminaires correctly orientated (rotation, tilt)? For floodlights have they been installed upside-down?	Yes / No
Have the lamps been run for >100 hours to ensure lamp stability?	Yes / No
Is the quality of the electrical supply suitable (voltage, current, voltage surges or dips, harmonics)?	Yes / No
For high-pressure discharge lamps have they been on for > 20 minutes before measurement?	Yes / No
For fluorescent lamps have they been on for > 4 hours before measurement?	Yes / No
Is the light meter calibrated and does it have adequate accuracy of measurement?	Yes / No
Are the measurements being made at the correct height and orientation?	Yes / No
Are the measurement points correctly positioned?	Yes / No

### Interior

Is the space empty or furnished and was the scheme calculation for the same condition?	Yes / No
Are the surface reflection factors the same as used in the scheme calculation?	Yes / No
Is the ambient temperature different to that expected and is this affecting the running temperature of the lamps?	Yes / No
Has the protective film been removed from luminaire component such as louvres and diffusers	Yes / No

### Outdoor

Has the electrical supply cable been correctly sized?	Yes / No
Is the voltage and current supplied to the lamp correct?	Yes / No

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## High intensity discharge luminaire fails to operate correctly

Symptom	Possible cause	Test and remedy
Lamp does not light but is visibly intact	Faulty lamp	Test lamp in a working luminaire and replace if necessary
	Faulty lamp holder	Check that the lamp is properly seated in the lamp holder(s). For high voltage lamps with non-screw thread connection check lamp holders are in sound condition. Lamp holders with pitting or corrosion must be replaced
	Supply interruption	Check for voltage at circuit input terminals. Check any fuses and ensure cabling is correctly sized
	Open circuit in wiring or ballast	Check for voltage at lamp holder
	Circuit misconnection	Check that the circuit is wired in accordance with manufacturers installation instructions
	Ignitor fault	For circuits incorporating an ignitor substitute a new ignitor
	End of lamp life	Lamp could have developed a high striking characteristic towards the end of life. Check that the lamp has not completed a full life
Poor light output	Insufficient re-strike time	Some high intensity discharge lamps require a cooling period before they will re-ignite
	End of lamp life	Test lamp in a working luminaire and relate to lamp usage
Outer of lamp broken or cracked	Outer of lamp or luminaire dirty	Clean and try again
	Low supply voltage	Test voltage applied to luminaire/circuit. Check that the ballast is correctly rated and tapped. For parallel ballast circuits check both ballasts are operating correctly
Outer of lamp broken or cracked	Explosion	Look for obvious signs of misuse/overload on the lamp. Check that the circuit is wired correctly and suitably tapped. Check that voltage is correct. Check ballast for signs of overheating and damage to windings. If in doubt replace ballast and test for impedance before reusing the luminaire
	Thermal shock	Check for any internal moisture due to luminaire seals failing
Light output unstable /fluctuating	Mechanical damage/transit damage	Lamps that have incurred damage during transit may operate for a period of time before failing due to a weakened construction. Damage and deterioration of inner lamp components should be visible after a short period of running if the outer envelope is faulty
	End of lamp life	Test lamp in a working luminaire and relate to lamp usage
	Low supply voltage	Check voltage applied to the luminaire
	Circuit misconnection	Check that the circuit is wired correctly and suitably tapped. Check that there is no fault on the ballast. Check that the power factor capacitor is connected correctly
Light output unstable /fluctuating	Lamp holder contact	Check that the lamp is properly seated in the lamp holder(s). Check for any signs of arcing. For high voltage lamps with non-screw thread connection check lamp holders are in sound condition. Lamp holders with pitting or corrosion must be replaced
	Supply voltage dip	Lamp extinction could be associated with sudden dips in supply voltage, possibly caused by switching of heavy loads
Lamp extinguishing	Lamp orientation	Some lamps are sensitive to burning position. Check lamp is orientated according to manufacturers recommendations
	Temperature	Check ballast operating temperature. Ballast may incorporate a thermal cut-out

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Fluorescent tube luminaire fails to operate correctly		
Symptom	Possible cause	Test and remedy
Tube does not attempt to strike – no end glow from tube	Fuse blown	Check for voltage at circuit input terminals
	Faulty starter (non-electronic control gear)	Insert starter switch in working luminaire
	Faulty tube	Insert tube into working luminaire. NOTE if one or more of the cathodes are broken check for faulty wiring (short circuit to earth or wrong control gear) before inserting a new tube
	Open circuit	Test for open circuit on control gear or short to earth between control gear and tube
Tube fails to strike – bright glow from one end of the tube	Crossed leads in twin lamp luminaires	Check that the correct lamp holders are connected to each tube
	Short circuit on lamp holder	Test for short circuit across lamp holder lead or for short circuit to earth on wiring
	Short circuit on tube	Test for internal short circuits on cathode of tube
Tube does not attempt to strike – bright glow from both ends of the tube	Short circuit on starter switch or associated wiring (non-electronic control gear)	Test starter switch in working luminaire. If satisfactory test starter switch socket and associated wiring
Tube flashes on and off – fails to maintain discharge	Faulty tube (end of life)	Test tube in working luminaire. At end of life other symptoms are reduced light output, increased flicker and reddish glow from cathodes
	Low voltage	Test voltage at terminal block of luminaire. If low check external wiring for excessive voltage drop
	Faulty starter (non-electronic control gear)	Test starter switch on working luminaire
	Low temperature	Screen open type luminaires
	Crossed leads in twin lamp luminaires	Check that the correct lamp holders are connected to each tube
Ballast overheats	Lack of ventilation	Check installation of luminaire to manufacturers recommendations
	Supply volts high	Check supply voltage
	Fault in ballast	Replace ballast

It should be noted that some types of electronic control gear will detect fault conditions and prevent any attempt to start the lamp. If the lamp fails to start the lamp, ballast or wiring could be faulty and should be checked.