

ConstantColor™ CMH Ultra

DATA SHEET

Ceramic Metal Halide (CMH) Lamps 70W Mini G8.5 and Single Ended G12 formats Product Information

The next generation of CMH

GE's low watt CMH lamps have opened new possibilities for lighting design, combining the power and light quality of far larger and less efficient lamps. It is now possible to achieve lighting design that could previously only be achieved with inferior technologies. GE's ConstantColor™ CMH technology has been developed to provide high efficiency, long life and superb overall lighting quality. These qualities are why GE is the leader in ceramic metal halide technology.

- Outstanding efficiency: 4x better than halogen
- Outstanding long life
- Robust and reliable performance
- Colour uniformity lamp to lamp
- Premium CRI
- Compact capsule

The next generation CMH lamps are the ultimate light source for retail applications where quality of light, colour and efficiency are important. Now, anyone with critical colour needs can enjoy the outstanding energy efficiency and the savings that CMH lamps provide.

Substantial benefits make them the clear choice for new store builds, or into substantial benefits that make them the clear choice to be specified into new store builds, or into re-lamping existing store fixtures through regular replacement needs.

Single ended format

Single ended Ceramic Metal Halide lamps are made to provide symmetrical beam distribution using the axial configuration of the discharge arc. A variety of beam angles are possible and adjustable beam control can be built into the luminaire. This compact lamp shape enables luminaire size to be minimised and the bi-pin lamp base enables easy changing with front access.



Benefits

- More usable light over life, 33% more lumen output at end of life vs. standard CMH lamps
- CMH Ultra Lamps offer enhanced colour rendition vs. standard 3000K CMH
- Extra long life: 15,000 hours
- Extend service life and relamp cycles
- Compatibility -direct replacement for existing 70W CMH systems

Applications areas

- Retail & accent lighting, office and hospital lighting
- General retail display
 - Wherever current generation CMH 70W G12 and CMH 70W G8.5 products are in use

New 70W Ultra retrofits directly into existing G8.5 and G12 fixtures, expands new sale offerings via improved lumen maintenance and colour rendering.



Specification summary

Ordering Information

Description	Wattage	Colour	Product Code
CMH70/TC/UVC/U/930/G8.5 ULTRA	70	3000K	96751
CMH70/T/UVC/U/930/G12 ULTRA	70	3000K	96752

General	Units	70W ULTRA 930 G8.5	Units	70W ULTRA 930 G12
Product code		96751	Product code	96752
Nominal Wattage	W	70	Nominal Wattage	W
Format		Single ended	Format	Single ended
Bulb type		T4.5	Bulb type	T6
Bulb diameter	mm	14.5	Bulb diameter	mm
Bulb material		UVC Quartz	Bulb material	UVC Quartz
Bulb finish		Clear	Bulb finish	Clear
Arc Gap	mm	6.0	Arc Gap	mm
Base		G8.5	Base	G12

Operating Conditions

Burning position	Universal	Universal
Luminaire characteristics	Enclosed	Enclosed

Notes:

- 1) Note that the lamp voltage inside the luminaire should not deviate by more than 5V from the bare lamp voltage in free air.
- 2) Thermal protection required

Electrical Characteristics *

Lamp power	W	72	Lamp power	W	72
Lamp voltage	V	95	Lamp voltage	V	95
Lamp current	A	0.93	Lamp current	A	0.93
Max. Ignition Voltage	kV	5.0	Max. Ignition Voltage	kV	5.0
Min. Ignition Voltage	kV	3.0	Min. Ignition Voltage	kV	3.0
Extinction voltage (% of rated input voltage)	%	90 (Max)	Extinction voltage (% of rated input voltage)	%	90 (Max)

* The specification contains data about typical performance on a 50 Hz sine wave ballast at rated power. Actual values may depend on ballast and application.

Specification summary

Photometric Characteristics*	Units	70W ULTRA	Units	70W ULTRA
		930 G8.5		930 G12
Product code		96751	Product code	96752
100 hrs Lumens	lm	6200	100 hrs Lumens	6400
Typical Lumen change with burning position – vertical to horizontal	lm	100-150	Typical Lumen change with burning position – vertical to horizontal	100-150
Typical voltage change with burning position – vertical to horizontal	V	8	Typical voltage change with burning position – vertical to horizontal	8
Correlated Colour Temperature	K	3000	Correlated Colour Temperature	3000
Chromaticity X		0.443	Chromaticity X	0.443
Chromaticity Y		0.405	Chromaticity Y	0.405
Colour Rendering Index	Ra	88	Colour Rendering Index	87
Luminous efficacy	lm/W	86	Luminous efficacy	89
Base		G8.5	Base	G12

* Photometric characteristics refer to lamp performance after 100hrs burning, in vertical base up position.

Starting and Warm-up Characteristics*

Time to start (at 25 °C)	sec.	< 2	Time to start (at 25 °C)	sec.	< 2
Time to start – Cold box test at -30 °C	sec.	< 15	Time to start - Cold box test at -30 °C	sec.	< 15
Hot restart time	min.	< 15	Hot restart time	min.	< 15
Warm-up time (for 90% lumens)	min.	< 3	Warm-up time (for 90% lumens)	min.	< 3

* Typical values (actual values are ballast and ignitor dependent)

Through life Performance

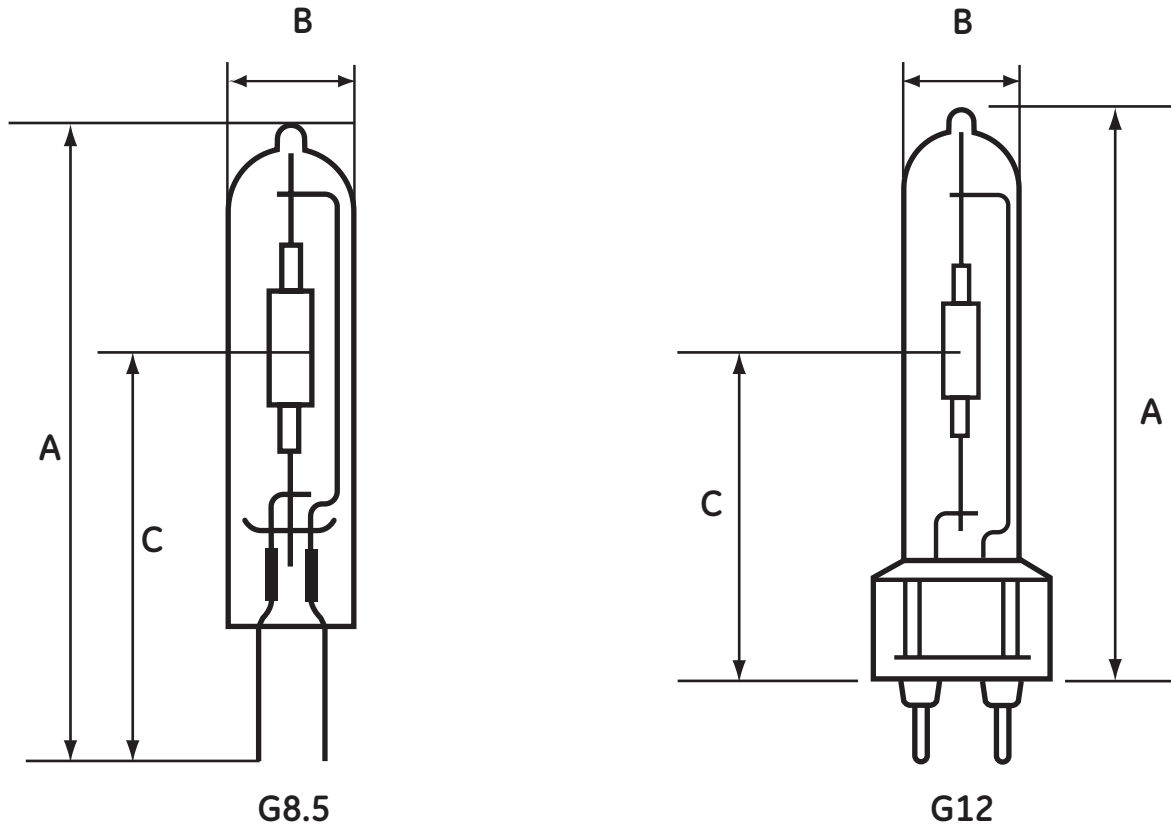
Lumen maintenance at 40% rated life (mean lumens)	%	87	Lumen maintenance at 40% rated life (mean lumens)	%	87
Average rated life	h	15000	Average rated life	h	15000

Maximum Operating temperatures*

Maximum allowed bulb temperature (horizontal orientation, thermocouple attached above burner)	°C	550	Maximum allowed bulb temperature (horizontal orientation, thermocouple attached above burner)	°C	500
Maximum pinch temperature (vertical base up orientation)	°C	300	Maximum pinch temperature (vertical base up orientation)	°C	350

* Temperatures above which lamp performance or reliability is impaired.

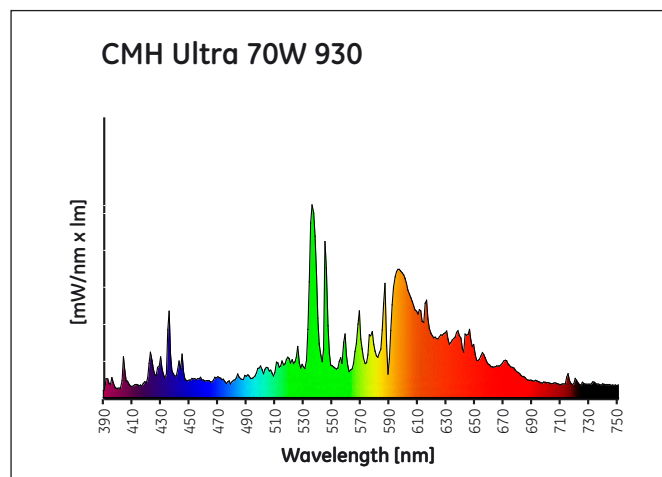
Dimension



Product code	96751			96752		
Dimension	A (mm) max	B (mm) nominal	C (mm) nominal	A (mm) max	B (mm) nominal	C (mm) nominal
	85	14.5	52	90	19	56

Spectral power distribution

Spectral Power Distribution curves are given in the following diagram

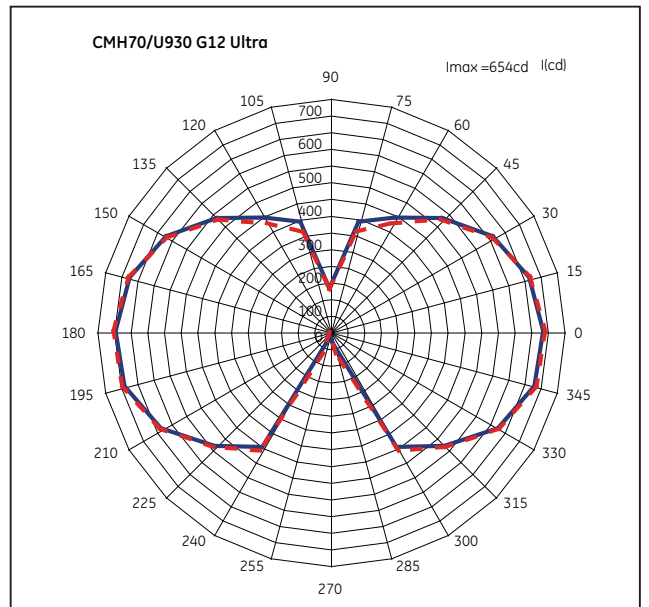
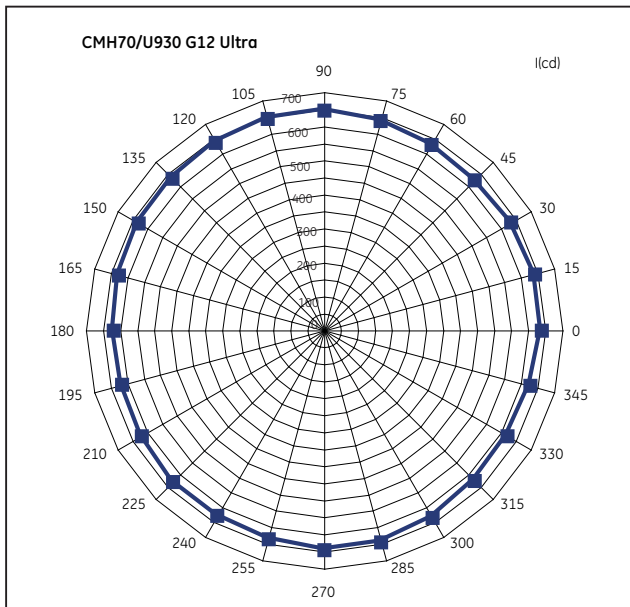
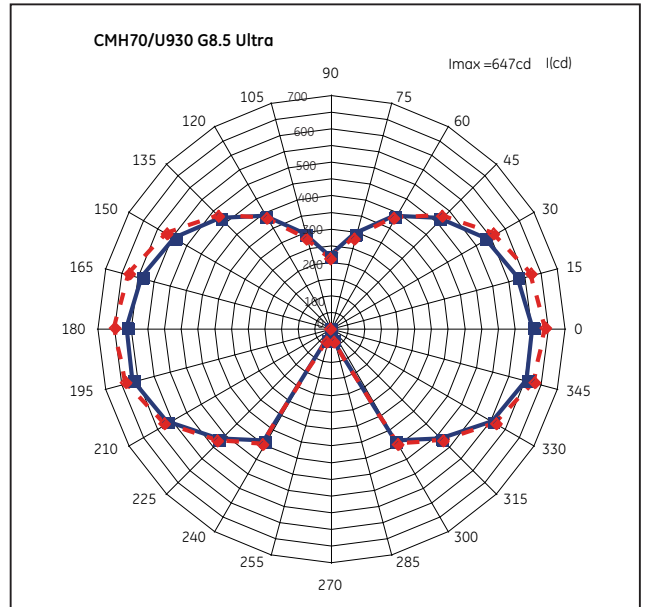
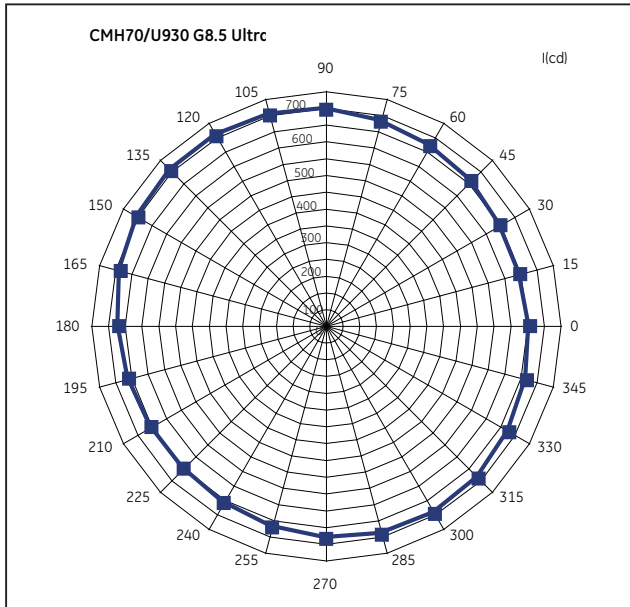


Distribution of luminous intensity

The following diagrams show the polar light intensity curves of the lamp in vertical base-up position

Horizontal plane polar intensity curve

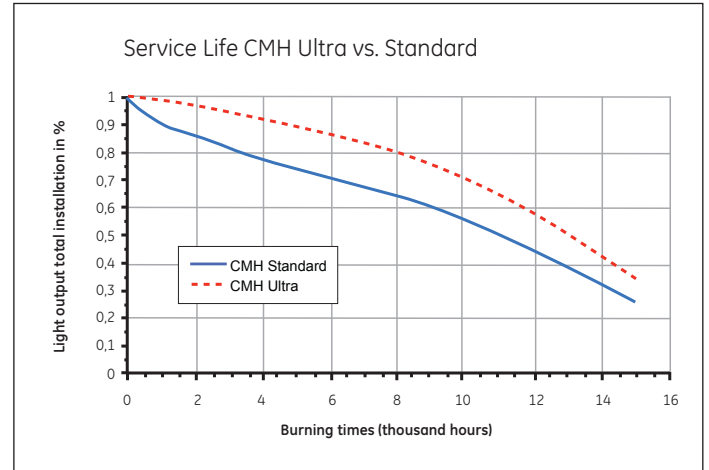
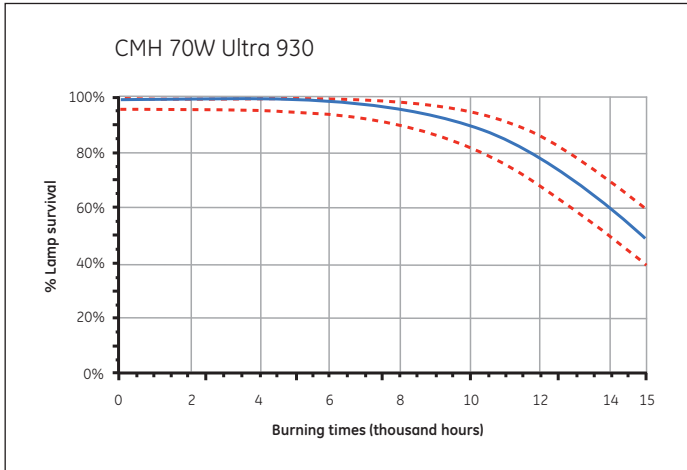
Vertical plane polar intensity curve



Lamp life

Life survival graphs are shown for statistically representative batches of lamps operated under controlled nominal conditions with an 11 hours per start switching cycle. The declared lamp life is the median life, which is when 50% of the lamps from a large sample batch would have failed. Lamp life in service will be affected by a number of parameters, such as supply voltage variation, switching cycle, operating position, mechanical vibration, luminaire design and control gear. The information is intended to be a practical guide for comparison with other lamp types. The determination of lamp replacement schedules will depend upon the acceptable reduction in illuminance and the relative costs of spot and group replacement.

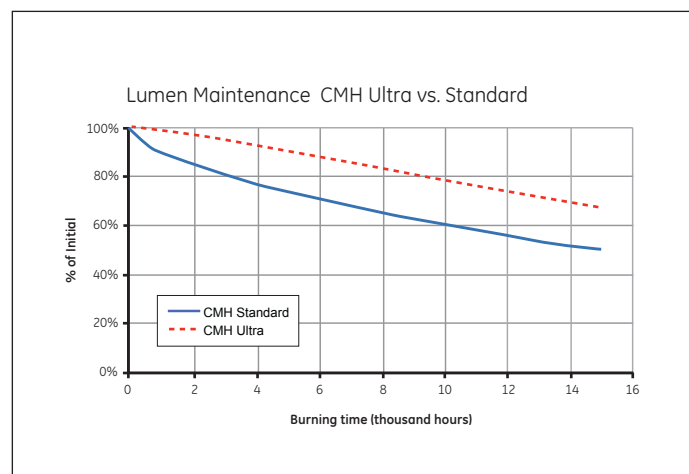
Note: The representative curves are taken in Vertical Base Up position.



Lumen maintenance

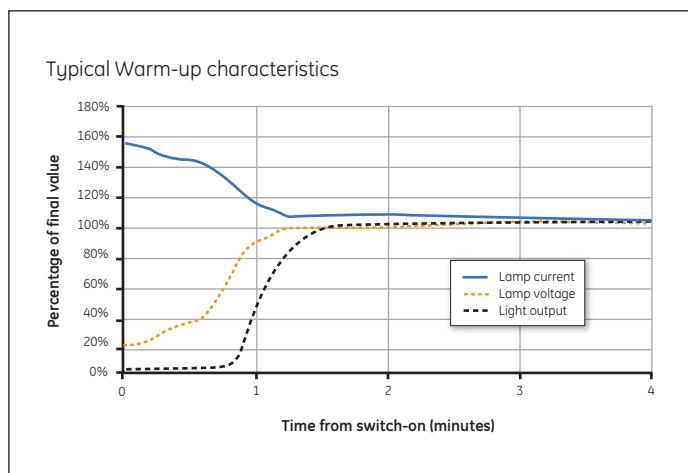
The lumen maintenance graph shows light output performance through life for statistically representative batches of lamps operated under controlled conditions with an 11 hours per start switching cycle. A common characteristic for all metal halide lamps is a reduction in light output and a slight increase in power consumption through life. Consequently there is an economic life at which lamp efficacy falls to a level when lamps should be replaced to restore design illumination levels. Where a quantity of lamps are installed within an area, consideration should be given to a group lamp replacement programme to maintain uniform illumination levels. Curves represent operating conditions for an 11 hours per start switching cycle, but less frequent switching will improve lumen maintenance.

Note: The representative curves are taken in Vertical Base Up position.



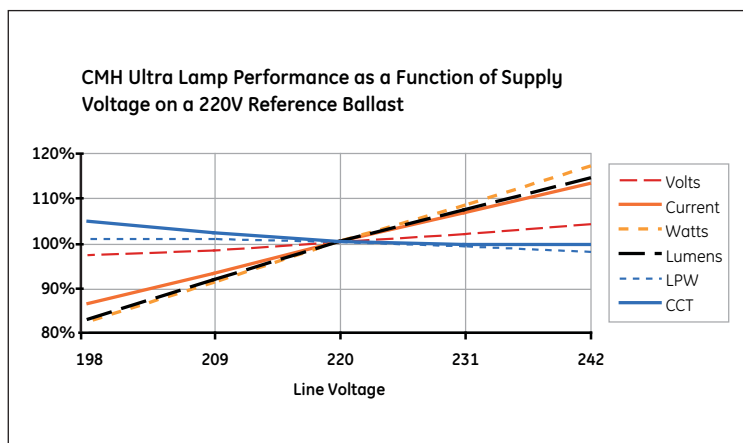
Warm-up characteristics

During the warm-up period immediately after starting, lamp temperature increases rapidly and mercury and the metal halides evaporate within the arc-tube. The lamp current and voltage will stabilise in less than 4 minutes. During this period the light output will increase from zero and the colour will approach the correct visual effect as each metallic element becomes vaporised.



Supply voltage sensitivity

The line supply voltage applied to the control gear should be as close to rated nominal as possible. Lamps will start and operate at 10% below rated supply voltage but this should not be considered as a normal operating condition. In order to maximise lamp survival, lumen maintenance and colour uniformity, supply voltage and rated ballast voltage should be within $\pm 3\%$. Supply variations of $\pm 5\%$ are permissible for short periods only. Where supply voltage variation is likely to occur the use of electronic control gear should be considered as this type of equipment is normally designed to function correctly for a voltage range of 200-240V.



Dimming

The dimming of ConstantColor™ CMH Ultra lamps is not recommended. Changes in lamp power alter the thermal characteristics of the lamp and will result in lamp colour shift and possible reduction in lumen maintenance and lamp survival.

Flicker

When ConstantColor™ CMH lamps are operated from a conventional magnetic ballast there will be 50Hz line frequency light output flicker, typically of 1.5%, in common with all other discharge lamps. Noticeably lower flicker levels occur when lamps are operated horizontally.

Flicker levels of 1.5% do not normally cause concern to the end user, but use of electronic control gear should be considered where visual comfort and performance is critical. Suitable electronic ballast for ConstantColor™ CMH typically provide square wave operation in the range 70-400Hz, eliminating perceptible flicker.

End-of-life conditions

The principal end-of-life failure mechanism for CMH lamps is arc tube leakage into the outer jacket. High operating temperature inside the arc tube causes metal halide dose material to gradually corrode through the ceramic arc tube wall, eventually resulting at normal end-of-life in leakage of the filling gas and dose. Arc tube leakage into the outer jacket can be observed by a sudden and significant lumen drop and a perceptible colour change (usually towards green).

The above situation is often accompanied by the so-called rectification phenomena. This occurs where a discharge is established between two mount-frame parts of different material and/or mass, causing asymmetry in the electrical characteristic of the resulting discharge current. Rectification can lead to overheating of the ballast, therefore conventional magnetic ballasts must conform to requirements of the IEC61167 lamp standard by incorporating protection to maintain safety and prevent damage.

It is good practice when lamps are operated continuously 24 hours per day, 7 days per week to introduce switching once every 24 hours. Lamps with one electrode failing often will not restart and can therefore be easily detected and replaced.

End-of-Life Cycling

A condition can exist at end-of-life whereby lamp voltage rises to a value exceeding the voltage supplied by the control gear. In such a case the lamp extinguished and on cooling restarts when the required ignition voltage falls to the actual pulse voltage provided by the ignitor. During subsequent warm-up the lamp voltage will again increase, causing extinction. This condition is known as end-of-life cycling. Normally cycling is an indication that lamp end-of-life has been reached, but it can also occur when lamps are operated above their recommended temperature. Lamp voltage at 100 hours life should not increase by more than 5V when operating in the luminaire, when compared to the same lamp operating in free-air. A good luminaire design will limit lamp voltage rise to 3V.

It is good practice to replace lamps that have reached end-of-life as soon as possible after failure, to minimise electrical and thermal stress on ignitor components. The use of a 'timed' or 'cut-out' ignitor is not a specific requirement for ConstantColor™ CMH lamps, but is worth considering as a good optional safety feature which also prolongs the life of ignitor internal components, lamp holder contact surfaces, and fixture wiring.

The operating period of a timed/cut-out ignitor must be adequate to allow lamps to cool and restart. A period of 10 to 15 minutes continuous or intermittent operation is recommended before the ignitor automatically switches off. Timed/cut-out ignitors, specifically offered for High-Pressure Sodium lamps, where the period of operation is less than 5 minutes, are not suitable for ConstantColor™ CMH lamps.

UV and damage to sensitive materials

The wall of the bulb, which is produced with specially developed 'UV Control' material, absorbs potentially harmful high energy UV radiation emitted by the ceramic arc-tube.

The use of UV control material together with an optically neutral front glass cover allows the lamp to significantly reduce the risk of discolouration or fading of products. When illuminating light-sensitive materials or at high light levels, additional UV filtration is recommended. Luminaires should not be used if the front glass is broken or missing. It is recommended that a safety interlock switch is incorporated into the luminaire to prevent operation when the luminaire is opened.

Although PET determines limits of human exposure to lamp UV, the risk of fading of materials due to UV can be quantified by a Damage Factor and a Risk of Fading. The risk of fading is simply the numerical product of the illuminance, exposure time and damage factor due to the light source.

Finally the selection of luminaire materials should take into consideration the UV emission. Current UV reduction types on the market are optimised for UV safety of human eye and skin exposure. However, luminaire materials may have different wavelength dependent response functions. Designers must take account of emission in each of the UV-A, UV-B and UV-C spectral ranges as well as material temperatures when designing luminaires.

Typical values for UV-A, UV-B and UV-C range radiation can be found in the table below.

Lamp type		70W Ultra 930 G8.5	70W Ultra 930 G12
UV-PET performance mW/(cm²)/500LUX			
UV C	220-280nm	0,0161	0,0149
UV B	280-315nm	0,0205	0,0219
UV A	315-400nm	3,638	5,575
UVC/UVB		0,785	0,682
UVB/UVA		0,006	0,004
E _{eff}		0,025	0,024
PET (h)±10%		34	36
Risk group		Exempt	Exempt

Information on luminaire design

Ballasts

ConstantColor™ CMH lamps operate from the same type of ballast as conventional quartz technology metal halide lamps of the same nominal power. IEC 61167 MH lamp standard and IEC 62035 HID lamp safety standard specify use of ballast thermal protection or equivalent protection device in the circuit. This safety device will protect the ballast and fixture from overheating damage at lamp end-of-life should rectification occur due to electrode imbalance or arc tube failure. The IEC61167 requirement applies to both ceramic and quartz arc tube metal halide lamps of the UV-A, UV-B, and UV-C spectral ranges as well as material temperatures when designing luminaires. ConstantColor™ CMH lamps are compatible with a list of approved ballasts; contact your GE representative for more information.

Stray magnetic field of conventional ballast

At the design stage for fixtures incorporating the control gear, careful consideration should be given to the physical layout of the lamp and ballast. The relative positions and distance between lamp and ballast can adversely affect lamp performance and drastically reduce lamp survival.

Conventional magnetic ballasts can produce a stray magnetic field and if the lamp is placed within this field, “bowing” of the arc in the discharge tube can occur. Since ceramic is a very rigid material, severe arc bowing can cause high thermal stress leading to cracking or rupture of the arc tube, resulting in failure of the lamp early in life.

Such bowing of the arc can also affect the quartz arc tube in conventional metal halide lamps, but cracking or rupture failure is less likely since quartz softens at the resulting higher wall temperature causing the arc tube to become swollen. Excessive swelling of a quartz arc tube can however also result in cracking or rupture failure.

In fixtures where the ballast is necessarily placed close to the lamp, use of magnetic shielding is essential. Another solution is to use an electronic ballast, which eliminates the need for an ignitor, simplifies wiring, reduces the risk of stray magnetic field, and eliminates light output flicker.

Containment requirement

ConstantColor™ CMH lamps operate above atmospheric pressure, therefore a very small risk exists that the lamp may shatter when the end of life is reached. Though this failure mode is unlikely, containment of shattered particles is required as prescribed by IEC 61167.

Single-ended lamp should only be used in a suitable enclosed luminaire with front cover glass capable of containing the fragments of a lamp should it shatter.

Control gear and accessories

Electronic Ballasts

A range of GE electronic ballasts have been introduced to complement the ConstantColor™ Ceramic Metal Halide lamps.

Power controlled electronic ballasts suitable for operation of Ceramic Metal Halide lamps are available from various gear manufacturers.

Advantages are:

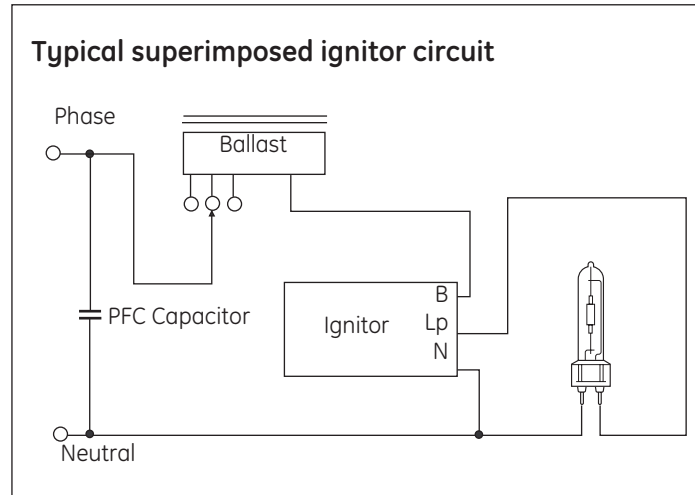
- Good regulation against supply voltage variation
- Improved lamp colour consistency
- Elimination of lamp flicker
- Reduced weight of control gear
- Reduced electrical power losses
- Ballast noise reduced/eliminated
- Single piece compact unit
- Reduced wiring complexity in the luminaire

For selecting proper ballast for CMH lamps please see separate CMH ballasts data sheet.



Superimposed ignitors

In many installations Ceramic Metal Halide lamps are operated from a conventional magnetic ballast in conjunction with a superimposed ignitor. These ignitors generate starting pulses independently from the ballast and should be placed close to the lamp, preferably within the luminaire. Wiring between ignitor and lamp should have a maximum capacitance to earth of 100pF (length equivalent to less than 1 Metre) - contact ignitor manufacturer for details of specific ignitor types. A typical circuit diagram is shown.



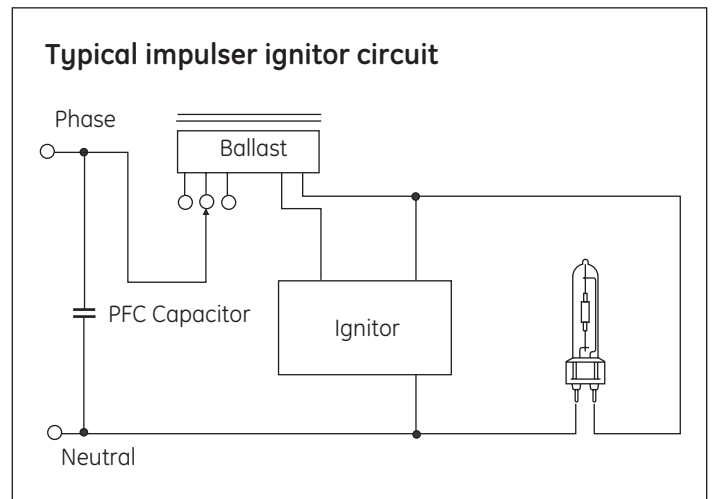
Suitable Ignitors

Suitable high-energy (superimposed) ignitors are listed below recommended by gear manufacturers. Check with your supplier for their current range of ignitors. Lamp re-starting under warm lamp conditions can take up to 15 minutes. Suitable ignitors with a warm restart of less than 15 minutes include the following, however the list may not be fully inclusive.

Maker	Products				
APF	SP23				
BAG Turgi	NI 150 SE	NI 150 SE-TM20	MZN 150 SE-C	Ni 400 LE/3.5 A	NI 400 LE/3.5 A-TM20
ERC	AZ A 1.8	AZ P 1.8	AZ P 3.0	AZ P 1.8 T3	AZ P 3.0 T3
Helvar	L-150	LSI-150T20			
Optima	ZG 0.5	ZG 2.0	ZG 2.0 D	ZG 4.5 D	
Parmar	PAV400	PCX400	PXE100		
Philips	SU20S				
Thorn	G53459	G53498	G53476	G53504.TB	
Tridonic	ZRM 1.8-ES/B	ZRM 2.5-ES/B	ZRM 4.5-ES/B	ZRM 6-ES/B	ZRM 2.5-ES/D
Vossloh-Schwabe	Z 150	Z 150 K	Z 150 A10	Z 150 A10	Z 250

Impulser ignitors

Impulser type ignitors use the ballast winding as a pulse transformer and can only be used with a matched ballast. Always check with the ballast and ignitor supplier that components are compatible. Longer cable lengths between ballast & ignitor and the lamp are possible due to the lower pulse frequency generated, giving greater flexibility for remote control gear applications. Ignitor pulse characteristics at the lamp must however comply with specified minimum values for ConstantColor™ CMH lamps under all conditions.



Other ignitor related considerations

Timed or Cut-out Ignitors

The use of a 'timed' or 'cut-out' ignitor is not a specific requirement for ConstantColor™ CMH lamps but it is a good optional safety feature worth considering to protect the ignitor from overheating and to prolong its life. If used, the timed period must be adequate to allow lamps to cool and restart as described in the previous section. A period of 10-15 minutes continuous or intermittent operation is recommended before the ignitor automatically switches off. Timed ignitors specifically offered for High-Pressure Sodium lamps where the period of operation is only about 5 minutes are not suitable for ConstantColor™ CMH lamps. Instant hot re-strike is only possible using a suitable very high voltage ignitor and double-ended lamp. GE Lighting should be consulted when considering use of an instant hot re-striking system.

Hot Re-strike

All ratings re-strike within 15 minutes following a short interruption in the supply. Hot re-strike may be achieved using a suitable ignitor. Actual re-strike time is determined by the ignitor type, pulse voltage and cooling rate of the lamp.

Warm Re-starting

The combined characteristics of ceramic arc tube material and vacuum outer jacket result in ConstantColor™ CMH lamps cooling relatively slowly. It is possible with low energy ignitors to reach the required breakdown voltage but not create a full thermionic discharge. Under these conditions the lamp can remain very warm and be prevented from cooling to a temperature at which the arc can be re-established. To avoid this, turn off the power supply for approximately fifteen minutes or change to a suitable high energy ignitor from the list given in the superimposed ignitor section.

Fusing Recommendations

For a very short period immediately after switch-on, all discharge lamps can act as a partial rectifier and a conventional magnetic ballast may allow higher than the normal current to flow. At switch-on the short duration surge current drawn by the power factor correction capacitor can be high. In order to prevent nuisance fuse failure at initial switch-on, the fuse rating must take these transient conditions into account. A separate technical data sheet providing additional explanation and information for the fusing of High Intensity Discharge lighting circuits is available from GE Lighting. Fusing of individual fixtures is recommended, in order to provide added protection for end-of-life conditions when lamp rectification can also occur.

Number of Lamps	1	2	3	4	5	6
70W Fuse Rating (A)	4	4	4	6	6	10

Safety warnings

The use of these products requires awareness of the following safety issues:

Warning

- Risk of electric shock - isolate from power supply before changing lamp
- Strong magnetic fields may impair lamp performance, and in the worst case could lead to lamp shattering.

Use in enclosed fixtures to avoid the following:

- Risk of fire
- A damaged lamp emits UV radiation which may cause eye/skin injury
- Unexpected lamp shattering may cause injury, fire or property damage

Caution

- Risk of burn when handling hot lamp
- Lamp may shatter and cause injury if broken
- Arc tube fill gas contains Kr-85

Always follow the lamp operation and handling instructions supplied.