



GE Lighting

ConstantColor CMH™

Single Ended G8.5 Ceramic Metal Halide Lamps

Product Information for Original Equipment Manufacturers

LAMP TECHNOLOGY

ConstantColor CMH™ lamps combine HPS technology (providing stability, efficiency & uniformity) and Metal Halide Technology (providing bright white quality light) to produce highly efficient light sources with good color rendering and consistent color performance through life. This is achieved by using the ceramic arc tube material from the Lucalox™ lamp, which minimizes the chemical changes inside the lamp through life. When combined with the halide doses used in Arcstream™ Metal Halide lamps the quality and stability of the dose maintains the color consistency. Hence the name ConstantColor CMH™.

Metal halide lamps, traditionally made with quartz arc tubes, are prone to colour shift through life and lamp-to-lamp color variation. Some of the dose, e.g. sodium, (an important component of metal halide lamps), can migrate through quartz to cause color shift and loss of light through life. The ceramic arc tube resists this material loss, can be manufactured to tighter tolerances and withstands a higher temperature to provide a more constant color.

FEATURES

- Consistent color over life
- Good color uniformity lamp to lamp
- Bright light – in a very compact size
- Excellent color rendition
- Improved reliability due to 3 part design
- Up to 97 Lumen per Watt (LPW) efficacy
- Up to 10,000 Hr life
- UV control
- Color temperature 3000K



SINGLE ENDED FORMAT

Single ended Ceramic Metal Halide lamps are designed 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.

APPLICATION AREAS

- Retail
- Offices
- Stage/Studio
- Architectural lighting
- Display Cabinet
- Hotels

ConstantColor™ CMH - 20W, 39W, 70W Mini



SPECIFICATION SUMMARY*

Ordering Information				
Description	ANSI Ballast Type	Wattage	Color	Product Code
CMH20/TC/U/830/G8.5	M156	20	3000K	92696
CMH39/TC/U/830/G8.5	M130	39	3000K	90352
CMH70/TC/U/830/G8.5	M98 or M139	70	3000K	92585

General	Units	20W	39W	70W
		3000K	3000K	3000K
Product code		92696	90352	92585
Nominal wattage	W	20	39	70
Format		Single Ended		
Bulb type		T4.5		
Bulb diameter	mm	14.5		
Bulb material		UVC Quartz		
Bulb finish		Clear		
Arc Gap	mm	3.35	4.7	7.4
Base		G8.5		

Operating Conditions	
Burning position	Universal
Luminaire characteristics	Enclosed

Notes:

- 1) Lamp voltage in the luminaire should not increase by more than 5V when compared to lamp voltage in free air.
- 2) Ballast protection required, according to C78.1300 series.
- 3) 39W & 70W data is based on operation from a conventional magnetic ballast. Improved performance can be achieved using an electronic ballast.
- 4) 20W designed for operation only from an electronic ballast.

Electrical Characteristics				
Lamp power	W	20	39	72
Lamp voltage	V	90	90	90
Lamp current	A	0.226	0.50	0.98
Max. Ignition Voltage	kV	***	4.0	4.0
Min. Ignition Voltage	kV	***	3.0	3.0
Extinction voltage (% of rated input voltage)	%	***	90 (Max.)	90 (Max.)

* The specification provides typical performance data for 39W & 70W operating on a conventional magnetic ballast at nominal power. Actual values depend on ballast, supply voltage and application
20W to be used only with an electronic ballast - see later for additional notes on electronic ballast requirements

SPECIFICATION SUMMARY*

Photometric characteristics		20W	39W	70W
		3000K	3000K	3000K
Product code		92696	90352	92585
100 hrs Lumens	lm	1700	3400	6200
Typical Lumen change with burning position - vertical to horizontal	lm		100 - 150	
Typical voltage change with burning position - vertical to horizontal	V		8	
Correlated Colour Temperature	K	3000	3000	3000
Chromaticity X		0.435	0.435	0.435
Chromaticity Y		0.400	0.400	0.400
Color Rendering Index	Ra	80+	80+	80+
Luminous efficacy	lm/W	85	86	97

Starting and Warm-up Characteristics¹

Time to start (at 25 C)	sec.		< 2	
Time to start - Cold box test at -30 C	sec.		< 2	
Hot restart time	minutes	<3	15	15
Warm-up time to 90% lumen output	minutes	1,2	3	3

¹Typical values (actual values are ballast and ignitor dependent)

Through life Performance

Lumen maintenance at 40% rated life (mean lumens)	%	72	78	76
Average rated life horizontal	hours	9000	10000	9000
Average rated life vertical	hours	7500	10000	9000

Safety requirements

Maximum allowed bulb temperature under abnormal conditions	C	340 ²	410 ³	590 ³
Maximum base temperature	C	150 ²	190 ³	280 ³

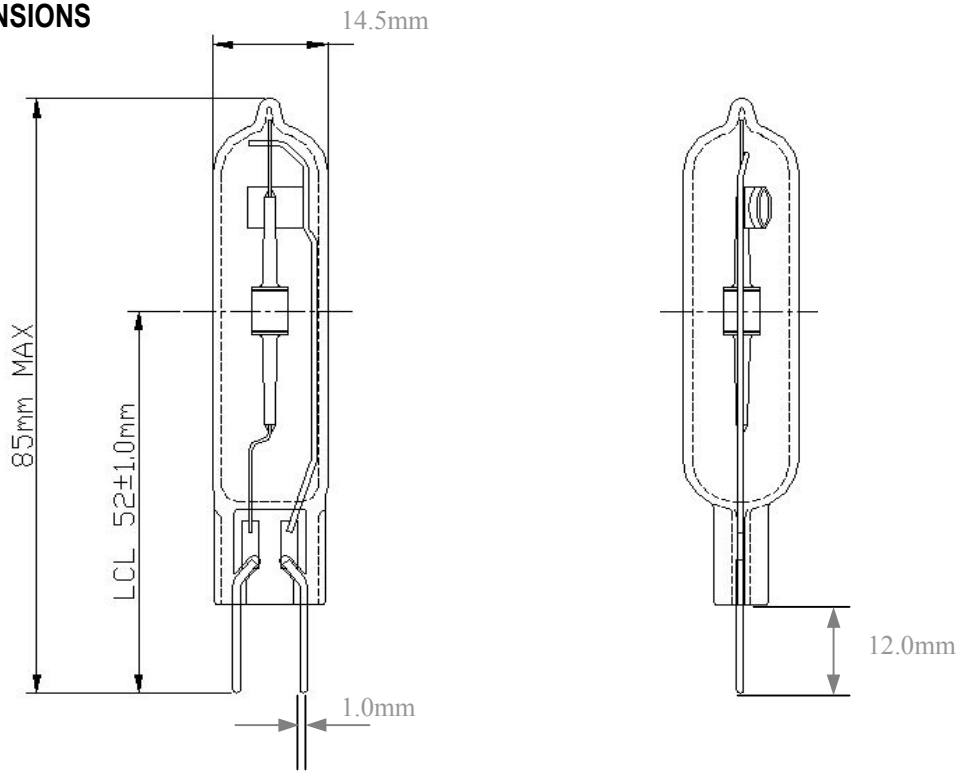
² Data based on measurements in actual fixtures at 35°C Ambient

³ Lamp operating in free air conditions at 1.25 X normal power, to simulate the most unfavorable conditions of high supply line voltage and low ballast impedance in a fixture environment

* The specification provides typical performance data for 39W & 70W operating on a conventional magnetic ballast at nominal power. Actual values depend on ballast, supply voltage and application

20W to be used only with an electronic ballast - see later for additional notes on electronic ballast requirements

DIMENSIONS



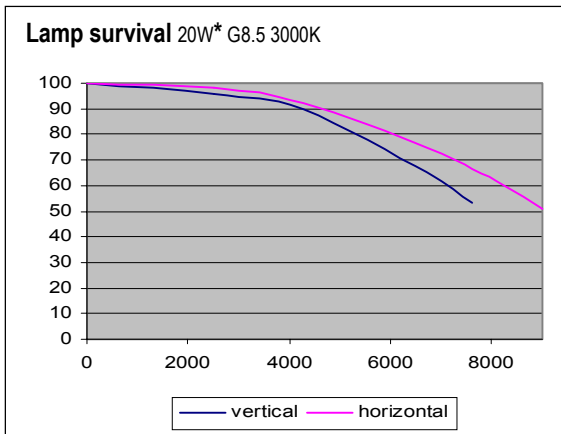
Lamp dimensions

LAMP LIFE

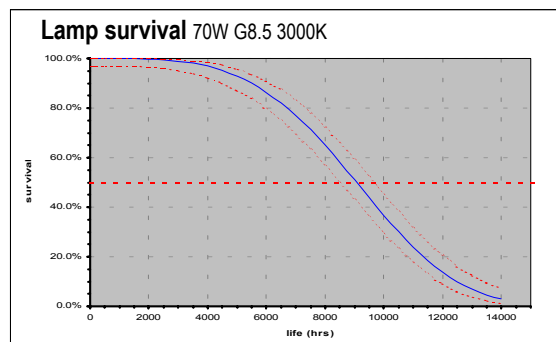
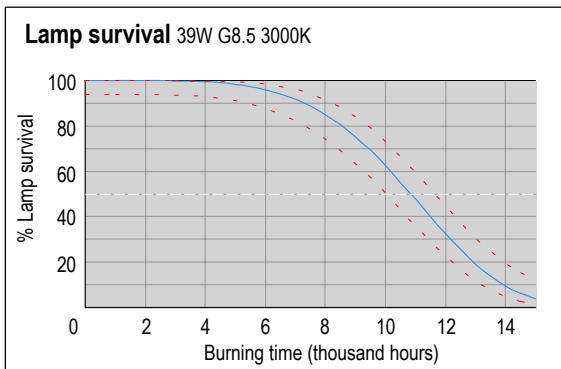
Life survival graphs are shown for statistically representative batches of lamps operated under controlled nominal conditions with a 7 hours per start switching cycle. Declared lamp life is the median value, i.e. when 50% of lamps from a large sample batch would have failed. Lamp life in service is affected by a number of parameters, including supply voltage variation, switching cycle, operating position, ballast impedance tolerance, luminaire design and mechanical vibration.

The information provided is intended to be a practical guide for comparison with other lamp types. Determination of lamp replacement schedules will depend upon relative costs of spot or group replacement and acceptable reduction in lighting levels.

Note: Representative curves are shown for Vertical Base-Up lamp orientation unless otherwise specified. Life performance is significantly increased in the Horizontal burning position.



* Provisional data



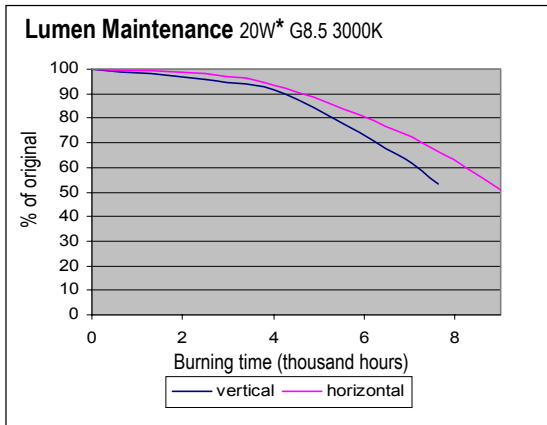
LUMEN MAINTENANCE

Lumen maintenance graphs show light output performance through life for statistically representative batches of lamps operated under controlled nominal conditions with a 7 hours per start switching cycle.

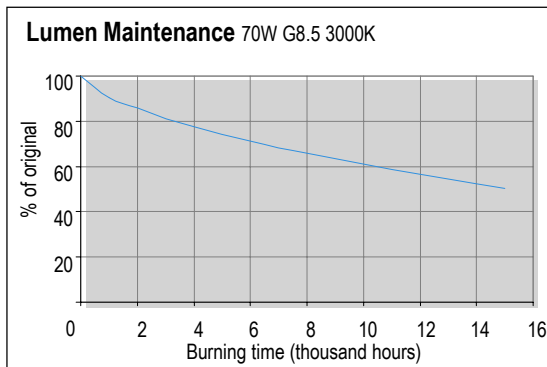
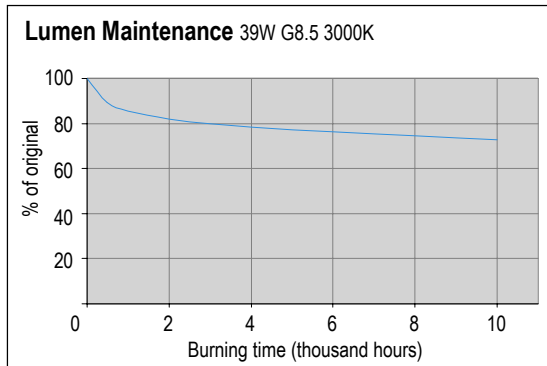
A common characteristic for all metal halide lamps is a reduction in light output and a slight increase in power consumption through life. Consequently there is an economic life at which lamp efficacy falls to a level when lamps should be replaced to restore design illumination levels. Where a quantity of lamps are installed within an area, consideration should be given to a group lamp replacement program to maintain uniform illumination levels.

Curves represent operating conditions for a 7 hours per start switching cycle, but less frequent switching will improve lumen maintenance.

Note: The representative curves are shown for Vertical Base-Up lamp orientation unless otherwise specified. Lumen maintenance performance is significantly improved in the Horizontal burning position.

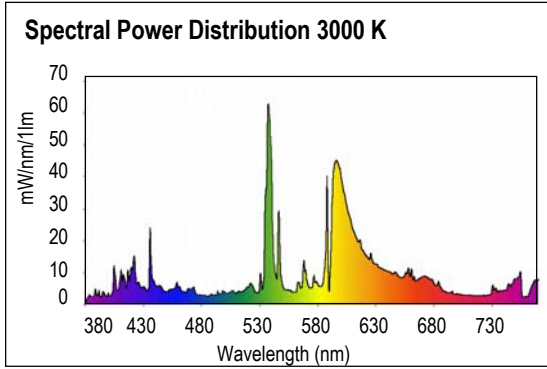


* Provisional data



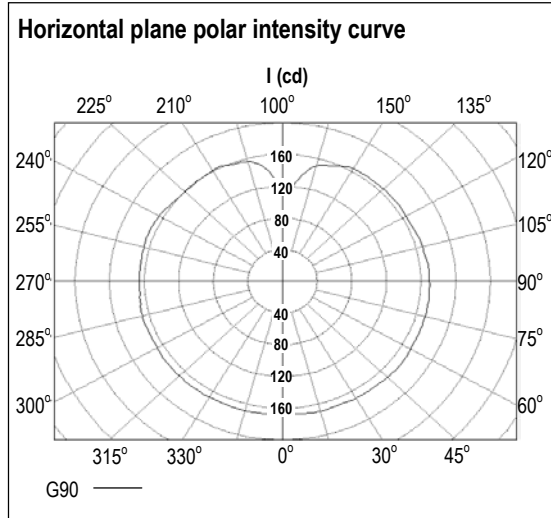
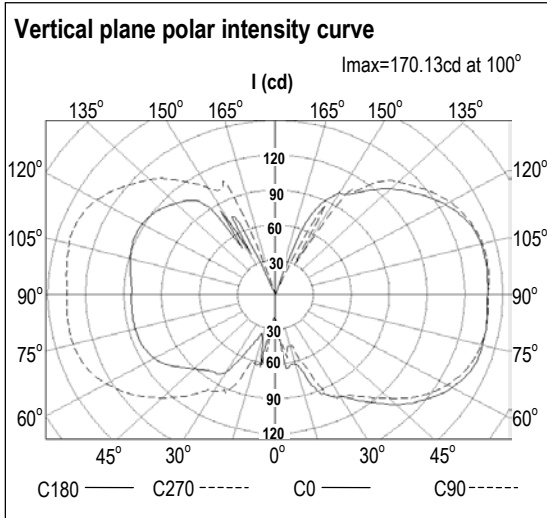
SPECTRAL POWER DISTRIBUTION

Spectral Power Distribution curves are given in the following diagram



DISTRIBUTION OF LUMINOUS INTENSITY

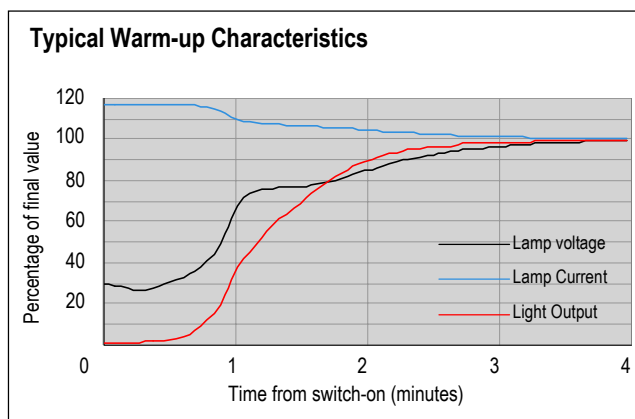
The following diagrams show polar light intensity curves for lamp base-up orientation



WARM-UP CHARACTERISTICS

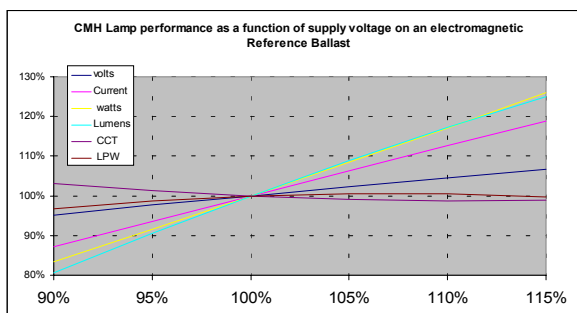
During the warm-up period immediately after starting, lamp temperature increases rapidly evaporating mercury and metal halide dose in the arc-tube.

Lamp electrical characteristics and light output stabilize in less than 4 minutes. During this period light output increases from zero to full output and colour approaches the final visual effect as each metallic element becomes vaporised.



SUPPLY VOLTAGE SENSITIVITY

Supply line voltage to conventional magnetic ballast control gear should be as close to the rated nominal value 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 maximize 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 large supply voltage variation is likely to occur, use of electronic control gear, which is designed to function correctly over a wider range of voltages.



DIMMING

The dimming of metal halide lamps is not normally recommended. Large changes in lamp power alter the thermal characteristics of the lamp resulting in lamp colour shift and possible reduction in lamp life.

Lamp 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 color change (usually towards green).

The above situation is sometimes 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 C78.1300 lamp standard by incorporating protection to maintain safety and prevent damage.

NEMA recommends that if lamps are operated continuously 24 hours per day, 7 days per week, they be turned off at least once per week for 15 minutes. Lamps with one electrode failing often will not restart and can therefore be easily detected and replaced.

Lumen Depreciation

All metal halide lamps experience a reduction in light output and slight increase in power consumption through life. Consequently there is an economic life when the efficacy of lamps fall to a level at which is advisable to replace lamps and restore illumination levels. Where a number of lamps are used within the same area it may be well worth considering a group lamp replacement program to ensure uniform output from all the lamps.

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 extinguishes 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 minimize electrical and thermal stress on ignitor internal 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 luminaire 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 in the luminaire is recommended. Luminaires should not be used if the front glass is broken or missing.

The risk of fading of merchandise 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 of the lamp. GE ‘UV Control’ lamps are designed to significantly reduce UV emissions. However, luminaire materials may have different wavelength dependent response functions. Luminaire 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 at 500 LUX and at 20cm can be found in the table below. Use the appropriate table depending on the intended application when designing or applying the luminaire.

Lamp type		20W CMH	39W CMH	70W CMH
Bulb / Base		T4.5/G8.5	T4.5/G8.5	T4.5/G8.5
Color Temperature		3000K	3000K	3000K
UV-PET Performance				
UV-C 200-280nm	$\mu\text{W/cm}^2$ @ 500LUX	0.0445	0.0279	0.0097
UV-B 280-315nm	$\mu\text{W/cm}^2$ @ 500LUX	0.0565	0.0382	0.0126
UV-A 315-400nm	$\mu\text{W/cm}^2$ @ 500LUX	11.40	9.71	5.08
Eeff (Es)	$\mu\text{W/cm}^2$ @ 500LUX	0.065	0.044	0.015
PET	hr	13.5	19.4	55.4
PET	hr 95% LCL	9.2	16.3	49.4
Risk Group	IESNA RP-27.3-96	Exempt	Exempt	Exempt

GECP Product Codes	92696	90352	92585
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Lamp type		20W CMH	39W CMH	70W CMH
Bulb / Base		T4.5/G8.5	T4.5/G8.5	T4.5/G8.5
Color Temperature		3000K	3000K	3000K
UV-PET Performance				
UV-C 200-280nm	$\mu\text{W/cm}^2$ @ 20cm	0.3504	0.4753	0.3251
UV-B 280-315nm	$\mu\text{W/cm}^2$ @ 20cm	0.4459	0.6517	0.4208
UV-A 315-400nm	$\mu\text{W/cm}^2$ @ 20cm	90.01	165.03	170.23
Eeff (Es)	$\mu\text{W/cm}^2$ @ 20cm	0.516	0.742	0.508
PET	hr	1.7	1.1	1.7
PET	hr 95% LCL	1.2	0.9	1.5

GECP Product Codes	92696	90352	92585
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INFORMATION FOR LUMINAIRE DESIGN

BALLASTS

ConstantColor CMH™ operate from the same type of ballast as conventional quartz technology metal halide lamps of the same nominal power. C78.1300 series lamp standard and ANSI/IEC C78.62035 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 C78.1300 series requirement applies to both ceramic and quartz arc tube metal halide lamps.

STRAY MAGNETIC FIELD FROM CONVENTIONAL BALLASTS

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 life 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 small risk exists that the lamp may shatter when the end-of-life is reached. Although this failure mode is unlikely, containment of shattered particles is required as prescribed by C78.1300 series and ANSI/IEC C78.62035.

ConstantColor CMH™ lamps should only be operated in a suitable enclosed luminaire with front cover glass capable of containing the fragments of a lamp, should it shatter. Also see ANSI/UL 1598 on requirements for construction of luminaires.

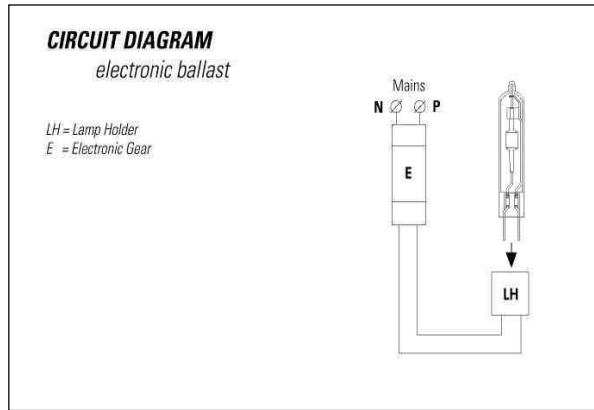
CONTROL GEAR AND ACCESSORIES

Electronic Ballasts

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



The following table gives a representative list of suitable electronic ballasts for GE ConstantColor CMH™ lamps but other ballast types may also be suitable. Contact GE Lighting for more details.

Wattage	Ballast Manufacturer	Model
20W	Aromat	M2012-27CK-3EU
	Hatch Transformers, Inc.	MC20-1-N-120U
	Hatch Transformers, Inc.	MC20-1-F-UNIX
	Hatch Transformers, Inc.	MC20-1-F-120U
	Hatch Transformers, Inc.	MC20-1-F-120V
	Hatch Transformers, Inc.	MC20-1-F-277U
	Hatch Transformers, Inc.	MC20-1-F-277V
	Hatch Transformers, Inc.	MC20-1-J-120U
	Hatch Transformers, Inc.	MC20-1-J-277U
39W	Aromat	M3912CK-3EU
	Aromat	M3927CK-3EU
	Aromat	M3912CK-3EUN-F
	Aromat	M3912/27CK-3EU-F
	Aromat	M3912CK-5EU
	Aromat	M3927CK-5EU
	Aromat	M3912CK-5EUN-F
	Aromat	M3912/27CK-5EU-F
	Advance (rated 39W & 50W)	IMH-50-A-LF
	Reliable Ballast	PS11B90T
	Reliable Ballast	PS12B90T
	Hatch Transformers, Inc.	MC-39-1-F-120U
	Hatch Transformers, Inc.	MC-39-1-J-120U
	Hatch Transformers, Inc.	MC-39-1-F-120V
70W	Aromat	M7012CK-3EU
	Aromat	M7027CK-3EU
	Aromat	M7012CK-3EUN-F
	Aromat	M7012CK-5EU
	Aromat	M7027CK-5EU
	Aromat	M7012CK-5EUN-F
	Advance (rated 70W & 100W)	IMH-100-A-LF
	Hatch Transformers, Inc.	MC-39-1-F-120U
	Hatch Transformers, Inc.	MC-39-1-J-120U
	Hatch Transformers, Inc.	MC-39-1-F-120V
	MagneTek	MH 170-120
	Reliable Ballast	PS11B90T
	Reliable Ballast	PS12B90T
	WPI	EM85-120-S01
	MagneTek	EM85-277-S01

Notes:

GE Lighting are willing to carry out compatibility testing on electronic ballasts not listed above. For specific requests please contact your local representative or visit www.gelighting.com

The 20W product can only be run on electronic ballasts. The 39W and 70W can run on electromagnetic or electronic ballasts but the benefits above favor performance on electronic.

SAFETY WARNINGS

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

WARNING

- Risk of electric shock - turn power off before inspection, installation or removal
- Strong magnetic fields may impair lamp performance and worst case can lead to lamps shattering

Use only in **ENCLOSED FIXTURES** to avoid the following:

- Risk of fire
- A damaged lamp emits UV radiation which may cause eye / skin injury in close proximity to the lamp
- 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. Read enclosed safety notice.



GE Lighting

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