TUNGSRAM™

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EST. 1896

DATA SHEET

Ceramic Metal Halide Lamps MR16 Precise™

35W

Product information

Tungsram'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 not be achieved previously with inferior technologies.
Tungsrams new CMH Precise technology platform has been developed with specific focus to retail applications. Tungsram Precise technology offers superb overall light quality, outstanding lumen maintenance, improved efficacy, while maintaining long life and reliability. These qualities are why Tungsram is the leader in ceramic metal halide technology.

- Premium CRI
- Dramatically improved lumen maintenance
- Outstanding efficiency: 4x better than halogen
- Long life
- Robust and reliable performance
- Colour uniformity lamp to lamp
- Compact lamp

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. CMH Precise lamps offer substantial benefits that make them the clear choice for specification into new stores, or into re-lamping existing store fixtures through regular replacement needs.

Benefits

- More usable light over life, up to 22% more lumen output at 10,000 hours vs standard CMH lamps
- Extra long life of 18,000 hours
- Extended life and relamp cycles
- Compatible with electronic HID ballasts
- Universal burning position on ECG
- Same size as standard CMH MR16
- New 35W retrofits directly into existing MR16 fixtures, ex-pands new sale offerings via improved lumen maintenance and longer life.

Applications

- Office
- Retail
- Hospitality
- Commercial areas / city beautification / architectural

Specification summary

Wattage	Operating Position	Length [mm]	Description	Cap	Colour	CBCP [cd]	Rated Average Life Hrs.	Pack Qty	Product Code
35	U	54.5	CMH35/MR16/UVC/U/930/GX10/SP PRECISE™TU	GX10	930	18,000	18,000	12	93102207
35	U	54.5	CMH35/MR16/UVC/U/930/GX10/FL PRECISE™TU	GX10	930	7,300	18,000	12	93102208
35	U	54.5	CMH35/MR16/UVC/U/930/GX10/WFL PRECISE™TU	GX10	930	3,700	18,000	12	93102209

General Information			
Product Code	**93102207**	**93102208**	**93102209**
Nominal Wattage [W]	35	35	35
Nominal CCT [K]	3,000	3,000	3,000
Format	MR16	MR16	MR16
Bulb Type	MR16	MR16	MR16
Bulb Diameter [mm]	51	51	51
Bulb Material	Borosilicate glass	Borosilicate glass	Borosilicate glass
Bulb Finish	Aluminized	Aluminized	Aluminized
Mercury Content [mg]	4.5	4.5	4.5
Arc gap [mm]	5.1	5.1	5.1
Operating Conditions			
Burning Position	Universal	Universal	Universal
Luminaire	Open	Open	Open
Electrical Characteristics			
Rated power [W]	39.2	39.2	39.2
Weighted Energy Consumption [kWh/1000 hrs]	42.9	42.9	42.9
Voltage [V]	93	93	93
Current [A]	0.42	0.42	0.42
Max Ignition Voltage [kV]	5	5	5
Min Ignition Voltage [kV]	3	3	3
Extinction Voltage (max) [%]	90	90	90

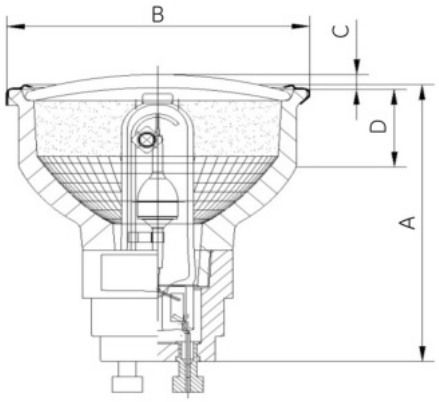
The specification provides typical performance data for 35W lamp operating on most electronic ballasts. Actual values t, supply voltage and application.
depend on ballas
Contact your GE representative for more information.

Photometric Characteristics Nominal Beam Angle	12° spot	25° flood	40° wide flood
Rated Beam Angle	11.2°	24.4°	39.4°
CBCP [Cd]	18,500	7,500	3,800
Rated Peak Intensity [Cd]	19,376	7,764	4,011
Nominal Luminous Flux [lm]	2,400	2,400	2,400
Rated Luminous Flux [lm]	2,453	2,558	2,501
Nominal Useful Lumens Luminous Flux (90° Cone) [lm]	2,000	2,000	2,000
Rated Useful Lumens Luminous Flux (90° Cone) [lm]	2,123	2,137	2,062
Rated Luminous Efficacy [LpW]	62.5	65.2	63.7
CCx	0.433	0.433	0.433
CCy	0.394	0.394	0.394
Color Rendering Index [Ra]	91	91	91
Energy Efficiency Class [EEC]	A	A	A
Starting and Warm-up Characteristics			
Time to Start @ 10ºC, sec	<2	<2	<2
Time to Start @ -15ºC, sec	<15	<15	<15
Switching cycles	1636	1636	1636
Hot Restart Time, Minutes	<7	<7	<7
Warm-up to Time to 90% Lumen Output [Min]	<1.5	<1.5	<1.5
Warm-up to Time to 60% Lumen Output [Sec]	45	45	45
Through life Performance			
Lumen Maintenance at 40% Rated Life [Mean Lumens] [%]	81	81	81
Average Rated Life [h]	18,000	18,000	18,000
Life to 10% Failures, B10 [h]	12,000	12,000	12,000
Maximum Operating Conditions			
Max Bulb Temperature[1]	300ºC	300ºC	300ºC
Max BaseTemperature[2]	300ºC	300ºC	300ºC

[1] Measured at centre of MR16 lens, in vertical base-up position.

[2] Measured on 25mm GX10 ceramic cap rim, at transition to 23mm diameter.

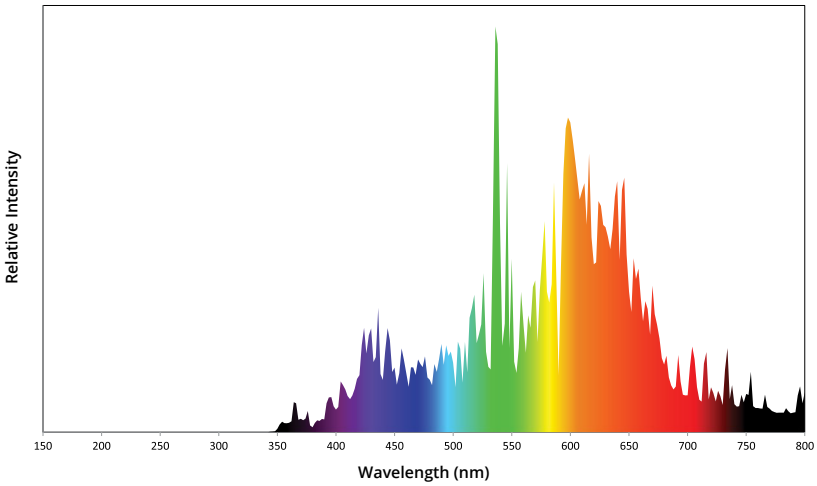
Dimensions



A Length (max.) [mm]	54.5
B Diameter (max.) [mm]	51
C (max.) [mm]	3.5
D (max.) [mm]	14

Spectral power distribution

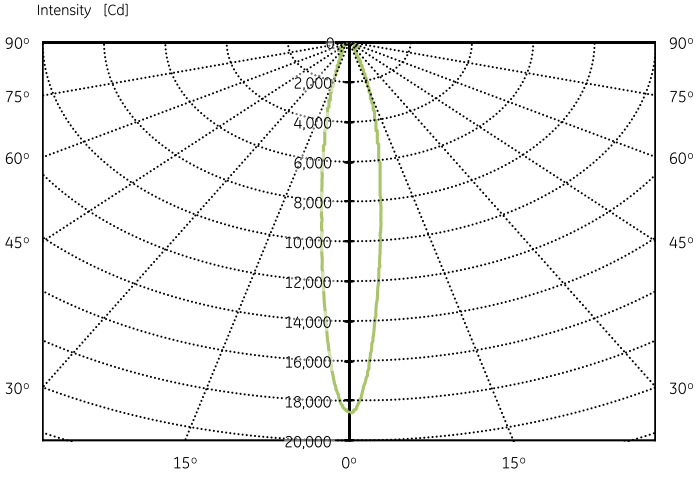
Spectral power distribution curves are given in the following diagram



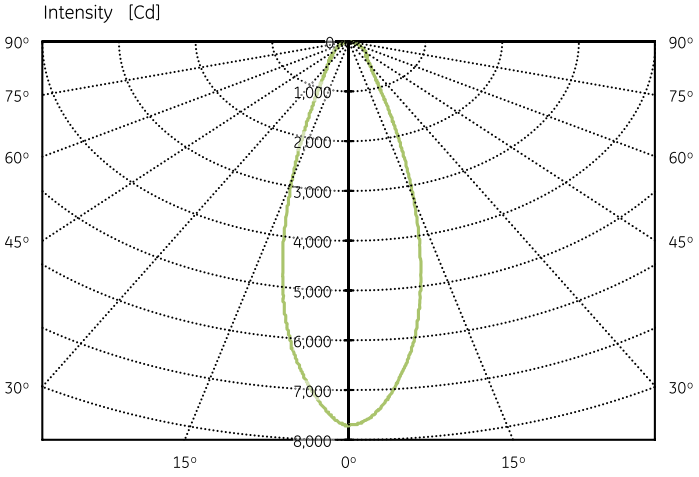
Distribution of luminous intensity

The following diagrams show polar light intensity curves and beam diagrams for vertical base-up orientation.

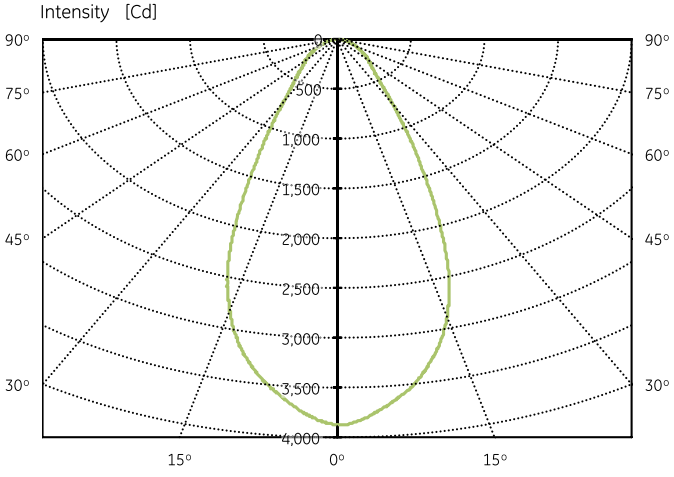
CMH MR16 35W 930 SP



CMH MR16 35W 930 FL

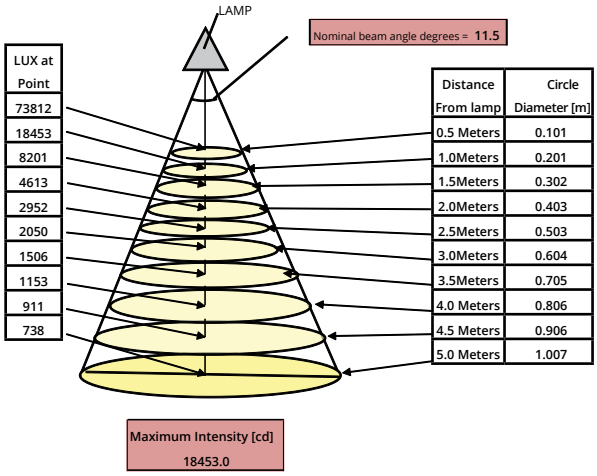


CMH MR16 35W 930 WFL

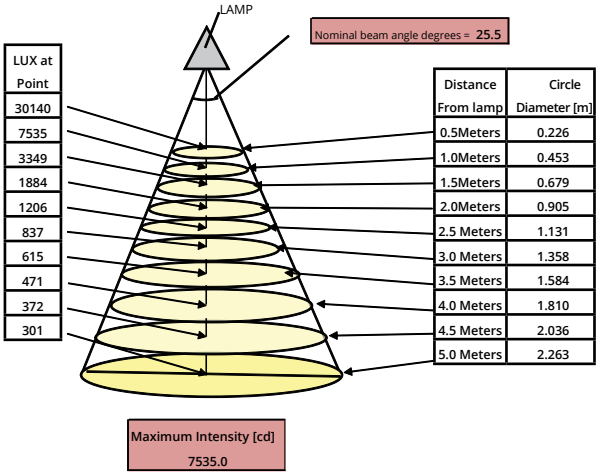


Beam diagrams

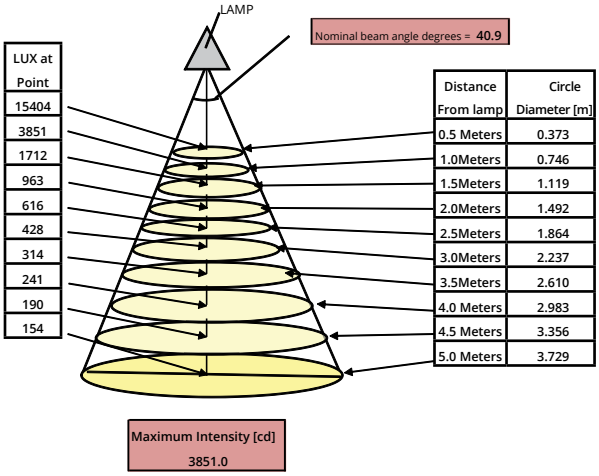
CMH35/MR16/UVC/U/930/GX10/SP PRECISE™TU



CMH35/MR16/UVC/U/930/GX10/FL PRECISE™TU



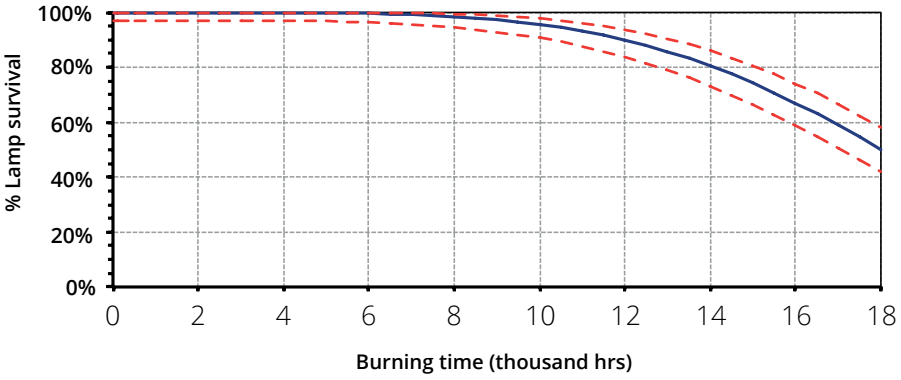
CMH35/MR16/UVC/U/930/GX10/WFL PRECISE™TU



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 relative costsof spot or group replacement and acceptable reduction in lighting levels.

Lamp survival CMH Precise™ 35W ECG



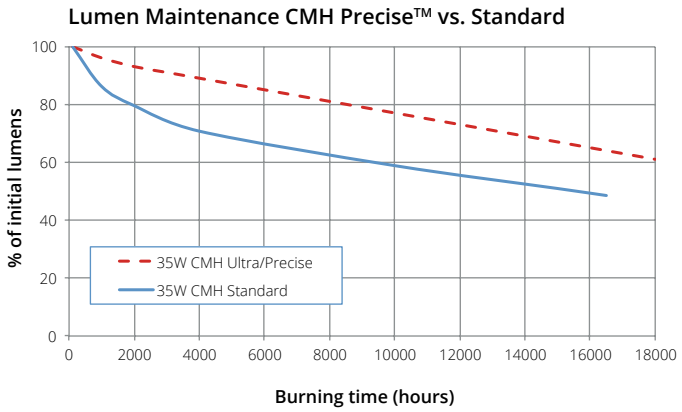
Lumen maintenance

Lumen maintenance graphs show light output performance through life for statistically representative batches of lamps operated under controlled nominal 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. In areas where multiple lamps are installed, consideration should be given to a group lamp replacement programme to maintain uniform illumination levels.

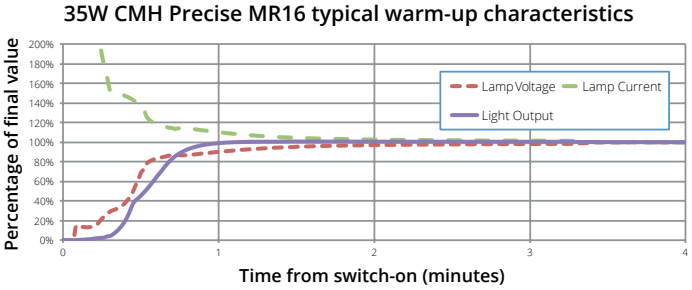
Curves represent operating conditions for an 11 hours per start switching cycle, but less frequent switching will improve lumen maintenance.

Note: the representative curves are shown for vertical base-up lamp orientation unless otherwise specified.



Warm-up characteristics

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



Dimming

In certain cases, dimming may be acceptable, subject to further testing. Contact your Tungsram representative for more information. Large changes in lamp power alter the thermal characteristics of the lamp resulting in lamp colour shift and possible reduction in lamp survival.

Flicker

Suitable electronic ballasts for CMH lamps provide squared wave operation in the 70-400 Hz range and eliminate perceptible flicker.

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 colour change (usually towards green).

The above situation can be 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 to maintain safety use electronic ballast or system which can shut itself off if ballast overheating occurs.

End of life cycling

A possible 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 gear. During subsequent warm-up the lamp voltage will again increase, causing extinction. This condition is known as end-of-life cycling. With electronic ballasts, cycling is unlikely.

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 practise to replace lamps that have reached end-of-life as soon as possible after failure, to minimise electrical and thermal stress on control gear components.

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 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. 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.

UV PET performance data from bare lamp

	UV-C [1]	UV-B [1]	UV-A[1]	UVC/UVB	UVB/UVA	Eeff [2]	PET (h)	Risk group
	200-280 nm	280-315 nm	315-400 nm					
CMH35MR16/930/Precise	0.000	0.000	3.618	0.000	0.000	0.00552	3036	Exempt

[1] µ W / (cm^2) / 500 Lux
[2] mW / (m2*klx)

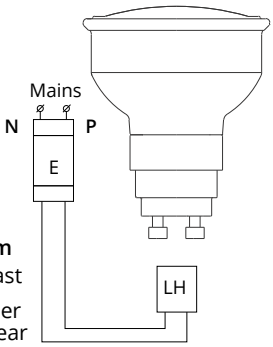
Information for luminaire design

Electronic ballast operation

CMH 35W Precise lamps have optimum performance on electronic gear.* This provides many advantages:

- Flicker free light output
- Well controlled electronic ignition process
- Simple wiring for fixtures due to elimination of ignitor and PFC capacitor
- Reduces fixture weight
- Automatic sensing of failed lamps and shutdown
- Lower overall system power consumption

* For details of approved electronic ballasts for CMH lamps please consult your Tungsram representative.



Circuit diagram
electronic ballast

LH: Lamp Holder
E: Electronic Gear

Containment requirement

CMH Precise MR16 lamps may be used in open fixtures.

Control gear and accessories

Electronic ballasts

Tungsram's range of electronic HID ballasts are designed to allow optimal performance of our range of CMH lamps, offering reduced power consumption, regulated power through life, simplified circuitry and more stable lamp operation compared to electromagnetic systems.

Tungsram has upgraded its range which now includes a miniature range of 20-35 Watt ballasts in integral and remote versions to be compatible with all types of CMH 20-35 Watt lamps. Please consult Tungsram for up to date details on approved ballast types for CMH 35W Precise .

Advantages:

- 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

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, remove and dispose of broken lamp
- Unexpected lamp shattering may cause injury, fire or property damage

Caution

- Risk of burn, allow lamp to cool before handling
- Lamp may shatter and cause injury if broken
- Arc tube fill gas contains Kr-85

Always follow the supplied lamp operation and handling instructions.