

Infusion™ Module M1000, M1500, M2000 and M3000 Series

The LED platform with built-in upgradeability

Product information

GE Lighting's range of Infusion™ LED modules has provided the lighting industry with a game-changing platform, opening up new possibilities for the use of long-lasting controllable, low maintenance LED solutions where the quality of light is critical to the customer/visitor experience. The range provides a complete tool kit to the designer when specifying track/accent lighting as well as ambient lighting applications using downlights. It also provides the freedom to create attention-grabbing displays, with the flexibility to alternate beam angles and light packages by simply swapping modules and/or optics. Plus, there's the assurance of GE reliability and performance: like all our LED chips and luminaires, the Infusion™ range is tested with LM79 & LM80 rigour.

As an LED system, Infusion™ is also inherently more sustainable than other lighting technologies, enabling significant reductions in energy consumption. By investing in Infusion™ technology today, upgrades to luminaires are made possible in the future which will be of great benefit as energy costs rise, LED costs fall and efficacy continues to increase.

The Infusion™ LED solution maintains incredibly consistent colour quality from module to module – as low as 2-MacAdam ellipse consistency. The socketable system design ensures consistent thermal performance, and this in turn means that colour consistency can be easily translated through to the luminaire.

Application areas



Retail



Offices



Museums and Art Galleries



Education



Healthcare



Hospitality



Features & Benefits

- Wide range of different lighting solutions from one platform
- Modular solution for quick, tool-free upgrading
- Lowest cost of ownership in the long term
- Long-term colour consistency
- Three colour temperature options 2700K, 3000K, 4000K for crisp white light
- High colour rendering - CRI ranges to Ra > 90
- Colour point stabilises by 1000 hours and is maintained within 2 MacAdam ellipses
- Exceptionally stable CRI across all colour ratings
- Excellent lumen maintenance (L85 at 50,000 hours)

IEC Standards

- IEC62471: Photobiological safety of lamps and lamp systems.
- IEC62031: LED modules for general lighting - safety specification.



Specification summary

Product Code	Description	Body Colour	CCT [K]	CRI	Colour Variation (MacAdam Ellipse)	Rated Life (L85) [h]	Drive Current [mA]	Rated Lumens [lm]	Rated Watts [W]
Infusion™ M1000 Series									
97184	M1000/827/W/N	White	2700	> 80	< 4-steps	50,000	700	900	15
							500	675	11
							350	500	7
97186	M1000/830/W/N	White	3000	> 80	< 4-steps	50,000	700	1000	15
							500	750	11
							350	550	7
97187	M1000/930/W/N	White	3000	> 87	< 2-steps	50,000	700	850	15
							500	650	11
							350	475	7
97188	M1000/840/W/N	White	4000	> 80	< 4-steps	50,000	700	1100	15
							500	825	11
							350	600	7
Infusion™ M1500 Series									
97185	M1500/827/W/N	White	2700	> 80	< 4-steps	50,000	700	1500	23
							500	1125	16
							350	825	11
97189	M1500/830/W/N	White	3000	> 80	< 4-steps	50,000	700	1600	23
							500	1200	16
							350	900	11
97190	M1500/930/W/N	White	3000	> 87	< 2-steps	50,000	700	1400	23
							500	1050	16
							350	775	11
97191	M1500/840/W/N	White	4000	> 80	< 4-steps	50,000	700	1750	23
							500	1325	16
							350	975	11
Infusion™ M2000 Series									
97192	M2000/827/W/N	White	2700	> 80	< 4-steps	50,000	1400	1800	30
							1000	1350	21
							700	1000	14
							500	775	10
							350	600	7
97193	M2000/830/W/N	White	3000	> 80	< 4-steps	50,000	1400	2000	30
							1000	1500	21
							700	1100	14
							500	875	10
							350	675	7
97194	M2000/930/W/N	White	3000	> 87	< 2-steps	50,000	1400	1700	30
							1000	1275	21
							700	950	14
							500	750	10
							350	575	7
97199	M2000/840/W/N	White	4000	> 80	< 4-steps	50,000	1400	2200	30
							1000	1675	21
							700	1225	14
							500	950	10
							350	750	7
Infusion™ M3000 Series									
97200	M3000/827/W/N	White	2700	> 80	< 4-steps	50,000	1400	3000	46
							1000	2275	32
							700	1625	22
							500	1300	15
							350	1000	10
97201	M3000/830/W/N	White	3000	> 80	< 4-steps	50,000	1400	3200	46
							1000	2425	32
							700	1775	22
							500	1400	15
							350	1050	10
97202	M3000/930/W/N	White	3000	> 87	< 2-steps	50,000	1400	2800	46
							1000	2125	32
							700	1550	22
							500	1225	15
							350	950	10
97203	M3000/840/W/N	White	4000	> 80	< 4-steps	50,000	1400	3500	46
							1000	2650	32
							700	1950	22
							500	1525	15
							350	1200	10



M1000



M1500



M2000



M3000

Accessories

Infusion™ LED modules are supplied without integrated optics giving luminaire designers the flexibility to design or use optics of their choice according to the application needs.

GE offers a range of optical attachments to interface with the Infusion™ LED modules, each featuring a twist-and-lock interface for easy, tool-free replacement and assembly.



Module Optic - 75mm

Module Optic - 100mm
Flood

Module Optic - 100mm
Spot

Holder

Optics

Product Code	Description	Body Colour	Diameter [mm]	Length [mm]	Corresponding Module Series	Beam Category	Nominal Beam Angle* [°]	Peak Intensity** [cd]
97204	OP1000/SP/W	White	100	70	M1000	Spot	14	10500
97208	OP1000/1500/FL/W	White	75	43	M1000/M1500	Flood	25/25	3300/4500
	OP3000/WFL/W				M3000	Wide Flood	35	6000
97206	OP1000/1500/WFL/W	White	75	43	M1000/M1500	Wide Flood	35/35	1900/3000
97207	OP1000/1500/VWFL/W	White	75	43	M1000/M1500	Very Wide Flood	55/55	900/1400
97205	OP1500/SP/W	White	100	70	M1500	Spot	14	15000
64996	OP2000/3000/FL/W	White	75	43	M2000/M3000	Flood	25/25	5000/6500
64995	OP2000/WFL/W	White	75	43	M2000	Wide Flood	35	3700
64994	OP2000/3000/VWFL/W	White	75	43	M2000/M3000	Very Wide Flood	55/55	1800/2700
98482	OP3000/4500/FL/100mm	White	100	71	M3000	Flood	25	9100
65292	OP1000/SP/B	Black	100	70	M1000	Spot	14	10500
65294	OP1000/1500/FL/B	Black	75	43	M1000/M1500	Flood	25/25	3300/4500
	OP3000/WFL/B				M3000	Wide Flood	35	6000
65295	OP1000/1500/WFL/B	Black	75	43	M1000/M1500	Wide Flood	35/35	1900/3000
65296	OP1000/1500/VWFL/B	Black	75	43	M1000/M1500	Very Wide Flood	55/55	900/1400
65293	OP1500/SP/B	Black	100	70	M1500	Spot	14	15000
65297	OP2000/3000/FL/B	Black	75	43	M2000/M3000	Flood	25/25	5000/6500
65298	OP2000/WFL/B	Black	75	43	M2000	Wide Flood	35	3700
65301	OP2000/3000/VWFL/B	Black	75	43	M2000/M3000	Very Wide Flood	55/55	1800/2700
98488	OP3000/4500/FL/100mm	Black	100	71	M3000	Flood	25	9100

* Full Width Half Maximum (FWHM)

** Candela values relate to colour 830. For other colour temperatures see the 'Beam performance' table. Peak intensity values are for module driven at maximum rated drive currents. For values at lower drive currents use lumen ratio in the 'Specification summary' table.

Holders

Product Code	Description	Body Colour	Lead Insulation	Lead Length [mm]
66233	MHOLDERW/PVC600	White	PVC	600
66232	MHOLDERB/PVC600	Black	PVC	600
97276	MHOLDERW/LSOH600	White	LSOH	600
97277	MHOLDERB/LSOH600	Black	LSOH	600
61450	MACC07HOLDERW	White	None	n/a
78835	MACC07HOLDERB	Black	None	n/a

Beam performance from Infusion™ modules and GE optics

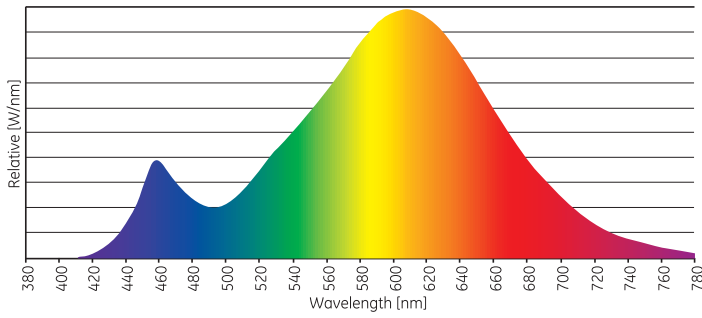
Module Series	Module Product Code	Module CCT [K]	Optic Beam Category	Optic Product Code White	Optic Product Code Black	Peak Intensity* [cd]	Nominal Beam Angle** [°]	Nominal Diameter [mm]	Nominal Length [mm]
M1000	97184	827	SP	97204	65292	9400	14	100	70
	97186	830				10500	14	100	70
	97187	930				8900	14	100	70
	97188	840				11500	14	100	70
	97184	827	FL	97208	65294	2900	25	75	43
	97186	830				3300	25	75	43
	97187	930				2800	25	75	43
	97188	840				3600	25	75	43
	97184	827	WFL	97206	65295	1700	35	75	43
	97186	830				1900	35	75	43
	97187	930				1600	35	75	43
	97188	840				2000	35	75	43
	97184	827	VWFL	97207	65296	800	55	75	43
	97186	830				900	55	75	43
97187	930	700				55	75	43	
97188	840	900				55	75	43	
M1500	97185	827	SP	97205	65293	14000	14	100	70
	97189	830				15000	14	100	70
	97190	930				13100	14	100	70
	97191	840				16400	14	100	70
	97185	827	FL	97208	65294	4200	25	75	43
	97189	830				4500	25	75	43
	97190	930				3900	25	75	43
	97191	840				4900	25	75	43
	97185	827	WFL	97206	65295	2800	35	75	43
	97189	830				3000	35	75	43
	97190	930				2600	35	75	43
	97191	840				3200	35	75	43
	97185	827	VWFL	97207	65296	1300	55	75	43
	97189	830				1400	55	75	43
97190	930	1200				55	75	43	
97191	840	1500				55	75	43	
M2000	97192	827	FL	97207	65296	4500	25	75	43
	97193	830				5000	25	75	43
	97194	930				4200	25	75	43
	97199	840				5500	25	75	43
	97192	827	WFL	64996	65297	3300	35	75	43
	97193	830				3700	35	75	43
	97194	930				3100	35	75	43
	97199	840				4000	35	75	43
	97192	827	VWFL	64995	65298	1600	55	75	43
	97193	830				1800	55	75	43
97194	930	1500				55	75	43	
97199	840	1900				55	75	43	
M3000	97200	827	FL	64996	65297	6000	25	75	43
	97201	830				6500	25	75	43
	97202	930				5600	25	75	43
	97203	840				7100	25	75	43
	97200	827	FL	98482	98488	8500	25	100	71
	97201	830				9100	25	100	71
	97202	930				8000	25	100	71
	97203	840				10000	25	100	71
	97200	827	WFL	97208	65294	5600	35	75	40
	97201	830				6000	35	75	40
	97202	930				5200	35	75	40
	97203	840				6500	35	75	40
	97200	827	VWFL	64994	65301	2500	55	75	40
	97201	830				2700	55	75	40
97202	930	2300				55	75	40	
97203	840	2900				55	75	40	

* Peak intensity values are for module driven at maximum rated drive currents. For values at lower drive currents contact your GE representative for details.

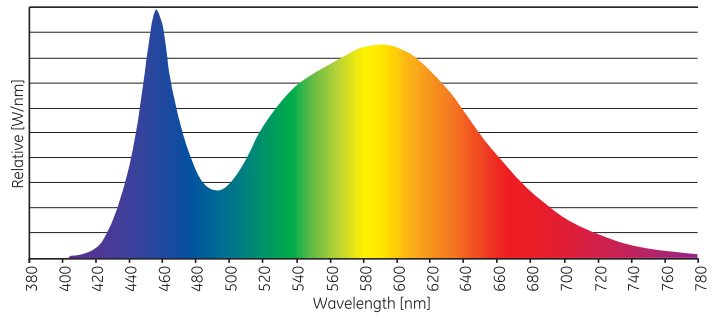
** Full Width Half Maximum (FWHM)

Spectral power distribution

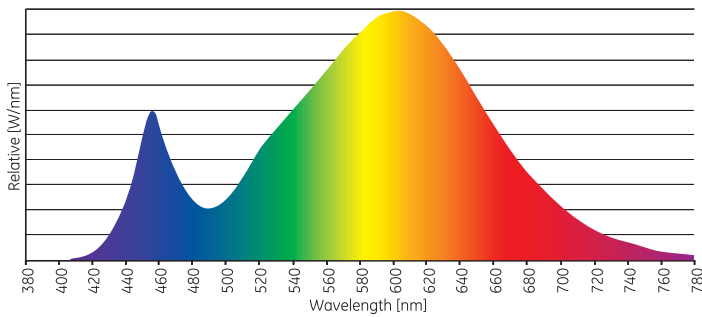
827



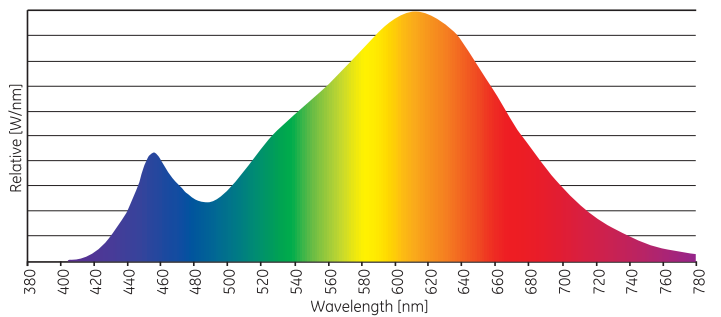
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830

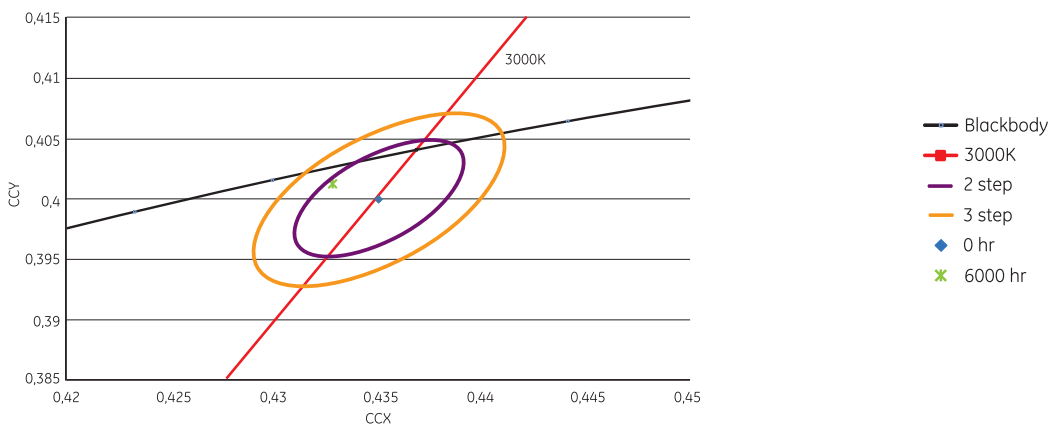


930



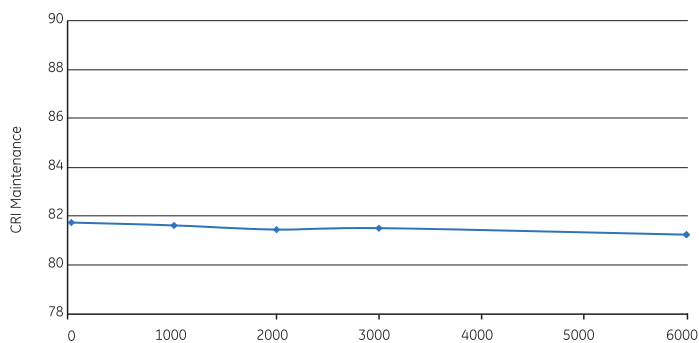
Colour maintenance

Colour point stabilises by 1000 hours and is maintained within 2 MacAdam ellipses.



CRI maintenance

Very stable CRI across all colour ratings.

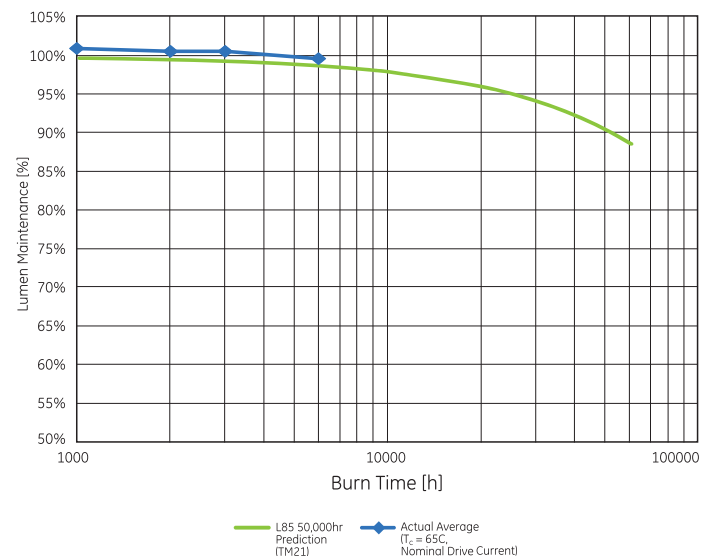


Unless otherwise stated, colour, CRI and lumen maintenance data is based on measurements on production modules with colour 830 at nominal driver current and $T_c = 65^\circ\text{C}$.

Colour, CRI and lumen results may vary depending on temperature, application, and drive current.

Lumen maintenance

L85 at 50,000 hours based on LM-80 testing of LED chips to 10,000 hours and modules to 6,000 hours.



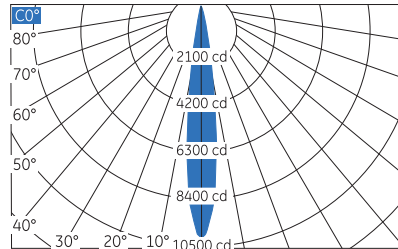
Photometric data

Photometric data shown below is for 830 colour at max drive current.
For different colours see the correction factor table.

827	0.9
840	1.1
930	0.85

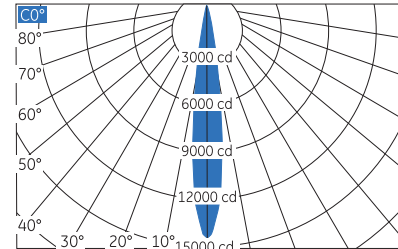
Spot Optics 15°

Infusion™ M1000



H [m]	D [m]	MaxLux
1.00	0.246	10500
2.00	0.491	2625
3.00	0.737	1167
4.00	0.982	656
5.00	1.228	420

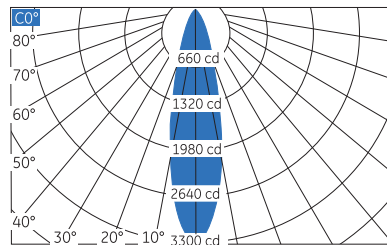
Infusion™ M1500



H [m]	D [m]	MaxLux
1.00	0.246	15000
2.00	0.491	3750
3.00	0.737	1667
4.00	0.982	938
5.00	1.228	600

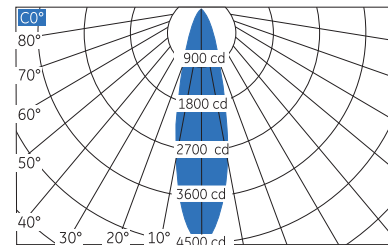
Flood Optics 25°

Infusion™ M1000



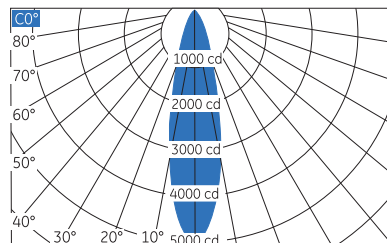
H [m]	D [m]	MaxLux
1.00	0.407	3300
2.00	0.814	825
3.00	1.221	367
4.00	1.628	206
5.00	2.035	132

Infusion™ M1500



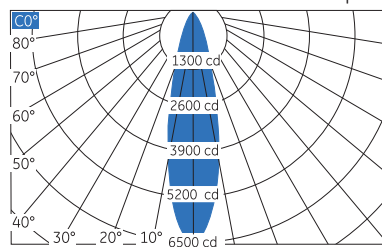
H [m]	D [m]	MaxLux
1.00	0.462	4500
2.00	0.923	1125
3.00	1.385	500
4.00	1.847	281
5.00	2.309	180

Infusion™ M2000



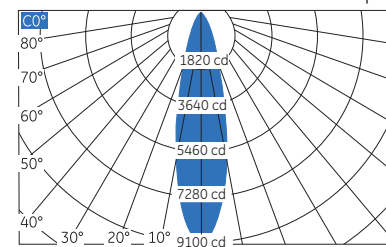
H [m]	D [m]	MaxLux
1.00	0.407	5000
2.00	0.814	1250
3.00	1.221	556
4.00	1.628	313
5.00	2.035	200

Infusion™ M3000 with 75mm flood optics



H [m]	D [m]	MaxLux
1.00	0.480	6500
2.00	0.960	1625
3.00	1.440	722
4.00	1.921	406
5.00	2.401	260

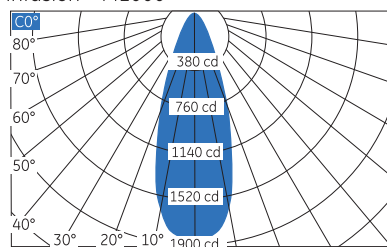
Infusion™ M3000 with 100mm flood optics



H [m]	D [m]	MaxLux
1.00	0.443	9100
2.00	0.887	2275
3.00	1.330	1011
4.00	1.774	569
5.00	2.217	364

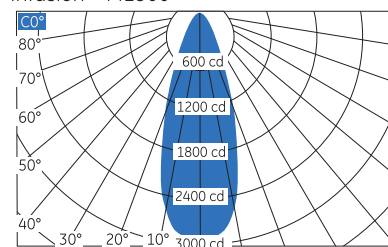
Wide Flood Optics 36°

Infusion™ M1000



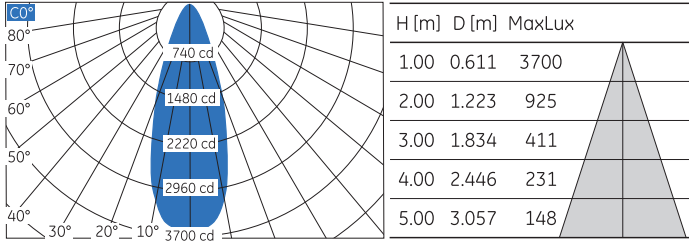
H [m]	D [m]	MaxLux
1.00	0.631	1900
2.00	1.261	475
3.00	1.892	211
4.00	2.522	119
5.00	3.153	76

Infusion™ M1500

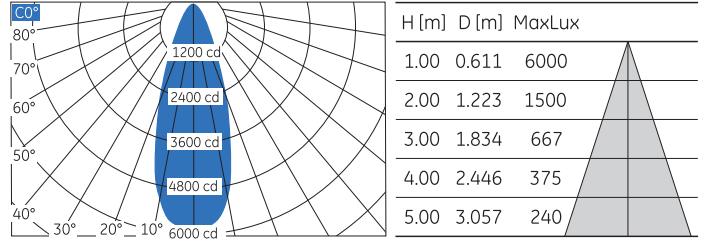


H [m]	D [m]	MaxLux
1.00	0.631	3000
2.00	1.261	750
3.00	1.892	333
4.00	2.522	188
5.00	3.153	120

Infusion™ M2000

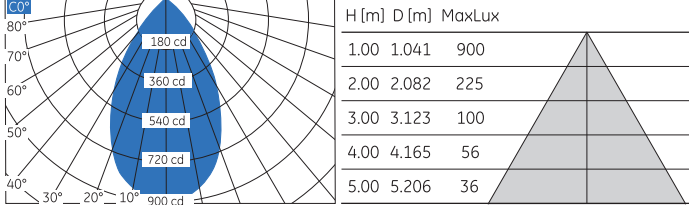


Infusion™ M3000

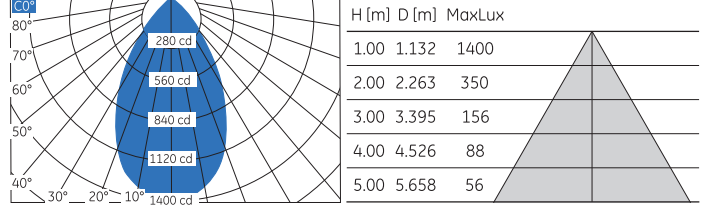


Very Wide Flood Optics 60°

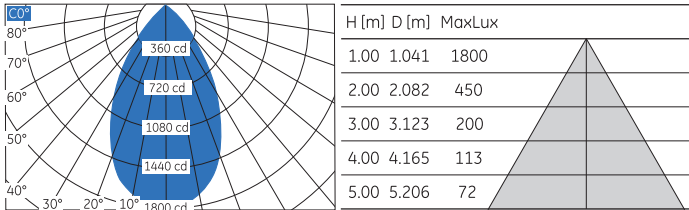
Infusion™ M1000



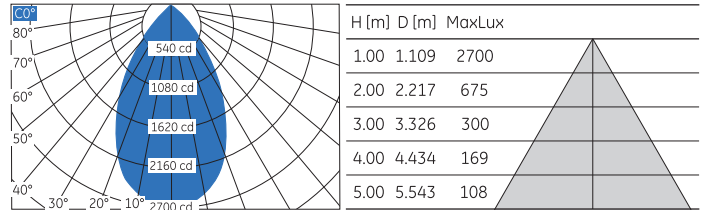
Infusion™ M1500



Infusion™ M2000



Infusion™ M3000



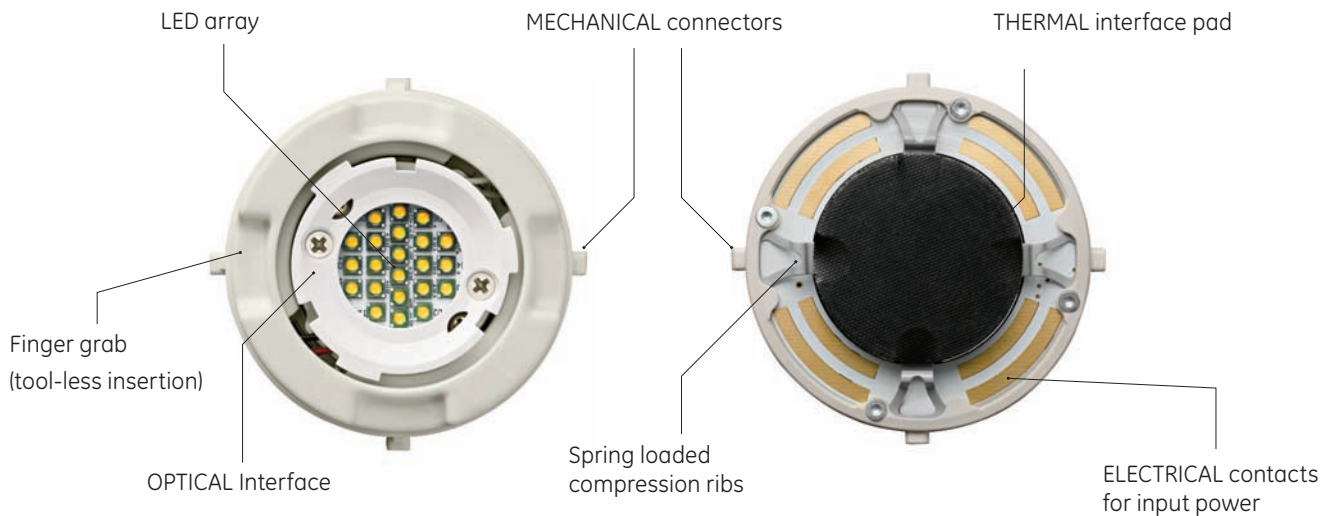
Three-in-one connectivity

Every GE Infusion™ LED module offers the simplicity and ease of installation that comes with three-in-one connectivity. Twist an Infusion™ module into place and three key interfaces – thermal, electrical and mechanical – are connected at once.

The printed circuit board (PCB) that carries the LEDs is connected to a thermal interface, which in turn is attached to the main body of the module by a set of springs. The module also has electrical connectors and mechanical tabs enabling all three interfaces to be connected with one single twist action.

Front view

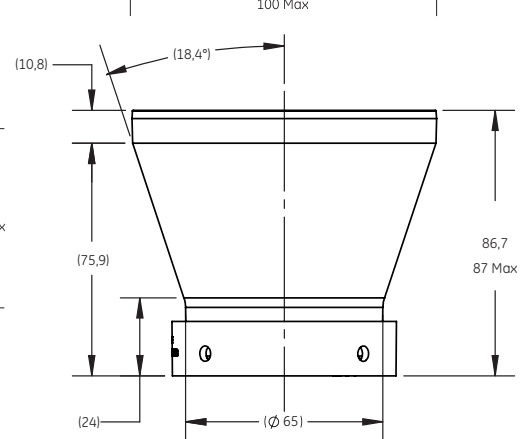
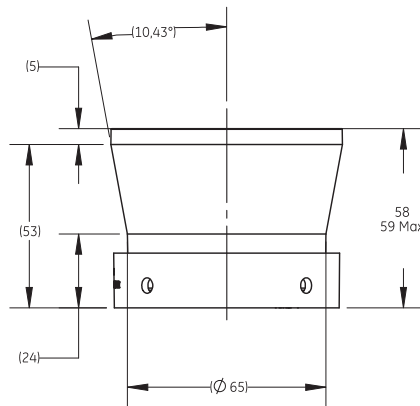
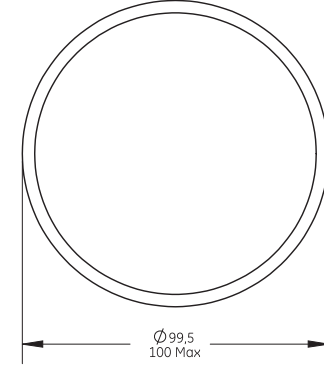
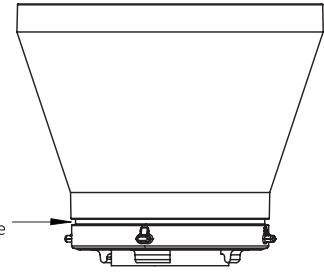
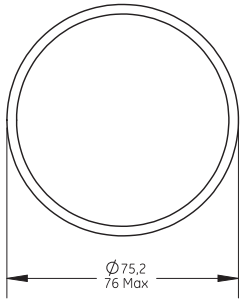
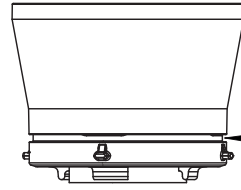
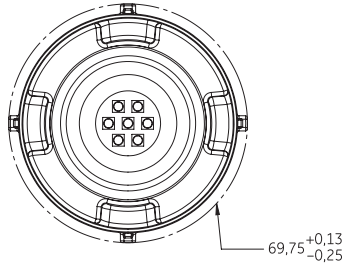
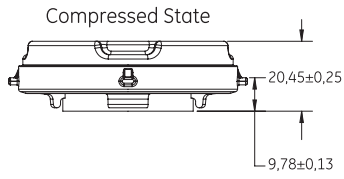
Rear view



Dimensions

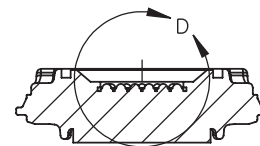
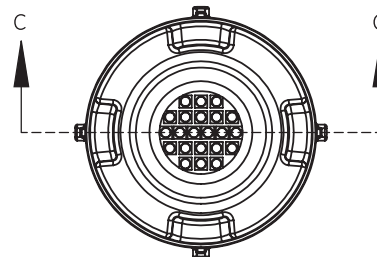
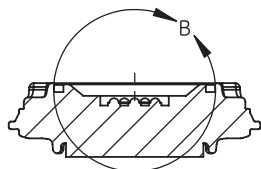
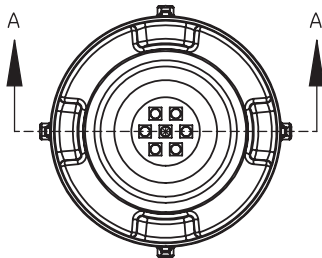
Overall dimensions: holder, module, optic

Module dimensions

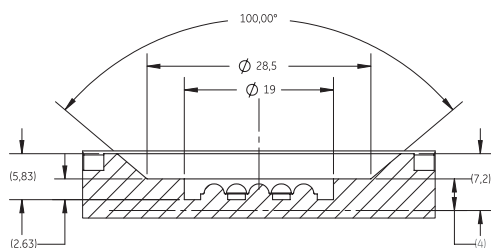


Dimensions for optic designers

Optical interface for M1000, M1500, M2000 and M3000 series

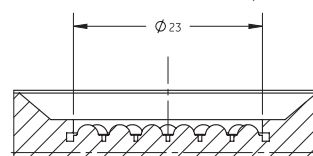


Optical Interface for M1000 and M1500 Series



DETAIL B
SCALE 2 : 1

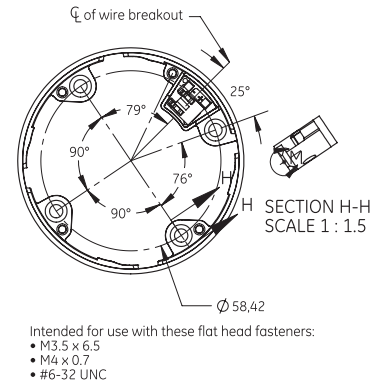
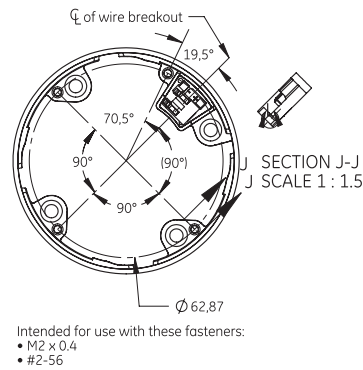
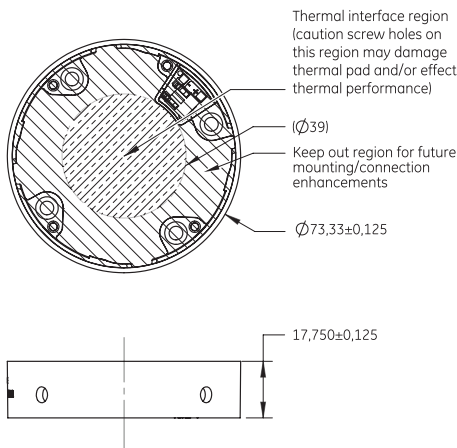
Optical Interface for M2000 and M3000 Series
(Same as M1000 and M1500 Series except where indicated)



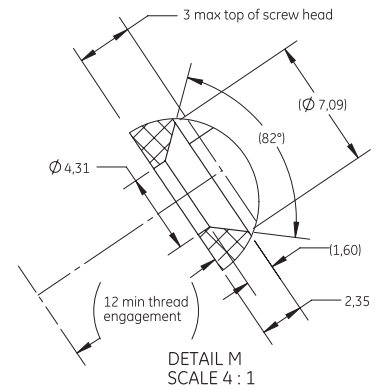
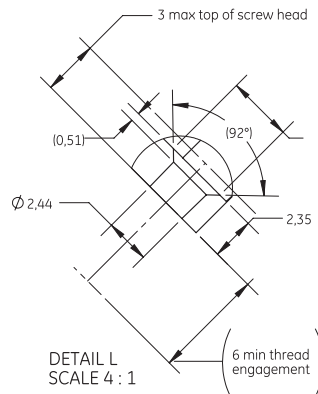
DETAIL D
SCALE 2 : 1

- 3D Customer Models of the module are simplified versions of detailed solid models. Not all details/features are included in drawing or in models. Geometry in the 3D Customer Models is typically provided in nominal condition and typically does not reflect max/min conditions.
- Height from base to top of lock tab as shown represents compressed distance when mated to holder accessory. This compression is required to make appropriate mechanical, electrical, and thermal connections. This dimension and tolerance is driven by holder.
- Height from base to top of housing as shown represents compressed condition when mated to holder.
- Multiple lumen level and beam angle solutions are provided within same overall system envelope.
- Check overall height of system against drawing to confirm proper mating. There is a gap in outer surfaces between the Module and Optic Accessory when properly mated.
- Ensure bottom diameter of reflector clears the light emitting surface of the module. Using lower diameter reflector may damage the LEDs.
- Dimensions in parenthesis () are for reference only.
- Consult GE Lighting for more information.

Holder dimensions for heat sink designers



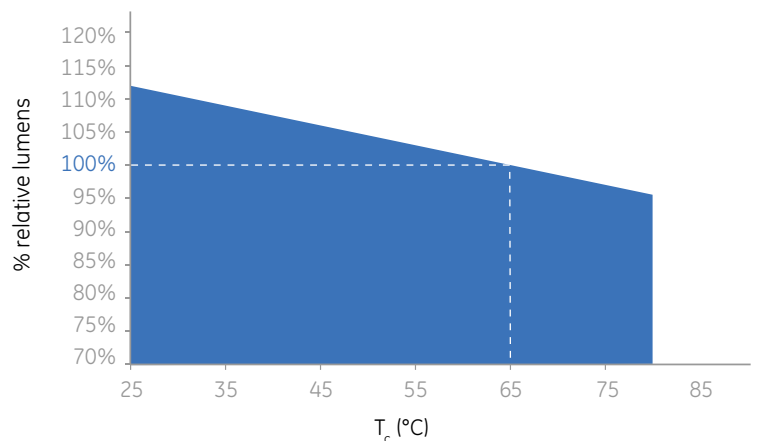
- 3D Customer Model for holder accessory is provided as a detailed solid model.
- Geometry in 3D Customer Models is typically provided in nominal condition and may not reflect max/min conditions. Consult this drawing for max/min conditions.
- Thermal Interface Region indicates where thermal pad attached to thermal base makes contact to heat sink. The region should be smooth, flat, and clean. Non-clean surface can damage thermal pad and result improper thermal contact. Recommend 0.1 mm flatness with surface roughness tolerance of RMS $\sqrt{16}$
- Entire mating area beneath OD of holder should be flat with no infringements into this region to allow for any future holder mounting options.
- Wire connections to solder pads per polarity indicated. Ensure proper strain relief is provided. Solder pads are designed for connection to 20 AWG stranded cable. (20 AWG stranded UL 1007 tinned copper conductor). Consult local codes and standards to ensure use of proper cable.
- Dimensions in parenthesis () are for reference only.
- Ensure holder mounting and thermal interface surface are at the same level. Thermal interface surface being at different level can cause either difficult assembly or improper thermal contact.



Lumen performance with temperature

The operating temperature of the module will impact on lumen output. Claimed lumens assumes a steady-state T_c reading of 65°C. Modules operating cooler than this will have higher lumen output, while modules operating at a higher temperature will show a reduction in lumens, as illustrated in this graph.

T_c vs % Relative Lumens



Designing a heat sink

The necessary size of the heat sink will depend on the temperature difference between T_c and ambient temperature, total input power, and material properties of the heat sink. To ensure that adequate heat is dissipated from the light engine, heat sink design must take into account the input power to the LED module as well as effects from nearby heat sources.

Assuming that ambient temperature is 25°C, T_c is 65°C, the heat sink is in a free-air condition, and the module is run at nominal current (necessary to achieve the rated lumens) the minimum $R\theta_{hs-a}$ for the different module systems are:

Module Series Lumen Value	Required Heat Sink $R\theta$ [K/W]
1000	2.7
1500	1.7
2000	1.3
3000	0.75

Notes: $R\theta_{hs-a}$ can generally be reduced by adding heat fin surface area or introducing forced convection via active cooling methods

Electronic control gear

Infusion™ LED modules are designed to run from external SELV-rated electronic control gear (ECG) providing constant current input. NPM Series are rated for max 700mA operation.

A wide range of commercially available LED drivers has been qualified for use with Infusion™ modules including dimming drivers that operate on DALI, DMX, 0-10V, leading edge and trailing edge systems; static drivers; and drivers with auxiliary active cooling outputs.

Infusion™ LED modules are compatible with a wide range of GE Lightech and other 3rd party LED drivers, making it simple to specify a driver with the correct input voltage, dimming protocol, and form factor to suit your application.

The approved driver list is updated on a regular basis. Please contact your GE representative for details. For more information visit www.gelighting.com/eu.

Zhaga product data set

Product Description	Luminous Flux Category	CCT [K]	CRI	LES Category	OCA Category	Luminance Uniformity "U"	Luminance Rotational Symmetry "S"	Tr, max [°C]	Rth, max [K/W]	Ambient Temp [°C]
M1000/827/W/N	C008	2700	80	LES 19	OCA B	0.11	0.99	62	2.7	25
M1000/830/W/N	C008	3000	80	LES 19	OCA B	0.11	0.99	62	2.7	25
M1000/930/W/N	C008	3000	87	LES 19	OCA B	0.11	0.99	62	2.7	25
M1000/840/W/N	C011	4000	80	LES 19	OCA B	0.11	0.99	62	2.7	25
M1500/827/W/N	C015	2700	80	LES 19	OCA B	0.16	0.74	61	1.7	25
M1500/830/W/N	C015	3000	80	LES 19	OCA B	0.16	0.74	61	1.7	25
M1500/930/W/N	C011	3000	87	LES 19	OCA B	0.16	0.74	61	1.7	25
M1500/840/W/N	C015	4000	80	LES 19	OCA B	0.16	0.74	61	1.7	25
M2000/827/W/N	C015	2700	80	LES 23	OCA C	0.15	0.7	59	1.3	25
M2000/830/W/N	C020	3000	80	LES 23	OCA C	0.15	0.7	59	1.3	25
M2000/930/W/N	C015	3000	87	LES 23	OCA C	0.15	0.7	59	1.3	25
M2000/840/W/N	C020	4000	80	LES 23	OCA C	0.15	0.7	59	1.3	25
M3000/827/W/N	C030	2700	80	LES 23	OCA C	0.22	0.98	50	0.75	25
M3000/830/W/N	C030	3000	80	LES 23	OCA C	0.22	0.98	50	0.75	25
M3000/930/W/N	C025	3000	87	LES 23	OCA C	0.22	0.98	50	0.75	25
M3000/840/W/N	C030	4000	80	LES 23	OCA C	0.22	0.98	50	0.75	25