

Precision Subminiature NVIS Components

- NVIS Green A Ring Filters for Incandescent Light Sources
- Incandescent Lamps for NVIS Green A Ring Filters
- NVIS Green A Ring Filters for Green LED Light sources
- Green LED Lamps for NVIS Green A Ring Filters
- NVIS Green A Ring Filters for White LED Light sources
- White LED Lamps for NVIS Green A Ring Filter
- NVIS Friendly AA Flashlight

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Application Notes

Night vision imaging system (NVIS) compatible lighting

Military personnel using night vision goggles (NVG) must be able to read illuminated displays without those displays interfering with the performance of the goggles. The displays also must be readable to those not using night vision.

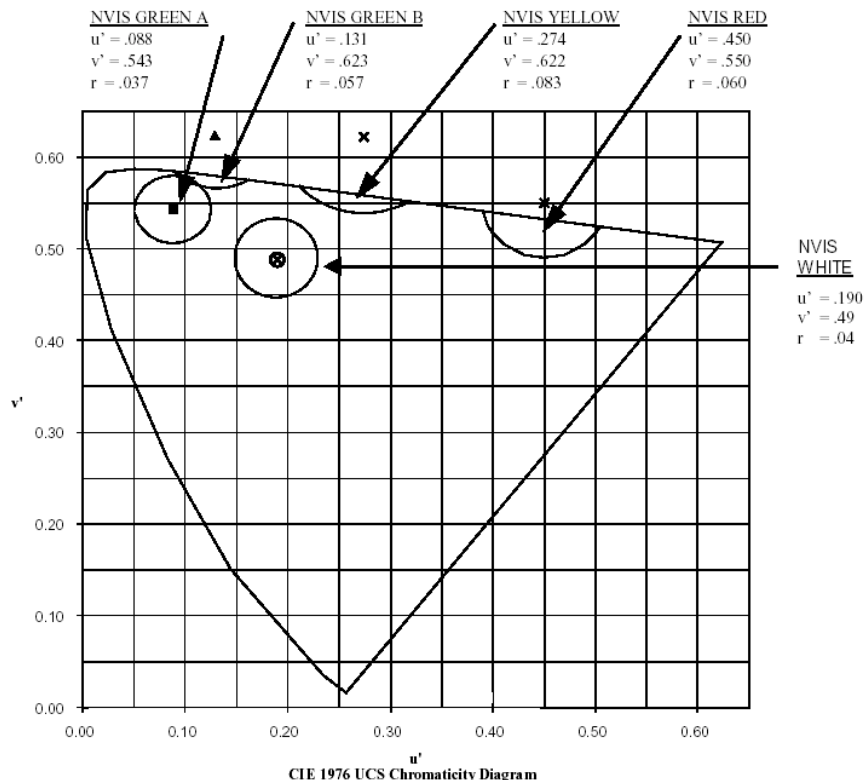
Displays illuminated with unfiltered Incandescent lamps or LEDs (light emitting diodes) can interfere with NVG since they can emit significant energy in the infrared (IR) region of the spectrum. Excess IR radiation can cause conflicts with NVG night vision functionality. For example, IR interference can cause night vision goggles to bloom (creating a halo-like glow around the displays and reducing visibility), create ghosting images (IR reflections from the cockpit surface), or goggle sensitivity loss due to activation of the automatic gain control due to higher levels of IR.

Illuminated displays filtered with Lumitron NVIS filters allow displays to be both visible to the unaided eye while fully NVG compatible per the NVIS requirements of MIL-STD-3009.

NVIS Green A and B for primary and secondary lighting components

MIL-STD-3009 describes the color coordinates and NVIS radiance required for various NVIS compatible lighting components. Primary and secondary lighting components typically require NVIS Green A or Green B color properties. These lighting components must be NVIS compatible when the luminance is scaled to 0.1 fL. Parameters for NVIS colors per MIL-STD-3009:

MIL-STD-3009



Incandescent Light Sources

Incandescent subminiature lamps typically used in integrally illuminated instruments and panels have a broad emission throughout the visible spectrum. However, the majority of the radiated energy lies in the infrared region. Filament temperatures vary over a very broad wavelength range extending from 400 nm in the visible (blue) region to 10,000 nm in the far infrared. Typical temperatures for low wattage subminiature lamps range from 1850 °K – 2275 °K.

Lumitron 3-series NVIS glass is designed specifically for incandescent lamps. Our Monolithic glass construction NVIS ring filters and NVIS lamps (lamp/filter assemblies) offer reliable, rugged, and temperature resistant NVIS compliance in lighting applications where low wattage subminiature incandescent lamps are the preferred source of illumination. NVIS compatibility is achieved when the glass is machined with a wall thickness of 0.040" (1.0 mm).

Lumitron 3-series glass NVIS filters and lamps are available in either a matte or polished finish.

LED Light Sources

LEDs as a light source in a display heavily influence its color, contrast, and NVIS radiance (NR) properties. Lumitron offers 6-series plastic NVIS filters that are designed to optimize the unique spectral emission properties of LEDs, allowing for higher visible transmission than our 3-series glass NVIS filters. Lumitron also offers LEDs in single colors such as blue, green, yellow, red, and white. Please see our catalog or web site (www.lumitron.com) for more information on our LED products.

White LED Lamps

Relatively new semiconductor chemistry based on gallium nitride has enabled high-efficiency blue LEDs to emerge into the market place. This new GaN now yields very high brightness blue emission. In turn, the blue emission can be harnessed to generate a "white" LED color. The white emission is realized by applying a thin phosphor coating over the blue emitting LED.

White LEDs with broadband spectral emission can be filtered with Lumitron 6-series plastic NVIS filters to produce displays that comply with various NVIS color coordinates described in MIL-STD-3009.

Broadband vs. narrowband LEDs

If a specific color coordinate range is critical to an application, it is important to select either:

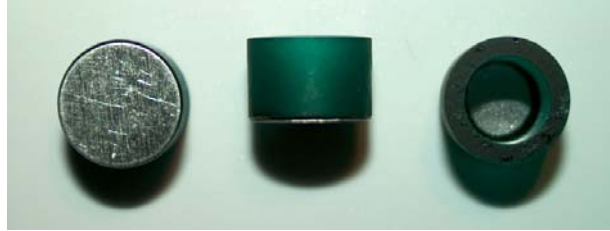
- A broadband LED source that can be filtered to the correct color coordinates, or
- A narrowband LED source that inherently complies with the correct color coordinates.

Please note that monochrome narrowband emission LEDs with non-compliant color coordinates generally cannot be rendered compliant with the addition of an NVIS filter.

Lumitron 6-series plastic ring filters are available for NVIS Green A applications using white or green LEDs. Typically, NVIS compatibility is achieved when the 6-series plastic NVIS filter material is machined with a wall thickness of 0.028" (0,7 mm).

3-series NVIS filters for Incandescent Light Sources

NVG COMPATIBILITY FOR TYPE V PANELS – MIL-L-7788F
 NVG COMPATIBILITY FOR AVIONICS PER MIL-L-85762A and MIL-STD-3009



Dimensions are in inches (mm)

PART NUMBER	INSIDE DIAMETER	OVERALL LENGTH*	OUTSIDE DIAMETER	WALL	FILTER TYPE
L-43130-210	.130 (3,3)	.135 (3,4)	.215 (5,5)	.040 (1,0)	NVIS "A" LG-3 Green
L-43130-150	.130 (3,3)	.160 (4,1)	.215 (5,5)	.040 (1,0)	NVIS "A" LG-3 Green
L-43170-125	.170 (4,3)	.135 (3,4)	.245 (6,2)	.040 (1,0)	NVIS "A" LG-3 Green
L-43170-250	.170 (4,3)	.160 (4,1)	.245 (6,2)	.040 (1,0)	NVIS "A" LG-3 Green
L-53130-210	.130 (3,3)	.135 (3,4)	.215 (5,5)	.040 (1,0)	NVIS "A" Intruder-3 Green
L-53130-150	.130 (3,3)	.160 (4,1)	.215 (5,5)	.040 (1,0)	NVIS "A" Intruder-3 Green
L-53170-125	.170 (4,3)	.135 (3,4)	.245 (6,2)	.040 (1,0)	NVIS "A" Intruder-3 Green
L-53170-250	.170 (4,3)	.160 (4,1)	.245 (6,2)	.040 (1,0)	NVIS "A" Intruder-3 Green

NVIS LAMPS PER MIL-L-85762A and MIL-STD-3009



Dimensions are in inches (mm)

PART NUMBER**	INSIDE DIAMETER	OVERALL LENGTH*	OUTSIDE DIAMETER	WALL	FILTER TYPE
L-43130-150-XXXX	.130 (3,3)	.200 (5,1)	.215 (5,5)	.040 (1,0)	NVIS "A" LG-3 Green
L-43170-250-XXXX	.170 (4,3)	.200 (5,1)	.245 (6,2)	.040 (1,0)	NVIS "A" LG-3 Green
L-43170-125-XXXX	.170 (4,3)	.175 (4,5)	.245 (6,2)	.040 (1,0)	NVIS "A" LG-3 Green
L-53095-150-XXXX	.130 (3,3)	.200 (5,1)	.215 (5,5)	.040 (1,0)	NVIS "A" Intruder-3 Green
L-53170-250-XXXX	.170 (4,3)	.200 (5,1)	.245 (6,2)	.040 (1,0)	NVIS "A" Intruder-3 Green
L-53170-125-XXXX	.170 (4,3)	.175 (4,5)	.245 (6,2)	.040 (1,0)	NVIS "A" Intruder-3 Green

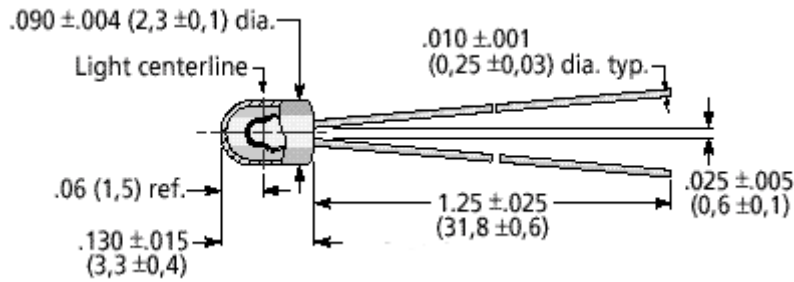
For polished finish add "P" to part number (L-43130-210-P)

* Including aluminum cap heat sink.

** See note 3 on next page for lamp options.

NVIS Incandescent Light Source Options

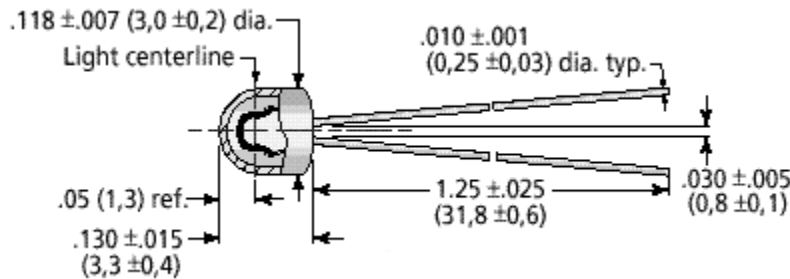
T-3/4 Short Wire Terminal (0.215 O.D. Ring Filters)



Dimensions in inches (mm)

Part Number	Volts	MSCP	Amps	Filament	-XXXX
L-6153/S-AS15	5.0	0.15	0.060	C-2R	6153
L-7133/S-AS15	5.0	0.09	0.075	C-2R	7133
L-7153/S-AS15	5.0	0.15	0.115	C-2R	7153

T-1 Short Wire Terminal (0.215 & 0.245 O.D. Ring Filters)



Dimensions in inches (mm)

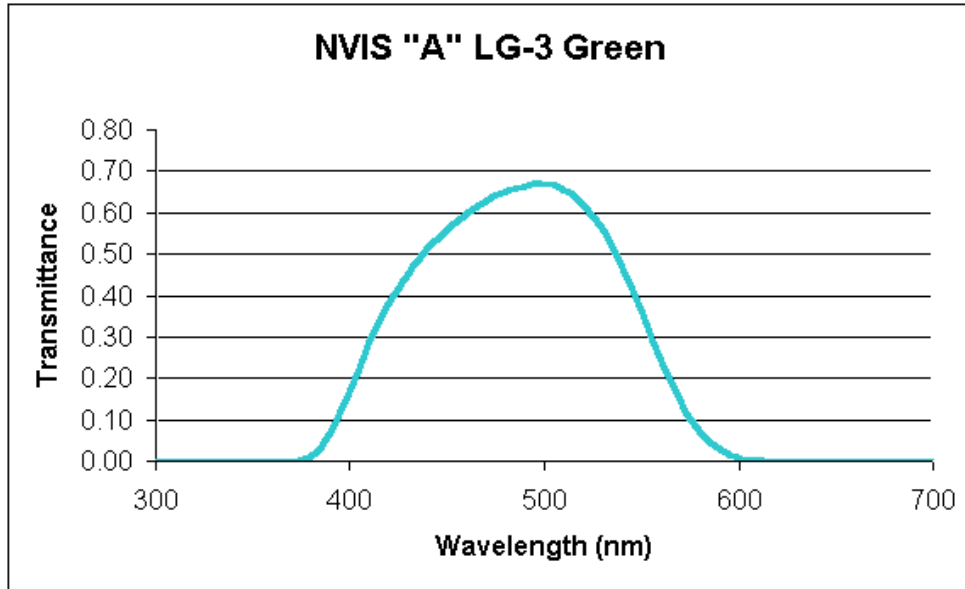
Part Number	Volts	MSCP	Amps	Filament	-XXXX
L-7132-AS15	5.0	0.09	0.075	C-2R	7132
L-6152-AS15	5.0	0.15	0.060	C-2R	6152
L-7152-AS15	5.0	0.15	0.115	C-2R	7152
L-7009-AS15	28.0	0.15	0.024	CC-2F	7009

Notes:

- 1) 3-series NVIS Ring Filters and NVIS Lamps include heat-sink aluminum cap.
- 2) For polished surface please add "P" to the part number (L-43170-210-P).
- 3) Add required lamp dash number to selected 3-series ring filter to describe NVIS Lamp. Example: L-43170-250P-7152 is an assembly using our polished NVIS "A" LG-3 Green filter assembled with our L-7152-AS15 lamp.
- 4) NVIS Lamps (lamp/filter assemblies) are subject to some degree of "abbreviated life" from the rated life of the unfiltered lamp. Performance and life of lamp/filter assemblies are directly related to the environment in which they operate. Suitability of lamp/filter assemblies for specific applications must be determined by the user.

Filter Type: 3-series LG-3 Green

NVIS Green A (Lower Green) compliance of incandescent lamps



Chromaticity and NVIS Radiance

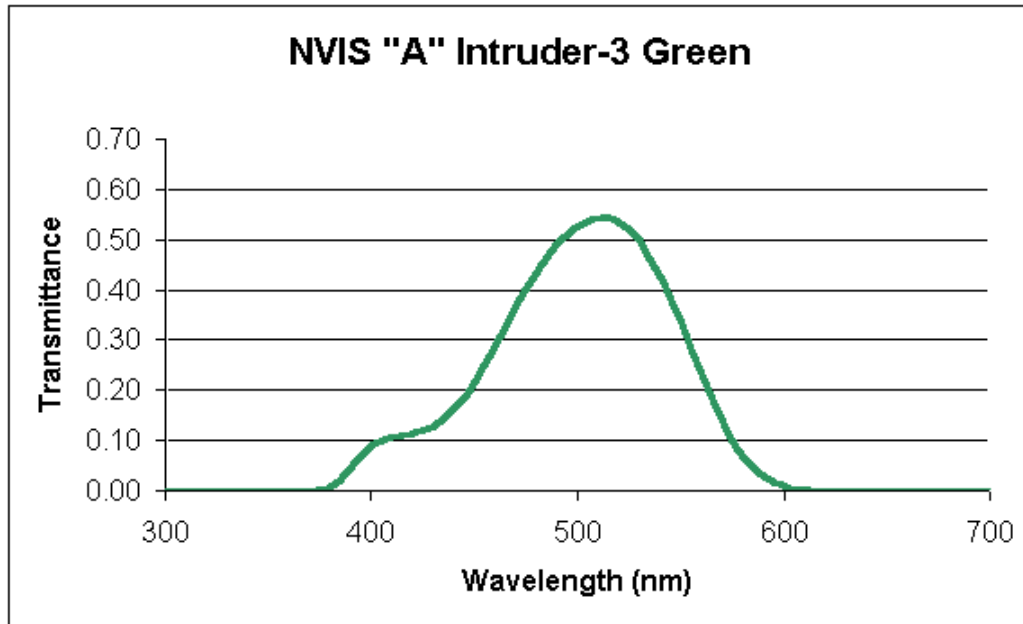
	Chromaticity		Chromaticity		Photopic	NVG
	CIE '76		CIE '31		Transmittance	Radiance
Source	u'	v'	x	y	Y(%)	N/R A
1800 K	0.104	0.542	0.236	.0542	15.4	7.4E-11
2100 K	0.100	0.526	0.216	0.503	18.0	6.5E-11

Physical Properties

Nominal Thickness	0.040 inches (1.00 mm)
Refractive Index	$n_d = 1.671$
Density	3.92 g/cc
Thermal Linear Expansion	$105E-7 / ^\circ C$
Transition Temperature	476 °C
Annealing Temperature	489 °C
Deformation Temperature	510 °C

Filter Type: 3-series Intruder-3 Green

NVIS Green A (Upper Green) compliance of incandescent lamps



Chromaticity and NVIS Radiance

	Chromaticity		Chromaticity		Photopic	NVG
	CIE '76		CIE '31		Transmittance	Radiance
Source	u'	v'	x	y	Y(%)	N/R A
1800 K	0.106	0.555	0.254	0.590	13.9	7.8E-11
2100 K	0.101	0.547	0.235	0.568	16.2	6.9E-11

Physical Properties

Nominal Wall Thickness	0.040 inches (1.00 mm)
Refractive Index	$n_d = 1.680$
Density	4.03 g/cc
Thermal Linear Expansion	$109E-7 / ^\circ\text{C}$
Transition Temperature	471 °C
Annealing Temperature	484 °C
Deformation Temperature	502 °C

6-series Plastic NVIS filters for LED Light Sources

NVG COMPATIBILITY FOR GREEN LEDs
 NVG DISPLAY COMPATIBILITY PER MIL-L-85762A and MIL-STD-3009



Dimensions are in inches (mm)

PART NUMBER	INSIDE DIAMETER	OVERALL LENGTH*	OUTSIDE DIAMETER	WALL	LED	FILTER TYPE
L-66198-210	.160 (4,0)	.135 (3,4)	.215 (5,5)	.028 (0,7)	Green	NVIS "A" LG-6 Green
L-66198-150	.160 (4,0)	.160 (4,1)	.215 (5,5)	.028 (0,7)	Green	NVIS "A" LG-6 Green
L-66198-125	.185 (4,7)	.130 (3,2)	.245 (6,2)	.028 (0,7)	Green	NVIS "A" LG-6 Green
L-66198-250	.185 (4,7)	.160 (4,1)	.245 (6,2)	.028 (0,7)	Green	NVIS "A" LG-6 Green

NVG COMPATIBILITY FOR WHITE LEDs
 NVG DISPLAY COMPATIBILITY PER MIL-L-85762A and MIL-STD-3009



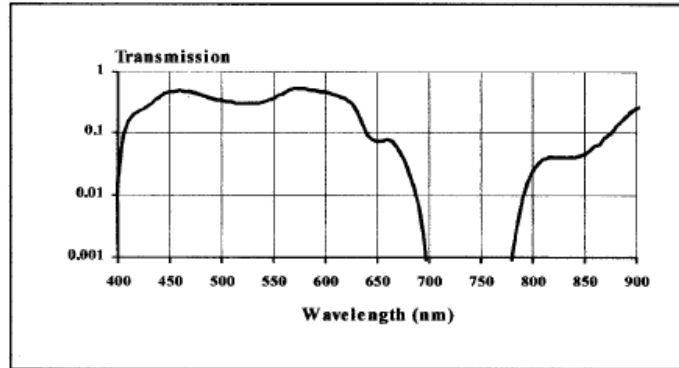
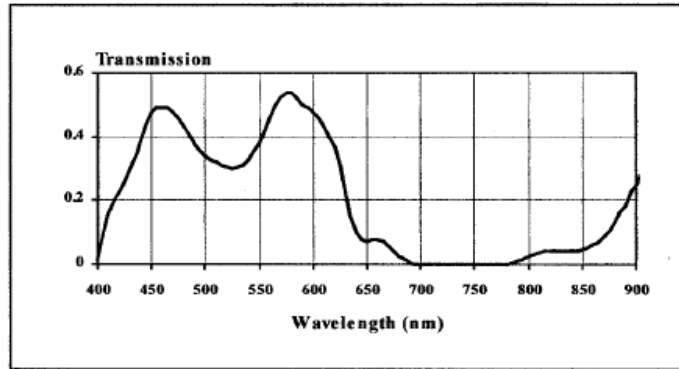
Dimensions are in inches (mm)

PART NUMBER	INSIDE DIAMETER	OVERALL LENGTH*	OUTSIDE DIAMETER	WALL	LED	FILTER TYPE
L-65196-210	.160 (4,0)	.135 (3,4)	.215 (5,5)	.028 (0,7)	White	NVIS "A" LW-6 Green
L-65196-150	.160 (4,0)	.160 (4,1)	.215 (5,5)	.028 (0,7)	White	NVIS "A" LW-6 Green
L-65196-125	.185 (4,7)	.130 (3,2)	.245 (6,2)	.028 (0,7)	White	NVIS "A" LW-6 Green
L-65196-250	.185 (4,7)	.160 (4,1)	.245 (6,2)	.028 (0,7)	White	NVIS "A" LW-6 Green

Lumitron can machine 6-series plastic NVIS filter material to dimensional specifications for virtually any illuminated device. Please contact us with your requirements.

Filter Type: 6-series LG-6 Green

NVIS Green A compliance of green LEDs



Nominal Properties¹

Light Source ²	Transmission	Color (x, y)	Color (u', v')	(NR) _a @ 0.1 fL
Green LED ($\lambda_{DOM} \cong 532 \text{ nm}$)	34%	0.20, 0.67	0.08, 0.57	< 1.7e-10

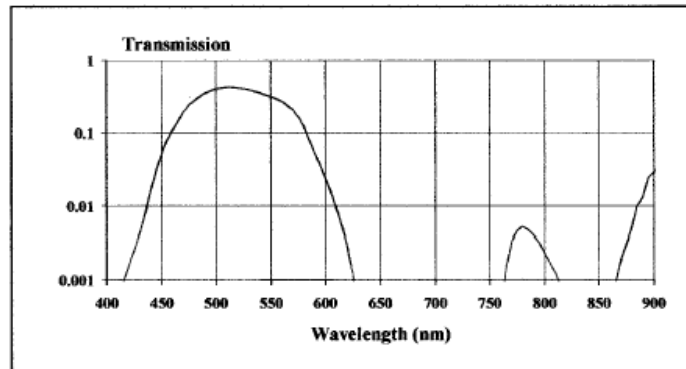
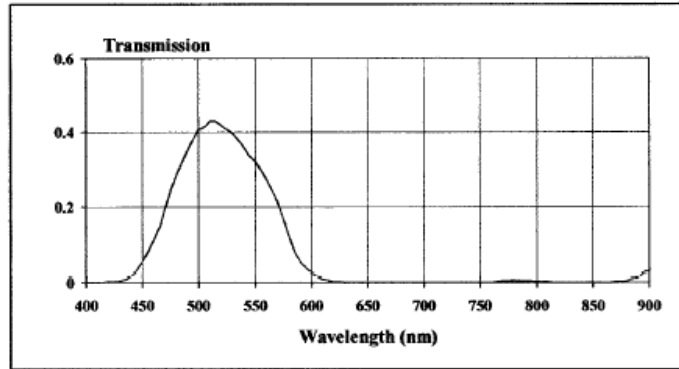
LED Lamp Options: Lumitron 3 mm Green LED Lamps

Part No.	Chip		Lens Color	Wave Length (nm)	Absolute Maximum Ratings				Electro-Optical Characteristics					View Angle (deg)	
	Raw Material	Emitted Color			n	Pd mW	If mA	If (Peak)	Vf(V)			If (Rec)	Iv (med)		
									Min.	Typ.	Max.		Min.		Typ.
L314UPGC-S	GainN	Green	Water Clear	525	--	100	30	100		3.6	4.0			7800	15
L314UPGC-30DS	GainN	Green	Water Clear	525	--	100	30	100		3.6	4.0			3900	30
L314UPGC-45DS	GainN	Green	Water Clear	525	--	100	30	100		3.6	4.0			2300	45

For the full line of Lumitron lamp type and surface mount device (SMD) LEDs please see our LED catalog or go to www.lumitron.com

Filter Type: 6-series LW-6 Green

NVIS Green A compliance of white LEDs



Nominal Properties¹

Light Source ²	Transmission	Color (x, y)	Color (u', v')	(NR) _a @ 0.1 fL
Low Color Temperature White LED	22%	0.26, 0.53	0.12, 0.54	< 1.7e-10

LED Lamp Options: Lumitron 3 mm White LED Lamps

Part No.	Chip		Lens Color	Wave Length (nm)	Absolute Maximum Ratings				Electro-Optical Characteristics						View Angle (deg)
	Raw Material	Emitted Color			n	Pd mW	If mA	If (Peak)	Vf(V)			If (med)			
									Min.	Typ.	Max.		(Rec)	Min.	
L314WC-15DS	InGaN	White	Water Clear	x - 0.31 y - 0.32	--	84	20	100		3.6	4.0	30	3900	5520	15
L314WC-30DS	InGaN	White	Water Clear	x - 0.31 y - 0.32	--	84	20	100		3.6	4.0		2600	3700	30
L314WC-60DS	InGaN	White	Water Clear	x - 0.31 y - 0.32	--	84	20	100		3.6	4.0			1900	60

For the full line of Lumitron lamp type and surface mount device (SMD) LEDs please see our LED catalog or go to www.lumitron.com

NVIS FRIENDLY LED FLASHLIGHT



This rugged waterproof and shockproof solid-state flashlight is powered by 4 NVIS friendly LEDs that emit a diffused hallow-free green light that will not cause night vision goggles to bloom. And because it uses LEDs, batteries last 14 times longer than regular flashlights.

- Solid-state circuitry means batteries last over 300 hours.
 - Easy-twist head for on/off.
 - Shockproof high-impact composite case.
- Dimensions: 7 inches by 1 inch. 1.25 inches at head.
 - Includes 3 AA alkaline batteries.

Additional Information:

CUSTOM SIZES AVAILABLE.

PLEASE CONTACT LUMITRON FOR YOUR SPECIFIC NVG COMPATIBILITY REQUIREMENTS.

Please Note: NVIS Lamp/filter assemblies are subject to some degree of “abbreviated life” from the rated life of the lamp. Performance and life of lamp/filter assemblies are directly related to the environment in which they operate. Suitability of lamp/filter assemblies for specific applications must be determined by the user.

Specifications are subject to change without notice.

Ordering Information

To place an order:

Call: 908-508-9100 Extension 111

Hours: 8:30 a.m. - 5:00 p.m. EST Monday - Friday

Fax: 908-273-0853 **E-Mail:** sales@lumitroncorp.com

Mail: Lumitron Customer Service Department, P.O. Box 267, Summit, NJ 07902-0267

For prompt, accurate service when ordering, please provide the following information:

- Part Number, quantity, purchase order number
- Billing and shipping instructions (including any special instructions).
- Name and title of the person placing the order

PRICES AND TERMS

Prices and specifications are subject to change without notice. To confirm prices, please submit a Request For Quote (RFQ) by phone, fax, or e-mail. Payment terms are net 30 days, F.O.B. Berkeley Heights, NJ.

We accept MasterCard, VISA, or American Express.

LEAD TIMES

Some NVIS filters are kept stock and available for same-day shipping. Build-to-order lead times vary from four to six weeks, depending on filter selection.

INTERNATIONAL ORDERS

Lumitron Corporation ships merchandise worldwide. Orders must be prepaid in American dollars, including freight, prior to shipping. We accept Wire Transfers, MasterCard, VISA, or American Express. Orders over \$1,000 may require Letter of Credit and partial payment prior to shipping.

RETURN POLICY

1. Please call 908-273-8998 Extension 112 to request a Return Authorization (RA) number. To issue you an RA number, the customer service representative will need your order reference number or invoice number. Please have that number available when you call.
2. Include a copy of your invoice or packing list inside the package, and any documentation of noncompliance.
3. Make sure you put your RA number on the mailing label on the outside of the shipping carton.
4. Address your shipment to the following: Lumitron Customer Service Department, 10 Summit Avenue, Berkeley Heights, NJ 07922.