PYNCO

Revision 6.3

NVIS Glass Filtering Specialists

# Product Catalog 2024


✦ Glass • Acrylic • Polymer ✦

✦ Machining • Grinding • Polishing ✦

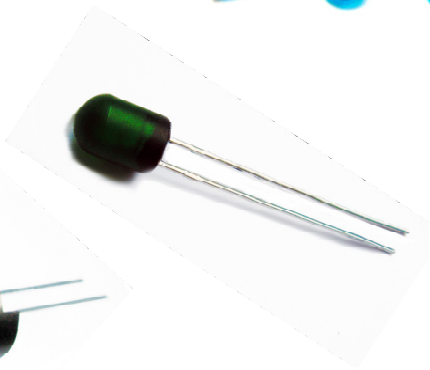
✦ Custom Milling up to 18”x18” ✦

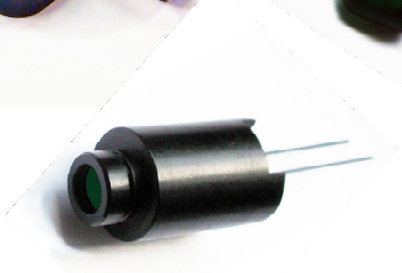
✦ Spectroradiometric Testing ✦

**Pynco supports our mission critical customers by utilizing the distinct skills of our team to produce filters, components, parts and devices crucial to national security. Contact us for evaluation and development of OEM compatible and custom filters essential for your time sensitive projects.**

www.pynco.com 2605 35th Street Bedford, IN 47421 sales@pynco.com

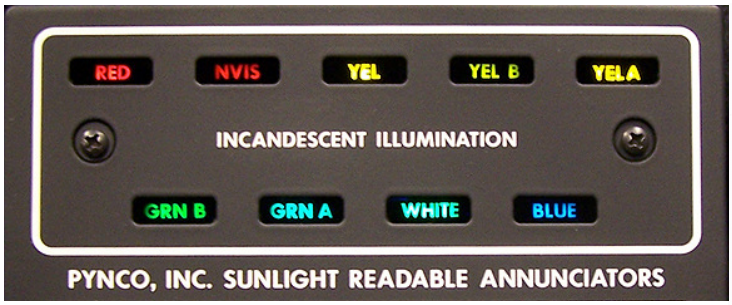
# FILTERED LIGHTING SPECTRUM

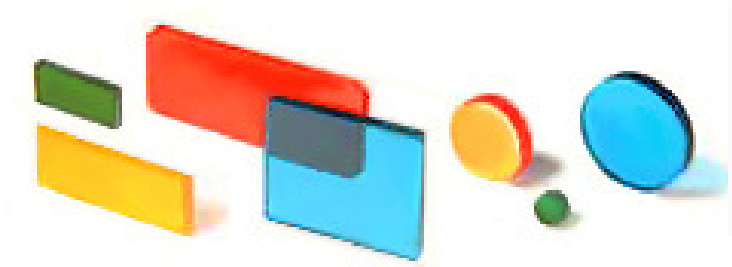





## FILTERING IS OUR SPECIALTY

PYNCO SPECIALIZES IN CUSTOM MANUFACTURING OF NIGHT VISION AND NIGHT VISION GOGGLE COMPATIBLE PRODUCTS, PYNCO CAN PRODUCE REPLACEMENT FILTERS OR FILTERED ASSEMBLIES TO MODIFY ORIGINAL OEM LIGHTING UNITS TO NIGHT VISION COMPATIBLE UNITS.



IF YOU HAVE A REQUIREMENT THAT IS NOT DISPLAYED IN THIS CATALOG, CONTACT OUR SALES TEAM: SALES@PYNCO.COM

# Optical Filter Catalog 2024

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**Continued on next page….**

# Optical Filter Catalog 2024

## Table of Contents

# About Pynco

*Thirty-seven years ago, James N. Seib had a vision. Jim found the need to pursue extensive research to aid the military in the development of night vision technologies. Pynco, Inc. was founded by Jim Seib to assist the military with securing beneficial filtering products required for covert military operations utilizing night vision goggles.*

*Nearly four decades later, Pynco NVIS lighting and optical filters have proliferated into many United States military aircraft platforms. Our commitment to quality and continuous improvement has been at the heart of our success. Pynco has become a reliable source for custom machining of glass and acrylic, specializing in NVIS/NVG filtering. By combining advanced processes with our time-tested quality standards, Pynco excels in manufacturing time sensitive and unique products at competitive prices.*

*Pynco customers demand reliability. Our experience with mission critical clients has enabled Pynco to develop advanced processes and capabilities to produce trustworthy components and products used across a wide range of industries from defense to commercial manufacturing clients.*

*Our products are machined in-house by advanced CNC milling centers. In-house machining and spectral testing performed by our engineers enable Pynco NVIS filters to exhibit improved chromaticity, radiance and transmittance characteristics. These intricate processes benefit design changes, reduce lead times, low volume orders, precision dimensional consistency and superior spectral transmittance.*

*We combine a world class machining center with advanced research, precision design capabilities, skilled assembly techniques and a personal touch to provide our customers with products and services that exceed their expectations. Our capabilities are constantly expanding as we continue to utilize our teams' skills to manufacture unique products requested by our customers.*

We look forward to assisting you with design plans, manufacturing and delivery questions.
Contact the Pynco Sales Team: **info@pynco.com** or **sales@pynco.com**

# Quality

*Pynco's quality management system is compliant with AS9100C and ISO 9001-2008 standards.*

*NVIS filters are manufactured to comply with MIL-L-85762A & MIL-STD-3009. Aviation colors are certified per MIL-C-25050. We strive to meet unique customer specifications.*

*Our solution to customer inquiries begins with the evaluation of technical requirements, performing necessary empirical measurements and determining the best technical solution to meet client specifications. We prepare comparative technical reports to aid our customers in the selection of the best options for optimum performance.*

*Pynco products are inspected and shipped with a certificate of conformance. Our customers can take comfort in knowing that upon receipt, all products are ready for installation and the characteristics adhere to the required standards and specifications.*

# Pynco history

James N. Seib

James H. Collins

*Pynco is a family owned company, founded in 1987 by James N. Seib, a pioneering and entrepreneurial engineer. After studying physics in school Jim joined the government. He served as a civilian engineer at the Naval Weapons Surface Center (NWSC), Indianapolis. During his 19-year career he worked primarily as an instrumentation engineer, developing expertise in air mass instruments (barometric altimeters, rate of climb indicators, and airspeed indicators). He also performed radiation testing on Trident missile guidance and fire control electronics. From the very beginning, innovation was at the forefront of Jim's aspirations. With the help of senior physicist, James H. Collins, (a NWSC co-worker), Pynco was founded and began to develop leading edge technologies beneficial for military applications.*

*The failed night time rescue mission of the hostages in the 1979 Iranian hostage crisis was in part due to the lack of reliable night vision technology for U.S. military aircraft. Throughout the 1980s, the demand for the development of effective night vision compatibility for aircraft instrumentation and cockpit lighting became an important requisite for a variety of military, search and rescue, and aerospace applications. With industry leading research and development, Pynco became the first organization during this critical period to manufacture reliable night vision lighting solutions and NVIS compatible glass filters for a variety of mission critical industries.*

*A crucial technology refined by Pynco was electronic relay systems, reliable enough for military applications. For years the U.S. military was continuing to have issues with expensive aircraft having faulty electrical systems and battery discharges while in combat zones and remote locations. Pynco's research and development provided the technology to address this critical issue. Presently used in a wide range of aircraft, these innovative control systems monitor a variety of the aircrafts' electrical functions and regulate their resources appropriately.*

*For nearly four decades, Pynco has been developing technologies and manufacturing customized products that benefit the United States' national security. Pynco's origins began with the development of reliable night vision lighting and electronic relay systems for defense aerospace. Continued developments have allowed Pynco to become an industry-respected organization for the development of those filtering, night-vision and electronic related technologies.*

*Over the years, Pynco has become a respected manufacturer of glass products for the aerospace, biotech and commercial manufacturing industries. One unique project involved machining a glass frame for artist Daniel Clayman, of Montague Studios, designer of the 2013 National Geographic Adventurer of the Year Award, presented to Felix Baumgartner. It is a unique combination of innovation and the practical application of our product development that has propelled Pynco's reputation across multiple industries.*

*Following Jim Seib's untimely death in February 2008, the Seib family has provided oversight of Pynco operations. Employing a team of experienced and skilled experts, Pynco continues to use the ingenuity and proficient practices developed by our founders. Today, we aspire to develop new technologies and services while continuing to advance our manufacturing capabilities.*

# Machining Capabilities & Processes

Pynco specializes in manufacturing precision-machined parts from raw stock or cast materials with a full range of manual and CNC machining equipment.

## Machining Capabilities

CNC Machining
Grinding
Lap Polishing
Spherical Machining
Optical Windows and Lenses
Cutting and Drilling

## Glass Materials

Borofloat
Borosilicate
Silicate
Phosphate
Soda-lime

## Plastic Materials

Acrylic
Acetal
HDPE
Peek
PFA
Polycarbonate
Polystyrene
PPO
PTFE
PVC
Teflon

## Aluminum

(Machining Only)


## Machining

Custom Machining of Glass and Plastic Materials
Aluminum Machining - Housings and Components
Custom Filters for Aerospace, Defense and Commercial
Night Vision, Sunlight Readable and Panel Display Filters
Custom NVIS, NVG and Non-NVIS Flat Optical Filters
Custom NVIS and Ring and Bathtub Filters
Acrylic Panels, Windows and Components

## Assembly

NVIS Filtered (MS) Lamp Assemblies
*(Flat and Hemispherical Domes)*
NVIS LED FLAs
Flat Optical Filters
NVIS Indicators
Electromagnetic Relay Systems for Military Aircraft

## Technical

Filter Light Source Requirements: LED, LCD, Incandescent
NVIS Sunlight Readable Annunciators & Flat Optical Filters
Interference and Absorption Filters (IR, Long & Short Wave)
Certified Aviation Colors per MIL-C-25050
Certified NVIS colors per MIL-L-85762A & MIL-STD-3009

## Services

Spectroradiometric Measurement Service
Recertification Services
Research, Design and Testing Services

# Machining·Grinding·Polishing

Pynco has a documented history of custom in-house fabrication of a variety of glass and plastic materials. If customers have a drawing or an idea, Pynco may be able to manufacture precision products per their custom requirements in a timely manner.

Our grinding and polishing glass processes are completed in-house. We are able to produce specialized thicknesses required for custom filters designed to meet our customers' specifications.

**Common filter thicknesses are as follows:**

1mm (.040"), 1.5mm (.060"), 2mm (.080")

Pynco also produces filters with diffusing characteristics as specified by customer requirements.

Most machining processes can be completed with a precision +/- .005" tolerance.

Contact a Pynco representative today for pricing and custom options.

# Optical Flat Glass Filters

Pynco manufactures a variety of custom optical interference and absorption filters. Our high performance flat glass Night Vision filters are designed with superior color and NVIS radiance in order to meet military specifications listed in MIL-STD-3009. Aside from flat NVIS filters, our offerings include Infrared (IR), Long Wave Pass (LWP) and Short Wave Pass (SWP) filters. We can fabricate monolithic filters, as well as multi-layer filters that combine various optical properties. With our advanced testing and measurement capabilities and our precision machining experience, Pynco can produce superior filters with very tight tolerances. Reference our flat glass filter options on page 23.

# Inventory Management

Pynco's inventory management process is a decisive benefit for our customers. Pynco takes customer service, inventory control and lead times very serious. We strive to improve our processes and performance to enable efficient and timely delivery of products to our customers.

Pynco can organize production and inventory control to make sure we have specific products in stock to meet the needs of customers ordering specific parts on a regular basis or for future delivery requirements. If an unplanned emergency arises and a customer needs product overnight, we try to have you covered.

Imagine...ordering NVIS filters and having them arrive on your dock the very next day. Can your current optical filter supplier do that?

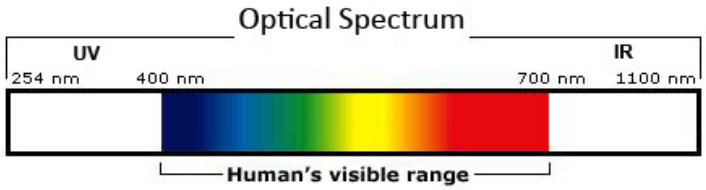
# Assembly

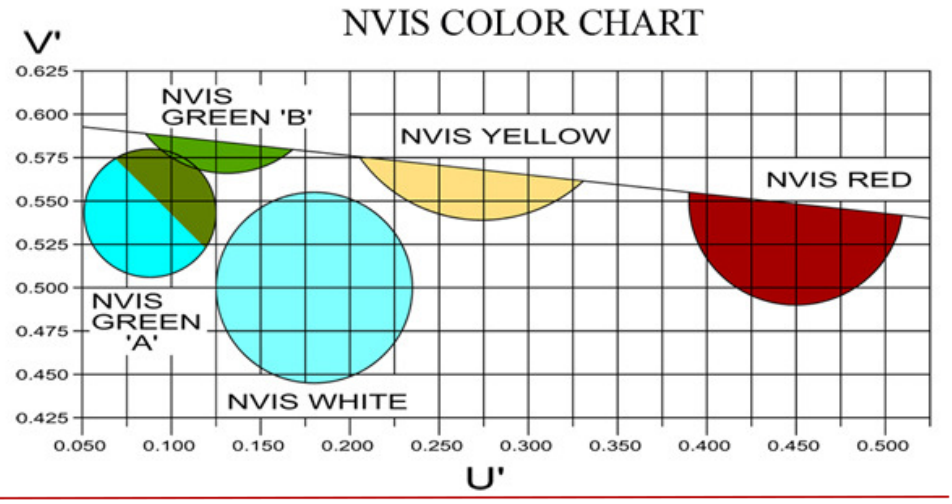
Pynco's experienced assembly team has been assembling customized products to meet customer specifications. This experience, combined with our quality control and streamlined processes will allow for fast, reliable service.

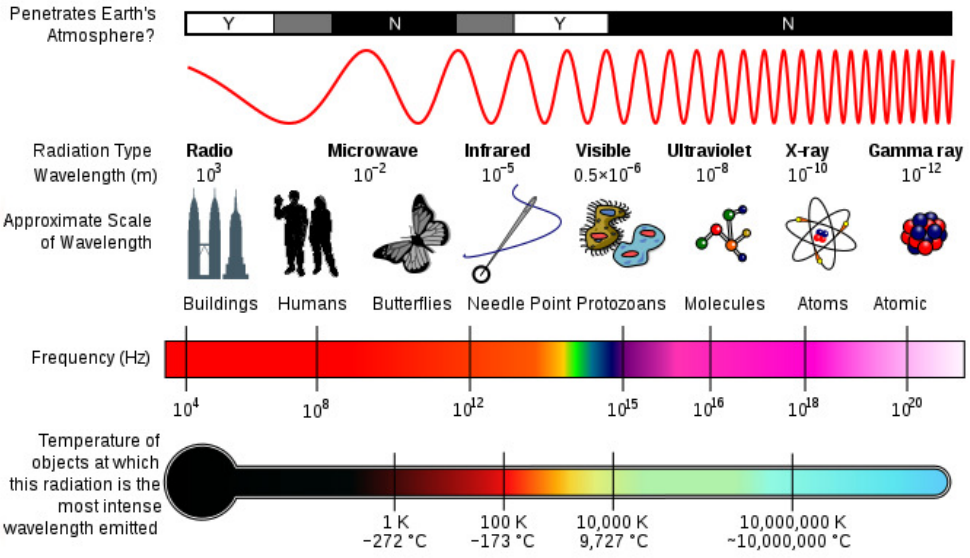
We assemble our in-house manufactured parts for customized applications. Our manufacturing and assembly personnel take great pride in meeting customer expectations, specifications and delivery requirements.

# Testing & Measurement

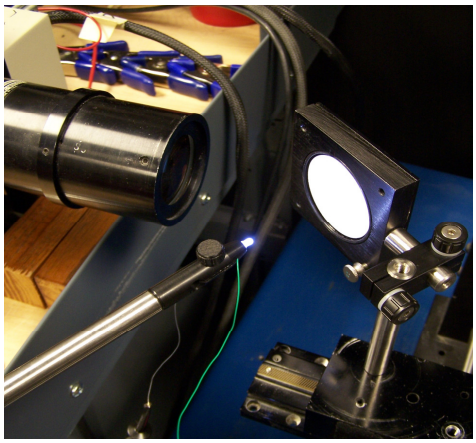
In the world of optics, research, design and testing are crucial steps during the development of customized products. Pynco has an in-house optics laboratory. From product development to the final inspection, our experts provide the answers to fulfill the wishes of our most demanding clients. Our sales team and engineers work directly with customers to assist with research and design plans, manufacturing and assembly.




* Image taken from Wikipedia.org



**Measurement Tool:**
The OL 750-D Spectroradiometer enables turnkey measurements of aircraft display and lighting compatibility with night vision systems (NVIS), such as night vision goggles to MIL-L-85762A and MIL-STD-3009.

**Application Type:** NVIS compatibility, Aircraft lighting and display (cockpit and external)

**Spectral Range:** 380 - 930nm

**Spectroradiometric Measurements:**
Chromaticity
Photometric Transmission (%Y)
Luminance (fL)
Radiance (W/ (sr * $mm^2$))
Irradiance (W / $mm^2$)
Transmittance
Reflectance
Mean Spherical Candle Power (MSCP)
Recertification

**Light Sources Include:**
LED, LCD, Incandescent

# Pynco Part Numbers Options

## Incandescent

## NVIS Filter Options for Incandescent Illumination

Pynco uses a schema to help our customers organize our most common filters and related assemblies. This page displays general part number options for NVIS filters with and without subminiature assemblies. Assembly options are displayed in the legends on the right. For specific assembly options, reference the appropriate page later in this catalog.

***Our sales team is also ready to review customer drawings to help determine our best component match for your application.***

### NVIS FILTERED ASSEMBLIES

**1) SIZE**……Select a sub-miniature package width (T-1, T-3¼, etc.)

**2) FORM**……..…Choose a filter shape / form-factor (Flat Top or Hemispherical Dome)

**3) BASE**……....Select a connector option (Midget Flange, Bayonet, etc.)

**4) COLOR**……...Select one of our NVIS color options

**5) FINISH**……....Polished, Unpolished, Outer Polish only, etc.

**6) VOLTAGE**……Choose the appropriate Voltage

**7) CURRENT**……Choose the appropriate Amperage

Sample Part using the schema at right: **T134-HD-MF-GB-P-28v-20mA**

(T-1 ¾ / Hemispherical Dome / Midget Flange / Green B / Polished / 28 Volts / 20 mA)

### NVIS RING FILTERS

**1) FORM**…….....Choose the filter shape / form-factor (Ring filter, Bathtub, etc.)

**2) COLOR**……..Select one of our NVIS color options

**3) FINISH**……..Polished, Unpolished, Outer Polish only, etc.

**4) HEIGHT**…….The height of the filter (in 0.001”)

**5) OD** ……..The “Outer Diameter” or width of the filter (in 0.001”)

**Note:** ….For capped filters, add AL (for aluminum) or SS (for stainless steel) at the end

**Note:** ….For “Bathtub” filters, OD will be replaced with two qualifiers “Length” and “Width”

**Note:** ….All dimensions are (+0.000” / -0.005”) in tolerance, unless otherwise specified

Sample Part using the schema at right: **RF-GB-P-240-210**

(Ring Filter / Green B / Polished / .240” in height / .210” in diameter)

**Contact a Pynco representative today for customized options, pricing and lead times.**
**Info@Pynco.com sales@pynco.com**

### PART NUMBER LEGEND

| 1) | BASE SIZE |
|---|---|
| T1 | T-1 (3mm) |
| T134 | T-1¾ (5mm) |
| T314 | T-3¼ |

| 2) | FORM FACTOR |
|---|---|
| RF | Ring Filter |
| HD | Hemispherical Dome |
| FD | Flat Glass Dome |
| BT | Bathtub |

| 3) | BASE OPTIONS |
|---|---|
| BP | Bi-Pin |
| BAY | Bayonet |
| GW | Gull Wing (Type II) |
| IBP | Integral Bi-Pin |
| MF | Midget Flange |
| MG | Midget Groove |
| SM | Sub Midget |
| WL | Wire Lead (Type I) |

| 4) | NVIS COLOR |
|---|---|
| GAL | Green A (Low) |
| GAM | Green A (Mid) |
| GAU | Green A (Upper) |
| GB | Green B |
| YB | Yellow (Class B) |
| W | White |
| WNF | White (NVIS Friendly) |
| WHT | White (High Transmission) |

| 5) | FINISH |
|---|---|
| P | Polished (both sides) |
| U | Unpolished (both sides) |
| OP | Outer Polish (only) |

| 6) VOLTS | 7) CURRENT mA | |
|---|---|---|
| 5 | 20 | 21 |
| 14 | 24 | 60 |
| 28 | 115 | 125 |

# Pynco Part Numbers Options

## LED Lighting

## NVIS Filter Options for LEDs & Indicators

Pynco uses a schema to help our customers organize our most common filters and related assemblies. This page displays general part number options for NVIS filters with and without subminiature assemblies. Assembly options are displayed in the legends on the right. For specific assembly options, reference the appropriate page later in this catalog.

***Our sales team is also ready to review customer drawings to help determine our best component match for your application.***

**1) SIZE**……...Select a sub-miniature package ( T-1¾ )

**2) FORM**……...Choose a form-factor (Ring Filter, Bathtub, etc…)

**3) BASE**……Select a lead option (Thru-Hole, Bayonet, Midget Flange, etc…)

**4) COLOR**……..Select one of our NVIS or NVG color options

**5) FINISH**……...Polished, Unpolished, Outer Polish only, etc...

**6) VOLTAGE**……Choose the appropriate Voltage

**Note:** …….. For all LED current (mA) ratings, see the specific part description page

Sample Part using the schema at right: **T134-HD-MF-LGB-P-28v**

(T-1 ¾ / Hemispherical Dome / Midget Flange / LED Green B / Polished / 28 Volts)

### NVIS Indicators w/ Assemblies

**1) FORM**……Indicator Aluminum Housing, Flanged Top Housing, etc...

**2) BASE**……Options include: Thru-Hole, Wire Lead

**3) COLOR**……..Select one of our NVIS or NVG color options

**4) FINISH**……...Polished, Unpolished, Outer Polish only, etc...

**5) HEIGHT**…….The Height of the part

**6) DIAMETER**…...The Width of the part

**Note:** ……. Contact Pynco for customized indicator assemblies

Sample Part using the schema at right: **AH-TH-LGB-P-320-180**

(Aluminum Housing / Thru-Hole / LED Green B / Polished / Height / Diameter)

### PART NUMBER LEGEND

| 1) | BASE SIZE |
|---|---|
| T134 | T-1¾ (5mm) |

| 2) | FORM FACTOR |
|---|---|
| HD | Hemispherical Dome |
| FD | Flat Glass Dome |
| AH | Aluminum Housing |
| FTH | Flanged Top Housing |
| FBH | Flanged Base Housing |
| WBH | Wide Base Housing |

| 3) | BASE OPTIONS |
|---|---|
| TH | Thru-Hole |
| IBP | Integral Bi-Pin |
| MF | Midget Flange |
| MG | Midget Groove |
| WL | Wire Terminal (Type I) |

| 4) | NVIS COLORS |
|---|---|
| LGAL | Green A (Low) |
| LGAM | Green A (Mid) |
| LGB | Green B |
| LYB | Yellow (Class B) |
| LW | White |
| LWV | NVG White |
| LRNF | Red (NVIS Friendly) |

| 5) | FILTER FINISH |
|---|---|
| P | Polished (both sides) |
| U | Unpolished (both sides) |
| OP | Outer Polish (only) |

| 6) VOLTS |
|---|
| 5 |
| 14 |
| 28 |

**Contact a Pynco representative today for customized options, pricing and lead times.**
**Info@Pynco.com sales@pynco.com**

# NVIS Color Options

## NVIS Filter Color Information

**NVIS Green 'A' (Low)** - (Lowest on the u' v' scale) Used for cockpit information and status indicators. Reference our Standard Green 'A' color data on page 14.

**NVIS Green 'A' (Mid)** - (Middle on the u' v' scale) offering lower transmission than the standard Green 'A', while offering higher transmission than Intruder Green 'A' Upper. Reference the Intruder Green 'A' Mid color data on page 15.

**NVIS Green 'A' Intruder (Upper)** - (Highest on the u' v' scale) offering the lowest transmission of the three Green 'A' color options. Reference the Intruder green 'A' Upper color data on page 16.

**NVIS Green 'B'** - Originally designed for it's sunlight readability and higher color and luminance contrast. Currently Used for Status indicators and information. Reference our Green 'B' color data on page 17.

**NVIS Yellow (Class A)** - Used for cockpit warning, caution and status indicators. Only used as a flat filter. Class A is more sensitive because of the extended response from the visible to the NIR region. Reference Yellow Class A color data on page 18.

**NVIS Yellow (Class B)** - Used for cockpit warning, caution and status indicators. Commonly used as a flat filter, rarely used as a ring or bathtub filter. Class B includes less response in the visible light region. Reference our Yellow B color data on page 19.

**NVIS White** - This MIL-SPEC NVIS compliant filter meets MIL-STD-3009 color and radiance requirements and is used for workstation illumination, status indicators and general information.

**NVG White** - This NVIS compatible filter is also used for workstation illumination, status indicators and general information. It meets NVIS radiance requirements, but does not meet the chromaticity requirements of the military standard. The color location would be just outside of the NVIS White color region. Reference our NVG White color data on page 20.

**NVIS Friendly White** - This filter is just outside military specifications because of its increased NVIS radiance. Our 'Friendly White' is still NVG compatible, while providing higher transmittance for unique applications where MIL specs are not required. Reference our NVIS Friendly White color data on page 21.

**NVIS Friendly White HT** - This filter offers an even higher transmission than our 'NVIS Friendly White' filter while still maintaining NVG compatibility. Reference our NVIS Friendly White (HT) color data on page 21.

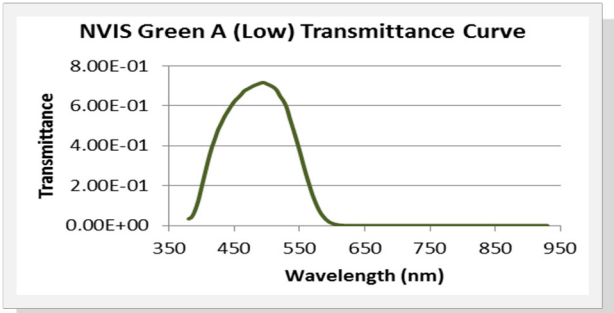
**NVIS Red** - NVIS Red is used for warning indicators and status indicators. Reference our NVIS Red color data on page 22.

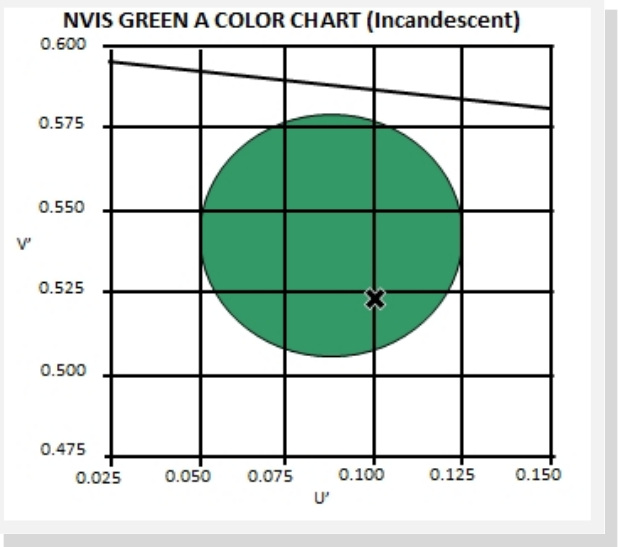
# NVIS Color & Spectral Data

## Green 'A' (Low)

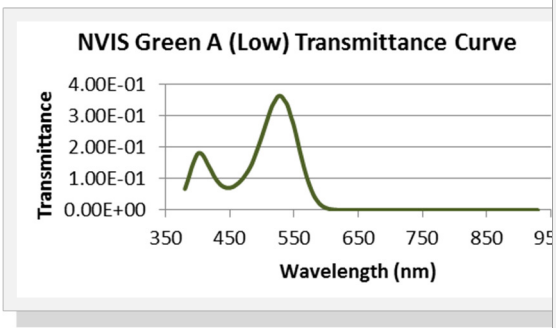
### Incandescent

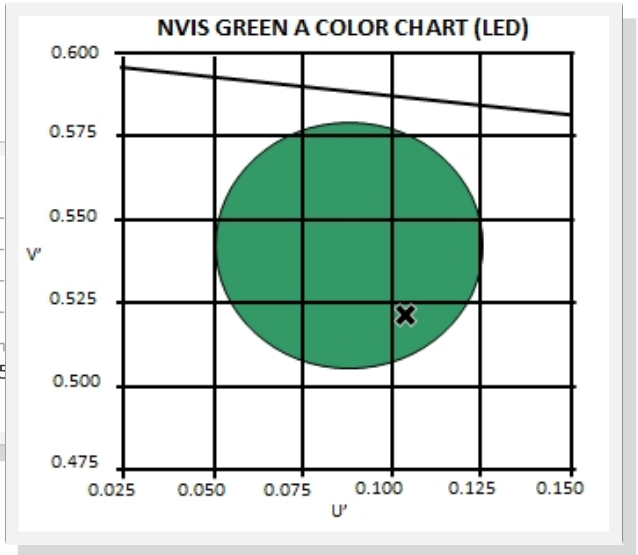
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.100 | 0.524 | 17.6 | 6.50E-11 | 4.70E-12 |




### LED



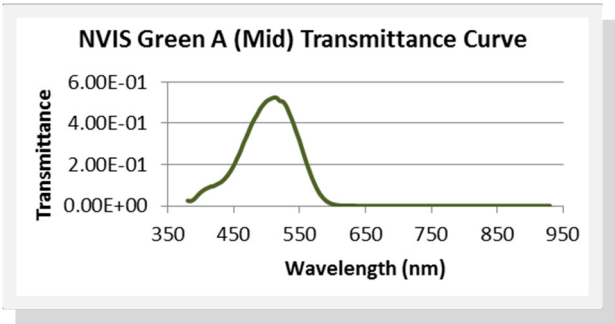

| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| White LED (CCT=6815K) | 0.105 | 0.521 | 18.7 | 5.30E-11 | 3.80E-12 |
| Nichia NSSW100DT White LED | 0.106 | 0.536 | 17.8 | 5.60E-11 | 4.10E-12 |

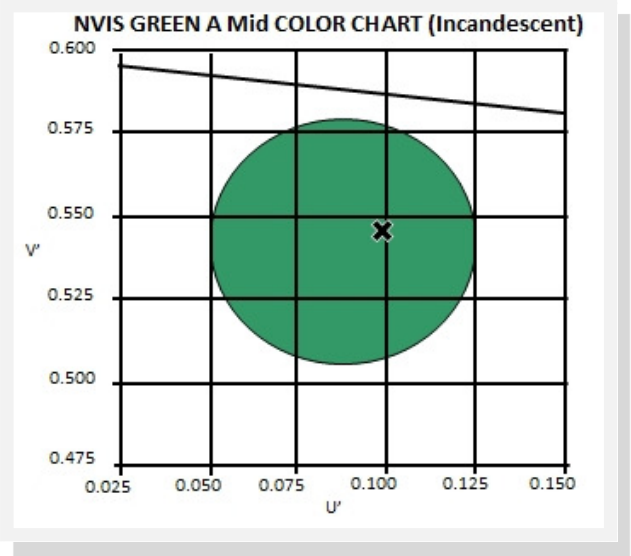
# NVIS Color & Spectral Data

## Incandescent

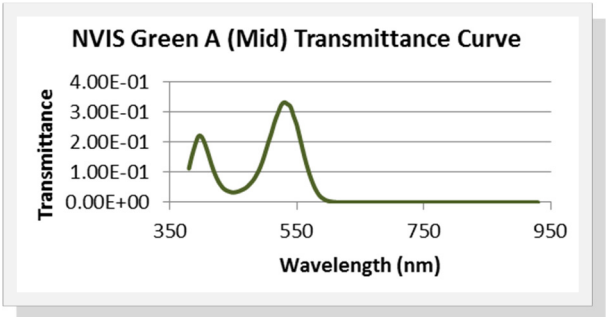
## Green 'A' (Mid)

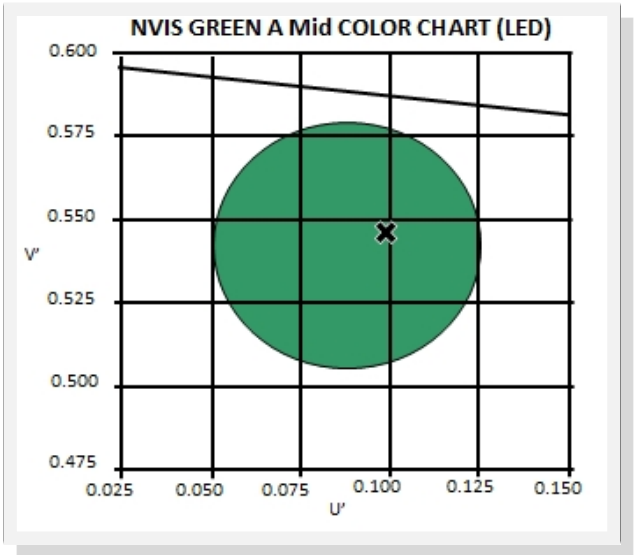
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.099 | 0.544 | 16.8 | 6.70E-11 | 4.50E-12 |




## LED



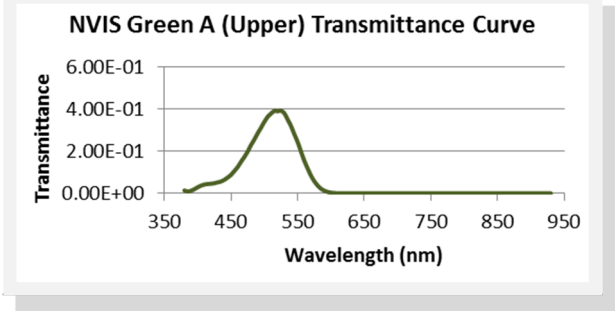

| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| White LED (CCT=6815K) | 0.100 | 0.544 | 17.1 | 5.00E-11 | 3.50E-12 |
| Nichia NSSW100DT White LED | 0.102 | 0.555 | 16.4 | 5.30E-11 | 3.80E-12 |

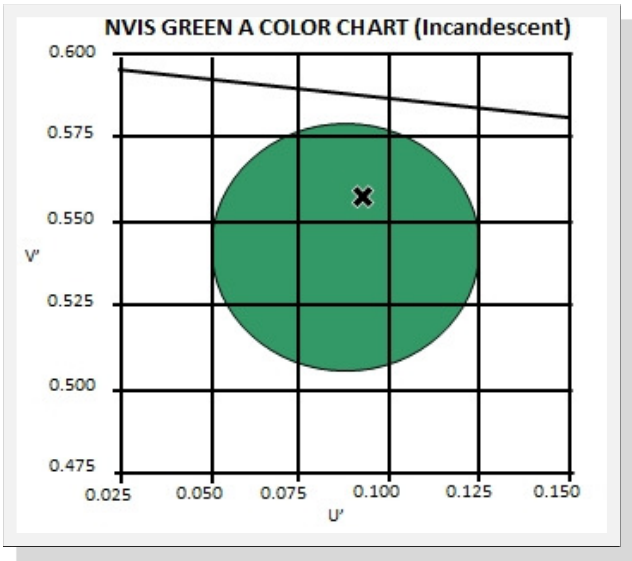
# NVIS Color & Spectral Data

## Green 'A' Intruder (Upper)

### Incandescent

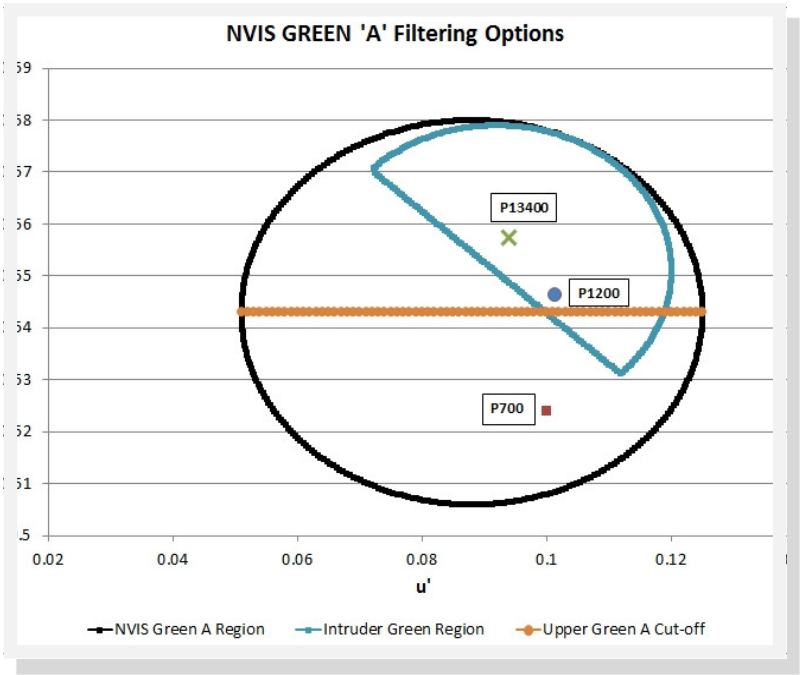
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.095 | 0.557 | 11.5 | 5.60E-11 | 4.00E-12 |




### Green 'A' Filter Options

Pynco manufactures three MIL SPEC versions of NVIS Green A. The original Standard Green A will offer the highest transmission, while the Intruder series will provide a deeper green filter color. Our Upper Intruder filter provides additional compatibility with comparable filters across the industry.

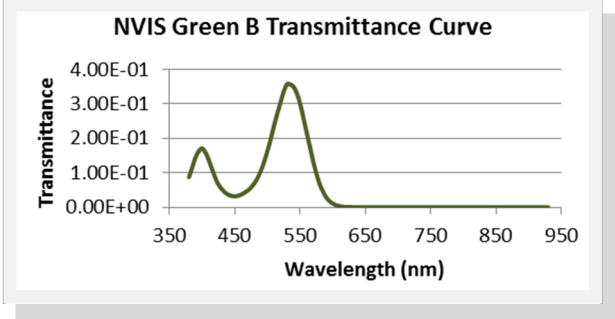


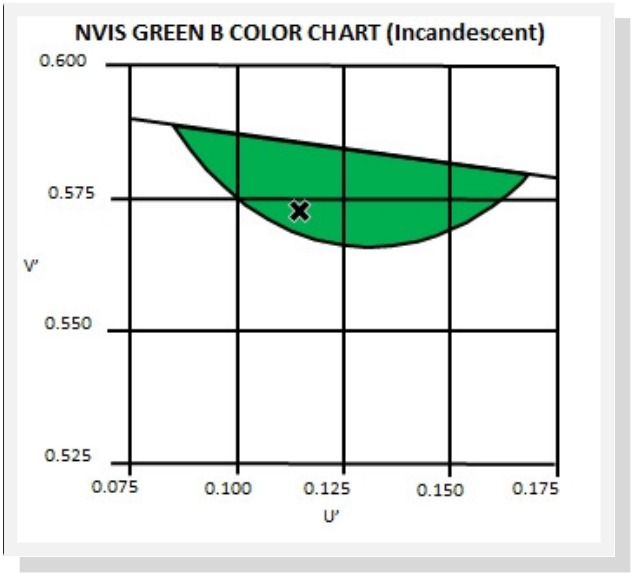
# NVIS Color & Spectral Data

## Incandescent

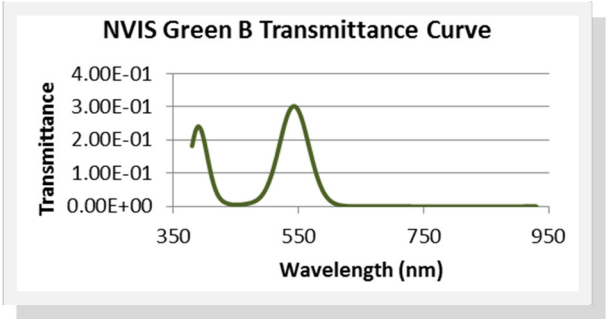
## Green 'B'

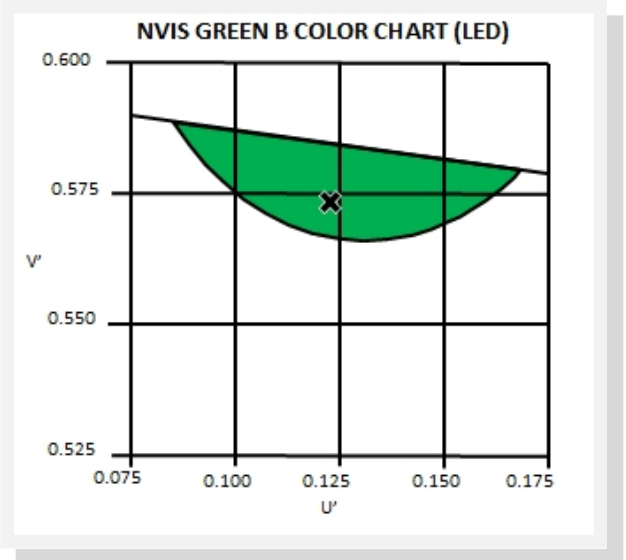
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.114 | 0.570 | 12.4 | 1.10E-10 | 1.60E-11 |




## LED



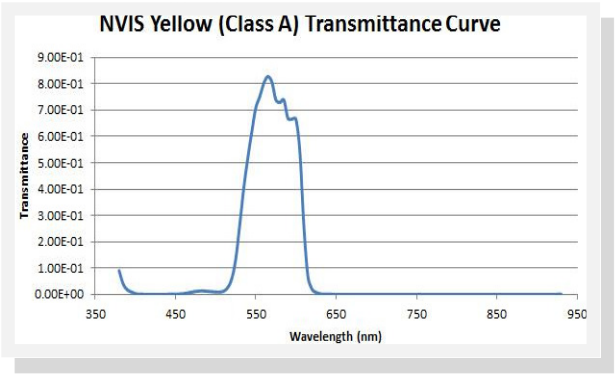

| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| White LED (CCT=6815K) | 0.117 | 0.571 | 17.2 | 8.90E-11 | 9.40E-12 |
| Nichia NSSW100DT White LED | 0.121 | 0.574 | 16.9 | 9.60E-11 | 1.10E-11 |

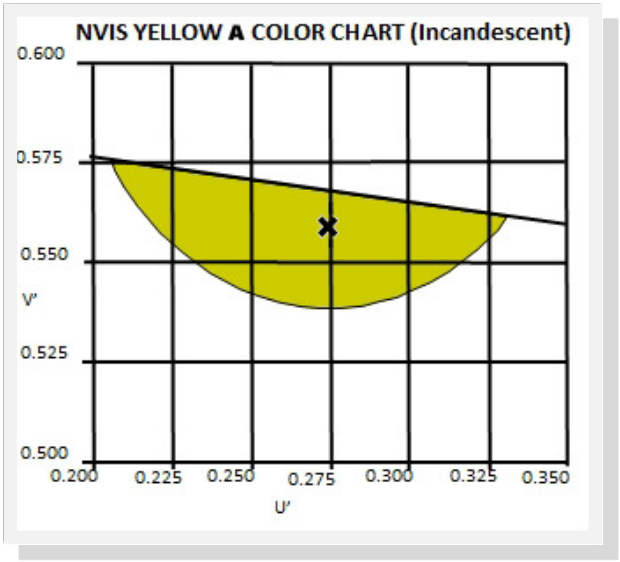
# NVIS Color & Spectral Data

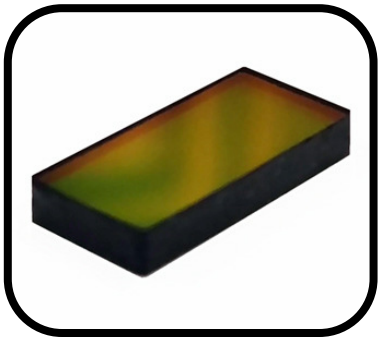
## Yellow (Class A)

### Incandescent

| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | NRA | NRB |
| Incandescent (CCT=2200K) | 0.275 | 0.558 | 34.0 | 1.15E-07 | - |



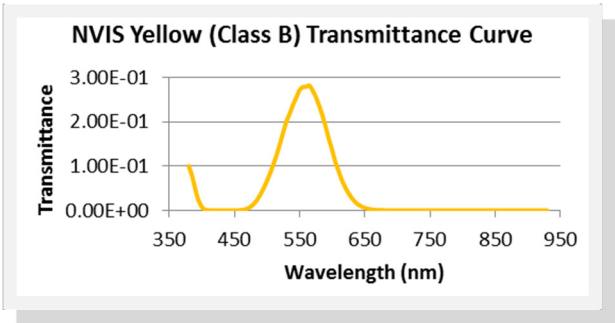



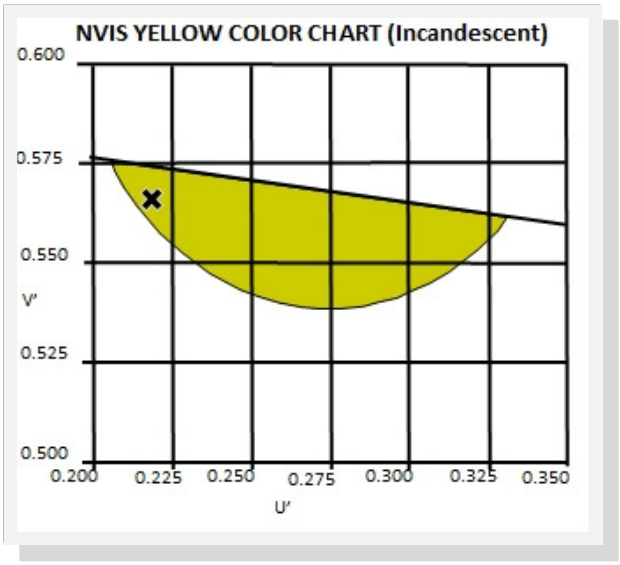
# NVIS Color & Spectral Data

## Yellow (Class B)

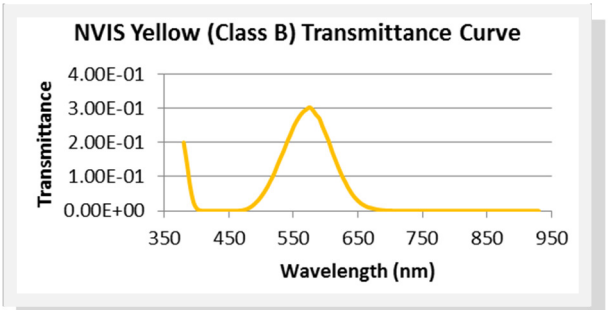
### Incandescent

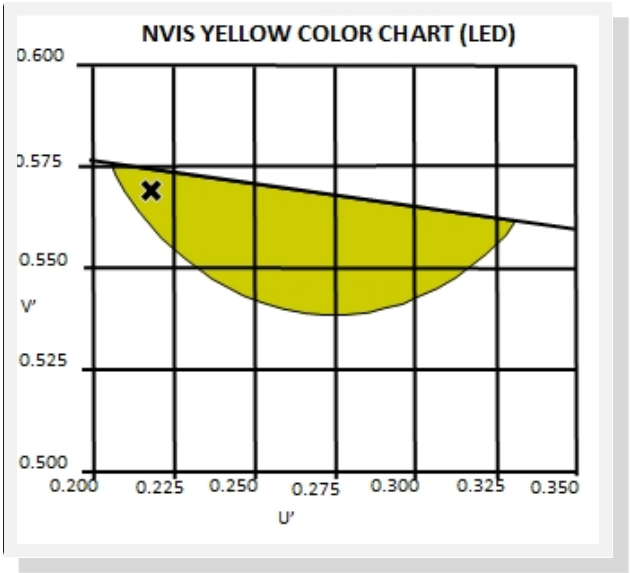
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.217 | 0.565 | 16.0 | - | 6.3E-8 |




### LED



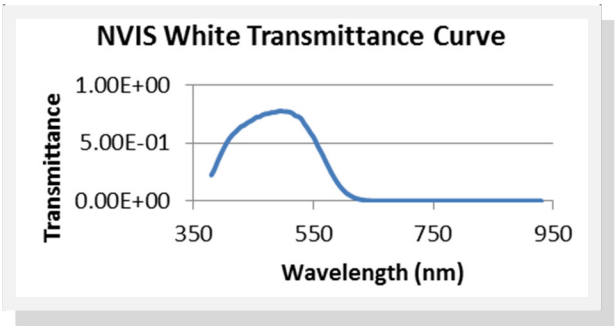

| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| White LED (CCT=6815K) | 0.215 | 0.565 | 22.9 | - | 9.60E-8 |
| Nichia NSSW100DT White LED | 0.215 | 0.565 | 22.9 | - | 9.60E-8 |

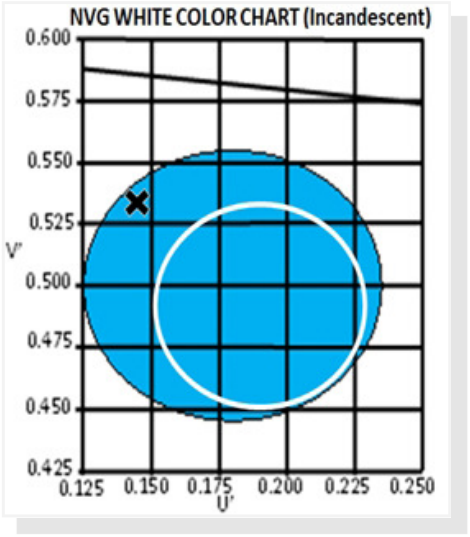
# NVIS Color & Spectral Data

## NVG White

### Incandescent

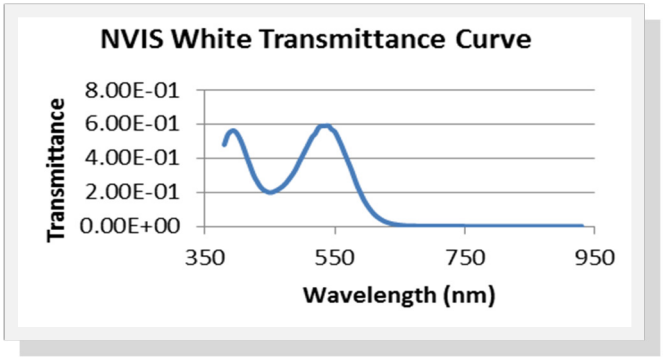
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.139 | 0.535 | 29.6 | 7.00E-10 | 8.80E-11 |

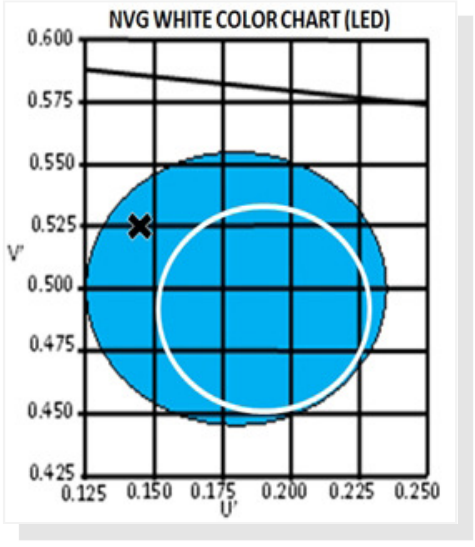



Blue Region: RTCA DO-275; White Boundary: MIL-STD-3009

### LED



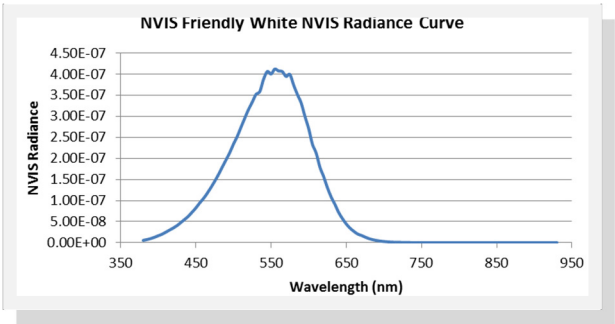

Blue Region: RTCA DO-275; White Boundary: MIL-STD-3009

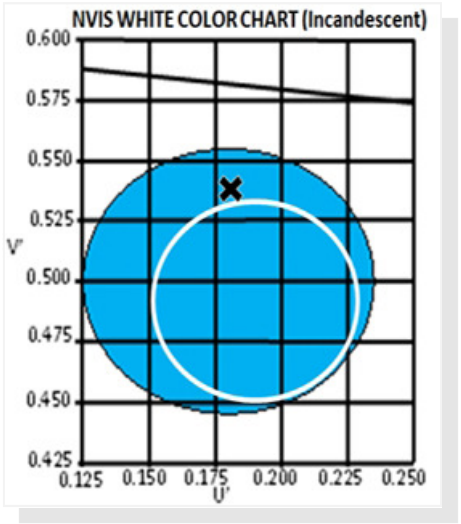
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| White LED (CCT=6815K) | 0.140 | 0.507 | 40.0 | 4.80E-10 | 6.60E-11 |
| Nichia NSSW100DT White LED | 0.143 | 0.525 | 39.1 | 5.70E-10 | 7.50E-11 |

# NVIS Color & Spectral Data

## NVIS Friendly White

| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.179 | 0.538 | 45.5 | 4.10E-9 | 1.30E-9 |



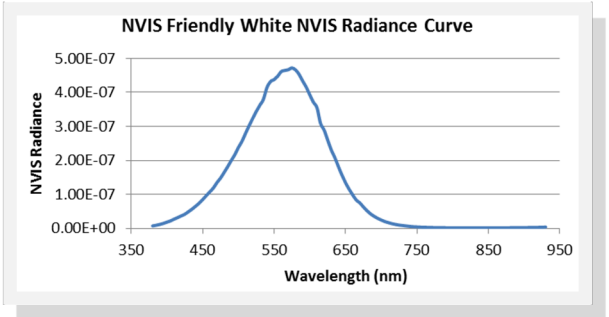

Blue Region: RTCA DO-275; White Boundary: MIL-STD-3009

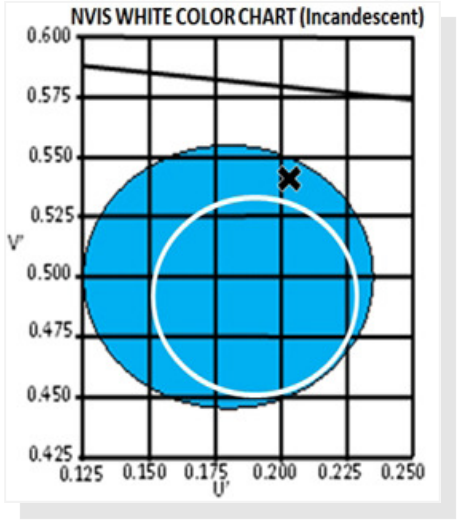
**Incandescent**

## NVIS Friendly White HT

**High Transmission**

**Incandescent**




Blue Region: RTCA DO-275; White Boundary: MIL-STD-3009

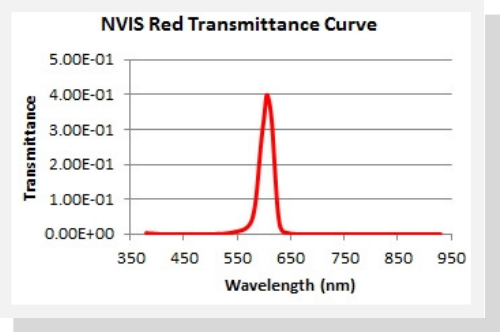
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.203 | 0.540 | 53.9 | 1.10E-8 | 5.10E-9 |

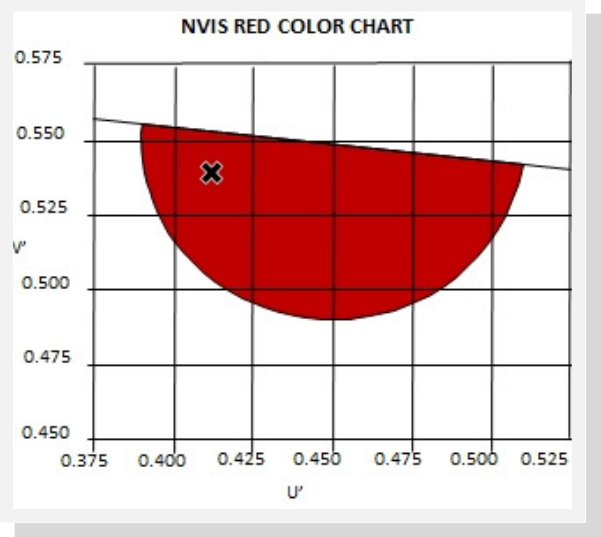
# NVIS Color & Spectral Data

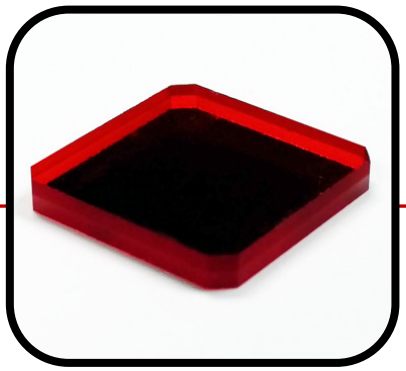
## NVIS Red

### Incandescent

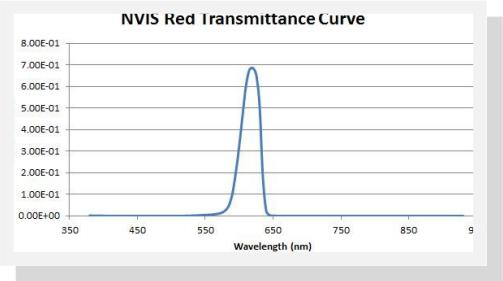
| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | $NR_A$ | $NR_B$ |
| Incandescent (CCT=2200K) | 0.412 | 0.538 | 9.7 | - | 7.15E-8 |

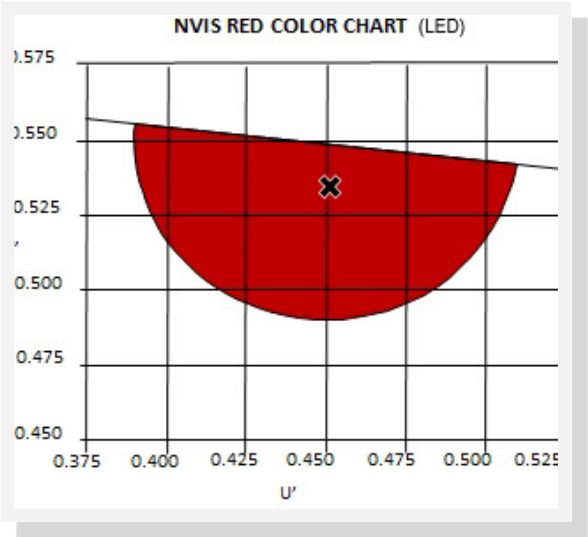


### LED




| | Chromaticity | | Photopic Transmission | NVIS Radiance | |
|---|---|---|---|---|---|
| Light Source | u' | v' | Y(%) | NRA | NRB |
| White LED (CCT=6000K) | 0.451 | 0.532 | 6.0 | - | 1.05E-07 |
| Nichia NSSW100DT White LED | 0.445 | 0.533 | 5.6 | - | 9.10E-08 |

# Pynco optical filter options

## Optical Flat Glass Filter Options

To order Optical Flat Filters, Pynco will need to know the dimensional constraints including thickness, width and length (or diameter for round flat filters). Aside from dimensional characteristics, the second aspect is choosing the appropriate optical filter or combination. Samples of optical and NVIS filter options are displayed below As mentioned, many of these filters can be combined for custom applications. Other options may include etching, legends, metalized edges, edge wrapping etc.

**Colored Filter Options**

NVIS Green A (Low)
NVIS Green A (Mid)
NVIS Green A (Upper)
NVIS Green B
NVIS Yellow (Class A)
NVIS Yellow (Class B)
NVIS White
NVIS Red

NVG Green A, not MIL-SPEC
NVG Green B, not MIL-SPEC
NVG Yellow, not MIL-SPEC
NVG Red, not MIL-SPEC
NVG White, not MIL-SPEC

Aviation Green,
Aviation Yellow
Aviation Red
Aviation White
Aviation Blue

IPL Red, IPL White
Air Force Blue / White

**Optical Filter Options**

Absorption Filters
Anti-Reflection
Bandpass Filters
High Contrast
High Brightness
ITO
Interference Filtering
- Short Wave Pass Filters
- Long Wave Pass Filters

Metallic Coatings
Military Spec Compliant Filters
Neutral Density
Notch Filtering
NVG Compatible Filters
NVIS Compatible Filters
Sunlight Readability
VIS / NIR Applications

**More Options**

Diffused Surfaces
Edge Wrapping
Etching
Legends
Metalized Edges
Polished Surfaces

**Light Sources:**
**LED, LCD, Incandescent**
**Surface Quality: 80-50**

**Contact a Pynco representative today for customized options, pricing and lead times.**

## Monolithic Thickness Options

### Flat Filters - Incandescent

**NVIS Green A (Low)**

| | |
|---|---|
| 1.0 mm | 0.040” |
| 1.5 mm | 0.059” |
| 2.0 mm | 0.080” |
| 2.5 mm | 0.098” |
| 3.0 mm | 0.118” |
| 4.0 mm | 0.157” |

**NVIS Green A (Mid)**

| | |
|---|---|
| 1.0 mm | 0.040” |
| 1.5 mm | 0.059” |
| 2.0 mm | 0.080” |
| 3.0 mm | 0.118” |

**NVIS Green A (Upper)**

| | |
|---|---|
| 1.0 mm | 0.040” |

**NVIS Green B**

| | |
|---|---|
| 1.0 mm | 0.040” |
| 1.5 mm | 0.059” |
| 2.0 mm | 0.080” |
| 2.5 mm | 0.098” |
| 3.0 mm | 0.118” |

**NVIS White**

| | |
|---|---|
| 1.0 mm | 0.040” |
| 2.0 mm | 0.080” |

**NVIS Yellow (Class B)**

| | |
|---|---|
| 1.0 mm | 0.040” |
| 1.5 mm | 0.059” |
| 2.0 mm | 0.080” |
| 2.5 mm | 0.098” |
| 3.0 mm | 0.118 |

### Flat Filters - LED

**NVIS Green A (Low)**

| | |
|---|---|
| 1.0 mm | 0.040” |
| 2.0 mm | 0.080” |

**NVIS Green A (Mid)**

| | |
|---|---|
| 2.0 mm | 0.080” |

**NVIS Green B**

| | |
|---|---|
| 2.0 mm | 0.080” |

**NVIS White**

| | |
|---|---|
| 1.0 mm | 0.040” |
| 1.5 mm | 0.059” |
| 2.0 mm | 0.080” |

**NVIS Yellow (Class B)**

| | |
|---|---|
| 2.0 mm | 0.080” |

# SPECIALTY NVIS GLASS

## P10300 MATERIAL

Often referred to as 'High Performance Green', this material is designed for an LED source with a peak wavelength of 568 nm. Commonly used with dot-matrix and alpha-numeric displays, the P10300 filtering lies between NVIS Green-B and NVIS-Yellow, while the NRA is well within spec and Sunlight Contrast is marginal.

## P9200, P9300, P9400 MATERIAL

These materials were developed to provide a high transmission Class A NVIS-Yellow performance using an incandescent source of 2100 Kelvin. The three filtering options differ in their respective color locations in the NVIS Yellow region: P9200 being on the far left, P9300 in the middle and P9400 on the far right. P9200 is preferable for annunciators and P9400 for warning indicators. When needed, Sunlight Readability is an added option that can be considered.

## P8700 MATERIAL

This material provides Class A NVIS-Yellow performance for Warning Indicators using an LED source whose peak wavelength is 568 nm. It is an absorption filter and is therefore not subject to off -axis color shifting. It provides some degree of Sunlight Readability without the use of any addition-al components.

## P6700, P8100 MATERIAL

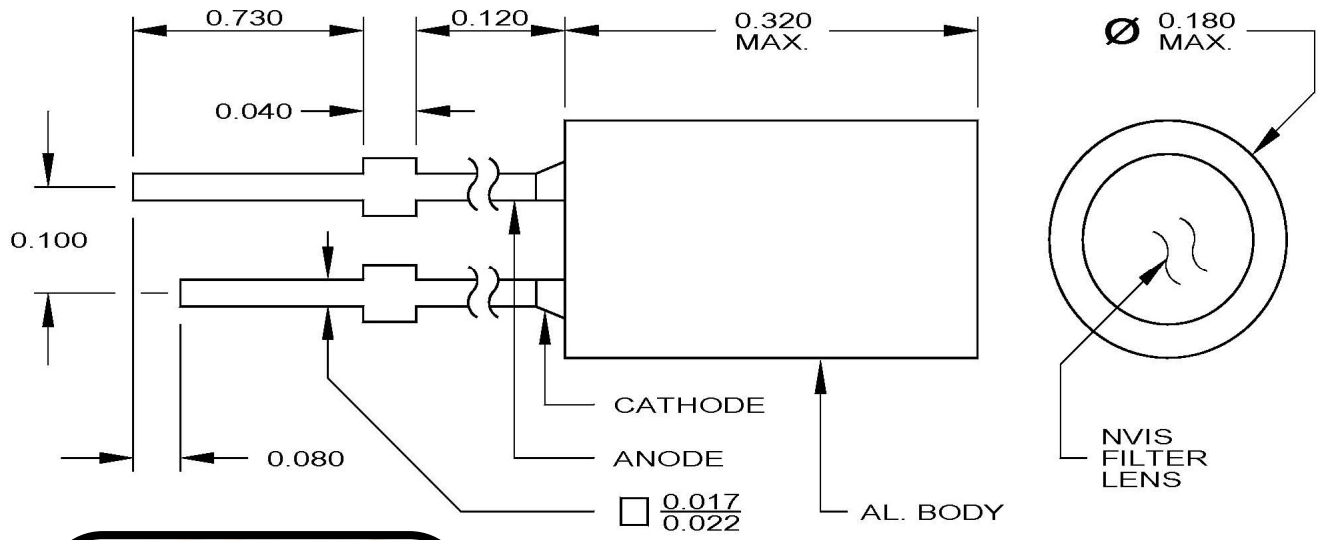
The P6700 and P8100 materials are the basis for Class B NVIS-Red Warning Indicators when used with an incandescent lamp of 2100 Kelvin. P8100 sometimes has a slightly higher u' value, other-wise, performance of the two is essentially identical. They are not Sunlight Readable as-is, but the option can be added.

**Contact a Pynco representative today for customized options, pricing and lead times.**

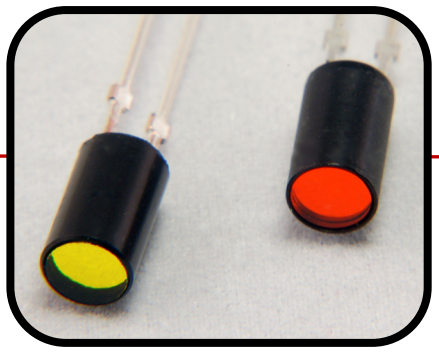
**Info@Pynco.com sales@pynco.com**

# LED Indicator - Aluminum Housing

## LED Lighting




**LED Indicator**



| Part Number Example (AH-TH-LGB-P-320-180) | | | | | |
|---|---|---|---|---|---|
| Form | Base | Color | Finish | Height | Diameter |
| AH | TH | LGB | P | 320 | 180 |

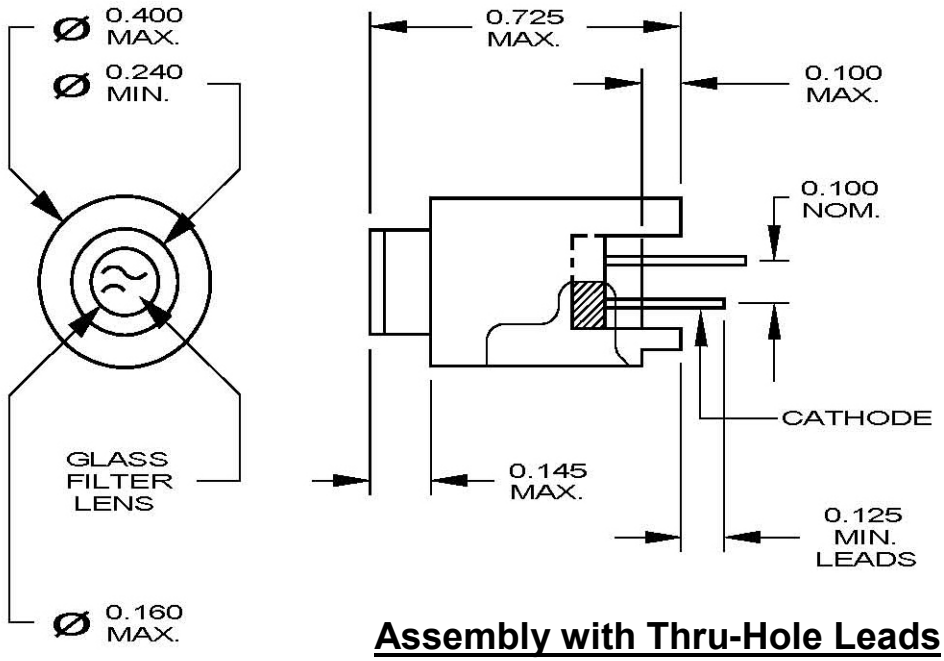
| NVIS Color | Part Number |
|---|---|
| Green A (Low) | AH-TH-**LGAL-**P-320-180 |
| Green A (Mid) | AH-TH-**LGAM-**P-320-180 |
| Yellow (Class B) | AH-TH-**LYB-**P-320-180 |
| White | AH-TH-**LW-**P-320-180 |
| Red | AH-TH-**LR-**P-320-180 |

| f) Polishing Options | |
|---|---|
| P | Polished (both sides) |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified
* This LED indicator assembly will operate at 20mA in current, current (mA) ratings are approximate

# NVIS Green 'B' LED Indicator

## LED Lighting




**Assembly with Thru-Hole Leads**

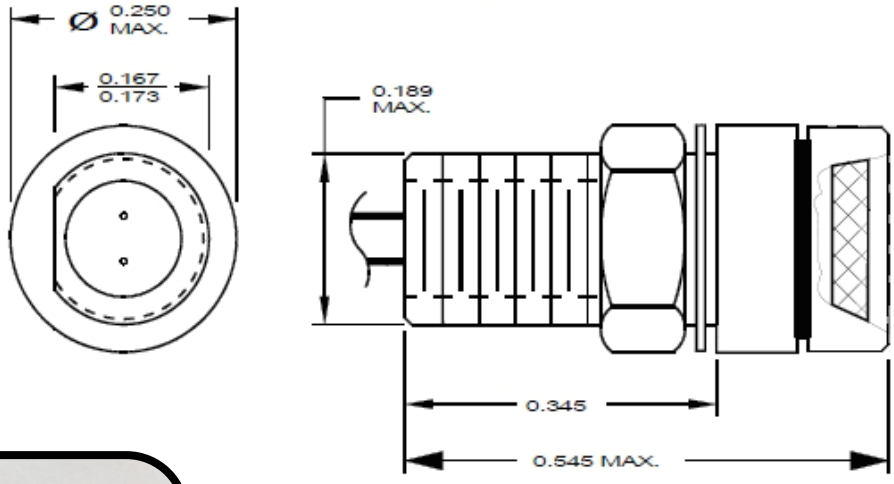
| Part Number Example (WBH-TH-LGB-725-400) | | | | |
|---|---|---|---|---|
| Form | Base | Color | Height | Diameter |
| WBH | TH | LGB | 725 | 400 |

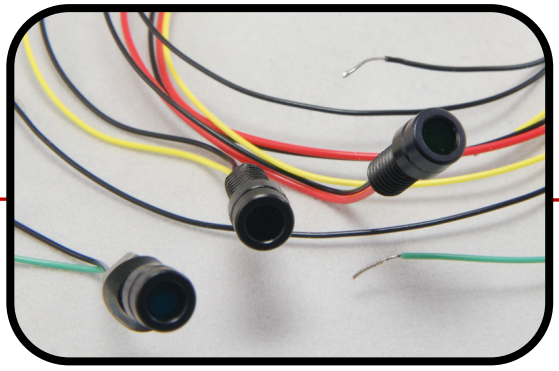
| NVIS Color | Part Number |
|---|---|
| Green B | WBH-TH-LGB-725-400 |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified
* LED Wide Base indicator assemblies will operate at 4mA in current, current (mA) ratings are approximate

# LED Indicator - Threaded Base

## LED Lighting



**Indicator with Wired Lead**

| Part Number Example (TB-WL-LGB-15-545-250) | | | | | |
|---|---|---|---|---|---|
| Form | Base | Color | l) Length | Height | Diameter |
| TB | WL | LGB | 15 | 545 | 250 |

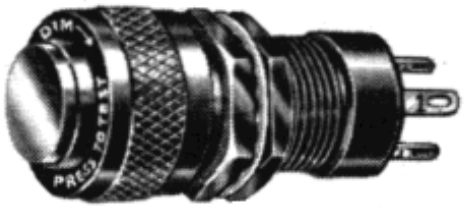
| NVIS Color | Part Number |
|---|---|
| Green B | TB-WL-**LGB-l-**545-250 |
| Yellow (Class B) | TB-WL-**LYB-l-**545-250 |
| White | TB-WL-**LW-l-**545-250 |
| Red | TB-WL-**LR-l-**545-250 |

| l) Lead Length | |
|---|---|
| 6 | 6 inch wired lead |
| 12 | 12 inch wired lead |
| 15 | 15 inch wired lead |

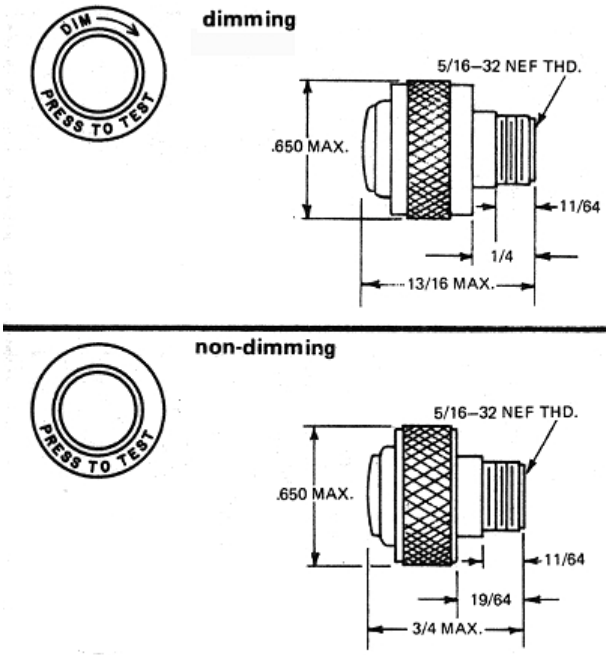
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified
* This LED indicator assembly will operate at 20mA in current, current (mA) ratings are approximate

# Press-to-Test Indicator (MS25041)

## LED Lighting



*MS25041 full assembly photo for Reference*





## Press-to-Test (Cap Dimension Options)

| Part Number Example (PTT-T134-LGB-3-D-P-650) | | | | | | |
|---|---|---|---|---|---|---|
| Form | Base | Color | t)Terminal | d)Dimmer | f) Finish | OD |
| PTT | T134 | LGB | 3 | D | P | 650 |

| NVIS Color | Part Number |
|---|---|
| Green B | PTT-T134-**LGB-t-d-f-**650 |
| Yellow (Class B) | PTT-T134-**LYB-t-d-f-**650 |
| White | PTT-T134-**LW-t-d-f-**650 |
| Red | PTT-T134-**LR-t-d-f-**650 |

| t) Midget Flange Base | |
|---|---|
| 3 | Three Terminal |
| 4 | Four Terminal |

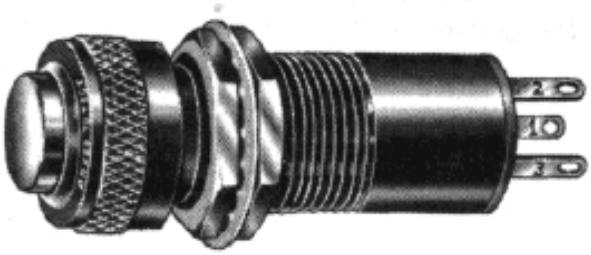
| d) Dimmer | |
|---|---|
| D | Dimmable |
| N | Non-Dimmable |

| f) NVIS Filter Options | |
|---|---|
| P | Standard Polished |
| AR | Anti Reflection |
| MF | Matte Finish (inside), polished (outside) |
| SR | Sunlight Readable |

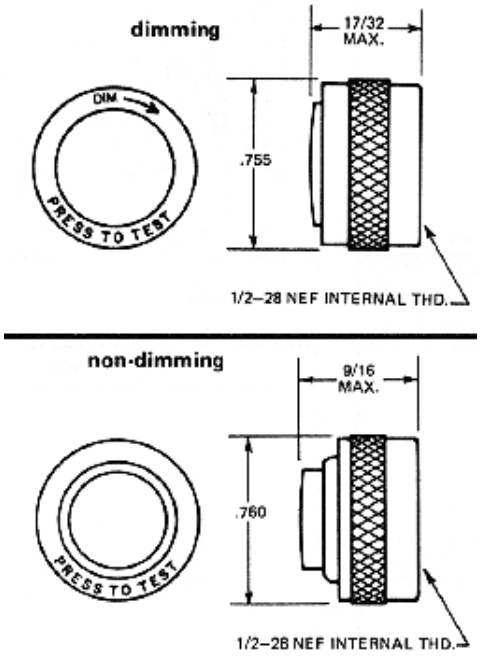
* Midget Flange T-1¾ base with an LED.
* Contact a Pynco representative for 'Legend' options. 'Indicator Cap' also sold as a standalone item.
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* An LED indicator assembly will operate at 20mA in current, current (mA) ratings are approximate.

# Press-to-Test Indicator (MS25331)

## LED Lighting



*MS25331 full assembly photo for Reference*





## Press-to-Test (Cap Dimension Options)

| Part Number Example (PTT-T314-LGB-3-D-P-755) | | | | | | |
|---|---|---|---|---|---|---|
| Form | Base | Color | t)Terminal | d)Dimmer | f) Finish | OD |
| PTT | T314 | LGB | 3 | D | P | 755 |

| NVIS Color | Part Number |
|---|---|
| Green B | PTT-T314-**LGB-t-d-f-**755 |
| Yellow (Class B) | PTT-T314-**LYB-t-d-f-**755 |
| White | PTT-T314-**LW-t-d-f-**755 |
| Red | PTT-T314-**LR-t-d-f-**755 |

| t) Midget Flange Base | |
|---|---|
| 3 | Three Terminal |
| 4 | Four Terminal |

| d) Dimmer | |
|---|---|
| D | Dimmable |
| N | Non-Dimmable |

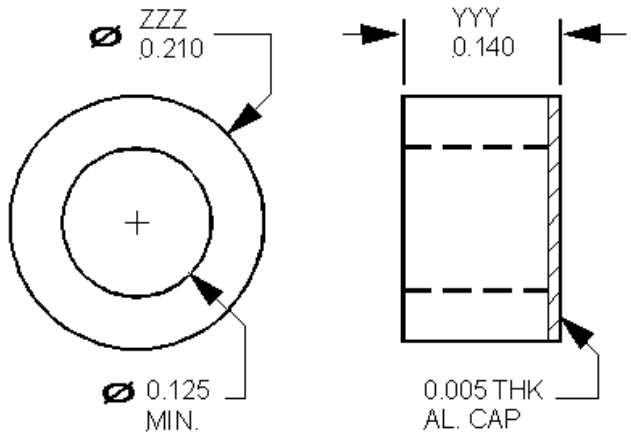
| f) NVIS Filter Options | |
|---|---|
| P | Standard Polished |
| AR | Anti Reflection |
| MF | Matte Finish (inside), polished (outside) |
| SR | Sunlight Readable |

* Midget Flange T-3¼ base with an LED. Non-dimmable version O.D. will be 0.760" (see the illustration).
* Contact a Pynco representative for 'Legend' options. 'Indicator Cap' also sold as a standalone item.
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* An LED indicator assembly will operate at 20mA in current, current (mA) ratings are approximate.

# Ring filters

## Incandescent

### EXAMPLE: Ring Filter with Cap (Heat-Sink)




| Part Number Example (RF-GB-P-140-210) | | | | |
|---|---|---|---|---|
| Form | Color | f) Finish | YYY) OAL | ZZZ) OD |
| RF | GB | P | 140 | 210 |

| NVIS Color | Part Number |
|---|---|
| Green B | RF-**GB-f-YYY-ZZZ** |
| Green A (Low) | RF-**GAL-f-YYY-ZZZ** |
| Green A (Mid) | RF-**GAM-f-YYY-ZZZ** |
| Green A (Upper) | RF-**GAU-f-YYY-ZZZ** |
| Yellow (Class B) | RF-**YB-f-YYY-ZZZ** |
| NVG White | RF-**W-f-YYY-ZZZ** |
| Friendly White | RF-**WNF-f-YYY-ZZZ** |
| Friendly White (HT) | RF-**WHT-f-YYY-ZZZ** |

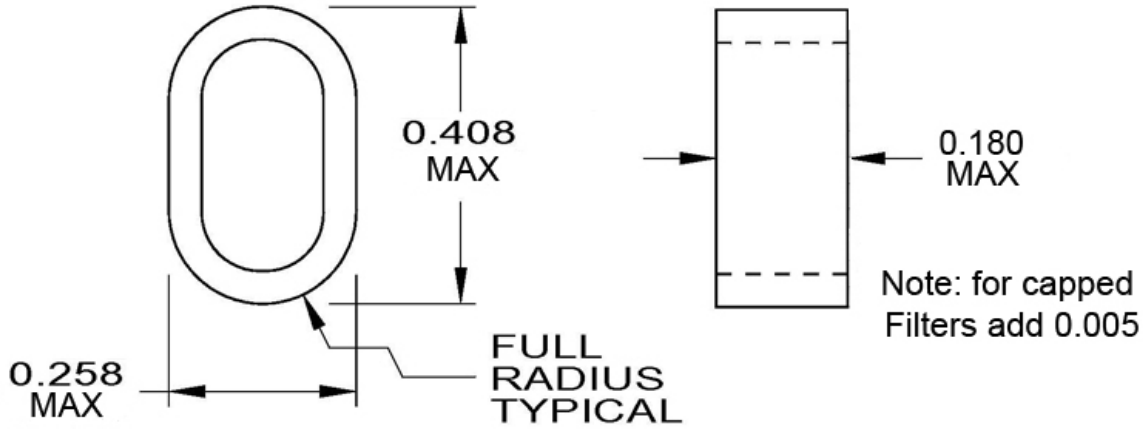
| f) Polishing Options | |
|---|---|
| P | Polished |
| U | Unpolished |

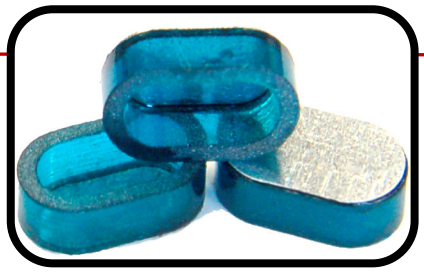
| Common Dimesions | |
|---|---|
| OAL YYY | OD ZZZ |
| 140 | 210 |
| 145 | 245 |
| 155 | 190 |
| 160 | 255 |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* Product dimensions include 0.005" aluminum cap.
* For capped filters, add AL (for aluminum) suffix at the end ( Example: RF-GB-P-140-210-AL ).
* For customized dimensions that are not listed, contact a Pynco representative to discuss your options.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# Bathtub filters

## Incandescent



| Part Number Example: (BT-GB-P-180-258-408) | | | | | |
|---|---|---|---|---|---|
| Form | Color | f) Finish | XXX) Height | YYY) Width | ZZZ) Length |
| BT | GB | P | 180 | 258 | 408 |

| NVIS Color | Part Number |
|---|---|
| Green B | BT-**GB-f-XXX-YYY-ZZZ** |
| Green A (Low) | BT-**GAL-f-XXX-YYY-ZZZ** |
| Green A (Mid) | BT-**GAM-f-XXX-YYY-ZZZ** |
| Green A (Upper) | BT-**GAU-f-XXX-YYY-ZZZ** |
| Yellow (Class B) | BT-**YB-f-XXX-YYY-ZZZ** |
| White | BT-**W-f-XXX-YYY-ZZZ** |
| Friendly White | BT-**WNF-f-XXX-YYY-ZZZ** |
| White (HT) | BT-**WHT-f-XXX-YYY-ZZZ** |

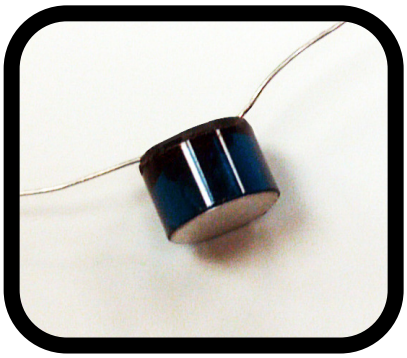
| f) Polishing Options | |
|---|---|
| P | Polished |
| U | Unpolished |

| Common Dimensions | | |
|---|---|---|
| **Height XXX** | **Width YYY** | **Length ZZZ** |
| 105 | 218 | 366 |
| | | |
| 125 | 218 | 366 |
| | | |
| 120 | 258 | 408 |
| | | |
| 180 | 258 | 408 |

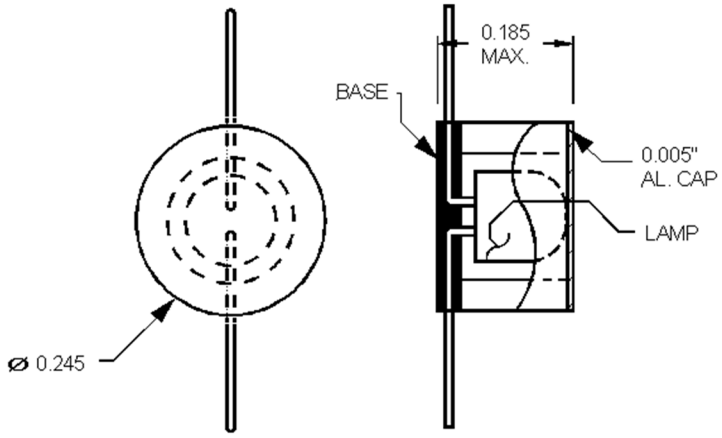
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* For capped filters, add SS (for stainless steel) at the end ( Example: BT-GB-P-180-258-408-SS ).
* Stainless steel caps are 0.006" nominal.
* For customized dimensions that are not listed, contact a Pynco representative to discuss your options.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# Filtered Lamp Assemblies (FLAs)

## Incandescent



### FLA with Gull Wing Lead




| Part Number Example (RF-WL-GB-P-185-210-28v-20mA) | | | | | | | |
|---|---|---|---|---|---|---|---|
| Form | b) Base | Color | f) Finish | YYY) OAL | ZZZ) OD | v) Voltage | mA) Current |
| RF | WL | GB | P | 185 | 210 | 28v | 20mA |

| NVIS Color | Part Number Options |
|---|---|
| Green B | RF-**b-GB-f-YYY-ZZZ-v-mA** |
| Green A (Low) | RF-**b-GAL-f-YYY-ZZZ-v-mA** |
| Green A (Mid) | RF-**b-GAM-f-YYY-ZZZ-v-mA** |
| Green A (Upper) | RF-**b-GAU-f-YYY-ZZZ-v-mA** |
| Yellow (Class B) | RF-**b-YB-f-YYY-ZZZ-v-mA** |
| Friendly White | RF-**b-WNF-f-YYY-ZZZ-v-mA** |
| Friendly White (HT) | RF-**b-WHT-f-YYY-ZZZ-v-mA** |

| Common Dimensions | | |
|---|---|---|
| YYY) OAL | | ZZZ) OD |
| 185 | | 210 |
| | | |
| 190 | | 245 |
| | | |
| | | 255 |
| | | |
| | | 280 |

| b) Base Options | |
|---|---|
| GW | Gull Wing (Type I) |
| WL | Wire Lead (Type II) |
| BP | Bi-Pin |

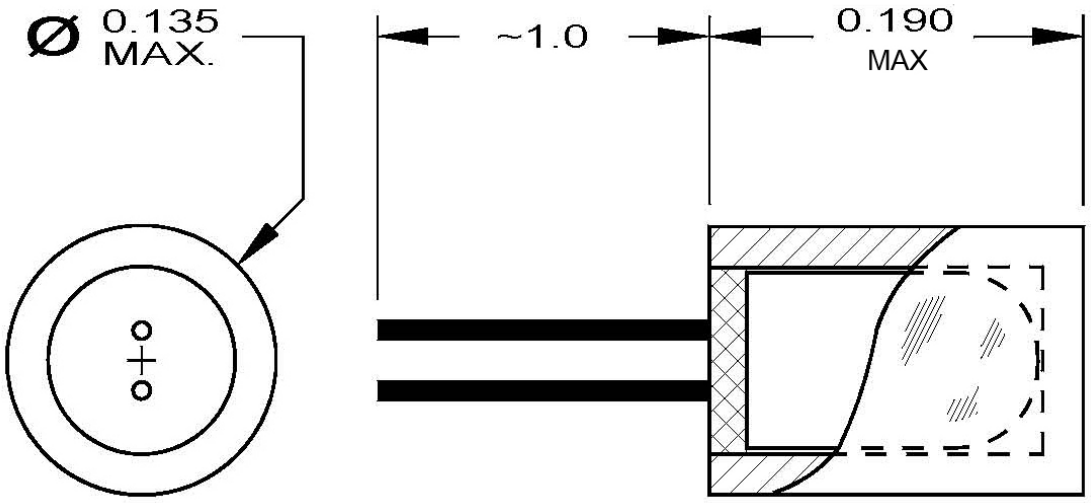
| f) Polishing Options | |
|---|---|
| P | Polished |
| U | Unpolished |

| v) Voltage | mA) Current Options |
|---|---|
| 5 | 20, 60, 75, 115, 125 |
| 14 | 40 |
| 28 | 20 |

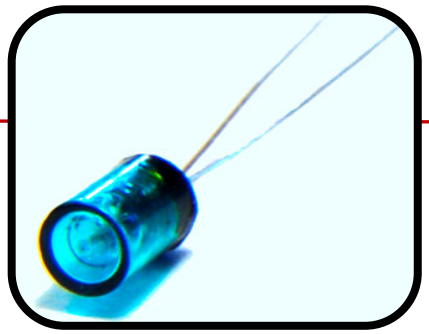
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* For customized dimensions that are not listed, contact a Pynco representative to discuss your options.
* Product dimensions include 0.005" aluminum cap.
* Current (mA) ratings are nominal.

# T-1 Direct Replacement - Short (5v)

## Incandescent




**Short Version with Wire Lead**



| Part Number Example (T1SH-FD-GAM-P-20v-60mA) | | | | | |
|---|---|---|---|---|---|
| Size | Form | Color | f) Finish | v) Voltage | mA) Current |
| T1SH | FD | GAM | P | 5v | 60mA |

| NVIS Color | Part Number |
|---|---|
| **Green A (Mid)** | T1SH-FD-**GAM-f-**5-**mA** |
| Friendly White | T1SH-FD-**WNF-f-**5-**mA** |
| Friendly White (HT) | T1SH-FD-**WHT-f-**5-**mA** |

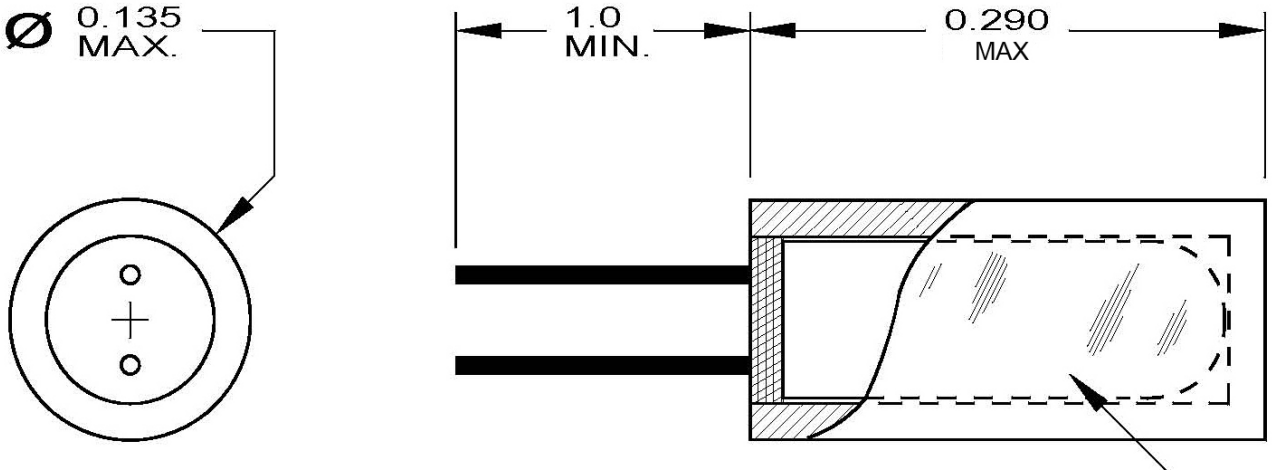
| f) Polishing Options | |
|---|---|
| P | Polished |
| U | Unpolished |

| mA) Current Options |
|---|
| 20, 60, 75, 115, 125 |

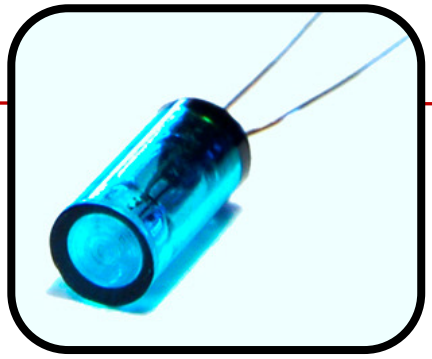
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* T-1 replacement assemblies are only sold with a Flat Glass Dome filter and Wire Leads (Type I).
* Available with Bi-Pin lead (pin diameter: 0.016 nominal, spacing: 0.050 nominal) - Reference Bi-Pin lead on page 36.
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# T-1 Direct Replacement - Long (14v & 28v)

## Incandescent




**Long Version with Wire Lead**



| Part Number Example (T1LG-FD-GAM-P-14v-50mA) | | | | | |
|---|---|---|---|---|---|
| Size | Form | Color | f) Finish | v) Voltage | mA) Current |
| T1LG | FD | GAM | P | 14v | 50mA |

| NVIS Color | Part Number |
|---|---|
| Green A (Mid) | T1LG-FD-**GAM-f-v-mA** |
| Friendly White | T1LG-FD-**WNF-f-v-mA** |
| Friendly White (HT) | T1LG-FD-**WHT-f-v-mA** |

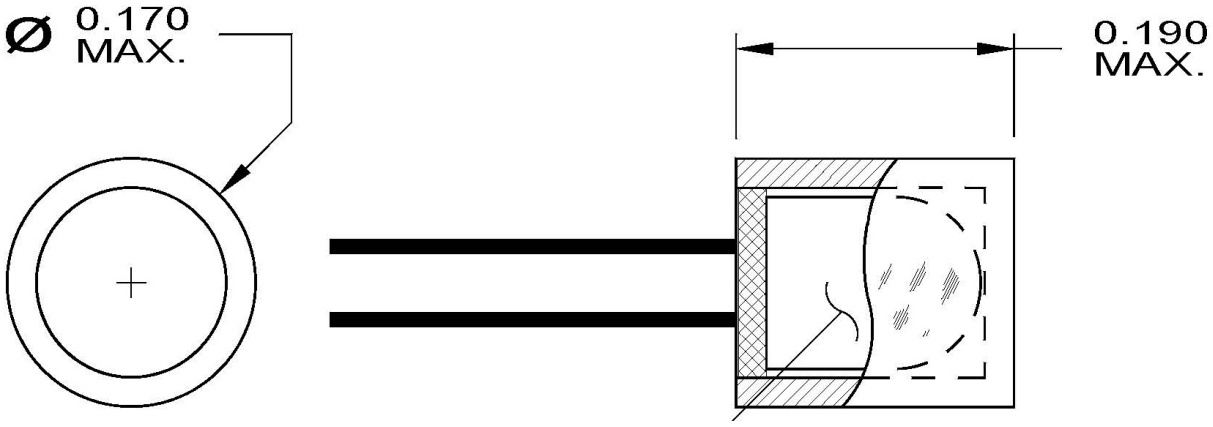
| f) Polishing Options | |
|---|---|
| P | Polished |
| U | Unpolished |

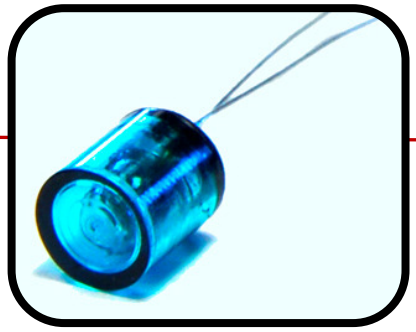
| v)Voltage | mA)Current |
|---|---|
| 14 | 50 |
| 28 | 24 |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* T-1 direct replacement assemblies (long) are only sold with a Flat Glass Dome filter and Wire Leads (Type I).
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# T-1 Direct Replacement - Substitute

## Incandescent



**Substitute Version with Wire Lead**

| Part Number Example (T1SB-FD-GAM-P-28v-20mA) | | | | | |
|---|---|---|---|---|---|
| Size | Form | Color | f) Finish | v) Voltage | mA) Current |
| T1SB | FD | GAM | P | 28v | 20mA |

| NVIS Color | Part Number |
|---|---|
| Green A (Mid) | T1SB-FD-**GAM-f-v-mA** |
| Friendly White | T1SB-FD-**WNF-f-v-mA** |
| Friendly White (HT) | T1SB-FD-**WHT-f-v-mA** |

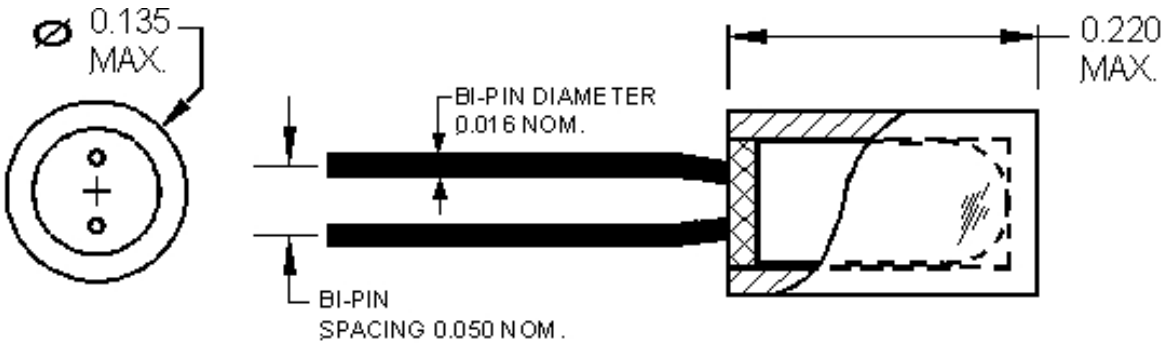
| f) Polishing Options | |
|---|---|
| P | Polished |
| U | Unpolished |

| v) Voltage | mA) Current Options |
|---|---|
| 5 | 20, 60, 75, 115, 125 |
| 14 | 40 |
| 28 | 20 |

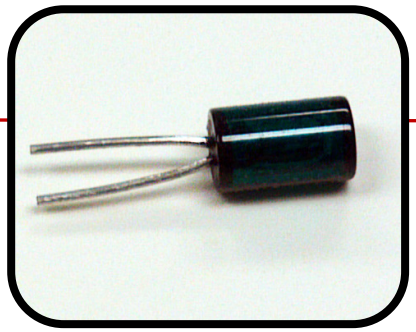
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* T-1 replacement assemblies are only sold with a Flat Glass Dome filter and Wire Leads (Type I).
* Note: The "T-1 Substitute" has a wider diameter than the standard T1 diameter.
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# T-1 Direct Replacement - Bi-Pin

## Incandescent




**Replacement with Bi-Pin Leads**



| Part Number Example (T1BP-FD-GAM-P-5v-115mA) | | | | | |
|---|---|---|---|---|---|
| Size | Form | Color | f) Finish | v) Voltage | mA) Current |
| T1BP | FD | GAM | P | 5v | 115mA |

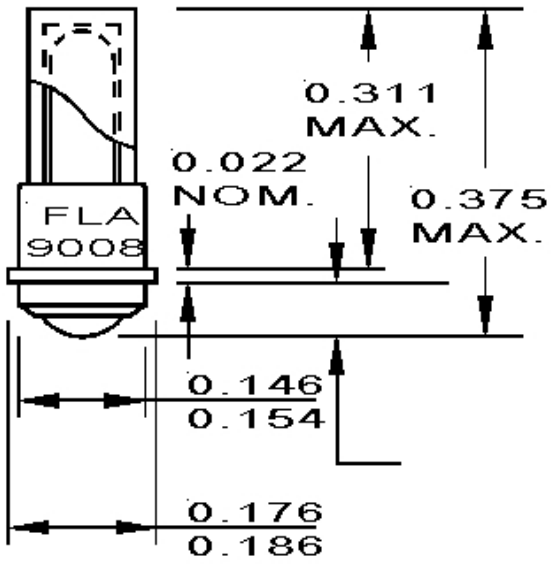
| NVIS Color | Part Number |
|---|---|
| Green A (Mid) | T1BP-FD-**GAM-**P-5v-115mA |
| Friendly White | T1BP-FD-**WNF-**P-5v-115mA |
| Friendly White (HT) | T1BP-FD-**WHT-**P-5v-115mA |

| f) Polishing Options | |
|---|---|
| P | Polished |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* This T-1 replacement includes Bi-Pin leads instead of the typical Wire Leads (Type I).
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# T-1 Sub-Midget Flange FLA Flat Dome

## Incandescent




| T-1: Part Number Example (T1-FD-SM-GAM-P-28v-24mA) | | | | | | |
|---|---|---|---|---|---|---|
| Size | Form | Base | Color | f) Finish | v) Voltage | mA) Current |
| T1 | FD | SM | GAM | P | 28v | 24mA |

| NVIS Color | Part Number Options |
|---|---|
| Green A (Mid) | T1-FD-SM-**GAM-P-v-mA** |
| Friendly White | T1-FD-SM-**WNF-P-v-mA** |
| Friendly White (HT) | T1-FD-SM-**WHT-P-v-mA** |

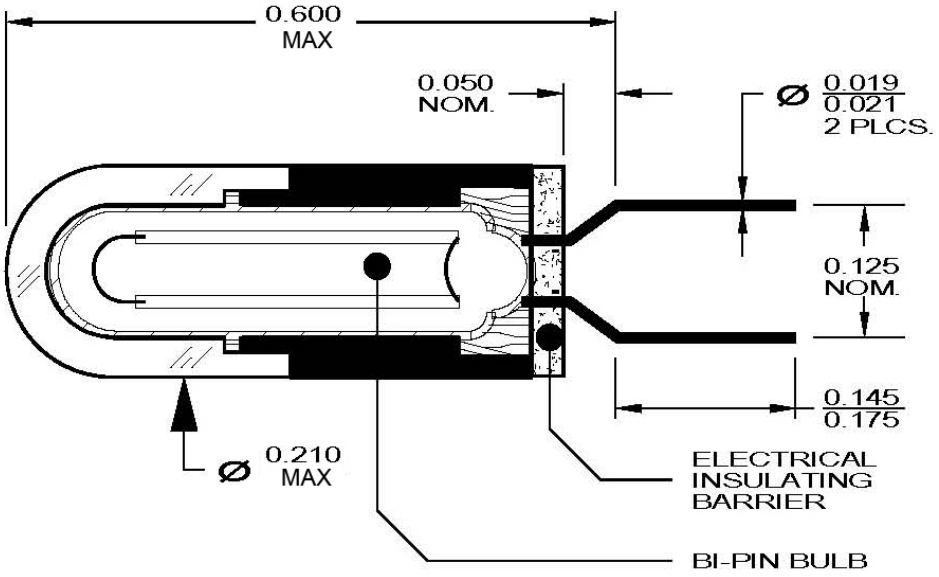
| f) Polishing Options | |
|---|---|
| P | Polished |

| v)Voltage | mA)Current |
|---|---|
| 5 | 115 |
| 28 | 24 |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# T-1¾ Bi-Pin - Hemispherical Dome

## Incandescent




| Part Number Example (T134-HD-BP-GAL-P-28v-24mA) | | | | | | |
|---|---|---|---|---|---|---|
| Size | Form | Base | Color | f) Finish | v) Voltage | mA) Current |
| T134 | HD | BP | GAL | P | 28v | 24mA |

| NVIS Color | Part Number Options |
|---|---|
| Green B | T134-HD-BP-**GB**-P-v-mA |
| Green A (Low) | T134-HD-BP-**GAL**-P-v-mA |
| Green A (Mid) | T134-HD-BP-**GAM**-P-v-mA |
| Friendly White | T134-HD-BP-**WNF**-P-v-mA |
| Friendly White (HT) | T134-HD-BP-**WHT**-P-v-mA |

| f) Polishing Options | |
|---|---|
| P | Polished (both sides) |

| v)Voltage | mA)Current |
|---|---|
| 5 | 115 |
| 14 | 65 |
| 28 | 24 |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# T-1¾ Midget Groove - Hemispherical Dome

## Incandescent


| Part Number Example (T134-HD-MG-GB-P-28v-24mA) | | | | | | |
|---|---|---|---|---|---|---|
| Size | Form | Base | Color | f) Finish | v) Voltage | mA) Current |
| T134 | HD | MG | GB | P | 28v | 24mA |

| NVIS Color | Part Number |
|---|---|
| Green B | T134-HD-MG-**GB**-P-**v**-**mA** |
| Green A (Low) | T134-HD-MG-**GAL**-P-**v**-**mA** |
| Green A (Mid) | T134-HD-MG-**GAM**-P-**v**-**mA** |
| Yellow (Class B) | T134-HD-MG-**YB**-P-**v**-**mA** |
| Friendly White | T134-HD-MG-**WNF**-P-**v**-**mA** |
| Friendly White (HT) | T134-HD-MG-**WHT**-P-**v**-**mA** |

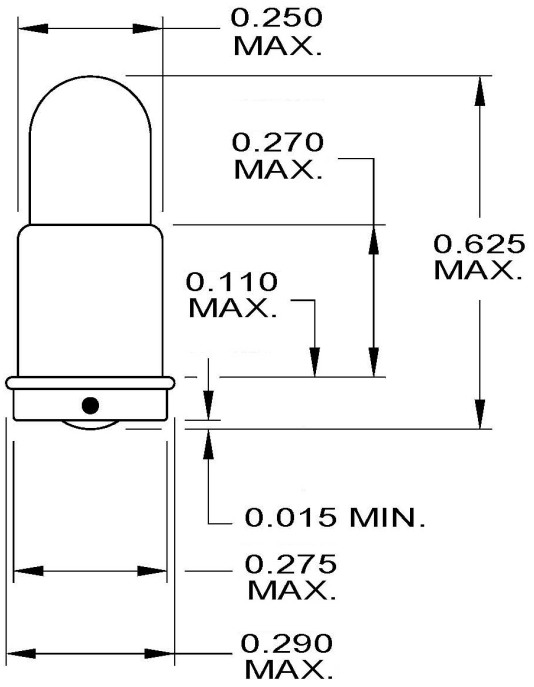
| f) Polishing Options | |
|---|---|
| P | Polished (both sides) |

| v)Voltage | mA)Current |
|---|---|
| 5 | 60 |
| 14 | 40 |
| 28 | 24 |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. 'Friendly White (HT)' equals high transmission.

# T-1¾ Midget Flange - Hemispherical Dome

## Incandescent




| Part Number Example (T134-HD-MF-GB-P-28v-24mA) | | | | | | |
|---|---|---|---|---|---|---|
| Size | Form | Base | Color | f) Finish | v) Voltage | mA) Current |
| T134 | HD | MF | GB | P | 28v | 24mA |

| NVIS Color | Part Number |
|---|---|
| Green B | T134-HD-MF-**GB**-P-v-mA |
| Green A (Low) | T134-HD-MF-**GAL**-P-v-mA |
| Green A (Mid) | T134-HD-MF-**GAM**-P-v-mA |
| Yellow (Class B) | T134-HD-MF-**YB**-P-v-mA |
| Friendly White | T134-HD-MF-**WNF**-P-v-mA |
| Friendly White (HT) | T134-HD-MF-**WHT**-P-v-mA |

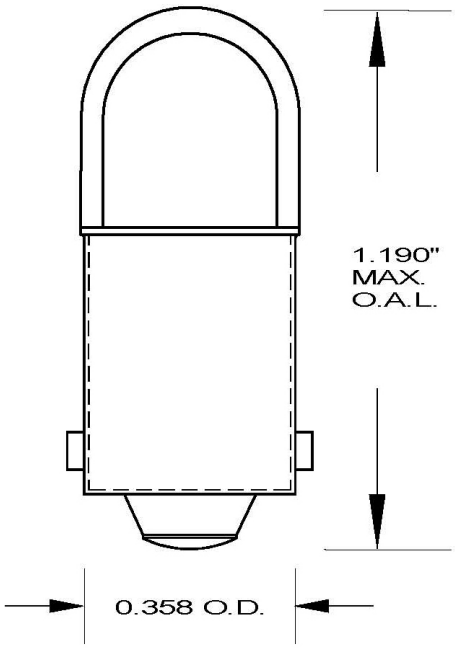
| f) Polishing Options | |
|---|---|
| P | Polished (both sides) |

| v)Voltage | mA)Current |
|---|---|
| 5 | 60 |
| 14 | 40 |
| 28 | 24 |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* Current (mA) ratings are nominal.
* 'Friendly White' filters are standard brightness. Friendly White (HT) equals high transmission.

# T-3¼ Bayonet Base Hemispherical Dome (28v)

**Incandescent**




| Part Number Example (T314-HD-BAY-GB-P) | | | | |
|---|---|---|---|---|
| Size | Form | Base | Color | f) Finish |
| T314 | HD | BAY | GB | P |

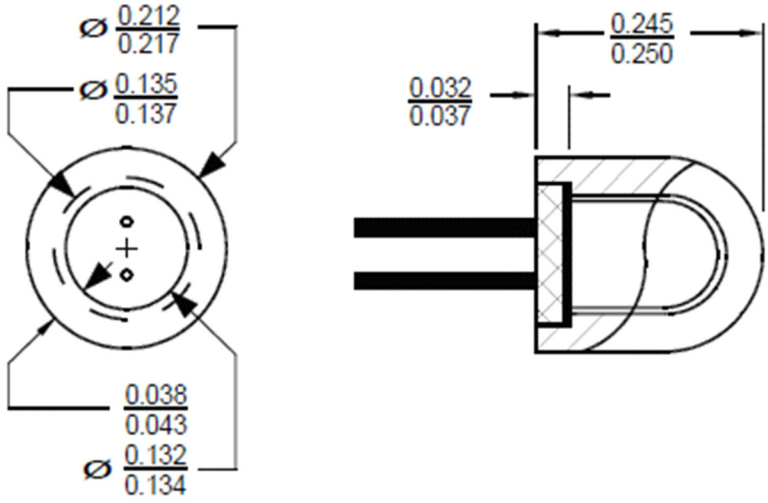
| NVIS Color | Part Number |
|---|---|
| **Green B** | T314-HD-BAY-**GB**-P |
| **Green A (Low)** | T314-HD-BAY-**GAL**-P |
| **Green A (Mid)** | T314-HD-BAY-**GAM**-P |
| Yellow (Class B) | T314-HD-BAY-**YB**-P |
| Friendly White | T314-HD-BAY-**WNF**-P |
| Friendly White (HT) | T314-HD-BAY-**WHT**-P |

| f) Polishing Options | |
|---|---|
| P | Polished (both sides) |

* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.
* T-3¼ assemblies normally use the Bayonet base connector. Contact Pynco for customized options.
* T-3¼ assemblies operate at 28 volts and 85 mA in current.
* 'Friendly White' filters are standard brightness, (HT) equals high transmission.

# Hemispherical Dome - Lamp Assembly

## Incandescent




| Part Number Example (HD-WL-LGB-P-250-215) | | | | | |
|---|---|---|---|---|---|
| Form | Base | Color | f) Finish | Height | Diameter |
| HD | WL | GB | P | 250 | 215 |

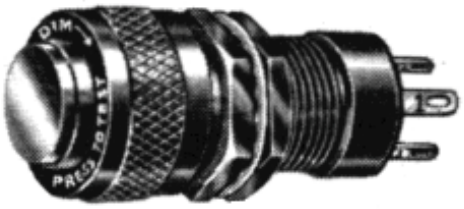
| NVIS Color | Part Number |
|---|---|
| Green B | HD-WL-**GB**-P-250-215 |
| Green A (Mid) | HD-WL-**GAM**-P-250-215 |
| White | HD-WL-**W**-P-250-215 |

| f) Polishing Options | |
|---|---|
| P | Polished (both sides) |

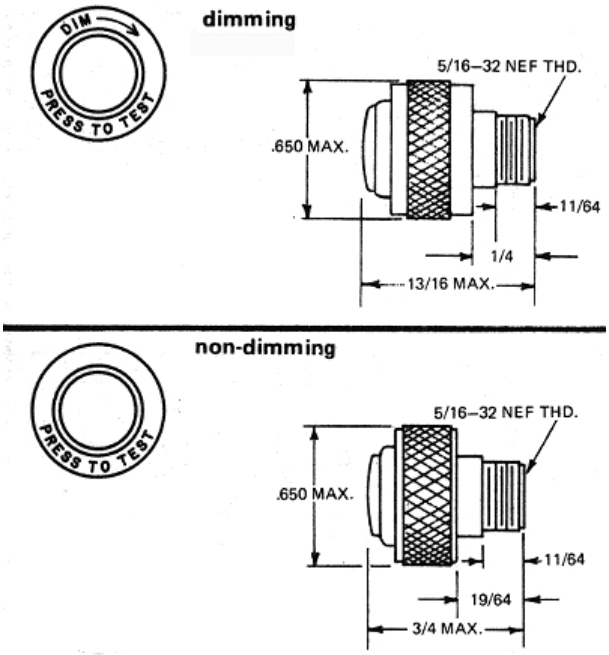
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified
* For customized dimensions that are not listed, contact a Pynco representative to discuss your options

# Press-to-Test Indicator Cap (MS25041)

## Incandescent



*MS25041 full assembly photo for Reference*





## Press-to-Test (Cap Dimension Options)

| Part Number Example (PTT-T134-GB-3-D-P-650) | | | | | | |
|---|---|---|---|---|---|---|
| Form | Base | Color | t)Terminal | d)Dimmer | f) Finish | OD |
| PTT | T134 | GB | 3 | D | P | 650 |

| NVIS Color | Part Number |
|---|---|
| Green B | PTT-T134-**GB-t-d-f-**650 |
| Yellow (Class B) | PTT-T134-**YB-t-d-f-**650 |
| White | PTT-T134-**W-t-d-f-**650 |
| Red | PTT-T134-**R-t-d-f-**650 |

| t) Midget Flange Base | |
|---|---|
| 3 | Three Terminal |
| 4 | Four Terminal |

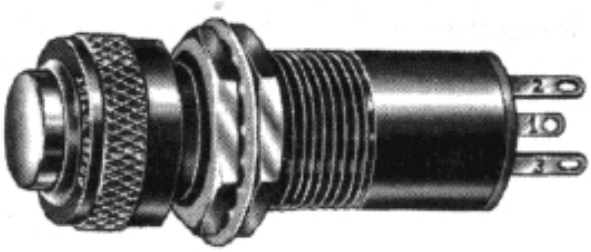
| d) Dimmer | |
|---|---|
| D | Dimmable |
| N | Non-Dimmable |

| f) NVIS Filter Options | |
|---|---|
| P | Standard Polished |
| AR | Anti Reflection |
| MF | Matte Finish (inside), polished (outside) |
| SR | Sunlight Readable |

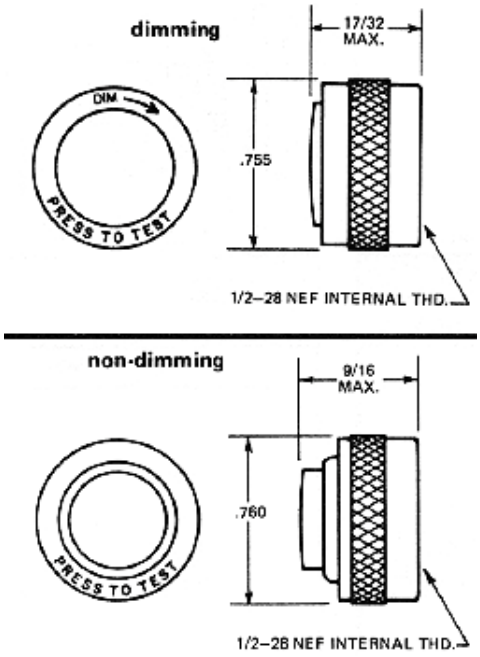
* Midget Flange Base with a T-1¾ Incandescent Lamp.
* Contact a Pynco representative for 'Legend' options. 'Indicator Cap' also sold as a separate item.
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.

# Press-to-Test Indicator Cap (MS25331)

## Incandescent



*MS25331 full assembly photo for Reference*





## Press-to-Test (Cap Dimension Options)

| Part Number Example (PTT-T314-GB-3-D-P-755) | | | | | | |
|---|---|---|---|---|---|---|
| Form | Base | Color | t)Terminal | d)Dimmer | f) Finish | OD |
| PTT | T314 | GB | 3 | D | P | 755 |

| NVIS Color | Part Number |
|---|---|
| Green B | PTT-T314-**GB-t-d-f-**755 |
| Yellow (Class B) | PTT-T314-**YB-t-d-f-**755 |
| White | PTT-T314-**W-t-d-f-**755 |
| Red | PTT-T314-**R-t-d-f-**755 |

| t) Midget Flange Base | |
|---|---|
| 3 | Three Terminal |
| 4 | Four Terminal |

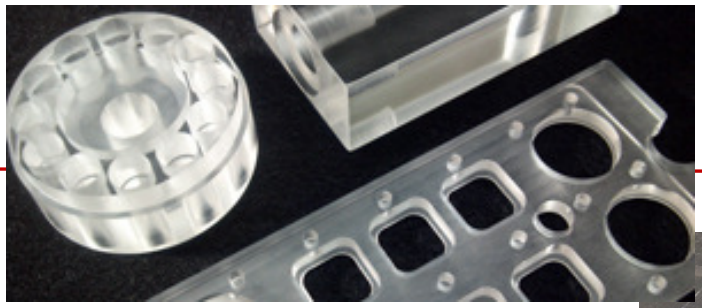
| d) Dimmer | |
|---|---|
| D | Dimmable |
| N | Non-Dimmable |

| f) NVIS Filter Options | |
|---|---|
| P | Standard Polished |
| AR | Anti Reflection |
| MF | Matte Finish (inside), polished (outside) |
| SR | Sunlight Readable |

* Midget Flange Base with a T-3¼ Incandescent Lamp. Non-dimmable version O.D. will be 0.760" (see illustration).
* Contact a Pynco representative for 'Legend' options. 'Indicator Cap' also sold as a standalone item.
* All dimensions are in 0.001", and (+0.000 / -0.005) in tolerance, unless otherwise specified.

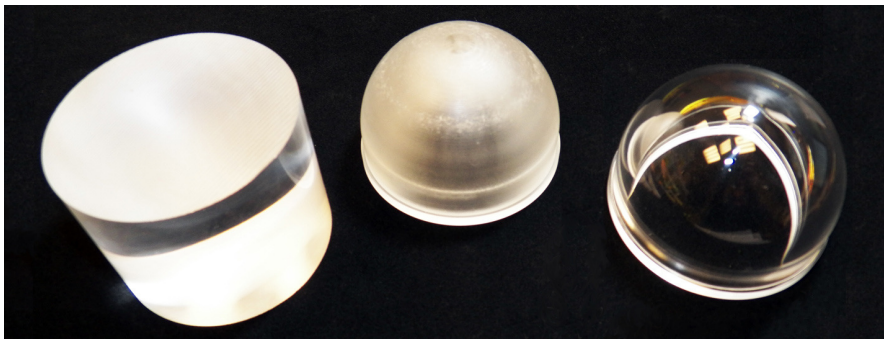
# Custom Machined Products

Pynco excels in the fabrication of glass and plastic materials. With 34 years of experience serving multiple industries, we have the time tested processes to manufacture and deliver mission critical items to meet our customers' requirements.

We specialize in the grinding, polishing or machining of a wide variety of materials including:

- Borofloat
- Borosilicate
- Silicate Phosphate
- Soda-lime
- Polymers
- Polycarbonates
- Acrylics



**Contact a Pynco representative today for customized options, pricing and lead times.**
**Info@Pynco.com sales@pynco.com**

# Glossary

**Absorption Filter:** These filters operate by attenuation of light through the absorption of specific wavelengths, so that spectral performance is a function of the physical thickness of the filter and the amount of dye present in the glass.

**Acrylic:** A clear high grade plastic material made primarily from petroleum. At half the weight, acrylic is seventeen times stronger and more impact resistant than glass. Cell cast acrylic is easily machined and polished, and ideal for optical windows and panel blanks. Unlike other materials, scratches in acrylic can be buffed out.

**AR Coating:** An anti-reflection (AR) coating is a type of optical coating applied to the surface of lenses and other optical devices to reduce reflection. This improves the efficiency of the system since less light is lost.

**CCT (Correlated Color Temperature):** Color temperature in lighting refers to the tone of "white" light that is emitted from a light source. CCT defines the color appearance of a white LED, and is defined in degrees Kelvin; a warm light, is around 2700K, moving to neutral white at around 4000K, and to cool white at 7000K or more.

**CIE Color Coordinate System:** The fundamental definitions of color are expressed in terms of the "standard observer" and coordinate system adopted by the International Commission on Illumination (C.I.E.) at Cambridge, England, in 1931 and published in the Journal of the Optical Society of America, Vol. 23, page 359, October 1933. Wherever chromaticity coordinates (x, *y,* z) appear in this document, they relate to this system. The CIE 1976 uniform chromaticity scale (UCS) diagram is the CIE 1931 chromaticity diagram redrawn with the x and y axes subjected to a linear transformation as defined in CIE Publication 15, Supplement 2, 1978.

**Chromaticity:** An objective specification of the quality of a color regardless of its luminance. These values can include x,y coordinates (CIE1931) or u',v' coordinates (CIE1976).

**Class A NVIS:** Class A NVIS is not compatible with red cockpit lights because of the overlap between the spectrum of red light and the sensitivity of Class A NVIS.

**Class B NVIS:** Class B NVIS is compatible with NVIS Red and therefore is compatible with properly filtered red lights and color electronic displays that meet the requirements.

**Class C NVIS:** Some aircraft have a heads up display (HUDs) that use a hologram as the reflective element in the combining glass. Holograms typically work with only one wavelength of light. This feature can be used to improve the efficiency and see-through clarity of the HUD, but it means the light coming from the HUD is concentrated at one wavelength. Since this wavelength is in the green part of the spectrum and is blocked by the minus blue filter in the NVIS, it is nearly impossible to see a holograph HUD with Class A or B NVIS. Consequently, modified NVIS have been built and tested which have a "notch" or "leak" in the green part of the spectrum. The Class C filter is sometimes called the "leaky green" filter.

# Glossary

**Coatings:** Multi-layer films which are applied by vacuum deposition methods to alter the optical characteristics of the substrate on which they are deposited.

**Compatible Interior Lighting:** The aircraft interior lighting that provides acquisition of aircraft interior information with the unaided eye without degrading the image intensification capabilities of the NVIS during night flight operations.

**Compliant:** A device that can be used with night vision goggles while also meeting MIL SPEC requirements.

**Contrast:** The amount of emitted light from an illuminated or non-illuminated display compared to the ambient illuminance.

**Covert:** IR lights or lights that are typically filtered so they are not visible to the naked eye beyond 20 – 30 feet. These lights may be intended to provide illumination so that NVIS will work without adequate natural light. (The observer uses infrared to provide adequate illumination for the goggle. Infrared is needed when it is too dark for the goggle to work properly.)

**Crewstation or Compartment:** Per MIL-STD-3009, all military crew member work stations or compartments, within the aircraft, are required to use NVIS in the performance of duties.

**Diffuser:** A device that diffuses or spreads out or scatters light in some manner. This will cause the emitted light to become more uniform to the viewer.

**Diffusion:** The scattering of incident light by reflection from, or transmission through, a rough surface.

**Direct View Image NVIS (Type I):** Any NVIS that uses the goggle and displays the intensified Image on a phosphor screen in the user's direct line of sight.

**Edge Wrapping:** Is the process of manufacturing a border around the edge of an optical filter to block light transmission and/or protect the edges from damage. The edge wrapped area of an optical filter is often used to permanently attach or hold a given filter in place.

**Electronic and/or Electro-Optical Displays:** All displays capable of presenting a variety of different images on their screen. These displays may present characters, numerals, symbols, graphics, or video. They are based on a CRT, a dot matrix technology, or a segmented design, and may, or may not be, capable of portraying shades of gray.

**Filtered Lamp Assembly (FLA):** A device that includes an optical filter, an incandescent lamp or LED and a metal assembly that encapsulates the filtered lamp. Most FLAs are made to industry standard sizes like T-1, T-1¾ and T-3¼ as examples.

# Glossary

**Glass Annealing:** The process of heating glass gradually and then allowing it to cool slowly at a controlled rate, in order to remove internal stresses. The primary purpose for annealing is to soften the glass to improve its machinability. After the removal of the internal stresses, the annealing process will also improve the clarity and consistency of glass (and acrylics) for optical filters and windows.

**Glass Tempering:** The process of improving the hardness of glass (called toughening) by heating it at a very high temperature and then quickly cooling it. The primary benefit is added strength for projects where maximum durability is desirable. Tempered glass is also much safer to handle, when broken it will break into small, circular pieces instead of the usual sharp, jagged shards.

**Infrared (IR):** Infrared energy is light that we cannot see, but our bodies can detect as heat. It includes the portion of the color spectrum with wavelengths longer than visible light.

**Interference Filter:** A substrate containing a deposition coating that is applied to one side of the substrate. The filter is highly reflective, but can obtain steep cut-off points at specific wavelengths.

**Interior Lighting:** All lighting within the aircraft including but not restricted to the following lighting systems:

A) Instrument
- Primary (Green A, Green B)
- Secondary

B) Console
- Primary (Green A, Green B)
- Secondary

C) Emergency
D) Warning, Caution, and Advisory displays and indicators (Yellow, Red)
E) Utility and Map (White)
F) Controls (Knobs, Handles, Push Buttons)
G) Compartment
H) Work and Inspection Lights (White)
I) Jump Lights (Yellow)

**IR Mode:** The infrared (IR) or covert mode for exterior lighting is defined as not viewable by a dark-adapted, unaided eye at a distance greater than 30 feet, in the dark, and when the system is on the ground.

**ITO Coating:** Indium Tin Oxide (ITO) is a transparent and conductive substance. The layers must be thin to provide substantial transparency, particularly at the blue end of the spectrum.

# Glossary

**Laminate Filter:** An optical filter that is made from multiple material layers (known as a stack-up) to achieve the desired optical filter properties.

**Light Leaks:** Visual evidence through the NVIS of light emitted from a component from areas that are not intended to be illuminated.

**Lighting Subsystem:** All devices that emit or transmit light within the flight deck or other crew compartments and are attached to the aircraft power via a common dimmer control.

**Lighting System:** All devices that emit or transmit light within the flight deck or other crew compartments.

**Long Wave Pass Filter:** A dichroic filter that reflects 90% of the visible light spectrum while allowing transmission of infrared wavelengths IR and near IR of up to 80% (also called a "cold mirror").

**Luminance:** Characterizes emission or reflection from flat, diffused surfaces. The luminance indicates how much luminous power will be perceived by an eye looking at the surface from a particular angle of view. Luminance is thus an indicator of how bright the surface will appear. [Units: candela per square meter ($cd/m^2$)]

**Metalized Edge:** A metallic coating (often thin layers of chrome, nickel and gold) placed around the edges of an optical filter. A metalized edge creates a surface that can be soldered or bonded directly into an opto-mechanical assembly allowing one to create a hermetic seal.

**MIL-L-85762A:** This military standard was published in 1988 and served very well for eleven years as the standard definition and interface criteria for NVIS compatibility. It established performance, general configuration, testing, and acceptance requirements for NVIS compatible aircraft interior lighting. MIL-L-85762A applied to all systems, subsystems, component equipment and hardware which provide the lighting environment in aircraft crew stations and compartments where NVIS are used.

**MIL-STD-3009:** Developed in 2001, this new standard was derived from MIL-L-85762A as a way to preserve standard definition, and to comply with the Perry directive. This document no longer contains the lighting system design requirements that were in MIL-L-85762A, it now deals only with interface and performance requirements. MIL-STD-3009 also adds exterior lighting compatibility definitions and criteria as well as the 'Class C' NVIS standard to incorporate compatibility with HUD display technology.

**Monolithic Filter:** This describes a filter that is made of a single material or layer to achieve the desired optical filter properties.

# Glossary

**Neutral Density Filter:** A filter designed to reduce transmission evenly across a portion of a certain spectrum, ultraviolet and visible, visible, or infrared. There are two types of Neutral Density filters: absorptive and reflective.

**NVG Compatible:** Any device or filter that is compatible with night vision goggles, but does not necessarily comply with MIL SPEC.

**NVG Filter:** A night vision filter that is compatible with the goggle. The filter meets MIL-STD-3009 NVIS radiance requirements, but not the chromaticity specifications.

**NVIS (Night Vision Imaging Systems):** An illumination system that is compatible with night vision compliant goggles (via image intensifier tubes) to produce an enhanced image of a scene in light conditions too low for normal navigation and pilotage. All NVIS filters categorized in this catalog are MIL-STD-3009 compliant.

**NVIS Filter:** A night vision filter which is compliant with MIL-STD-3009 requirements for chromaticity and NVIS radiance.

**NVIS Friendly Filter:** A night vision compatible filter that does not meet all MIL-STD-3009 requirements for NVIS radiance and/or chromaticity specifications. NVIS friendly filters will still work effectively with night vision compliant goggles.

**NVIS Radiance (NR):** The amount of energy emitted by a light source that is visible through NVIS. (This is how sensitive the goggle will be to the light.)

**Polycarbonate:** Made of thermoplastic polymers containing carbonate groups in their chemical structure, Polycarbonate is an excellent plastic for optical filters. With just 1/6 the weight of glass, it also provides high impact resistance and an excellent flammability rating. To prevent scratching, it is recommended to use a clear hard coating with optional anti-glare or anti-reflection properties.

**Projected Image NVIS (Type II):** Any NVIS that uses goggles and projects the intensified image on a see-through medium in the user's line of sight. This configuration allows simultaneous viewing of the intensified image and visual cues such as HUD (Head Up Display) symbols.

**Radiance:** The amount of light that passes through or is emitted from a source. This indicates how much of the power emitted by an emitting or reflecting surface will be received by an optical system.

**Rated Drive Condition:** The electrical power states obtained by conformance to the allowable electrical characteristics (voltage, current, pulse width modulation, frequency, etc.).

# Glossary

**Secure**: An Army definition, often applied to ground vehicles and equipment, meaning that the visible light emitted is reduced to the minimum needed to do the mission, and the near IR content is reduced to less than an estimated 5% of the visible light. (The observer has a limited range of use for the goggle. The goggles would be secure up to a certain distance.)

**Short Wave Pass Filter:** A dichroic filter that reflects 90% of near infrared (NIR) and infrared (IR) light while transmitting up to 80% of the visible light (also called a "hot mirror").

**SMD (Surface-Mounted Device):** Refers to a component (LED, IC, resistor or capacitor) that uses surface-mount technology (SMT) to mount directly to a printed circuit board (PCB).

**SMT (Surface-Mount Technology):** Is a method for producing electronic circuits in which the components are mounted or placed directly onto the surface of printed circuit boards (PCBs). As opposed to 'Through-Hole Mounting (THM)' that uses traditional leads placed into drilled holes on a PCB.

**Spectroradiometer:** Is a device designed to measure the wavelengths of individual colors of light. Spectroradiometers typically take measurements of spectral irradiance and spectral radiance. CIE chromaticity coordinates and luminosity can then be calculated, providing a complete description of the source's color, including chromaticity, spectral power, illuminance, luminance and NVIS radiance.

**Spatter:** Surface contamination resulting from the unintentional deposition of non-vaporized evaporant on the substrate.

**Sunlight Readable:** Meeting the contrast requirements stated in MIL-STD-3009 in order to view an illuminated signal effectively in daylight conditions.

**Thin-film Interference:** Patterns of light and dark bands of a generally parallel appearance caused by the additive effects of in-phase or out-of-phase wave fronts reflected from two or more surfaces.

**Thin-film Interference Coating:** A deposition coating that is applied to one side of a substrate. This coating is highly reflective, but can obtain steep cut-off points at specific wavelengths.

**Transmittance:** The effectiveness of a material in transmitting radiant energy.

**TABLE II. Chromaticity requirements.**

| Lighting component(s) | Para. | TYPE 1 | | | | | | | | | | TYPE II | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Class A | | | | | Class B | | | | | Class A | | | | | Class B | | | | |
| | | $u'_1$ | $v'_1$ | r | $cd/m^2$ (fL) | NVIS Color | $u'_1$ | $v'_1$ | r | $cd/m^2$ (fL) | NVIS Color | $u'_1$ | $v'_1$ | r | $cd/m^2$ (fL) | NVIS Color | $u'_1$ | $v'_1$ | r | $cd/m^2$() | NVIS Color |
| Primary | 4.3.4.1 | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | |
| Secondary | 4.3.4.2 | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | |
| Illuminated controls | 4.3.4.3 | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | |
| Compartment lighting | 4.3.4.4 | .088 | .543 | .037 | 0.343 (0.1) | Green A | Same | | | | | .088 | .543 | .037 | 0.343 (0.1) | Green A | Same | | | | |
| Utility, map, work, and inspection | 4.3.4.5 | .088 | .543 | .037 | 0.343 (0.1) | Green A | as | | | | | .088 | .543 | .037 | 0.343 (0.1) | Green A | as | | | | |
| | 4.3.4.5 | .190 | .49 | .04 | 0.343 (0.1) | White | Class A | | | | | .190 | .49 | .04 | 0.343 (0.1) | White | Class A | | | | |
| Caution and advisory signals | 4.3.4.6 | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | | .088 | .543 | .037 | 0.343 (0.1) | Green A | | | | | |
| Jump lights | 4.3.4.7 | .088 | .543 | .037 | 17.2 (5.0) | Green A | | | | | | .088 | .543 | .037 | 17.2 (5.0) | Green A | | | | | |
| | | .274 | .622 | .083 | 51.5 (15.0) | Yellow | | | | | | .274 | .622 | .083 | 51.5 (15.0) | Yellow | | | | | |
| Special lighting components where increased display emphasis by highly saturated (mono-chromatic) color is necessary, or adequate display light readability cannot be achieved with "GREEN A" | All of the above | .131 | .623 | .057 | 0.343 (0.1) | Green B | | | | | | .131 | .623 | .057 | 0.1 | Green B | | | | | |
| Warning signal | 4.3.4.8.1 | .274 | .622 | .083 | 51.5 (15.0) | Yellow | .274 | .622 | .083 | 51.5 (15.0) | Yellow | .274 | .622 | .083 | 51.5 (15.0) | Yellow | .274 | .622 | .083 | 51.5 (15.0) | Yellow |
| | | NOT APPLICABLE | | | | | .450 | .550 | .060 | 51.5 (15.0) | Red | NOT APPLICABLE | | | | | .450 | .550 | .060 | 51.5 (15.0) | Red |
| Master caution signal | 4.3.4.8.2 | .274 | .622 | .083 | 51.5 (15.0) | Yellow | Same as Class A | | | | | .274 | .622 | .083 | 51.5 (15.0) | Yellow | Same as Class A | | | | |

Where:
$u'_1$ and $v'_1$ = 1976 UCS chromaticity coordinates of the center point of the specified color area.
r = radius of the allowable circular area on the 1976 UCS chromaticity diagram for the specified color.
fL = footlamberts

**TABLE III.a. NVIS radiance requirements using English units.**

| Lighting components | | Paragraph | TYPE 1 | | | | | | TYPE II | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Class A | | | Class B | | | Class A | | | Class B | | |
| | | | Not Less Than: ($NR_A$) | Not Greater Than: ($NR_A$) | fL | Not Less Than: ($NR_B$) | Not Greater Than: ($NR_B$) | fL | Not Less Than: ($NR_A$) | Not Greater Than: ($NR_A$) | fL | Not Less Than: ($NR_B$) | Not Greater Than: ($NR_B$) | fL |
| Primary | | 4.3.5.1 | --- | $1.7x10^{-10}$ | 0.1 | 1/ Same as Class A | | | --- | $1.7x10^{-10}$ | 0.1 | 1/ Same as Class A | | |
| Secondary | | 4.3.5.2 | --- | $1.7x10^{-10}$ | 0.1 | | | | --- | $1.7x10^{-10}$ | 0.1 | | | |
| Illuminated controls | | 4.3.5.3 | --- | $1.7x10^{-10}$ | 0.1 | | | | --- | $1.7x10^{-10}$ | 0.1 | | | |
| Compartment | | 4.3.5.4 | --- | $1.7x10^{-10}$ | 0.1 | | | | --- | $1.7x10^{-10}$ | 0.1 | | | |
| Utility, map, work, and Inspection lights | Green | 4.3.5.5 | --- | $1.7x10^{-10}$ | 0.1 | | | | --- | $1.7\text{-}10^{-10}$ | 0.1 | | | |
| | White | 4.3.5.5 | | $1.0x10^{-9}$ | 0.1 | | | | --- | $1.0\text{-}10^{-9}$ | 0.1 | | | |
| Caution and advisory lights | | 4.3.5.6 | --- | $1.7x10^{-10}$ | 0.1 | | | | --- | $1.7\text{-}10^{-10}$ | 0.1 | | | |
| Jump lights | | 4.3.5.7 | $1.7x10^{-8}$ | $5.0x10^{-8}$ | 5.00 | $1.6x10^{-8}$ | $4.7x10^{-8}$ | 5.0 | --- | $5.0x10^{-8}$ | 5.0 | --- | $4.7x10^{-8}$ | 5.0 |
| Warning signal | | 4.3.5.8 | $5.0x10^{-8}$ | $1.5x10^{-7}$ | 15.0 | $4.7x10^{-8}$ | $1.4x10^{-7}$ | 15.0 | --- | $1.5x10^{-7}$ | 15.0 | --- | $1.4x10^{-7}$ | 15.0 |
| Master caution signal | | 4.3.5.8 | $5.0x10^{-8}$ | $1.5x10^{-7}$ | 15.0 | $4.7x10^{-8}$ | $1.4x10^{-7}$ | 15.0 | --- | $1.5x10^{-7}$ | 15.0 | --- | $1.4x10^{-7}$ | 15.0 |
| Emergency exit lighting | | | $5.0x10^{-8}$ | $1.5x10^{-7}$ | 15.0 | $4.7x10^{-8}$ | $1.4x10^{-7}$ | 15.0 | --- | $1.5x10^{-7}$ | 15.0 | --- | $1.4x10^{-7}$ | 15.0 |
| Electronic and electro-optical displays (monochromatic) | | | --- | $1.7x10^{-10}$ | 0.5 | --- | $1.6x10^{-10}$ | 0.5 | --- | $1.7x10^{-10}$ | 0.5 | --- | $1.6x10^{-10}$ | 0.5 |
| Electronic and electro-optical displays (multi-color) | White | | --- | $2.3x10^{-9}$ | 0.5 | --- | $2.2x10^{-9}$ | 0.5 | --- | $2.3x10^{-9}$ | 0.5 | --- | $2.2x10^{-9}$ | 0.5 |
| | MAX | | --- | $1.2x10^{-8}$ | 0.5 | --- | $1.1x10^{-8}$ | 0.5 | --- | $1.2x10^{-8}$ | 0.5 | --- | $1.1x10^{-8}$ | 0.5 |
| HUD systems | | 4.3.5.10 | $1.7x10^{-9}$ | $5.1x10^{-9}$ | 5.0 | $1.6x10^{-9}$ | $4.7x10^{-9}$ | 5.0 | --- | $1.7x10^{-9}$ | 5.0 | --- | $1.6x10^{-9}$ | 5.0 |

Where:

$NR_A$ = NVIS radiance requirements for Class A equipment.
$NR_B$ = NVIS radiance requirements for Class B equipment.
fL = footlamberts

NOTE 1. For these lighting components, Class B equipment shall meet all Class A requirements of this specification. The relative NVIS response data for Class A equipment, $G_A(\lambda)$ (TABLE III.a), shall be substituted for $G_B(\lambda)$ to calculate NVIS radiance.

# Metric Conversion

## Millimeters to Inches Conversion Chart

| mm | Inches | mm | Inches | mm | Inches |
|---|---|---|---|---|---|
| 1 | 0.0394 | 21 | 0.8268 | 41 | 1.6142 |
| 2 | 0.0787 | 22 | 0.8661 | 42 | 1.6535 |
| 3 | 0.1181 | 23 | 0.9055 | 43 | 1.6929 |
| 4 | 0.1575 | 24 | 0.9449 | 44 | 1.7323 |
| 5 | 0.1969 | 25 | 0.9843 | 45 | 1.7717 |
| 6 | 0.2362 | 26 | 1.0236 | 46 | 1.8110 |
| 7 | 0.2756 | 27 | 1.0630 | 47 | 1.8504 |
| 8 | 0.3150 | 28 | 1.1024 | 48 | 1.8898 |
| 9 | 0.3543 | 29 | 1.1417 | 49 | 1.9291 |
| 10 | 0.3937 | 30 | 1.1811 | 50 | 1.9685 |
| 11 | 0.4331 | 31 | 1.2205 | 51 | 2.0079 |
| 12 | 0.4724 | 32 | 1.2598 | 52 | 2.0472 |
| 13 | 0.5118 | 33 | 1.2992 | 53 | 2.0866 |
| 14 | 0.5512 | 34 | 1.3386 | 54 | 2.1260 |
| 15 | 0.5906 | 35 | 1.3780 | 55 | 2.1654 |
| 16 | 0.6299 | 36 | 1.4173 | 56 | 2.2047 |
| 17 | 0.6693 | 37 | 1.4567 | 57 | 2.2441 |
| 18 | 0.7087 | 38 | 1.4961 | 58 | 2.2835 |
| 19 | 0.7480 | 39 | 1.5354 | 59 | 2.3228 |
| 20 | 0.7874 | 40 | 1.5748 | 60 | 2.3622 |

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