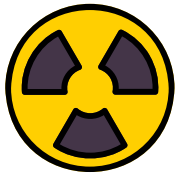
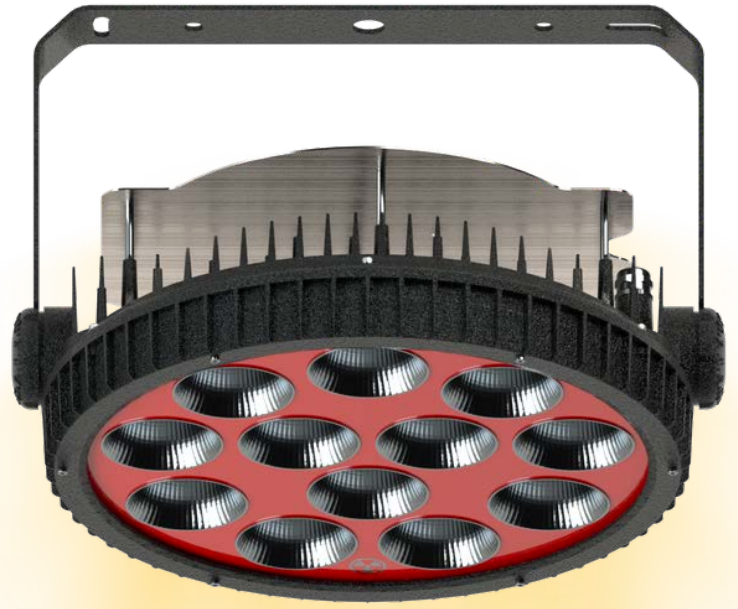


**ParagonLED®**

# Product Catalog

TTL-RH (Radiation Hardened Lighting)

Cobalt-free alloys



IP66  
IP68



1000kGy / 100Mrad Rated LED Light





**ParagonLED®**

# Company Profile

- 2008 – Company founded, establishing its focus on advanced AC COB LED technology
- 2010 – Achieved the world's first CE certification for AC COB LED technology, setting a global benchmark.
- 2011 – Recognized as the first to gain both FCC and ErP certifications for AC COB LEDs.
- 2012 – Introduced the world's first AC COB LED explosion-proof lighting and obtained UL certification.
- 2013 – Attained ISO9001:2008 certification and established the world's first 3V–300V AC LM80 laboratory, certified by DOE and Energy Star.
- 2016 – Expanded to an annual production capacity of 6 million units, reinforcing large-scale manufacturing capability.
- 2017 – Set up the world's first 600V AC LM80-certified laboratory, further strengthening reliability testing infrastructure.
- 2019 – Developed the world's first ACCOB light engine with  $T_c = 145^{\circ}\text{C}$ , marking a breakthrough in high-temperature LED technology.
- 2020 – Deployed the extreme-environment ACCOB light engine ( $-80^{\circ}\text{C}$  to  $+115^{\circ}\text{C}$ ) into commercial operation at U.S. paper mills and steel mills. By 2025, more than 60,000 light engines have been successfully installed in these facilities.
- 2023 – Became a subsidiary of the AVC Group, enhancing global resources and thermal management expertise.
- 2025 –
- Completed the world's first flip-chip ACCOB light engine designed for extreme temperatures.
- Radiation-Hardened lighting successfully passed 1000 kGy gamma radiation testing at the National Atomic Energy Research Institute (NARI).
- Targeting PSE certification (100V/200V) for the Japanese market and UL certification (120V–600V) for linear models, paving the way for global expansion.

## Product matrix

TTL-RH (Radiation Hardened Lighting)

|                              |                                                                                   |                                                                                   |                                                                                    |                                                                                     |
|------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                              |  |  |  |  |
| <b>Wattage</b>               | 500W                                                                              | 350W                                                                              | 225W                                                                               | 10W~140W                                                                            |
| <b>Beam Angle</b>            | Beam Angle 70°                                                                    | Beam Angle 110°/70°                                                               | Beam Angle 110°/70°                                                                | Beam Angle 110°                                                                     |
| <b>Voltage</b>               | 120VAC/277VAC/347VAC/<br>480VAC/600VAC/250VDC                                     | 120VAC/277VAC/347VAC/<br>480VAC/600VAC/250VDC                                     | 120VAC/277VAC/347VAC/<br>480VAC/600VAC/250VDC                                      | 120VAC/277VAC/347VAC/<br>480VAC/600VAC/250VDC                                       |
| <b>Lumens</b>                | 62,500 LUMENS                                                                     | 43,750 LUMENS                                                                     | 28,125 LUMENS                                                                      | 1,250~18,000 LUMENS                                                                 |
| <b>Color temperature</b>     | 5000k                                                                             | 5000k                                                                             | 5000k                                                                              | 5000k                                                                               |
| <b>Operation temperature</b> | -80°C (-112°F) to<br>115°C (239°F)                                                | -80°C (-112°F) to<br>115°C (239°F)                                                | -80°C (-112°F) to<br>115°C (239°F)                                                 | -80°C (-112°F) to<br>115°C (239°F)                                                  |
| <b>Military test</b>         | MIL-STD-810G (-80 °C) +<br>MIL-STD-810H (+115 °C)                                 | MIL-STD-810G (-80 °C) +<br>MIL-STD-810H (+115 °C)                                 | MIL-STD-810G (-80 °C) +<br>MIL-STD-810H (+115 °C)                                  | MIL-STD-810G (-80 °C) +<br>MIL-STD-810H (+115 °C)                                   |
| <b>GAMMA Radiation Test</b>  | 1000 kGy                                                                          | 1000 kGy                                                                          | 1000 kGy                                                                           | 1000 kGy                                                                            |

TTL-RH has successfully completed fast-neutron irradiation at NARI Taiwan's TR-30/15 facility, receiving a  $\sim 4.46 \times 10^{14}$  n/cm<sup>2</sup> fast-neutron fluence (1 MeV equivalent) under a 1–14 MeV spectrum during a 5-hour exposure.

The lighting unit remained fully functional after testing, confirming TTL-RH as the world's only commercial lighting platform with 1000 kGy gamma hardness and true survivability under 1–14 MeV fast-neutron irradiation.

# TTL-RH 10W~140W/225W/350W/500W Radiation Hardened Lighting

**70°/110° Beam Angle High Temperature Lighting**

"A real innovation in extreme environment LED lighting."

- Engineered and tested for reliable operation you can count on in temperatures ranging from -80°C(-112°F) to 115°C (239°F)
- PVDF corrosion resistant coating over a die-cast aluminum housing + stainless steel hardware for incredible durability. 1,000 hour salt-fog test yielded no corrosion. [ASTM B117-19/ASTM D610-08(2019)]
- Instantaneous activation of lighting function, without the need for standby time.
- Game changing LED module design (see details below). Replaceable to reduce the cost of long term ownership.
- Chemical repellent housing to stand up in areas where industrial chemicals are used or produced.
- Provide better eye protection and workplace safety.

We use Nord-Lock washers for optimized safety performance.

**NORD-LOCK**  
PART OF THE NORD-LOCK GROUP

Nord-Lock wedge-locking washers consistently outperform alternative locking methods when it comes to securing bolted joints. This is proven by the results of thousands of Junker tests carried out for customers all over the world by Nord-Lock engineers. When exposed to transverse vibrations underneath the bolt head, alternative locking methods such as plain washers, helical spring washers, check lock nuts, nylon inserted nuts and double nuts all show a loss of clamp load – loosening the bolt and exposing the joint to failure unless frequently retightened. So, Nord-Lock engineers would usually recommend wedge-locking washers to achieve the most secure bolted joint.



**The heart of the TTL series is its revolutionary**

**DRIVER-ON-BOARD LED MODULE.**

MIL-STD-810G (-80 °C) + MIL-STD-810H (+115 °C)

A marvel of engineering and innovative manufacturing processes, this proprietary module gives the TTL series outstanding light performance even in extreme hot and cold temperatures and requires no separate driver.

## **Over-Engineered**

We use 12 IC current control chips when 4 would be enough for extra durability. Tested to 200° C without failure.

## **No Load Shedding**

As modules approach their max. rated temperature, lumen output will not decrease. Reducing output at high temp. is a common occurrence with other high temp. lights.

## **1.2 mil Gold Wire**

TTL series LEDs are connected with gold wire for enhanced durability under heavy thermal cycle stress.

## **No Harmonic Distortion**

Quality components and advanced circuit design results in longer fixture life and no line noise generated by the TTL series.

## **No Inrush Current**

Inrush current has been engineered out of the module preventing large line voltage drops at start-up protecting the fixture and other equipment.

## **Waterproof/Thermal Coating**

Special silicone based coating creates a waterproof seal around the module and dissipates heat for increased durability.

# Technical Info

## SPECIFICATIONS

|                         |                                                       |
|-------------------------|-------------------------------------------------------|
| <b>Voltage</b>          | 120VAC/277VAC/347VAC/480VAC/<br>600VAC/250VDC         |
| <b>Wattage</b>          | 500W (+/- 10%)                                        |
| <b>Color Temp</b>       | 5000 Kelvin                                           |
| <b>Housing</b>          | C5M(standard) / PVDF optional                         |
| <b>Color</b>            | Black(standard) / White optional                      |
| <b>Lens</b>             | Flat tempered glass lens                              |
| <b>CRI</b>              | >70                                                   |
| <b>Efficacy</b>         | 125 lm/W (500W)                                       |
| <b>Beam Angle</b>       | 70°                                                   |
| <b>Cable Gland</b>      | Stainless steel                                       |
| <b>Power Cord</b>       | 600V / 200°C rated                                    |
| <b>Surge Protection</b> | > 20KV                                                |
| <b>Ambient Temp.</b>    | -80°C (-112°F) to 115°C (239°F)                       |
|                         | <b>MIL-STD-810G (-80 °C) + MIL-STD-810H (+115 °C)</b> |

## LUMENS

|             |
|-------------|
| <b>500W</b> |
| 62,500 lm   |

## WARRANTY

| Ambient Temperature             | Warranty                           |
|---------------------------------|------------------------------------|
| 65°C (149°F) Max Ambient Temp.  | 7 Year Limited Warranty            |
| 85° C(185°F) Max Ambient Temp.  | 3 Year Limited Warranty            |
| 105°C (221°F) Max Ambient Temp. | 1 Year Limited Warranty            |
| 105°C (221°F) Max Ambient Temp. | 3 Year Limited Warranty (optional) |

TTL Getter System (optional) — extends lifetime to 3 years @105 °C. It continuously absorbs residual oxygen, moisture, and gases released from internal materials under high temperature, preventing oxidation and degradation.

## PART NUMBERS

| Part Number         | Watt | Voltage |
|---------------------|------|---------|
| TTL-500-50-120V-1yz | 500W | 120VAC  |
| TTL-500-50-277V-1yz |      | 277VAC  |
| TTL-500-50-347V-1yz |      | 347VAC  |
| TTL-500-50-480V-1yz |      | 480VAC  |
| TTL-500-50-600V-1yz |      | 600VAC  |
| TTL-500-50-250V-1yz |      | 250VDC  |

x(Beam Angle)0=110° 1=70°  
y(Coating) : 0=PVDF 1=C5M  
z(Fixture color)0=white 1=black

## DIMENSIONS :

Diameter : 562mm(22.1inch)  
Height : 441mm(17.4inch)  
Weight : 24.2Kg(53.4lb)



**IP66**



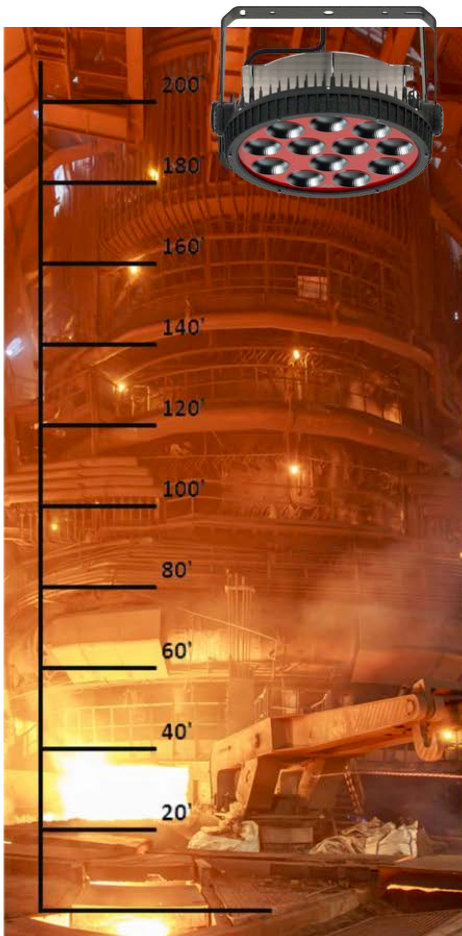
## INDUSTRIAL APPLICATIONS

Primary Metal Fabrication  
Steel Mills  
Smelting Operations  
Casting Foundries  
Metal Polishing  
Boiler Rooms

Blast Furnaces  
Paint Curing  
Ovens/Kilns  
Pulp/Paper Production  
Glass Manufacturing  
Power Generation

Power Plants  
Chemical Plants  
Refineries  
Aircraft Hangars  
Ship Yards  
Rail Yards

Aerospace Facilities  
Industrial Freezers  
Ice Manufacturing  
Cryogenic Industries  
cold-chain storage  
overhead crane



## ACCESSORIES

Wire Guard



Visor



# Technical Info

## SPECIFICATIONS

|                         |                                                                                          |
|-------------------------|------------------------------------------------------------------------------------------|
| <b>Voltage</b>          | 120VAC/277VAC/347VAC/480VAC<br>/600VAC/250VDC                                            |
| <b>Wattage</b>          | 225W/350W (+/- 10%)                                                                      |
| <b>Color Temp</b>       | 5000 Kelvin                                                                              |
| <b>Housing</b>          | C5M(standard) / PVDF optional                                                            |
| <b>Color</b>            | Black(standard) / White optional                                                         |
| <b>Lens</b>             | Flat tempered glass lens                                                                 |
| <b>CRI</b>              | >70                                                                                      |
| <b>Efficacy</b>         | 125 lm/W                                                                                 |
| <b>Beam Angle</b>       | 70°/110°                                                                                 |
| <b>Cable Gland</b>      | Stainless steel                                                                          |
| <b>Power Cord</b>       | 600V / 200°C rated                                                                       |
| <b>Surge Protection</b> | > 20KV                                                                                   |
| <b>Ambient Temp.</b>    | -80°C (-112°F) to 115°C (239°F)<br><b>MIL-STD-810G (-80 °C) + MIL-STD-810H (+115 °C)</b> |

## LUMENS

| 225W      | 350W      |
|-----------|-----------|
| 28,125 lm | 43,750 lm |

## WARRANTY

| Ambient Temperature             | Warranty                           |
|---------------------------------|------------------------------------|
| 65°C (149°F) Max Ambient Temp.  | 7 Year Limited Warranty            |
| 85°C (185°F) Max Ambient Temp.  | 3 Year Limited Warranty            |
| 105°C (221°F) Max Ambient Temp. | 1 Year Limited Warranty            |
| 105°C (221°F) Max Ambient Temp. | 3 Year Limited Warranty (optional) |

TTL Getter System (optional) — extends lifetime to 3 years @105 °C. It continuously absorbs residual oxygen, moisture, and gases released from internal materials under high temperature, preventing oxidation and degradation.

## PART NUMBERS

| Part Number         | Watt | Voltage |
|---------------------|------|---------|
| TTL-225-50-120V-1yz | 225W | 120VAC  |
| TTL-225-50-277V-1yz |      | 277VAC  |
| TTL-225-50-347V-1yz |      | 347VAC  |
| TTL-225-50-480V-1yz |      | 480VAC  |
| TTL-225-50-600V-1yz |      | 600VAC  |
| TTL-225-50-250V-1yz |      | 250VDC  |
|                     |      |         |

| Part Number         | Watt | Voltage |
|---------------------|------|---------|
| TTL-350-50-120V-1yz | 350W | 120VAC  |
| TTL-350-50-277V-1yz |      | 277VAC  |
| TTL-350-50-347V-1yz |      | 347VAC  |
| TTL-350-50-480V-1yz |      | 480VAC  |
| TTL-350-50-600V-1yz |      | 600VAC  |
| TTL-350-50-250V-1yz |      | 250VDC  |
|                     |      |         |

x(Beam Angle)0=110° 1=70°  
y(Coating) : 0=PVDF 1=C5M  
z(Fixture color)0=white 1=black



IP66



## DIMENSIONS :

Diameter : 450mm(17.7inch)  
Height : 373mm(14.7inch)  
Weight : 15.3Kg(33.7lb)

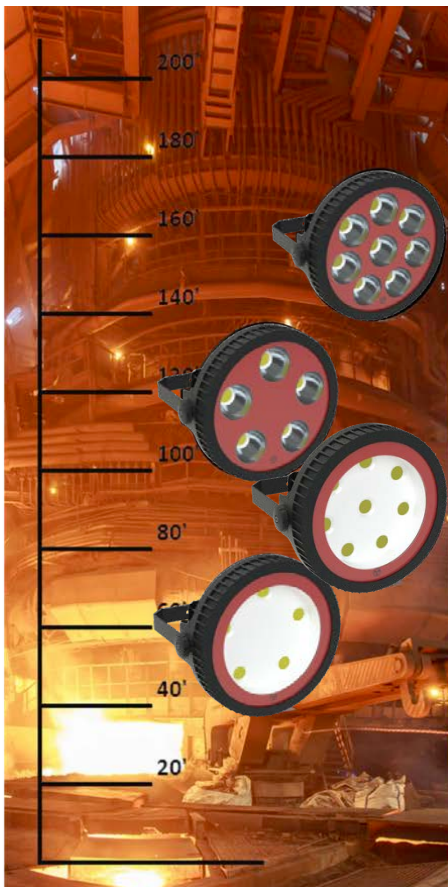
## INDUSTRIAL APPLICATIONS

Primary Metal Fabrication  
Steel Mills  
Smelting Operations  
Casting Foundries  
Metal Polishing  
Boiler Rooms

Blast Furnaces  
Paint Curing  
Ovens/Kilns  
Pulp/Paper Production  
Glass Manufacturing  
Power Generation

Power Plants  
Chemical Plants  
Refineries  
Aircraft Hangars  
Ship Yards  
Rail Yards

Aerospace Facilities  
Industrial Freezers  
Ice Manufacturing  
Cryogenic Industries  
cold-chain storage  
overhead crane



## ACCESSORIES

welded wire mesh light guards



Specifications and data are subject to change without notice.

# ParagonLED Radiation Hardened Lighting

Advanced Shielded Lighting for Radiological Environments



- Radiation Hardened LED task light engineered for temperature extremes, wet environments, and long-term reliability.
- Certified radiation hardness up to 1000 kGy / 100 Mrad (megarad).
- Features radiation-hardened components and multiple shielding solutions to increase longevity in high-radiation environments.
- LED module includes several layers of radiation protection.
- Ambient operating temperature: -80°C (-112°F) to 115°C (239°F).
- Proprietary driver-on-board (driver-less) LED modules.
- Replaceable LED modules for low long-term cost and extended fixture life.
- 5 mm quartz glass: Fully resistant to radiation-induced darkening, ensuring long-term light transmission.
- Fully lead-free design avoids export, environmental, and waste-management restrictions related to lead.
- Special stainless-steel components using low-cobalt or cobalt-free alloys reduce the risk of creating long-lived activation isotopes.
- Lower decommissioning and disposal costs.
- Long lifespan × high reliability: At 55°C, L70 light-output lifetime exceeds 15 years.
- >15 kV surge protection.
- Available in single, double, or triple configurations.
- High vibration resistance using Nord-Lock® washers.
- Optional chemical-repellent PVDF coating for extreme corrosion resistance.
- AWM style 4476 — 600 V / 200°C rated power cord, stainless-steel cable gland.
- Trade Agreement Act (TAA) compliant.
- Non-Safety-Related zones: Plug-and-play, no additional certification required.

| Radiation Test       |                                                               |
|----------------------|---------------------------------------------------------------|
| GAMMA dose speed     | 6.0 kGy/h                                                     |
| Total GAMMA dose     | 1000kGy                                                       |
| fast-neutron fluence | ~4.46 × 10 <sup>14</sup> n/cm <sup>2</sup> , 1 MeV equivalent |

Exposure to GAMMA radiation and fast-neutron fluence was tested in National Atomic Energy Research Institute (NARI).

## Specification

|                |                                                                                  |
|----------------|----------------------------------------------------------------------------------|
| Voltage        | 100VAC /120VAC /200VAC /208VAC /230VAC<br>250VDC /277VAC /347VAC /480VAC /600VAC |
| Frequency      | 50Hz/60Hz                                                                        |
| Wattage        | 10W~140W                                                                         |
| Color Temp     | 5000K                                                                            |
| Housing        | Die-cast aluminum                                                                |
| Color          | Black                                                                            |
| Coating        | PVDF coating                                                                     |
| Inrush Current | Zero inrush current (0 Amp)                                                      |

|                  |                                                          |
|------------------|----------------------------------------------------------|
| Lens             | Quartz Glass(5mm)                                        |
| Cable Gland      | Stainless steel                                          |
| IP Protection    | IP66/IP68                                                |
| Surge Protection | >15kV                                                    |
| Power Factor     | > 0.95                                                   |
| Ambient Temp.    | -80°C (-112°F) to 115°C (239°F)                          |
| Weight           | 3.0KG(6.6lbs)                                            |
| Lifetime         | L70 15 years@55°C<br>L50 30 years@55°C<br>1 years @105°C |

# ParagonLED Radiation Hardened Lighting

## Advanced Shielded Lighting for Radiological Environments

### LUMENS

| 10W      | 20W     | 30W      | 35W     | 40W      | 60W     |
|----------|---------|----------|---------|----------|---------|
| 1,200 lm | 2,400lm | 3,600 lm | 4,200lm | 4,800 lm | 7,200lm |

| 70W     | 80W     | 105W      | 140W     |
|---------|---------|-----------|----------|
| 8,400lm | 9,600lm | 12,600 lm | 16,800lm |

### WARRANTY

| Ambient Temperature             | Warranty Length                    |
|---------------------------------|------------------------------------|
| 65°C (149°F) Max Ambient Temp.  | 7 Year Limited Warranty            |
| 85°C (185°F) Max Ambient Temp.  | 3 Year Limited Warranty            |
| 105°C (221°F) Max Ambient Temp. | 1 Year Limited Warranty            |
| 105°C (221°F) Max Ambient Temp. | 3 Year Limited Warranty (optional) |

MIL-STD-810G (–80 °C) + MIL-STD-810H (+115 °C)

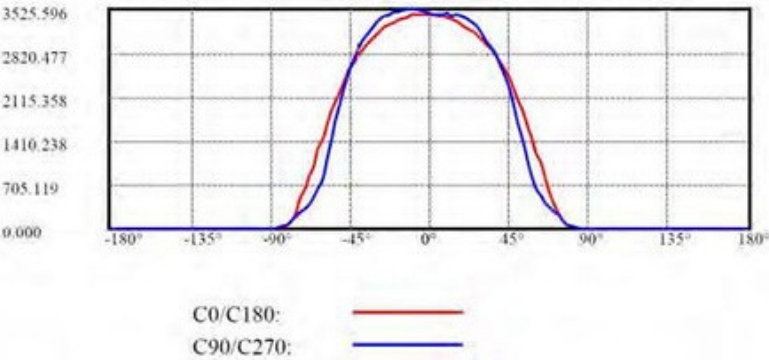
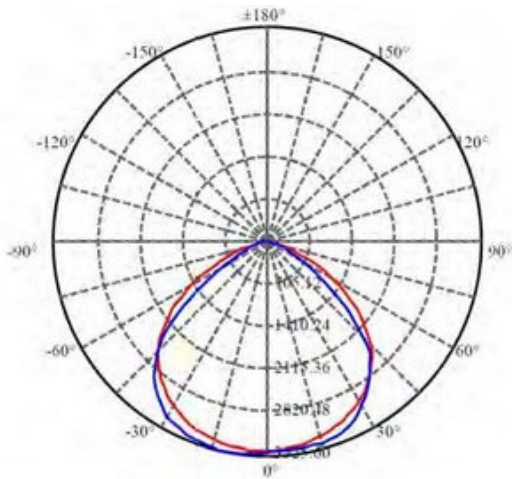
TTL Getter System (optional) — extends lifetime to 3 years @105 °C. It continuously absorbs residual oxygen, moisture, and gases released from internal materials under high temperature, preventing oxidation and degradation.

### Ordering Information

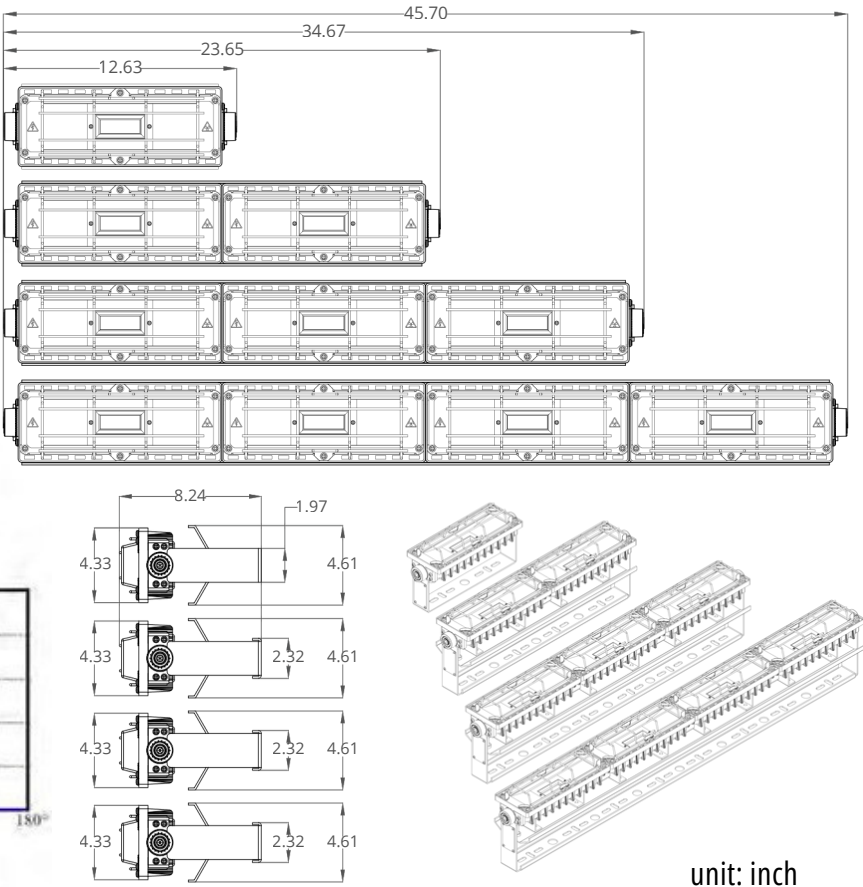
Example:PPD-RH-040-50-120V-2

| Series | Wattage  | Color Temperature | Voltage     | Unit          |
|--------|----------|-------------------|-------------|---------------|
| TTL-RH | 010 10W  | 50 5000K          | 100V 100VAC | 1 one unit    |
|        | 020 20W  |                   | 120V 120VAC | 2 two units   |
|        | 030 30W  |                   | 200V 200VAC | 3 three units |
|        | 035 35W  |                   | 208V 208VAC | 4 four units  |
|        | 040 40W  |                   | 230V 230VAC |               |
|        | 070 70W  |                   | 277V 277VAC |               |
|        | 060 60W  |                   | 347V 347VAC |               |
|        | 105 105W |                   | 480V 480VAC |               |
|        | 80 80W   |                   | 600V 600VAC |               |
|        | 140 140W |                   | 250V 250VDC |               |

### Photometrics



### Dimensions



|       |                  |
|-------|------------------|
| one   | 1.95Kg(4.30lbs)  |
| Two   | 3.79Kg(8.36lbs)  |
| Three | 5.37Kg(11.84lbs) |
| Four  | 7.5Kg(16.5lbs)   |

# ParagonLED Radiation Hardened Lighting

Advanced Shielded Lighting for Radiological Environments



CERTIFIED  
UL 1598

IP68



CB FC



## Feature

### 1. Lower Decommissioning & Disposal Cost

- Modular design for quick disassembly, separating contaminated parts to avoid scrapping the whole fixture.
- Low-adhesion coating minimizes radioactive particle buildup, easing decontamination.
- Lead-free, mercury-free, recyclable materials; compliant with IAEA/IEC/ISO recycling classifications to avoid costly nuclear waste handling.

### 2. Long Service Life & Proven Durability

- Passed 1000 kGy gamma radiation test; 5 mm high-purity quartz glass prevents darkening. AC-COB solid-state light engine (no electrolytic capacitors) — not limited
- by 55 °C driver constraints. At 55 °C in low-dose zones, L70 lifetime can exceed 30 years; field record: 15+ years without failure in 24/7 cleanroom use.
- 

### 3. High Radiation Zone Design

- Low-cobalt or cobalt-free stainless steel reduces long-lived activation isotopes ( $^{60}\text{Co}$ ).
- High surface finish improves decontamination efficiency.

### 4. International Recycling Compliance

- Materials follow IAEA/IEC/ISO classification: low contamination → general recycling; decontaminable → recycle after cleaning; high contamination → nuclear waste storage/disposal.
- Quartz, stainless steel, aluminum, copper recyclable if uncontaminated; organic plastics disposed as general waste if uncontaminated.

### 5. Market Differentiation

- IP66/IP68 sealing for high-dust, high-humidity, underwater use.
- Fully traceable materials & processes meet nuclear/defense/research compliance.
- Low maintenance cost & high recycling value reduce total cost of ownership.

### 6. Electropolished Stainless Steel Mounting Brackets

- Smooth, non-porous surface minimizes radioactive particle adhesion.
- Easier decontamination and lower lifecycle maintenance costs.
- Enhanced corrosion resistance with a strengthened chromium oxide passive layer.
- Reduced bacterial and biofilm adhesion for cleanroom and radiopharmaceutical environments.
- Lower particle shedding for improved cleanliness.
- Increased fatigue resistance by eliminating surface micro-defects.
- Superior appearance and higher-quality weld finish.
- Reduced radioactive waste during facility decommissioning.

## Paragon Semiconductor lighting Technologoy Inc.

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