

**LED** *Narrow Spectrum Lighting™*  
Healthcare, Research and Cleanroom Applications

Narrow Spectrum

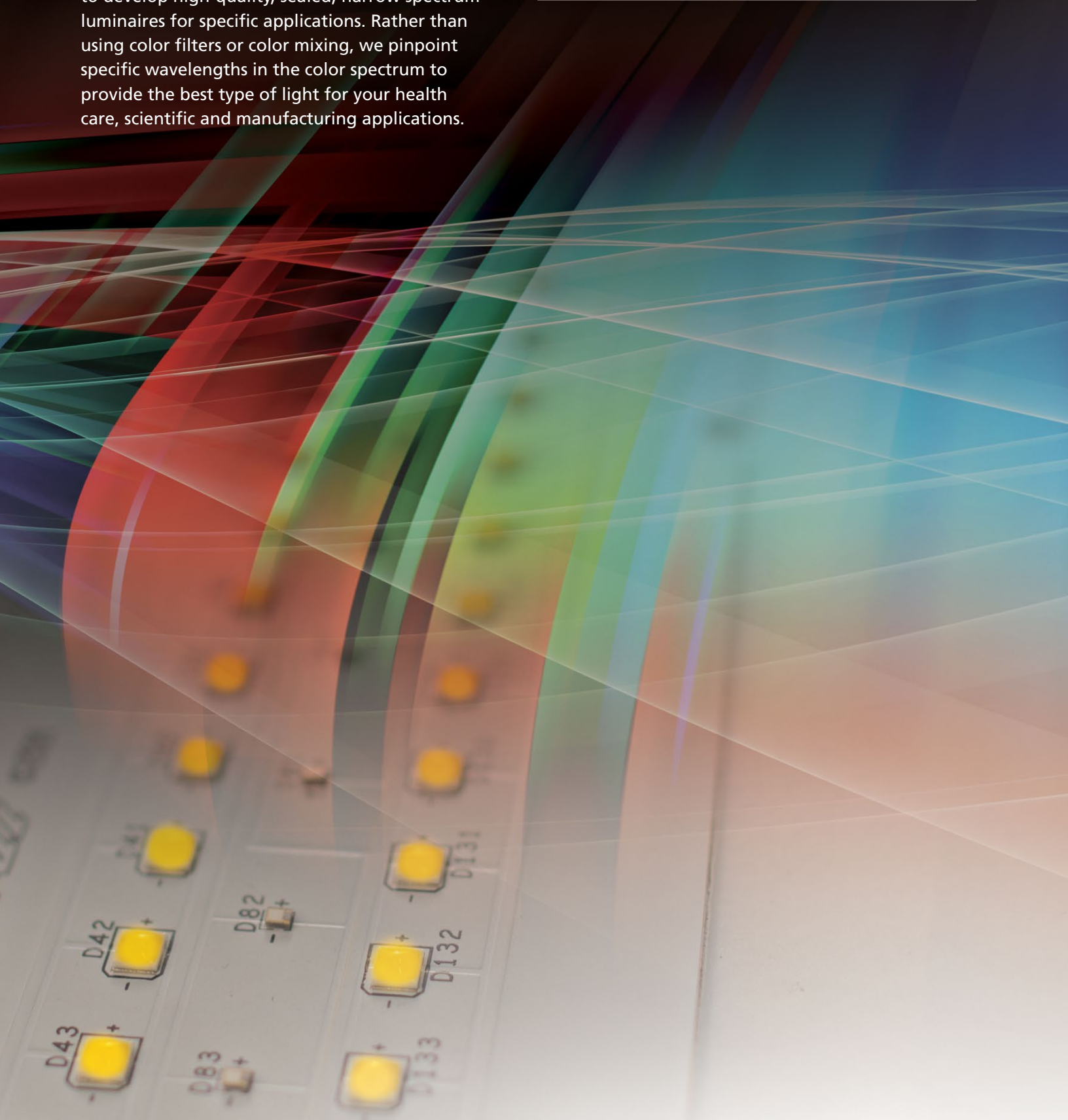
NS

### **Kenall Brings You the Applied Science of Color**

For more than 50 years, Kenall has been perfecting lighting for challenging applications. With the continued integration of LED, Kenall is now implementing the applied science of color to develop high-quality, sealed, narrow spectrum luminaires for specific applications. Rather than using color filters or color mixing, we pinpoint specific wavelengths in the color spectrum to provide the best type of light for your health care, scientific and manufacturing applications.

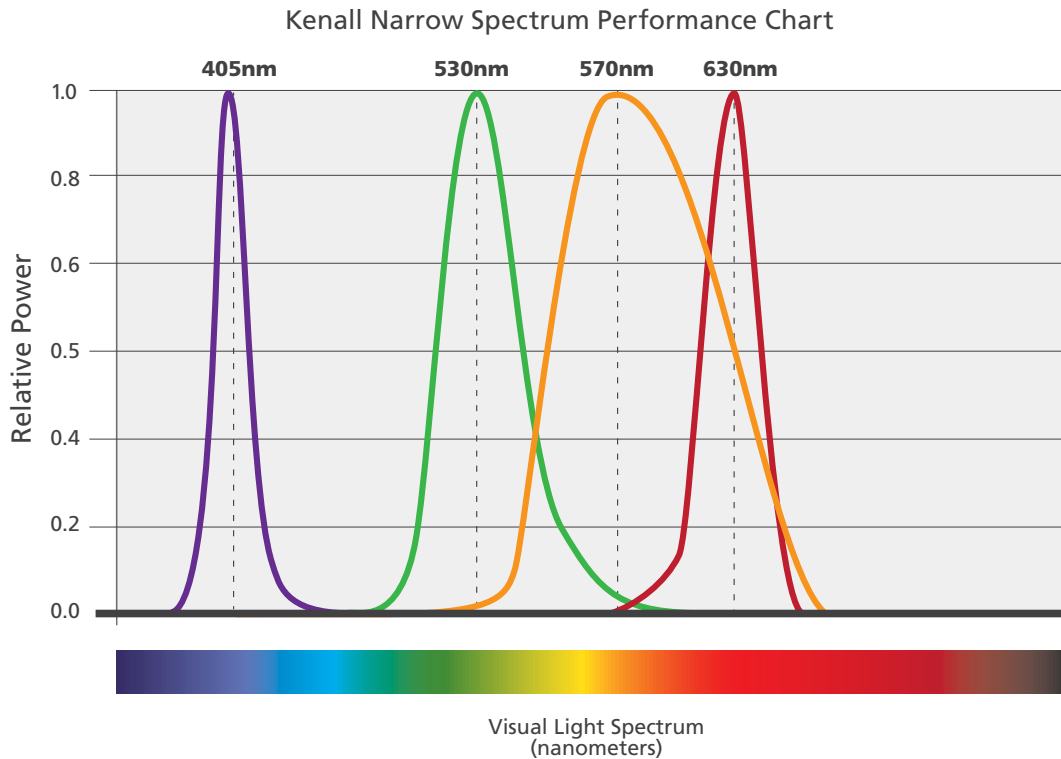
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# Why Narrow Spectrum Light?

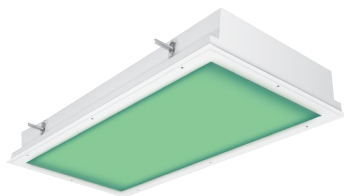
Narrow spectrum is generated light energy limited to targeted bandwidths for the purposes of improving technical performance or visual acuity. When combined with Kenall sealed luminaires, it provides consistent lighting for specific demands in healthcare, research and cleanroom applications. Kenall provides lighting solutions for many challenging applications: narrow spectrum LED luminaires are another way we support your specific lighting needs.



## Kenall Narrow Spectrum LED Luminaires



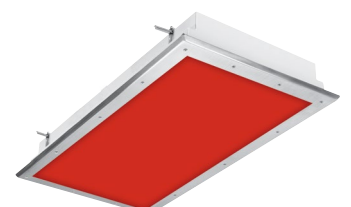
**Indigo-Clean®**  
 CSEDOIC Series  
 Features 405 nm LED Indigo-Clean™  
 for critical environments



**MedMaster™**  
 M4SEDI Green Series  
 Features 530 nm LED  
 for healthcare operating  
 room applications



**SimpleSeal™**  
 CSEDO Amber Series  
 Features 570 nm LED  
 for semiconductor and  
 pharmaceutical manufacturing  
 applications



**SimpleSeal™**  
 CSEDO Red Series  
 Features 630 nm LED  
 For vivarium (scientific) applications



# Continuous, Whole-Room Disinfection Technology

# 405 nm



**White disinfection mode** provides ambient lighting and continuous environmental disinfection while room is occupied

**Indigo disinfection mode** can be selected to provide maximum continuous disinfection when room is not in use

# MedMaster™ Indigo-Clean® CSEDOIC

Kenall's CSEDOIC Series features 405 nm LED Indigo-Clean™ Continuous Environmental Disinfection



**Indigo-Clean™**

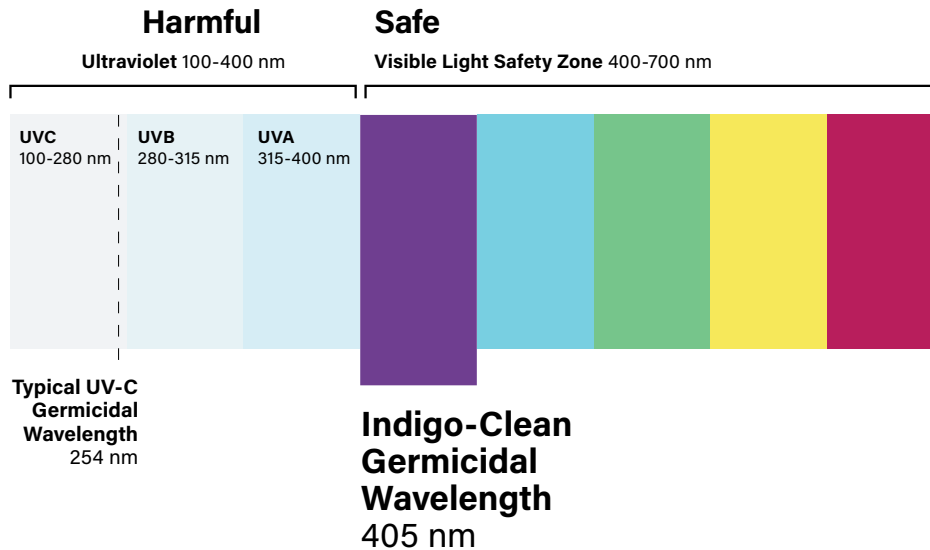
- Indigo-Clean is NOT UV light... it uses safe 405 nm visible light
- Switchable White Disinfection Mode and Indigo Disinfection Mode
- 405 nm visible light automatically kills bacteria in the air and on hard and soft surfaces, reducing risk of human error and eliminating the need for special training or a technician
- 1'x 4', 2'x 2' and 2'x 4' available



## Indigo-Clean works while people are in the room.

Unlike other lighting disinfection technologies, Indigo-Clean uses the visible light spectrum. As such, it is classified as 'risk exempt' by the International Electrotechnical Commission (IEC 62471). Additionally, many published, peer-reviewed studies have shown

that its level of irradiance causes NO damage to human skin or eyes 4,5—even when performing at the highest level of disinfection. This means rooms can remain occupied when the light is on.



405 nanometers: Peak bactericidal activity.



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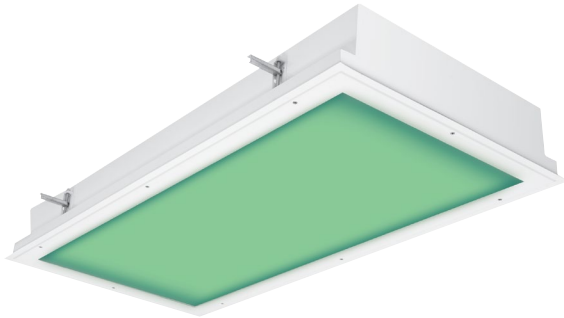
Improve Visual Acuity  
for the Surgical Team

**530 nm**



# HC MedMaster™ M4SEDI-Green Series

Kenall's MedMaster™ M4SEDI-Green Series features 530nm green LED light, which increases visual acuity throughout the room during surgical procedures, with no transmission loss due to filters.



- High-performance mid-power LEDs provides high level of delivered lumens
- Diffused high-efficiency lens for reduced glare
- Symmetric and asymmetric optic distributions
- Dual-function white and green LED sources provide individually dimmable illumination. Also available in green only.
- Antimicrobial finish on all exposed painted surfaces
- Universal housing accommodates either flange or grid applications
- One-piece sealed housing; smooth exterior doorframe and lens for infection control and simplified cleaning protocols
- Conducted emissions controlled as per MIL-STD-461F
- 1'x4', 2'x2' and 2'x4' available



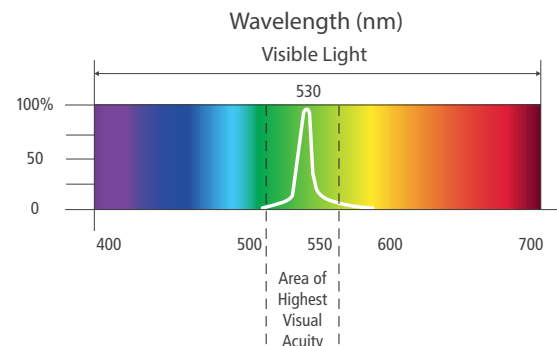
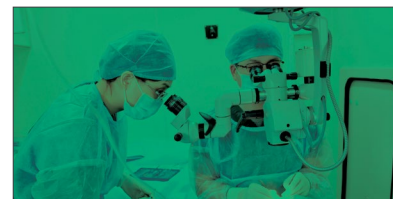
## MedMaster™ M4SEDI-Green Series Enhances Visibility of Monitors, Reduces Staff Eye Strain During Surgery

Clearly seeing vital information displayed on OR monitors is crucial to successful surgical procedures: over-illumination causes contrast issues, resulting in unnecessary eye strain that diverts attention away from the patient. The true 530 nm green LED of the M4SEDI-Green Series luminaire provides OR staff with an application-optimized light source that has no transmission loss due to filters. The 530 nm saturated green hue creates a balance of light for reading, monitor viewing and surgical procedures.

Narrow spectrum green LEDs also provide a more efficient, reliable method of producing light as compared to filtered fluorescent tubes and/or white LEDs. This narrow spectrum, sealed luminaire is IP65 and NSF listed, which supports ease of cleanability and helps reduce the spread of pathogens.



530 nm "green" LED light significantly reduces monitor glare to allow the medical staff to see clearly without adjusting the lights.



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Protect Photosensitive  
Processes and Products

**570 nm**



## SE SimpleSeal™ Amber Series

Kenall's SimpleSeal™ Amber Series features 570 nm Phosphor-Converted (PC) amber LED light, which helps prevent negative outcomes resulting from overexposure to light. It provides visual acuity for detailed tasks without the damaging effects of white light to light-sensitive products and processes.



- Available in recessed (CSEDI, CSEDO) or surface mount (CSESO) configurations
- High-purity light for spectrally-sensitive applications
- Dual function white and amber LED sources provide individually dimmable illumination. Also available in amber only
- Diffused high-efficiency lens for reduced glare
- 1'×4', 2'×2' and 2'×4' available



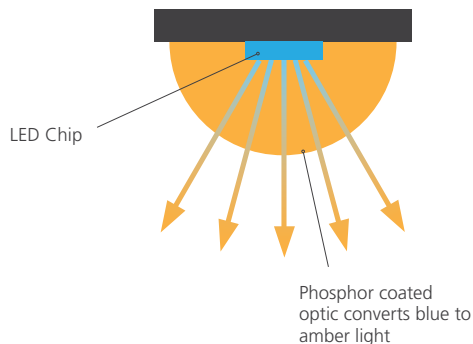
### SimpleSeal™ Amber Series -- Light that Preserves Photo-Sensitive Processes and Products

It is well-known that UV light is damaging... but even normal light encompasses some damaging shorter wavelengths. Therefore, life sciences and manufacturing use narrow spectrum amber light to avoid negative outcomes resulting from overexposure to the shorter wavelength found in ordinary light.

#### Uses for narrow-spectrum amber light:

- Increase cell viability at IVF clinics
- Reduce possible damage to delicate DNA during stem cell transplant procedures
- Prevent damage to light-sensitive ingredients in pharmaceutical manufacturing and compounding
- Protect photosensitive processes used in the semiconductor manufacturing industry and nanotechnology research

### How Blue LED Light is converted to Amber

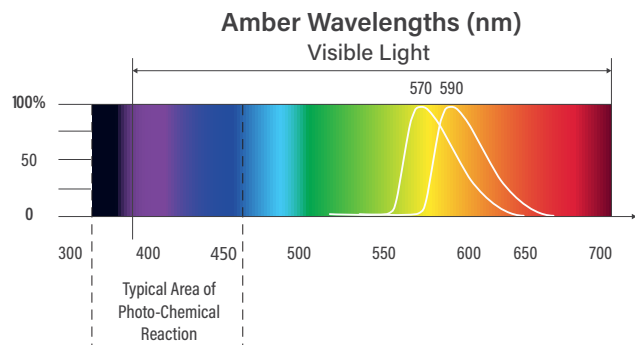


### Why use PC (InGaN) amber versus Native Amber?

Native amber LEDs perform poorly compared to other chemistries and produce less light per watt at room temperature. Native amber performs even worse when heated, causing designers to add extra LEDs to make up for the losses and adding heat and power.

Heat accelerates the aging of all LEDs, but this effect is magnified for native amber, reducing expected life to less than 15,000 hours (L70) in general illumination fixtures -- far below the 50,000+ hours expected from LED technology.

Phosphor-converted amber is light created using an LED chemistry called Indium gallium nitride (InGaN) with a phosphor to convert native blue light into longer wavelength amber light. PC amber provides the high performance and long life our industry has come to expect from LEDs without the weakness of native amber. An additional benefit of amber phosphor technology is very high efficiency, producing more lumens per watt than white LEDs, which is helpful for high illumination applications.



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Preserve the Natural Circadian  
Rhythms of Lab Animals

**630 nm**



## SE SimpleSeal™ Red Series

Kenall's SimpleSeal™ Red Series features 630 nm red LED light, which provides consistent, controllable red light to support the natural circadian rhythms of laboratory animals in research environments.



- Available in recessed ceiling (CSEDI, CSEDO) and surface ceiling (CSESO) configurations
- Narrow-spectrum 630 nm red LED circuit provides only high-purity light for spectrally-sensitive applications.
- Dual-function white and red LED sources provide individually dimmable illumination. Also available in red only.
- Certified fixture-to-room seal with NSF P442 protocol
- 1'x4', 2'x2' and 2'x4' available



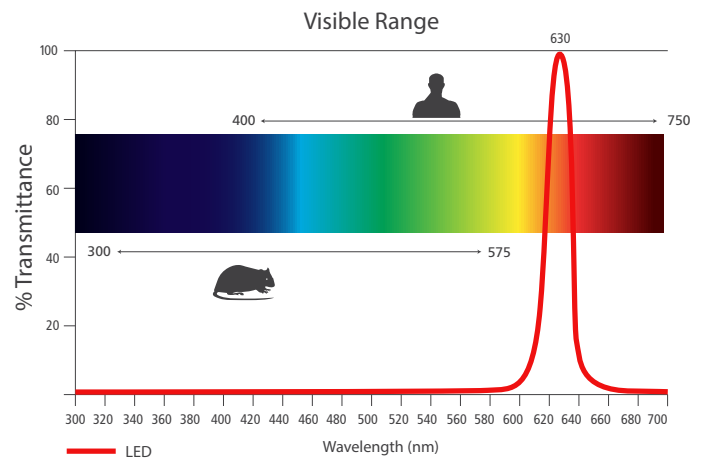
### SimpleSeal™ Red Series Helps Preserve Animal Circadian Rhythms for Better Research Results

Research facilities commonly use rodents for study, and therefore have to address the issue of proper lighting for these nocturnal animals. Studies indicate that the timing and duration of light and dark cycles (called a photoperiod) influences the body weight and food intake of laboratory animals. It also can induce a shift in the circadian rhythms of blood pressure, heart rate and activity.

Since red light is invisible to rodents (and to some other research animals), it is used at times when white light would disrupt activity cycles. Historically, the industry has used filters in cleanroom fixtures to produce the desired color. The use of white light and red light is then automated to assure conformity to the correct schedule. If a fixture must generate both white and red light, typically one lamp would be fitted with a red-filtered lamp sleeve and a separate circuit. Over time, the filter's effectiveness degrades, allowing visible light, which erodes the effectiveness of the vivarium.

Red LEDs made with AlInGaP die chemistry have advantages that filters cannot provide. The use of 630 nm red LEDs offers pure, consistent and controllable red light intensity over time. They do not degrade in purity, even when light output has degraded.

Visible light spectrum showing the active element in SimpleSeal™ Red Series



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# Listings & Certifications

**NSF** NSF2— An NSF2 Listing denotes that the luminaire has been evaluated for corrosion resistance, cleanability and the ability of exposed material to withstand normal wear. This supports the infection control standards established by healthcare facilities as it indicates that the luminaire is easy to sanitize.

**P442** NSF P442— This protocol is a series of minimum requirements for the design, construction, performance and certifications of luminaires for cleanrooms. It requires ingress protection IEC 60529/60598 (IP-65) and NSF-2 Food Equipment certifications and a performance test for pressure decay resistance in which the sealed fixture is stressed with positive and negative pressure and checked to ensure that no leaks are present.

**IP64** IP64— UL Certified IP64 per IEC 60598 ensures that the enclosure is dust-tight and protected against splashing water without any harmful effects.

**IP65** IP65— UL Certified IP65 per IEC 60598 ensures that the enclosure is dust-tight and protected against jet streams of water from any direction without any harmful effects.

**IP66** IP66—UL Certified IP66 per IEC 60598 ensures that the enclosure is dust-tight and heavy seas and water projected in powerful jets will not enter the enclosure in harmful quantities.

**BSL** BioSafety Level (BSL-x) classifies the relative danger from biohazardous material to the surrounding people and environment. There are four biosafety levels (BSL1 – BSL4), with the highest number representing the greatest risk. Luminaires in each class are designed to provide the protections necessary for containing the risks associated with that level. For example, BSL-1 laboratories provide protection for pathogens such as E. coli and are most often found in high schools and colleges. BSL-2 labs protect against more dangerous organisms such as HIV, influenza A and MRSA. BSL-3 labs work with SARS-CoV, West Nile and other very dangerous viruses in tightly controlled clinical spaces with close supervision. BSL-4 is reserved for the most exotic and dangerous diseases where treatments are not available, such as viral hemorrhagic fever (Ebola and Marburg are examples) and smallpox. Fixtures for BSL-3 and 4 spaces must demonstrate an extremely reliable seal.

**MIL STD 461F**— Military Standards testing measurements cover both radiated and conducted electromagnetic emissions in addition to maximum allowable amounts of emitted energy based on both frequency range and field strength. Luminaires meeting MIL STD 461F pose the lowest possible likelihood of causing EMI-related issues.

**CCEA Approved**—The City of Chicago Environmental Air (CCEA) rating ensures that the luminaire is inherently airtight. Wiring and/or branch circuit terminations are sealed off and gasketed from the plenum air space. This listing ensures that the luminaire is sealed to limit air flow from the room side to the plenum.

**UL/CUL Listed**—The UL symbol signifies that Underwriter's Laboratory (UL) has determined that a manufacturer has demonstrated the ability to produce a product complying with UL's requirements with respect to specific risk, performance under specific conditions, compliance with regulatory codes and specified standards, or any other conditions as determined by UL.

**ETL**—A product bearing the ETL Listed mark is determined to have met the minimum requirements of prescribed product safety standards as certified by a Nationally Recognized Testing Laboratory (NRTL). The mark also indicates that the manufacturer's production site conforms to a range of compliance measures and is subject to periodic follow-up inspections to verify continued conformance.

**FN** FN refers to Food Zone/Non-Food Contact. Fixtures are located in food preparation and handling areas but do not come in contact with food under normal conditions. All fixtures in this category have a higher level of construction: housing painted with paint that meets U.S. Code of Federal Regulations; fasteners constructed with stainless-steel and removable without tools; and FDA-approved Food Grade polycarbonate material outer exposed lensing.

**ISO 5**— Suitable for ISO 5, Class 100 Rated Rooms (FED-STD 209E). Measures the number of particles equal to or greater than 0.5 mm in one cubic foot of air. The measurement must not exceed specified particle limits in order for the space to be considered a controlled 'clean room' environment.

## Kenall Warranty Information



### LED 5-Year Warranty

Kenall's LED products are warranted by Kenall to be free of defects in workmanship and materials for a period of one (1) year from the date of invoice. Kenall warrants LED lamps and internal power regulation components for a period of five (5) years from the date of invoice against defects in materials and workmanship that result in a fixture depreciation of 30% or greater. Lumen depreciation is compared to the published lumen output of the product on the date of manufacture per IESNA LM-79 reporting procedures. Normal accumulation of particulates on the optical surfaces shall not be factored into the lumen depreciation.



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# Other Literature



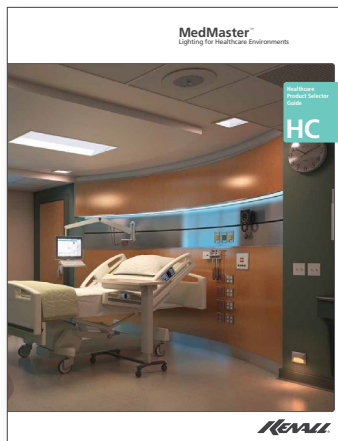
Healthcare Lighting Series White Paper: The Science Behind Properly Lighting an Operating Room



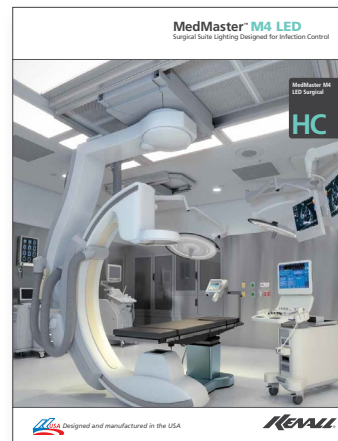
Cleanroom Lighting



The Competitive Edge Series: Red LED Light use within a Vivarium



Healthcare Lighting Product Selector Guide



MedMaster™ M4 LED

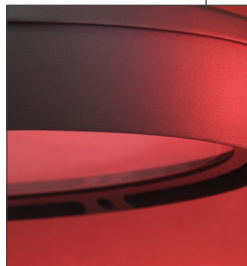
## State-of-the-art, certified testing facility

Kenall is equipped with a state-of-the-art certified safety laboratory, providing comprehensive in-house testing capabilities:

### Thermal Testing



Cold Weather Testing



High Temperature Testing

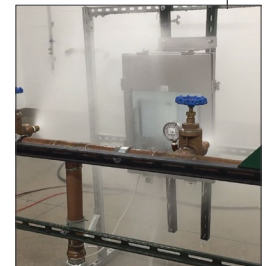
### Photometrics Testing



### Ingress Testing



Solids and Particulates Testing



Water Ingress Testing



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Kenall offers luminaires designed according to industry best practices and certified performance standards in each market segment we serve. From high abuse fixtures with an exclusive 'Peace of Mind' Guarantee® against breakage and healthcare fixtures sealed for infection control, to sealed enclosure fixtures that comply with stringent military standards for RFI/EMI and food processing fixtures that carry mission critical NSF, NEMA and IP ratings, our fixtures are designed with your specific needs in mind.



Guaranteed against breakage for the life of the installation.

**Main Applications**

- Schools & Universities
- Public environments
- Military
- Restrooms & Stairwells



Engineered to the specialized demands of healthcare environments with an attention to cleanability and infection control.

**Main Applications**

- Patient rooms
- Surgical suites
- MRI
- Labs



One piece, seam welded enclosures for containment, controlled and sealed spaces.

**Main Applications**

- Pharmaceutical & Research labs
- Cleanrooms
- Corrosive environments
- Hazardous locations



Sealed, NSF listed, high-efficiency lighting for food processing and preparation.

**Main Applications**

- Food processing & preparation
- Freezers
- Hosedown environments
- Hazardous locations



## Kenall Market Segments

Whether you're lighting a healthcare facility and need fixtures that support effective infection control and cleanability, or a tunnel, transit platform or parking facility that calls for features like corrosion-, shock- and vibration-resistance, Kenall can help at every turn. For everything from dependable task lighting that requires environmental integrity and versatility, to emergency exit lighting that meets life safety codes, you can depend on Kenall.

### Correctional

# COR

Leader in heavy gauge, welded enclosures to deter even the most determined attempts to destroy, enter or vandalize.

#### Main Applications

- Cells
- Common areas
- Behavioral health
- Dayrooms



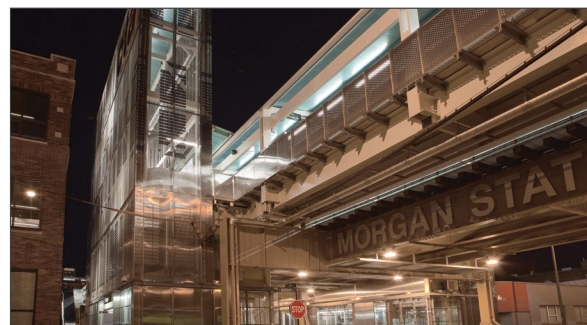
### Transportation

# TR

Meeting the specialized demands of transportation related structures for high performance, corrosion resistance and serviceability.

#### Main Applications

- Tunnel & Underpass
- Platform & Depot
- Parking decks & Surface lots
- Bridges



### Task Lighting

# TL

High-efficiency LED, modular undercabinet lighting for professional spaces.

#### Main Applications

- Nurses stations
- Labs/MRI suites
- Military/Government
- University dorms & Administration areas



### Emergency

# EE

High abuse, extreme environment LED exit and emergency egress lighting.

#### Main Applications

- Schools & Universities
- Recreational
- Sealed & Correctional environments
- Outdoor/cold weather/extreme conditions



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