# VMU24V010CL9xxA

## 22”LINEARHO DC MODULE, 24V CONSTANT VOLTAGE

- For use in UL Class 2 lighting systems
- 24V constant voltage input, suitable for multiple parallel
- Extruded Aluminum material for thermal management
- Magnets pre-mounted, for ease of installation
- High lumen, high efficacy
- Accessories: Diffused lens and End-Caps available
- Suitable for DLC applications: L70 >60,000hrs/L90 =40,000hrs
- Meets UL8750 recognized
- RoHS compliant
- The module is supplied by short circuit proof SELV controlgear

### General Specifications

| | Min. | Typical | Max. |
|---|---|---|---|
| Input Voltage ① | 21.5VDC | 24VDC | 26.5VDC |
| Input Current ① | 246mA | 453mA | 662mA |
| Input Power ① | 5.3W | 10.9W | 17.5W |
| Initial Lumens @2700K / 90CRI | 664 lumens | 1,251 lumens | 1,794 lumens |
| Initial Efficacy @2700K / 90CRI | 126 lm/W | 115 lm/W | 102 lm/W |
| Beam Angle | 120° | | |
| CRI | 90CRI standard | | |
| Storage Temperature Range | -40°C to 100°C / -40°F to 212°F | | |
| Operating Temperature Range (ta) | -40°C to 55°C / -40°F to 131°F | | |
| Maximum Case Temperature (Tc) | L70: Tc max 105°C (Ts=110°C) / L90: Tc max 105°C (Ts=110°C) | | |
| Estimated Lumen Maintenance ② | L70: >60,000Hrs / L90: 40,000Hrs | | |
| Color Consistency | Binning per ANSI C78.377-2015 @ 25°C; 3 SDCM | | |
| Overall Size | 22” L x 1.73” W x 0.39” H (560mm x 44mm x 10mm) | | |
| PCB Material / Thermal Conductivity | CEM-3 (CCP-308) High Thermal Conductive/ 1.5W/mK | | |
| Extruded Material / Finish | Aluminum / surface treatment with Anodic Oxidation | | |
| LED Quantity | 56pcs. | | |
| Module Weight | 110g / 0.24lb | | |
| PCB Part Number | PTL030C01C3 | | |
| Magnets Quantity / Magnetic Force | 2 / 2N (.45lbf) per magnet | | |
| Maximum Screw Installation Torque | 25 inch - ounces | | |
| Connector Type | WAGO #744-392 (2 pin connector) | | |
| Packaging: Master Carton | 20pcs. | | |
| Thermal Feedback | Not Available | | |
| Safety/Compliance | cURus (File # E351548) | | |
| | Suitable for UL Class 2 Lighting Systems | | |
| | RoHS Compliant | | |
| | Dry and Damp Location | | |
| | CE (IEC 62031: 2008. AMD1: 2012, AMD2: 2014) | | |
| | SELV | | |
| Energy Efficiency Label (EEI-Label) | A++ | | |
| Warranty | 5 years @ Max. Tc from the date of manufacture | | |

①Measured electrical data per UL file

②TM-21 Reported Numbers

# VMU24V010CL9xxA

RoHS COMPLIANT

## Electrical and Optical Specifications

| LinearHO Module Part Number | Number of LED | Input Voltage | Nom. Forward Current | Nom. Rated Power | Nom. Lum. Flux @2700K/90 CRI | Nom. Efficacy @2700K/90 CRI |
|---|---|---|---|---|---|---|
| VMU24V010CL9xxA | 56 | 21.5 VDC* | 0.246 A | 5.3 W | 664 lm | 126 lm/W |
| | | 22.0 VDC | 0.287 A | 6.3 W | 784 lm | 124 lm/W |
| | | 22.5 VDC | 0.329 A | 7.4 W | 904 lm | 122 lm/W |
| | | 23.0 VDC | 0.370 A | 8.5 W | 1021 lm | 120 lm/W |
| | | 23.5 VDC | 0.412 A | 9.7 W | 1137 lm | 117 lm/W |
| | | 24.0 VDC | 0.453 A | 10.9 W | 1251 lm | 115 lm/W |
| | | 24.5 VDC | 0.495 A | 12.1 W | 1363 lm | 112 lm/W |
| | | 25.0 VDC | 0.537 A | 13.4 W | 1473 lm | 110 lm/W |
| | | 25.5 VDC | 0.578 A | 14.7 W | 1582 lm | 107 lm/W |
| | | 26.0 VDC | 0.620 A | 16.1 W | 1689 lm | 105 lm/W |
| | | 26.5 VDC* | 0.662 A | 17.5 W | 1794 lm | 102 lm/W |

## Luminous Flux De-Rating: CCT and CRI Multipliers

| | 2700K | 3000K | 3500K | 4000K | 5000K | 5700K | 6500K |
|---|---|---|---|---|---|---|---|
| **CRI 80(R9> 0)** | 1.19 | 1.23 | 1.25 | 1.29 | 1.31 | 1.30 | 1.29 |
| **CRI 90(R9>50)** | 1.00 | 1.08 | 1.07 | 1.10 | 1.12 | 1.12 | 1.10 |

**NOTES:**

1) Performance based on Tc mod = 25°C. See thermal de-rating chart (pg. 3) for higher temperature operation
2) Standard lumen output and efficacy is calculated for standard options. Reference CCT & CRI vs Luminous Flux chart for lumen ratio calculation.
3) Specifications are subject to change without notice.
4) The LED DC Module can be configure with different LED chip quantities, series and parallel design configurations to meet a specific design requirement. Contact Fulham for further assistance.
5) * Indicates minimum and maximum rated voltage. Modules may be operated at a voltage within this range, below the Tc rating.
6) 70CRI is NOT available.

# VMU24V010CL9xxA

## Thermal Specifications

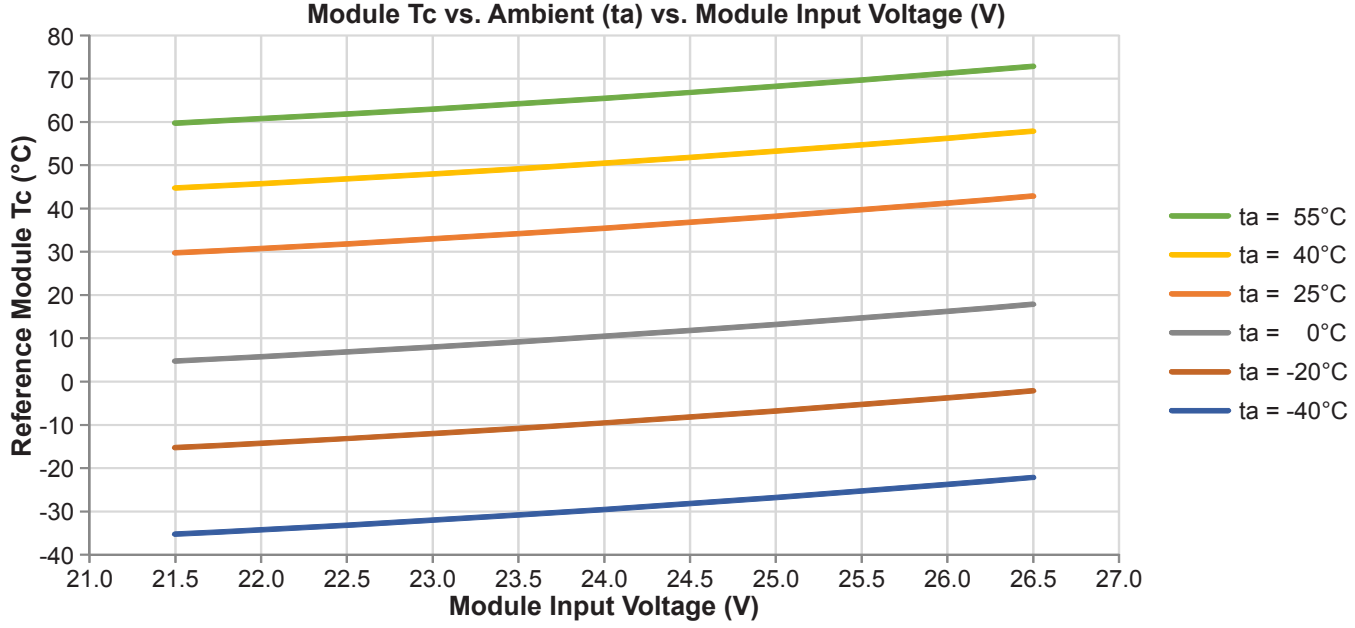
| | LinearHO CV DC Module |
|---|---|
| Storage Temperature Range | -40 to +100°C / -40 to +212°F |
| Operating Ambient Temperature Range (ta) | -40 to 55°C / -40 to 131°F |
| Maximum Case Temperature (Tc) | L70 = 105°C (221°F) / L90 = 105°C (221°F) |

## Thermal De-Rating:

**Tc vs. Luminous Flux vs. Input Power**

| Module Case Temperature (Tc) | Power Multiplier | Luminous Flux Multiplier |
|---|---|---|
| 25ºC | 1.000 | 1.000 |
| 30ºC | 1.006 | 0.998 |
| 35ºC | 1.012 | 0.995 |
| 40ºC | 1.019 | 0.992 |
| 45ºC | 1.025 | 0.990 |
| 50ºC | 1.031 | 0.987 |
| 55ºC | 1.037 | 0.984 |
| 60ºC | 1.043 | 0.981 |
| 65ºC | 1.049 | 0.978 |
| 70ºC | 1.056 | 0.974 |
| 75ºC | 1.062 | 0.971 |
| 80ºC | 1.068 | 0.968 |
| 85ºC | 1.074 | 0.964 |
| 90ºC | 1.080 | 0.960 |
| 95ºC | 1.087 | 0.957 |
| 100ºC | 1.093 | 0.953 |

**Module Tc vs. Ambient (ta) vs. Module Input Voltage (V)**




**NOTES:**

1) Chart "Module Tc vs. Ambient (ta) vs. Module Input voltage (V)" for referance only in an open ambient. The performance with in a luminaire will vary depending on the size and material of luminaire.

# VMU24V010CL9xxA

## Certification Chart

| Classification \ Model | VMU24V010CL9xxA |
|---|---|
| RoHS COMPLIANT | YES |
| c UL us | YES |
| CE | YES |
| Energy Efficiency Label (EEI-Label) | A++ |
| Suitable for UL Class 2 Lighting System | YES |

## Energy Star™ TM-21 Calculator Data

| Tc Module | Reported L70 | Reported L90 |
|---|---|---|
| 55°C | >60,000 Hrs | >54,000 Hrs |
| 85°C | >60,000 Hrs | 46,000 Hrs |
| 105°C | >60,000 Hrs | 40,000 Hrs |

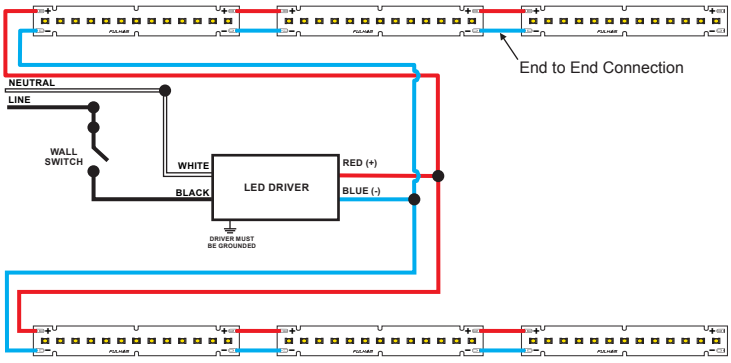
| Tc Module | Calculated L70 | Calculated L90 |
|---|---|---|
| 55°C | 180,000 Hrs | 54,000 Hrs |
| 85°C | 154,000 Hrs | 46,000 Hrs |
| 105°C | 133,000 Hrs | 40,000 Hrs |

## Wiring Diagram

**Parallel, One to Six (1-6) Modules In Line**

- Recommended for up to six end to end connections.
- Voltage remains constant between modules (voltage of each module must be the same for all modules wired together).

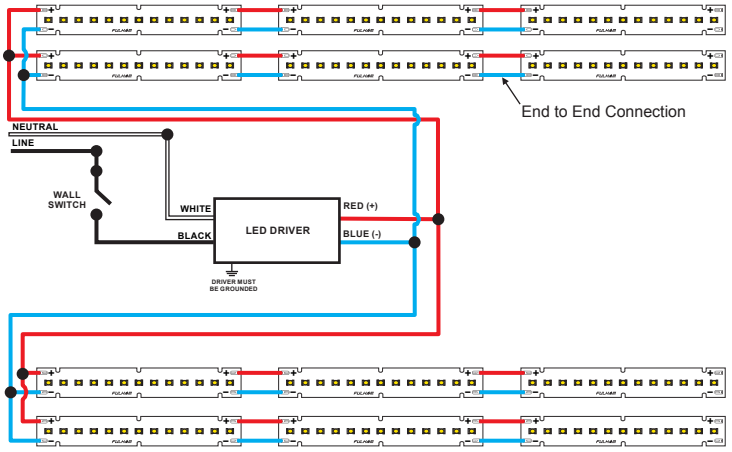
**Module Current = Driver Current / 6**




**Parallel, Six + (6+) Modules In Line**

- Recommended for up to six end to end connections.
- Voltage remains constant between modules (voltage of each module must be the same for all modules wired together).

**Module Current = Driver Current / 12**



# VMU24V010CL9xxA

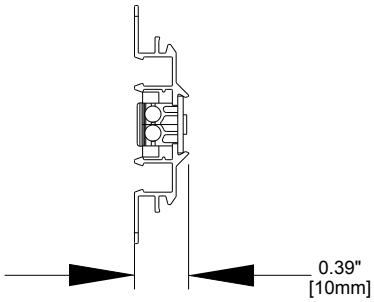
RoHS COMPLIANT

## Mechanical Drawings

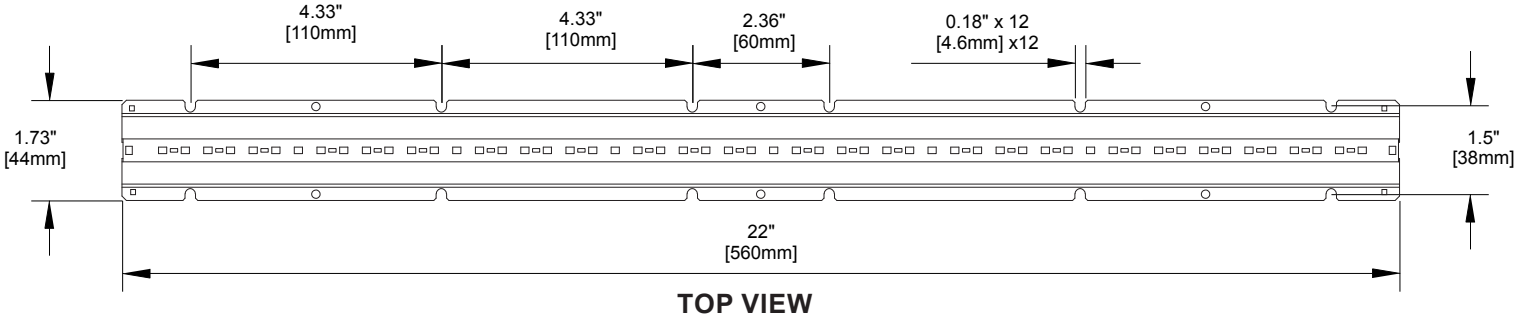
(Scale 1:5)

**22”**
[560mm]

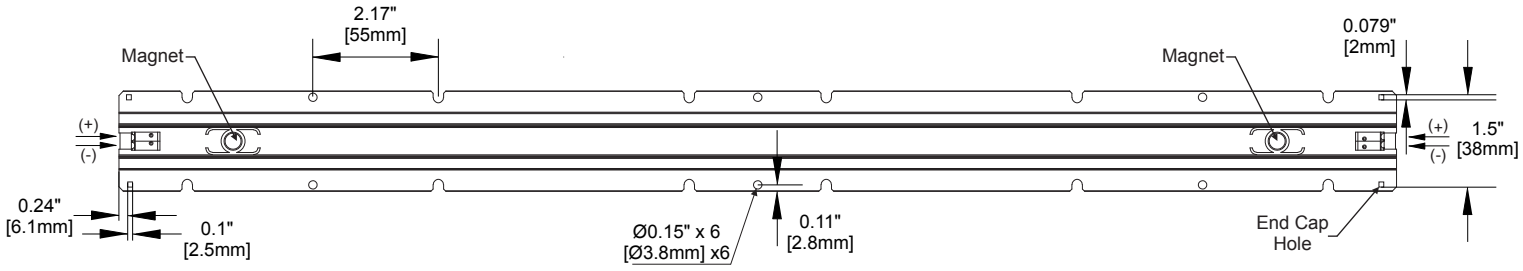
| Overall Dimensions | |
|---|---|
| Length | 22” [560mm] |
| Width | 1.73” [44mm] |
| Height | 0.39” [10mm] |




**SIDE VIEW**




**TOP VIEW**




**BOTTOM VIEW**

# VMU24V010CL9xxA

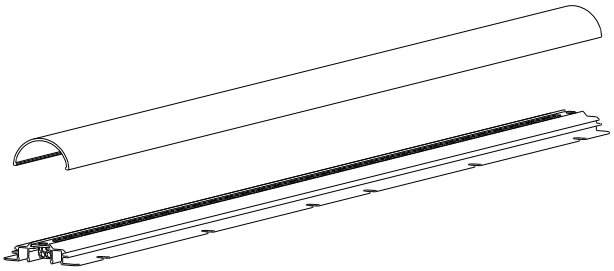
## Accessories

Fulham Part Number: **TLE-OPT-120-004 (22" Diffuser Lens - 120° Beam Angle)**

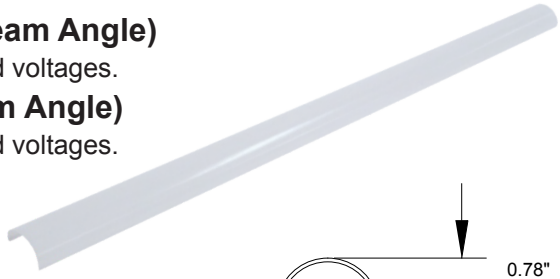
- White polycarbonate diffuser lens - 82% transmissivity at nominally rated voltages.

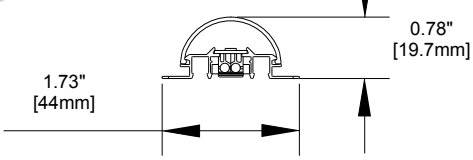
Fulham Part Number: **VLE-OPT-060-022C (22" Clear Lens - 60° Beam Angle)**

- White polycarbonate diffuser lens - 90% transmissivity at nominally rated voltages.



ISOMETRIC VIEW






SIDE VIEW

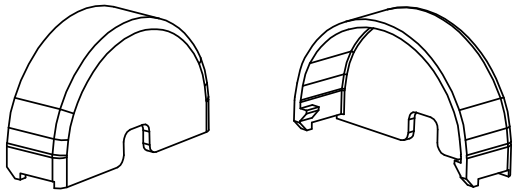
**Installation Steps when using clamps:**

1.Place the LED Module on the luminaire surface.
2.Place the Diffuser lens on top of LED module (line it up with LED module mounting edges).
3.Push down to snap into place.

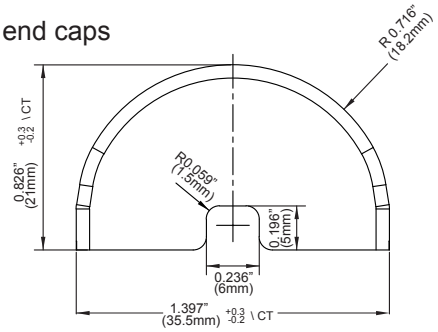
## End Caps

Fulham Part Number: **TLE-OPT-120-020**

- White Polybutylene Terephthalate (PBT) end caps



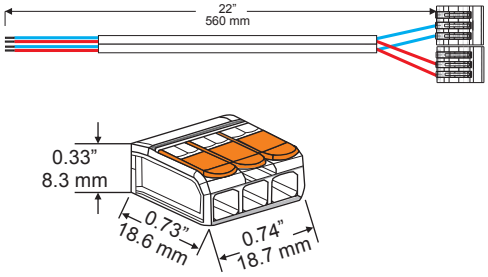
ISOMETRIC VIEW




SIDE VIEW

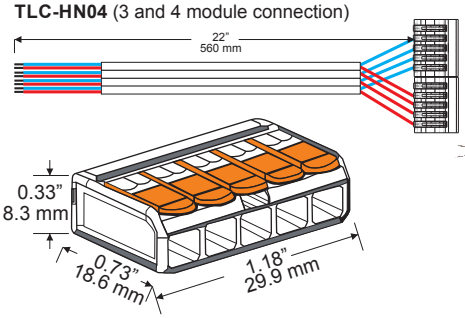
## Harness

**TLC-HN02** (1 and 2 module connection)

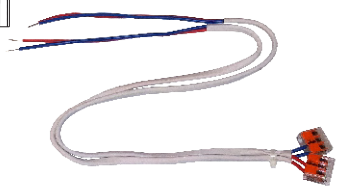



ISOMETRIC VIEW

**TLC-HN04** (3 and 4 module connection)

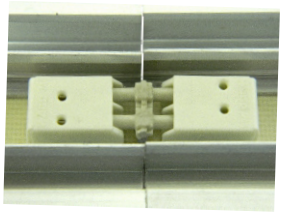



ISOMETRIC VIEW



## Interconnects

- Interconnect Type: WAGO Double pins to interconnect Modules (#2060-952/028-000)
- Approvals: cURus, UL 1977, and RoHS Compliant



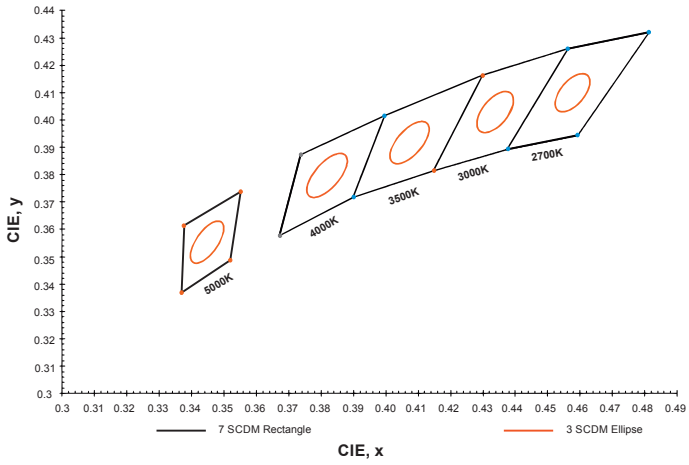
BOTTOM VIEW

**NOTES:**

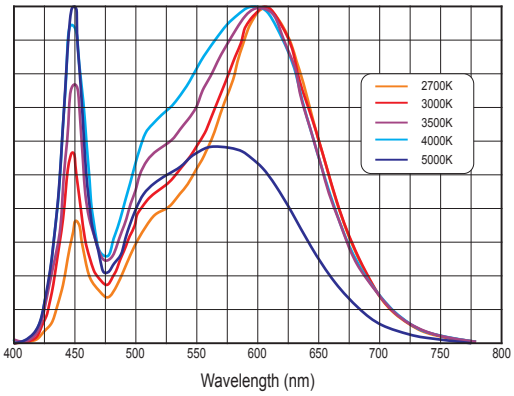
1) Interconnects are NOT sold by Fulham.
2) Do not connect more than six(6) Modules in parallel (end to end). This type of wiring would cause the pass-through current on the first module to exceed the rated current. This setup is in reference to wiring diagram #2 per Fulham's wiring diagram (see link on page #7). If the current is higher than the rated max, it is recommended to use wiring diagram #3.

# VMU24V010CL9xxA

## Color and Binning




## Optical Spectrum




## Compatible Fulham Drivers

(Please use the links below for a complete list of compatible Fulham drivers and wiring diagrams)

- LinearHO CV System Combination:
- Fulham's Wiring Diagrams: https://cdn.fulham.com/PDFs/SpecSheets/DC-Modules-Wiring-Diagrams.pdf
- Compatible with Fulham Hotspot EM Systems.

**NOTES:**

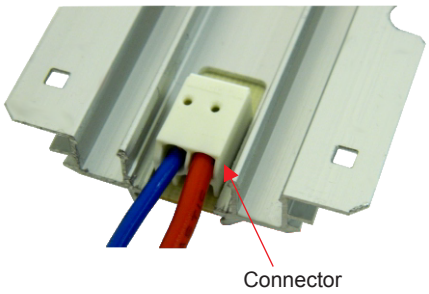
1) The Color and Binning and Optical Spectrum charts are for reference only. For more detailed info, contact factory.
2) Reference Samsung Chromaticity Diagram for Color and Binning. Binning per ANSI C78.377-2015 @ 25°C; 3 SDCM.
3) The Optical Spectrum values vary depending on product type and color rank.
4) Driver not included.
5) Do not connect more than six(6) Modules in parallel (end to end). This type of wiring would cause the pass-through current on the first module to exceed the rated current. This setup is in reference to wiring diagram #2 per Fulham's wiring diagram (see the link above). If the current is higher than the rated max, it is recommended to use wiring diagram #3.

# VMU24V010CL9xxA

## Guidelines

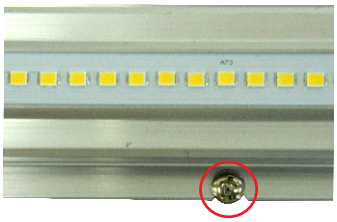
### Termination Notes

- Connector Type: WAGO #744-392 (2 pin push wire connector)
  - AWG: 20...16 solid wire
  - Strip length: 8...9mm / 0.31...0.35in




### Fastening Notes

- If fastening by screw hole, use any screw with diameter less than 0.185 in (4.7mm). Use all available screw holes to ensure good contact between back side of module and mounting surface. Refer to max specified torque for installation. Suggested screw sizes: #6 or M4 Pan Head screw.



- If fastening using double-sided tape, start with clean, oil-free and dust-free surface. Peel backing and place LED module on mounting surface. Firmly press down on the module to ensure good adherence. Follow the double-side tape manufacturer's installation instructions.

- BJB P2F (Push-to-Fix) fixing elements for PCBs can be used to fasten LED modules to mounting surface. Reference BJB's website for ordering information and specific model to use: http://www.bjb.com/index.php?pid=376706&lid=10.

### Environmental Rating / Conformal Coating

- The DC LinearHO CV Modules have been evaluated for use in dry or damp locations only. If used in wet locations, acceptability and the need for additional evaluation shall be determined in the end product.

- Fulham's LinearHO CV modules are available with conformal coating; made to order with MOQ and lead time will apply. The conformal coating is a silicone based material which is double sprayed on the module only (LEDs and PCB). Conformal coating is recommended for the following applications: near ocean where salt is present, constant moisture, refrigeration, continuously high humidity, or outdoor applications. An IP rating of IP64 or IP65 is achieved when the conformal coating is used, but other factors should be considered. Fulham still recommends the luminaire also meet an IP64/65 rating.

### Electrostatic Sensitive Product (ESD)

- Fulham LED products should be handled with proper measures to protect against any potential ESD damage.
- When servicing, personnel should be ground and direct contact with LED should be avoided.

### Thermal Management

- Proper thermal management should be employed to ensure life and reliability of product. Max Tc of module should not be exceeded.
- Use of thermal grease, paste, pad, or other material interface is highly recommended.

### Polarity Notes

- DC Modules are polarity sensitive.
- Ensure that "positive" from LED Driver is connected to "positive" of LED modules and that "negative" from LED Driver is connected to "negative" of LED modules.
- Polarities of modules are marked with "+" for positive and "-" for negative.

# VMU24V010CL9xxA

RoHS COMPLIANT

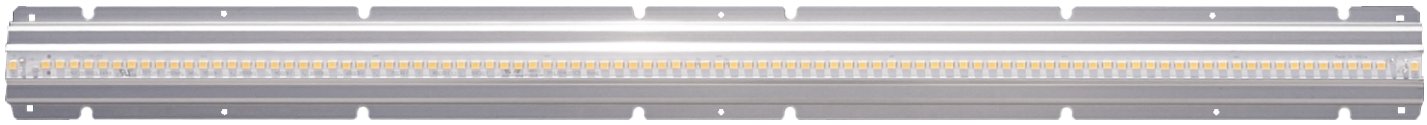
## Part Number Matrix

# V MU 24V 010 CL 9 XX A

| Product Line | Type | Control Type | Input Voltage | Typ. Power | Design | CRI | Color Temperature | Option |
|---|---|---|---|---|---|---|---|---|
| **V** = Vizion | **M** = Module (UL Class 2) | **U** = None | **24V** = 24Vdc | **010** = 10W | **CL** = Linear | **8** = 80<br>③ **9** = 90 | ③ **27** = 2700K<br>③ **35** = 3500K<br>**50** = 5000K<br>**57** = 5700K<br>**65** = 6500K | **A =** Standard<br>④ **D =** Conformal Coating (MTO) |

③ Standard Product offering (All other options are made to order with MOQ and lead time)
④ See page #9 for Conformal Coating information. Made to order (MTO).

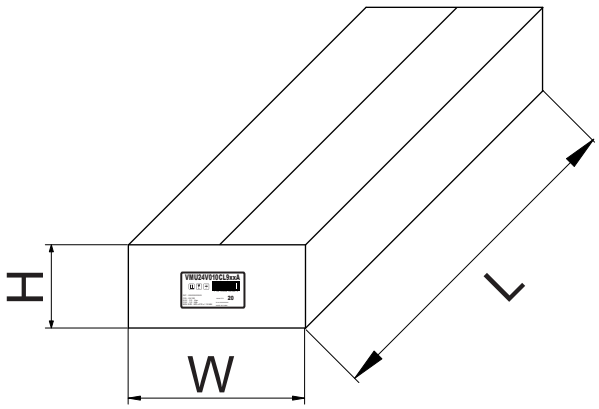
## Product Image: LinearHO CV DC Module



**TOP VIEW**

## Packaging

Master Carton




| OUTER DIMENSION | | |
|---|---|---|
| L | W | H |
| 23.43”(595mm) | 10.63”(270mm) | 4.33”(110mm) |

| Net Weight | Gross Weight | QUANTITY |
|---|---|---|
| 5.51 lbs. (2.5kg) | 7.71 lbs. (3.5kg) | 20pc. |