# LED LINEAR ALLROUND – GEN. 2

## IP00 BUILT-IN MODULES

## LED LINEAR ALLROUND – GEN. 2

**WU-M-541/xx-C**

These modules were designed for built-in into luminaire casings. They enable a modular luminaire design.

The modules are available in three shapes (4, 8 or 16 LEDs) and in three white colour tones.

**Typical Applications**
**(depending on the choice of optics)**

- Integration in luminaires
- Street lighting, urban street lighting
- Tunnel lighting
- Flood and area lighting
- Indoor lighting
- Industrial lighting for:
  - Production halls
  - Warehouses
- Lighting for sports facilities

**LED Linear Allround – Gen. 2**

- **HIGHLY EFFICIENT: UP TO 162 LM/W AT $T_P$ = 60 °C**
- **FLEXIBLE LIGHT DISTRIBUTION BY VARIOUS ATTACHMENT OPTICS**
- **HUGE RANGE OF CCT & CRI VARIANTS**
- **INITIAL COLOUR ACCURACY: 5 SDCM**
- **PROTECTION AGAINST TRANSIENT MAIN PEAKS: 4 KV**
- **ZHAGA-COMPLIANT MOUNTING DIMENSION**
- **VDE PENDING (ACC. TO EN 62031)**

VDE pending

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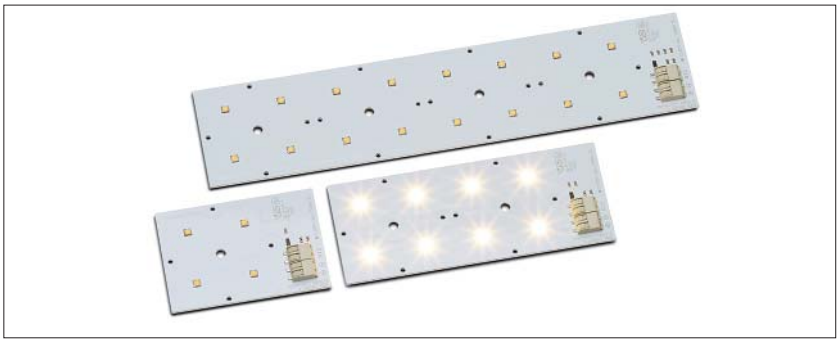

### Technical Notes

- LED built-in module for integration into luminaires
- 4, 8 or 16 high-efficiency High Power LEDs
- Dimensions (excl. optics) LxWxH
  4 LEDs: 71.1x49.5x6 mm
  8 LEDs: 121.9x49.5x6 mm
  16 LEDs: 223.5x49.5x6 mm
- Push-in terminals for quick and simple wiring (WAGO series 2060)
- Suitable for standard 2x2 optics
- Design for optimum thermal management
- Degree of protection: IP00
- ESD protection class 2
- NTC resistor for external driver feedback of module temperature
  Type: NCP18xH103J03RB
- Inverse-polarity protection

### Electrical Characteristics

at $t_p$ = 60 °C

| Type | No. of | Voltage DC (V) 350 mA | | | 700 mA | | | 1050 mA | | | 1400 mA | | | Temperature coefficient | Power consumption (W) 350 mA | | | 700 mA | | | 1050 mA | | | 1400 mA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WU-M-541 | LEDs | min. | typ. | max. | min. | typ. | max. | min. | typ. | max. | min. | typ. | max. | mV/K | min. | typ. | max. | min. | typ. | max. | min. | typ. | max. | min. | typ. | max. |
| .../4-C | 4 | 9.8 | 11 | 11.4 | 10.4 | 11.5 | 12 | 10.8 | 11.9 | 12.4 | 11.2 | 12.3 | 12.8 | –11.1 | 3.4 | 3.9 | 4 | 7.3 | 8.1 | 8.4 | 11.3 | 12.5 | 13 | 15.7 | 17.2 | 17.9 |
| .../8-C | 8 | 19.7 | 21.9 | 22.9 | 20.7 | 23 | 23.9 | 21.6 | 23.9 | 24.8 | 22.4 | 24.6 | 25.6 | –22.2 | 6.9 | 7.7 | 8 | 14.5 | 16.1 | 16.7 | 22.7 | 25.1 | 26 | 31 | 34.4 | 35.8 |
| .../16-C | 16 | 39.4 | 43.9 | 45.8 | 41.5 | 46 | 47.9 | 43.3 | 47.7 | 49.7 | 44.8 | 49.2 | 51.2 | –44.4 | 13.8 | 15.4 | 16 | 29.1 | 32.2 | 33.5 | 45.5 | 50.1 | 52.2 | 62.7 | 68.9 | 71.7 |

Use of external LED constant current driver required.

### Maximum Ratings

Exceeding the maximum ratings can lead to destruction of the module.

| Type | Operation current | Operation temperature range at $t_c$ point | | Storage temperature range | | Max. allowed repetitive peak current |
|---|---|---|---|---|---|---|
| | mA | °C min. | °C max. | °C min. | °C max. | mA |
| All types | 350 | –30 | +85 | –30 | +85 | 2270 |
| All types | 700 | –30 | +85 | –30 | +85 | 2060 |
| All types | 1050 | –30 | +80 | –30 | +85 | 1940 |
| All types | 1400 | –30 | +70 | –30 | +85 | 1860 |
| All types | 1500 | –30 | +65 | –30 | +85 | 1840 |





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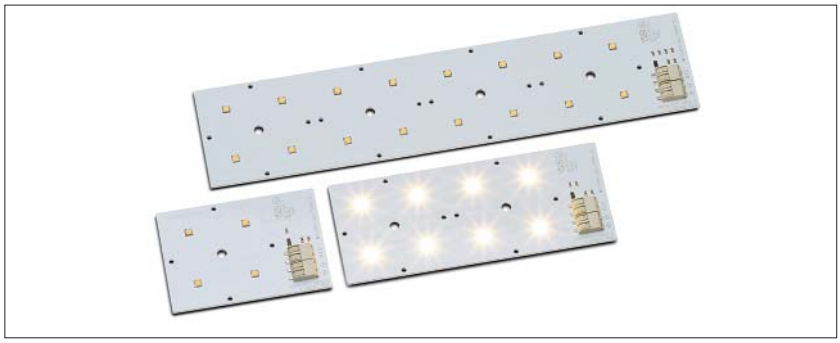

## Optical Characteristics

at $t_p$ = 60 °C

| Type | Ref.-No. | Colour | Correlated colour temperature K | Luminous flux* (lm) and typ. efficiency (lm/W) 350 mA min. lm | 350 mA typ. lm | 350 mA typ. lm/W | 700 mA min. lm | 700 mA typ. lm | 700 mA typ. lm/W | 1050 mA min. lm | 1050 mA typ. lm | 1050 mA typ. lm/W | 1400 mA min. lm | 1400 mA typ. lm | 1400 mA typ. lm/W | CRI** $R_a$ | Photometric code |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LED Linear Allround - 4 LEDs** | | | | | | | | | | | | | | | | | |
| 541/4-C-730 | **563248** | warm white | 3000 -90/+185 | 555 | 580 | 149 | 1050 | 1085 | 134 | 1485 | 1525 | 122 | 1850 | 1900 | 110 | ≥ 70 | 730/579 |
| 541/4-C-830 | **563249** | warm white | 3000 -90/+185 | 500 | 520 | 133 | 945 | 980 | 121 | 1330 | 1365 | 109 | 1660 | 1715 | 100 | ≥ 80 | 830/579 |
| 541/4-C-740 | **563250** | neutral white | 4000 -235/+230 | 575 | 620 | 159 | 1090 | 1165 | 144 | 1535 | 1635 | 131 | 1915 | 2040 | 119 | ≥ 70 | 740/579 |
| 541/4-C-840 | **563251** | neutral white | 4000 -235/+230 | 535 | 560 | 144 | 1015 | 1060 | 131 | 1435 | 1480 | 118 | 1785 | 1850 | 108 | ≥ 80 | 840/579 |
| 541/4-C-650 | **563252** | cool white | 5000 -265/+360 | 615 | 630 | 162 | 1160 | 1180 | 146 | 1635 | 1665 | 133 | 2040 | 2075 | 121 | ≥ 65 | 650/579 |
| 541/4-C-850 | **563254** | cool white | 5000 -265/+360 | 480 | 545 | 140 | 905 | 1020 | 126 | 1280 | 1430 | 114 | 1595 | 1785 | 104 | ≥ 80 | 850/579 |
| **LED Linear Allround - 8 LEDs** | | | | | | | | | | | | | | | | | |
| 541/8-C-730 | **563255** | warm white | 3000 -90/+185 | 1110 | 1145 | 149 | 2105 | 2160 | 134 | 2965 | 3050 | 122 | 3700 | 3800 | 110 | ≥ 70 | 730/579 |
| 541/8-C-830 | **563256** | warm white | 3000 -90/+185 | 995 | 1030 | 134 | 1885 | 1945 | 121 | 2660 | 2740 | 109 | 3320 | 3430 | 100 | ≥ 80 | 830/579 |
| 541/8-C-740 | **563257** | neutral white | 4000 -235/+230 | 1150 | 1225 | 159 | 2175 | 2320 | 144 | 3070 | 3280 | 131 | 3830 | 4085 | 119 | ≥ 70 | 740/579 |
| 541/8-C-840 | **563258** | neutral white | 4000 -235/+230 | 1075 | 1110 | 144 | 2030 | 2105 | 131 | 2865 | 2965 | 118 | 3575 | 3700 | 108 | ≥ 80 | 840/579 |
| 541/8-C-650 | **563259** | cool white | 5000 -265/+360 | 1225 | 1245 | 162 | 2320 | 2355 | 146 | 3275 | 3330 | 133 | 4085 | 4150 | 121 | ≥ 65 | 650/579 |
| 541/8-C-850 | **563261** | cool white | 5000 -265/+360 | 960 | 1075 | 140 | 1815 | 2030 | 126 | 2560 | 2865 | 114 | 3190 | 3575 | 104 | ≥ 80 | 850/579 |
| **LED Linear Allround - 16 LEDs** | | | | | | | | | | | | | | | | | |
| 541/16-C-730 | **563262** | warm white | 3000 -90/+185 | 2225 | 2290 | 149 | 4205 | 4320 | 134 | 5935 | 6100 | 122 | 7405 | 7605 | 110 | ≥ 70 | 730/579 |
| 541/16-C-830 | **563263** | warm white | 3000 -90/+185 | 1995 | 2060 | 134 | 3770 | 3885 | 121 | 5320 | 5485 | 109 | 6640 | 6860 | 100 | ≥ 80 | 830/579 |
| 541/16-C-740 | **563264** | neutral white | 4000 -235/+230 | 2300 | 2455 | 159 | 4350 | 4640 | 144 | 6140 | 6550 | 131 | 7660 | 8170 | 119 | ≥ 70 | 740/579 |
| 541/16-C-840 | **563265** | neutral white | 4000 -235/+230 | 2145 | 2225 | 144 | 4060 | 4205 | 131 | 5730 | 5935 | 118 | 7150 | 7410 | 108 | ≥ 80 | 840/579 |
| 541/16-C-650 | **563266** | cool white | 5000 -265/+360 | 2455 | 2490 | 162 | 4640 | 4715 | 146 | 6550 | 6650 | 133 | 8170 | 8310 | 121 | ≥ 65 | 650/579 |
| 541/16-C-850 | **563268** | cool white | 5000 -265/+360 | 1915 | 2150 | 140 | 3625 | 4060 | 126 | 5115 | 5730 | 114 | 6385 | 7150 | 104 | ≥ 80 | 850/579 |

On account of the complex manufacturing process of the modules, the above values only represent statistical variables.
The values do not necessarily correspond exactly to the actual parameters of every single product, which can vary from the typical specification.
* Measurement tolerance of luminous flux: ±7% | ** Measurement tolerance CRI: ±2

## Operating Life

| Modules | Operating life in hours at measured temperature at $t_p$ point $I_F$ 350 mA 40 °C | 60 °C | 85 °C | $I_F$ 700 mA 40 °C | 60 °C | 85 °C | $I_F$ 1050 mA 40 °C | 60 °C | 80 °C | $I_F$ 1400 mA 40 °C | 60 °C | 70 °C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L80/B10* | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | 52,000 | > 60,000 | > 60,000 | > 60,000 |
| L70/B10* | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 | > 60,000 |

These values do not refer to the colour temperature. | * Lxx/Byy (lumen maintenance at xx%, failure rate yy%)





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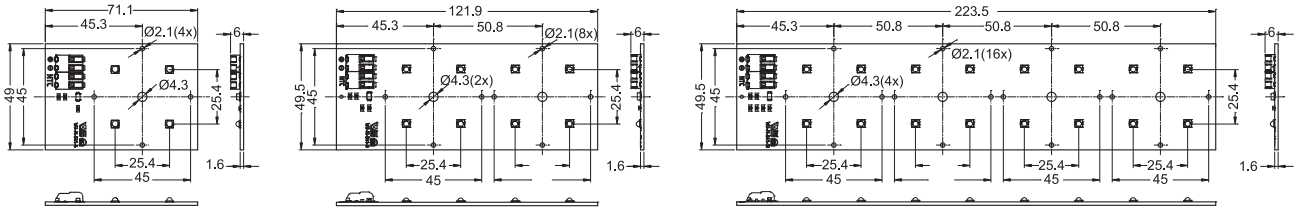
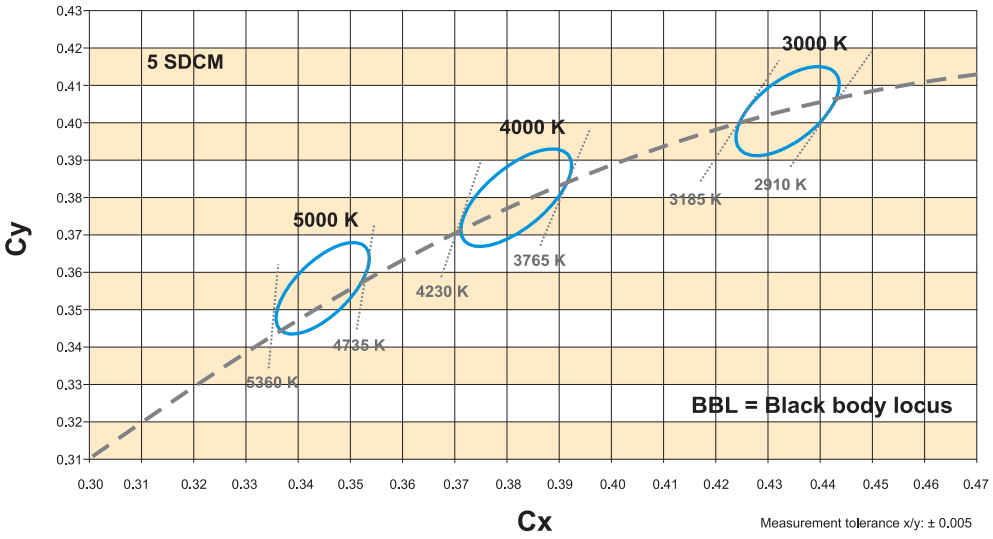
### Mechanical Dimensions




**WU-M-541/4** **WU-M-541/8** **WU-M-541/16**

### Bins




Measurement tolerance x/y: ± 0.005

### Assembly and Safety Information

Installation must be carried out under observation of the relevant regulations and standards. The LED modules are designed for operation within a casing or luminaire. Safety regulations acc. to EN 60598 has to be observed. Installation must be carried out in a voltage-free state (i.e.disconnection from the mains).

- LED built-in modules must not be subjected to any undue mechanical stress, e. g.:
  - handle LED modules carefully
  - avoid shear and compressive forces onto
  - the optics during handling and installation
  - avoid vibrations of more than 2 kHz, 40 G
- The module must be fixed onto a thermally conductive surface with 1 to 4 M3 screws (respectively M4). Recommended torque: 0,6±0,1 Nm.
  - In case of using 2x2-array lenses (available from third party suppliers), please refer to your lens supplier to define the max. allowd torque to be applied to the screws (usually M3).
  - In this regard please observe also the usage of proper thermal interface material. Make sure not to go below the min. contact pressure needed. The installation instructions of the selected interface materials have to be followed.
- When installing/screwing the module into a luminaire, please ensure that the cables are not squeezed between luminaire/heat sink and LED module. Also ensure that the mounting surface is clean and flat. For a reliable thermal attachment, we recommend the mounting surface flatness of ≤ 0.2 mm.
- Safe operation only possible by the use of external constant current sources ($I_{max.}$ see table "Electrical Characteristics").
- Operation is dependent on constant current drivers that should provide the following protective measures:
  - short-circuit protection
  - overload protection
  - overheating protection
- Please ensure the correct polarity of the leads prior to commissioning. Reversed polarity can destroy the modules.
- The maximum output of the power supply must be observed.
- For optimal load of used constant current driver the modules can only be connected in series. The quantity of LED modules is limited by the sum of forward voltage and the capacity of used constant current driver. Safety regulations acc. to EN 60598 has to be observed if the sum of forward voltage exceed the permitted touchable value.





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### Assembly and Safety Information

- The clearance and creepage distances of LED modules WU-M-541/xx-C are designed for working voltages up to 500 V DC (basic insulation) acc. to EN 62031/EN 60598.
- If a system consists of multiple LED Linear Allround modules connected to a single driver, only one module will be monitored by the NTC. That means that one module is in "master" mode operated and the rest are operated in "slave" mode.
- Please ensure standard ESD (electrostatic discharge) protection measures are employed when handling and installing LED modules. Electrostatic discharge can damage LEDs.
- To ensure problem-free operation, the specified maximum temperature at the $t_c$ and $t_p$ point (see "Operating Life") must be observed (measured in accordance with EN 60598-1). To satisfy this point, it is necessary to put measures in place to ensure any heat is dissipated from the LED module to the environment.
- To ensure good thermal contact, it is recommended to use proper thermal interface material (e.g. thermal paste, phase change or thermal pads).
- When mounting LED Linear Allround modules directly on the luminaire housing, we reccommend to use aluminum of at least 3 mm thickness. Thicker material will improve the heatflow through the luminaire, resulting in a lower $t_p$ temperature on the module itself.
- Use anodised or painted surfaces rather than blank surfaces to enhance the heat-transfer via thermal radiation.
- Try to limit as far as possible the number of thermal interfaces in the primary heat path towards ambient air. For the primary heat path use solely materials with high thermal conductivity (e.g. aluminum).
- The LED Linear Allround modules are built-in modules and have no IP-classification (IP00). They are not designed for operation in "open air". In the event of outdoor applications or applications in damp locations, care must be taken to protect LED assembly modules against humidity, splashes and jets of water. Any corrosion damage resulting from humidity or contact with condensation will not be recognised as a defect or manufacturing fault. LED assembly modules are not specially protected against foreign bodies or dust. Depending on the type of application, further protection must be ensured to prevent dust and foreign bodies from entering.
- A parallel connection of the modules is not allowed.
- Operating LED modules in the presence of certain chemical substances or in chemically enriched (aggressive) environments can impair module functionality or even cause total module failure. Detailed information can be found in our "Chemical Incompatibility" PDF on our website www.vossloh-schwabe.com
- The photobiological safety of the LED modules must be classified into risk groups in accordance with EN 62471: 2008.
  – general lighting
    exempt group:
    WU-M-541/xx-C
  – other applications
    risk group 2:
    WU-M-541/xx-C

  Assessment in acc. with IEC/TR 62778:
  Given a clearance of more than $d_{min}$, within which the lighting intensity limit of $E_{thr}$ = 1200 lx is attained, the classification goes down to Risk Group 1.

### Applied Standards

EN 62031
LED modules for general lighting – Safety specifications

**pending**

EN 62471
Photobiological safety of lamps and lamp systems

### Product Guarantee

- 5 years
- The conditions for the Product Guarantee of the Vossloh-Schwabe Group shall apply as published on our homepage (www.vossloh-schwabe.com).
  We will be happy to send you these conditions upon request.





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