# ST-1916-SL-GHE PARK

Designové LED svítidlo určené pro veřejné osvětlení. Přednosti: tenké hliníkové tělo, vysoká světelná účinnost, možnost otevření bez nářadí, instalace na dřík sloupu, široká škála optik (včetně backlight control).
Možnost "SMART" výbavy ZHAGA/NEMA socket a řízení DALI

## Certifikáty

## Charakteristika

| Označení | Příkon | Účinnost* | Světelný tok (2700 K/2200 K) | CCT | CRI** | Rozměry |
|---|---|---|---|---|---|---|
| ST-1916-SLGHE | 5 | 145-165 lm/W | 825 lm/725 lm | 2200-4000 K | 70 (80) Ra | 466x222x109 mm |
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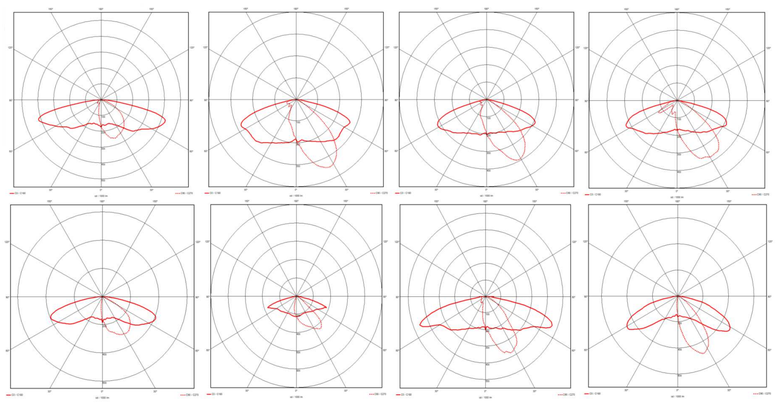
** V základu jsou svítidla vyráběna s CRI 70Ra, 80Ra je volitelné

## Fotometrie



## Vlastnosti produktu

LED · inventronics · L80B50 100 000h · IP66 · IK 08 · 230V · 50Hz · 50°C · -30°C · LUMILEDS

# ST-1916-SL-GHE

Svítidlo klasického typu určené pro veřejné osvětlení. Přednosti: tenké hliníkové tělo, vysoká světelná účinnost, možnost otevření bez nářadí, instalace na výložník/dřík sloupu, široká škála optik (včetně backlight control). Možnost "SMART" výbavy ZHAGA/NEMA socket a řízení DALI

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CE RoHS COMPLIANT

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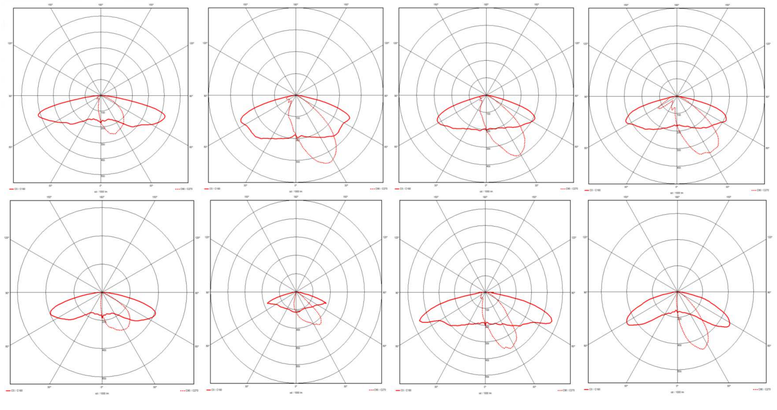

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GREENICE

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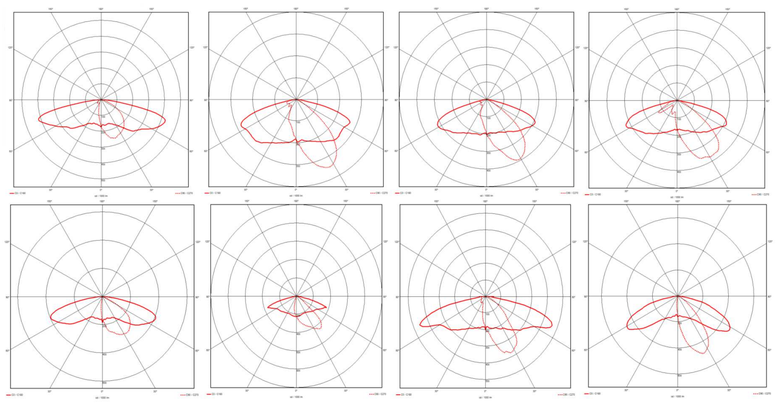

## Vlastnosti produktu

LED | inventronics | L80B50 100 000h | IP66 | IK 08 | 230V | 50Hz | 50°C | -30°C | LUMILEDS

# PROTOKOL O ZKOUŠCE LVD

| | |
|---|---|
| Název produktu: | LED Lamp |
| Model: | ST1916 |
| Vypracováno pro: | |
| Vypracoval: | **Shanghai OUTAO Testing Technology Service Co., Ltd.**<br>Suite 26D, Meliliyuan Mansion, No 358 Yan'an Road (W), Jing'an District, Shanghai, China |
| Datum zpracování: | December 19th, 2013 |
| Číslo protokolu: | LVD-OUTAO131204 |

| |
|---|
| **ZKUŠEBNÍ PROTOKOL**<br>**EN 60598 -1& EN 60598-2-3**<br>**Svítidla**<br>**Část 2-3: Speciální požadavky**<br>**Svítidla pro silniční a pouliční osvětlení** |
| Referenční číslo protokolu : LVD-OUTAO131204<br>Vystavil + podpis : Leo Li<br>Schválil + podpis : Jimmy Xie<br>Datum testu : 8-18 Prosince, 2013<br>Obsah : 26 stran |
| Zkušební laboratoř : Shanghai OUTAO Testing and Technology Service Co., Ltd<br>Adresa : Suite 26D, Meiliyuan Mansion, NO 358 Yan'an Road (W), Jing'an District, Shanghai, China |
| Jméno žadatele :<br>Adresa : |
| Specifikace testu<br>Norma : EN 60598-2-3:2003+A1:2011 & EN 60598-1:2008+A11:2011<br>Zkušební procedura : CE LVD<br>Nestandartní zkušební metody : N/A |
| Výsledek zkoušky : Shoda s EN 60598-2-3:2003 &EN 60598-1:2008+A11:2011 |
| Název výrobku : LED lampa<br>Výrobce : Shodný s žadatelem<br>Ochranná známka :<br>Zkoušený model : ST1916<br>Odpovídající model : ST1916<br>Parametry : AC230V, 50HZ, 30W |
| **Poznámky**<br>P = vyhovění, shoda s požadavkem<br>F = nevyhovění, neshoda s požadavkem<br>NA = Nepoužije se, což znamená, že tato položka není použitelná pro toto zařízení |

Obecné poznámky

Tato zpráva nesmí být reprodukována jinak než v plném znění bez písemného souhlasu zkušební laboratoře.
Výsledky zkoušek uvedené v tomto protokolu se vztahují pouze na zkoušený(é) předmět(y).
"(viz poznámka č.)" odkazuje na poznámku připojenou k protokolu.
"(viz příloha č.)" odkazuje na přílohu připojenou k protokolu.
Čísla článků v závorkách odkazují na články v IEC60598-1 (EN 60598-1).
V celé této zprávě se jako desetinný oddělovač používá čárka.

Stručný popis zkušebního vzorku:
Zařízení je LED lampa pro všeobecné použití.

Kopie štítku výrobku

**ST1916 LED Lamp** **230V/50 Hz** **30W**

Made in China

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| 3.1 (0) | Rozsah | | P |
| 3.4 (2) | Klasifikace | | P |
| (2.2) | Typ ochrany……: | Třída II | - |
| (2.3) | Stupeň ochrany……..: | IP X5 | - |
| (2.4) | Přenosné/ruční svítidlo……..: | Ne | - |
| | Svítidlo vhodné pro upevnění na běžně hořlavé povrchy……: | Ano | - |
| | Pevné svítidlo vhodné pouze pro upevnění na nehořlavé materiály……: | Ne | - |
| (2.5) | Svítidlo pro běžné použití……: | Ano | - |
| | Svítidlo do hrubého provozu……..: | Ne | - |
| | | | |
| 3.5 (3) | Označení | | P |
| (3.2) | Povinná označení | | P |
| | Umístění označení | Umístění na krytu | P |
| | Formát textu/symbolů | | P |
| (3.3) | Dodatečné informace | | P |
| | Jazyk návodu | Čeština | P |
| (3.3.1) | Kombinovaná svítidla | Nejsou kombinovaná | N |
| (3.3.2) | Nominální frekvence v Hz | 50Hz | P |
| (3.3.3) | Provozní teplota | | N |
| (3.3.4) | Výstražné symboly | | N |
| (3.3.5) | Schéma zapojení | | N |
| (3.3.6) | Zvláštní podmínky | | N |
| (3.3.7) | Svítidlo s halogenidovými výbojkami | | N |
| (3.3.8) | Omezení pro polosvítidlo | | N |
| (3.3.9) | Účiník a napájecí proud | | N |
| (3.3.10) | Vhodné pro použití v interiéru | | N |
| (3.3.11) | Svítidla s dálkovým ovládáním | Bez dálkového ovládání | N |
| (3.3.12) | Svítidlo s příchytkou | Pevné svítidlo | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
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| (3.3.13) | Specifikace ochranného stínu | | N |
| (3.3.14) | Symbol pro povahu dodávky | - | P |
| (3.3.15) | Jmenovitýproud zásuvky | Není k dispozici zásuvka | N |
| (3.3.16) | Svítidlo pro těžký provoz | | N |
| (3.3.17) | Montážní návod pro typ Y, typ Z a některé nástavce typu X | Nástavec typu Y | P |
| (3.3.18) | Neobvyklá svítidla s kabelem z PVC | | N |
| (3.3.101) | Svorkovnice dodávaná se svítidlem | | N |
| (3.4) | Zkouška vodou | 15s s vodou | P |
| | Zkouška hexanem | 15s s hexanem | P |
| | Čitelnost po zkoušce | Značení je čitelné | P |
| | Připevnění štítku | Štítek není snadno odstranitelný a nevykazuje žádné zvlnění | P |
| 3.5(-) | Kromě toho musí být v návodu uvedeny informace | | N |
| | a) Konstrukční poloha | | N |
| | b) Hmotnost | | N |
| | c) Celkové rozměry | | N |
| | d) Síla větru (montáž ve výšce větší než 8 m) | | N |
| | e) Rozsah průřezů závěsného drátu | | N |
| | f) Použití ve vnitřních prostorách | | N |
| | g) Rozměry vnitřního prostoru | | N |
| | h) Točivý moment | | N |

| | | | |
|---|---|---|---|
| 3.6 (4) | Konstrukce | | P |
| 3.6.1(-) | Všechna svítidla musí mít ochranu proti vniknutí nečistot alespoň IPX3 | | P |
| | Ostatní | | N |
| 3.6.2(-) | Svítidla pro zavěšení na lanko | | N |
| 3.6.3(-) | Připevněné a vnější části musí odolávat větru o rychlosti 150 km/h. | | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
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| 3.6.3.1(-) | Zkouška statické síly | | N |
| 3.6.4(-) | Jediná objímka musí dostatečně podpírat | | N |
| 3.6.5(-) | Skleněné kryty | | N |
| 3.6.6(-) | Adekvátní místo pro připojovací prostor | | N |
| 3.6.7(-) | Svítidla integrovaná do sloupů musí splňovat normy ISO | | N |
| 3.6.8(-) | Dvířka svítidel integrovaných do sloupu musí být chráněna proti korozi | | N |
| | - Štěrbina pro vstup kabelu nesmí být menší než 50 mm x 150 mm | | N |
| | - Cesta ze štěrbiny do vnitřního prostoru svítidla nesmí být kratší než 50 mm. | | N |
| 3.6 (4.2) | Bezproblémově vyměnitelné součásti | | P |
| 3.6 (4.3) | Dráty jsou hladké a bez ostrých hran. | | P |
| 3.6 (4.4) | Držáky světelných zdrojů | | N |
| 3.6 (4.4.1) | Integrované objímky | | N |
| 3.6 (4.4.2) | Připojení kabeláže | | N |
| 3.6 (4.4.3) | Objímka pro montáž od konce ke konci | | N |
| 3.6 (4.4.4) | Umístění | | N |
| 3.6 (4.4.5) | Špičkové impulzní napětí | | N |
| 3.6 (4.4.6) | Středový kontakt | | N |
| 3.6 (4.4.7) | Svítidla do hrubého provozu | | N |
| 3.6 (4.4.8) | Konektory pro svítidla | Konektor pro svítidlo není k dispozici | N |
| 3.6 (4.5) | Držáky startéru | | |
| | Držák startéru ve svítidlech jiných než třídy II | | N |
| | Držák startéru konstrukční třídy II | | N |
| 3.6 (4.6) | Svorkovnice | | N |
| | Koncovky | | N |
| | Nezajištěné části | | N |
| 3.6 (4.7) | Svorky a přívody | | N |
| 3.6 (4.7.1) | Styk s kovovými částmi | | N |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| 3.6 (4.7.2) | Zkouška 8 mm vodiče pod napětím | | N |
| | Zkouška uzemňovacího vodiče 8 mm | | N |
| 3.6 (4.7.3) | Svorky pro přívodní vodiče | | N |
| 3.6 (4.7.4) | Svorky jiné než pro připojení přívodních vodičů | | N |
| 3.6 (4.7.5) | Tepelně odolné vodiče / rukávy | | P |
| 3.6 (4.7.6) | Vícepólová zástrčka | | N |
| 3.6 (4.8) | Spínače | | N |
| | - Odpovídající jmenovitá hodnota | Žádný spínač | N |
| | - Odpovídající upevnění | | N |
| | - Polarizovaný přívod | | N |
| 3.6 (4.9) | Izolační obložení a dutinky | | P |
| 3.6 (4.9.1) | Udržení | | P |
| | Způsob upevnění.....: | | P |
| 3.6 (4.9.2) | Izolační obložení a pouzdra | | P |
| | a) a) a c) Izolační odpor a elektrická pevnost | | P |
| | b) b) Zkouška stárnutí. Teplota (°C).....: | | P |
| 3.6 (4.10) | Izolace svítidel třídy II | | |
| 3.6 (4.10.1) | Bez dotyku, montážní povrch - přístupné kovové části - zapojení základních svítidel | | P |
| | Bezpečná instalace pevných svítidel | | P |
| | Kondenzátory | | N |
| | Kondenzátory pro odrušení podle IEC 60384-14 | Žádný takový kondenzátor | N |
| 3.6 (4.10.2) | Montážní mezery | | |
| | - - Žádné náhodné | | N |
| | - - Žádný přímý přístup se zkušební sondou | | N |
| 3.6 (4.10.3) | Zachování izolace | | |
| | - - pevná | | P |
| | - - nelze vyměnit; svítidlo nefunkční | | P |
| | - - objímky zachovány na svých místech | | P |
| | - - obložení v objímce | | P |
| 3.6 (4.11) | Elektrické připojení | | |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| 3.6 (4.11.1) | Kontaktní tlak | Nepřenáší se přes izolační materiál | P |
| 3.6 (4.11.2) | Šrouby | | P |
| | - - samořezné šrouby | | P |
| | - - závitotvorné šrouby | | N |
| | - - nejméně dva samořezné šrouby | | N |
| 3.6 (4.11.3) | Zajištění šroubů | | P |
| | - - pružná podložka | | P |
| | - - nýty | | P |
| 3.6 (4.11.4) | Materiál proudovodných částí | Použitý měděný vodič | P |
| 3.6 (4.11.5) | Žádný kontakt se dřevem | Žádný dřevěný materiál ve svítidle | P |
| 3.6 (4.11.6) | Elektromechanické kontaktní systémy | Žádné takové systémy | N |
| 3.6 (4.12) | Mechanické spoje a vývodky | | P |
| 3.6 (4.12.1) | Šrouby, které nejsou vyrobeny z měkkého kovu | | P |
| | Šrouby z izolačního materiálu | | N |
| | Zkouška krouticího momentu: krouticí moment (Nm); část.....: | | P |
| | Zkouška krouticího momentu: krouticí moment (Nm); část.....: | | N |
| | Zkouška točivého momentu: točivý moment (Nm); část.....: | | N |
| 3.6 (4.12.2) | Šrouby o průměru < 3 mm šroubované do kovu | | N |
| 3.6 (4.12.4) | Uzamčené spoje: | | N |
| | - - pevná ramena; krouticí moment (Nm).....: | | N |
| | - - držák lampy; krouticí moment (Nm).....: | | N |
| | - - Tlačítkové spínače; krouticí moment 0,8 Nm.....: | | N |
| 3.6 (4.12.5) | Šroubové vývodky; síla (N).....: | | N |
| 3.6 (4.13) | Mechanická pevnost | | P |
| 3.6 (4.13.1) | Zkouška nárazem: | | P |
| | - - křehké části; energie (Nm).....: | 0,5 Nm | P |
| | - - ostatní díly; energie (Nm).....: | Kryt : 0,70 Nm | P |

| | | | |
|---|---|---|---|
| | 1) 1) živé části | Bez přístupu | P |
| | 2) 2) obložení | Není narušen | P |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | 3) 1) ochrana | Nadále poskytuje stupeň ochrany proti vniknutí prachu, pevných předmětů a vlhkosti | P |
| | 4) 4) kryty | Žádné porušení | P |
| 3.6 (4.13.3) | Rovný zkušební prst | Nelze se dotknout živou částí s 30 N | P |
| 3.6 (4.13.4) | Svítidla pro hrubý provoz | | N |
| | a) a) pevná | Obyčejné svítidlo | N |
| | b) b) ruční | | N |
| | c) c) dodávaná se stojanem | | N |
| | d) d) pro dočasné instalace a vhodné pro montáž na stojan | | N |
| 3.6 (4.13.6) | Točící se hlaveň | | N |
| 3.6 (4.14) | Závěsná a nastavovací zařízení | | N |
| 3.6 (4.14.1) | Mechanické zatížení: | | N |
| | a) a) čtyřnásobek hmotnosti | Nezávěsné svítidlo | N |
| | b) b) točivý moment 2,5 Nm | | N |
| | c) c) rameno konzoly; ohybový moment (Nm).....: | | N |
| | d) d) zatížení kolejnice - namontovaná svítidla | | N |
| | e) e) svítidla namontovaná na klip, skleněná police. Tloušťka (mm).....: | | N |
| | Kovová tyč. Průměr (mm).....: | | N |
| 3.6 (4.14.2) | Zátěž na flexibe kabely | | N |
| | Hmotnost (kg).....: | Není zavěšeno na ohebných kabelech | N |
| | Napětí ve vodiči (N/mm2).....: | | N |

| | | | |
|---|---|---|---|
| | Polosvítidla - hmotnost (kg) | | N |
| | Polosvítidla - ohybový moment (Nm)...: | | N |
| 3.6 (4.14.3) | Nastavovací zařízení: | | N |
| | - - Zkouška ohybem; počet cyklů.....: | Žádné nastavovací zařízení | N |
| | - přetržená vlákna | | N |
| | - následná zkouška elektrické pevnosti | | N |
| 3.6 (4.14.4) | Teleskopické trubky: šňůry nejsou připevněny k trubce; nedochází k namáhání vodičů | Žádné teleskopické trubice | N |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| 3.6 (4.14.5) | Příručka pulleAno | Bez příručky pulleAno | N |
| 3.6 (4.14.6) | namáhání zásuvek | | N |
| 3.6 (4.15) | Hořlavé materiály: | | P |
| | - - Zkouška žhavým drátem 650 °C | | P |
| | - - rozteč ≥ 30 mm | | N |
| | - - zkouška odolnosti stínění podle 13.3.1 | | N |
| | - - rozměry stínění | | N |
| | - - žádný prudce hořící materiál | | N |
| | - - tepelná ochrana | | N |
| | - - elektronické obvody vyjmuty | | N |
| 3.6 (4.15.2) | Svítidla z termoplastického materiálu s ovládacím zařízením světelného zdroje | | P |
| | a) a) konstrukce | | P |
| | b) b) ovládání pomocí teplotního čidla | | N |
| | c) c) povrchová teplota | | P |
| 3.6 (4.16) | Svítidla označená symbolem F | | N |
| | Bez ovládacího zařízení svítidla | (dodržení oddílu 12) | P |
| 3.6 (4.16.1) | Rozteč ovládacího zařízení světelného zdroje: | | P |
| | - - Rozteč 35 mm | | N |
| | - - rozteč 10 mm | | N |
| 3.6 (4.16.2) | Tepelná ochrana | | N |
| | - - v ovládacím zařízení světlometu | | N |
| | - - vnější | | N |
| | - - pevná poloha | | N |

| | | | |
|---|---|---|---|
| | - - ovládací zařízení světlometu označené teplotou | | N |
| 3.6 (4.16.3) | změřená křivka "F" | (viz 12.6) | N |
| 3.6 (4.17) | Vypouštěcí otvory | | N |
| | Vůle nejméně 5 mm | | N |
| 3.6 (4.18) | Odolnost proti korozi: | | P |
| 3.6 (4.18.1) | - odolnost proti korozi | | P |
| 3.6 (4.18.2) | - sezónní praskání v mědi | | P |
| 3.6 (4.18.3) | - koroze hliníku | | P |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| 3.6 (4.19) | Spouštěče kompatibilní s předřadníkem | | N |
| 3.6 (4.20) | Hrubé provozní vibrace.....: | Běžné provozní svítidlo | N |
| 3.6 (4.21) | Ochranný štít: | | N |
| 3.6 (4.21.1) | Namontovaný štít | | N |
| 3.6 (4.21.2) | Částice z rozbíjejícího se svítidla nenarušují bezpečnost | | N |
| 3.6 (4.21.3) | Žádná přímá cesta | | N |
| 3.6 (4.21.4) | Zkouška nárazem do štítu | | N |
| | Zkouška žhavicím drátem v prostoru svítilny | | N |
| 3.6 (4.22) | Připojení ke svítilnám | Žádné připojení | N |
| 3.6 (4.23) | Polosvítidla odpovídají třídě II | | N |
| 3.6 (4.24) | UV záření | | N |
| 3.6 (4.25) | Žádný ostrý rohů nebo hrany | Bez ostrich rohů/hran | P |
| 3.6 (4.26) | Ochrana proti zkratu: | | N |
| 3.6 (4.26.1) | Neizolované přístupné části SELV | | N |
| 3.6 (4.26.2) | Zkouška zkratu | | N |
| 3.6 (4.26.3) | Zkušební řetězec podle IEC 61032 | | N |

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|---|---|---|---|
| 3.7 (11) | PLAZIVÉ VZDÁLENOSTI A VOLNÉ PROSTORY | | P |
| | Pracovní napětí (V).....: | 230V | - |
| | Průběh napětí | Sinusový | - |
| | PTI | <600 | - |
| | Jmenovité impulzní napětí (kV).....: | -- | - |

| | | | |
|---|---|---|---|
| | (1) (1) Proudové části různé polarity: cr (mm); cl (mm).....: | Cr>2,5mm, Cl>1,5mm | P |
| | (2) Spouštěče kompatibilní s předřadníkem | Cr>5mm, Cl>3mm | P |
| | (3) Hrubé provozní vibrace.....: | | N |
| | (4) Ochranný štít: | | N |
| | (5) Namontovaný štít | | N |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | (6) Proudové části a nosná plocha: cr (mm); cl (mm).....: | Cr>5mm, Cl>3mm | P |

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|---|---|---|---|
| 3.8(7) | OPATŘENÍ PRO UZEMNĚNÍ | | N |
| 3.8(7.2.1 +7.2.3) | Přístupné kovové části | | N |
| | Kovové části ve styku s nosnou plochou | | N |
| | Odpor < 0,5 Ω | | N |
| | Použití dvou samořezných šroubů | | N |
| | Závitotvorné šrouby | | N |
| | Uzemnění konektoru jako první | | N |
| 3.8.1(-) | Upevnění pevných částí termiálů se nesmí při sejmutí upnuté části otáčet. | | N |
| 3.8 (7.2.2 + 7.2.3) | Spojitost uzemnění ve spojích apod. | | N |
| 3.8 (7.2.4) | Zajištění upínacích prostředků | | N |
| | Soulad s 4.7.3 | | N |
| 3.8 (7.2.5) | Uzemňovací svorka je nedílnou součástí zásuvky konektoru | | N |
| 3.8 (7.2.6) | Zemnicí svorka přiléhající k síťovým svorkám | | N |
| 3.8 (7.2.7) | Elektrolytická koroze zemnicí svorky | | N |
| 3.8 (7.2.8) | Materiál zemnicí svorky | | N |
| | Kontaktní plocha holý kov | | N |
| 3.8 (7.2.10) | Svítidlo třídy II pro smyčkování - v | | N |
| 3.8 (7.2.11) | Uzemňovací jádro zbarvené zeleně - žlutě | | N |
| | Délka zemnicího vodiče | | N |

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|---|---|---|---|
| 3.9 (14) | TERMINÁLY | | N |
| | Samostatně schválené; seznam součástí | | N |

| | | | |
|---|---|---|---|
| | TERMINÁLY | | N |
| (-) | Samostatně schválené; seznam součástí | | |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | TERMINÁLY | | N |

| | | | |
|---|---|---|---|
| 3.9 (15) | Součást svítidla | | N |
| | Plocha průřezu vedení pro koncovky pro připojení napájení musí odpovídat tabulce 14.1 normy IEC 60598-1. | | N |
| | Vyloučení přívodního kabelu | | N |

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|---|---|---|---|
| 3.10 (5) | TERMINÁLY | | P |
| 3.10.1 (-) | Samostatně schválené; seznam součástí | | N |
| | Součást svítidla | | N |
| | | | N |
| 3.10 (5.2) | VNĚJŠÍ A VNITŘNÍ VEDENÍ | | P |
| 3.10 (5.2.1) | Upevnění kabelu | | P |
| 3.10 (5.2.2) | Zkušební | | P |
| | Montáž ve výšce větší než 20 m a hmotnost větší než 4 kg | | N |
| 3.10 (5.2.3) | Přípojka napájení a vnější kabeláž | Typ připojení Y | P |
| 3.10 (5.2.5) | Prostředky připojení.....: | | N |
| 3.10 (5.2.6) | Typ kabelu.....: | | P |
| | - Jmenovitý průřez (mm2).....: | | P |
| | - Typ upevnění, X, Y nebo Z | | P |
| 3.10 (5.2.7) | Typ Z není připojen ke šroubům | | P |
| 1.10 (5.2.8) | Kabelové přívody: | | N |
| | - - Vhodné pro zavedení | | N |
| | - - Dostatečný stupeň ochrany | | N |
| | - Kabelové vstupy přes pevný materiál mají zaoblené hrany | | N |
| 3.10 (5.2.9) | Izolační průchodky: | | N |
| 3.10 (5.2.10) | - Vhodně upevněné | | N |
| | - - Materiál v průchodkách | | N |
| | - - Trubky nebo kryty z izolačního materiálu | | N |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | - - Žádné mechanické nebo tepelné namáhání | | N |
| | - - Žádné vázání kabelů do uzlů apod. | | N |
| | - - Izolační materiál nebo obložení | | N |
| 3.10 (5.2.10.1) | Ukotvení kabelů pro upevnění typu X: | | N |
| | a) a) Alespoň jedna část je pevná | | N |
| | b) b) Typy kabelů | | N |
| | c) c) Žádné poškození kabelu | | N |
| | d) d) Lze upevnit celý kabel | | N |
| | e) e) Žádný dotyk upínacích šroubů | | N |
| | f) f) Kovový šroub není přímo na kabelu | | N |
| | g) g) Výměna bez speciálního nástroje | | N |
| | Vývodky, které se nepoužívají jako kotevní prvky | | N |
| | Labyrintové kotevní úchyty | | N |
| 3.10 (5.2.10.2) | Dostatečné ukotvení šňůr pro upevnění typu Y a typu Z | | P |
| 3.10 (5.2.10.3) | Zkoušky: | | N |
| | - - Nemožnost zatlačit kabel; nebezpečné | | N |
| | - - Zkouška tahem: 25krát; tah (N).....: | | N |
| | - - Zkouška točivého momentu: točivý moment (Nm).....: | | N |
| | - - Posunutí ≤ 2 mm | | N |
| | - - Žádný pohyb vodiče | | N |
| | - - Žádné poškození kabelu nebo šňůry | | N |
| 3.10 (5.2.11) | Vnější vedení procházející do svítidla | | N |
| 3.10 (5.2.12) | Smyčka - ve svorkách | | N |
| 3.10 (5.2.13) | Konce vodičů nejsou pocínované | | N |
| | Konce vodičů pocínované: žádný tok za studena | | N |

| | | | |
|---|---|---|---|
| 3.10 (5.2.14) | Síťová zástrčka se stejnou ochranou | | N |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | Zástrčka svítidla třídy III | | N |
| 3.10 (5.2.15) | Barevné označení nízkého napětí | | N |
| 3.10 (5.2.16) | Přívody pro spotřebiče (IEC 60320) | | N |
| | Spotřebičové zásuvky třídy II | | N |
| 3.10 (5.3) | Vnitřní zapojení | | P |
| 3.10 (5.3.1) | Vnitřní elektroinstalace vhodné velikosti a typu | | P |
| | Přestože je elektroinstalace | | P |
| | - - Nedodává se/montážní návod | | P |
| | - - Montáž z výroby | | P |
| | - - Zatížená zásuvka (A).....: | | N |
| | - - Teploty.....: | | P |
| | Zelená - žlutá pouze pro uzemnění | | N |
| 3.10 (5.3.1.1) | Vnitřní vedení připojené přímo k pevnému vedení | | P |
| | Průřez (mm2).....: | | P |
| | Tloušťka izolace | | P |
| | V případě potřeby se přidá dodatečná izolace | | N |
| 3.10 (5.3.1.2) | Vnitřní vedení připojené k pevnému vedení přes vnitřní proudový chránič | | N |
| | Dostatečná plocha průřezu a tloušťka izolace | | N |
| 3.10 (5.2.1.3) | Dvojitá nebo zesílená izolace pro třídu II | | P |
| 3.10 (5.2.1.4) | Vodiče bez izolace | | N |
| 3.10 (5.2.1.5) | Proudotěsné části SELV | | N |
| 3.10 (5.2.1.6) | Tloušťka izolace jiná než PVC nebo pryž | | N |

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|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |

| | | | |
|---|---|---|---|
| 3.10 (5.3.2) | Ostré hrany atd. | Vnitřní drát se nesmí dotýkat ostrých hran, nýtů a podobných součástí. | P |
| | Žádné pohyblivé části spínačů apod. | Nejsou použity žádné pohyblivé části | N |
| | Klouby, zvedací/spouštěcí zařízení | Žádná taková zařízení | N |
| | Teleskopické trubky atd. | Žádné teleskopické trubky apod. | N |
| | Žádné otáčení o více než 360° | | P |
| 3.10 (5.3.3) | Otvory | Žádné otvory | N |
| | Neodnímatelná pouzdra | | N |
| | Pouzdra v ostrých otvorech | | N |
| | Kabely s ochranným pláštěm | | N |
| 3.10 (5.3.4) | Spoje a spoje účinně izolované | Žádné spoje a klouby | N |
| 3.10 (5.3.5) | Namáhání vnitřních vodičů | | N |
| 3.10 (5.3.6) | Nosiče vodičů | Zařízení je pevné svítidlo | N |
| 3.10 (5.3.7) | Konce vodičů nejsou pocínované | Vnitřní drát se nesmí dotýkat ostrých hran, nýtů a podobných součástí. | N |
| | Konce vodičů pocínované: bez proudění za studena | Nejsou použity žádné pohyblivé části | N |

| | | | |
|---|---|---|---|
| 3.11 (8) | OCHRANA PŘED ÚRAZEM ELEKTRICKÝM PROUDEM | | P |
| 3.11 (8.2.1) | nepřístupné části pod napětím | Žádný přístup k živé části při běžném používání | P |
| | Ochrana v jakékoli poloze | | P |
| | Oboustranná žárovka s wolframovým vláknem | | N |
| | Izolační lak není spolehlivý | Žádný izolační lak a podobné materiály jako ochrana před úrazem elektrickým proudem | N |
| | Oboustranná vysokotlaká výbojka | | N |

| | | | |
|---|---|---|---|
| 3.11 (8.2.2) | Přenosné svítidlo nastavené do nejnepříznivější polohy | Pevné svítidlo | N |
| 3.11 (8.2.3) | Svítidlo třídy II: | Žádný přístup k živé části při běžném používání | N |
| | - Základní izolované kovové části nepřístupné při startování nebo výměně svítidla | | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | - - Základní izolace není přístupná jinak než při výměně startéru nebo žárovky. | | N |
| | - - Skleněné ochranné štíty nejsou součástí doplňkové izolace | | N |
| | Svítidlo třídy I s objímkou BC | | N |
| 3.11 (8.2.4) | Přenosné svítidlo: | | N |
| | - - Ochrana nezávislá na nosném povrchu | | N |
| | - - Svorkovnice zcela zakrytá | | N |
| 3.11 (8.2.6) | Kryty spolehlivě zajištěné | | N |
| 3.11 (8.2.7) | Vybíjení kondenzátorů ≥ 0,5 µF | | N |
| | Přenosné svítidlo připojené zástrčkou s kondenzátorem | | N |
| | Ostatní svítidla připojená zástrčkou s kondenzátorem | | N |
| | Vybíjecí zařízení na kondenzátoru nebo uvnitř kondenzátoru | | N |
| | Vybíjecí zařízení namontované samostatně | | N |

| | | | |
|---|---|---|---|
| 3.12 (12) | ZKOUŠKA ODOLNOSTI A TEPELNÁ ZKOUŠKA | | P |
| 3.12.1 (-) | Mezní hodnota se odečte 10 °C tabulky oddílu 12 normy IEC 60598-1. | | P |
| | Zkušební prostředí při ta+ 5°C pro venkovní použití | | P |
| 3.12.2 (-) | IP větší než IP20 | | P |
| 3.12 (12.3) | Test odolnosti: | | P |
| | - Montážní - pozice.....: | Běžná pozice | - |
| | - Zkušební teplota (°C).....: | 35°C | - |

| | | | |
|---|---|---|---|
| | - Celková doba trvání (h).....: | 168h | - |
| | - Napájecí napětí: Un faktor; vypočtené napětí (V).....: | 253V | - |
| | - Použitá lampa.....: | | - |
| 3.12 (12.3.2) | Po vytrvalostním testu: | | P |
| | -žádná část není nepoužitelná | | P |
| | -svítidlo není nebezpečné | | P |
| | -žádné poškození kolejového systému | Bez kolejového systému | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | -Čitelné značení | Značení je stále čitelné a není zvlněné | P |
| | -žádné praskliny, deformace atd. | | P |
| 3.12 (12.4) | Tepelná zkouška (běžný provoz) | (viz příloha 2) | P |
| 3.12 (12.5) | Tepelná zkouška (abnormální provoz) | (viz příloha 2) | N |
| 3.12 (12.6) | Tepelná zkouška (stav selhání ovládacího zařízení svítilny): | | N |
| 3.12 (12.6.1) | -případ abnormálních podmínek.....: | | N |
| | -elektronická řídicí jednotka světlometu | | N |
| | -měřená teplota vinutí (°C) při 1,1 Un.....: | | - |
| | -měřená teplota montážního povrchu (°C) při 1,1 Un.....: | | N |
| | -vypočtená teplota montážního povrchu (°C).....: | | N |
| | -svítidla montovaná na kolejnici | | N |
| 3.12 (12.6.2) | Řízení se snímáním teploty | | N |
| | -případ abnormálních podmínek.....: | Žádná regulace snímání teploty | - |
| | -teplotní článek | | N |
| | -ruční resetování vypínače | | N |
| | -automatické resetování vypínače | | N |
| | -měřená teplota montážního povrchu (°C): | | N |
| | -svítidla montovaná na lištu | | N |
| 3.12 (12.7) | Teplotní zkouška (selhání ovládacího zařízení světelného zdroje v plastových svítidlech): | | N |
| | -případ abnormálních podmínek.....: | | - |

| | | | |
|---|---|---|---|
| 3.12 (12.7.1) | -měřená teplota vinutí (°C) při 1,1 Un.....: | | - |
| | -měřená teplota upevňovacího bodu / exponované části (°C) při 1,1 Un.....: | | N |
| | -vypočítaná teplota upevňovacího bodu / exponované části (°C) při 1,1 Un.....: | | N |
| 3.12 (12.7.2) | Řízení snímání teploty | | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | -tepelné propojení | | N |
| | -ruční resetování vypínače | | N |
| | -automatické resetování vypínače | | N |
| | -naměřená teplota upevňovacího bodu/exponované části (°C) .....: | | N |

| | | | |
|---|---|---|---|
| 3.13(9) | RESISTANCE TO DUST, SOLID OBJECTS AND MOISTURE | | P |
| 3.13.1(-) | Zkoušky na vniknutí prachu, pevných předmětů a vlhkosti: | | P |
| 3.13 (9.2) | Zkoušky vniknutí prachu, pevných předmětů a vlhkosti: | | P |
| | -klasifikace podle IP.....: | IP X5 | - |
| | -montážní polohy při zkoušce.....: | | - |
| | -utažení upevňovacích šroubů; krouticí moment (Nm).....: | | - |
| | -zkouška podle bodů.....: | | - |
| | -zkouška elektrické pevnosti po | | P |
| | a) žádné usazeniny v prachotěsném svítidle | | P |
| | b) žádný mastek v prachotěsném svítidle | | P |
| | c)žádné stopy vody na částech, kterými prochází proud, nebo na místech, kde by se mohla stát nebezpečnou | | P |
| | d)i)u svítidel bez vypouštěcích otvorů - žádný průnik vody | | P |
| | d)ii)u svítidel s vypouštěcími otvory - bez nebezpečného vniknutí vody | | N |
| | e)bez přístupu vody do vodotěsného svítidla | | P |
| | f)žádný kontakt s živými částmi (IP 2X) | | N |
| | f)žádný vstup do krytu (IP 3X a IP 4X). | | N |

| | | | |
|---|---|---|---|
| 3.13 (9.3) | Zkouška vlhkosti 48 h | R.H.:93% T:25°C | P |

| | | |
|---|---|---|
| 3.14 (10) | IZOLAČNÍ ODPOR A ELEKTRICKÁ PEVNOST | P |
| 3.14 (10.2.1) | Zkouška izolačního odporu | P |
| | Izolační odpor (MΩ): | P |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | SELV | | N |
| | -mezi částmi nesoucími proud různé polarity.....: | | N |
| | -mezi proudovodnými částmi a montážním povrchem.....: | | N |
| | -mezi proudovodnými částmi a kovovými částmi svítidla.....: | | N |
| | Jiné než SELV: | | P |
| | -mezi živými částmi různé polarity.....: | >100 MΩ | P |
| | -mezi živými částmi a montážním povrchem.: | >100 MΩ | P |
| | -mezi živými částmi a krytem.....: | >100 MΩ | P |
| | -mezi živými částmi různé polarity působením spínače.....: | | N |
| 3.14 (10.2.2) | Zkouška elektrické pevnosti | | P |
| | Atrapa svítidla | | N |
| | Svítidla se zapalovači po 24hodinové zkoušce | | N |
| | Svítidla s ručními zapalovači | | N |
| | Zkušební napětí (V): | | P |
| | SELV: | | N |
| | -mezi částmi s různou polaritou proudu.....: | | N |
| | -mezi proudovodnými částmi a montážním povrchem.....: | | N |
| | -mezi částmi, kterými protéká proud, a kovovými částmi svítidla.....: | | N |
| | Jiné než SELV: | | P |
| | -mezi živými částmi různé polarity.....: | 1460V | P |
| | -mezi živými částmi a montážním povrchem.: | 2920V | P |
| | -mezi živými částmi a krytem.....: | 2920V | P |

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|---|---|---|---|
| | -mezi živými částmi různé polarity působením spínače.....: | | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| 3.14 (10.3.1) | Svodový proud (mA).....: | 0.266 mA < 0.7 mA | P |

| | | | |
|---|---|---|---|
| 3.15 (13) | ODOLNOST PROTI TEPLU, OHNI A SLEDOVÁNÍ | | P |
| 3.15 (13.2.1) | Zkouška tlakem kuličky: | | P |
| | -testovaná část; teplota (°C).....: | PCB: 125°C | P |
| | -testovaná část; teplota (°C).....: | Cívka: 125°C | P |
| 3.15 (13.3.1) | Zkouška plamenem jehly (10 s): | | P |
| | -část testována.....: | Doba hoření nesmí překročit 30 s po odstranění zkušebního plamene a žádná kapka hoření nesmí zapálit hedvábný papír. | P |
| | -část testována.....: | Doba hoření nesmí překročit 30 s po odstranění zkušebního plamene a žádná hořící kapka nesmí zapálit hedvábný papír. | P |
| 3.15 (13.3.2) | Zkouška žhavicím drátem (650 °C) | | P |
| | -testovaná část ..... .....: | PCB | P |
| | -testovaná část ..... .....: | Cívka | P |
| 3.15 (13.4.1) | Kontrolní test: testovaná část.....: | | N |
| | | | |
| | BĚŽNÉ ÚPRAVY | | N |
| (3.3.101+ 5.2.1) | Pro svítidla připojená pomocí koncovek, informace o svorkovnici | | N |

| | | | |
|---|---|---|---|
| (5.2.2) | Kabely odpovídající HD 21 S2 nebo HD 22 S2 | | N |

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|---|---|---|
| ZB | PŘÍLOHA ZB, ZVLÁŠTNÍ VNITROSTÁTNÍ PODMÍNKY | N |
| (2.2) | Třída 0 není akceptovatelná | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| (3.3) | DK: napájecí kabel se štítkem | | N |
| | IT: výstražný štítek na svítidle třídy 0 | | N |
| (4.5.1) | DK: zásuvky | | N |
| (4.5.1) | FR: zásuvky | | N |
| (5.2.1) | DK, FI, SE, GB: typ zástrčky | | N |

| | | | | | |
|---|---|---|---|---|---|
| ZC | PŘÍLOHA ZC, NÁRODNÍ ODCHYLKY | | | | |
| (13.3) | DK: Zkouška jehlovým plamenem nebo zkouška žhavým drátem 750 °C pro svítidla v přístupových cestách | | | | N |
| (13.3) | GB: Požadavky podle stavebních předpisů Spojeného království | | | | N |
| (13.3.2) | FR: Zkouška žhavicím drátem 850 °C alt. 750°C pro svítidla v prostorách přístupných veřejnosti a pracovníkům. | | | | N |
| | PŘÍLOHA 1: součásti | | | | |
| Objekt/ díl č. | Výrobce/ Obchodní značka | Typ/model | Technické údaje | Norma | Značka(y) shody |
| Interní vodič | Různé | Různé | 105°C | -- | UL |
| PCB | Různé | Různé | 130°C | -- | UL |
| | PŘÍLOHA 2: měření teploty, tepelné zkoušky oddílu 12 | | | | P |
| | Referenční typ.....: | | DR-30W | | - |
| | Použitá lampa.....: | | 30W | | - |
| | Použité ovládací zařízení světla.....: | | | | - |
| | Montážní poloha svítidla.....: | | Běžná poloha | | - |
| | Příkon (W).....: | | | | - |
| | Napájecí proud (A).....: | | | | - |
| | Vypočtený účiník.....: | | | | - |
| | Tabulka: naměřené teploty korigované na ta = 25 °C | | | | - |
| | -normální provozní režim.....: | | Bez abnormálního provozu | | - |

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|---|---|---|---|
| | -test 1: jmenovité napětí.....: | -- | - |
| | -test 2: 1,06násobek jmenovitého výkonu nebo 1,05násobek jmenovitého výkonu.....: | 243.8V | - |
| | -test 3: Zatížení vedení do zásuvky, 1,06násobek napětí nebo 1,05násobek příkonu.....: | -- | - |

| EN 60598-1 & EN 60598-2-3 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Cl. | Požadavek – Test | | | | Výsledek | | Verdikt |
| | -test 4: 1,1násobek jmenovitého napětí nebo 1,05násobek jmenovitého příkonu.....: | | | | -- | | - |
| Teplota (°C) části | | Bod 12.4 - normální | | | Bod 12.5 - abnormální | | |
| | | Test 1 | Test 2 | Test 3 | Limits | Test 4 | Limit |
| Vnitřní vodiče | | | 50.3 | | 105 | | |
| PCB | | | 60.4 | | 130 | | |
| Vnější kryt | | | 32.6 | | 90 | | |
| Okolí | | | 23.7 | | -- | | |
| | | | | | | | |
| | PŘÍLOHA 3: šroubové svorky (součást svítidla) | | | | | | P |
| (14) | ŠROUBOVÉ SVORKY | | | | | | - |
| (14.2) | Typ terminálu.....: | | | | | | - |
| | Jmenovitý proud (A).....: | | | | | | - |
| (14.3.2.1) | Jeden nebo více vodičů | | | | | | N |
| (14.3.2.2) | Speciální příprava | | | | | | N |
| (14.3.2.3) | Velikost terminálu | | | | | | N |
| | Plocha průřezu (mm2).....: | | | | | | N |
| (14.3.3) | Prostor pro vodiče (mm).....: | | | | | | N |
| (14.4) | Mechanické zkoušky | | | | | | N |
| (14.4.1) | Minimální vzdálenost | | | | | | N |
| (14.4.2) | Nelze vyklouznout | | | | | | N |
| (14.4.3) | Speciální příprava | | | | | | N |
| (14.4.4) | Jmenovitý průměr závitu (metrický závit ISO).: | | | | | | N |
| | Vnější zapojení | | | | | | N |
| | Žádný měkký kov | | | | | | N |
| (14.4.5) | Koroze | | | | | | N |
| (14.4.6) | Jmenovitý průměr závitu (mm).....: | | | | | | N |
| | Točivý moment (Nm).....: | | | | | | N |
| (14.4.7) | Mezi kovovými povrchy | | | | | | N |
| | Vývodová svorka | | | | | | N |
| | Terminál pláště | | | | | | N |

| EN 60598-1 & EN 60598-2-3 | | | |
|---|---|---|---|
| Cl. | Požadavek – Test | Výsledek | Verdikt |
| | Zkouška tahem; tah (N).....: | | N |
| 14.4.8) | Bez nežádoucího poškození | | N |

| | | | |
|---|---|---|---|
| | PŘÍLOHA 4: BEZŠROUBOVÉ SVORKY (SOUČÁST SVÍTIDLA) | | N |
| (15) | BEZŠROUBOVÉ SVORKY | | N |
| (15.2) | Typ svorky.....: | | - |
| | Jmenovitý proud (A).....: | | - |
| (15.3.1) | Materiál | | N |
| (15.3.2) | Svorka | | N |
| (15.3.3) | Zarážka | | N |
| (15.3.4) | Nepřipravené vodiče | | N |
| (15.3.5) | Tlak na izolační materiál | | N |
| (15.3.6) | Jasný způsob připojení | | N |
| (15.3.7) | Samostatné upínání | | N |
| (15.3.8) | Pevně na místě | | N |
| (15.3.10) | Velikost vodiče | | N |
| | Typ vodiče | | N |
| (15.5.1) | Svorky vnitřní zapojení | | N |
| (15.5.1.1) | Svorky s tažnou zkušební pružinou (4N, 4 vzorky) | | N |
| (15.5.1.2) | Zkušební svorky s kolíkem nebo jazýčkem (4N, 4 vzorky) | | N |
| | Zasouvací síla nepřesahující 50 N | | N |
| (15.5.2) | Trvalé spoje: zkouška vytažením (20 N) | | N |
| (15.6) | Elektrické zkoušky | | N |
| | Pokles napětí (mV) po 1 hodině (4 vzorky).....: | | N |
| | Úbytek napětí na dvou neoddělitelných spojích (M95) | | N |
| | Počet cyklů.....: | | - |
| | Úbytek napětí (mV) po 10. alt. 25. cyklu (4 vzorky).....: | | N |
| | Pokles napětí (mV) po 50. alt. 100. cyklu (4 vzorky).....: | | N |
| | Po stárnutí, pokles napětí (mV) po 10. alt. 25. cyklu (4vzorky).....: | | N |

| EN 60598-1 & EN 60598-2-3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Cl. | Požadavek – Test | | | | | | Výsledek | | Verdikt | |
| | Po zestárnutí, pokles napětí (mV) po 50. alt. 100. cyklu (4 vzorky).....: | | | | | | | | N | |
| (15.7) | Vnější zapojení svorek | | | | | | | | N | |
| | Velikost a jmenovitá hodnota svorky | | | | | | | | N | |
| (15.8.1) | Zkouška tahem pružinové svorky (4 vzorky); tah (N) | | | | | | | | N | |
| | Zkouška kolíkem nebo jazýčkem (4 vzorky); tah (N) | | | | | | | | N | |
| (15.9) | Zkouška kontaktního odporu | | | | | | | | N | |
| | Pokles napětí (mV) po 1 h | | | | | | | | N | |
| Terminal | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Pokles napětí (mV) | | | | | | | | | | |
| | Úbytek napětí dvou neoddělitelných spojů | | | | | | | | | |
| | Úbytek napětí po 10. alt. 25. cyklu | | | | | | | | | |
| | Maximální povolený úbytek napětí (mV).....: | | | | | | | | - | |
| Terminal | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Pokles napětí (mV) | | | | | | | | | | |
| | Pokles napětí po 50. alt. 100. cyklu | | | | | | | | | |
| | Maximální povolený pokles napětí (mV).....: | | | | | | | | - | |
| Terminal | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Pokles napětí (mV) | | | | | | | | | | |
| | Pokračující stárnutí: 25. cyklus: pokles napětí po 10. alt. 25. cyklu | | | | | | | | | |
| | Maximální povolený pokles napětí (mV).....: | | | | | | | | - | |
| Terminal | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Pokles napětí (mV) | | | | | | | | | | |
| | Pokračující stárnutí: Pokles napětí po 50. alt. 100. cyklu | | | | | | | | | |
| | Maximální povolený pokles napětí (mV).....: | | | | | | | | - | |
| Terminal | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Pokles napětí (mV) | | | | | | | | | | |

| Zkušební zařízení | Výrobce | Model | Sériové číslo | Poslední kal. | Datum splatnosti kal. |
|---|---|---|---|---|---|
| EFT Source | EM-TEST | USC 500M6 | 0701-15 | 2012.05.13 | 2014.05.12 |
| Poznámka: Všechny zkoušky byly provedeny s použitím mezinárodně uznávaných norem. Všechny zkušební přístroje byly kalibrovány. | | | | | |

SIGNED BY: Allen Xia
ENGINEER

REVIEWED BY: Liu Xiaoming
REVIEWER

# Lumileds

## IESNA LM-80 Test Report

### 1. Description of LED light sources tested

LUXEON 7070 with nominal CCT of 3000K (L170-308070H360000).

### 2a. Package Pictures

**Figure 1. Picture of the LUXEON 7070.**

### 2b. Average current density per LED die at max. current tested

400.0 mA/mm$^2$

### 2c. Average power density per LED die at max. current tested

1.29 W/mm$^2$

### 2d. Average CRI Ra of LED light sources tested at max. current tested

80.71

### 2e. Minimum die edge to die edge spacing of LED light sources tested

0.26 mm

### 2f. Total Input Power at max. current tested

15.60 W

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## 3a. Projected $L_{70}$ extrapolations per IESNA TM-21-11 for LUXEON 7070 36V

| | If = 200mA | If = 300mA | If = 400mA |
|---|---|---|---|
| Ts = 105°C | 82,816 | 53,350 | - |
| Ts = 85°C | 68,867 | 93,351 | 45,131 |
| Ts = 55°C | -246,815 | -443,591 | 241,174 |

## 3b. Reported $L_{70}$ extrapolations per IESNA TM-21-11 for LUXEON 7070 36V

| | If = 200mA | If = 300mA | If = 400mA |
|---|---|---|---|
| Ts = 105°C | > 36,000 | > 36,000 | - |
| Ts = 85°C | > 36,000 | > 36,000 | > 36,000 |
| Ts = 55°C | > 36,000 | > 36,000 | > 36,000 |

## 4. Applicable LUXEON® Series part number(s)

This Test Report applies to the following LUXEON part numbers:

| Product Family | Part Number | Die Configuration | Equivalent maintenance currents |
|---|---|---|---|
| LUXEON 7070 (36V) | L170-aabb70H36xxxx | 12 die in series, 2 parallel strings | 200mA, 300mA, 400mA |
| LUXEON 7070 (12V) | L170-aabb7012xxxxx | 4 die in series, 6 parallel strings | 600mA, 900mA, 1200mA |

For LUXEON 7070: aa designates nominal ANSI CCT (27=2700K, 30=3000K, 40=4000K, 50=5000K, 57=5700K, 65=6500K), bb designates minimum CRI (70=70CRI, 80=80CRI, 90=90CRI), xxxx and xxxxx designates Lumileds internal code.

## 5. Number of LED light sources reported

24 units.

## 6a. Dates Tests Started

2016/10/17.

## 6b. Dates Tests Ended

2017/7/24.

## 7. Date Report Issued

2021/06/10.

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## 8. Mechanical Drawing

For detailed mechanical drawings, please see the LUXEON 7070 datasheet.

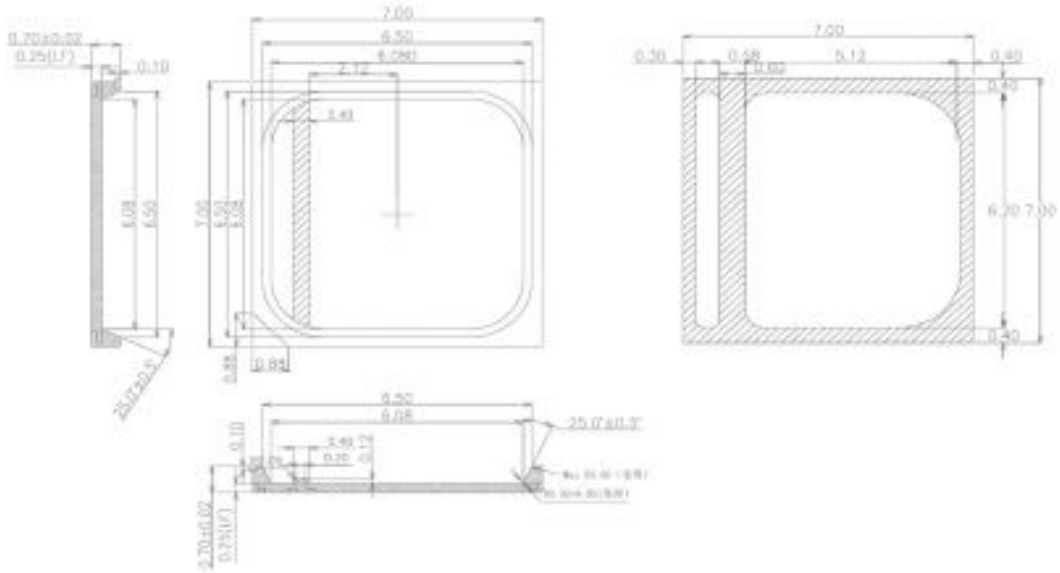

**Figure 2. Mechanical drawings for the LUXEON 7070 (all dimensions in millimeters).**

## 9. $T_s$ Measurement Point

The circular pad in the bottom side of LUXEON 7070 corresponds to the recommended temperature measurement point $T_s$, see Figure 3.

**Figure 3. The recommended $T_s$ point is located in the bottom of LUXEON 7070.**

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## 10. Description of auxiliary equipment

Reliability stress boards are mounted in a thermal chamber which provides liquid N2 cooling and has a controlled air temperature.

## 11. Operating Cycle

LUXEON 7070 LEDs are driven with a constant direct current (DC).

## 12. Ambient conditions including airflow, temperature, and relative humidity

Case temperature (Ts): controlled to within -2°C

Surrounding air temperature: controlled to within -5°C of Ts

Humidity: < 65 RH, No forced air flow.

## 13. Case and ambient temperatures

See Section 3.

## 14. Drive current of the LED light source during lumen maintenance test

See tables.

## 15. Initial luminous flux and forward voltage at photometric measurement current

See tables.

## 16. Lumen maintenance for data for each individual light source along with median value, standard deviation, minimum and maximum lumen maintenance value for all of the light sources

See tables.

## 17. Observation of LED light source failures including the failure conditions and time of failure

No failures observed.

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## 18. LED light source monitoring interval

Units were tested at 0 and every 1000 hours thereafter.

## 19. Photometric measurement uncertainty

Long-term measurement uncertainty is based on reproducibility tests done over a period of one year, calculated to k = 2 coverage (i.e. 95% coverage).

Uncertainty of light output is U=1.59%. Uncertainy of correlated color temperature is U=21K.

## 20. Chromaticity shift reported over the measurement time

See tables.

## 21. Sampling Method/Sample size

LED samples for IESNA LM-80 testing consist of units built from a minimum of three manufacturing lots with each manufacturing lot built from different wafer lots built on non-consecutive days. These manufacturing lots are picked to represent a wide parametric distribution. Each Sample is soldered to all of the reliability stress boards for a given set of IESNA LM-80 tests.

LED sample size is indicated in Section 5 of this report.

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## Notes

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The TM-21 extrapolations are based on the IESNA TM-21-11 technical memorandum. The TM-21 lumen maintenance model is based on the flux data normalized to 1 at 0 hours and the use of an exponential model for flux (time):

Flux(time) = B exp[-alpha*time], where normally B ≅ 1, and alpha > 0.

An L70 extrapolation less than 0 means that the model predicts an increasing flux output with time, i.e. alpha < 0 (see graphs). Generally, this means that additional test time is needed to determine the long-term lumen maintenance behavior.

Customer needs to check for all applicable local rules regarding application of LM-80 reports.

Number of LED light sources tested: 24 units.

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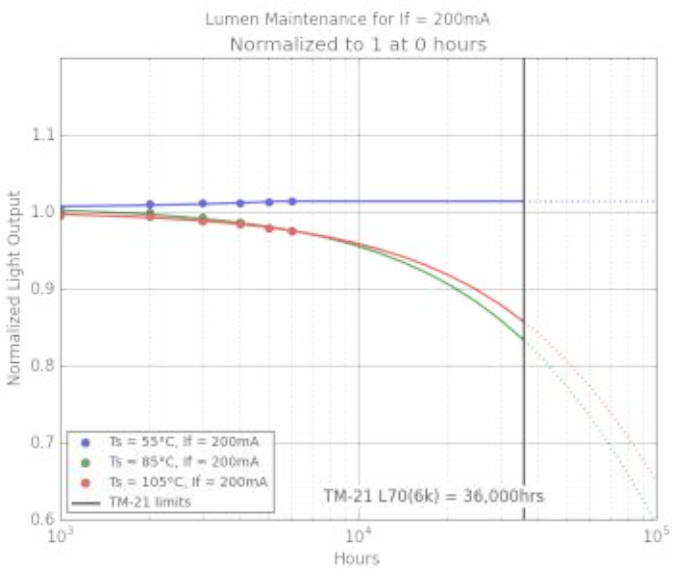
**Normalized Flux Statistics for $I_f$ = 200mA**

| | | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs | alpha | B | L70 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | median = | 1.0000 | 0.9963 | 0.9945 | 0.9902 | 0.9866 | 0.9823 | 0.9789 | | | |
| Ts=Tair=105°C | average = | 1.0000 | 0.9955 | 0.9933 | 0.9878 | 0.9832 | 0.9786 | 0.9754 | 4.3142e-06 | 1.0006 | 82,816 |
| | st dev = | 0.0000 | 0.0078 | 0.0110 | 0.0132 | 0.0143 | 0.0152 | 0.0160 | TM-21 L70(6k) > 36,000hrs | | |
| | min = | 1.0000 | 0.9724 | 0.9603 | 0.9476 | 0.9401 | 0.9320 | 0.9260 | | | |
| | max = | 1.0000 | 1.0072 | 1.0067 | 1.0018 | 0.9972 | 0.9949 | 0.9930 | | | |
| | median = | 1.0000 | 0.9974 | 1.0008 | 0.9952 | 0.9888 | 0.9809 | 0.9775 | | | |
| Ts=Tair=85°C | average = | 1.0000 | 0.9980 | 0.9992 | 0.9928 | 0.9866 | 0.9788 | 0.9750 | 5.2770e-06 | 1.0068 | 68,867 |
| | st dev = | 0.0000 | 0.0057 | 0.0088 | 0.0120 | 0.0144 | 0.0160 | 0.0180 | TM-21 L70(6k) > 36,000hrs | | |
| | min = | 1.0000 | 0.9850 | 0.9762 | 0.9637 | 0.9571 | 0.9497 | 0.9460 | | | |
| | max = | 1.0000 | 1.0079 | 1.0124 | 1.0086 | 1.0038 | 1.0010 | 1.0037 | | | |
| | median = | 1.0000 | 1.0028 | 1.0088 | 1.0106 | 1.0109 | 1.0109 | 1.0126 | | | |
| Ts=Tair=55°C | average = | 1.0000 | 1.0042 | 1.0101 | 1.0118 | 1.0117 | 1.0121 | 1.0134 | -1.4668e-06 | 1.0054 | -246,815 |
| | st dev = | 0.0000 | 0.0028 | 0.0035 | 0.0035 | 0.0035 | 0.0035 | 0.0037 | TM-21 L70(6k) = 36,000hrs | | |
| | min = | 1.0000 | 1.0001 | 1.0052 | 1.0066 | 1.0059 | 1.0067 | 1.0076 | | | |
| | max = | 1.0000 | 1.0110 | 1.0176 | 1.0187 | 1.0197 | 1.0201 | 1.0212 | | | |




**Delta u'v' for $I_f$ = 200mA**

| | | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| | median = | 0.0000 | 0.0008 | 0.0008 | 0.0008 | 0.0010 | 0.0012 | 0.0014 |
| Ts=Tair=105°C | average = | 0.0000 | 0.0008 | 0.0008 | 0.0009 | 0.0012 | 0.0014 | 0.0016 |
| | st dev = | 0.0000 | 0.0002 | 0.0003 | 0.0005 | 0.0006 | 0.0008 | 0.0008 |
| | min = | 0.0000 | 0.0005 | 0.0005 | 0.0006 | 0.0007 | 0.0008 | 0.0010 |
| | max = | 0.0000 | 0.0011 | 0.0016 | 0.0024 | 0.0030 | 0.0038 | 0.0041 |
| | median = | 0.0000 | 0.0005 | 0.0005 | 0.0007 | 0.0009 | 0.0012 | 0.0016 |
| Ts=Tair=85°C | average = | 0.0000 | 0.0006 | 0.0006 | 0.0007 | 0.0011 | 0.0014 | 0.0017 |
| | st dev = | 0.0000 | 0.0002 | 0.0003 | 0.0004 | 0.0006 | 0.0008 | 0.0009 |
| | min = | 0.0000 | 0.0003 | 0.0002 | 0.0003 | 0.0004 | 0.0004 | 0.0006 |
| | max = | 0.0000 | 0.0011 | 0.0015 | 0.0022 | 0.0029 | 0.0032 | 0.0034 |
| | median = | 0.0000 | 0.0004 | 0.0003 | 0.0004 | 0.0004 | 0.0005 | 0.0005 |
| Ts=Tair=55°C | average = | 0.0000 | 0.0004 | 0.0004 | 0.0004 | 0.0005 | 0.0005 | 0.0005 |
| | st dev = | 0.0000 | 0.0001 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0001 |
| | min = | 0.0000 | 0.0002 | 0.0002 | 0.0001 | 0.0001 | 0.0002 | 0.0003 |
| | max = | 0.0000 | 0.0008 | 0.0007 | 0.0009 | 0.0009 | 0.0009 | 0.0009 |

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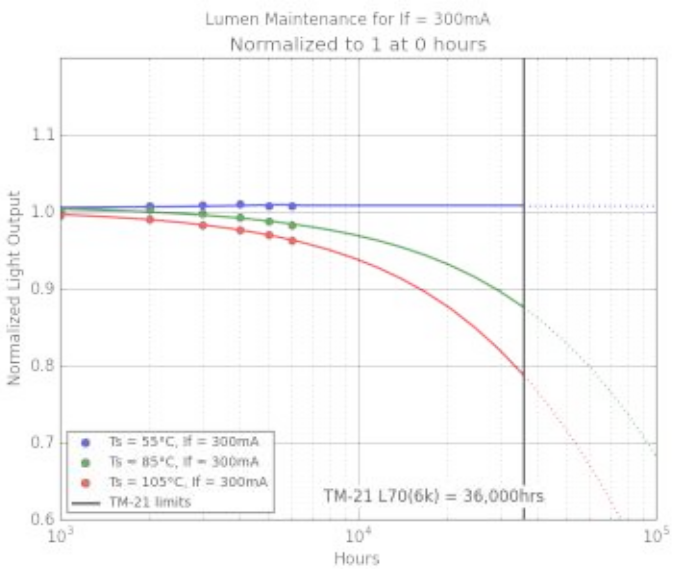
**Normalized Flux Statistics for $I_f$ = 300mA**

| | | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs | alpha | B | L70 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | median = | 1.0000 | 0.9958 | 0.9912 | 0.9840 | 0.9771 | 0.9709 | 0.9647 | | | |
| Ts=Tair=105°C | average = | 1.0000 | 0.9952 | 0.9903 | 0.9831 | 0.9763 | 0.9697 | 0.9628 | 6.7390e-06 | 1.0029 | 53,350 |
| | st dev = | 0.0000 | 0.0046 | 0.0065 | 0.0074 | 0.0085 | 0.0088 | 0.0101 | TM-21 L70(6k) > 36,000hrs | | |
| | min = | 1.0000 | 0.9860 | 0.9757 | 0.9651 | 0.9574 | 0.9511 | 0.9437 | | | |
| | max = | 1.0000 | 1.0031 | 1.0002 | 0.9931 | 0.9881 | 0.9833 | 0.9803 | | | |
| | median = | 1.0000 | 1.0006 | 1.0034 | 0.9993 | 0.9944 | 0.9899 | 0.9852 | | | |
| Ts=Tair=85°C | average = | 1.0000 | 0.9996 | 1.0022 | 0.9974 | 0.9922 | 0.9872 | 0.9825 | 3.8971e-06 | 1.0071 | 93,351 |
| | st dev = | 0.0000 | 0.0045 | 0.0055 | 0.0068 | 0.0081 | 0.0093 | 0.0104 | TM-21 L70(6k) > 36,000hrs | | |
| | min = | 1.0000 | 0.9897 | 0.9882 | 0.9785 | 0.9705 | 0.9633 | 0.9552 | | | |
| | max = | 1.0000 | 1.0081 | 1.0121 | 1.0098 | 1.0063 | 1.0023 | 0.9980 | | | |
| | median = | 1.0000 | 1.0019 | 1.0072 | 1.0084 | 1.0107 | 1.0076 | 1.0079 | | | |
| Ts=Tair=55°C | average = | 1.0000 | 1.0021 | 1.0081 | 1.0083 | 1.0105 | 1.0072 | 1.0079 | -8.1416e-07 | 1.0045 | -443,591 |
| | st dev = | 0.0000 | 0.0036 | 0.0038 | 0.0038 | 0.0042 | 0.0041 | 0.0043 | TM-21 L70(6k) = 36,000hrs | | |
| | min = | 1.0000 | 0.9960 | 1.0018 | 1.0022 | 1.0036 | 0.9997 | 1.0013 | | | |
| | max = | 1.0000 | 1.0088 | 1.0151 | 1.0152 | 1.0189 | 1.0153 | 1.0161 | | | |




**Delta u'v' for $I_f$ = 300mA**

| | | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| | median = | 0.0000 | 0.0007 | 0.0011 | 0.0013 | 0.0015 | 0.0016 | 0.0018 |
| Ts=Tair=105°C | average = | 0.0000 | 0.0008 | 0.0011 | 0.0014 | 0.0016 | 0.0018 | 0.0020 |
| | st dev = | 0.0000 | 0.0001 | 0.0002 | 0.0003 | 0.0004 | 0.0004 | 0.0004 |
| | min = | 0.0000 | 0.0005 | 0.0008 | 0.0010 | 0.0012 | 0.0013 | 0.0016 |
| | max = | 0.0000 | 0.0011 | 0.0016 | 0.0020 | 0.0025 | 0.0029 | 0.0032 |
| | median = | 0.0000 | 0.0008 | 0.0007 | 0.0008 | 0.0009 | 0.0011 | 0.0013 |
| Ts=Tair=85°C | average = | 0.0000 | 0.0008 | 0.0007 | 0.0008 | 0.0009 | 0.0012 | 0.0015 |
| | st dev = | 0.0000 | 0.0002 | 0.0001 | 0.0002 | 0.0003 | 0.0004 | 0.0004 |
| | min = | 0.0000 | 0.0006 | 0.0004 | 0.0006 | 0.0005 | 0.0008 | 0.0009 |
| | max = | 0.0000 | 0.0012 | 0.0010 | 0.0015 | 0.0020 | 0.0024 | 0.0028 |
| | median = | 0.0000 | 0.0007 | 0.0007 | 0.0008 | 0.0009 | 0.0008 | 0.0009 |
| Ts=Tair=55°C | average = | 0.0000 | 0.0007 | 0.0007 | 0.0008 | 0.0009 | 0.0008 | 0.0009 |
| | st dev = | 0.0000 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| | min = | 0.0000 | 0.0003 | 0.0002 | 0.0004 | 0.0006 | 0.0005 | 0.0005 |
| | max = | 0.0000 | 0.0012 | 0.0012 | 0.0014 | 0.0014 | 0.0012 | 0.0013 |

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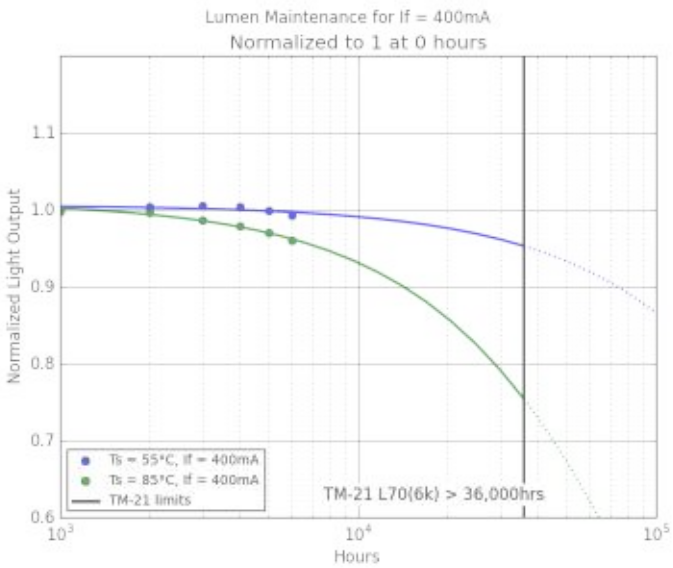
**Normalized Flux Statistics for $I_f$ = 400mA**

| | | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs | alpha | B | L70 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | median = | 1.0000 | 0.9987 | 0.9969 | 0.9874 | 0.9794 | 0.9735 | 0.9630 | | | |
| Ts=Tair=85°C | average = | 1.0000 | 0.9980 | 0.9967 | 0.9868 | 0.9782 | 0.9702 | 0.9599 | 8.1202e-06 | 1.0098 | 45,131 |
| | st dev = | 0.0000 | 0.0051 | 0.0067 | 0.0091 | 0.0109 | 0.0123 | 0.0137 | TM-21 L70(6k) > 36,000hrs | | |
| | min = | 1.0000 | 0.9849 | 0.9801 | 0.9600 | 0.9469 | 0.9342 | 0.9236 | | | |
| | max = | 1.0000 | 1.0070 | 1.0095 | 1.0044 | 0.9996 | 0.9968 | 0.9908 | | | |
| | | | | | | | | | | | |
| | median = | 1.0000 | 1.0001 | 1.0032 | 1.0047 | 1.0036 | 0.9988 | 0.9930 | | | |
| Ts=Tair=55°C | average = | 1.0000 | 1.0000 | 1.0032 | 1.0046 | 1.0034 | 0.9985 | 0.9925 | 1.5022e-06 | 1.0056 | 241,174 |
| | st dev = | 0.0000 | 0.0032 | 0.0031 | 0.0033 | 0.0035 | 0.0038 | 0.0047 | TM-21 L70(6k) > 36,000hrs | | |
| | min = | 1.0000 | 0.9903 | 0.9956 | 0.9949 | 0.9950 | 0.9903 | 0.9827 | | | |
| | max = | 1.0000 | 1.0074 | 1.0098 | 1.0103 | 1.0101 | 1.0074 | 1.0035 | | | |




**Delta u'v' for $I_f$ = 400mA**

| | | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| | median = | 0.0000 | 0.0007 | 0.0008 | 0.0010 | 0.0012 | 0.0015 | 0.0015 |
| Ts=Tair=85°C | average = | 0.0000 | 0.0007 | 0.0009 | 0.0011 | 0.0013 | 0.0017 | 0.0016 |
| | st dev = | 0.0000 | 0.0001 | 0.0002 | 0.0004 | 0.0005 | 0.0006 | 0.0007 |
| | min = | 0.0000 | 0.0005 | 0.0006 | 0.0008 | 0.0010 | 0.0011 | 0.0009 |
| | max = | 0.0000 | 0.0010 | 0.0014 | 0.0025 | 0.0033 | 0.0039 | 0.0041 |
| | | | | | | | | |
| | median = | 0.0000 | 0.0006 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0005 |
| Ts=Tair=55°C | average = | 0.0000 | 0.0006 | 0.0006 | 0.0007 | 0.0008 | 0.0008 | 0.0005 |
| | st dev = | 0.0000 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 | 0.0002 |
| | min = | 0.0000 | 0.0004 | 0.0003 | 0.0004 | 0.0005 | 0.0003 | 0.0001 |
| | max = | 0.0000 | 0.0010 | 0.0010 | 0.0010 | 0.0012 | 0.0012 | 0.0010 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 200mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2973K | 1127.973 | 1128.076 | 1133.888 | 1135.396 | 1134.639 | 1135.554 | 1136.568 |
| 2 | 2962K | 1133.576 | 1138.569 | 1142.968 | 1146.124 | 1146.032 | 1145.991 | 1148.129 |
| 3 | 2991K | 1127.765 | 1130.535 | 1137.277 | 1138.985 | 1139.954 | 1138.906 | 1141.365 |
| 4 | 2962K | 1130.008 | 1132.545 | 1138.057 | 1140.071 | 1140.070 | 1140.537 | 1141.383 |
| 5 | 2957K | 1133.947 | 1136.062 | 1142.472 | 1145.427 | 1144.618 | 1145.328 | 1147.758 |
| 6 | 2988K | 1138.383 | 1140.940 | 1146.835 | 1149.367 | 1149.491 | 1149.457 | 1151.122 |
| 7 | 2971K | 1134.516 | 1137.956 | 1142.160 | 1144.066 | 1144.671 | 1145.294 | 1146.090 |
| 8 | 2968K | 1134.598 | 1142.533 | 1150.232 | 1152.555 | 1151.910 | 1151.039 | 1153.232 |
| 9 | 2965K | 1127.602 | 1134.131 | 1139.455 | 1141.167 | 1140.963 | 1141.526 | 1141.938 |
| 10 | 2960K | 1133.288 | 1135.612 | 1141.654 | 1142.896 | 1143.588 | 1142.896 | 1143.917 |
| 11 | 2963K | 1132.085 | 1134.785 | 1142.720 | 1144.776 | 1144.437 | 1144.379 | 1146.198 |
| 12 | 2966K | 1134.284 | 1141.989 | 1147.615 | 1150.518 | 1149.312 | 1147.583 | 1149.873 |
| 13 | 2962K | 1134.267 | 1139.857 | 1146.628 | 1148.804 | 1148.914 | 1149.737 | 1151.851 |
| 14 | 2969K | 1131.444 | 1143.921 | 1151.338 | 1152.633 | 1153.761 | 1154.143 | 1155.401 |
| 15 | 2948K | 1117.925 | 1119.328 | 1125.665 | 1127.646 | 1127.067 | 1128.442 | 1128.755 |
| 16 | 2972K | 1132.118 | 1132.872 | 1141.586 | 1143.670 | 1142.323 | 1144.106 | 1144.366 |
| 17 | 2976K | 1124.522 | 1130.964 | 1140.012 | 1142.581 | 1141.127 | 1143.241 | 1145.441 |
| 18 | 2961K | 1129.815 | 1136.266 | 1144.832 | 1145.877 | 1145.412 | 1146.269 | 1147.842 |
| 19 | 2993K | 1130.093 | 1137.593 | 1145.208 | 1145.445 | 1145.943 | 1146.711 | 1146.686 |
| 20 | 2955K | 1127.268 | 1136.434 | 1144.621 | 1146.443 | 1146.111 | 1147.272 | 1149.448 |
| 21 | 2989K | 1122.771 | 1125.515 | 1130.206 | 1130.999 | 1131.559 | 1132.206 | 1133.686 |
| 22 | 2965K | 1139.569 | 1142.249 | 1148.757 | 1149.956 | 1150.321 | 1151.717 | 1153.117 |
| 23 | 2963K | 1135.816 | 1138.804 | 1146.195 | 1147.212 | 1147.211 | 1148.714 | 1150.340 |
| 24 | 2978K | 1123.357 | 1133.361 | 1141.829 | 1143.705 | 1143.960 | 1144.191 | 1146.289 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 200mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2973K | 1.0000 | 1.0001 | 1.0052 | 1.0066 | 1.0059 | 1.0067 | 1.0076 |
| 2 | 2962K | 1.0000 | 1.0044 | 1.0083 | 1.0111 | 1.0110 | 1.0110 | 1.0128 |
| 3 | 2991K | 1.0000 | 1.0025 | 1.0084 | 1.0099 | 1.0108 | 1.0099 | 1.0121 |
| 4 | 2962K | 1.0000 | 1.0022 | 1.0071 | 1.0089 | 1.0089 | 1.0093 | 1.0101 |
| 5 | 2957K | 1.0000 | 1.0019 | 1.0075 | 1.0101 | 1.0094 | 1.0100 | 1.0122 |
| 6 | 2988K | 1.0000 | 1.0022 | 1.0074 | 1.0096 | 1.0098 | 1.0097 | 1.0112 |
| 7 | 2971K | 1.0000 | 1.0030 | 1.0067 | 1.0084 | 1.0090 | 1.0095 | 1.0102 |
| 8 | 2968K | 1.0000 | 1.0070 | 1.0138 | 1.0158 | 1.0153 | 1.0145 | 1.0164 |
| 9 | 2965K | 1.0000 | 1.0058 | 1.0105 | 1.0120 | 1.0118 | 1.0123 | 1.0127 |
| 10 | 2960K | 1.0000 | 1.0021 | 1.0074 | 1.0085 | 1.0091 | 1.0085 | 1.0094 |
| 11 | 2963K | 1.0000 | 1.0024 | 1.0094 | 1.0112 | 1.0109 | 1.0109 | 1.0125 |
| 12 | 2966K | 1.0000 | 1.0068 | 1.0118 | 1.0143 | 1.0132 | 1.0117 | 1.0137 |
| 13 | 2962K | 1.0000 | 1.0049 | 1.0109 | 1.0128 | 1.0129 | 1.0136 | 1.0155 |
| 14 | 2969K | 1.0000 | 1.0110 | 1.0176 | 1.0187 | 1.0197 | 1.0201 | 1.0212 |
| 15 | 2948K | 1.0000 | 1.0013 | 1.0069 | 1.0087 | 1.0082 | 1.0094 | 1.0097 |
| 16 | 2972K | 1.0000 | 1.0007 | 1.0084 | 1.0102 | 1.0090 | 1.0106 | 1.0108 |
| 17 | 2976K | 1.0000 | 1.0057 | 1.0138 | 1.0161 | 1.0148 | 1.0166 | 1.0186 |
| 18 | 2961K | 1.0000 | 1.0057 | 1.0133 | 1.0142 | 1.0138 | 1.0146 | 1.0160 |
| 19 | 2993K | 1.0000 | 1.0066 | 1.0134 | 1.0136 | 1.0140 | 1.0147 | 1.0147 |
| 20 | 2955K | 1.0000 | 1.0081 | 1.0154 | 1.0170 | 1.0167 | 1.0177 | 1.0197 |
| 21 | 2989K | 1.0000 | 1.0024 | 1.0066 | 1.0073 | 1.0078 | 1.0084 | 1.0097 |
| 22 | 2965K | 1.0000 | 1.0024 | 1.0081 | 1.0091 | 1.0094 | 1.0107 | 1.0119 |
| 23 | 2963K | 1.0000 | 1.0026 | 1.0091 | 1.0100 | 1.0100 | 1.0114 | 1.0128 |
| 24 | 2978K | 1.0000 | 1.0089 | 1.0164 | 1.0181 | 1.0183 | 1.0185 | 1.0204 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 200mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2973K | 0.2517 | 0.2515 | 0.2515 | 0.2514 | 0.2516 | 0.2513 | 0.2513 |
| 2 | 2962K | 0.2518 | 0.2517 | 0.2517 | 0.2516 | 0.2517 | 0.2517 | 0.2517 |
| 3 | 2991K | 0.2510 | 0.2510 | 0.2509 | 0.2510 | 0.2510 | 0.2508 | 0.2508 |
| 4 | 2962K | 0.2518 | 0.2516 | 0.2516 | 0.2517 | 0.2516 | 0.2515 | 0.2515 |
| 5 | 2957K | 0.2521 | 0.2521 | 0.2521 | 0.2520 | 0.2521 | 0.2521 | 0.2519 |
| 6 | 2988K | 0.2510 | 0.2510 | 0.2512 | 0.2511 | 0.2511 | 0.2510 | 0.2511 |
| 7 | 2971K | 0.2514 | 0.2513 | 0.2510 | 0.2511 | 0.2512 | 0.2510 | 0.2511 |
| 8 | 2968K | 0.2517 | 0.2521 | 0.2521 | 0.2521 | 0.2521 | 0.2521 | 0.2521 |
| 9 | 2965K | 0.2518 | 0.2517 | 0.2518 | 0.2516 | 0.2518 | 0.2515 | 0.2516 |
| 10 | 2960K | 0.2520 | 0.2520 | 0.2520 | 0.2517 | 0.2518 | 0.2518 | 0.2517 |
| 11 | 2963K | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 | 0.2519 |
| 12 | 2966K | 0.2518 | 0.2517 | 0.2517 | 0.2517 | 0.2517 | 0.2517 | 0.2517 |
| 13 | 2962K | 0.2520 | 0.2520 | 0.2522 | 0.2519 | 0.2521 | 0.2520 | 0.2520 |
| 14 | 2969K | 0.2516 | 0.2516 | 0.2518 | 0.2518 | 0.2517 | 0.2518 | 0.2518 |
| 15 | 2948K | 0.2523 | 0.2524 | 0.2523 | 0.2524 | 0.2523 | 0.2523 | 0.2520 |
| 16 | 2972K | 0.2514 | 0.2513 | 0.2513 | 0.2514 | 0.2515 | 0.2512 | 0.2512 |
| 17 | 2976K | 0.2515 | 0.2515 | 0.2516 | 0.2517 | 0.2517 | 0.2517 | 0.2516 |
| 18 | 2961K | 0.2519 | 0.2516 | 0.2518 | 0.2518 | 0.2518 | 0.2517 | 0.2517 |
| 19 | 2993K | 0.2509 | 0.2510 | 0.2510 | 0.2510 | 0.2511 | 0.2510 | 0.2509 |
| 20 | 2955K | 0.2521 | 0.2522 | 0.2524 | 0.2524 | 0.2523 | 0.2523 | 0.2523 |
| 21 | 2989K | 0.2512 | 0.2511 | 0.2509 | 0.2510 | 0.2509 | 0.2509 | 0.2509 |
| 22 | 2965K | 0.2517 | 0.2516 | 0.2517 | 0.2517 | 0.2517 | 0.2517 | 0.2516 |
| 23 | 2963K | 0.2518 | 0.2517 | 0.2517 | 0.2518 | 0.2519 | 0.2518 | 0.2517 |
| 24 | 2978K | 0.2514 | 0.2517 | 0.2516 | 0.2518 | 0.2517 | 0.2517 | 0.2517 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 200mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2973K | 0.5214 | 0.5216 | 0.5215 | 0.5217 | 0.5214 | 0.5217 | 0.5216 |
| 2 | 2962K | 0.5226 | 0.5229 | 0.5229 | 0.5231 | 0.5229 | 0.5230 | 0.5231 |
| 3 | 2991K | 0.5211 | 0.5215 | 0.5214 | 0.5214 | 0.5215 | 0.5216 | 0.5216 |
| 4 | 2962K | 0.5226 | 0.5230 | 0.5228 | 0.5230 | 0.5228 | 0.5231 | 0.5230 |
| 5 | 2957K | 0.5222 | 0.5224 | 0.5224 | 0.5225 | 0.5225 | 0.5226 | 0.5226 |
| 6 | 2988K | 0.5216 | 0.5222 | 0.5221 | 0.5222 | 0.5223 | 0.5224 | 0.5224 |
| 7 | 2971K | 0.5227 | 0.5229 | 0.5229 | 0.5230 | 0.5229 | 0.5231 | 0.5230 |
| 8 | 2968K | 0.5220 | 0.5227 | 0.5226 | 0.5227 | 0.5227 | 0.5227 | 0.5228 |
| 9 | 2965K | 0.5219 | 0.5224 | 0.5224 | 0.5224 | 0.5225 | 0.5226 | 0.5226 |
| 10 | 2960K | 0.5222 | 0.5225 | 0.5225 | 0.5225 | 0.5225 | 0.5226 | 0.5227 |
| 11 | 2963K | 0.5220 | 0.5225 | 0.5224 | 0.5226 | 0.5226 | 0.5226 | 0.5227 |
| 12 | 2966K | 0.5222 | 0.5227 | 0.5228 | 0.5228 | 0.5228 | 0.5228 | 0.5229 |
| 13 | 2962K | 0.5218 | 0.5222 | 0.5220 | 0.5220 | 0.5221 | 0.5221 | 0.5221 |
| 14 | 2969K | 0.5223 | 0.5228 | 0.5228 | 0.5227 | 0.5228 | 0.5227 | 0.5226 |
| 15 | 2948K | 0.5227 | 0.5231 | 0.5230 | 0.5230 | 0.5231 | 0.5229 | 0.5231 |
| 16 | 2972K | 0.5224 | 0.5227 | 0.5226 | 0.5227 | 0.5226 | 0.5227 | 0.5227 |
| 17 | 2976K | 0.5214 | 0.5219 | 0.5219 | 0.5220 | 0.5220 | 0.5218 | 0.5219 |
| 18 | 2961K | 0.5225 | 0.5227 | 0.5228 | 0.5227 | 0.5229 | 0.5228 | 0.5228 |
| 19 | 2993K | 0.5211 | 0.5217 | 0.5217 | 0.5216 | 0.5218 | 0.5217 | 0.5218 |
| 20 | 2955K | 0.5225 | 0.5227 | 0.5226 | 0.5226 | 0.5228 | 0.5228 | 0.5229 |
| 21 | 2989K | 0.5204 | 0.5206 | 0.5204 | 0.5205 | 0.5206 | 0.5206 | 0.5206 |
| 22 | 2965K | 0.5224 | 0.5227 | 0.5226 | 0.5227 | 0.5228 | 0.5227 | 0.5227 |
| 23 | 2963K | 0.5225 | 0.5229 | 0.5229 | 0.5229 | 0.5228 | 0.5229 | 0.5230 |
| 24 | 2978K | 0.5216 | 0.5220 | 0.5220 | 0.5220 | 0.5222 | 0.5220 | 0.5221 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 200mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2973K | 0.0000 | 0.0003 | 0.0002 | 0.0004 | 0.0001 | 0.0005 | 0.0004 |
| 2 | 2962K | 0.0000 | 0.0004 | 0.0003 | 0.0006 | 0.0004 | 0.0005 | 0.0005 |
| 3 | 2991K | 0.0000 | 0.0005 | 0.0003 | 0.0004 | 0.0004 | 0.0005 | 0.0006 |
| 4 | 2962K | 0.0000 | 0.0004 | 0.0003 | 0.0004 | 0.0003 | 0.0005 | 0.0005 |
| 5 | 2957K | 0.0000 | 0.0002 | 0.0003 | 0.0004 | 0.0003 | 0.0004 | 0.0005 |
| 6 | 2988K | 0.0000 | 0.0006 | 0.0006 | 0.0006 | 0.0007 | 0.0008 | 0.0008 |
| 7 | 2971K | 0.0000 | 0.0003 | 0.0005 | 0.0005 | 0.0004 | 0.0006 | 0.0005 |
| 8 | 2968K | 0.0000 | 0.0008 | 0.0007 | 0.0009 | 0.0009 | 0.0009 | 0.0009 |
| 9 | 2965K | 0.0000 | 0.0005 | 0.0005 | 0.0005 | 0.0006 | 0.0008 | 0.0007 |
| 10 | 2960K | 0.0000 | 0.0003 | 0.0003 | 0.0004 | 0.0004 | 0.0005 | 0.0006 |
| 11 | 2963K | 0.0000 | 0.0004 | 0.0004 | 0.0005 | 0.0005 | 0.0006 | 0.0006 |
| 12 | 2966K | 0.0000 | 0.0005 | 0.0005 | 0.0006 | 0.0006 | 0.0006 | 0.0007 |
| 13 | 2962K | 0.0000 | 0.0004 | 0.0002 | 0.0001 | 0.0003 | 0.0003 | 0.0003 |
| 14 | 2969K | 0.0000 | 0.0005 | 0.0005 | 0.0004 | 0.0005 | 0.0004 | 0.0004 |
| 15 | 2948K | 0.0000 | 0.0003 | 0.0003 | 0.0002 | 0.0004 | 0.0002 | 0.0004 |
| 16 | 2972K | 0.0000 | 0.0003 | 0.0002 | 0.0003 | 0.0002 | 0.0003 | 0.0004 |
| 17 | 2976K | 0.0000 | 0.0005 | 0.0005 | 0.0006 | 0.0005 | 0.0004 | 0.0004 |
| 18 | 2961K | 0.0000 | 0.0003 | 0.0003 | 0.0002 | 0.0004 | 0.0003 | 0.0004 |
| 19 | 2993K | 0.0000 | 0.0006 | 0.0006 | 0.0005 | 0.0007 | 0.0007 | 0.0007 |
| 20 | 2955K | 0.0000 | 0.0003 | 0.0003 | 0.0003 | 0.0004 | 0.0003 | 0.0005 |
| 21 | 2989K | 0.0000 | 0.0003 | 0.0004 | 0.0003 | 0.0004 | 0.0004 | 0.0005 |
| 22 | 2965K | 0.0000 | 0.0003 | 0.0002 | 0.0003 | 0.0005 | 0.0003 | 0.0004 |
| 23 | 2963K | 0.0000 | 0.0004 | 0.0005 | 0.0004 | 0.0003 | 0.0004 | 0.0005 |
| 24 | 2978K | 0.0000 | 0.0005 | 0.0005 | 0.0006 | 0.0007 | 0.0005 | 0.0006 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 200mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2973K | 35.066 | 35.127 | 35.141 | 35.160 | 35.174 | 35.166 | 35.189 |
| 2 | 2962K | 35.115 | 35.181 | 35.201 | 35.209 | 35.217 | 35.230 | 35.244 |
| 3 | 2991K | 35.163 | 35.161 | 35.182 | 35.190 | 35.176 | 35.188 | 35.206 |
| 4 | 2962K | 35.048 | 35.104 | 35.119 | 35.124 | 35.152 | 35.150 | 35.161 |
| 5 | 2957K | 35.185 | 35.215 | 35.231 | 35.246 | 35.247 | 35.255 | 35.260 |
| 6 | 2988K | 35.129 | 35.237 | 35.275 | 35.290 | 35.288 | 35.316 | 35.326 |
| 7 | 2971K | 35.001 | 35.073 | 35.094 | 35.098 | 35.099 | 35.123 | 35.125 |
| 8 | 2968K | 35.125 | 35.205 | 35.233 | 35.248 | 35.257 | 35.276 | 35.266 |
| 9 | 2965K | 35.129 | 35.216 | 35.247 | 35.260 | 35.264 | 35.289 | 35.291 |
| 10 | 2960K | 35.144 | 35.207 | 35.247 | 35.268 | 35.278 | 35.287 | 35.275 |
| 11 | 2963K | 35.173 | 35.217 | 35.219 | 35.239 | 35.263 | 35.253 | 35.264 |
| 12 | 2966K | 35.283 | 35.352 | 35.375 | 35.388 | 35.382 | 35.417 | 35.403 |
| 13 | 2962K | 35.221 | 35.281 | 35.306 | 35.329 | 35.328 | 35.348 | 35.354 |
| 14 | 2969K | 35.137 | 35.205 | 35.233 | 35.239 | 35.256 | 35.264 | 35.275 |
| 15 | 2948K | 35.148 | 35.217 | 35.237 | 35.243 | 35.251 | 35.252 | 35.270 |
| 16 | 2972K | 35.081 | 35.151 | 35.166 | 35.202 | 35.205 | 35.218 | 35.217 |
| 17 | 2976K | 35.310 | 35.346 | 35.339 | 35.376 | 35.378 | 35.397 | 35.400 |
| 18 | 2961K | 35.246 | 35.317 | 35.339 | 35.369 | 35.370 | 35.385 | 35.397 |
| 19 | 2993K | 35.093 | 35.187 | 35.204 | 35.214 | 35.234 | 35.229 | 35.261 |
| 20 | 2955K | 35.117 | 35.186 | 35.205 | 35.217 | 35.231 | 35.240 | 35.234 |
| 21 | 2989K | 35.152 | 35.227 | 35.251 | 35.278 | 35.271 | 35.278 | 35.292 |
| 22 | 2965K | 35.028 | 35.103 | 35.097 | 35.116 | 35.110 | 35.134 | 35.121 |
| 23 | 2963K | 35.086 | 35.167 | 35.173 | 35.184 | 35.197 | 35.211 | 35.195 |
| 24 | 2978K | 35.270 | 35.321 | 35.341 | 35.351 | 35.357 | 35.377 | 35.383 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 200mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2969K | 1129.380 | 1137.699 | 1142.946 | 1139.043 | 1132.839 | 1123.871 | 1120.988 |
| 2 | 2981K | 1135.707 | 1129.741 | 1128.611 | 1120.940 | 1114.143 | 1104.635 | 1101.747 |
| 3 | 2970K | 1128.039 | 1123.506 | 1129.680 | 1123.541 | 1117.925 | 1111.897 | 1108.401 |
| 4 | 2978K | 1131.485 | 1140.445 | 1145.471 | 1140.103 | 1134.474 | 1124.785 | 1119.633 |
| 5 | 2957K | 1138.580 | 1127.937 | 1125.308 | 1114.727 | 1104.389 | 1091.710 | 1085.327 |
| 6 | 2960K | 1130.091 | 1126.049 | 1125.492 | 1117.311 | 1107.453 | 1098.498 | 1093.027 |
| 7 | 2948K | 1143.510 | 1145.027 | 1144.367 | 1134.391 | 1125.207 | 1113.452 | 1098.388 |
| 8 | 2976K | 1131.178 | 1134.338 | 1133.699 | 1124.790 | 1116.084 | 1102.922 | 1096.672 |
| 9 | 2975K | 1130.596 | 1129.368 | 1131.576 | 1122.596 | 1113.907 | 1103.657 | 1099.290 |
| 10 | 2971K | 1134.440 | 1127.942 | 1123.931 | 1111.257 | 1098.678 | 1085.025 | 1076.214 |
| 11 | 2970K | 1140.154 | 1135.278 | 1139.948 | 1139.092 | 1135.911 | 1128.690 | 1127.306 |
| 12 | 2975K | 1139.524 | 1141.814 | 1147.377 | 1145.087 | 1138.935 | 1130.777 | 1127.459 |
| 13 | 2959K | 1135.372 | 1142.035 | 1147.477 | 1143.361 | 1139.032 | 1131.745 | 1129.538 |
| 14 | 2951K | 1128.670 | 1125.573 | 1129.557 | 1125.096 | 1119.851 | 1113.192 | 1110.122 |
| 15 | 2972K | 1136.693 | 1133.958 | 1134.412 | 1123.820 | 1112.950 | 1103.722 | 1095.891 |
| 16 | 2960K | 1127.528 | 1110.623 | 1100.666 | 1086.642 | 1079.128 | 1070.785 | 1067.210 |
| 17 | 2966K | 1132.351 | 1130.806 | 1129.867 | 1116.771 | 1104.988 | 1095.948 | 1090.380 |
| 18 | 2965K | 1131.468 | 1130.179 | 1135.911 | 1133.166 | 1129.458 | 1121.167 | 1118.242 |
| 19 | 2972K | 1142.394 | 1135.534 | 1132.796 | 1117.621 | 1105.727 | 1092.261 | 1084.288 |
| 20 | 2978K | 1130.114 | 1118.593 | 1110.469 | 1095.881 | 1083.825 | 1073.861 | 1069.071 |
| 21 | 2961K | 1140.678 | 1136.812 | 1142.968 | 1141.724 | 1140.647 | 1135.867 | 1134.638 |
| 22 | 2956K | 1130.193 | 1123.293 | 1129.291 | 1128.852 | 1127.002 | 1121.918 | 1121.374 |
| 23 | 2970K | 1136.395 | 1143.895 | 1144.279 | 1137.836 | 1131.762 | 1126.095 | 1124.160 |
| 24 | 2973K | 1134.005 | 1133.494 | 1139.874 | 1138.382 | 1138.308 | 1135.112 | 1138.172 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 200mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2969K | 1.0000 | 1.0074 | 1.0120 | 1.0086 | 1.0031 | 0.9951 | 0.9926 |
| 2 | 2981K | 1.0000 | 0.9947 | 0.9938 | 0.9870 | 0.9810 | 0.9726 | 0.9701 |
| 3 | 2970K | 1.0000 | 0.9960 | 1.0015 | 0.9960 | 0.9910 | 0.9857 | 0.9826 |
| 4 | 2978K | 1.0000 | 1.0079 | 1.0124 | 1.0076 | 1.0026 | 0.9941 | 0.9895 |
| 5 | 2957K | 1.0000 | 0.9907 | 0.9883 | 0.9790 | 0.9700 | 0.9588 | 0.9532 |
| 6 | 2960K | 1.0000 | 0.9964 | 0.9959 | 0.9887 | 0.9800 | 0.9720 | 0.9672 |
| 7 | 2948K | 1.0000 | 1.0013 | 1.0007 | 0.9920 | 0.9840 | 0.9737 | 0.9605 |
| 8 | 2976K | 1.0000 | 1.0028 | 1.0022 | 0.9944 | 0.9867 | 0.9750 | 0.9695 |
| 9 | 2975K | 1.0000 | 0.9989 | 1.0009 | 0.9929 | 0.9852 | 0.9762 | 0.9723 |
| 10 | 2971K | 1.0000 | 0.9943 | 0.9907 | 0.9796 | 0.9685 | 0.9564 | 0.9487 |
| 11 | 2970K | 1.0000 | 0.9957 | 0.9998 | 0.9991 | 0.9963 | 0.9899 | 0.9887 |
| 12 | 2975K | 1.0000 | 1.0020 | 1.0069 | 1.0049 | 0.9995 | 0.9923 | 0.9894 |
| 13 | 2959K | 1.0000 | 1.0059 | 1.0107 | 1.0070 | 1.0032 | 0.9968 | 0.9949 |
| 14 | 2951K | 1.0000 | 0.9973 | 1.0008 | 0.9968 | 0.9922 | 0.9863 | 0.9836 |
| 15 | 2972K | 1.0000 | 0.9976 | 0.9980 | 0.9887 | 0.9791 | 0.9710 | 0.9641 |
| 16 | 2960K | 1.0000 | 0.9850 | 0.9762 | 0.9637 | 0.9571 | 0.9497 | 0.9465 |
| 17 | 2966K | 1.0000 | 0.9986 | 0.9978 | 0.9862 | 0.9758 | 0.9679 | 0.9629 |
| 18 | 2965K | 1.0000 | 0.9989 | 1.0039 | 1.0015 | 0.9982 | 0.9909 | 0.9883 |
| 19 | 2972K | 1.0000 | 0.9940 | 0.9916 | 0.9783 | 0.9679 | 0.9561 | 0.9491 |
| 20 | 2978K | 1.0000 | 0.9898 | 0.9826 | 0.9697 | 0.9590 | 0.9502 | 0.9460 |
| 21 | 2961K | 1.0000 | 0.9966 | 1.0020 | 1.0009 | 1.0000 | 0.9958 | 0.9947 |
| 22 | 2956K | 1.0000 | 0.9939 | 0.9992 | 0.9988 | 0.9972 | 0.9927 | 0.9922 |
| 23 | 2970K | 1.0000 | 1.0066 | 1.0069 | 1.0013 | 0.9959 | 0.9909 | 0.9892 |
| 24 | 2973K | 1.0000 | 0.9995 | 1.0052 | 1.0039 | 1.0038 | 1.0010 | 1.0037 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 200mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2969K | 0.2516 | 0.2520 | 0.2518 | 0.2517 | 0.2515 | 0.2512 | 0.2507 |
| 2 | 2981K | 0.2515 | 0.2511 | 0.2510 | 0.2507 | 0.2503 | 0.2500 | 0.2494 |
| 3 | 2970K | 0.2518 | 0.2518 | 0.2515 | 0.2516 | 0.2513 | 0.2509 | 0.2506 |
| 4 | 2978K | 0.2514 | 0.2518 | 0.2518 | 0.2516 | 0.2515 | 0.2513 | 0.2509 |
| 5 | 2957K | 0.2521 | 0.2515 | 0.2511 | 0.2509 | 0.2503 | 0.2497 | 0.2491 |
| 6 | 2960K | 0.2521 | 0.2518 | 0.2515 | 0.2513 | 0.2510 | 0.2504 | 0.2501 |
| 7 | 2948K | 0.2520 | 0.2521 | 0.2520 | 0.2517 | 0.2511 | 0.2505 | 0.2502 |
| 8 | 2976K | 0.2515 | 0.2513 | 0.2511 | 0.2508 | 0.2502 | 0.2499 | 0.2496 |
| 9 | 2975K | 0.2515 | 0.2519 | 0.2517 | 0.2513 | 0.2508 | 0.2504 | 0.2501 |
| 10 | 2971K | 0.2518 | 0.2518 | 0.2514 | 0.2512 | 0.2504 | 0.2498 | 0.2493 |
| 11 | 2970K | 0.2516 | 0.2513 | 0.2513 | 0.2513 | 0.2511 | 0.2509 | 0.2506 |
| 12 | 2975K | 0.2515 | 0.2514 | 0.2514 | 0.2515 | 0.2513 | 0.2509 | 0.2506 |
| 13 | 2959K | 0.2522 | 0.2522 | 0.2522 | 0.2522 | 0.2519 | 0.2516 | 0.2513 |
| 14 | 2951K | 0.2522 | 0.2517 | 0.2515 | 0.2515 | 0.2514 | 0.2509 | 0.2506 |
| 15 | 2972K | 0.2516 | 0.2513 | 0.2511 | 0.2509 | 0.2505 | 0.2500 | 0.2497 |
| 16 | 2960K | 0.2519 | 0.2513 | 0.2505 | 0.2499 | 0.2493 | 0.2489 | 0.2487 |
| 17 | 2966K | 0.2517 | 0.2513 | 0.2511 | 0.2508 | 0.2503 | 0.2498 | 0.2495 |
| 18 | 2965K | 0.2519 | 0.2519 | 0.2517 | 0.2517 | 0.2514 | 0.2511 | 0.2509 |
| 19 | 2972K | 0.2517 | 0.2514 | 0.2511 | 0.2510 | 0.2501 | 0.2494 | 0.2490 |
| 20 | 2978K | 0.2514 | 0.2510 | 0.2506 | 0.2501 | 0.2496 | 0.2491 | 0.2486 |
| 21 | 2961K | 0.2518 | 0.2514 | 0.2514 | 0.2513 | 0.2511 | 0.2507 | 0.2510 |
| 22 | 2956K | 0.2520 | 0.2518 | 0.2518 | 0.2516 | 0.2513 | 0.2514 | 0.2514 |
| 23 | 2970K | 0.2515 | 0.2517 | 0.2513 | 0.2511 | 0.2508 | 0.2504 | 0.2502 |
| 24 | 2973K | 0.2516 | 0.2517 | 0.2517 | 0.2517 | 0.2515 | 0.2515 | 0.2514 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 200mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2969K | 0.5224 | 0.5234 | 0.5232 | 0.5231 | 0.5230 | 0.5229 | 0.5227 |
| 2 | 2981K | 0.5208 | 0.5215 | 0.5211 | 0.5209 | 0.5208 | 0.5206 | 0.5205 |
| 3 | 2970K | 0.5215 | 0.5220 | 0.5220 | 0.5219 | 0.5219 | 0.5218 | 0.5218 |
| 4 | 2978K | 0.5215 | 0.5225 | 0.5223 | 0.5222 | 0.5221 | 0.5218 | 0.5217 |
| 5 | 2957K | 0.5221 | 0.5222 | 0.5218 | 0.5217 | 0.5214 | 0.5212 | 0.5209 |
| 6 | 2960K | 0.5219 | 0.5225 | 0.5221 | 0.5219 | 0.5218 | 0.5215 | 0.5214 |
| 7 | 2948K | 0.5241 | 0.5246 | 0.5243 | 0.5242 | 0.5240 | 0.5238 | 0.5237 |
| 8 | 2976K | 0.5216 | 0.5223 | 0.5220 | 0.5218 | 0.5217 | 0.5214 | 0.5211 |
| 9 | 2975K | 0.5217 | 0.5225 | 0.5222 | 0.5220 | 0.5218 | 0.5217 | 0.5215 |
| 10 | 2971K | 0.5211 | 0.5216 | 0.5211 | 0.5210 | 0.5206 | 0.5203 | 0.5200 |
| 11 | 2970K | 0.5222 | 0.5228 | 0.5227 | 0.5227 | 0.5228 | 0.5226 | 0.5225 |
| 12 | 2975K | 0.5215 | 0.5222 | 0.5220 | 0.5219 | 0.5219 | 0.5217 | 0.5216 |
| 13 | 2959K | 0.5214 | 0.5220 | 0.5220 | 0.5219 | 0.5217 | 0.5216 | 0.5217 |
| 14 | 2951K | 0.5227 | 0.5228 | 0.5228 | 0.5226 | 0.5223 | 0.5223 | 0.5224 |
| 15 | 2972K | 0.5217 | 0.5221 | 0.5219 | 0.5217 | 0.5212 | 0.5212 | 0.5210 |
| 16 | 2960K | 0.5225 | 0.5225 | 0.5220 | 0.5217 | 0.5214 | 0.5212 | 0.5214 |
| 17 | 2966K | 0.5224 | 0.5227 | 0.5224 | 0.5220 | 0.5216 | 0.5215 | 0.5214 |
| 18 | 2965K | 0.5218 | 0.5224 | 0.5224 | 0.5224 | 0.5222 | 0.5221 | 0.5221 |
| 19 | 2972K | 0.5215 | 0.5219 | 0.5216 | 0.5212 | 0.5208 | 0.5206 | 0.5204 |
| 20 | 2978K | 0.5217 | 0.5218 | 0.5214 | 0.5211 | 0.5205 | 0.5205 | 0.5205 |
| 21 | 2961K | 0.5226 | 0.5229 | 0.5229 | 0.5228 | 0.5226 | 0.5227 | 0.5227 |
| 22 | 2956K | 0.5230 | 0.5232 | 0.5232 | 0.5232 | 0.5231 | 0.5231 | 0.5233 |
| 23 | 2970K | 0.5226 | 0.5229 | 0.5229 | 0.5227 | 0.5224 | 0.5224 | 0.5224 |
| 24 | 2973K | 0.5215 | 0.5218 | 0.5219 | 0.5219 | 0.5219 | 0.5220 | 0.5220 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 200mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2969K | 0.0000 | 0.0011 | 0.0008 | 0.0008 | 0.0006 | 0.0007 | 0.0009 |
| 2 | 2981K | 0.0000 | 0.0007 | 0.0005 | 0.0008 | 0.0012 | 0.0015 | 0.0021 |
| 3 | 2970K | 0.0000 | 0.0005 | 0.0005 | 0.0004 | 0.0006 | 0.0009 | 0.0012 |
| 4 | 2978K | 0.0000 | 0.0011 | 0.0009 | 0.0007 | 0.0006 | 0.0004 | 0.0006 |
| 5 | 2957K | 0.0000 | 0.0007 | 0.0011 | 0.0013 | 0.0019 | 0.0026 | 0.0032 |
| 6 | 2960K | 0.0000 | 0.0006 | 0.0006 | 0.0007 | 0.0011 | 0.0017 | 0.0020 |
| 7 | 2948K | 0.0000 | 0.0005 | 0.0002 | 0.0004 | 0.0009 | 0.0015 | 0.0019 |
| 8 | 2976K | 0.0000 | 0.0007 | 0.0005 | 0.0006 | 0.0012 | 0.0016 | 0.0020 |
| 9 | 2975K | 0.0000 | 0.0009 | 0.0006 | 0.0003 | 0.0007 | 0.0011 | 0.0014 |
| 10 | 2971K | 0.0000 | 0.0005 | 0.0004 | 0.0007 | 0.0015 | 0.0022 | 0.0027 |
| 11 | 2970K | 0.0000 | 0.0007 | 0.0005 | 0.0006 | 0.0008 | 0.0008 | 0.0010 |
| 12 | 2975K | 0.0000 | 0.0007 | 0.0006 | 0.0004 | 0.0005 | 0.0007 | 0.0009 |
| 13 | 2959K | 0.0000 | 0.0007 | 0.0007 | 0.0005 | 0.0004 | 0.0007 | 0.0010 |
| 14 | 2951K | 0.0000 | 0.0005 | 0.0007 | 0.0008 | 0.0009 | 0.0014 | 0.0017 |
| 15 | 2972K | 0.0000 | 0.0005 | 0.0005 | 0.0008 | 0.0012 | 0.0017 | 0.0020 |
| 16 | 2960K | 0.0000 | 0.0006 | 0.0015 | 0.0022 | 0.0029 | 0.0032 | 0.0034 |
| 17 | 2966K | 0.0000 | 0.0005 | 0.0006 | 0.0010 | 0.0016 | 0.0021 | 0.0024 |
| 18 | 2965K | 0.0000 | 0.0005 | 0.0005 | 0.0006 | 0.0005 | 0.0008 | 0.0010 |
| 19 | 2972K | 0.0000 | 0.0005 | 0.0006 | 0.0007 | 0.0017 | 0.0024 | 0.0029 |
| 20 | 2978K | 0.0000 | 0.0004 | 0.0008 | 0.0014 | 0.0021 | 0.0026 | 0.0030 |
| 21 | 2961K | 0.0000 | 0.0005 | 0.0005 | 0.0006 | 0.0007 | 0.0011 | 0.0008 |
| 22 | 2956K | 0.0000 | 0.0003 | 0.0003 | 0.0004 | 0.0007 | 0.0006 | 0.0007 |
| 23 | 2970K | 0.0000 | 0.0003 | 0.0003 | 0.0004 | 0.0008 | 0.0011 | 0.0013 |
| 24 | 2973K | 0.0000 | 0.0003 | 0.0005 | 0.0004 | 0.0004 | 0.0006 | 0.0006 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 200mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2969K | 35.076 | 35.164 | 35.196 | 35.216 | 35.215 | 35.230 | 35.265 |
| 2 | 2981K | 35.230 | 35.347 | 35.382 | 35.409 | 35.421 | 35.433 | 35.445 |
| 3 | 2970K | 35.204 | 35.291 | 35.307 | 35.331 | 35.343 | 35.344 | 35.379 |
| 4 | 2978K | 35.166 | 35.262 | 35.282 | 35.308 | 35.307 | 35.307 | 35.329 |
| 5 | 2957K | 35.049 | 35.126 | 35.134 | 35.165 | 35.192 | 35.194 | 35.192 |
| 6 | 2960K | 35.168 | 35.254 | 35.299 | 35.285 | 35.316 | 35.327 | 35.315 |
| 7 | 2948K | 35.168 | 35.320 | 35.265 | 35.291 | 35.296 | 35.342 | 35.315 |
| 8 | 2976K | 35.229 | 35.332 | 35.343 | 35.383 | 35.391 | 35.396 | 35.417 |
| 9 | 2975K | 35.125 | 35.253 | 35.262 | 35.295 | 35.299 | 35.299 | 35.308 |
| 10 | 2971K | 35.218 | 35.296 | 35.312 | 35.333 | 35.338 | 35.352 | 35.349 |
| 11 | 2970K | 35.132 | 35.237 | 35.277 | 35.279 | 35.286 | 35.304 | 35.318 |
| 12 | 2975K | 35.159 | 35.234 | 35.244 | 35.268 | 35.286 | 35.285 | 35.317 |
| 13 | 2959K | 35.223 | 35.360 | 35.372 | 35.419 | 35.427 | 35.436 | 35.447 |
| 14 | 2951K | 35.057 | 35.150 | 35.137 | 35.172 | 35.176 | 35.201 | 35.208 |
| 15 | 2972K | 35.270 | 35.420 | 35.421 | 35.460 | 35.454 | 35.485 | 35.500 |
| 16 | 2960K | 35.201 | 35.321 | 35.348 | 35.356 | 35.399 | 35.418 | 35.412 |
| 17 | 2966K | 35.038 | 35.152 | 35.188 | 35.177 | 35.207 | 35.202 | 35.234 |
| 18 | 2965K | 35.091 | 35.196 | 35.255 | 35.231 | 35.262 | 35.268 | 35.296 |
| 19 | 2972K | 35.216 | 35.297 | 35.340 | 35.329 | 35.349 | 35.371 | 35.377 |
| 20 | 2978K | 35.116 | 35.203 | 35.257 | 35.283 | 35.278 | 35.285 | 35.299 |
| 21 | 2961K | 35.221 | 35.277 | 35.299 | 35.318 | 35.352 | 35.333 | 35.369 |
| 22 | 2956K | 35.156 | 35.274 | 35.314 | 35.331 | 35.347 | 35.340 | 35.378 |
| 23 | 2970K | 35.151 | 35.227 | 35.249 | 35.271 | 35.273 | 35.276 | 35.298 |
| 24 | 2973K | 35.056 | 35.186 | 35.223 | 35.222 | 35.254 | 35.255 | 35.286 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 200mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2998K | 1120.553 | 1128.636 | 1126.044 | 1120.648 | 1115.327 | 1110.894 | 1107.418 |
| 2 | 2967K | 1135.843 | 1129.786 | 1129.190 | 1124.247 | 1119.507 | 1115.490 | 1111.360 |
| 3 | 2980K | 1141.235 | 1138.373 | 1139.284 | 1134.275 | 1129.412 | 1123.999 | 1118.532 |
| 4 | 2966K | 1142.962 | 1133.419 | 1134.111 | 1131.318 | 1128.174 | 1123.814 | 1120.421 |
| 5 | 2960K | 1141.762 | 1140.737 | 1134.677 | 1124.974 | 1116.972 | 1111.458 | 1107.006 |
| 6 | 2986K | 1135.701 | 1129.303 | 1125.536 | 1122.052 | 1117.263 | 1112.648 | 1109.312 |
| 7 | 2999K | 1137.928 | 1117.397 | 1098.490 | 1082.596 | 1072.230 | 1064.767 | 1058.878 |
| 8 | 2971K | 1131.814 | 1129.979 | 1129.230 | 1125.160 | 1120.772 | 1116.285 | 1114.875 |
| 9 | 2978K | 1141.540 | 1136.508 | 1135.558 | 1131.842 | 1127.751 | 1123.495 | 1120.048 |
| 10 | 2974K | 1134.611 | 1138.533 | 1136.398 | 1128.998 | 1123.165 | 1116.521 | 1112.876 |
| 11 | 2979K | 1145.596 | 1142.193 | 1141.823 | 1134.734 | 1130.240 | 1125.645 | 1122.041 |
| 12 | 2995K | 1127.653 | 1128.805 | 1126.648 | 1118.728 | 1112.591 | 1106.761 | 1102.072 |
| 13 | 2984K | 1120.395 | 1126.035 | 1127.115 | 1121.432 | 1116.672 | 1112.529 | 1111.817 |
| 14 | 2978K | 1126.520 | 1118.402 | 1118.449 | 1112.668 | 1107.708 | 1101.471 | 1097.131 |
| 15 | 2975K | 1126.525 | 1123.786 | 1124.458 | 1118.480 | 1117.008 | 1111.542 | 1107.899 |
| 16 | 2979K | 1137.255 | 1136.615 | 1135.540 | 1132.408 | 1127.837 | 1123.649 | 1121.531 |
| 17 | 2969K | 1134.223 | 1134.514 | 1136.625 | 1134.718 | 1131.022 | 1128.478 | 1126.287 |
| 18 | 2954K | 1144.054 | 1112.505 | 1098.594 | 1084.071 | 1075.468 | 1066.249 | 1059.348 |
| 19 | 2982K | 1134.347 | 1119.644 | 1118.920 | 1113.158 | 1108.834 | 1104.351 | 1102.341 |
| 20 | 2988K | 1120.801 | 1128.552 | 1128.360 | 1122.793 | 1116.280 | 1110.209 | 1106.897 |
| 21 | 2984K | 1131.703 | 1124.636 | 1122.065 | 1116.580 | 1113.763 | 1108.755 | 1103.316 |
| 22 | 2969K | 1148.764 | 1138.178 | 1134.887 | 1129.805 | 1125.466 | 1120.551 | 1118.678 |
| 23 | 2965K | 1135.187 | 1125.345 | 1119.680 | 1112.808 | 1107.661 | 1102.370 | 1097.934 |
| 24 | 2978K | 1138.630 | 1130.623 | 1129.507 | 1123.347 | 1117.064 | 1110.417 | 1107.401 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 200mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2998K | 1.0000 | 1.0072 | 1.0049 | 1.0001 | 0.9953 | 0.9914 | 0.9883 |
| 2 | 2967K | 1.0000 | 0.9947 | 0.9941 | 0.9898 | 0.9856 | 0.9821 | 0.9784 |
| 3 | 2980K | 1.0000 | 0.9975 | 0.9983 | 0.9939 | 0.9896 | 0.9849 | 0.9801 |
| 4 | 2966K | 1.0000 | 0.9917 | 0.9923 | 0.9898 | 0.9871 | 0.9832 | 0.9803 |
| 5 | 2960K | 1.0000 | 0.9991 | 0.9938 | 0.9853 | 0.9783 | 0.9735 | 0.9696 |
| 6 | 2986K | 1.0000 | 0.9944 | 0.9910 | 0.9880 | 0.9838 | 0.9797 | 0.9768 |
| 7 | 2999K | 1.0000 | 0.9820 | 0.9653 | 0.9514 | 0.9423 | 0.9357 | 0.9305 |
| 8 | 2971K | 1.0000 | 0.9984 | 0.9977 | 0.9941 | 0.9902 | 0.9863 | 0.9850 |
| 9 | 2978K | 1.0000 | 0.9956 | 0.9948 | 0.9915 | 0.9879 | 0.9842 | 0.9812 |
| 10 | 2974K | 1.0000 | 1.0035 | 1.0016 | 0.9951 | 0.9899 | 0.9841 | 0.9808 |
| 11 | 2979K | 1.0000 | 0.9970 | 0.9967 | 0.9905 | 0.9866 | 0.9826 | 0.9794 |
| 12 | 2995K | 1.0000 | 1.0010 | 0.9991 | 0.9921 | 0.9866 | 0.9815 | 0.9773 |
| 13 | 2984K | 1.0000 | 1.0050 | 1.0060 | 1.0009 | 0.9967 | 0.9930 | 0.9923 |
| 14 | 2978K | 1.0000 | 0.9928 | 0.9928 | 0.9877 | 0.9833 | 0.9778 | 0.9739 |
| 15 | 2975K | 1.0000 | 0.9976 | 0.9982 | 0.9929 | 0.9916 | 0.9867 | 0.9835 |
| 16 | 2979K | 1.0000 | 0.9994 | 0.9985 | 0.9957 | 0.9917 | 0.9880 | 0.9862 |
| 17 | 2969K | 1.0000 | 1.0003 | 1.0021 | 1.0004 | 0.9972 | 0.9949 | 0.9930 |
| 18 | 2954K | 1.0000 | 0.9724 | 0.9603 | 0.9476 | 0.9401 | 0.9320 | 0.9260 |
| 19 | 2982K | 1.0000 | 0.9870 | 0.9864 | 0.9813 | 0.9775 | 0.9736 | 0.9718 |
| 20 | 2988K | 1.0000 | 1.0069 | 1.0067 | 1.0018 | 0.9960 | 0.9905 | 0.9876 |
| 21 | 2984K | 1.0000 | 0.9938 | 0.9915 | 0.9866 | 0.9841 | 0.9797 | 0.9749 |
| 22 | 2969K | 1.0000 | 0.9908 | 0.9879 | 0.9835 | 0.9797 | 0.9754 | 0.9738 |
| 23 | 2965K | 1.0000 | 0.9913 | 0.9863 | 0.9803 | 0.9758 | 0.9711 | 0.9672 |
| 24 | 2978K | 1.0000 | 0.9930 | 0.9920 | 0.9866 | 0.9811 | 0.9752 | 0.9726 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 200mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2998K | 0.2507 | 0.2509 | 0.2508 | 0.2505 | 0.2503 | 0.2499 | 0.2497 |
| 2 | 2967K | 0.2516 | 0.2516 | 0.2512 | 0.2511 | 0.2507 | 0.2505 | 0.2502 |
| 3 | 2980K | 0.2511 | 0.2511 | 0.2509 | 0.2508 | 0.2504 | 0.2501 | 0.2497 |
| 4 | 2966K | 0.2519 | 0.2517 | 0.2517 | 0.2514 | 0.2513 | 0.2511 | 0.2509 |
| 5 | 2960K | 0.2520 | 0.2517 | 0.2512 | 0.2509 | 0.2505 | 0.2501 | 0.2496 |
| 6 | 2986K | 0.2513 | 0.2513 | 0.2511 | 0.2509 | 0.2507 | 0.2505 | 0.2501 |
| 7 | 2999K | 0.2509 | 0.2504 | 0.2495 | 0.2486 | 0.2479 | 0.2472 | 0.2469 |
| 8 | 2971K | 0.2517 | 0.2517 | 0.2516 | 0.2514 | 0.2511 | 0.2508 | 0.2506 |
| 9 | 2978K | 0.2513 | 0.2512 | 0.2510 | 0.2508 | 0.2507 | 0.2504 | 0.2501 |
| 10 | 2974K | 0.2514 | 0.2517 | 0.2515 | 0.2511 | 0.2508 | 0.2506 | 0.2502 |
| 11 | 2979K | 0.2513 | 0.2513 | 0.2512 | 0.2510 | 0.2507 | 0.2502 | 0.2500 |
| 12 | 2995K | 0.2508 | 0.2512 | 0.2509 | 0.2506 | 0.2503 | 0.2499 | 0.2495 |
| 13 | 2984K | 0.2513 | 0.2517 | 0.2514 | 0.2512 | 0.2510 | 0.2508 | 0.2505 |
| 14 | 2978K | 0.2513 | 0.2514 | 0.2513 | 0.2512 | 0.2507 | 0.2505 | 0.2503 |
| 15 | 2975K | 0.2515 | 0.2517 | 0.2516 | 0.2515 | 0.2511 | 0.2511 | 0.2508 |
| 16 | 2979K | 0.2512 | 0.2513 | 0.2512 | 0.2509 | 0.2507 | 0.2504 | 0.2503 |
| 17 | 2969K | 0.2518 | 0.2518 | 0.2519 | 0.2517 | 0.2514 | 0.2514 | 0.2511 |
| 18 | 2954K | 0.2519 | 0.2511 | 0.2504 | 0.2496 | 0.2489 | 0.2484 | 0.2481 |
| 19 | 2982K | 0.2512 | 0.2511 | 0.2510 | 0.2509 | 0.2504 | 0.2504 | 0.2500 |
| 20 | 2988K | 0.2512 | 0.2516 | 0.2515 | 0.2512 | 0.2509 | 0.2506 | 0.2503 |
| 21 | 2984K | 0.2511 | 0.2514 | 0.2509 | 0.2508 | 0.2504 | 0.2502 | 0.2500 |
| 22 | 2969K | 0.2516 | 0.2514 | 0.2511 | 0.2508 | 0.2506 | 0.2503 | 0.2501 |
| 23 | 2965K | 0.2515 | 0.2514 | 0.2509 | 0.2507 | 0.2503 | 0.2500 | 0.2498 |
| 24 | 2978K | 0.2513 | 0.2514 | 0.2512 | 0.2509 | 0.2504 | 0.2503 | 0.2499 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 200mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2998K | 0.5213 | 0.5223 | 0.5221 | 0.5220 | 0.5222 | 0.5221 | 0.5222 |
| 2 | 2967K | 0.5224 | 0.5229 | 0.5227 | 0.5229 | 0.5230 | 0.5229 | 0.5231 |
| 3 | 2980K | 0.5226 | 0.5232 | 0.5232 | 0.5231 | 0.5233 | 0.5231 | 0.5231 |
| 4 | 2966K | 0.5216 | 0.5220 | 0.5220 | 0.5222 | 0.5222 | 0.5222 | 0.5223 |
| 5 | 2960K | 0.5222 | 0.5228 | 0.5225 | 0.5226 | 0.5225 | 0.5224 | 0.5223 |
| 6 | 2986K | 0.5208 | 0.5217 | 0.5214 | 0.5216 | 0.5218 | 0.5218 | 0.5217 |
| 7 | 2999K | 0.5202 | 0.5205 | 0.5197 | 0.5195 | 0.5195 | 0.5193 | 0.5193 |
| 8 | 2971K | 0.5217 | 0.5225 | 0.5223 | 0.5225 | 0.5225 | 0.5225 | 0.5226 |
| 9 | 2978K | 0.5221 | 0.5230 | 0.5228 | 0.5229 | 0.5229 | 0.5229 | 0.5228 |
| 10 | 2974K | 0.5222 | 0.5229 | 0.5227 | 0.5227 | 0.5229 | 0.5226 | 0.5225 |
| 11 | 2979K | 0.5217 | 0.5224 | 0.5223 | 0.5223 | 0.5223 | 0.5224 | 0.5223 |
| 12 | 2995K | 0.5213 | 0.5223 | 0.5222 | 0.5222 | 0.5222 | 0.5221 | 0.5218 |
| 13 | 2984K | 0.5212 | 0.5222 | 0.5222 | 0.5219 | 0.5220 | 0.5218 | 0.5221 |
| 14 | 2978K | 0.5221 | 0.5228 | 0.5228 | 0.5229 | 0.5228 | 0.5226 | 0.5227 |
| 15 | 2975K | 0.5215 | 0.5224 | 0.5225 | 0.5223 | 0.5226 | 0.5223 | 0.5224 |
| 16 | 2979K | 0.5222 | 0.5230 | 0.5231 | 0.5230 | 0.5231 | 0.5230 | 0.5232 |
| 17 | 2969K | 0.5213 | 0.5221 | 0.5220 | 0.5220 | 0.5222 | 0.5221 | 0.5221 |
| 18 | 2954K | 0.5236 | 0.5238 | 0.5233 | 0.5230 | 0.5230 | 0.5228 | 0.5227 |
| 19 | 2982K | 0.5216 | 0.5222 | 0.5222 | 0.5221 | 0.5223 | 0.5222 | 0.5224 |
| 20 | 2988K | 0.5207 | 0.5217 | 0.5215 | 0.5214 | 0.5213 | 0.5213 | 0.5211 |
| 21 | 2984K | 0.5216 | 0.5223 | 0.5224 | 0.5222 | 0.5225 | 0.5222 | 0.5223 |
| 22 | 2969K | 0.5221 | 0.5228 | 0.5227 | 0.5226 | 0.5227 | 0.5226 | 0.5228 |
| 23 | 2965K | 0.5232 | 0.5238 | 0.5238 | 0.5235 | 0.5237 | 0.5236 | 0.5236 |
| 24 | 2978K | 0.5219 | 0.5226 | 0.5225 | 0.5224 | 0.5224 | 0.5223 | 0.5225 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 200mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2998K | 0.0000 | 0.0011 | 0.0009 | 0.0008 | 0.0010 | 0.0011 | 0.0014 |
| 2 | 2967K | 0.0000 | 0.0005 | 0.0006 | 0.0007 | 0.0011 | 0.0012 | 0.0016 |
| 3 | 2980K | 0.0000 | 0.0006 | 0.0006 | 0.0006 | 0.0009 | 0.0011 | 0.0014 |
| 4 | 2966K | 0.0000 | 0.0005 | 0.0005 | 0.0008 | 0.0008 | 0.0011 | 0.0012 |
| 5 | 2960K | 0.0000 | 0.0007 | 0.0009 | 0.0011 | 0.0015 | 0.0019 | 0.0024 |
| 6 | 2986K | 0.0000 | 0.0009 | 0.0006 | 0.0008 | 0.0011 | 0.0012 | 0.0015 |
| 7 | 2999K | 0.0000 | 0.0006 | 0.0015 | 0.0024 | 0.0030 | 0.0038 | 0.0041 |
| 8 | 2971K | 0.0000 | 0.0008 | 0.0006 | 0.0008 | 0.0010 | 0.0012 | 0.0014 |
| 9 | 2978K | 0.0000 | 0.0009 | 0.0008 | 0.0009 | 0.0010 | 0.0012 | 0.0013 |
| 10 | 2974K | 0.0000 | 0.0008 | 0.0006 | 0.0006 | 0.0009 | 0.0009 | 0.0013 |
| 11 | 2979K | 0.0000 | 0.0007 | 0.0006 | 0.0007 | 0.0009 | 0.0013 | 0.0014 |
| 12 | 2995K | 0.0000 | 0.0011 | 0.0009 | 0.0009 | 0.0011 | 0.0012 | 0.0014 |
| 13 | 2984K | 0.0000 | 0.0011 | 0.0010 | 0.0007 | 0.0009 | 0.0008 | 0.0012 |
| 14 | 2978K | 0.0000 | 0.0008 | 0.0008 | 0.0008 | 0.0010 | 0.0010 | 0.0012 |
| 15 | 2975K | 0.0000 | 0.0008 | 0.0010 | 0.0008 | 0.0011 | 0.0008 | 0.0011 |
| 16 | 2979K | 0.0000 | 0.0008 | 0.0008 | 0.0008 | 0.0010 | 0.0011 | 0.0014 |
| 17 | 2969K | 0.0000 | 0.0008 | 0.0007 | 0.0007 | 0.0010 | 0.0009 | 0.0011 |
| 18 | 2954K | 0.0000 | 0.0008 | 0.0016 | 0.0024 | 0.0030 | 0.0036 | 0.0039 |
| 19 | 2982K | 0.0000 | 0.0007 | 0.0007 | 0.0007 | 0.0011 | 0.0010 | 0.0015 |
| 20 | 2988K | 0.0000 | 0.0010 | 0.0008 | 0.0007 | 0.0007 | 0.0008 | 0.0010 |
| 21 | 2984K | 0.0000 | 0.0008 | 0.0008 | 0.0007 | 0.0012 | 0.0012 | 0.0014 |
| 22 | 2969K | 0.0000 | 0.0007 | 0.0008 | 0.0009 | 0.0012 | 0.0014 | 0.0017 |
| 23 | 2965K | 0.0000 | 0.0006 | 0.0008 | 0.0009 | 0.0013 | 0.0015 | 0.0018 |
| 24 | 2978K | 0.0000 | 0.0008 | 0.0007 | 0.0007 | 0.0011 | 0.0012 | 0.0016 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 200mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2998K | 35.066 | 35.244 | 35.302 | 35.345 | 35.383 | 35.426 | 35.450 |
| 2 | 2967K | 35.174 | 35.333 | 35.398 | 35.462 | 35.509 | 35.565 | 35.587 |
| 3 | 2980K | 35.113 | 35.233 | 35.275 | 35.308 | 35.354 | 35.373 | 35.391 |
| 4 | 2966K | 35.260 | 35.454 | 35.531 | 35.629 | 35.668 | 35.747 | 35.770 |
| 5 | 2960K | 35.238 | 35.428 | 35.505 | 35.573 | 35.621 | 35.696 | 35.712 |
| 6 | 2986K | 35.091 | 35.290 | 35.330 | 35.415 | 35.456 | 35.533 | 35.559 |
| 7 | 2999K | 35.311 | 35.444 | 35.520 | 35.598 | 35.649 | 35.703 | 35.735 |
| 8 | 2971K | 35.176 | 35.300 | 35.389 | 35.479 | 35.532 | 35.596 | 35.637 |
| 9 | 2978K | 35.099 | 35.226 | 35.273 | 35.328 | 35.343 | 35.359 | 35.402 |
| 10 | 2974K | 35.133 | 35.308 | 35.347 | 35.429 | 35.456 | 35.521 | 35.533 |
| 11 | 2979K | 35.164 | 35.284 | 35.342 | 35.412 | 35.449 | 35.513 | 35.520 |
| 12 | 2995K | 35.091 | 35.290 | 35.358 | 35.446 | 35.498 | 35.570 | 35.591 |
| 13 | 2984K | 35.131 | 35.266 | 35.338 | 35.400 | 35.455 | 35.507 | 35.553 |
| 14 | 2978K | 35.077 | 35.233 | 35.310 | 35.358 | 35.407 | 35.449 | 35.474 |
| 15 | 2975K | 35.106 | 35.258 | 35.331 | 35.399 | 35.452 | 35.520 | 35.545 |
| 16 | 2979K | 35.123 | 35.284 | 35.350 | 35.422 | 35.435 | 35.469 | 35.485 |
| 17 | 2969K | 35.050 | 35.199 | 35.252 | 35.334 | 35.355 | 35.408 | 35.436 |
| 18 | 2954K | 35.314 | 35.480 | 35.561 | 35.629 | 35.685 | 35.732 | 35.768 |
| 19 | 2982K | 35.137 | 35.279 | 35.357 | 35.424 | 35.486 | 35.704 | 35.556 |
| 20 | 2988K | 35.181 | 35.306 | 35.392 | 35.461 | 35.491 | 35.621 | 35.608 |
| 21 | 2984K | 35.113 | 35.277 | 35.368 | 35.425 | 35.479 | 35.572 | 35.557 |
| 22 | 2969K | 35.077 | 35.165 | 35.219 | 35.256 | 35.279 | 35.312 | 35.347 |
| 23 | 2965K | 35.140 | 35.291 | 35.345 | 35.403 | 35.456 | 35.501 | 35.538 |
| 24 | 2978K | 35.086 | 35.242 | 35.293 | 35.336 | 35.378 | 35.458 | 35.455 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 300mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2989K | 1630.419 | 1642.453 | 1652.107 | 1652.384 | 1654.658 | 1651.454 | 1651.289 |
| 2 | 2978K | 1631.216 | 1638.398 | 1647.614 | 1648.126 | 1653.247 | 1646.593 | 1646.259 |
| 3 | 2990K | 1637.762 | 1637.110 | 1648.741 | 1648.841 | 1654.463 | 1649.669 | 1650.883 |
| 4 | 2983K | 1630.216 | 1636.946 | 1647.787 | 1646.778 | 1654.780 | 1647.026 | 1648.711 |
| 5 | 3010K | 1629.741 | 1644.091 | 1654.373 | 1654.521 | 1659.035 | 1654.647 | 1655.985 |
| 6 | 2984K | 1648.623 | 1648.697 | 1659.683 | 1660.015 | 1661.738 | 1657.822 | 1659.284 |
| 7 | 2994K | 1637.855 | 1644.566 | 1654.479 | 1653.968 | 1658.713 | 1651.016 | 1650.758 |
| 8 | 3001K | 1640.091 | 1643.143 | 1650.805 | 1650.007 | 1653.424 | 1646.481 | 1647.952 |
| 9 | 2978K | 1647.554 | 1647.063 | 1657.011 | 1657.974 | 1662.180 | 1655.315 | 1657.823 |
| 10 | 3009K | 1616.186 | 1629.230 | 1639.579 | 1639.979 | 1646.702 | 1639.398 | 1642.239 |
| 11 | 2982K | 1661.613 | 1664.959 | 1674.494 | 1676.786 | 1682.040 | 1674.641 | 1678.472 |
| 12 | 2977K | 1637.428 | 1643.835 | 1655.958 | 1654.355 | 1660.995 | 1652.730 | 1657.151 |
| 13 | 2993K | 1648.398 | 1650.486 | 1659.116 | 1660.921 | 1660.715 | 1658.694 | 1661.144 |
| 14 | 2981K | 1644.765 | 1643.875 | 1654.167 | 1653.611 | 1655.618 | 1650.619 | 1652.305 |
| 15 | 2984K | 1637.185 | 1634.437 | 1643.173 | 1643.570 | 1646.489 | 1640.647 | 1641.994 |
| 16 | 2987K | 1628.740 | 1637.907 | 1645.702 | 1646.843 | 1650.169 | 1645.247 | 1642.890 |
| 17 | 2970K | 1651.180 | 1647.571 | 1656.483 | 1657.481 | 1662.065 | 1657.131 | 1656.991 |
| 18 | 2972K | 1642.177 | 1641.944 | 1650.953 | 1650.908 | 1653.562 | 1648.732 | 1648.211 |
| 19 | 2953K | 1646.333 | 1650.855 | 1661.168 | 1662.004 | 1664.645 | 1660.107 | 1662.416 |
| 20 | 2975K | 1635.272 | 1632.112 | 1641.345 | 1642.749 | 1643.140 | 1639.751 | 1640.348 |
| 21 | 2986K | 1637.950 | 1644.926 | 1656.115 | 1657.524 | 1657.269 | 1655.783 | 1654.500 |
| 22 | 2986K | 1635.074 | 1644.676 | 1654.861 | 1655.535 | 1658.172 | 1652.626 | 1655.351 |
| 23 | 2966K | 1642.106 | 1638.221 | 1646.316 | 1645.755 | 1648.000 | 1641.626 | 1644.238 |
| 24 | 2970K | 1654.593 | 1648.005 | 1657.524 | 1658.340 | 1664.197 | 1657.377 | 1656.982 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 300mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2989K | 1.0000 | 1.0074 | 1.0133 | 1.0135 | 1.0149 | 1.0129 | 1.0128 |
| 2 | 2978K | 1.0000 | 1.0044 | 1.0101 | 1.0104 | 1.0135 | 1.0094 | 1.0092 |
| 3 | 2990K | 1.0000 | 0.9996 | 1.0067 | 1.0068 | 1.0102 | 1.0073 | 1.0080 |
| 4 | 2983K | 1.0000 | 1.0041 | 1.0108 | 1.0102 | 1.0151 | 1.0103 | 1.0113 |
| 5 | 3010K | 1.0000 | 1.0088 | 1.0151 | 1.0152 | 1.0180 | 1.0153 | 1.0161 |
| 6 | 2984K | 1.0000 | 1.0000 | 1.0067 | 1.0069 | 1.0080 | 1.0056 | 1.0065 |
| 7 | 2994K | 1.0000 | 1.0041 | 1.0101 | 1.0098 | 1.0127 | 1.0080 | 1.0079 |
| 8 | 3001K | 1.0000 | 1.0019 | 1.0065 | 1.0060 | 1.0081 | 1.0039 | 1.0048 |
| 9 | 2978K | 1.0000 | 0.9997 | 1.0057 | 1.0063 | 1.0089 | 1.0047 | 1.0062 |
| 10 | 3009K | 1.0000 | 1.0081 | 1.0145 | 1.0147 | 1.0189 | 1.0144 | 1.0161 |
| 11 | 2982K | 1.0000 | 1.0020 | 1.0078 | 1.0091 | 1.0123 | 1.0078 | 1.0101 |
| 12 | 2977K | 1.0000 | 1.0039 | 1.0113 | 1.0103 | 1.0144 | 1.0093 | 1.0120 |
| 13 | 2993K | 1.0000 | 1.0013 | 1.0065 | 1.0076 | 1.0075 | 1.0062 | 1.0077 |
| 14 | 2981K | 1.0000 | 0.9995 | 1.0057 | 1.0054 | 1.0066 | 1.0036 | 1.0046 |
| 15 | 2984K | 1.0000 | 0.9983 | 1.0037 | 1.0039 | 1.0057 | 1.0021 | 1.0029 |
| 16 | 2987K | 1.0000 | 1.0056 | 1.0104 | 1.0111 | 1.0132 | 1.0101 | 1.0087 |
| 17 | 2970K | 1.0000 | 0.9978 | 1.0032 | 1.0038 | 1.0066 | 1.0036 | 1.0035 |
| 18 | 2972K | 1.0000 | 0.9999 | 1.0053 | 1.0053 | 1.0069 | 1.0040 | 1.0037 |
| 19 | 2953K | 1.0000 | 1.0027 | 1.0090 | 1.0095 | 1.0111 | 1.0084 | 1.0098 |
| 20 | 2975K | 1.0000 | 0.9981 | 1.0037 | 1.0046 | 1.0048 | 1.0027 | 1.0031 |
| 21 | 2986K | 1.0000 | 1.0043 | 1.0111 | 1.0120 | 1.0118 | 1.0109 | 1.0101 |
| 22 | 2986K | 1.0000 | 1.0059 | 1.0121 | 1.0125 | 1.0141 | 1.0107 | 1.0124 |
| 23 | 2966K | 1.0000 | 0.9976 | 1.0026 | 1.0022 | 1.0036 | 0.9997 | 1.0013 |
| 24 | 2970K | 1.0000 | 0.9960 | 1.0018 | 1.0023 | 1.0058 | 1.0017 | 1.0014 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 300mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2989K | 0.2509 | 0.2517 | 0.2517 | 0.2518 | 0.2518 | 0.2515 | 0.2516 |
| 2 | 2978K | 0.2511 | 0.2513 | 0.2513 | 0.2514 | 0.2514 | 0.2512 | 0.2511 |
| 3 | 2990K | 0.2507 | 0.2510 | 0.2510 | 0.2510 | 0.2510 | 0.2510 | 0.2508 |
| 4 | 2983K | 0.2511 | 0.2514 | 0.2514 | 0.2515 | 0.2514 | 0.2514 | 0.2514 |
| 5 | 3010K | 0.2500 | 0.2504 | 0.2505 | 0.2506 | 0.2505 | 0.2504 | 0.2504 |
| 6 | 2984K | 0.2510 | 0.2510 | 0.2510 | 0.2511 | 0.2512 | 0.2509 | 0.2510 |
| 7 | 2994K | 0.2507 | 0.2511 | 0.2512 | 0.2512 | 0.2511 | 0.2510 | 0.2510 |
| 8 | 3001K | 0.2505 | 0.2508 | 0.2507 | 0.2507 | 0.2505 | 0.2507 | 0.2507 |
| 9 | 2978K | 0.2513 | 0.2517 | 0.2517 | 0.2516 | 0.2516 | 0.2516 | 0.2516 |
| 10 | 3009K | 0.2506 | 0.2512 | 0.2510 | 0.2512 | 0.2510 | 0.2510 | 0.2510 |
| 11 | 2982K | 0.2510 | 0.2512 | 0.2514 | 0.2514 | 0.2514 | 0.2513 | 0.2513 |
| 12 | 2977K | 0.2513 | 0.2516 | 0.2516 | 0.2516 | 0.2517 | 0.2516 | 0.2516 |
| 13 | 2993K | 0.2509 | 0.2508 | 0.2510 | 0.2509 | 0.2508 | 0.2506 | 0.2506 |
| 14 | 2981K | 0.2510 | 0.2511 | 0.2512 | 0.2511 | 0.2509 | 0.2510 | 0.2509 |
| 15 | 2984K | 0.2510 | 0.2509 | 0.2511 | 0.2511 | 0.2510 | 0.2509 | 0.2509 |
| 16 | 2987K | 0.2510 | 0.2510 | 0.2512 | 0.2511 | 0.2510 | 0.2510 | 0.2508 |
| 17 | 2970K | 0.2515 | 0.2515 | 0.2517 | 0.2517 | 0.2516 | 0.2516 | 0.2513 |
| 18 | 2972K | 0.2516 | 0.2518 | 0.2518 | 0.2517 | 0.2517 | 0.2516 | 0.2516 |
| 19 | 2953K | 0.2521 | 0.2519 | 0.2519 | 0.2521 | 0.2518 | 0.2518 | 0.2517 |
| 20 | 2975K | 0.2514 | 0.2512 | 0.2514 | 0.2514 | 0.2513 | 0.2513 | 0.2512 |
| 21 | 2986K | 0.2511 | 0.2515 | 0.2516 | 0.2516 | 0.2516 | 0.2515 | 0.2514 |
| 22 | 2986K | 0.2510 | 0.2513 | 0.2516 | 0.2514 | 0.2514 | 0.2514 | 0.2513 |
| 23 | 2966K | 0.2516 | 0.2514 | 0.2514 | 0.2513 | 0.2512 | 0.2511 | 0.2510 |
| 24 | 2970K | 0.2514 | 0.2514 | 0.2514 | 0.2514 | 0.2512 | 0.2513 | 0.2511 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 300mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2989K | 0.5216 | 0.5226 | 0.5226 | 0.5227 | 0.5227 | 0.5227 | 0.5228 |
| 2 | 2978K | 0.5225 | 0.5231 | 0.5230 | 0.5231 | 0.5232 | 0.5231 | 0.5232 |
| 3 | 2990K | 0.5223 | 0.5230 | 0.5230 | 0.5231 | 0.5232 | 0.5231 | 0.5232 |
| 4 | 2983K | 0.5218 | 0.5226 | 0.5226 | 0.5226 | 0.5228 | 0.5227 | 0.5227 |
| 5 | 3010K | 0.5220 | 0.5227 | 0.5227 | 0.5229 | 0.5228 | 0.5230 | 0.5230 |
| 6 | 2984K | 0.5223 | 0.5230 | 0.5229 | 0.5231 | 0.5230 | 0.5231 | 0.5230 |
| 7 | 2994K | 0.5218 | 0.5226 | 0.5224 | 0.5225 | 0.5226 | 0.5226 | 0.5225 |
| 8 | 3001K | 0.5215 | 0.5223 | 0.5222 | 0.5222 | 0.5223 | 0.5223 | 0.5223 |
| 9 | 2978K | 0.5218 | 0.5225 | 0.5224 | 0.5225 | 0.5226 | 0.5227 | 0.5226 |
| 10 | 3009K | 0.5199 | 0.5209 | 0.5209 | 0.5210 | 0.5210 | 0.5210 | 0.5211 |
| 11 | 2982K | 0.5225 | 0.5235 | 0.5233 | 0.5234 | 0.5235 | 0.5235 | 0.5235 |
| 12 | 2977K | 0.5223 | 0.5230 | 0.5230 | 0.5231 | 0.5233 | 0.5232 | 0.5233 |
| 13 | 2993K | 0.5212 | 0.5219 | 0.5219 | 0.5219 | 0.5220 | 0.5220 | 0.5221 |
| 14 | 2981K | 0.5225 | 0.5229 | 0.5230 | 0.5230 | 0.5231 | 0.5231 | 0.5233 |
| 15 | 2984K | 0.5222 | 0.5227 | 0.5226 | 0.5228 | 0.5228 | 0.5227 | 0.5228 |
| 16 | 2987K | 0.5219 | 0.5226 | 0.5226 | 0.5228 | 0.5228 | 0.5227 | 0.5228 |
| 17 | 2970K | 0.5224 | 0.5229 | 0.5228 | 0.5230 | 0.5230 | 0.5231 | 0.5230 |
| 18 | 2972K | 0.5219 | 0.5226 | 0.5226 | 0.5226 | 0.5227 | 0.5227 | 0.5226 |
| 19 | 2953K | 0.5231 | 0.5236 | 0.5235 | 0.5236 | 0.5238 | 0.5236 | 0.5237 |
| 20 | 2975K | 0.5222 | 0.5227 | 0.5226 | 0.5228 | 0.5228 | 0.5228 | 0.5228 |
| 21 | 2986K | 0.5216 | 0.5224 | 0.5224 | 0.5225 | 0.5224 | 0.5226 | 0.5226 |
| 22 | 2986K | 0.5219 | 0.5226 | 0.5225 | 0.5227 | 0.5227 | 0.5227 | 0.5229 |
| 23 | 2966K | 0.5227 | 0.5230 | 0.5229 | 0.5231 | 0.5232 | 0.5231 | 0.5231 |
| 24 | 2970K | 0.5228 | 0.5231 | 0.5230 | 0.5232 | 0.5233 | 0.5232 | 0.5232 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 300mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2989K | 0.0000 | 0.0012 | 0.0012 | 0.0014 | 0.0014 | 0.0012 | 0.0013 |
| 2 | 2978K | 0.0000 | 0.0006 | 0.0005 | 0.0006 | 0.0008 | 0.0006 | 0.0007 |
| 3 | 2990K | 0.0000 | 0.0007 | 0.0007 | 0.0009 | 0.0010 | 0.0008 | 0.0009 |
| 4 | 2983K | 0.0000 | 0.0009 | 0.0009 | 0.0009 | 0.0010 | 0.0009 | 0.0010 |
| 5 | 3010K | 0.0000 | 0.0009 | 0.0009 | 0.0011 | 0.0010 | 0.0011 | 0.0011 |
| 6 | 2984K | 0.0000 | 0.0007 | 0.0006 | 0.0008 | 0.0008 | 0.0008 | 0.0007 |
| 7 | 2994K | 0.0000 | 0.0009 | 0.0008 | 0.0009 | 0.0009 | 0.0009 | 0.0008 |
| 8 | 3001K | 0.0000 | 0.0009 | 0.0007 | 0.0008 | 0.0008 | 0.0008 | 0.0008 |
| 9 | 2978K | 0.0000 | 0.0008 | 0.0007 | 0.0008 | 0.0009 | 0.0009 | 0.0009 |
| 10 | 3009K | 0.0000 | 0.0012 | 0.0011 | 0.0012 | 0.0012 | 0.0012 | 0.0012 |
| 11 | 2982K | 0.0000 | 0.0010 | 0.0009 | 0.0010 | 0.0011 | 0.0011 | 0.0010 |
| 12 | 2977K | 0.0000 | 0.0008 | 0.0008 | 0.0009 | 0.0011 | 0.0010 | 0.0011 |
| 13 | 2993K | 0.0000 | 0.0007 | 0.0007 | 0.0008 | 0.0008 | 0.0009 | 0.0010 |
| 14 | 2981K | 0.0000 | 0.0003 | 0.0005 | 0.0005 | 0.0006 | 0.0006 | 0.0007 |
| 15 | 2984K | 0.0000 | 0.0005 | 0.0004 | 0.0006 | 0.0006 | 0.0005 | 0.0007 |
| 16 | 2987K | 0.0000 | 0.0007 | 0.0007 | 0.0009 | 0.0009 | 0.0008 | 0.0009 |
| 17 | 2970K | 0.0000 | 0.0005 | 0.0005 | 0.0006 | 0.0006 | 0.0007 | 0.0006 |
| 18 | 2972K | 0.0000 | 0.0008 | 0.0008 | 0.0007 | 0.0008 | 0.0008 | 0.0008 |
| 19 | 2953K | 0.0000 | 0.0005 | 0.0004 | 0.0005 | 0.0008 | 0.0006 | 0.0008 |
| 20 | 2975K | 0.0000 | 0.0006 | 0.0004 | 0.0006 | 0.0007 | 0.0006 | 0.0007 |
| 21 | 2986K | 0.0000 | 0.0009 | 0.0010 | 0.0011 | 0.0010 | 0.0011 | 0.0011 |
| 22 | 2986K | 0.0000 | 0.0008 | 0.0009 | 0.0009 | 0.0010 | 0.0009 | 0.0010 |
| 23 | 2966K | 0.0000 | 0.0004 | 0.0003 | 0.0005 | 0.0007 | 0.0007 | 0.0007 |
| 24 | 2970K | 0.0000 | 0.0003 | 0.0002 | 0.0004 | 0.0006 | 0.0005 | 0.0005 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 300mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2989K | 36.763 | 36.920 | 36.995 | 37.014 | 37.040 | 37.047 | 37.073 |
| 2 | 2978K | 36.656 | 36.754 | 36.784 | 36.814 | 36.841 | 36.835 | 36.856 |
| 3 | 2990K | 36.836 | 36.851 | 36.882 | 36.878 | 36.896 | 36.915 | 36.922 |
| 4 | 2983K | 36.670 | 36.747 | 36.782 | 36.807 | 36.830 | 36.824 | 36.840 |
| 5 | 3010K | 36.734 | 36.853 | 36.895 | 36.932 | 36.942 | 36.958 | 36.977 |
| 6 | 2984K | 36.706 | 36.788 | 36.827 | 36.850 | 36.867 | 36.869 | 36.883 |
| 7 | 2994K | 36.824 | 36.955 | 36.968 | 37.012 | 37.040 | 37.049 | 37.053 |
| 8 | 3001K | 36.699 | 36.840 | 36.889 | 36.914 | 36.927 | 36.925 | 36.964 |
| 9 | 2978K | 36.709 | 36.821 | 36.864 | 36.878 | 36.902 | 36.910 | 36.921 |
| 10 | 3009K | 36.820 | 36.941 | 36.974 | 36.992 | 37.036 | 37.041 | 37.059 |
| 11 | 2982K | 36.739 | 36.846 | 36.870 | 36.912 | 36.930 | 36.936 | 36.950 |
| 12 | 2977K | 36.943 | 36.917 | 36.936 | 36.939 | 36.968 | 36.973 | 36.978 |
| 13 | 2993K | 36.698 | 36.815 | 36.843 | 36.882 | 36.882 | 36.886 | 36.921 |
| 14 | 2981K | 36.667 | 36.739 | 36.759 | 36.764 | 36.784 | 36.793 | 36.810 |
| 15 | 2984K | 36.690 | 36.806 | 36.833 | 36.846 | 36.861 | 36.879 | 36.893 |
| 16 | 2987K | 36.813 | 36.898 | 36.929 | 36.945 | 36.975 | 36.962 | 36.985 |
| 17 | 2970K | 36.675 | 36.844 | 36.875 | 36.915 | 36.947 | 36.962 | 36.961 |
| 18 | 2972K | 36.731 | 36.889 | 36.928 | 36.952 | 36.954 | 36.976 | 36.992 |
| 19 | 2953K | 36.849 | 37.017 | 37.050 | 37.080 | 37.077 | 37.110 | 37.126 |
| 20 | 2975K | 36.674 | 36.834 | 36.869 | 36.883 | 36.913 | 36.914 | 36.936 |
| 21 | 2986K | 36.781 | 36.932 | 36.954 | 37.007 | 37.018 | 37.033 | 37.049 |
| 22 | 2986K | 36.638 | 36.795 | 36.833 | 36.863 | 36.888 | 36.897 | 36.921 |
| 23 | 2966K | 36.600 | 36.697 | 36.728 | 36.745 | 36.764 | 36.759 | 36.772 |
| 24 | 2970K | 36.720 | 36.803 | 36.820 | 36.846 | 36.845 | 36.837 | 36.872 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 300mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2977K | 1659.950 | 1658.518 | 1664.185 | 1653.557 | 1645.914 | 1636.389 | 1627.227 |
| 2 | 2988K | 1657.354 | 1640.331 | 1637.735 | 1621.793 | 1608.488 | 1596.449 | 1583.145 |
| 3 | 2984K | 1642.732 | 1638.770 | 1644.741 | 1640.343 | 1634.438 | 1633.469 | 1629.304 |
| 4 | 2978K | 1631.100 | 1634.707 | 1642.691 | 1637.232 | 1635.078 | 1634.839 | 1627.834 |
| 5 | 2991K | 1649.511 | 1652.287 | 1656.194 | 1649.240 | 1640.671 | 1634.542 | 1628.422 |
| 6 | 2989K | 1632.599 | 1631.418 | 1632.363 | 1624.674 | 1613.440 | 1603.748 | 1594.128 |
| 7 | 2986K | 1631.354 | 1633.260 | 1639.726 | 1633.154 | 1623.806 | 1614.838 | 1607.327 |
| 8 | 2989K | 1650.134 | 1634.932 | 1635.660 | 1623.696 | 1613.363 | 1604.016 | 1597.107 |
| 9 | 3006K | 1654.214 | 1646.583 | 1649.830 | 1640.736 | 1633.843 | 1626.602 | 1617.810 |
| 10 | 3001K | 1649.803 | 1650.983 | 1651.599 | 1640.022 | 1628.855 | 1617.685 | 1612.481 |
| 11 | 2980K | 1654.043 | 1647.682 | 1651.127 | 1646.108 | 1640.597 | 1632.515 | 1624.147 |
| 12 | 3009K | 1654.904 | 1657.063 | 1661.561 | 1653.636 | 1644.015 | 1638.222 | 1632.188 |
| 13 | 2969K | 1638.691 | 1633.125 | 1636.197 | 1624.121 | 1612.287 | 1602.040 | 1592.294 |
| 14 | 2974K | 1640.178 | 1630.249 | 1635.854 | 1632.407 | 1625.960 | 1618.902 | 1609.172 |
| 15 | 2980K | 1625.838 | 1633.710 | 1637.207 | 1628.532 | 1619.895 | 1610.101 | 1602.707 |
| 16 | 2978K | 1647.380 | 1649.443 | 1655.034 | 1649.472 | 1641.800 | 1633.096 | 1622.977 |
| 17 | 2989K | 1643.684 | 1644.381 | 1651.616 | 1643.871 | 1636.570 | 1627.205 | 1619.269 |
| 18 | 2977K | 1638.373 | 1633.913 | 1636.468 | 1624.451 | 1607.065 | 1591.219 | 1576.581 |
| 19 | 2982K | 1634.669 | 1637.542 | 1643.156 | 1633.588 | 1625.206 | 1615.065 | 1607.737 |
| 20 | 2998K | 1622.568 | 1635.723 | 1641.051 | 1635.241 | 1630.184 | 1619.363 | 1617.592 |
| 21 | 3007K | 1636.840 | 1640.744 | 1642.845 | 1638.298 | 1633.720 | 1625.910 | 1621.579 |
| 22 | 2973K | 1655.973 | 1652.050 | 1661.196 | 1656.796 | 1648.332 | 1641.660 | 1637.163 |
| 23 | 3005K | 1626.238 | 1630.716 | 1636.098 | 1627.839 | 1617.925 | 1612.024 | 1606.489 |
| 24 | 2993K | 1634.229 | 1646.980 | 1654.069 | 1650.212 | 1644.448 | 1636.771 | 1628.490 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 300mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2977K | 1.0000 | 0.9991 | 1.0026 | 0.9961 | 0.9915 | 0.9858 | 0.9803 |
| 2 | 2988K | 1.0000 | 0.9897 | 0.9882 | 0.9785 | 0.9705 | 0.9633 | 0.9552 |
| 3 | 2984K | 1.0000 | 0.9976 | 1.0012 | 0.9985 | 0.9950 | 0.9944 | 0.9918 |
| 4 | 2978K | 1.0000 | 1.0022 | 1.0071 | 1.0038 | 1.0024 | 1.0023 | 0.9980 |
| 5 | 2991K | 1.0000 | 1.0017 | 1.0041 | 0.9998 | 0.9946 | 0.9909 | 0.9872 |
| 6 | 2989K | 1.0000 | 0.9993 | 0.9999 | 0.9951 | 0.9883 | 0.9823 | 0.9764 |
| 7 | 2986K | 1.0000 | 1.0012 | 1.0051 | 1.0011 | 0.9954 | 0.9899 | 0.9853 |
| 8 | 2989K | 1.0000 | 0.9908 | 0.9912 | 0.9840 | 0.9777 | 0.9721 | 0.9679 |
| 9 | 3006K | 1.0000 | 0.9954 | 0.9973 | 0.9919 | 0.9877 | 0.9833 | 0.9780 |
| 10 | 3001K | 1.0000 | 1.0007 | 1.0011 | 0.9941 | 0.9873 | 0.9805 | 0.9774 |
| 11 | 2980K | 1.0000 | 0.9962 | 0.9982 | 0.9952 | 0.9919 | 0.9870 | 0.9819 |
| 12 | 3009K | 1.0000 | 1.0013 | 1.0040 | 0.9992 | 0.9934 | 0.9899 | 0.9863 |
| 13 | 2969K | 1.0000 | 0.9966 | 0.9985 | 0.9911 | 0.9839 | 0.9776 | 0.9717 |
| 14 | 2974K | 1.0000 | 0.9939 | 0.9974 | 0.9953 | 0.9913 | 0.9870 | 0.9811 |
| 15 | 2980K | 1.0000 | 1.0048 | 1.0070 | 1.0017 | 0.9963 | 0.9903 | 0.9858 |
| 16 | 2978K | 1.0000 | 1.0013 | 1.0046 | 1.0013 | 0.9966 | 0.9913 | 0.9852 |
| 17 | 2989K | 1.0000 | 1.0004 | 1.0048 | 1.0001 | 0.9957 | 0.9900 | 0.9851 |
| 18 | 2977K | 1.0000 | 0.9973 | 0.9988 | 0.9915 | 0.9809 | 0.9712 | 0.9623 |
| 19 | 2982K | 1.0000 | 1.0018 | 1.0052 | 0.9993 | 0.9942 | 0.9880 | 0.9835 |
| 20 | 2998K | 1.0000 | 1.0081 | 1.0114 | 1.0078 | 1.0047 | 0.9980 | 0.9969 |
| 21 | 3007K | 1.0000 | 1.0024 | 1.0037 | 1.0009 | 0.9981 | 0.9933 | 0.9907 |
| 22 | 2973K | 1.0000 | 0.9976 | 1.0032 | 1.0005 | 0.9954 | 0.9914 | 0.9886 |
| 23 | 3005K | 1.0000 | 1.0028 | 1.0061 | 1.0010 | 0.9949 | 0.9913 | 0.9879 |
| 24 | 2993K | 1.0000 | 1.0078 | 1.0121 | 1.0098 | 1.0063 | 1.0016 | 0.9965 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 300mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2977K | 0.2511 | 0.2509 | 0.2509 | 0.2508 | 0.2504 | 0.2501 | 0.2497 |
| 2 | 2988K | 0.2509 | 0.2499 | 0.2499 | 0.2494 | 0.2489 | 0.2485 | 0.2482 |
| 3 | 2984K | 0.2511 | 0.2510 | 0.2512 | 0.2511 | 0.2509 | 0.2506 | 0.2505 |
| 4 | 2978K | 0.2513 | 0.2513 | 0.2513 | 0.2513 | 0.2511 | 0.2510 | 0.2509 |
| 5 | 2991K | 0.2507 | 0.2506 | 0.2508 | 0.2504 | 0.2502 | 0.2500 | 0.2498 |
| 6 | 2989K | 0.2512 | 0.2510 | 0.2510 | 0.2505 | 0.2503 | 0.2499 | 0.2496 |
| 7 | 2986K | 0.2510 | 0.2512 | 0.2512 | 0.2508 | 0.2507 | 0.2504 | 0.2500 |
| 8 | 2989K | 0.2508 | 0.2503 | 0.2500 | 0.2498 | 0.2496 | 0.2492 | 0.2489 |
| 9 | 3006K | 0.2504 | 0.2503 | 0.2503 | 0.2499 | 0.2497 | 0.2496 | 0.2494 |
| 10 | 3001K | 0.2503 | 0.2505 | 0.2504 | 0.2501 | 0.2499 | 0.2495 | 0.2491 |
| 11 | 2980K | 0.2512 | 0.2510 | 0.2510 | 0.2509 | 0.2507 | 0.2505 | 0.2503 |
| 12 | 3009K | 0.2504 | 0.2506 | 0.2505 | 0.2504 | 0.2502 | 0.2500 | 0.2496 |
| 13 | 2969K | 0.2516 | 0.2515 | 0.2513 | 0.2511 | 0.2505 | 0.2502 | 0.2498 |
| 14 | 2974K | 0.2513 | 0.2511 | 0.2511 | 0.2509 | 0.2507 | 0.2505 | 0.2503 |
| 15 | 2980K | 0.2512 | 0.2511 | 0.2510 | 0.2509 | 0.2505 | 0.2496 | 0.2489 |
| 16 | 2978K | 0.2511 | 0.2512 | 0.2510 | 0.2510 | 0.2505 | 0.2502 | 0.2499 |
| 17 | 2989K | 0.2509 | 0.2512 | 0.2510 | 0.2509 | 0.2506 | 0.2504 | 0.2503 |
| 18 | 2977K | 0.2513 | 0.2513 | 0.2511 | 0.2508 | 0.2503 | 0.2497 | 0.2493 |
| 19 | 2982K | 0.2512 | 0.2508 | 0.2507 | 0.2505 | 0.2502 | 0.2499 | 0.2495 |
| 20 | 2998K | 0.2507 | 0.2510 | 0.2508 | 0.2509 | 0.2505 | 0.2502 | 0.2500 |
| 21 | 3007K | 0.2503 | 0.2504 | 0.2502 | 0.2499 | 0.2497 | 0.2494 | 0.2493 |
| 22 | 2973K | 0.2515 | 0.2514 | 0.2513 | 0.2511 | 0.2510 | 0.2506 | 0.2504 |
| 23 | 3005K | 0.2506 | 0.2506 | 0.2505 | 0.2503 | 0.2500 | 0.2497 | 0.2495 |
| 24 | 2993K | 0.2506 | 0.2509 | 0.2509 | 0.2508 | 0.2505 | 0.2503 | 0.2500 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 300mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2977K | 0.5228 | 0.5234 | 0.5233 | 0.5234 | 0.5232 | 0.5233 | 0.5233 |
| 2 | 2988K | 0.5218 | 0.5221 | 0.5218 | 0.5218 | 0.5215 | 0.5217 | 0.5215 |
| 3 | 2984K | 0.5217 | 0.5223 | 0.5222 | 0.5224 | 0.5223 | 0.5225 | 0.5226 |
| 4 | 2978K | 0.5219 | 0.5225 | 0.5226 | 0.5227 | 0.5227 | 0.5228 | 0.5230 |
| 5 | 2991K | 0.5223 | 0.5230 | 0.5230 | 0.5230 | 0.5229 | 0.5230 | 0.5231 |
| 6 | 2989K | 0.5207 | 0.5213 | 0.5213 | 0.5212 | 0.5210 | 0.5212 | 0.5211 |
| 7 | 2986K | 0.5218 | 0.5227 | 0.5225 | 0.5224 | 0.5224 | 0.5225 | 0.5224 |
| 8 | 2989K | 0.5220 | 0.5227 | 0.5226 | 0.5226 | 0.5223 | 0.5225 | 0.5225 |
| 9 | 3006K | 0.5210 | 0.5216 | 0.5216 | 0.5217 | 0.5215 | 0.5217 | 0.5217 |
| 10 | 3001K | 0.5221 | 0.5228 | 0.5228 | 0.5228 | 0.5225 | 0.5226 | 0.5228 |
| 11 | 2980K | 0.5223 | 0.5230 | 0.5229 | 0.5231 | 0.5231 | 0.5231 | 0.5231 |
| 12 | 3009K | 0.5207 | 0.5217 | 0.5216 | 0.5216 | 0.5215 | 0.5216 | 0.5217 |
| 13 | 2969K | 0.5225 | 0.5233 | 0.5230 | 0.5230 | 0.5229 | 0.5230 | 0.5229 |
| 14 | 2974K | 0.5227 | 0.5235 | 0.5233 | 0.5235 | 0.5234 | 0.5237 | 0.5236 |
| 15 | 2980K | 0.5222 | 0.5230 | 0.5228 | 0.5228 | 0.5227 | 0.5224 | 0.5223 |
| 16 | 2978K | 0.5227 | 0.5235 | 0.5233 | 0.5234 | 0.5232 | 0.5233 | 0.5234 |
| 17 | 2989K | 0.5217 | 0.5226 | 0.5224 | 0.5225 | 0.5224 | 0.5224 | 0.5224 |
| 18 | 2977K | 0.5220 | 0.5225 | 0.5224 | 0.5223 | 0.5220 | 0.5219 | 0.5218 |
| 19 | 2982K | 0.5216 | 0.5221 | 0.5218 | 0.5218 | 0.5216 | 0.5217 | 0.5217 |
| 20 | 2998K | 0.5211 | 0.5223 | 0.5220 | 0.5221 | 0.5219 | 0.5219 | 0.5221 |
| 21 | 3007K | 0.5211 | 0.5219 | 0.5216 | 0.5218 | 0.5216 | 0.5217 | 0.5217 |
| 22 | 2973K | 0.5218 | 0.5226 | 0.5225 | 0.5226 | 0.5224 | 0.5225 | 0.5225 |
| 23 | 3005K | 0.5203 | 0.5211 | 0.5208 | 0.5209 | 0.5208 | 0.5208 | 0.5208 |
| 24 | 2993K | 0.5223 | 0.5234 | 0.5231 | 0.5234 | 0.5232 | 0.5233 | 0.5233 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 300mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2977K | 0.0000 | 0.0007 | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0015 |
| 2 | 2988K | 0.0000 | 0.0011 | 0.0010 | 0.0015 | 0.0020 | 0.0024 | 0.0028 |
| 3 | 2984K | 0.0000 | 0.0006 | 0.0005 | 0.0007 | 0.0006 | 0.0010 | 0.0011 |
| 4 | 2978K | 0.0000 | 0.0006 | 0.0007 | 0.0007 | 0.0008 | 0.0010 | 0.0012 |
| 5 | 2991K | 0.0000 | 0.0007 | 0.0007 | 0.0008 | 0.0008 | 0.0010 | 0.0011 |
| 6 | 2989K | 0.0000 | 0.0006 | 0.0006 | 0.0009 | 0.0009 | 0.0014 | 0.0016 |
| 7 | 2986K | 0.0000 | 0.0009 | 0.0008 | 0.0007 | 0.0008 | 0.0010 | 0.0012 |
| 8 | 2989K | 0.0000 | 0.0009 | 0.0010 | 0.0012 | 0.0013 | 0.0017 | 0.0020 |
| 9 | 3006K | 0.0000 | 0.0007 | 0.0007 | 0.0009 | 0.0009 | 0.0011 | 0.0013 |
| 10 | 3001K | 0.0000 | 0.0007 | 0.0007 | 0.0007 | 0.0005 | 0.0009 | 0.0014 |
| 11 | 2980K | 0.0000 | 0.0007 | 0.0006 | 0.0008 | 0.0009 | 0.0010 | 0.0011 |
| 12 | 3009K | 0.0000 | 0.0010 | 0.0009 | 0.0009 | 0.0008 | 0.0010 | 0.0012 |
| 13 | 2969K | 0.0000 | 0.0008 | 0.0006 | 0.0007 | 0.0011 | 0.0015 | 0.0018 |
| 14 | 2974K | 0.0000 | 0.0008 | 0.0006 | 0.0009 | 0.0009 | 0.0013 | 0.0013 |
| 15 | 2980K | 0.0000 | 0.0008 | 0.0006 | 0.0006 | 0.0008 | 0.0016 | 0.0023 |
| 16 | 2978K | 0.0000 | 0.0007 | 0.0006 | 0.0007 | 0.0008 | 0.0011 | 0.0014 |
| 17 | 2989K | 0.0000 | 0.0009 | 0.0007 | 0.0008 | 0.0007 | 0.0008 | 0.0009 |
| 18 | 2977K | 0.0000 | 0.0006 | 0.0004 | 0.0006 | 0.0011 | 0.0016 | 0.0021 |
| 19 | 2982K | 0.0000 | 0.0007 | 0.0006 | 0.0008 | 0.0010 | 0.0013 | 0.0017 |
| 20 | 2998K | 0.0000 | 0.0012 | 0.0008 | 0.0010 | 0.0008 | 0.0009 | 0.0012 |
| 21 | 3007K | 0.0000 | 0.0009 | 0.0005 | 0.0009 | 0.0009 | 0.0011 | 0.0012 |
| 22 | 2973K | 0.0000 | 0.0008 | 0.0007 | 0.0009 | 0.0008 | 0.0011 | 0.0013 |
| 23 | 3005K | 0.0000 | 0.0008 | 0.0005 | 0.0007 | 0.0008 | 0.0010 | 0.0012 |
| 24 | 2993K | 0.0000 | 0.0011 | 0.0009 | 0.0010 | 0.0009 | 0.0010 | 0.0011 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 300mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2977K | 36.750 | 36.945 | 36.999 | 37.023 | 37.044 | 37.069 | 37.096 |
| 2 | 2988K | 36.891 | 37.080 | 37.141 | 37.204 | 37.249 | 37.280 | 37.313 |
| 3 | 2984K | 36.763 | 36.950 | 36.987 | 37.043 | 37.064 | 37.116 | 37.168 |
| 4 | 2978K | 36.681 | 36.892 | 36.941 | 36.987 | 37.027 | 37.079 | 37.114 |
| 5 | 2991K | 36.776 | 36.902 | 36.924 | 36.950 | 36.989 | 37.012 | 37.035 |
| 6 | 2989K | 36.774 | 36.999 | 37.022 | 37.063 | 37.119 | 37.152 | 37.156 |
| 7 | 2986K | 36.667 | 36.810 | 36.826 | 36.909 | 36.925 | 36.967 | 36.994 |
| 8 | 2989K | 36.614 | 36.758 | 36.801 | 36.849 | 36.881 | 36.917 | 36.947 |
| 9 | 3006K | 36.916 | 37.144 | 37.213 | 37.281 | 37.305 | 37.345 | 37.373 |
| 10 | 3001K | 36.733 | 36.867 | 36.926 | 36.946 | 36.959 | 36.988 | 37.004 |
| 11 | 2980K | 36.721 | 36.915 | 36.962 | 36.995 | 37.037 | 37.091 | 37.135 |
| 12 | 3009K | 36.820 | 37.002 | 37.053 | 37.076 | 37.110 | 37.160 | 37.196 |
| 13 | 2969K | 36.767 | 36.954 | 37.012 | 37.047 | 37.094 | 37.119 | 37.159 |
| 14 | 2974K | 36.711 | 36.904 | 36.969 | 37.018 | 37.065 | 37.079 | 37.120 |
| 15 | 2980K | 36.630 | 36.787 | 36.821 | 36.865 | 36.884 | 36.912 | 36.963 |
| 16 | 2978K | 36.680 | 36.821 | 36.875 | 36.907 | 36.935 | 36.968 | 37.018 |
| 17 | 2989K | 36.659 | 36.859 | 36.921 | 36.961 | 36.998 | 37.032 | 37.080 |
| 18 | 2977K | 36.823 | 37.058 | 37.104 | 37.162 | 37.200 | 37.213 | 37.294 |
| 19 | 2982K | 36.965 | 37.102 | 37.145 | 37.191 | 37.211 | 37.243 | 37.281 |
| 20 | 2998K | 36.734 | 36.884 | 36.943 | 36.993 | 37.040 | 37.046 | 37.111 |
| 21 | 3007K | 36.907 | 37.069 | 37.126 | 37.170 | 37.190 | 37.239 | 37.275 |
| 22 | 2973K | 36.750 | 36.931 | 36.955 | 36.994 | 37.013 | 37.056 | 37.089 |
| 23 | 3005K | 36.752 | 36.995 | 37.031 | 37.063 | 37.102 | 37.129 | 37.157 |
| 24 | 2993K | 36.684 | 36.919 | 36.971 | 37.033 | 37.068 | 37.092 | 37.126 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 300mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2981K | 1646.146 | 1637.936 | 1630.337 | 1617.993 | 1608.973 | 1597.473 | 1585.059 |
| 2 | 2979K | 1644.122 | 1625.597 | 1617.187 | 1604.696 | 1593.737 | 1580.475 | 1568.675 |
| 3 | 2986K | 1642.386 | 1628.189 | 1624.724 | 1614.629 | 1603.914 | 1595.401 | 1584.797 |
| 4 | 2991K | 1643.556 | 1632.592 | 1626.344 | 1615.075 | 1607.358 | 1597.047 | 1588.200 |
| 5 | 2994K | 1625.472 | 1624.804 | 1618.770 | 1604.757 | 1595.259 | 1583.222 | 1573.226 |
| 6 | 2989K | 1628.451 | 1624.554 | 1615.495 | 1603.964 | 1590.566 | 1579.780 | 1569.965 |
| 7 | 2973K | 1651.549 | 1646.463 | 1639.823 | 1629.058 | 1618.249 | 1607.082 | 1593.972 |
| 8 | 3013K | 1641.303 | 1641.473 | 1637.991 | 1628.385 | 1618.871 | 1607.137 | 1599.384 |
| 9 | 2985K | 1652.516 | 1649.973 | 1649.362 | 1638.437 | 1632.331 | 1623.159 | 1617.022 |
| 10 | 2988K | 1635.647 | 1640.702 | 1635.950 | 1624.287 | 1616.141 | 1608.328 | 1603.348 |
| 11 | 2981K | 1645.360 | 1637.433 | 1628.846 | 1613.187 | 1599.073 | 1588.262 | 1574.483 |
| 12 | 2974K | 1639.321 | 1633.444 | 1628.303 | 1618.475 | 1608.791 | 1597.727 | 1589.752 |
| 13 | 2957K | 1638.130 | 1636.037 | 1630.404 | 1619.607 | 1609.794 | 1599.058 | 1581.357 |
| 14 | 2986K | 1643.199 | 1620.130 | 1603.216 | 1585.933 | 1573.144 | 1562.896 | 1550.759 |
| 15 | 2983K | 1652.567 | 1647.841 | 1640.889 | 1630.748 | 1619.677 | 1608.495 | 1596.265 |
| 16 | 3009K | 1613.005 | 1599.370 | 1586.953 | 1573.706 | 1561.274 | 1551.628 | 1534.920 |
| 17 | 2975K | 1643.725 | 1645.048 | 1636.982 | 1631.392 | 1621.565 | 1611.652 | 1603.232 |
| 18 | 2979K | 1627.223 | 1630.325 | 1623.677 | 1611.258 | 1600.972 | 1590.411 | 1580.361 |
| 19 | 2972K | 1646.797 | 1636.386 | 1626.550 | 1614.781 | 1601.982 | 1590.899 | 1578.534 |
| 20 | 2984K | 1632.617 | 1612.748 | 1598.786 | 1583.367 | 1568.407 | 1556.598 | 1544.037 |
| 21 | 2979K | 1628.983 | 1613.814 | 1595.732 | 1583.228 | 1567.409 | 1555.815 | 1540.240 |
| 22 | 2973K | 1652.799 | 1638.455 | 1629.157 | 1615.055 | 1603.159 | 1587.161 | 1573.008 |
| 23 | 2976K | 1646.443 | 1634.145 | 1627.360 | 1617.395 | 1606.030 | 1597.008 | 1587.940 |
| 24 | 2967K | 1643.277 | 1637.988 | 1630.527 | 1618.867 | 1605.075 | 1593.836 | 1580.132 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 300mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2981K | 1.0000 | 0.9950 | 0.9904 | 0.9829 | 0.9774 | 0.9704 | 0.9629 |
| 2 | 2979K | 1.0000 | 0.9887 | 0.9836 | 0.9760 | 0.9694 | 0.9613 | 0.9541 |
| 3 | 2986K | 1.0000 | 0.9914 | 0.9892 | 0.9831 | 0.9766 | 0.9714 | 0.9649 |
| 4 | 2991K | 1.0000 | 0.9933 | 0.9895 | 0.9827 | 0.9780 | 0.9717 | 0.9663 |
| 5 | 2994K | 1.0000 | 0.9996 | 0.9959 | 0.9873 | 0.9814 | 0.9740 | 0.9679 |
| 6 | 2989K | 1.0000 | 0.9976 | 0.9920 | 0.9850 | 0.9767 | 0.9701 | 0.9641 |
| 7 | 2973K | 1.0000 | 0.9969 | 0.9929 | 0.9864 | 0.9798 | 0.9731 | 0.9651 |
| 8 | 3013K | 1.0000 | 1.0001 | 0.9980 | 0.9921 | 0.9863 | 0.9792 | 0.9745 |
| 9 | 2985K | 1.0000 | 0.9985 | 0.9981 | 0.9915 | 0.9878 | 0.9822 | 0.9785 |
| 10 | 2988K | 1.0000 | 1.0031 | 1.0002 | 0.9931 | 0.9881 | 0.9833 | 0.9803 |
| 11 | 2981K | 1.0000 | 0.9952 | 0.9900 | 0.9804 | 0.9719 | 0.9653 | 0.9569 |
| 12 | 2974K | 1.0000 | 0.9964 | 0.9933 | 0.9873 | 0.9814 | 0.9746 | 0.9698 |
| 13 | 2957K | 1.0000 | 0.9987 | 0.9953 | 0.9887 | 0.9827 | 0.9761 | 0.9653 |
| 14 | 2986K | 1.0000 | 0.9860 | 0.9757 | 0.9651 | 0.9574 | 0.9511 | 0.9437 |
| 15 | 2983K | 1.0000 | 0.9971 | 0.9929 | 0.9868 | 0.9801 | 0.9733 | 0.9659 |
| 16 | 3009K | 1.0000 | 0.9915 | 0.9838 | 0.9756 | 0.9679 | 0.9619 | 0.9516 |
| 17 | 2975K | 1.0000 | 1.0008 | 0.9959 | 0.9925 | 0.9865 | 0.9805 | 0.9754 |
| 18 | 2979K | 1.0000 | 1.0019 | 0.9978 | 0.9902 | 0.9839 | 0.9774 | 0.9712 |
| 19 | 2972K | 1.0000 | 0.9937 | 0.9877 | 0.9806 | 0.9728 | 0.9661 | 0.9585 |
| 20 | 2984K | 1.0000 | 0.9878 | 0.9793 | 0.9698 | 0.9607 | 0.9534 | 0.9457 |
| 21 | 2979K | 1.0000 | 0.9907 | 0.9796 | 0.9719 | 0.9622 | 0.9551 | 0.9455 |
| 22 | 2973K | 1.0000 | 0.9913 | 0.9857 | 0.9772 | 0.9700 | 0.9603 | 0.9517 |
| 23 | 2976K | 1.0000 | 0.9925 | 0.9884 | 0.9824 | 0.9755 | 0.9700 | 0.9645 |
| 24 | 2967K | 1.0000 | 0.9968 | 0.9922 | 0.9851 | 0.9768 | 0.9699 | 0.9616 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 300mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2981K | 0.2512 | 0.2511 | 0.2509 | 0.2507 | 0.2504 | 0.2502 | 0.2500 |
| 2 | 2979K | 0.2512 | 0.2505 | 0.2500 | 0.2498 | 0.2494 | 0.2492 | 0.2491 |
| 3 | 2986K | 0.2511 | 0.2508 | 0.2505 | 0.2503 | 0.2499 | 0.2498 | 0.2497 |
| 4 | 2991K | 0.2507 | 0.2504 | 0.2500 | 0.2498 | 0.2495 | 0.2493 | 0.2493 |
| 5 | 2994K | 0.2508 | 0.2509 | 0.2506 | 0.2502 | 0.2497 | 0.2497 | 0.2495 |
| 6 | 2989K | 0.2508 | 0.2508 | 0.2505 | 0.2502 | 0.2498 | 0.2496 | 0.2495 |
| 7 | 2973K | 0.2515 | 0.2509 | 0.2506 | 0.2504 | 0.2502 | 0.2501 | 0.2499 |
| 8 | 3013K | 0.2500 | 0.2498 | 0.2496 | 0.2493 | 0.2491 | 0.2488 | 0.2485 |
| 9 | 2985K | 0.2510 | 0.2509 | 0.2506 | 0.2505 | 0.2502 | 0.2501 | 0.2497 |
| 10 | 2988K | 0.2511 | 0.2510 | 0.2505 | 0.2504 | 0.2501 | 0.2498 | 0.2496 |
| 11 | 2981K | 0.2511 | 0.2507 | 0.2503 | 0.2500 | 0.2497 | 0.2493 | 0.2493 |
| 12 | 2974K | 0.2513 | 0.2510 | 0.2507 | 0.2504 | 0.2504 | 0.2501 | 0.2499 |
| 13 | 2957K | 0.2520 | 0.2514 | 0.2512 | 0.2510 | 0.2509 | 0.2505 | 0.2504 |
| 14 | 2986K | 0.2511 | 0.2505 | 0.2496 | 0.2490 | 0.2486 | 0.2482 | 0.2479 |
| 15 | 2983K | 0.2510 | 0.2504 | 0.2500 | 0.2498 | 0.2497 | 0.2495 | 0.2493 |
| 16 | 3009K | 0.2501 | 0.2497 | 0.2491 | 0.2487 | 0.2486 | 0.2479 | 0.2478 |
| 17 | 2975K | 0.2512 | 0.2507 | 0.2506 | 0.2506 | 0.2503 | 0.2500 | 0.2499 |
| 18 | 2979K | 0.2512 | 0.2508 | 0.2507 | 0.2504 | 0.2502 | 0.2497 | 0.2496 |
| 19 | 2972K | 0.2516 | 0.2509 | 0.2505 | 0.2501 | 0.2498 | 0.2495 | 0.2492 |
| 20 | 2984K | 0.2512 | 0.2501 | 0.2496 | 0.2492 | 0.2489 | 0.2484 | 0.2482 |
| 21 | 2979K | 0.2511 | 0.2504 | 0.2497 | 0.2493 | 0.2490 | 0.2487 | 0.2487 |
| 22 | 2973K | 0.2513 | 0.2504 | 0.2500 | 0.2498 | 0.2495 | 0.2494 | 0.2492 |
| 23 | 2976K | 0.2514 | 0.2508 | 0.2502 | 0.2500 | 0.2497 | 0.2495 | 0.2495 |
| 24 | 2967K | 0.2515 | 0.2508 | 0.2504 | 0.2500 | 0.2498 | 0.2493 | 0.2492 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 300mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2981K | 0.5217 | 0.5226 | 0.5229 | 0.5229 | 0.5229 | 0.5228 | 0.5229 |
| 2 | 2979K | 0.5222 | 0.5227 | 0.5230 | 0.5230 | 0.5228 | 0.5226 | 0.5228 |
| 3 | 2986K | 0.5214 | 0.5218 | 0.5222 | 0.5223 | 0.5221 | 0.5223 | 0.5225 |
| 4 | 2991K | 0.5221 | 0.5227 | 0.5229 | 0.5229 | 0.5229 | 0.5229 | 0.5231 |
| 5 | 2994K | 0.5214 | 0.5223 | 0.5226 | 0.5225 | 0.5224 | 0.5225 | 0.5225 |
| 6 | 2989K | 0.5220 | 0.5228 | 0.5229 | 0.5229 | 0.5227 | 0.5228 | 0.5230 |
| 7 | 2973K | 0.5219 | 0.5222 | 0.5225 | 0.5226 | 0.5224 | 0.5225 | 0.5225 |
| 8 | 3013K | 0.5217 | 0.5224 | 0.5226 | 0.5226 | 0.5225 | 0.5225 | 0.5226 |
| 9 | 2985K | 0.5218 | 0.5224 | 0.5226 | 0.5227 | 0.5226 | 0.5227 | 0.5229 |
| 10 | 2988K | 0.5213 | 0.5221 | 0.5223 | 0.5223 | 0.5221 | 0.5223 | 0.5224 |
| 11 | 2981K | 0.5221 | 0.5227 | 0.5230 | 0.5229 | 0.5228 | 0.5227 | 0.5227 |
| 12 | 2974K | 0.5225 | 0.5231 | 0.5234 | 0.5234 | 0.5232 | 0.5233 | 0.5235 |
| 13 | 2957K | 0.5228 | 0.5231 | 0.5231 | 0.5233 | 0.5233 | 0.5234 | 0.5232 |
| 14 | 2986K | 0.5214 | 0.5216 | 0.5215 | 0.5215 | 0.5214 | 0.5214 | 0.5214 |
| 15 | 2983K | 0.5225 | 0.5228 | 0.5228 | 0.5229 | 0.5230 | 0.5229 | 0.5230 |
| 16 | 3009K | 0.5218 | 0.5220 | 0.5219 | 0.5219 | 0.5217 | 0.5217 | 0.5217 |
| 17 | 2975K | 0.5227 | 0.5234 | 0.5233 | 0.5235 | 0.5235 | 0.5236 | 0.5236 |
| 18 | 2979K | 0.5220 | 0.5227 | 0.5225 | 0.5226 | 0.5226 | 0.5225 | 0.5226 |
| 19 | 2972K | 0.5219 | 0.5223 | 0.5222 | 0.5223 | 0.5222 | 0.5222 | 0.5224 |
| 20 | 2984K | 0.5214 | 0.5214 | 0.5213 | 0.5213 | 0.5212 | 0.5211 | 0.5212 |
| 21 | 2979K | 0.5224 | 0.5227 | 0.5226 | 0.5226 | 0.5225 | 0.5222 | 0.5223 |
| 22 | 2973K | 0.5227 | 0.5230 | 0.5230 | 0.5229 | 0.5230 | 0.5228 | 0.5228 |
| 23 | 2976K | 0.5220 | 0.5223 | 0.5223 | 0.5224 | 0.5223 | 0.5223 | 0.5224 |
| 24 | 2967K | 0.5229 | 0.5232 | 0.5232 | 0.5232 | 0.5231 | 0.5233 | 0.5232 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 300mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2981K | 0.0000 | 0.0008 | 0.0012 | 0.0013 | 0.0014 | 0.0015 | 0.0017 |
| 2 | 2979K | 0.0000 | 0.0009 | 0.0015 | 0.0017 | 0.0019 | 0.0020 | 0.0022 |
| 3 | 2986K | 0.0000 | 0.0006 | 0.0011 | 0.0013 | 0.0014 | 0.0016 | 0.0018 |
| 4 | 2991K | 0.0000 | 0.0007 | 0.0011 | 0.0012 | 0.0015 | 0.0016 | 0.0018 |
| 5 | 2994K | 0.0000 | 0.0009 | 0.0012 | 0.0013 | 0.0015 | 0.0016 | 0.0018 |
| 6 | 2989K | 0.0000 | 0.0008 | 0.0009 | 0.0011 | 0.0012 | 0.0014 | 0.0017 |
| 7 | 2973K | 0.0000 | 0.0007 | 0.0011 | 0.0014 | 0.0015 | 0.0016 | 0.0018 |
| 8 | 3013K | 0.0000 | 0.0007 | 0.0010 | 0.0011 | 0.0012 | 0.0014 | 0.0017 |
| 9 | 2985K | 0.0000 | 0.0007 | 0.0009 | 0.0011 | 0.0012 | 0.0013 | 0.0018 |
| 10 | 2988K | 0.0000 | 0.0008 | 0.0011 | 0.0012 | 0.0013 | 0.0016 | 0.0019 |
| 11 | 2981K | 0.0000 | 0.0007 | 0.0012 | 0.0014 | 0.0016 | 0.0019 | 0.0019 |
| 12 | 2974K | 0.0000 | 0.0007 | 0.0011 | 0.0013 | 0.0012 | 0.0015 | 0.0018 |
| 13 | 2957K | 0.0000 | 0.0006 | 0.0008 | 0.0011 | 0.0012 | 0.0016 | 0.0016 |
| 14 | 2986K | 0.0000 | 0.0007 | 0.0015 | 0.0020 | 0.0025 | 0.0029 | 0.0032 |
| 15 | 2983K | 0.0000 | 0.0006 | 0.0010 | 0.0012 | 0.0013 | 0.0015 | 0.0017 |
| 16 | 3009K | 0.0000 | 0.0005 | 0.0010 | 0.0014 | 0.0015 | 0.0022 | 0.0023 |
| 17 | 2975K | 0.0000 | 0.0009 | 0.0009 | 0.0011 | 0.0013 | 0.0016 | 0.0016 |
| 18 | 2979K | 0.0000 | 0.0008 | 0.0008 | 0.0010 | 0.0012 | 0.0016 | 0.0017 |
| 19 | 2972K | 0.0000 | 0.0008 | 0.0011 | 0.0015 | 0.0018 | 0.0021 | 0.0024 |
| 20 | 2984K | 0.0000 | 0.0011 | 0.0016 | 0.0020 | 0.0023 | 0.0028 | 0.0030 |
| 21 | 2979K | 0.0000 | 0.0007 | 0.0014 | 0.0018 | 0.0021 | 0.0024 | 0.0024 |
| 22 | 2973K | 0.0000 | 0.0009 | 0.0013 | 0.0015 | 0.0018 | 0.0019 | 0.0021 |
| 23 | 2976K | 0.0000 | 0.0007 | 0.0012 | 0.0015 | 0.0017 | 0.0019 | 0.0020 |
| 24 | 2967K | 0.0000 | 0.0007 | 0.0011 | 0.0015 | 0.0018 | 0.0023 | 0.0023 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 105°C$, $I_f = 300mA$; $T_s \geq 103°C$ and $T_{air} \geq 100°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2981K | 36.749 | 37.112 | 37.282 | 37.417 | 37.490 | 37.564 | 37.607 |
| 2 | 2979K | 36.757 | 37.069 | 37.251 | 37.368 | 37.439 | 37.526 | 37.563 |
| 3 | 2986K | 36.733 | 37.153 | 37.326 | 37.475 | 37.568 | 37.651 | 37.690 |
| 4 | 2991K | 36.624 | 36.933 | 37.036 | 37.117 | 37.205 | 37.263 | 37.285 |
| 5 | 2994K | 36.809 | 37.178 | 37.368 | 37.508 | 37.610 | 37.769 | 37.778 |
| 6 | 2989K | 36.702 | 37.056 | 37.268 | 37.406 | 37.500 | 37.664 | 37.638 |
| 7 | 2973K | 36.743 | 37.078 | 37.269 | 37.399 | 37.492 | 37.582 | 37.661 |
| 8 | 3013K | 36.714 | 37.075 | 37.218 | 37.333 | 37.411 | 37.485 | 37.553 |
| 9 | 2985K | 36.953 | 37.261 | 37.413 | 37.542 | 37.639 | 37.733 | 37.789 |
| 10 | 2988K | 36.943 | 37.252 | 37.428 | 37.575 | 37.659 | 37.769 | 37.825 |
| 11 | 2981K | 36.695 | 37.015 | 37.153 | 37.299 | 37.370 | 37.429 | 37.496 |
| 12 | 2974K | 36.663 | 36.961 | 37.099 | 37.203 | 37.297 | 37.383 | 37.420 |
| 13 | 2957K | 36.663 | 36.987 | 37.139 | 37.269 | 37.345 | 37.434 | 37.464 |
| 14 | 2986K | 36.853 | 37.120 | 37.237 | 37.358 | 37.449 | 37.528 | 37.566 |
| 15 | 2983K | 36.908 | 37.257 | 37.475 | 37.584 | 37.672 | 37.760 | 37.797 |
| 16 | 3009K | 36.848 | 37.135 | 37.310 | 37.400 | 37.479 | 37.547 | 37.599 |
| 17 | 2975K | 36.653 | 37.020 | 37.152 | 37.228 | 37.291 | 37.350 | 37.368 |
| 18 | 2979K | 36.740 | 37.093 | 37.284 | 37.401 | 37.486 | 37.566 | 37.627 |
| 19 | 2972K | 36.930 | 37.290 | 37.478 | 37.588 | 37.698 | 37.808 | 37.837 |
| 20 | 2984K | 36.770 | 37.093 | 37.268 | 37.394 | 37.515 | 37.641 | 37.638 |
| 21 | 2979K | 36.749 | 37.066 | 37.251 | 37.373 | 37.453 | 37.521 | 37.572 |
| 22 | 2973K | 36.763 | 37.015 | 37.137 | 37.257 | 37.306 | 37.383 | 37.413 |
| 23 | 2976K | 36.703 | 36.990 | 37.130 | 37.227 | 37.283 | 37.338 | 37.405 |
| 24 | 2967K | 36.696 | 37.019 | 37.136 | 37.224 | 37.296 | 37.370 | 37.416 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 400mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2986K | 2123.805 | 2128.720 | 2130.699 | 2136.093 | 2134.087 | 2125.172 | 2116.513 |
| 2 | 2991K | 2127.936 | 2132.362 | 2137.417 | 2143.074 | 2138.995 | 2129.380 | 2119.855 |
| 3 | 2994K | 2089.601 | 2104.982 | 2110.038 | 2111.068 | 2108.848 | 2097.872 | 2083.022 |
| 4 | 3000K | 2124.575 | 2120.363 | 2124.891 | 2126.448 | 2122.904 | 2114.919 | 2098.160 |
| 5 | 2982K | 2115.466 | 2112.830 | 2119.106 | 2125.463 | 2121.620 | 2115.083 | 2101.699 |
| 6 | 2992K | 2130.083 | 2126.619 | 2131.094 | 2136.700 | 2133.881 | 2123.748 | 2110.499 |
| 7 | 2991K | 2126.240 | 2130.293 | 2134.147 | 2135.060 | 2130.871 | 2117.513 | 2104.440 |
| 8 | 2998K | 2117.672 | 2116.211 | 2121.716 | 2125.514 | 2121.319 | 2113.219 | 2101.038 |
| 9 | 2990K | 2132.884 | 2140.489 | 2145.482 | 2149.231 | 2147.027 | 2135.258 | 2123.357 |
| 10 | 2999K | 2139.087 | 2138.117 | 2143.263 | 2149.081 | 2145.715 | 2133.455 | 2115.502 |
| 11 | 2986K | 2127.308 | 2130.386 | 2134.289 | 2135.813 | 2132.297 | 2119.443 | 2106.653 |
| 12 | 2994K | 2130.705 | 2122.561 | 2127.577 | 2128.999 | 2122.944 | 2110.077 | 2093.831 |
| 13 | 2971K | 2108.856 | 2109.761 | 2120.285 | 2120.981 | 2120.849 | 2108.850 | 2094.750 |
| 14 | 2990K | 2116.780 | 2112.380 | 2123.354 | 2125.828 | 2125.449 | 2114.726 | 2101.105 |
| 15 | 2996K | 2121.826 | 2101.335 | 2112.471 | 2110.943 | 2111.206 | 2101.220 | 2088.995 |
| 16 | 2991K | 2110.744 | 2113.508 | 2123.432 | 2126.543 | 2122.276 | 2114.332 | 2102.004 |
| 17 | 2993K | 2117.094 | 2119.190 | 2129.523 | 2132.640 | 2131.090 | 2121.233 | 2114.011 |
| 18 | 2985K | 2124.889 | 2127.282 | 2133.397 | 2139.686 | 2136.307 | 2124.781 | 2111.722 |
| 19 | 2992K | 2126.079 | 2122.386 | 2130.371 | 2132.598 | 2130.926 | 2119.635 | 2109.556 |
| 20 | 2996K | 2133.626 | 2141.856 | 2151.694 | 2154.160 | 2155.070 | 2149.408 | 2141.032 |
| 21 | 2973K | 2136.234 | 2133.163 | 2140.597 | 2144.305 | 2144.830 | 2131.272 | 2121.939 |
| 22 | 2982K | 2139.726 | 2133.785 | 2141.748 | 2141.475 | 2140.260 | 2126.777 | 2108.062 |
| 23 | 2988K | 2115.058 | 2117.642 | 2126.254 | 2127.184 | 2123.928 | 2112.219 | 2098.030 |
| 24 | 2979K | 2128.272 | 2127.666 | 2134.175 | 2138.554 | 2135.120 | 2129.101 | 2118.321 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 400mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2986K | 1.0000 | 1.0023 | 1.0032 | 1.0058 | 1.0048 | 1.0006 | 0.9966 |
| 2 | 2991K | 1.0000 | 1.0021 | 1.0045 | 1.0071 | 1.0052 | 1.0007 | 0.9962 |
| 3 | 2994K | 1.0000 | 1.0074 | 1.0098 | 1.0103 | 1.0092 | 1.0040 | 0.9969 |
| 4 | 3000K | 1.0000 | 0.9980 | 1.0001 | 1.0009 | 0.9992 | 0.9955 | 0.9876 |
| 5 | 2982K | 1.0000 | 0.9988 | 1.0017 | 1.0047 | 1.0029 | 0.9998 | 0.9935 |
| 6 | 2992K | 1.0000 | 0.9984 | 1.0005 | 1.0031 | 1.0018 | 0.9970 | 0.9908 |
| 7 | 2991K | 1.0000 | 1.0019 | 1.0037 | 1.0041 | 1.0022 | 0.9959 | 0.9897 |
| 8 | 2998K | 1.0000 | 0.9993 | 1.0019 | 1.0037 | 1.0017 | 0.9979 | 0.9921 |
| 9 | 2990K | 1.0000 | 1.0036 | 1.0059 | 1.0077 | 1.0066 | 1.0011 | 0.9955 |
| 10 | 2999K | 1.0000 | 0.9995 | 1.0020 | 1.0047 | 1.0031 | 0.9974 | 0.9890 |
| 11 | 2986K | 1.0000 | 1.0014 | 1.0033 | 1.0040 | 1.0023 | 0.9963 | 0.9903 |
| 12 | 2994K | 1.0000 | 0.9962 | 0.9985 | 0.9992 | 0.9964 | 0.9903 | 0.9827 |
| 13 | 2971K | 1.0000 | 1.0004 | 1.0054 | 1.0057 | 1.0057 | 1.0000 | 0.9933 |
| 14 | 2990K | 1.0000 | 0.9979 | 1.0031 | 1.0043 | 1.0041 | 0.9990 | 0.9926 |
| 15 | 2996K | 1.0000 | 0.9903 | 0.9956 | 0.9949 | 0.9950 | 0.9903 | 0.9845 |
| 16 | 2991K | 1.0000 | 1.0013 | 1.0060 | 1.0075 | 1.0055 | 1.0017 | 0.9959 |
| 17 | 2993K | 1.0000 | 1.0010 | 1.0059 | 1.0073 | 1.0066 | 1.0020 | 0.9985 |
| 18 | 2985K | 1.0000 | 1.0011 | 1.0040 | 1.0070 | 1.0054 | 0.9999 | 0.9938 |
| 19 | 2992K | 1.0000 | 0.9983 | 1.0020 | 1.0031 | 1.0023 | 0.9970 | 0.9922 |
| 20 | 2996K | 1.0000 | 1.0039 | 1.0085 | 1.0096 | 1.0101 | 1.0074 | 1.0035 |
| 21 | 2973K | 1.0000 | 0.9986 | 1.0020 | 1.0038 | 1.0040 | 0.9977 | 0.9933 |
| 22 | 2982K | 1.0000 | 0.9972 | 1.0009 | 1.0008 | 1.0002 | 0.9939 | 0.9852 |
| 23 | 2988K | 1.0000 | 1.0012 | 1.0053 | 1.0057 | 1.0042 | 0.9987 | 0.9919 |
| 24 | 2979K | 1.0000 | 0.9997 | 1.0028 | 1.0048 | 1.0032 | 1.0004 | 0.9953 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 400mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2986K | 0.2509 | 0.2508 | 0.2510 | 0.2508 | 0.2509 | 0.2506 | 0.2509 |
| 2 | 2991K | 0.2509 | 0.2508 | 0.2510 | 0.2509 | 0.2509 | 0.2505 | 0.2509 |
| 3 | 2994K | 0.2506 | 0.2509 | 0.2510 | 0.2511 | 0.2508 | 0.2506 | 0.2509 |
| 4 | 3000K | 0.2505 | 0.2503 | 0.2503 | 0.2504 | 0.2503 | 0.2498 | 0.2504 |
| 5 | 2982K | 0.2511 | 0.2512 | 0.2515 | 0.2513 | 0.2514 | 0.2512 | 0.2514 |
| 6 | 2992K | 0.2510 | 0.2505 | 0.2506 | 0.2506 | 0.2504 | 0.2502 | 0.2506 |
| 7 | 2991K | 0.2509 | 0.2510 | 0.2509 | 0.2510 | 0.2509 | 0.2507 | 0.2510 |
| 8 | 2998K | 0.2506 | 0.2504 | 0.2503 | 0.2503 | 0.2502 | 0.2499 | 0.2502 |
| 9 | 2990K | 0.2506 | 0.2506 | 0.2507 | 0.2507 | 0.2507 | 0.2504 | 0.2507 |
| 10 | 2999K | 0.2505 | 0.2507 | 0.2508 | 0.2507 | 0.2507 | 0.2506 | 0.2511 |
| 11 | 2986K | 0.2509 | 0.2506 | 0.2508 | 0.2506 | 0.2505 | 0.2503 | 0.2506 |
| 12 | 2994K | 0.2506 | 0.2502 | 0.2502 | 0.2503 | 0.2502 | 0.2498 | 0.2502 |
| 13 | 2971K | 0.2515 | 0.2511 | 0.2512 | 0.2513 | 0.2512 | 0.2511 | 0.2513 |
| 14 | 2990K | 0.2509 | 0.2508 | 0.2510 | 0.2510 | 0.2510 | 0.2510 | 0.2511 |
| 15 | 2996K | 0.2507 | 0.2498 | 0.2497 | 0.2499 | 0.2499 | 0.2496 | 0.2497 |
| 16 | 2991K | 0.2509 | 0.2506 | 0.2507 | 0.2506 | 0.2507 | 0.2506 | 0.2506 |
| 17 | 2993K | 0.2507 | 0.2506 | 0.2506 | 0.2507 | 0.2507 | 0.2507 | 0.2507 |
| 18 | 2985K | 0.2510 | 0.2509 | 0.2511 | 0.2509 | 0.2510 | 0.2510 | 0.2510 |
| 19 | 2992K | 0.2508 | 0.2505 | 0.2506 | 0.2505 | 0.2504 | 0.2505 | 0.2506 |
| 20 | 2996K | 0.2505 | 0.2505 | 0.2505 | 0.2505 | 0.2505 | 0.2504 | 0.2505 |
| 21 | 2973K | 0.2514 | 0.2507 | 0.2508 | 0.2508 | 0.2508 | 0.2507 | 0.2509 |
| 22 | 2982K | 0.2505 | 0.2502 | 0.2503 | 0.2504 | 0.2505 | 0.2504 | 0.2506 |
| 23 | 2988K | 0.2509 | 0.2506 | 0.2507 | 0.2507 | 0.2507 | 0.2505 | 0.2506 |
| 24 | 2979K | 0.2511 | 0.2507 | 0.2508 | 0.2511 | 0.2509 | 0.2508 | 0.2509 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 400mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2986K | 0.5224 | 0.5230 | 0.5230 | 0.5230 | 0.5232 | 0.5232 | 0.5229 |
| 2 | 2991K | 0.5215 | 0.5222 | 0.5222 | 0.5223 | 0.5224 | 0.5224 | 0.5220 |
| 3 | 2994K | 0.5222 | 0.5230 | 0.5231 | 0.5231 | 0.5233 | 0.5232 | 0.5228 |
| 4 | 3000K | 0.5215 | 0.5219 | 0.5220 | 0.5219 | 0.5220 | 0.5221 | 0.5217 |
| 5 | 2982K | 0.5219 | 0.5227 | 0.5228 | 0.5229 | 0.5229 | 0.5230 | 0.5227 |
| 6 | 2992K | 0.5208 | 0.5214 | 0.5215 | 0.5215 | 0.5217 | 0.5216 | 0.5212 |
| 7 | 2991K | 0.5214 | 0.5223 | 0.5224 | 0.5224 | 0.5225 | 0.5224 | 0.5220 |
| 8 | 2998K | 0.5214 | 0.5220 | 0.5221 | 0.5222 | 0.5221 | 0.5223 | 0.5219 |
| 9 | 2990K | 0.5226 | 0.5233 | 0.5232 | 0.5233 | 0.5234 | 0.5234 | 0.5232 |
| 10 | 2999K | 0.5220 | 0.5226 | 0.5227 | 0.5229 | 0.5229 | 0.5228 | 0.5223 |
| 11 | 2986K | 0.5222 | 0.5229 | 0.5228 | 0.5229 | 0.5229 | 0.5229 | 0.5225 |
| 12 | 2994K | 0.5222 | 0.5227 | 0.5228 | 0.5227 | 0.5227 | 0.5227 | 0.5222 |
| 13 | 2971K | 0.5225 | 0.5229 | 0.5229 | 0.5230 | 0.5232 | 0.5230 | 0.5228 |
| 14 | 2990K | 0.5216 | 0.5221 | 0.5220 | 0.5222 | 0.5222 | 0.5222 | 0.5219 |
| 15 | 2996K | 0.5212 | 0.5213 | 0.5213 | 0.5213 | 0.5215 | 0.5214 | 0.5212 |
| 16 | 2991K | 0.5216 | 0.5221 | 0.5222 | 0.5223 | 0.5222 | 0.5222 | 0.5222 |
| 17 | 2993K | 0.5218 | 0.5225 | 0.5224 | 0.5225 | 0.5227 | 0.5227 | 0.5226 |
| 18 | 2985K | 0.5222 | 0.5228 | 0.5227 | 0.5229 | 0.5229 | 0.5229 | 0.5226 |
| 19 | 2992K | 0.5217 | 0.5220 | 0.5220 | 0.5222 | 0.5222 | 0.5221 | 0.5221 |
| 20 | 2996K | 0.5222 | 0.5226 | 0.5225 | 0.5228 | 0.5227 | 0.5227 | 0.5228 |
| 21 | 2973K | 0.5224 | 0.5228 | 0.5227 | 0.5228 | 0.5229 | 0.5228 | 0.5225 |
| 22 | 2982K | 0.5244 | 0.5247 | 0.5248 | 0.5248 | 0.5250 | 0.5247 | 0.5244 |
| 23 | 2988K | 0.5222 | 0.5226 | 0.5224 | 0.5227 | 0.5227 | 0.5226 | 0.5225 |
| 24 | 2979K | 0.5226 | 0.5229 | 0.5229 | 0.5231 | 0.5231 | 0.5231 | 0.5229 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 400mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2986K | 0.0000 | 0.0006 | 0.0007 | 0.0006 | 0.0008 | 0.0008 | 0.0005 |
| 2 | 2991K | 0.0000 | 0.0007 | 0.0007 | 0.0008 | 0.0009 | 0.0010 | 0.0005 |
| 3 | 2994K | 0.0000 | 0.0010 | 0.0010 | 0.0010 | 0.0012 | 0.0010 | 0.0007 |
| 4 | 3000K | 0.0000 | 0.0005 | 0.0005 | 0.0004 | 0.0005 | 0.0009 | 0.0003 |
| 5 | 2982K | 0.0000 | 0.0008 | 0.0009 | 0.0010 | 0.0009 | 0.0010 | 0.0008 |
| 6 | 2992K | 0.0000 | 0.0008 | 0.0008 | 0.0009 | 0.0011 | 0.0012 | 0.0006 |
| 7 | 2991K | 0.0000 | 0.0009 | 0.0009 | 0.0010 | 0.0011 | 0.0010 | 0.0006 |
| 8 | 2998K | 0.0000 | 0.0006 | 0.0007 | 0.0008 | 0.0008 | 0.0012 | 0.0006 |
| 9 | 2990K | 0.0000 | 0.0007 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0006 |
| 10 | 2999K | 0.0000 | 0.0007 | 0.0008 | 0.0009 | 0.0010 | 0.0008 | 0.0007 |
| 11 | 2986K | 0.0000 | 0.0007 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0004 |
| 12 | 2994K | 0.0000 | 0.0006 | 0.0007 | 0.0006 | 0.0006 | 0.0010 | 0.0004 |
| 13 | 2971K | 0.0000 | 0.0006 | 0.0005 | 0.0005 | 0.0008 | 0.0006 | 0.0003 |
| 14 | 2990K | 0.0000 | 0.0005 | 0.0004 | 0.0006 | 0.0006 | 0.0006 | 0.0003 |
| 15 | 2996K | 0.0000 | 0.0010 | 0.0010 | 0.0009 | 0.0009 | 0.0011 | 0.0010 |
| 16 | 2991K | 0.0000 | 0.0005 | 0.0005 | 0.0007 | 0.0006 | 0.0006 | 0.0006 |
| 17 | 2993K | 0.0000 | 0.0007 | 0.0006 | 0.0007 | 0.0008 | 0.0009 | 0.0008 |
| 18 | 2985K | 0.0000 | 0.0006 | 0.0006 | 0.0007 | 0.0007 | 0.0007 | 0.0005 |
| 19 | 2992K | 0.0000 | 0.0005 | 0.0003 | 0.0006 | 0.0006 | 0.0005 | 0.0004 |
| 20 | 2996K | 0.0000 | 0.0004 | 0.0004 | 0.0006 | 0.0006 | 0.0006 | 0.0007 |
| 21 | 2973K | 0.0000 | 0.0008 | 0.0007 | 0.0007 | 0.0008 | 0.0008 | 0.0006 |
| 22 | 2982K | 0.0000 | 0.0005 | 0.0004 | 0.0004 | 0.0005 | 0.0003 | 0.0001 |
| 23 | 2988K | 0.0000 | 0.0004 | 0.0003 | 0.0005 | 0.0005 | 0.0005 | 0.0004 |
| 24 | 2979K | 0.0000 | 0.0005 | 0.0004 | 0.0005 | 0.0006 | 0.0006 | 0.0004 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 55°C$, $I_f = 400mA$; $T_s \geq 53°C$ and $T_{air} \geq 50°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2986K | 38.330 | 38.467 | 38.487 | 38.525 | 38.540 | 38.570 | 38.595 |
| 2 | 2991K | 38.392 | 38.610 | 38.647 | 38.683 | 38.728 | 38.753 | 38.777 |
| 3 | 2994K | 38.297 | 38.508 | 38.553 | 38.602 | 38.619 | 38.622 | 38.687 |
| 4 | 3000K | 38.555 | 38.705 | 38.738 | 38.786 | 38.800 | 38.815 | 38.851 |
| 5 | 2982K | 38.516 | 38.670 | 38.719 | 38.753 | 38.763 | 38.776 | 38.839 |
| 6 | 2992K | 38.209 | 38.354 | 38.398 | 38.422 | 38.441 | 38.432 | 38.464 |
| 7 | 2991K | 38.514 | 38.773 | 38.848 | 38.888 | 38.930 | 38.932 | 38.999 |
| 8 | 2998K | 38.429 | 38.667 | 38.715 | 38.751 | 38.791 | 38.805 | 38.834 |
| 9 | 2990K | 38.167 | 38.275 | 38.307 | 38.349 | 38.356 | 38.365 | 38.382 |
| 10 | 2999K | 38.176 | 38.319 | 38.362 | 38.392 | 38.395 | 38.434 | 38.470 |
| 11 | 2986K | 38.207 | 38.384 | 38.393 | 38.457 | 38.481 | 38.498 | 38.513 |
| 12 | 2994K | 38.299 | 38.522 | 38.558 | 38.620 | 38.624 | 38.660 | 38.697 |
| 13 | 2971K | 38.300 | 38.469 | 38.488 | 38.525 | 38.557 | 38.574 | 38.612 |
| 14 | 2990K | 38.247 | 38.419 | 38.442 | 38.480 | 38.502 | 38.509 | 38.527 |
| 15 | 2996K | 38.499 | 38.761 | 38.793 | 38.858 | 38.886 | 38.904 | 38.950 |
| 16 | 2991K | 38.221 | 38.453 | 38.488 | 38.549 | 38.566 | 38.592 | 38.618 |
| 17 | 2993K | 38.250 | 38.334 | 38.379 | 38.400 | 38.424 | 38.451 | 38.481 |
| 18 | 2985K | 38.240 | 38.433 | 38.507 | 38.544 | 38.554 | 38.589 | 38.614 |
| 19 | 2992K | 38.343 | 38.360 | 38.397 | 38.395 | 38.428 | 38.426 | 38.473 |
| 20 | 2996K | 38.435 | 38.542 | 38.563 | 38.579 | 38.611 | 38.632 | 38.652 |
| 21 | 2973K | 38.345 | 38.490 | 38.525 | 38.538 | 38.561 | 38.581 | 38.630 |
| 22 | 2982K | 38.278 | 38.454 | 38.505 | 38.535 | 38.564 | 38.588 | 38.626 |
| 23 | 2988K | 38.187 | 38.471 | 38.518 | 38.568 | 38.592 | 38.613 | 38.653 |
| 24 | 2979K | 38.409 | 38.449 | 38.484 | 38.510 | 38.502 | 38.524 | 38.556 |

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**Luminous Flux [lm] data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 400mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2995K | 2113.389 | 2117.187 | 2117.071 | 2099.312 | 2083.783 | 2064.150 | 2041.831 |
| 2 | 2982K | 2113.758 | 2098.281 | 2097.254 | 2078.394 | 2057.636 | 2029.787 | 2002.520 |
| 3 | 2982K | 2123.014 | 2129.519 | 2130.937 | 2114.030 | 2102.725 | 2081.596 | 2064.207 |
| 4 | 3010K | 2104.360 | 2092.619 | 2062.420 | 2020.090 | 1992.696 | 1965.946 | 1943.656 |
| 5 | 3000K | 2118.108 | 2126.845 | 2129.011 | 2110.576 | 2095.268 | 2075.866 | 2061.710 |
| 6 | 2982K | 2104.375 | 2115.309 | 2124.327 | 2113.676 | 2103.634 | 2097.673 | 2084.911 |
| 7 | 2983K | 2103.521 | 2105.565 | 2103.628 | 2085.587 | 2071.579 | 2057.287 | 2042.340 |
| 8 | 2991K | 2118.187 | 2120.014 | 2119.913 | 2101.187 | 2082.162 | 2063.558 | 2048.372 |
| 9 | 2988K | 2118.261 | 2121.271 | 2117.409 | 2095.958 | 2082.194 | 2064.025 | 2043.221 |
| 10 | 2973K | 2126.807 | 2125.229 | 2116.759 | 2088.938 | 2066.141 | 2045.592 | 2023.458 |
| 11 | 2978K | 2119.847 | 2121.160 | 2113.240 | 2090.131 | 2071.570 | 2049.480 | 2026.864 |
| 12 | 2986K | 2110.263 | 2124.967 | 2122.535 | 2108.400 | 2091.364 | 2071.358 | 2053.376 |
| 13 | 2985K | 2128.306 | 2124.155 | 2117.939 | 2090.095 | 2062.337 | 2042.699 | 2013.939 |
| 14 | 2996K | 2135.689 | 2121.744 | 2119.253 | 2096.957 | 2073.477 | 2053.550 | 2025.770 |
| 15 | 3001K | 2118.810 | 2105.804 | 2104.122 | 2083.794 | 2067.909 | 2053.528 | 2031.954 |
| 16 | 2998K | 2111.404 | 2109.818 | 2110.532 | 2088.242 | 2072.036 | 2059.458 | 2039.110 |
| 17 | 2988K | 2130.660 | 2117.510 | 2121.051 | 2105.392 | 2090.944 | 2078.839 | 2054.485 |
| 18 | 2986K | 2149.869 | 2143.419 | 2141.003 | 2121.120 | 2100.573 | 2086.309 | 2062.961 |
| 19 | 2996K | 2139.724 | 2130.859 | 2130.569 | 2113.792 | 2098.895 | 2091.712 | 2071.735 |
| 20 | 2986K | 2133.014 | 2124.811 | 2128.710 | 2112.159 | 2096.720 | 2085.586 | 2061.163 |
| 21 | 2989K | 2130.704 | 2098.581 | 2093.685 | 2068.386 | 2043.473 | 2024.850 | 2001.532 |
| 22 | 3009K | 2127.719 | 2123.982 | 2121.030 | 2099.957 | 2080.538 | 2069.858 | 2046.387 |
| 23 | 2981K | 2138.238 | 2115.653 | 2113.154 | 2092.813 | 2074.982 | 2060.763 | 2031.190 |
| 24 | 2999K | 2113.544 | 2116.262 | 2108.657 | 2079.308 | 2057.536 | 2039.893 | 2014.262 |

**Normalized Luminous Flux data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 400mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2995K | 1.0000 | 1.0018 | 1.0017 | 0.9933 | 0.9860 | 0.9767 | 0.9661 |
| 2 | 2982K | 1.0000 | 0.9927 | 0.9922 | 0.9833 | 0.9734 | 0.9603 | 0.9474 |
| 3 | 2982K | 1.0000 | 1.0031 | 1.0037 | 0.9958 | 0.9904 | 0.9805 | 0.9723 |
| 4 | 3010K | 1.0000 | 0.9944 | 0.9801 | 0.9600 | 0.9469 | 0.9342 | 0.9236 |
| 5 | 3000K | 1.0000 | 1.0041 | 1.0051 | 0.9964 | 0.9892 | 0.9801 | 0.9734 |
| 6 | 2982K | 1.0000 | 1.0052 | 1.0095 | 1.0044 | 0.9996 | 0.9968 | 0.9908 |
| 7 | 2983K | 1.0000 | 1.0010 | 1.0001 | 0.9915 | 0.9848 | 0.9780 | 0.9709 |
| 8 | 2991K | 1.0000 | 1.0009 | 1.0008 | 0.9920 | 0.9830 | 0.9742 | 0.9670 |
| 9 | 2988K | 1.0000 | 1.0014 | 0.9996 | 0.9895 | 0.9830 | 0.9744 | 0.9646 |
| 10 | 2973K | 1.0000 | 0.9993 | 0.9953 | 0.9822 | 0.9715 | 0.9618 | 0.9514 |
| 11 | 2978K | 1.0000 | 1.0006 | 0.9969 | 0.9860 | 0.9772 | 0.9668 | 0.9561 |
| 12 | 2986K | 1.0000 | 1.0070 | 1.0058 | 0.9991 | 0.9910 | 0.9816 | 0.9730 |
| 13 | 2985K | 1.0000 | 0.9980 | 0.9951 | 0.9820 | 0.9690 | 0.9598 | 0.9463 |
| 14 | 2996K | 1.0000 | 0.9935 | 0.9923 | 0.9819 | 0.9709 | 0.9615 | 0.9485 |
| 15 | 3001K | 1.0000 | 0.9939 | 0.9931 | 0.9835 | 0.9760 | 0.9692 | 0.9590 |
| 16 | 2998K | 1.0000 | 0.9992 | 0.9996 | 0.9890 | 0.9814 | 0.9754 | 0.9658 |
| 17 | 2988K | 1.0000 | 0.9938 | 0.9955 | 0.9881 | 0.9814 | 0.9757 | 0.9642 |
| 18 | 2986K | 1.0000 | 0.9970 | 0.9959 | 0.9866 | 0.9771 | 0.9704 | 0.9596 |
| 19 | 2996K | 1.0000 | 0.9959 | 0.9957 | 0.9879 | 0.9809 | 0.9776 | 0.9682 |
| 20 | 2986K | 1.0000 | 0.9962 | 0.9980 | 0.9902 | 0.9830 | 0.9778 | 0.9663 |
| 21 | 2989K | 1.0000 | 0.9849 | 0.9826 | 0.9708 | 0.9591 | 0.9503 | 0.9394 |
| 22 | 3009K | 1.0000 | 0.9982 | 0.9969 | 0.9870 | 0.9778 | 0.9728 | 0.9618 |
| 23 | 2981K | 1.0000 | 0.9894 | 0.9883 | 0.9788 | 0.9704 | 0.9638 | 0.9499 |
| 24 | 2999K | 1.0000 | 1.0013 | 0.9977 | 0.9838 | 0.9735 | 0.9652 | 0.9530 |

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**CIE 1976 u' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 400mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2995K | 0.2506 | 0.2506 | 0.2503 | 0.2501 | 0.2499 | 0.2496 | 0.2496 |
| 2 | 2982K | 0.2510 | 0.2507 | 0.2507 | 0.2503 | 0.2500 | 0.2498 | 0.2497 |
| 3 | 2982K | 0.2511 | 0.2508 | 0.2508 | 0.2506 | 0.2502 | 0.2500 | 0.2499 |
| 4 | 3010K | 0.2501 | 0.2495 | 0.2488 | 0.2476 | 0.2469 | 0.2463 | 0.2462 |
| 5 | 3000K | 0.2506 | 0.2503 | 0.2501 | 0.2498 | 0.2495 | 0.2491 | 0.2489 |
| 6 | 2982K | 0.2511 | 0.2508 | 0.2508 | 0.2506 | 0.2505 | 0.2502 | 0.2503 |
| 7 | 2983K | 0.2511 | 0.2506 | 0.2504 | 0.2504 | 0.2502 | 0.2498 | 0.2500 |
| 8 | 2991K | 0.2506 | 0.2501 | 0.2502 | 0.2500 | 0.2496 | 0.2494 | 0.2493 |
| 9 | 2988K | 0.2507 | 0.2504 | 0.2501 | 0.2499 | 0.2496 | 0.2493 | 0.2493 |
| 10 | 2973K | 0.2512 | 0.2507 | 0.2505 | 0.2497 | 0.2493 | 0.2488 | 0.2489 |
| 11 | 2978K | 0.2511 | 0.2506 | 0.2504 | 0.2498 | 0.2494 | 0.2492 | 0.2494 |
| 12 | 2986K | 0.2510 | 0.2509 | 0.2508 | 0.2505 | 0.2501 | 0.2498 | 0.2498 |
| 13 | 2985K | 0.2508 | 0.2508 | 0.2505 | 0.2501 | 0.2494 | 0.2488 | 0.2488 |
| 14 | 2996K | 0.2505 | 0.2502 | 0.2500 | 0.2497 | 0.2495 | 0.2492 | 0.2494 |
| 15 | 3001K | 0.2502 | 0.2499 | 0.2495 | 0.2492 | 0.2489 | 0.2485 | 0.2485 |
| 16 | 2998K | 0.2507 | 0.2503 | 0.2502 | 0.2499 | 0.2496 | 0.2494 | 0.2493 |
| 17 | 2988K | 0.2507 | 0.2505 | 0.2504 | 0.2503 | 0.2501 | 0.2498 | 0.2500 |
| 18 | 2986K | 0.2508 | 0.2506 | 0.2503 | 0.2501 | 0.2498 | 0.2492 | 0.2492 |
| 19 | 2996K | 0.2507 | 0.2505 | 0.2502 | 0.2499 | 0.2497 | 0.2493 | 0.2495 |
| 20 | 2986K | 0.2508 | 0.2509 | 0.2508 | 0.2506 | 0.2502 | 0.2500 | 0.2501 |
| 21 | 2989K | 0.2507 | 0.2500 | 0.2497 | 0.2495 | 0.2492 | 0.2488 | 0.2486 |
| 22 | 3009K | 0.2502 | 0.2498 | 0.2496 | 0.2492 | 0.2489 | 0.2483 | 0.2484 |
| 23 | 2981K | 0.2510 | 0.2504 | 0.2502 | 0.2499 | 0.2494 | 0.2488 | 0.2490 |
| 24 | 2999K | 0.2505 | 0.2504 | 0.2502 | 0.2497 | 0.2492 | 0.2489 | 0.2487 |

**CIE 1976 v' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 400mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2995K | 0.5219 | 0.5228 | 0.5228 | 0.5227 | 0.5227 | 0.5226 | 0.5222 |
| 2 | 2982K | 0.5227 | 0.5234 | 0.5233 | 0.5233 | 0.5231 | 0.5227 | 0.5222 |
| 3 | 2982K | 0.5220 | 0.5229 | 0.5228 | 0.5227 | 0.5227 | 0.5226 | 0.5223 |
| 4 | 3010K | 0.5214 | 0.5220 | 0.5215 | 0.5211 | 0.5209 | 0.5207 | 0.5203 |
| 5 | 3000K | 0.5214 | 0.5219 | 0.5220 | 0.5219 | 0.5216 | 0.5217 | 0.5216 |
| 6 | 2982K | 0.5221 | 0.5227 | 0.5227 | 0.5229 | 0.5229 | 0.5230 | 0.5229 |
| 7 | 2983K | 0.5219 | 0.5225 | 0.5224 | 0.5223 | 0.5223 | 0.5224 | 0.5220 |
| 8 | 2991K | 0.5228 | 0.5235 | 0.5235 | 0.5234 | 0.5232 | 0.5232 | 0.5231 |
| 9 | 2988K | 0.5228 | 0.5233 | 0.5232 | 0.5231 | 0.5231 | 0.5231 | 0.5227 |
| 10 | 2973K | 0.5233 | 0.5237 | 0.5235 | 0.5234 | 0.5230 | 0.5230 | 0.5226 |
| 11 | 2978K | 0.5227 | 0.5231 | 0.5231 | 0.5229 | 0.5229 | 0.5227 | 0.5222 |
| 12 | 2986K | 0.5217 | 0.5224 | 0.5223 | 0.5223 | 0.5221 | 0.5221 | 0.5219 |
| 13 | 2985K | 0.5227 | 0.5235 | 0.5234 | 0.5234 | 0.5230 | 0.5229 | 0.5225 |
| 14 | 2996K | 0.5222 | 0.5229 | 0.5229 | 0.5229 | 0.5228 | 0.5225 | 0.5221 |
| 15 | 3001K | 0.5226 | 0.5232 | 0.5233 | 0.5232 | 0.5229 | 0.5230 | 0.5228 |
| 16 | 2998K | 0.5213 | 0.5219 | 0.5221 | 0.5220 | 0.5220 | 0.5220 | 0.5218 |
| 17 | 2988K | 0.5227 | 0.5234 | 0.5236 | 0.5236 | 0.5235 | 0.5234 | 0.5232 |
| 18 | 2986K | 0.5225 | 0.5231 | 0.5230 | 0.5231 | 0.5228 | 0.5228 | 0.5227 |
| 19 | 2996K | 0.5216 | 0.5220 | 0.5222 | 0.5222 | 0.5221 | 0.5222 | 0.5221 |
| 20 | 2986K | 0.5226 | 0.5232 | 0.5234 | 0.5235 | 0.5234 | 0.5234 | 0.5231 |
| 21 | 2989K | 0.5224 | 0.5229 | 0.5230 | 0.5230 | 0.5226 | 0.5224 | 0.5223 |
| 22 | 3009K | 0.5213 | 0.5218 | 0.5218 | 0.5218 | 0.5216 | 0.5215 | 0.5214 |
| 23 | 2981K | 0.5225 | 0.5229 | 0.5230 | 0.5231 | 0.5229 | 0.5226 | 0.5222 |
| 24 | 2999K | 0.5216 | 0.5225 | 0.5224 | 0.5223 | 0.5222 | 0.5219 | 0.5217 |

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**Delta u'v' data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 400mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2995K | 0.0000 | 0.0009 | 0.0010 | 0.0009 | 0.0011 | 0.0012 | 0.0011 |
| 2 | 2982K | 0.0000 | 0.0008 | 0.0007 | 0.0009 | 0.0011 | 0.0012 | 0.0013 |
| 3 | 2982K | 0.0000 | 0.0010 | 0.0008 | 0.0009 | 0.0012 | 0.0013 | 0.0012 |
| 4 | 3010K | 0.0000 | 0.0008 | 0.0014 | 0.0025 | 0.0033 | 0.0039 | 0.0041 |
| 5 | 3000K | 0.0000 | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0015 | 0.0017 |
| 6 | 2982K | 0.0000 | 0.0007 | 0.0007 | 0.0010 | 0.0010 | 0.0014 | 0.0012 |
| 7 | 2983K | 0.0000 | 0.0008 | 0.0009 | 0.0009 | 0.0010 | 0.0014 | 0.0012 |
| 8 | 2991K | 0.0000 | 0.0009 | 0.0008 | 0.0008 | 0.0011 | 0.0013 | 0.0013 |
| 9 | 2988K | 0.0000 | 0.0006 | 0.0007 | 0.0009 | 0.0012 | 0.0015 | 0.0015 |
| 10 | 2973K | 0.0000 | 0.0006 | 0.0006 | 0.0014 | 0.0019 | 0.0024 | 0.0024 |
| 11 | 2978K | 0.0000 | 0.0006 | 0.0008 | 0.0013 | 0.0017 | 0.0019 | 0.0018 |
| 12 | 2986K | 0.0000 | 0.0008 | 0.0007 | 0.0008 | 0.0010 | 0.0013 | 0.0012 |
| 13 | 2985K | 0.0000 | 0.0008 | 0.0008 | 0.0011 | 0.0015 | 0.0020 | 0.0020 |
| 14 | 2996K | 0.0000 | 0.0008 | 0.0009 | 0.0011 | 0.0012 | 0.0014 | 0.0012 |
| 15 | 3001K | 0.0000 | 0.0007 | 0.0010 | 0.0012 | 0.0013 | 0.0018 | 0.0018 |
| 16 | 2998K | 0.0000 | 0.0007 | 0.0009 | 0.0010 | 0.0012 | 0.0014 | 0.0015 |
| 17 | 2988K | 0.0000 | 0.0007 | 0.0010 | 0.0010 | 0.0010 | 0.0012 | 0.0009 |
| 18 | 2986K | 0.0000 | 0.0006 | 0.0007 | 0.0009 | 0.0010 | 0.0016 | 0.0016 |
| 19 | 2996K | 0.0000 | 0.0005 | 0.0008 | 0.0010 | 0.0011 | 0.0015 | 0.0013 |
| 20 | 2986K | 0.0000 | 0.0006 | 0.0008 | 0.0009 | 0.0011 | 0.0011 | 0.0009 |
| 21 | 2989K | 0.0000 | 0.0010 | 0.0012 | 0.0014 | 0.0016 | 0.0020 | 0.0021 |
| 22 | 3009K | 0.0000 | 0.0007 | 0.0007 | 0.0011 | 0.0014 | 0.0019 | 0.0018 |
| 23 | 2981K | 0.0000 | 0.0008 | 0.0010 | 0.0013 | 0.0017 | 0.0023 | 0.0021 |
| 24 | 2999K | 0.0000 | 0.0008 | 0.0009 | 0.0011 | 0.0014 | 0.0017 | 0.0018 |

**Forward Voltage [V] data for tested units**
**$T_s = T_{air} = 85°C$, $I_f = 400mA$; $T_s \geq 83°C$ and $T_{air} \geq 80°C$ in compliance with LM-80-15**

| | CCT (t=0) | 0hrs | 1000hrs | 2000hrs | 3000hrs | 4000hrs | 5000hrs | 6000hrs |
|---|---|---|---|---|---|---|---|---|
| 1 | 2995K | 38.253 | 38.620 | 38.735 | 38.868 | 38.942 | 39.009 | 39.092 |
| 2 | 2982K | 38.230 | 38.543 | 38.664 | 38.750 | 38.830 | 38.883 | 38.923 |
| 3 | 2982K | 38.447 | 38.797 | 38.894 | 38.972 | 39.053 | 39.132 | 39.193 |
| 4 | 3010K | 38.513 | 38.789 | 38.924 | 39.004 | 39.092 | 39.199 | 39.331 |
| 5 | 3000K | 38.358 | 38.654 | 38.757 | 38.838 | 38.964 | 39.004 | 39.074 |
| 6 | 2982K | 38.171 | 38.532 | 38.663 | 38.754 | 38.844 | 38.881 | 38.948 |
| 7 | 2983K | 38.283 | 38.626 | 38.749 | 38.833 | 38.916 | 38.988 | 38.999 |
| 8 | 2991K | 38.214 | 38.526 | 38.667 | 38.748 | 38.826 | 38.897 | 38.950 |
| 9 | 2988K | 38.248 | 38.568 | 38.700 | 38.776 | 38.864 | 38.919 | 39.006 |
| 10 | 2973K | 38.378 | 38.678 | 38.759 | 38.827 | 38.888 | 38.945 | 38.991 |
| 11 | 2978K | 38.214 | 38.458 | 38.564 | 38.664 | 38.711 | 38.819 | 38.886 |
| 12 | 2986K | 38.362 | 38.625 | 38.728 | 38.844 | 38.917 | 39.010 | 39.125 |
| 13 | 2985K | 38.158 | 38.391 | 38.471 | 38.534 | 38.601 | 38.676 | 38.711 |
| 14 | 2996K | 38.344 | 38.587 | 38.695 | 38.795 | 38.871 | 38.937 | 39.007 |
| 15 | 3001K | 38.286 | 38.524 | 38.609 | 38.689 | 38.729 | 38.810 | 38.863 |
| 16 | 2998K | 38.394 | 38.755 | 38.864 | 38.977 | 39.062 | 39.147 | 39.288 |
| 17 | 2988K | 38.165 | 38.502 | 38.593 | 38.716 | 38.806 | 38.923 | 39.005 |
| 18 | 2986K | 38.275 | 38.702 | 38.790 | 38.873 | 38.975 | 39.021 | 39.080 |
| 19 | 2996K | 38.420 | 38.650 | 38.725 | 38.820 | 38.899 | 38.956 | 39.035 |
| 20 | 2986K | 38.280 | 38.657 | 38.767 | 38.894 | 38.999 | 39.041 | 39.157 |
| 21 | 2989K | 38.270 | 38.666 | 38.765 | 38.907 | 39.020 | 39.120 | 39.225 |
| 22 | 3009K | 38.255 | 38.481 | 38.573 | 38.673 | 38.762 | 38.838 | 38.954 |
| 23 | 2981K | 38.099 | 38.402 | 38.509 | 38.626 | 38.714 | 38.782 | 38.863 |
| 24 | 2999K | 38.425 | 38.644 | 38.773 | 38.874 | 38.975 | 39.092 | 39.179 |

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Lumileds is a leading provider of power LEDs for everyday lighting applications. The company's records for light output, efficacy and thermal management are direct results of the ongoing commitment to advancing solid-state lighting technology and enabling lighting solutions that are more environmentally friendly, help reduce CO2 emissions and reduce the need for power plant expansion. Lumileds LUXEON LEDs are enabling never before possible applications in outdoor lighting, shop lighting, home lighting, digital imaging, display and automotive lighting.

Lumileds is a fully integrated supplier, producing core LED material in all three base colors, (red, green, blue) and white. Lumileds has R & D centers in San Jose, California and in the Netherlands, and production capabilities in San Jose, Singapore and Penang, Malaysia. Founded in 1999, Lumileds is the high flux LED technology leader and is dedicated to bridging the gap between solid-state technology and the lighting world. More information about the company's LUXEON LED products and solid-state lighting technologies can be found at www.lumileds.com.

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## Appendix: Additional Projected Extrapolations per IESNA TM-21-11

### Projected $L_{75}$ extrapolations per IESNA TM-21-11

| | If = 200mA | If = 300mA | If = 400mA |
|---|---|---|---|
| Ts = 105°C | 66,824 | 43,113 | - |
| Ts = 85°C | 55,793 | 75,648 | 36,635 |
| Ts = 55°C | -199,779 | -358,850 | 195,246 |

### Projected $L_{80}$ extrapolations per IESNA TM-21-11

| | If = 200mA | If = 300mA | If = 400mA |
|---|---|---|---|
| Ts = 105°C | 51,865 | 33,536 | - |
| Ts = 85°C | 43,563 | 59,087 | 28,687 |
| Ts = 55°C | -155,779 | -279,580 | 152,284 |

### Projected $L_{85}$ extrapolations per IESNA TM-21-11

| | If = 200mA | If = 300mA | If = 400mA |
|---|---|---|---|
| Ts = 105°C | 37,813 | 24,540 | - |
| Ts = 85°C | 32,074 | 43,530 | 21,221 |
| Ts = 55°C | -114,448 | -205,118 | 111,927 |

### Projected $L_{90}$ extrapolations per IESNA TM-21-11

| | If = 200mA | If = 300mA | If = 400mA |
|---|---|---|---|
| Ts = 105°C | 24,564 | 16,058 | - |
| Ts = 85°C | 21,243 | 28,863 | 14,182 |
| Ts = 55°C | -75,480 | -134,913 | 73,878 |

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Test Report issued under the responsibility of:

# TEST REPORT
## IEC TR 62778
## Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires

| | |
|---|---|
| **Report Number.....:** | 6108075.50P |
| **Date of issue.....:** | 2021-08-12 |
| **Total number of pages.....** | 32 |
| **Name of Testing Laboratory preparing the Report.....:** | DEKRA Testing and Certification (Shanghai) Ltd.<br>3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Jing'an District, Shanghai, P.R.C 200436 |
| **Applicant's name.....:** | Lumileds (Shanghai) Management Co.,Ltd. |
| **Address .....:** | Building 1-A，No.19 & 20, Lane 299, Wenshui Road, JingAn District, Shanghai, P.R. China, 200072 |
| **Test specification:** | |
| **Standard .....:** | EN 62471: 2008<br>IEC TR 62778:2014 (Second Edition) |
| **Test procedure .....:** | CB Scheme |
| **Non-standard test method .....:** | N/A |
| **Test Report Form No.....:** | IEC62778A |
| **Test Report Form(s) Originator ....:** | TÜV SÜD Product Service GmbH |
| **Master TRF .....:** | Dated 2016-02 |

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| | |
|---|---|
| **Test item description.....** : | LED module |
| **Trade Mark.....** : | LUMILEDS |
| **Manufacturer.....** : | Lumileds (Shanghai) Management Co.,Ltd.<br>Building 1-A，No.19 & 20, Lane 299, Wenshui Road, JingAn District, Shanghai, P.R. China, 200072 |
| **Model/Type reference.....** : | L170-aabb70ccddddd, where<br>aa = nominal CCT (22=2200K,27=2700K,30 =3000K,35=3500K,40 = 4000K, 50=5000K,57=5700K,65=6500K)<br>bb = min CRI (70 = 70CRI,80=80CRI,90=90 CRI),<br>cc=froward voltage(12 = 12V, 18=18V,24=24V,36 = 36V, 72=72V) ,<br>ddddd for marketing use |
| **Ratings.....** : | Max current 1200mA |

| | | | |
|---|---|---|---|
| **Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):** | | | |
| ☒ | **CB Testing Laboratory:** | DEKRA Testing and Certification (Shanghai) Ltd. | |
| **Testing location/ address.....** | | 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Jing'an District, Shanghai, P.R.C 200436 | |
| ☐ | ~~Associated CB Testing Laboratory:~~ | | |
| ~~Testing location/ address.....~~ | | | |
| **Tested by (name, function, signature).....** | | Nancy Wang | Nancy Wang |
| **Approved by (name, function, signature).....** | | Hanson Zhang | Hanson |
| | | | |
| ☐ | ~~Testing procedure: CTF Stage 1:~~ | | |
| ~~Testing location/ address.....~~ | | | |
| ~~Tested by (name, function, signature).~~ | | | |
| ~~Approved by (name, function, signature).....~~ | | | |
| | | | |
| ☐ | ~~Testing procedure: CTF Stage 2:~~ | | |
| ~~Testing location/ address.....~~ | | | |
| ~~Tested by (name + signature).....~~ | | | |
| ~~Witnessed by (name, function, signature).....~~ | | | |
| ~~Approved by (name, function, signature).....~~ | | | |

| | | | |
|---|---|---|---|
| ☐ | ~~Testing procedure: CTF Stage 3:~~ | | |
| ☐ | ~~Testing procedure: CTF Stage 4:~~ | | |
| ~~Testing location/ address~~ ..... | | | |
| ~~Tested by (name, function, signature)~~ . | | | |
| ~~Witnessed by (name, function, signature)~~ ..... | | | |
| ~~Approved by (name, function, signature)~~ ..... | | | |
| ~~Supervised by (name, function, signature)~~ ..... | | | |

**List of Attachments (including a total number of pages in each attachment):**

- Appendix 1: Photo Documentation
- Appendix 2: Model List
- Appendix 3: Relative Spectrum Of Tested Sample(s)
- Appendix 4: Table 6.1 Based On IEC 62471:2006
- Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences

**Summary of testing:**

| **Tests performed (name of test and test clause):** | **Testing location:** |
|---|---|
| These tests fulfil the requirements of standard ISO/IEC 17025.<br>When determining the test conclusion, the Measurement Uncertainty of test has been considered.<br><br>The tested sample of<br>L170-3070701200000 (1100mA)<br>L170-4070701200000 (650mA)<br>L170-6570701200000 (330mA)<br>Have been tested according to the IEC 62471(first edition, 2006-07) **at 200mm** and been classified as **RG 1.**<br>Have been tested according to the EN 62471:2008 **at 200mm** and been classified as **RG 1.**<br>Have been tested according to the IEC/TR 62778:2014 and been classified as **RG 1 Unlimited for blue light hazard**.<br><br>The tested sample of<br>L170-3070701200000 (1200mA)<br>L170-4070701200000 (1200mA)<br>L170-6570701200000 (1200mA)<br>Have been tested according to the IEC 62471(first edition, 2006-07) **at 200mm** and been classified as **RG 2**.<br>Have been tested according to the EN 62471:2008 **at 200mm** and been classified as **RG 2**.<br>Have been tested according to the IEC/TR 62778:2014 and been classified as **RG 2 for blue light hazard**. | DEKRA Testing and Certification (Shanghai) Ltd.<br>3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Jing'an District, Shanghai, P.R.C 200436 |

**Summary of compliance with National Differences (List of countries addressed): EN Standards**

EN 62471:2008

☒ **The product fulfills the requirements**

**Copy of marking plate:**

**The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.**

N/A

| | |
|---|---|
| **Test item particulars .....:** | See below |
| **Product evaluated .....:** | ☐ **LED package**<br>☒ **LED module**<br>☐ **Lamp**<br>☐ **Luminaire** |
| **Rated voltage (V).....:** | -- |
| **Rated current (mA).....:** | Max current 1200 mA |
| **Rated CCT (K) .....:** | -- |
| **Rated Luminance (Mcd/m$^2$).....:** | -- |
| **Component report data used .....:** | ☒ **Not applicable**<br>☐ **LED package**<br>☐ **LED module**<br>☐ **Lamp**<br>Report number: -- |
| **Possible test case verdicts:** | |
| **- test case does not apply to the test object..... :** | N/A |
| **- test object does meet the requirement..... :** | P (Pass) |
| **- test object does not meet the requirement..... :** | F (Fail) |
| **Testing ..... :** | -- |
| **Date of receipt of test item..... :** | 2021-06-21 |
| **Date (s) of performance of tests ..... :** | 2021-08-12 |

**General remarks:**

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

**Throughout this report a ☒ comma / ☐ point is used as the decimal separator.**

The product complied with the following standards:

☒IEC 62471:2006
☒EN 62471:2008
☐IEC/TR 62471-2:2009
☒IEC/TR 62778:2014

Decision rules applied Procedure 2 “Accuracy Method” as stated in the IEC Guide 115:2007.

**Manufacturer’s Declaration per sub-clause 4.2.5 of IECEE 02:**

| | |
|---|---|
| The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....: | ☐ **Yes**<br>☒ **Not applicable** |

| |
|---|
| **When differences exist; they shall be identified in the General product information section.** |
| **Name and address of factory (ies)..... :** Lumileds (Shanghai) Management Co.,Ltd.<br>Building 1-A，No.19 & 20, Lane 299, Wenshui Road, JingAn District, Shanghai, P.R. China, 200072 |
| **General product information:**<br><br>Full tests were performed on model L170-3070701200000, L170-4070701200000 and L170-6570701200000.<br><br>The products considered as worst case which should be evaluated at 200mm.<br><br>The sample of L170-3070701200000, L170-4070701200000 and L170-6570701200000 was tested at 200mm from the light source.<br><br>Base on the Model list which listed on the appendix 2, The tested sample can be considered as<br>☐ typical product ☒ worst product<br>Which the results can be reference used for the other models.<br><br>Type test was performed according to IEC 62471:2006 procedure. |

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| **7** | **MEASUREMENT INFORMATION FLOW** | | **P** |
| **7.1** | **Basic flow** | | **P** |
| | 'Law of conservation of luminance' applied | | N/A |
| | Use of only true luminance/radiance values | | P |
| | In case of luminaire:<br>The light source is operated in the luminaire under similar conditions as when tested as a component | | N/A |
| | In case $E_{thr}$ value for RG2 was established the peak value was derived from angular light distribution | | N/A |
| **7.2** | **Conditions for the radiance measurement** | | **P** |
| | Standard condition applied<br>(200mm distance, 0,011rad field of view) | | P |
| | Non-standard condition applied | | N/A |
| **7.3** | **Special cases (I): Replacement by a lamp or LED module of another type** | | **N/A** |
| | Light source is a white light source | | N/A |
| | Evaluation done based on highest luminance | | N/A |
| | Evaluation done based on CCT value | | N/A |
| **7.4** | **Special cases (II): Arrays and clusters of primary light sources** | | **N/A** |
| | LED package is evaluated as .....: | ☐RG0 unlimited<br>☐ RG1 unlimited | N/A |
| | $E_{thr}$ of LED package applies to array | | N/A |
| **8** | **RISK GROUP CLASSIFICATION** | | **P** |
| | Risk group achieved: | | P |
| | -...Risk Group 0 unlimited | | N/A |
| | -...Risk Group 1 unlimited | L170-3070701200000 (1100mA);<br>L170-4070701200000 (650mA);<br>L170-6570701200000 (330mA) | P |
| | - $E_{thr}$..... (lx) :<br>Distance to reach RG1..... (m) : | Refer to the Supplementary information of **TABLE:Spectroradiometric measurement** as following | P |

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| | **TABLE:Spectroradiometric measurement** | | |
| | **Measurement performed on:** | ☐ **LED package**<br>☒ **LED module**<br>☐ **Lamp**<br>☐ **Luminaire** | |
| | **Model number** ..... | L170-3070701200000 | |
| | **Test voltage (V)** ..... | -- | — |
| | **Test current (mA)** ..... | 1200 mA | — |
| | **Test frequency (Hz)** ..... | -- | — |
| | **Ambient, t(°C)**..... | 25°C | — |
| | **Measurement distance**..... | ☒ 20 cm<br>☐ ... cm | — |
| | **Source size** ..... | ☐ Non-small<br>☒ Small : | — |
| | **Field of view** ..... | ☐ 100 mrad<br>☒ 11 mrad<br>☐ 1,7 mrad (for small sources) | — |

| Item | Symbol | Units | Result | Remark |
|---|---|---|---|---|
| Correlated colour temperature | CCT | K | 3101 | |
| x/y colour coordinates | | | 0,4291/0,3998 | |
| Blue light hazard radiance | $L_B$ | $W/(m^2 \cdot sr^1)$ | 1,06E+04 | @11mrad |
| Blue light hazard irradiance | $E_B$ | $W/m^2$ | -- | |
| Luminance | L | $cd/m^2$ | 2,46E+07 | @11mrad |
| Illuminance | E | lx | 1,05E+04 | |
| | | | | |

Supplementary information:
Per IEC/TR 62778:2014
Ethr= 2310 lx
Dmin= 426 mm

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| | **TABLE:Spectroradiometric measurement** | | |
| | **Measurement performed on:** | ☐ **LED package**<br>☒ **LED module**<br>☐ **Lamp**<br>☐ **Luminaire** | |
| | **Model number** ..... | L170-3070701200000 | |
| | **Test voltage (V)** ..... | -- | — |
| | **Test current (mA)** ..... | 1100 mA | — |
| | **Test frequency (Hz)** ..... | -- | — |
| | **Ambient, t(°C)**..... | 25°C | — |
| | **Measurement distance**..... | ☒ 20 cm<br>☐ ... cm | — |
| | **Source size** ..... | ☐ Non-small<br>☒ Small : | — |
| | **Field of view** ..... | ☐ 100 mrad<br>☒ 11 mrad<br>☐ 1,7 mrad (for small sources) | — |

| Item | Symbol | Units | Result | Remark |
|---|---|---|---|---|
| Correlated colour temperature | CCT | K | 3093 | |
| x/y colour coordinates | | | 0,4293/0,3993 | |
| Blue light hazard radiance | $L_B$ | $W/(m^2 \cdot sr^1)$ | 9,96E+03 | @11mrad |
| Blue light hazard irradiance | $E_B$ | $W/m^2$ | -- | |
| Luminance | L | $cd/m^2$ | 2,70E+07 | @11mrad |
| Illuminance | E | lx | 1,05E+04 | |
| | | | | |

Supplementary information:
N/A

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| | **TABLE:Spectroradiometric measurement** | | |
| | **Measurement performed on:** | ☐ **LED package**<br>☒ **LED module**<br>☐ **Lamp**<br>☐ **Luminaire** | |
| | **Model number** ..... | L170-4070701200000 | |
| | **Test voltage (V)** ..... | -- | — |
| | **Test current (mA)** ..... | 1200 mA | — |
| | **Test frequency (Hz)** ..... | -- | — |
| | **Ambient, t(°C)**..... | 25°**C** | — |
| | **Measurement distance**..... | ☒ 20 cm<br>☐ ... cm | — |
| | **Source size** ..... | ☐ Non-small<br>☒ Small : | — |
| | **Field of view** ..... | ☐ 100 mrad<br>☒ 11 mrad<br>☐ 1,7 mrad (for small sources) | — |

| Item | Symbol | Units | Result | Remark |
|---|---|---|---|---|
| Correlated colour temperature | CCT | K | 3994 | |
| x/y colour coordinates | | | 0,3831/0,3856 | |
| Blue light hazard radiance | $L_B$ | $W/(m^2 \cdot sr^1)$ | 1,64E+04 | @11mrad |
| Blue light hazard irradiance | $E_B$ | $W/m^2$ | -- | |
| Luminance | L | $cd/m^2$ | 3,00E+07 | @11mrad |
| Illuminance | E | lx | 1,03E+04 | |
| | | | | |
| Supplementary information:<br>Per IEC/TR 62778:2014<br>Ethr= 1828 lx<br>Dmin= 476 mm | | | | |

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| | **TABLE:Spectroradiometric measurement** | | |
| | **Measurement performed on:** | ☐ **LED package**<br>☒ **LED module**<br>☐ **Lamp**<br>☐ **Luminaire** | |
| | **Model number** ..... | L170-4070701200000 | |
| | **Test voltage (V)** ..... | -- | — |
| | **Test current (mA)** ..... | 650 mA | — |
| | **Test frequency (Hz)** ..... | -- | — |
| | **Ambient, t(°C)**..... | 25°**C** | — |
| | **Measurement distance**..... | ☒ 20 cm<br>☐ ... cm | — |
| | **Source size** ..... | ☐ Non-small<br>☒ Small : | — |
| | **Field of view** ..... | ☐ 100 mrad<br>☒ 11 mrad<br>☐ 1,7 mrad (for small sources) | — |

| Item | Symbol | Units | Result | Remark |
|---|---|---|---|---|
| Correlated colour temperature | CCT | K | 4003 | |
| x/y colour coordinates | | | 0,3833/0,3876 | |
| Blue light hazard radiance | $L_B$ | $W/(m^2 \cdot sr^1)$ | 9,92E+03 | @11mrad |
| Blue light hazard irradiance | $E_B$ | $W/m^2$ | -- | |
| Luminance | L | $cd/m^2$ | 1,93E+07 | @11mrad |
| Illuminance | E | lx | 7,69E+03 | |
| | | | | |

Supplementary information:
N/A

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| | **TABLE:Spectroradiometric measurement** | | |
| | **Measurement performed on:** | ☐ **LED package**<br>☒ **LED module**<br>☐ **Lamp**<br>☐ **Luminaire** | |
| | **Model number** ..... | L170-6570701200000 | |
| | **Test voltage (V)** ..... | -- | — |
| | **Test current (mA)** ..... | 1200 mA | — |
| | **Test frequency (Hz)** ..... | -- | — |
| | **Ambient, t(°C)**..... | 25°**C** | — |
| | **Measurement distance**..... | ☒ 20 cm<br>☐ ... cm | — |
| | **Source size** ..... | ☐ Non-small<br>☒ Small : | — |
| | **Field of view** ..... | ☐ 100 mrad<br>☒ 11 mrad<br>☐ 1,7 mrad (for small sources) | — |

| Item | Symbol | Units | Result | Remark |
|---|---|---|---|---|
| Correlated colour temperature | CCT | K | 6949 | |
| x/y colour coordinates | | | 0,3060/0,3227 | |
| Blue light hazard radiance | $L_B$ | $W/(m^2 \cdot sr^1)$ | 2,98E+04 | @11mrad |
| Blue light hazard irradiance | $E_B$ | $W/m^2$ | -- | |
| Luminance | L | $cd/m^2$ | 2,50E+07 | @11mrad |
| Illuminance | E | lx | 9,67E+03 | |
| | | | | |

Supplementary information:
Per IEC/TR 62778:2014
Ethr= 839 lx
Dmin= 679 mm

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | |
|---|---|---|---|
| | **TABLE:Spectroradiometric measurement** | | |
| | **Measurement performed on:** | ☐ **LED package**<br>☒ **LED module**<br>☐ **Lamp**<br>☐ **Luminaire** | |
| | **Model number** ..... | L170-6570701200000 | |
| | **Test voltage (V)** ..... | -- | — |
| | **Test current (mA)** ..... | 330 mA | — |
| | **Test frequency (Hz)** ..... | -- | — |
| | **Ambient, t(°C)**..... | 25°**C** | — |
| | **Measurement distance**..... | ☒ 20 cm<br>☐ ... cm | — |
| | **Source size** ..... | ☐ Non-small<br>☒ Small : | — |
| | **Field of view** ..... | ☐ 100 mrad<br>☒ 11 mrad<br>☐ 1,7 mrad (for small sources) | — |

| Item | Symbol | Units | Result | Remark |
|---|---|---|---|---|
| Correlated colour temperature | CCT | K | 6787 | |
| x/y colour coordinates | | | 0,3077/0,3286 | |
| Blue light hazard radiance | $L_B$ | $W/(m^2 \cdot sr^1)$ | 9,90E+03 | @11mrad |
| Blue light hazard irradiance | $E_B$ | $W/m^2$ | -- | |
| Luminance | L | $cd/m^2$ | 9,15E+06 | @11mrad |
| Illuminance | E | lx | 3,81E+03 | |
| | | | | |

Supplementary information:
N/A

| IEC TR 62778 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | |
|---|---|---|
| | **TABLE: Angular light distribution** | **N/A** |

**List of test equipment used:**

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.
Note: This page may be removed when CTF stage 1 CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

| Clause | Measurement / testing | Testing / measuring equipment / material used, (Equipment ID) | Range used | Last Calibration date | Calibration due date |
|---|---|---|---|---|---|
| 7 | Irradiance measurements Radiance measurements | IDR 300 Monochromator (SH 344) | 200-3000nm | / | / |
| 7 | Radiance measurements | S009 Telescope (SH 345) | 300-1400nm | / | / |
| 7 | Radiance measurements | SRS 12 Radiance Standard (SH 348) | 300-1400nm | 2021/2/25 | 2022/2/24 |
| 7 | Irradiance measurements | CL6 Spectral irradiance standard (SH 350) | 300-3000nm | 2021/2/25 | 2022/2/24 |
| 7 | Irradiance measurements | CL7 Spectral irradiance standard (SH 351) | 200-400nm | 2021/2/25 | 2022/2/24 |
| 7 | Irradiance measurements | Photometric detector head (SH 359) | 380nm-800nm | 2021/2/26 | 2022/2/25 |
| 7 | Irradiance measurements Radiance measurements | Wattmeter (SH030) | 500V,40A | 2020/10/10 | 2021/10/10 |

Appendix 1: Photo Documentation

L170-3070701200000

L170-4070701200000

L170-6570701200000

Appendix 2: Model List

L170-aabb70ccddddd
where
aa = nominal CCT (22=2200K,27=2700K,30 =3000K,35=3500K,40 = 4000K, 50=5000K,57=5700K,65=6500K);
bb = min CRI (70 = 70CRI,80=80CRI,90=90 CRI);
cc=froward voltage(12 = 12V, 18=18V,24=24V,36 = 36V, 72=72V);
ddddd for marketing use.

| Model | Max Current (mA) |
|---|---|
| L170-aabb7012ddddd | 1200 |
| L170-aabb7018ddddd | 800 |
| L170-aabb7024ddddd | 600 |
| L170-aabb7036ddddd | 400 |
| L170-aabb7072ddddd | 200 |

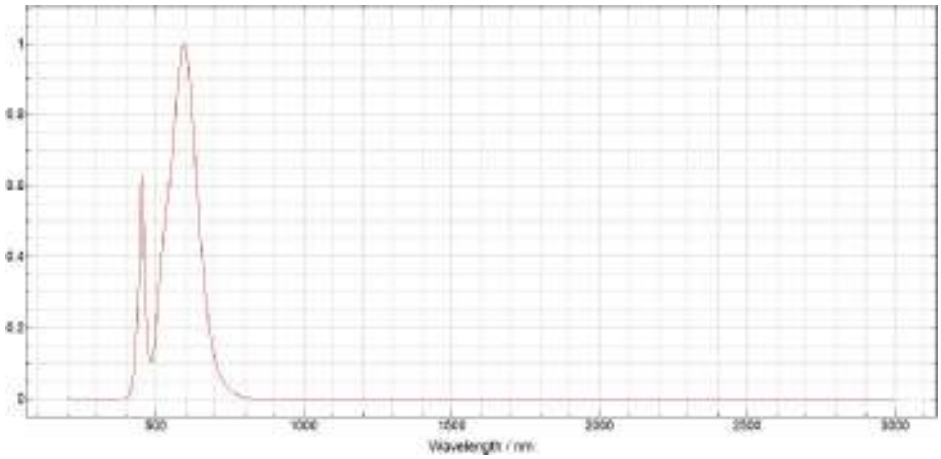
Threshold drive current for RG1-RG2 boundary limit:

| | | Nominal CCT | | |
|---|---|---|---|---|
| | Threshold drive current (mA) | ≤3000K | ≤4000K | ≤6500K |
| L170-aabb7012ddddd | 1200 | RG2 | RG2 | RG2 |
| | 1100 | RG1 unlimited | RG2 | RG2 |
| | 650 | RG1 unlimited | RG1 unlimited | RG2 |
| | 330 | RG1 unlimited | RG1 unlimited | RG1 unlimited |

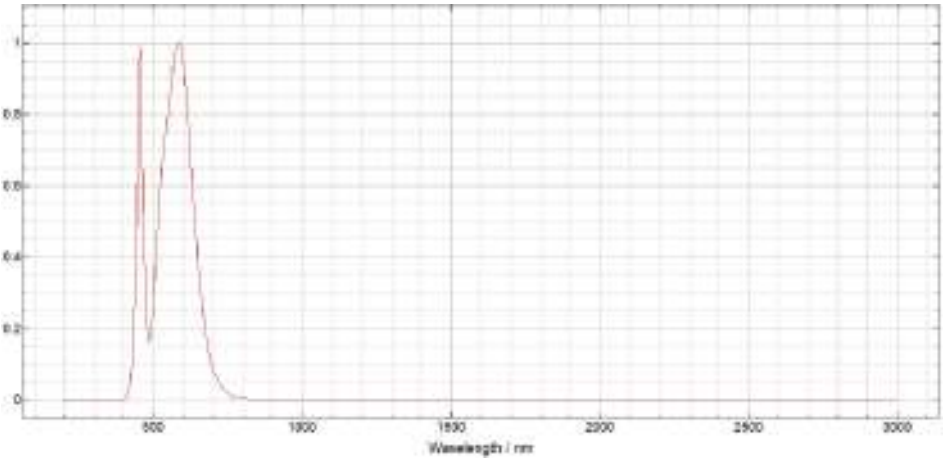
**Ethr (lx)**

| | | Nominal CCT | | |
|---|---|---|---|---|
| | Threshold drive current (mA) | ≤3000K | ≤4000K | ≤6500K |
| L170-aabb7012ddddd | 1200 | 2310 lx | 1828 lx | 839 lx |
| | 1100 | n/a | 1828 lx | 839 lx |
| | 650 | n/a | n/a | 839lx |
| | 330 | n/a | n/a | n/a |

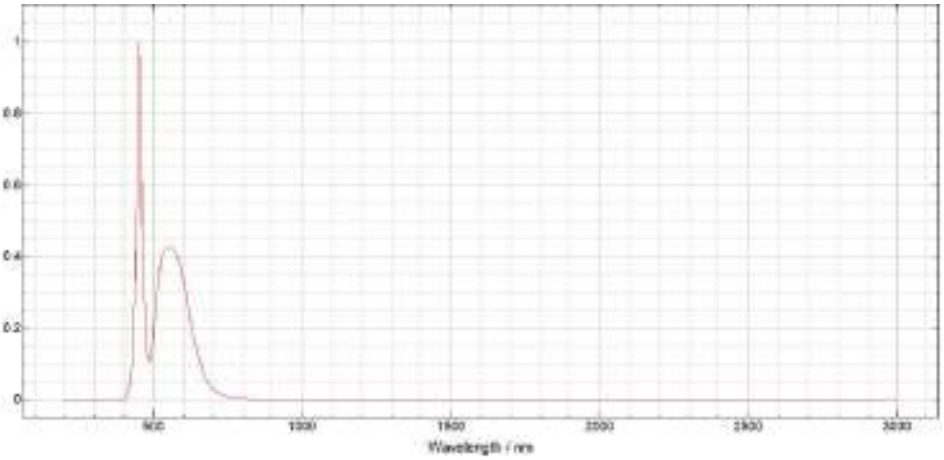
Appendix 3: Relative Spectrum Of Tested Sample(s)




L170-3070701200000




L170-4070701200000




L170-6570701200000

Appendix 4: Table 6.1 Based On IEC 62471:2006

DUT: L170-3070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| IEC 62471 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,59E+02 | 10000 | 1,06E+04 | 4000000 | 1,06E+04 |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | -- | 400 | -- |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,60E+05 | 28000/α | | 71000/α | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/α | -- | 6000/α | | 6000/α | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,14 | 570 | | 3200 | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.

** Involves evaluation of non-GLS source

DUT: L170-3070701200000 (1100mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| IEC 62471 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,57E+02 | 10000 | 9,96E+03 | 4000000 | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | -- | 400 | -- |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,60E+05 | 28000/α | | 71000/α | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/α | -- | 6000/α | | 6000/α | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,14 | 570 | | 3200 | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

DUT: L170-4070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| IEC 62471 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 6,21E+02 | 10000 | 1,64E+04 | 4000000 | 1,81E+04 |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | -- | 400 | -- |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 2,24E+05 | 28000/α | | 71000/α | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/α | -- | 6000/α | | 6000/α | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,10 | 570 | | 3200 | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

DUT: L170-4070701200000 (650mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| IEC 62471 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,52E+02 | 10000 | 9,92E+03 | 4000000 | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | -- | 400 | -- |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,38E+05 | 28000/α | | 71000/α | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/α | -- | 6000/α | | 6000/α | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,11 | 570 | | 3200 | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

DUT: L170-6570701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| IEC 62471 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | $B(\lambda)$ | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 1,12E+03 | 10000 | 2,98E+04 | 4000000 | 3,73E+04 |
| Blue light, small source | $B(\lambda)$ | $E_B$ | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | -- | 400 | -- |
| Retinal thermal | $R(\lambda)$ | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 3,42E+05 | 28000/α | | 71000/α | |
| Retinal thermal, weak visual stimulus** | $R(\lambda)$ | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/α | -- | 6000/α | | 6000/α | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,10 | 570 | | 3200 | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

DUT: L170-6570701200000 (330mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| IEC 62471 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | 0,003 | | 0,03 | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 10 | 0,0000 | 33 | | 100 | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,19E+02 | 10000 | 9,90E+03 | 4000000 | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 1,0* | -- | 1,0 | -- | 400 | -- |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,15E+05 | 28000/α | | 71000/α | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 6000/α | -- | 6000/α | | 6000/α | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,08 | 570 | | 3200 | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences
DUT: L170-3070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| EN 62471 | | | |
|---|---|---|---|
| **Clause** | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,59E+02 | 10000 | 1,06E+04 | 4000000 | 1,06E+04 |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | -- | 400 | -- |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,60E+05 | 28000/α | | 71000/α | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000<br>0,0017≤ α ≤ 0,011 | -- | | | | |
| | | | | 6000/α<br>0,011≤ α ≤ 0,1 | -- | | | | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,14 | 570 | | 3200 | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

DUT: L170-3070701200000 (1100mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| EN 62471 | | | |
|---|---|---|---|
| **Clause** | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | | |
| | | | | Limit | Result | Limit | Result | Limit | Result | |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,57E+02 | 10000 | 9,96E+03 | 4000000 | | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | -- | 400 | -- | |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,60E+05 | 28000/α | | 71000/α | | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000<br>0,0017≤ α ≤ 0,011 | -- | | | | | |
| | | | | 6000/α<br>0,011≤ α ≤ 0,1 | -- | | | | | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,14 | 570 | | 3200 | | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

DUT: L170-4070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| EN 62471 | | | |
|---|---|---|---|
| **Clause** | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | | |
| | | | | Limit | Result | Limit | Result | Limit | Result | |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 6,21E+02 | 10000 | 1,64E+04 | 4000000 | 1,81E+04 | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | -- | 400 | -- | |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 2,24E+05 | 28000/α | | 71000/α | | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000<br>0,0017≤ α ≤ 0,011 | -- | | | | | |
| | | | | 6000/α<br>0,011≤ α ≤ 0,1 | -- | | | | | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,10 | 570 | | 3200 | | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

DUT: L170-4070701200000 (650mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| EN 62471 | | | |
|---|---|---|---|
| **Clause** | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | | |
| | | | | Limit | Result | Limit | Result | Limit | Result | |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,52E+02 | 10000 | 9,92E+03 | 4000000 | | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | -- | 400 | -- | |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,38E+05 | 28000/α | | 71000/α | | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000<br>0,0017≤ α ≤ 0,011 | -- | | | | | |
| | | | | 6000/α<br>0,011≤ α ≤ 0,1 | -- | | | | | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,11 | 570 | | 3200 | | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

DUT: L170-6570701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| EN 62471 | | | |
|---|---|---|---|
| **Clause** | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | | |
| | | | | Limit | Result | Limit | Result | Limit | Result | |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 1,12E+03 | 10000 | 2,98E+04 | 4000000 | 3,73E+04 | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | -- | 400 | -- | |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 3,42E+05 | 28000/α | | 71000/α | | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000<br>0,0017≤ α ≤ 0,011 | -- | | | | | |
| | | | | 6000/α<br>0,011≤ α ≤ 0,1 | -- | | | | | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,10 | 570 | | 3200 | | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

DUT: L170-6570701200000 (330mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α: 100 mrad

| EN 62471 | | | |
|---|---|---|---|
| **Clause** | Requirement + Test | Result – Remark | Verdict |

| **Table 6.1** | Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Risk | Action spectrum | Symbol | Units | Emission Measurement | | | | | | |
| | | | | Exempt | | Low risk | | Mod risk | | |
| | | | | Limit | Result | Limit | Result | Limit | Result | |
| Actinic UV | $S_{UV}(\lambda)$ | $E_s$ | $W \cdot m^{-2}$ | 0,001 | 0,0000 | -- | -- | -- | -- | |
| Near UV | | $E_{UVA}$ | $W \cdot m^{-2}$ | 0,33 | 0,0000 | -- | -- | -- | -- | |
| Blue light | B(λ) | $L_B$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 100 | 4,19E+02 | 10000 | 9,90E+03 | 4000000 | | |
| Blue light, small source | B(λ) | $E_B$ | $W \cdot m^{-2}$ | 0,01* | -- | 1,0 | -- | 400 | -- | |
| Retinal thermal | R(λ) | $L_R$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 28000/α | 1,15E+05 | 28000/α | | 71000/α | | |
| Retinal thermal, weak visual stimulus** | R(λ) | $L_{IR}$ | $W \cdot m^{-2} \cdot sr^{-1}$ | 545000<br>0,0017≤ α ≤ 0,011 | -- | | | | | |
| | | | | 6000/α<br>0,011≤ α ≤ 0,1 | -- | | | | | |
| IR radiation, eye | | $E_{IR}$ | $W \cdot m^{-2}$ | 100 | 0,08 | 570 | | 3200 | | |

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

----------End----------

# STRADA-2X2-SHD-BLK

**Black shade for additional backlight control.**

## SPECIFICATION:

| | |
|---|---|
| Dimensions | 49.9 x 49.9 mm |
| Height | 11.1 mm |
| Fastening | screw |
| ROHS compliant | yes |

## MATERIALS:

| Component | Type | Material | Colour | Finish |
|---|---|---|---|---|
| STRADA-2X2-SHD-BLK | Shade | PC | black | |

## ORDERING INFORMATION:

| Component | Qty in box | MOQ | MPQ | Box weight (kg) |
|---|---|---|---|---|
| C17677_STRADA-2X2-SHD-BLK<br>» Box size: 310 x 215 x 175 mm | 480 | 160 | 20 | 1.9 |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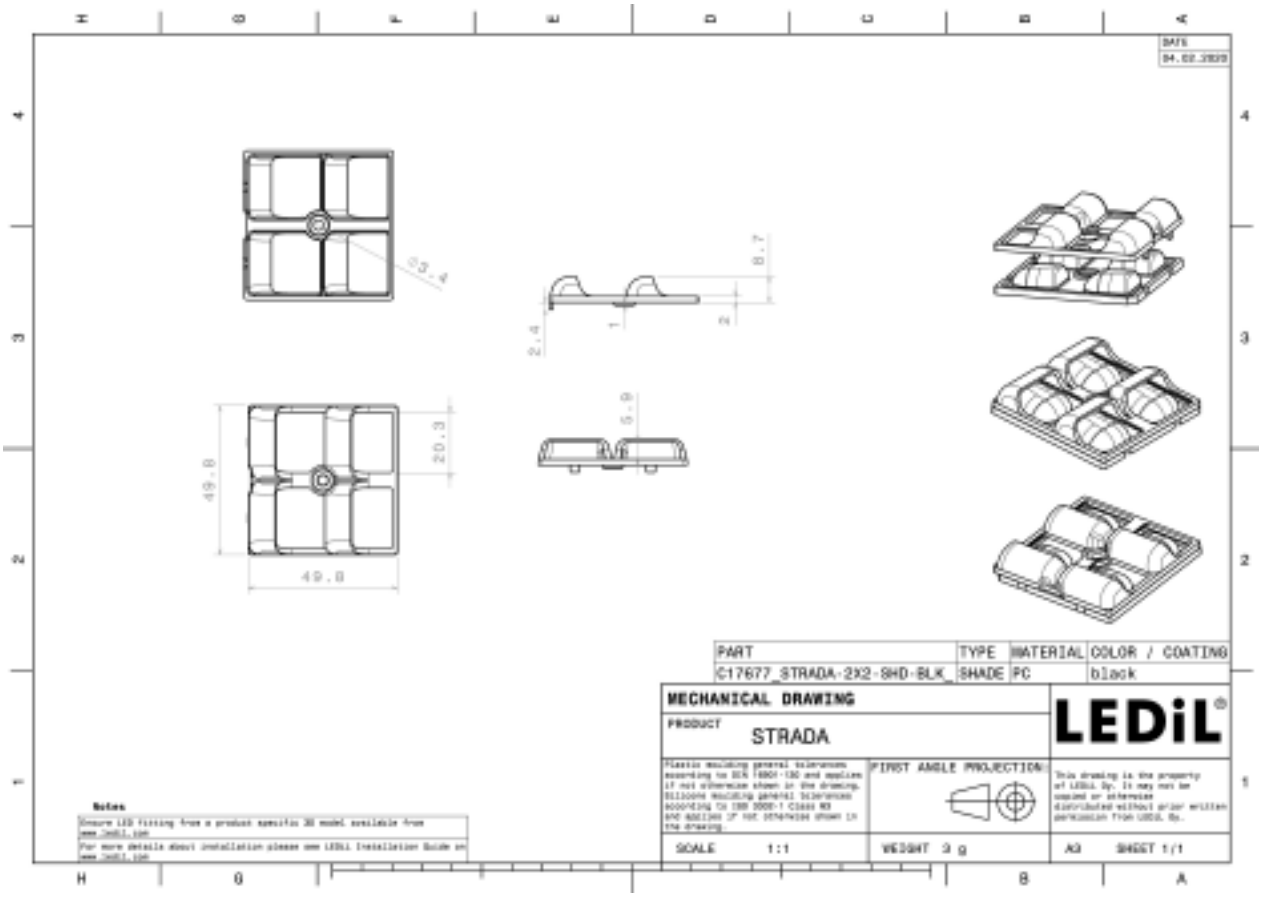


See also our general installation guide: www.ledil.com/installation_guide


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## GENERAL INFORMATION:

NOTE: The typical beam angle will be changed by different color, chip size and chip position tolerance. The typical total beam angle is the full angle measured where the luminous intensity is half of the peak value.

## MATERIALS:

As part of our continuous research and improvement processes, and to ensure the best possible quality and availability of our products, LEDiL reserves the right to change material grades without notice.

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## Features

- Full Power at Wide Output Current Range (Constant Power)
- Adjustable Output Current (AOC) with Programmability
- Isolated 1-5V/1-10V/10V PWM/3-Timer-Modes Dimmable
- Output Lumen Compensation
- Input Surge Protection: DM 4kV, CM 6kV
- All-Around Protection: OVP, SCP, OTP
- IP66/IP67 and UL Dry/Damp/Wet Location
  Only IP66 and UL Dry/Damp Location (DF models)
- Class 2 & SELV Output
- TYPE HL, for use in a Class I, Division 2 Hazardous (Classified) Location
- Suitable for Luminaires with Protection Class I
- 5 Years Warranty

## Description

The EUM-050SxxxDx series is a 50W, constant-current, programmable and IP66/IP67 rated LED driver that operates from 90-305Vac input with excellent power factor. It is created for many lighting applications including low bay, tunnel and street, etc. The high efficiency of these drivers and compact metal case enables them to run cooler, significantly improving reliability and extending product life. To ensure trouble-free operation, protection is provided against input surge, output over voltage, short circuit, and over temperature.

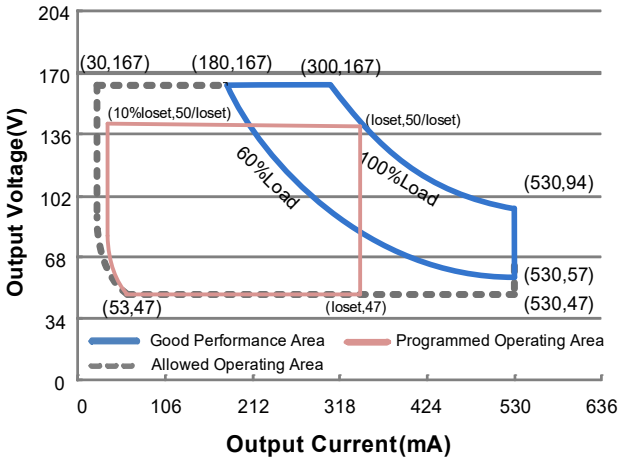
## Models

| Adjustable Output Current Range | Full-Power Current Range (1) | Default Output Current | Input Voltage Range(2) | Output Voltage Range | Max. Output Power | Typical Efficiency (3) | Typical Power Factor | | Model Number (4) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 120Vac | 220Vac | |
| 30-530mA | 300-530mA | 530 mA | 90~305Vac/ 127~300 Vdc | 47~167 Vdc | 50W | 90.5% | 0.99 | 0.96 | EUM-050S053Dx(5) |
| 55-900mA | 550-900mA | 700 mA | 90~305 Vac/ 127~300 Vdc | 28~91 Vdc | 50W | 89.0% | 0.99 | 0.96 | EUM-050S090Dx(6) |
| 92-1500mA | 920-1500mA | 1050 mA | 90~305 Vac/ 127~300 Vdc | 17~54 Vdc | 50W | 88.0% | 0.99 | 0.96 | EUM-050S150Dx(7) |

**Notes:** (1) Output current range with constant power at 50W
(2) Certified input voltage range: UL, FCC 100-277Vac; otherwise 100-240Vac.
(3) Measured at 100% load and 220Vac input (see below “General Specifications” for details).
(4) x = G are UL Recognized, ENEC and CCC, etc. models; x = T are UL Class P models; x = B are BIS models; x = F are UL Class P models with flying leads. See below "Mechanical Outline" for details.
(5) Only available with x = G, and only with ENEC, CE, CB and CCC certificates.
(6) SELV output.
(7) Class 2 & SELV output.

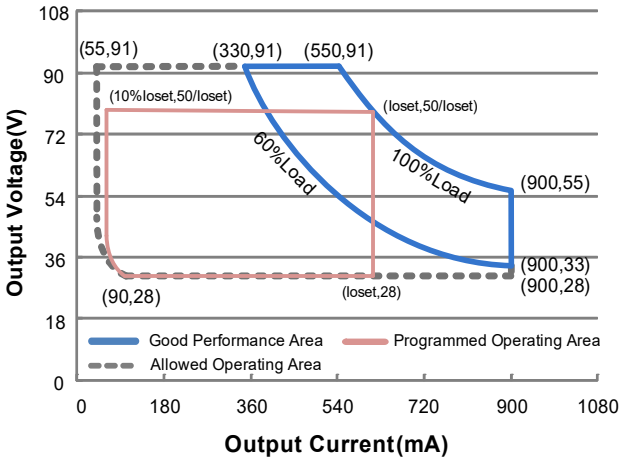
## I-V Operation Area

### EUM-050S053Dx



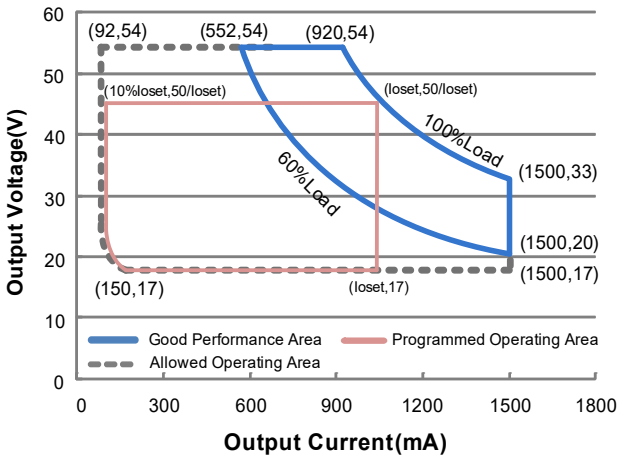

Note: 300mA≤Ioset≤530mA

### EUM-050S090Dx




Note: 550mA≤Ioset≤900mA

### EUM-050S150Dx




Note: 920mA≤Ioset≤1500mA

## Input Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|
| Input AC Voltage | 90 Vac | - | 305 Vac | |
| Input DC Voltage | 127 Vdc | - | 300 Vdc | |
| Input Frequency | 47 Hz | - | 63 Hz | |
| Leakage Current | - | - | 0.75 MIU | UL 8750; 277Vac/ 60Hz |
| | - | - | 0.70 mA | IEC 60598-1; 240Vac/ 60Hz |
| Input AC Current | - | - | 0.55 A | Measured at 100% load and 120 Vac input. |
| | - | - | 0.30 A | Measured at 100% load and 220 Vac input. |

## Input Specifications (Continued)

| Parameter | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|
| Inrush Current($I^2t$) | - | - | 0.48 $A^2s$ | At 220Vac input, 25°C cold start, duration=292 μs, 10%Ipk-10%Ipk. See Inrush Current Waveform for the details. |
| PF | 0.9 | - | - | At 100-277Vac, 50-60Hz, 60%-100% Load (30-50W) |
| THD | - | - | 20% | |
| THD | - | - | 10% | At 220-240Vac, 50-60Hz, 60%-100% Load (30-50W) |

## Output Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|
| Output Current Tolerance | -5%Ioset | - | 5%Ioset | At 100% load condition |
| Output Current Setting(Ioset) Range<br>EUM-050S053Dx<br>EUM-050S090Dx<br>EUM-050S150Dx | <br>30 mA<br>55 mA<br>92 mA | <br>-<br>-<br>- | <br>530 mA<br>900 mA<br>1500 mA | |
| Output Current Setting Range with Constant Power<br>EUM-050S053Dx<br>EUM-050S090Dx<br>EUM-050S150Dx | <br>300 mA<br>550 mA<br>920 mA | <br>-<br>-<br>- | <br>530 mA<br>900 mA<br>1500 mA | |
| Total Output Current Ripple (pk-pk) | - | 5%Iomax | 10%Iomax | At 100% load condition. 20 MHz BW |
| Output Current Ripple at < 200 Hz (pk-pk) | - | 2%Iomax | - | At 100% load condition. Only this component of ripple is associated with visible flicker. |
| Startup Overshoot Current | - | - | 10%Iomax | At 100% load condition |
| No Load Output Voltage<br>EUM-050S053Dx<br>EUM-050S090Dx<br>EUM-050S150Dx | <br>-<br>-<br>- | <br>-<br>-<br>- | <br>200 V<br>120 V<br>60 V | |
| Line Regulation | - | - | ±1% | Measured at 100% load |
| Load Regulation | - | - | ±5% | |
| Turn-on Delay Time | - | - | 0.5 s | Measured at 120-277Vac input, 60%-100% Load |
| Temperature Coefficient of Ioset | - | 0.06%/°C | - | Case temperature = 0°C ~Tc max |

## General Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|
| Efficiency at 120 Vac input:<br>EUM-050S053Dx<br>Io= 300 mA<br>Io= 530 mA<br>EUM-050S090Dx<br>Io= 550 mA<br>Io= 900 mA<br>EUM-050S150Dx<br>Io= 920 mA<br>Io=1500 mA | <br><br>85.0%<br>86.0%<br><br>84.0%<br>85.0%<br><br>83.0%<br>83.5% | <br><br>87.0%<br>88.0%<br><br>86.0%<br>87.0%<br><br>85.0%<br>85.5% | <br><br>-<br>-<br><br>-<br>-<br><br>-<br>- | Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |
| Efficiency at 220 Vac input:<br>EUM-050S053Dx<br>Io= 300 mA<br>Io= 530 mA<br>EUM-050S090Dx<br>Io= 550 mA<br>Io= 900 mA<br>EUM-050S150Dx<br>Io= 920 mA<br>Io=1500 mA | <br><br>87.5%<br>88.5%<br><br>86.5%<br>87.0%<br><br>85.0%<br>86.0% | <br><br>89.5%<br>90.5%<br><br>88.5%<br>89.0%<br><br>87.0%<br>88.0% | <br><br>-<br>-<br><br>-<br>-<br><br>-<br>- | Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |
| Efficiency at 277 Vac input:<br>EUM-050S053Dx<br>Io= 300 mA<br>Io= 530 mA<br>EUM-050S090Dx<br>Io= 550 mA<br>Io= 900 mA<br>EUM-050S150Dx<br>Io= 920 mA<br>Io=1500 mA | <br><br>88.0%<br>89.0%<br><br>87.0%<br>87.5%<br><br>86.0%<br>86.0% | <br><br>90.0%<br>91.0%<br><br>89.0%<br>89.5%<br><br>88.0%<br>88.0% | <br><br>-<br>-<br><br>-<br>-<br><br>-<br>- | Measured at 100% load and steady-state temperature in 25°C ambient; (Efficiency will be about 2.0% lower if measured immediately after startup.) |
| MTBF | - | 548,000 Hours | - | Measured at 220Vac input, 80%Load and 25°C ambient temperature (MIL-HDBK-217F) |
| Lifetime | - | 103,000 Hours | - | Measured at 220Vac input, 80%Load and 70°C case temperature; See lifetime vs. Tc curve for the details |
| Operating Case Temperature for Safety Tc_s | -40°C | - | +90°C | |
| Operating Case Temperature for Warranty Tc_w | -40°C | - | +80°C | Case temperature for 5 years warrant Humidity: 10% RH to 95% RH; |
| Storage Temperature | -40°C | - | +85°C | Humidity: 5%RH to 95%RH |
| Dimensions<br>Inches (L × W × H)<br>Millimeters (L × W × H) | 3.75 × 2.52 × 1.44<br>95 × 64 × 36.5 | | | With mounting ear<br>4.41 × 2.52 × 1.44<br>112 × 64 × 36.5 |
| Net Weight | - | 490 g | - | |

## Dimming Specifications

| Parameter | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|
| Absolute Maximum Voltage on the Vdim (+) Pin | -20 V | - | 20 V | |
| Source Current on Vdim (+)Pin | 200 uA | 300 uA | 450 uA | Vdim(+) = 0 V |

## Dimming Specifications (Continued)

| Parameter | | Min. | Typ. | Max. | Notes |
|---|---|---|---|---|---|
| Dimming Output Range | EUM-050S053Dx<br>EUM-050S090Dx<br>EUM-050S150Dx | 10%Ioset | - | Ioset | 300 mA ≤ Ioset ≤ 530 mA<br>550 mA ≤ Ioset ≤ 900 mA<br>920 mA ≤ Ioset ≤ 1500 mA |
| | EUM-050S053Dx<br>EUM-050S090Dx<br>EUM-050S150Dx | 30 mA<br>55 mA<br>92 mA | - | Ioset | 30 mA ≤ Ioset < 300 mA<br>55 mA ≤ Ioset < 550 mA<br>92 mA ≤ Ioset < 920 mA |
| Recommended Dimming Range for 1-5V | | 0.25 V | - | 4.75 V | Dimming mode set to 1-5V in PC interface. |
| Recommended Dimming Range for 1-10V | | 1 V | - | 9 V | Default 1-10V dimming mode with positive logic. |
| PWM_in High Level | | - | 10V | - | |
| PWM_in Low Level | | - | 0V | - | |
| PWM_in Frequency Range | | 200 Hz | - | 2 KHz | |
| PWM_in Duty Cycle | | 0% | - | 100% | |

## Safety &EMC Compliance

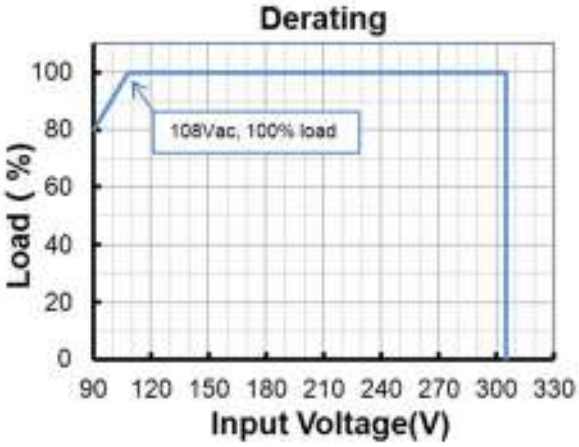
| Safety Category | Standard |
|---|---|
| UL/CUL | UL8750,CAN/CSA-C22.2 No. 250.13 |
| ENEC & CE | EN 61347-1, EN 61347-2-13 |
| UKCA | BS EN 61347-1, BS EN 61347-2-13 |
| CB | IEC 61347-1, IEC 61347-2-13 |
| CCC | GB 19510.1, GB 19510.14 |
| PSE | J 61347-1, J 61347-2-13 |
| KS | KS C 7655 |
| BIS | IS 15885(Part2/Sec13) |
| EAC | TP TC 004, TP TC 020 |
| **Performance** | **Standard** |
| ENEC | EN 62384 |
| **EMI Standards** | **Notes** |
| BS EN/EN IEC 55015/GB 17743/KN 15(1) | Conducted emission Test &Radiated emission Test |
| BS EN/EN IEC 61000-3-2/GB 17625.1 | Harmonic current emissions |
| BS EN/EN 61000-3-3 | Voltage fluctuations & flicker |

## Safety &EMC Compliance (Continued)

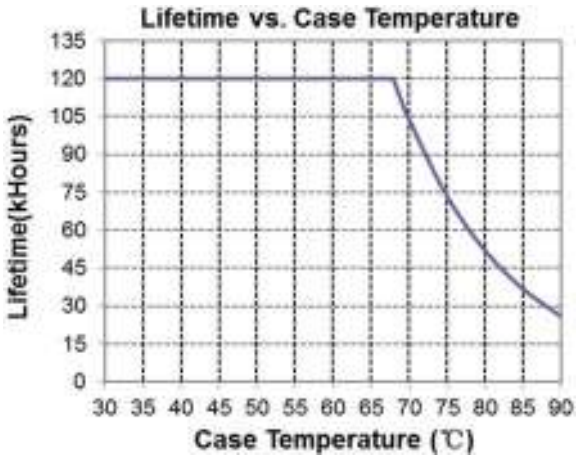
| EMI Standards | Notes |
|---|---|
| FCC Part 15(1) | ANSI C63.4 Class B |
| | This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: [1] this device may not cause harmful interference, and [2] this device must accept any interference received, including interference that may cause undesired Operation. |
| **EMS Standards** | **Notes** |
| BS EN/EN 61000-4-2 | Electrostatic Discharge (ESD): 8 kV air discharge, 4 kV contact discharge |
| BS EN/EN 61000-4-3 | Radio-Frequency Electromagnetic Field Susceptibility Test-RS |
| BS EN/EN 61000-4-4 | Electrical Fast Transient / Burst-EFT |
| BS EN/EN 61000-4-5 | Surge Immunity Test: AC Power Line: Differential Mode 4 kV, Common Mode 6 kV |
| BS EN/EN 61000-4-6 | Conducted Radio Frequency Disturbances Test-CS |
| BS EN/EN 61000-4-8 | Power Frequency Magnetic Field Test |
| BS EN/EN 61000-4-11 | Voltage Dips |
| BS EN/EN 61547 | Electromagnetic Immunity Requirements Applies To Lighting Equipment |

**Note:** (1) This LED driver meets the EMI specifications above, but EMI performance of a luminaire that contains it depends also on the other devices connected to the driver and on the fixture itself.

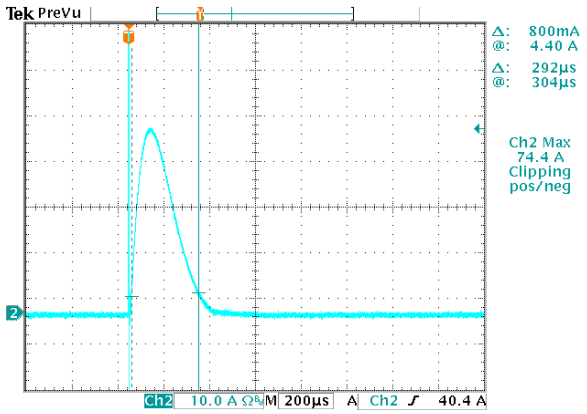
## Derating



## Lifetime vs. Case Temperature

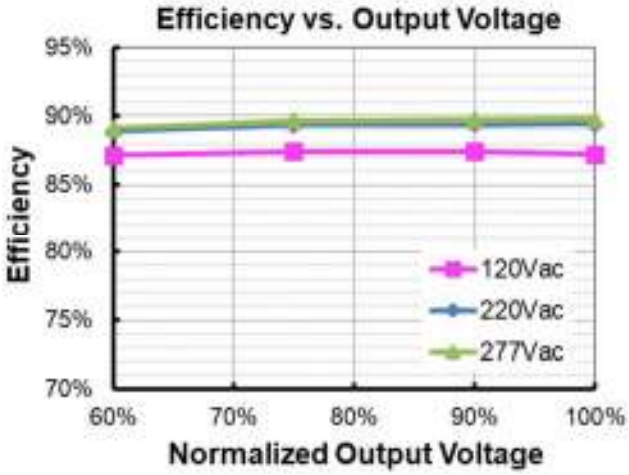



## Inrush Current Waveform

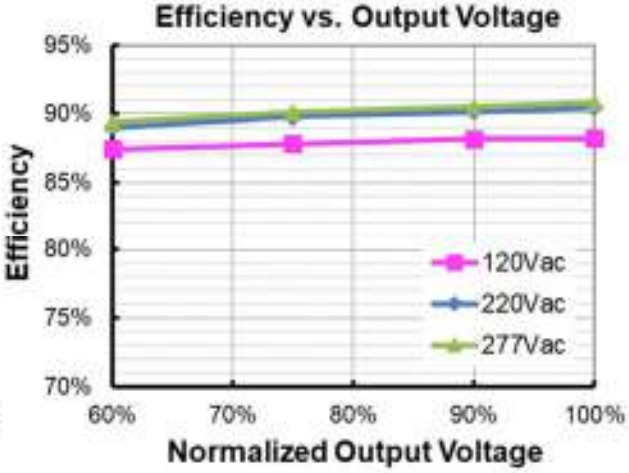



## Efficiency vs. Load

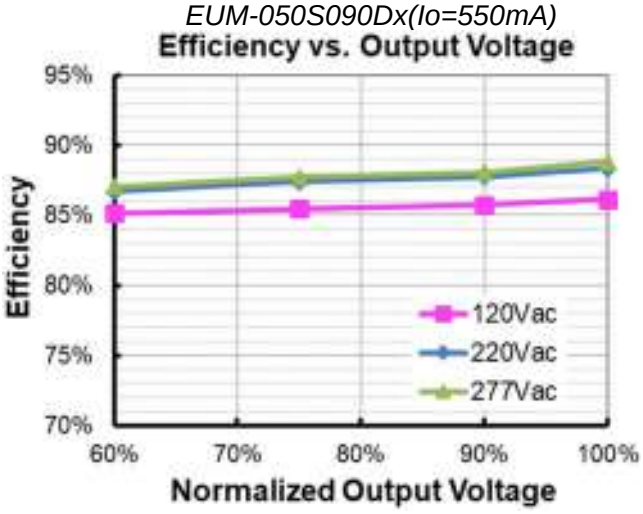
*EUM-050S053Dx(Io=300mA)*



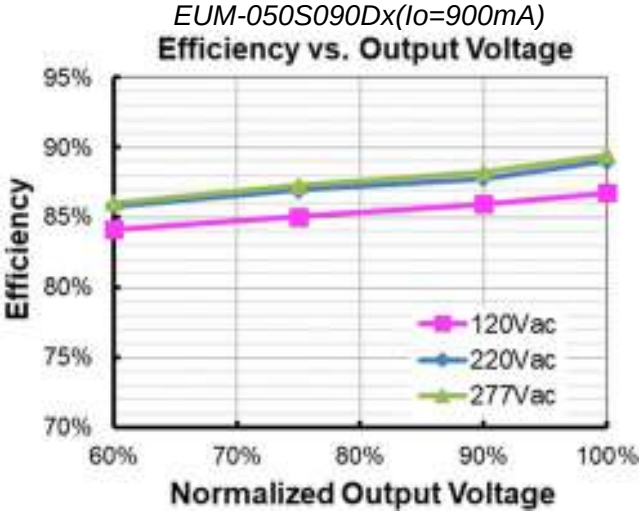

*EUM-050S053Dx(Io=530mA)*



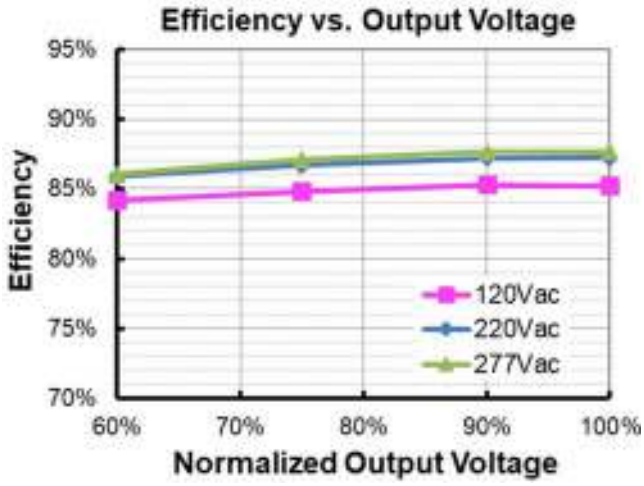
*EUM-050S090Dx(Io=550mA)*



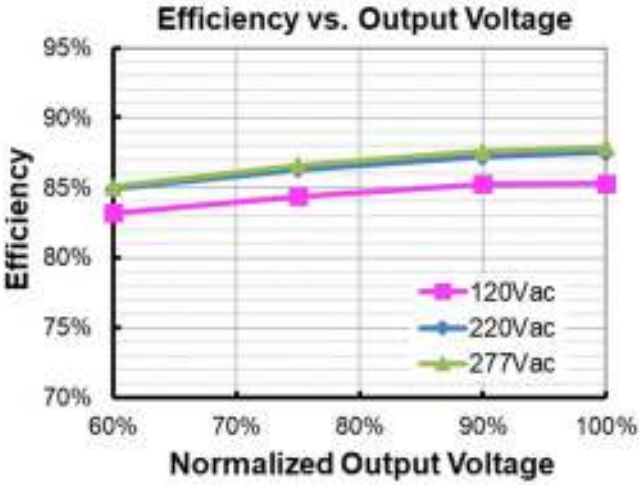

*EUM-050S090Dx(Io=900mA)*



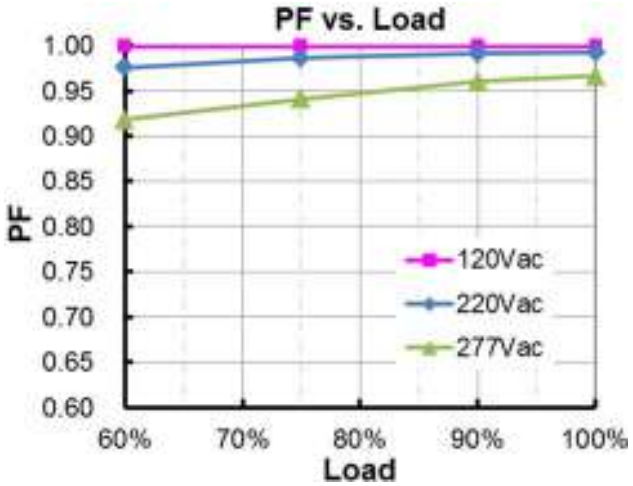

*EUM-050S150Dx(Io=920mA)*



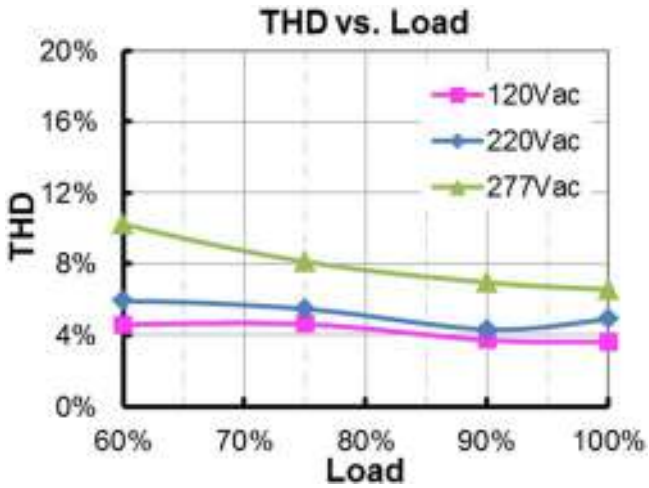

*EUM-050S150Dx(Io=1500mA)*




## Power Factor



## Total Harmonic Distortion



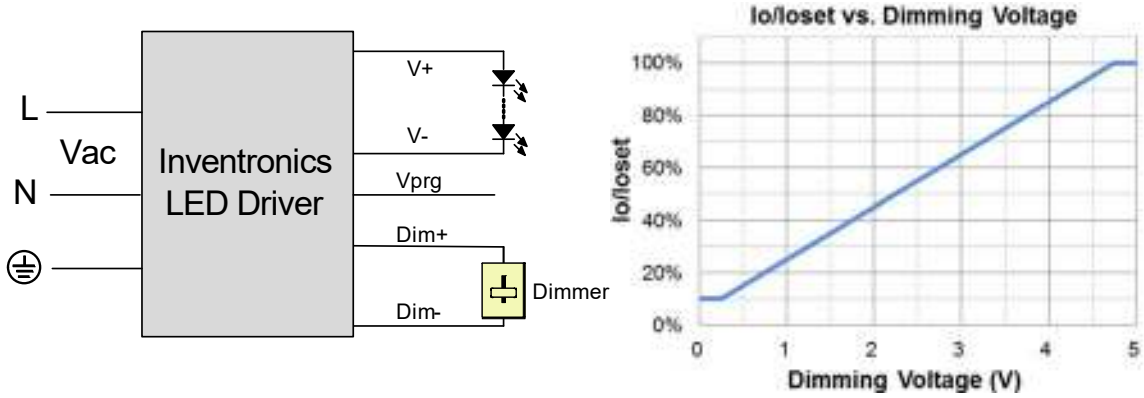

## Protection Functions

| Parameter | Notes |
|---|---|
| Over Temperature Protection | Decreases output current, returning to normal after over temperature is removed. |
| Short Circuit Protection | Auto Recovery. No damage will occur when any output is short circuited. The output shall return to normal when the fault condition is removed. |
| Over Voltage Protection | Limits output voltage at no load and in case the normal voltage limit fails. |

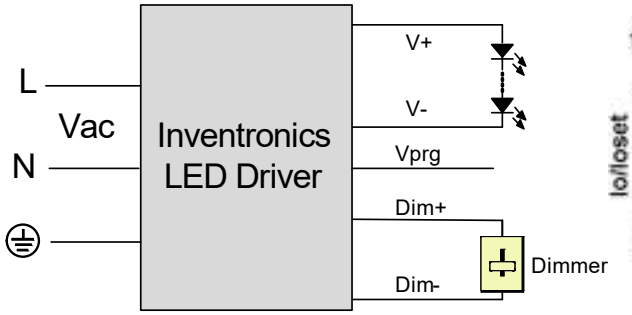
## Dimming

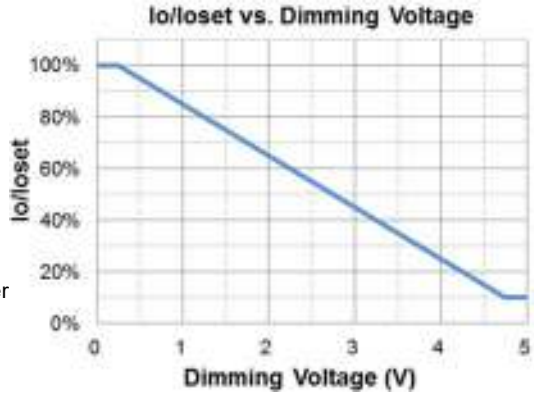
- **1-5V Dimming**

The recommended implementation of the dimming control is provided below.




**Implementation 1: Positive logic**



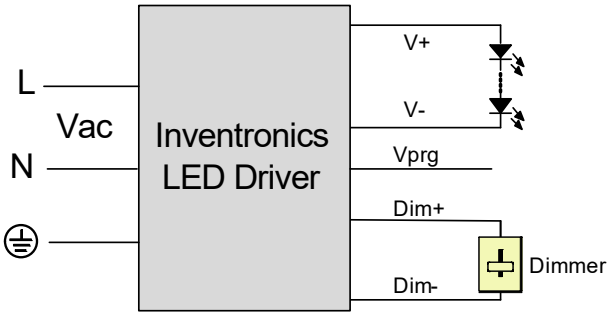

**Implementation 2: Negative logic**

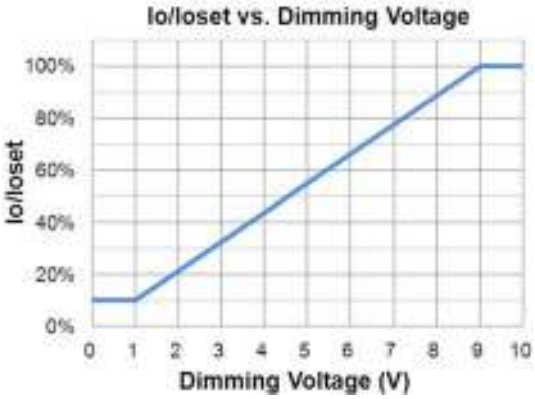
**Notes:**

1. Do NOT connect Dim− to the output V− or V+, otherwise the driver will not work properly.
2. The dimmer can also be replaced by an active 1-5V voltage source signal or passive components like zener.
3. When 1-5V negative logic dimming mode and Dim+ is open, the driver will output maximum current.

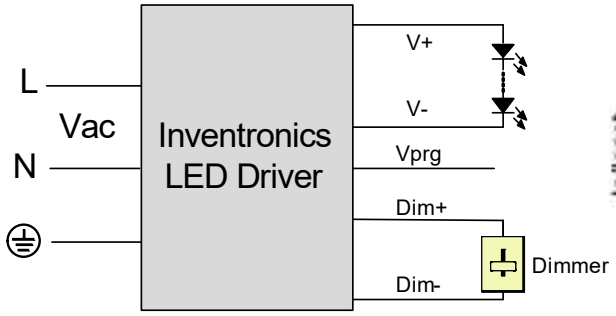
## ● 1-10V Dimming

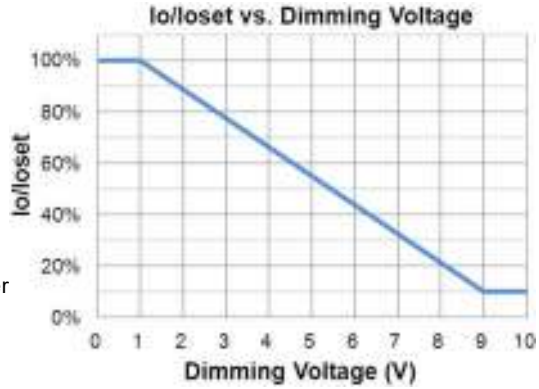
The recommended implementation of the dimming control is provided below.




**Implementation 3: Positive logic**



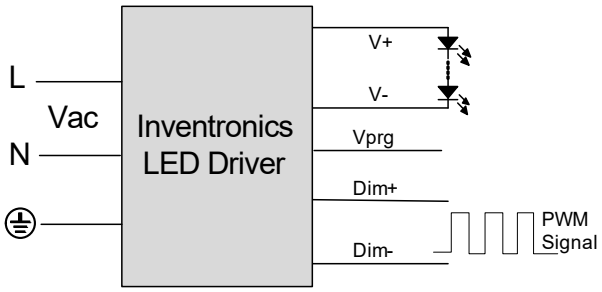

**Implementation 4: Negative logic**

**Notes:**

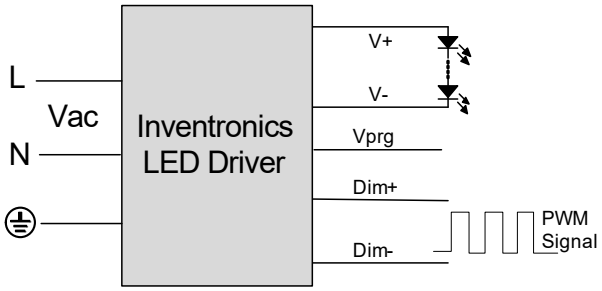
1. Do NOT connect Dim− to the output V− or V+, otherwise the driver will not work properly.
2. The dimmer can also be replaced by an active 1-10V voltage source signal or passive components like zener.
3. When 1-10V negative logic dimming mode and Dim+ is open, the driver will output minimum current.

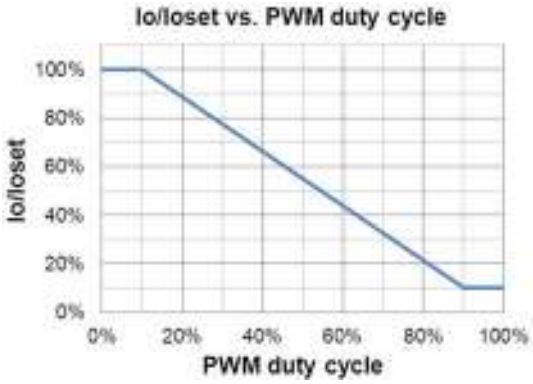
## 10V PWM Dimming

The recommended implementation of the dimming control is provided below.



**Implementation 5: Positive logic**




**Implementation 6: Negative logic**

**Notes:**

1. Do NOT connect Dim− to the output V− or V+, otherwise the driver will not work properly.
2. When PWM negative logic dimming mode and Dim+ is open, the driver will output minimum current.

## Time Dimming

Time dimming control includes 3 kinds of modes, they are Self Adapting-Midnight, Self Adapting-Percentage and Traditional Timer.

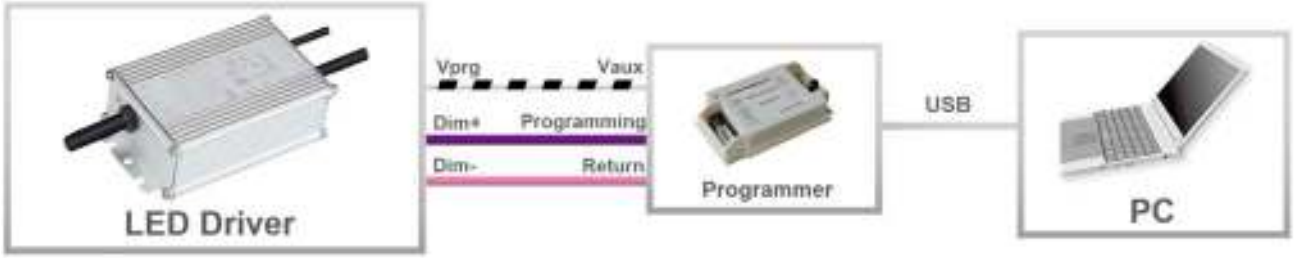
- **Self Adapting-Midnight**: Automatically adjusts the dimming curve based on the on-time of past two days (if difference <15 minutes), assuming that the center point of the dimming curve is midnight local time.
- **Self Adapting-Percentage**: Automatically adjusts the on-time of each step by a constant percentage = (actual on-time for the past 2 days if difference <15 min) / (programmed on-time from the dimming curve).
- **Traditional Timer**: Follows the programmed timing curve after power on with no changes.

## Output Lumen Compensation

Output Lumen Compensation (OLC) may be used to maintain constant light output over the life of the LEDs by driving them at a reduced current when new, then gradually increasing the drive current over time to counteract LED lumen degradation.

## Programming Connection Diagram

*EUM-050SxxxDG/ EUM-050SxxxDT/EUM-050SxxxDB*



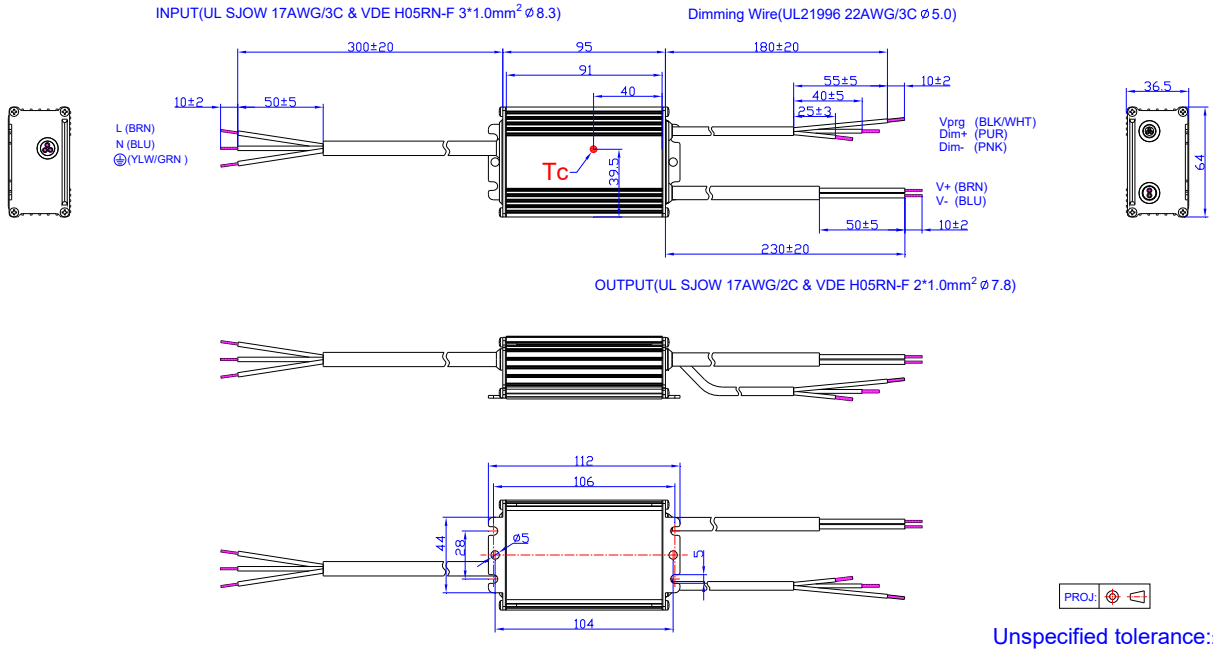

*EUM-050SxxxDF*

**Note:** The driver does not need to be powered on during the programming process.

- **Please refer to PRG-MUL2 (Programmer) datasheet for details.**

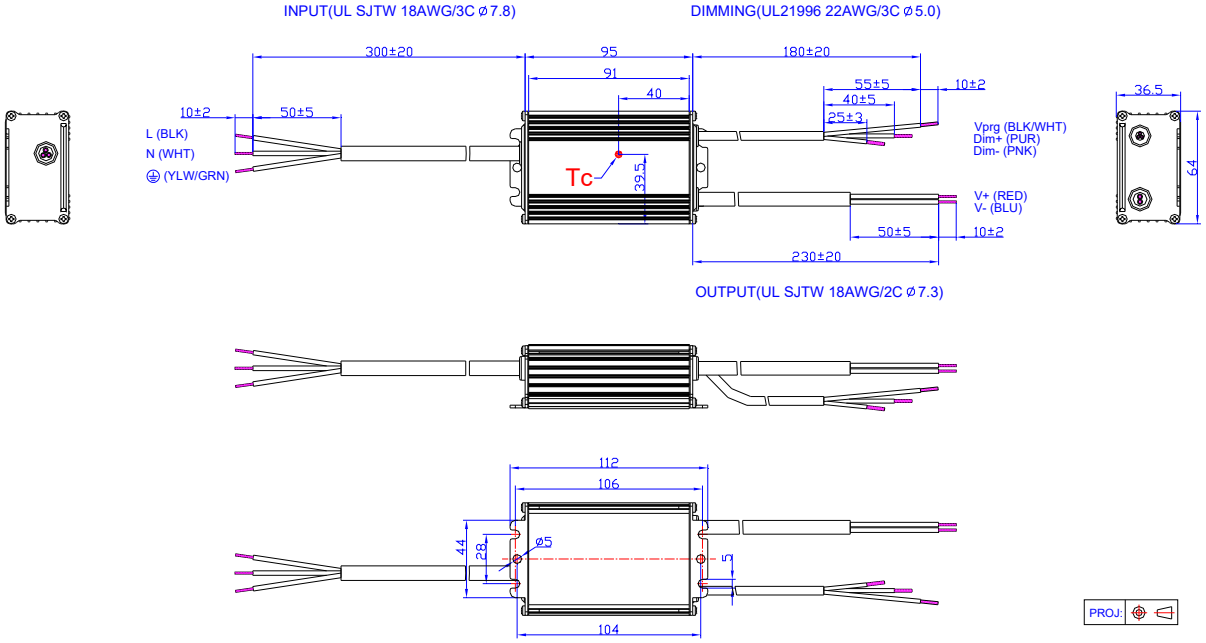
## Mechanical Outline

*EUM-050SxxxDG*



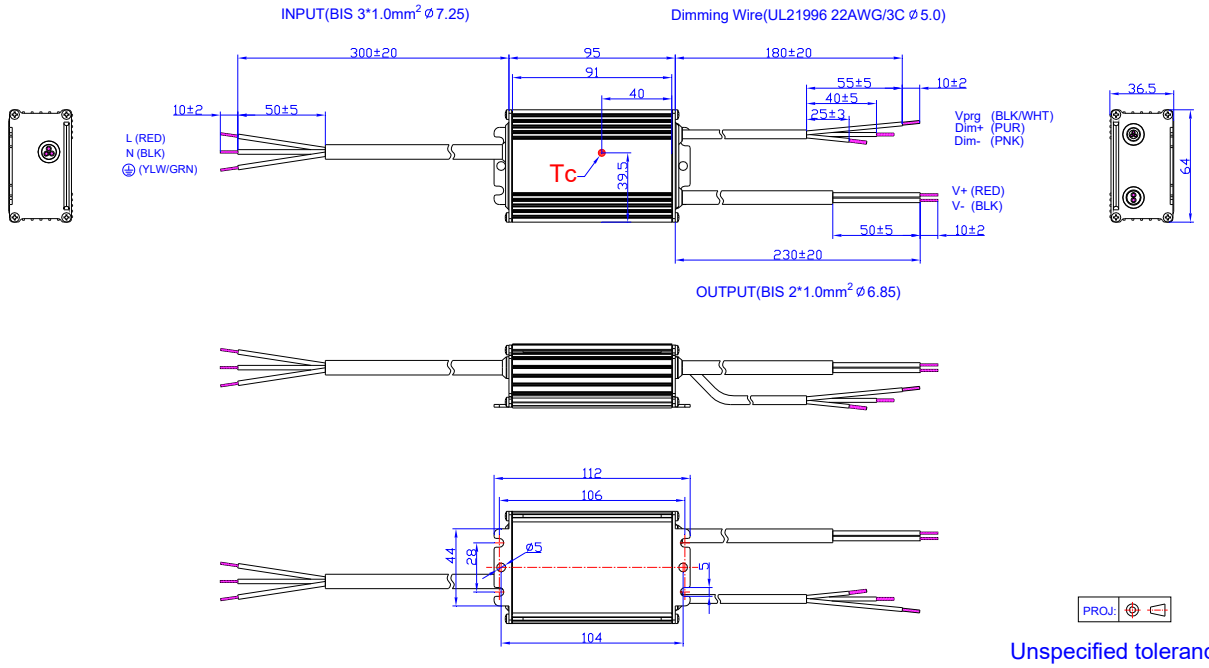

Unspecified tolerance:±1

## EUM-050SxxxDT




Unspecified tolerance:±1

## EUM-050SxxxDB



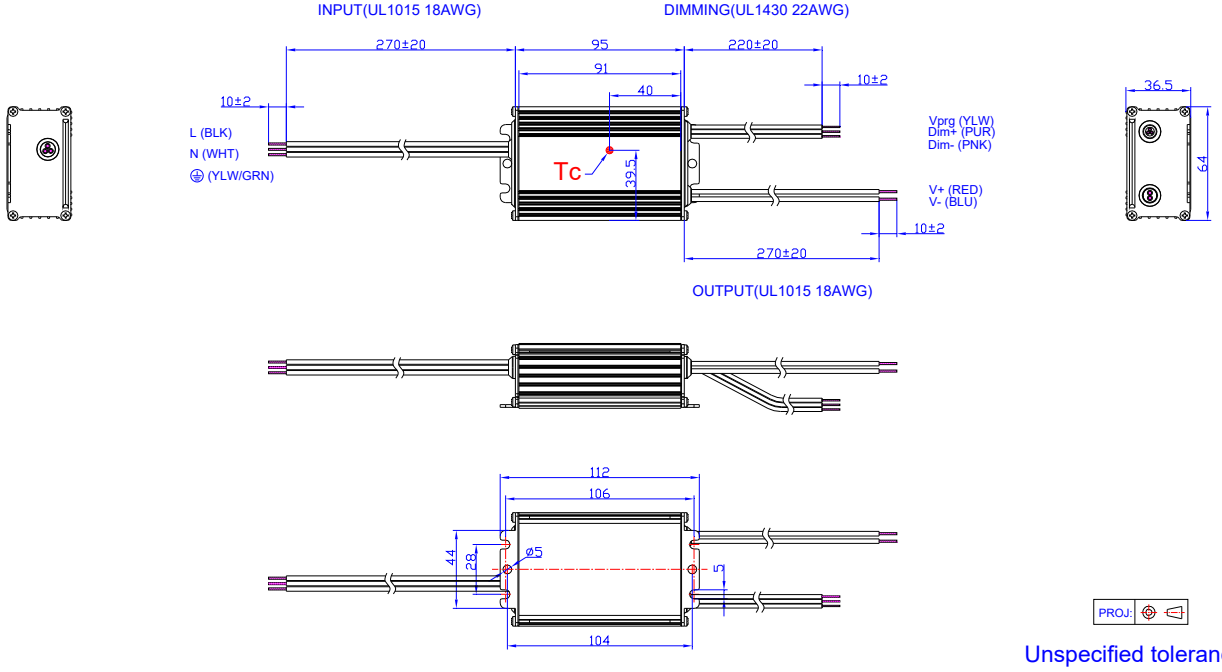

Unspecified tolerance:±1



*Specifications are subject to changes without notice.* *All specifications are typical at 25 ℃ unless otherwise stated.*

**www.inventronics-co.com** **Tel: 86-571-56565800** **Fax: 86-571-86601139** **sales@inventronics-co.com**

*EUM-050SxxxDF*




Unspecified tolerance:±1

## RoHS Compliance

Our products comply with reference to RoHS Directive (EU) 2015/863 amending 2011/65/EU, calling for the elimination of lead and other hazardous substances from electronic products.

## Revision History

| Change Date | Rev. | Description of Change | | |
|---|---|---|---|---|
| | | Item | From | To |
| 2021-01-21 | A | Datasheets Release | / | / |
| 2021-12-24 | B | Product photograph | EUM-050SxxxDF | Updated |
| | | UKCA logo | / | Added |
| | | EAC logo | / | Added |
| | | Models | EUM-050S053Dx | Added |
| | | Models | Note (5) | Added |
| | | I-V Operation Area | EUM-050S053Dx | Added |
| | | Output Current Setting(Ioset) Range | EUM-050S053Dx | Added |
| | | Output Current Setting Range with Constant Power | EUM-050S053Dx | Added |
| | | No Load Output Voltage | EUM-050S053Dx | Added |
| | | Efficiency at 120 Vac input | EUM-050S053Dx | Added |
| | | Efficiency at 220 Vac input: | EUM-050S053Dx | Added |
| | | Efficiency at 277 Vac input: | EUM-050S053Dx | Added |
| | | Dimming Output Range | EUM-050S053Dx | Added |
| | | Safety &EMC Compliance | UKCA | Added |
| | | Safety &EMC Compliance | EAC | Added |
| | | Efficiency vs. Load | EUM-050S053Dx | Added |
| | | Dimming | Note | Updated |
| | | Programming Connection Diagram | EUM-050SxxxDT | Updated |
| | | Programming Connection Diagram | EUM-050SxxxDF | Updated |
| | | Mechanical Outline | EUM-050SxxxDT | Updated |
| | | Mechanical Outline | EUM-050SxxxDF | Updated |
| 2023-06-13 | C | Product photograph | / | Updated |
| | | Safety &EMC Compliance | / | Updated |
| | | Dimming | / | Updated |
| | | Programming Connection Diagram | / | Updated |
| | | Mechanical Outline | / | Updated |

# Návod k použití

## VEŘEJNÉ LED OSVĚTLENÍ

GREENICE

**TYP: ST-1916-SL-G-HE**

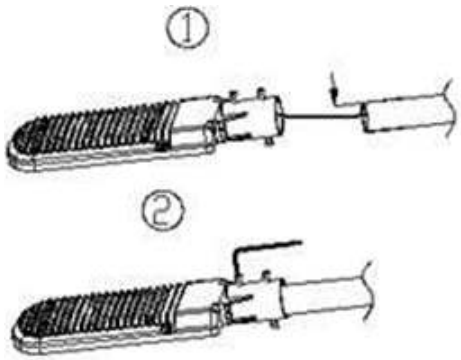
| | |
|---|---|
| Vstupní napětí | AC 230 V |
| Pracovní teplota | -30˚ ~ 50˚C |
| Krytí | IP 66 |
| Mechanická odolnost | IK 08 |
| Hmotnost | cca 5 kg |
| Životnost | 100 000 h |
| Montáž | Sloup / výložník |

## Upozornění

- Před instalací výrobku si nejprve pečlivě přečtěte tento návod.
- Nepřipojujte svítidlo k elektrické síti před odstraněním ochranného obalu.
- Instalaci svítidla provádějte vždy až po odpojení svítidla od hlavního napájení.
- Zajistěte řádné uzemnění svítidla.
- Nepoužívejte svítidlo v prostředí, které vykazuje teplotu a vlhkost mimo rozsah stanovený výrobcem jako provozní. Použitím svítidla v takovém prostředí se výrazně snižuje jeho životnost.
- K čištění svítidla nepoužívejte korozivní chemikálie nebo rozpouštědla, která mohou poškodit povrchovou úpravu nebo ochrannou vrstvu svítidla. Nepoužívejte vysokotlaké čističe.
- Instalaci a údržbu svítidla musí vždy provádět pouze osoba s platnou kvalifikací dle vyhlášky NV č. 194/2022 Sb.
- Nepoužívejte svítidlo v případě, že došlo k poškození svítidla nebo přívodního kabelu a jeho izolace. Kontrolu svítidla a kabeláže doporučujeme provádět pravidelně.
- Svítidlo je vybaveno 10m přívodním kabelem CYKY – J 3x1,0 mm$^2$.
- Napájení v předřadníkové části svítidla je zapojené ve svorkovnici bez použití trubičkové pojistky v obvodu, trubičková pojistka je však připravena pro budoucí zapojení. Pro zapojení stačí přepojit fázový vodič na zdířku s připravenou trubičkovou pojistkou 3,15 A.

## Postup montáže

- Přívodní kabel zaveďte do stožáru / výložníku pro VO.
- Svítidlo nasaďte na dřík výložníku a poté utáhněte zajišťovací šrouby (M8) pomocí imbusového klíče.
- Zkontrolujte dotažení šroubů tak, aby nemohlo dojít k uvolnění svítidla.




## VAROVÁNÍ

Při instalaci svítidla vždy dbejte na bezpečnost a vyvarujte se riziku vzniku požáru a elektrického šoku způsobeným nesprávným postupem při instalaci svítidla. Zapojení svítidla vždy přenechte osobám s příslušnou kvalifikací.

# MĚŘENÍ PROVOZNÍ TEPLOTY LED SVÍTIDLA

Datum měření: 14.8.2022
Teplota okolí: 22±1 °C
Svítidlo: ST1916SLG
Měřící přístroj: Ruční termokamera Fluke Ti480 PRO

Tabulka naměřených hodnot

| **Místo měření** | **Nejvyšší naměřená teplota [°C]** | **Průměrná naměřená teplota [°C]** | **Nejnižší naměřená teplota [°C]** |
|---|---|---|---|
| Přední strana (foto 1) | 29,5 | 28,6 | 28,2 |
| Zadní strana (foto 2) | 29,9 | 29,6 | 28,4 |
| Čelní hrana svítidla (foto 3) | 29,3 | 27,5 | 26,3 |
| Svítidlo z profilu (foto 4) | 29,2 | 27,6 | 26,2 |
| Předřadník (foto 5) | 35,1 | 34,0 | 27,0 |
| LED čipy (foto 6) | 30,5 | 30,0 | 27,4 |
| LED čipy – detail (foto 7) | 30,3 | 30,1 | 29,7 |

Cílem měření bylo zjistit provozní teplotu svítidla. Před měřením bylo svítidlo zapnuto na nominální výkon po dobu 5 hodin, aby se teploty ustálily a svítidlo dosáhlo provozní teploty. Měření bylo provedeno termokamerou, která pro danou výseč stanovila maximální, minimální a průměrnou hodnotu. Naměřené hodnoty jsou shrnuty v tabulce, přičemž jednotlivé snímky z termokamery jsou přiloženy níže.

1 – Přední strana svítidla

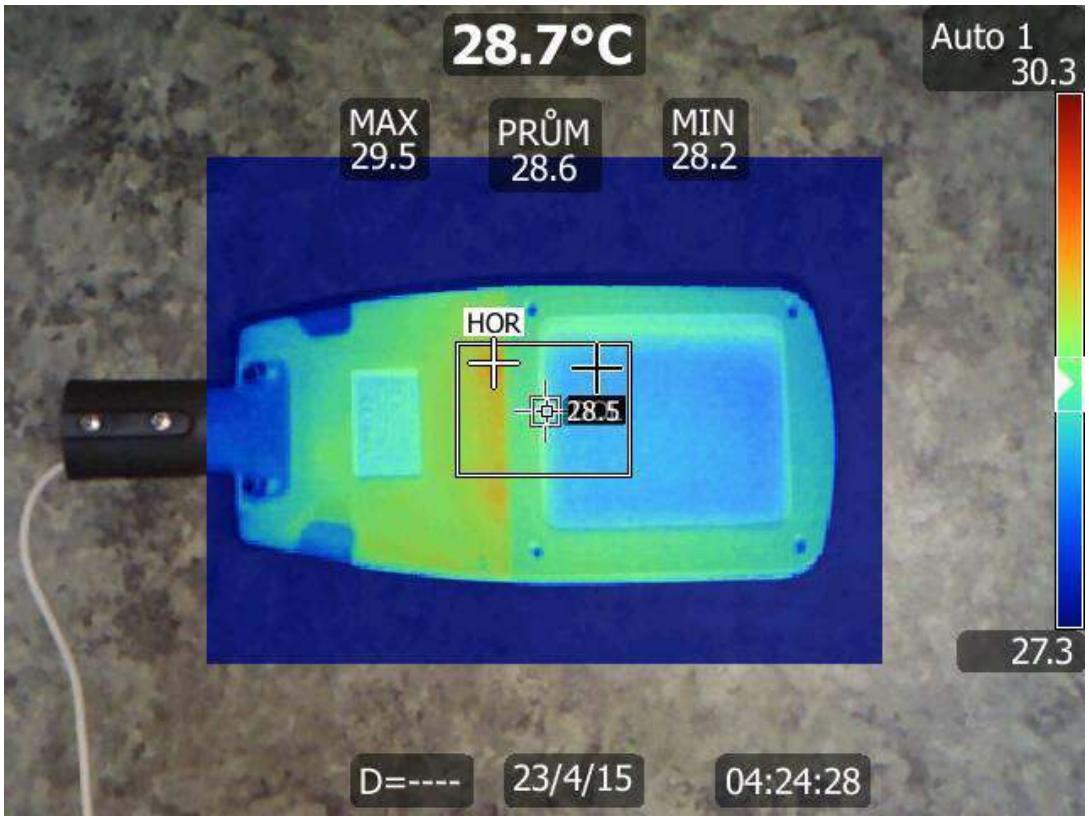



Foto 2 – Zadní strana svítidla

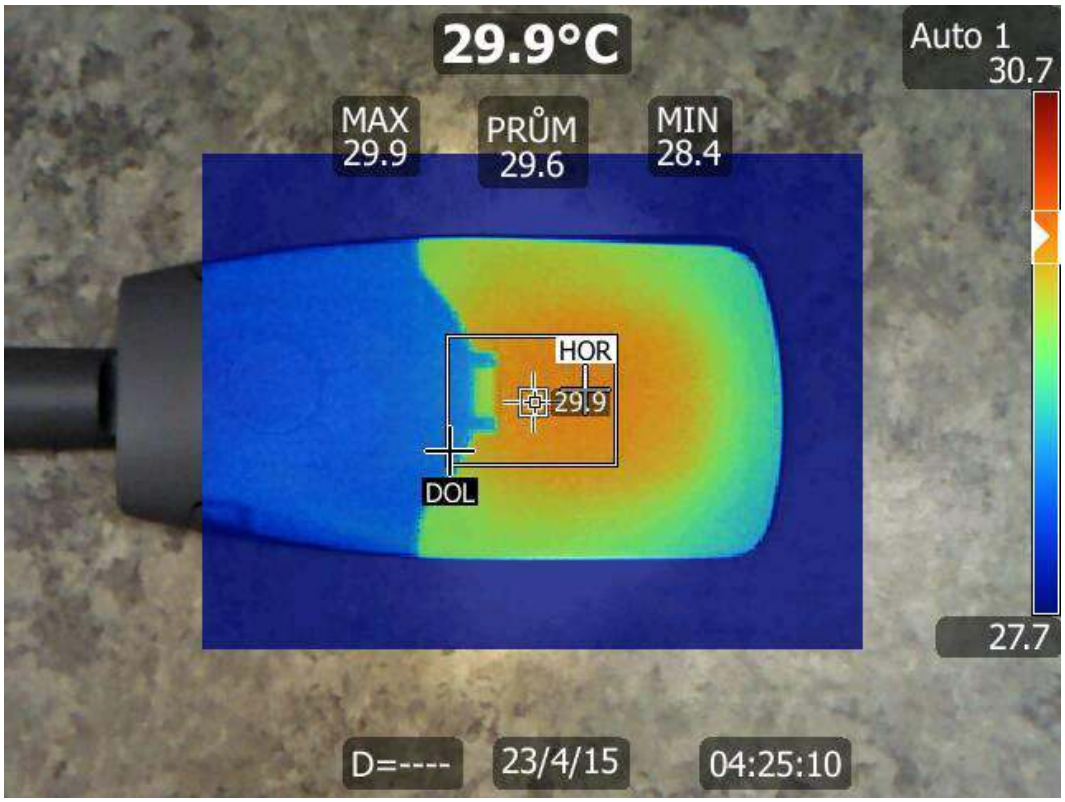


Foto 3 – Čelní hrana svítidla

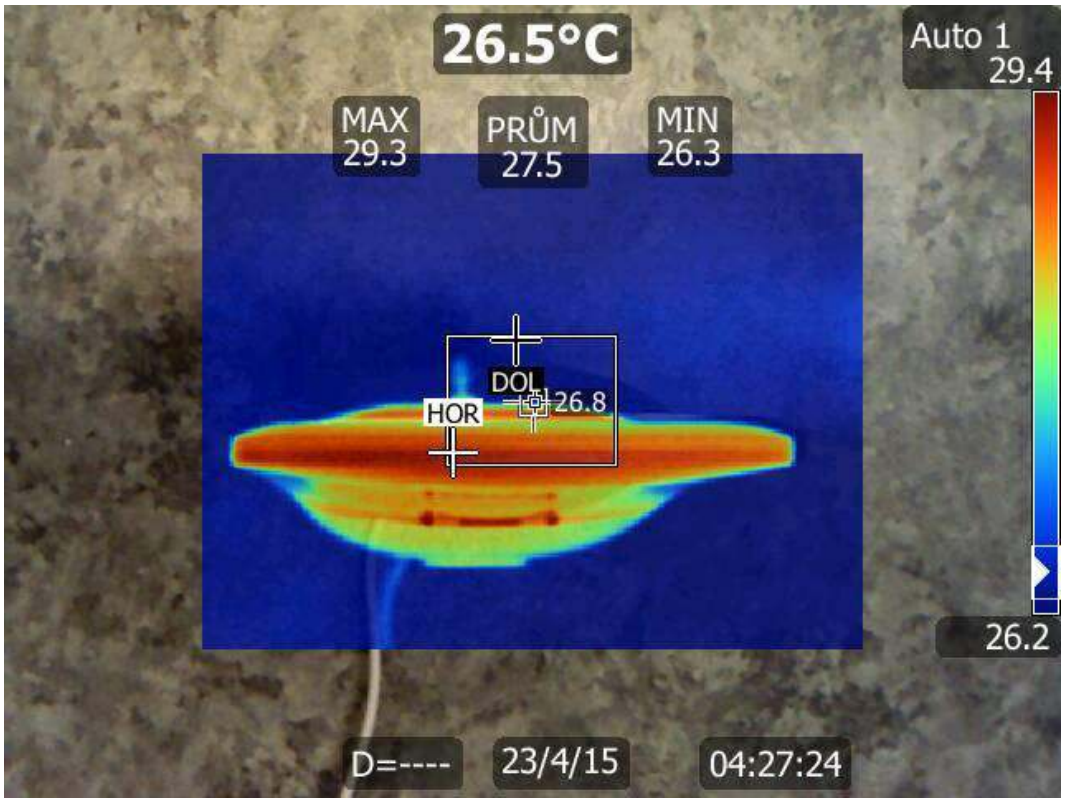



Foto 4 – Svítidlo z profilu

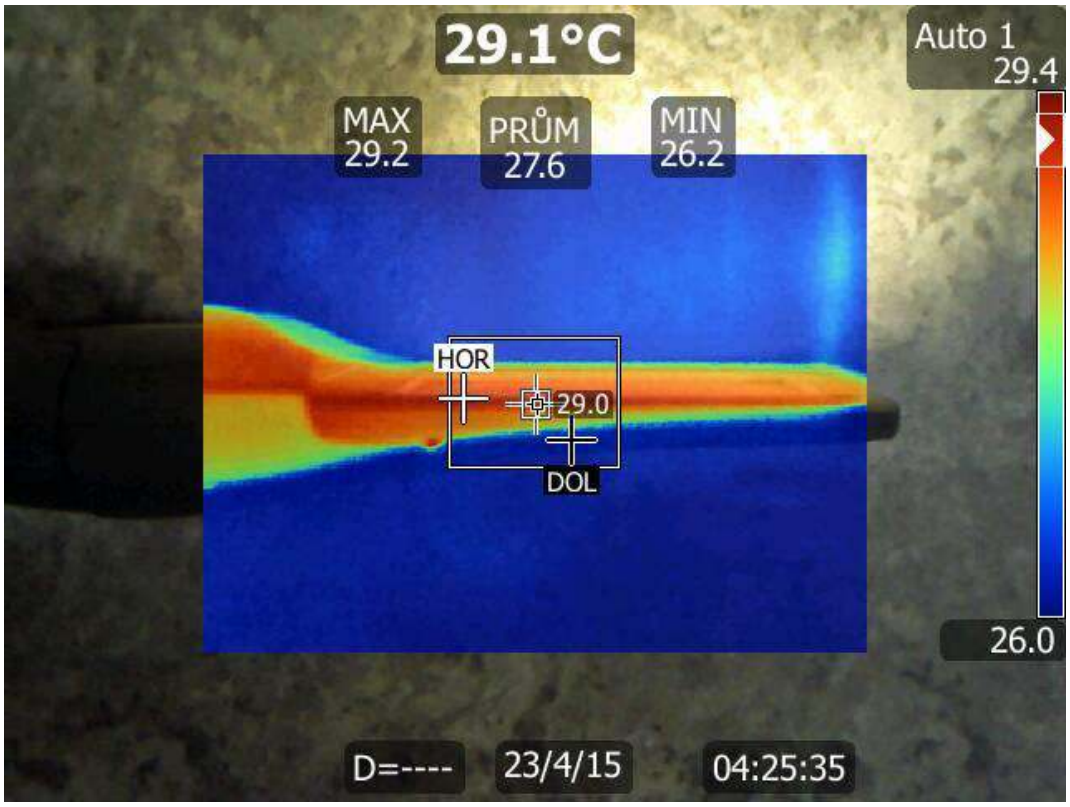


Foto 5 - Předřadník

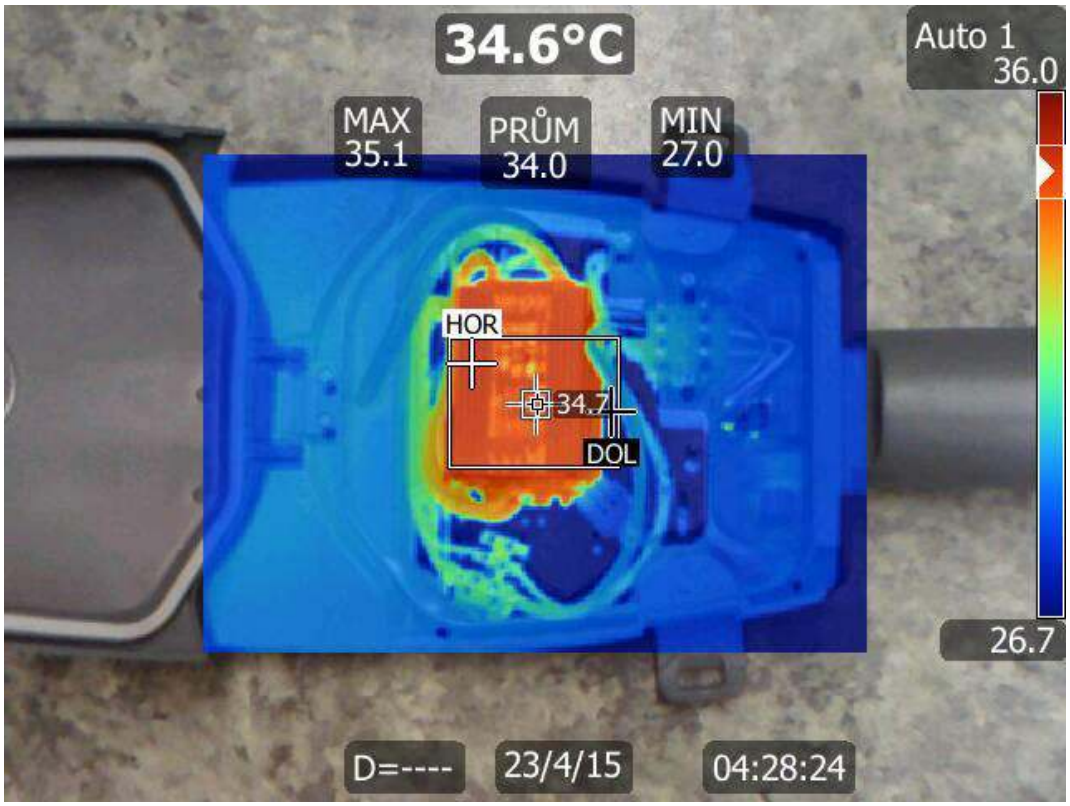



Foto 6 – LED čip

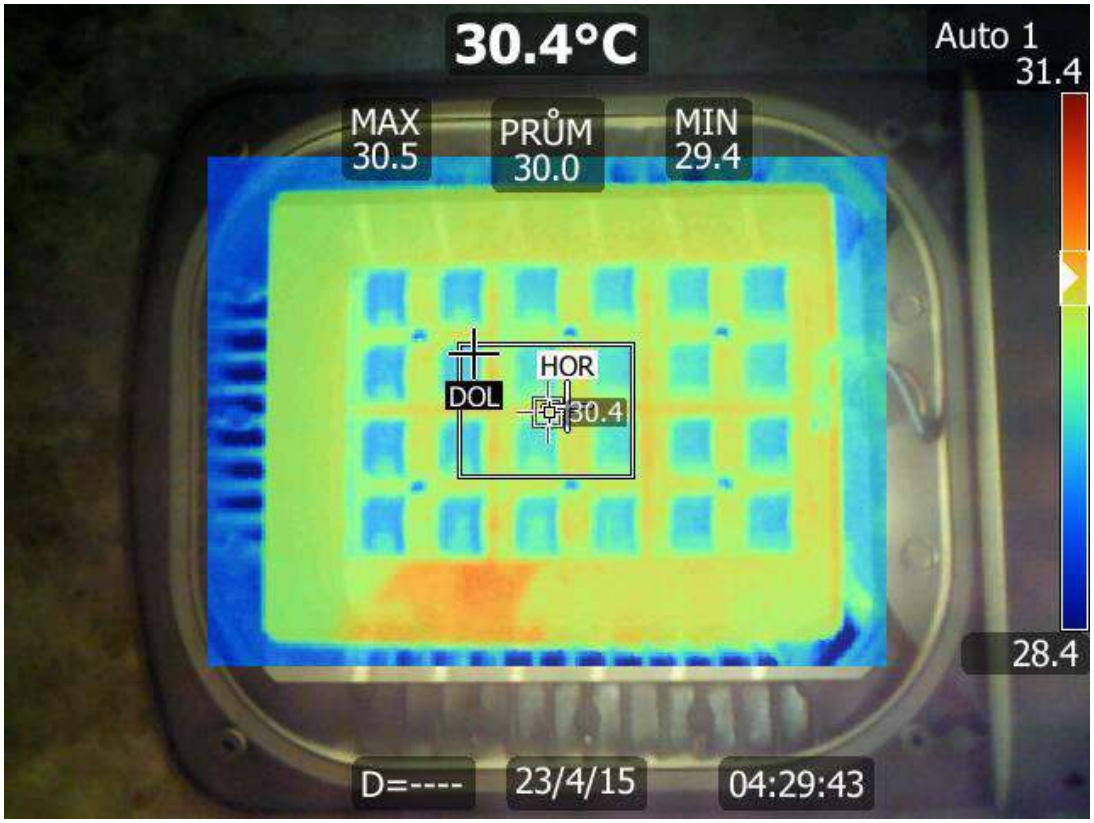
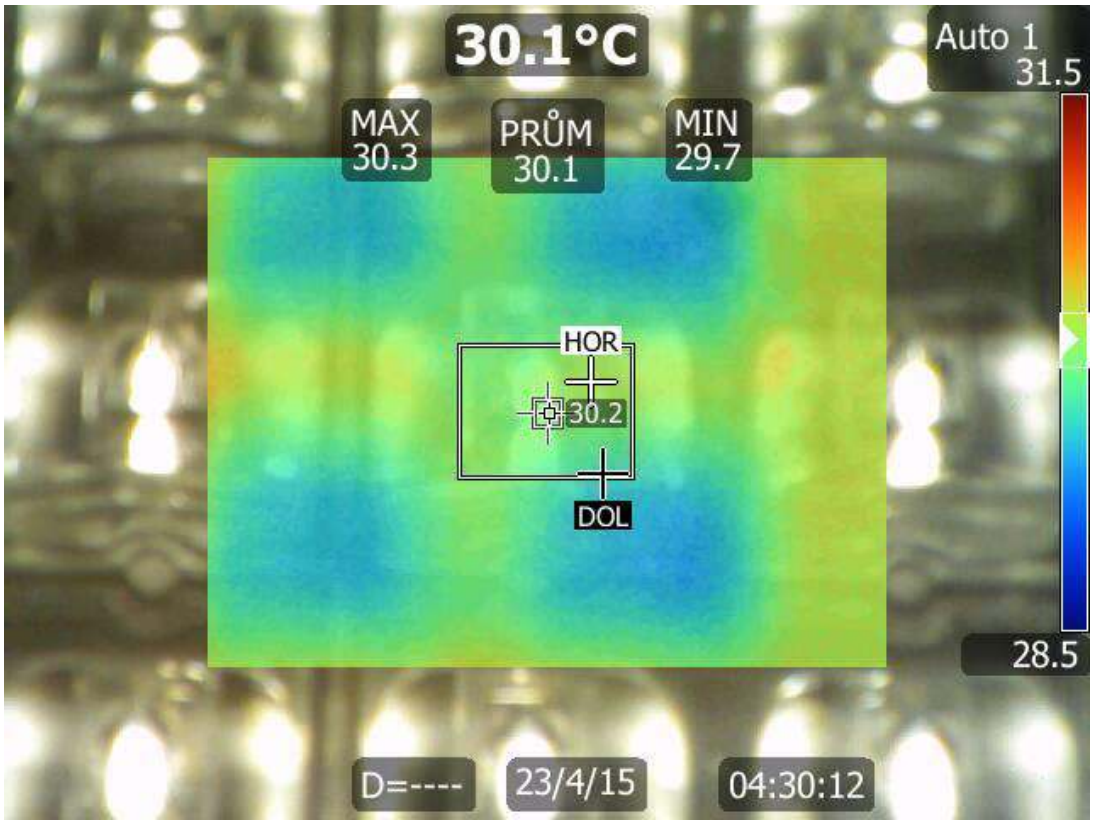



Foto 7 – LED čip - detail