

ALLOY LED® Specifications

VariTune™ 4.3 COB Tunable LED Tape Light

Actual size shown

0.39 in. wide
Cut point every 1.04 in.



Combining full-spectrum white control with ultra-smooth output of Chip-on-Board (COB) technology, this 24V tape light delivers a continuous line of light without visible dots. Perfect for cove lighting, millwork, and modern spaces that demand smooth lines of light, VariTune 4.3 COB Tunable offers a sophisticated blend of visual comfort and advanced controllability.

- Tunable White Range from 2700K to 6500K
- Dot-free, seamless illumination
- Industry-leading 90+ CRI (Color Rendering Index)
- Pair with PowerFactor Wet Location Multi-Drive Dimmable Driver with Junction Box and PowerFactor Multi-Drive VariTune Switch
- Hotspot-free when paired with most Alloy LED channels, even in shallow or exposed installations

TECHNICAL INFORMATION

Stocked Color Temperature	2700K~6500K
Power Consumption Per Foot	4.41 Watts/102.24mA
Input Voltage	24V DC
Diodes per foot	185
Diode Spacing	0.0647 inches
Tape Height	0.07 inches
Beam Angle	135°
Field Cuttable (UL 2108)	Every 1.04 inches
Max Run Length	20 ft.
Dimmable	Yes

Diode Type	COB
Mounting	3M™ Self-Adhesive Tape (Non-porous)
Operating Temperature	-77° F to 140° F
Ambient Temperature	-104° F to 176° F
Environment	Indoor, Dry
Spool Lengths*	17ft.
Certifications	UL Listed, UL 2108, CE, RoHS UL Closet Rated
Warranty	6 Year Limited

*Each spool includes 36 in., 20 AWG tinned lead wires at both ends of the tape light.

PRODUCT INFORMATION

17 ft. Spool Item Number	Voltage	Color Temperature	CRI	R9 Values	R13 Values	Lumens / foot (Max Output)
AL-01-68-2401	24V DC	2700K~6500K	90	72	99	477

VOLTAGE DROP GUIDANCE CHART

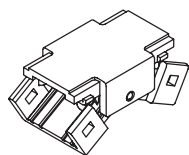
Standard Non-XT 24V Voltage Drop & Wire Length Distance Chart (3% Drop or 24V)

Wire Gauge	Copper Wire Resistance (Ω/kFT)	10W (0.42A)	20W (0.83A)	30W (1.25A)	40W (1.67A)	50W (2.08A)	60W (2.50A)	70W (2.92A)	80W (3.33A)	90W (3.75A)	96W (4A)
22 AWG	16.14	54 ft.	27 ft.	18 ft.	14 ft.	11 ft.	9 ft.	8 ft.	7 ft.	6 ft.	6 ft.
20 AWG	10.15	86 ft.	43 ft.	29 ft.	22 ft.	18 ft.	15 ft.	13 ft.	11 ft.	10 ft.	9 ft.
18 AWG	6.39	136 ft.	68 ft.	46 ft.	34 ft.	28 ft.	23 ft.	20 ft.	17 ft.	16 ft.	15 ft.
16 AWG	4.02	216 ft.	108 ft.	72 ft.	54 ft.	44 ft.	36 ft.	31 ft.	27 ft.	24 ft.	23 ft.
14 AWG	2.53	343 ft.	172 ft.	115 ft.	86 ft.	69 ft.	58 ft.	49 ft.	43 ft.	39 ft.	36 ft.
12 AWG	1.59	545 ft.	273 ft.	182 ft.	137 ft.	109 ft.	91 ft.	78 ft.	69 ft.	61 ft.	57 ft.
10 AWG	0.99	865 ft.	433 ft.	289 ft.	217 ft.	173 ft.	145 ft.	124 ft.	109 ft.	97 ft.	91 ft.

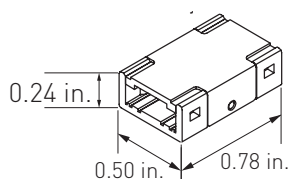
Note: These tables provide general guidelines for determining Wire Gauge based on total load and distance from LED driver to beginning of luminaire.

ACCESSORIES (SOLD SEPARATELY)

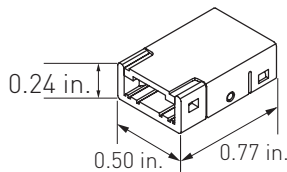
In-Wall-Rated Tape Light Connectors(20 AWG)



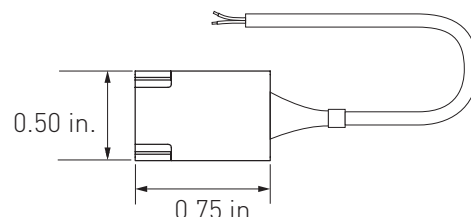
Tape-to-Tape Connector



Tape-to-Tape Connector



Tape Light Splice Connector



Tape Light Splice Connector

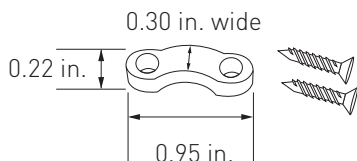
Item Number	Description	Wire
AL-01-68-9901	Tape-to-Tape Connector	N/A
AL-01-68-9901-10	Tape-to-Tape Connector (10-pack)	N/A

Item Number	Description	Wire
AL-01-68-9902	Tape Light Splice Connector	6 in.
AL-01-68-9902-10	Tape Light Splice Connector (10-pack)	6 in.

Wire and Tape Light Management

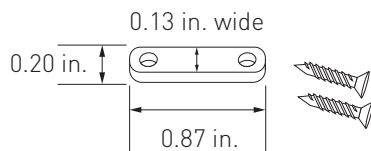
We recommend the use of the wire and tape harness.

- At least 1 wire harness at the beginning to secure the lead wire; for longer lead wires, place a harness every 2 feet
- 1 tape harness every 2 feet and 1 harness at the end of the tape light to secure it



Wire Harness

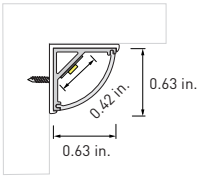
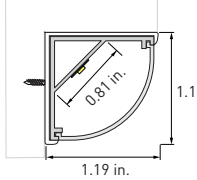
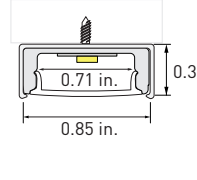
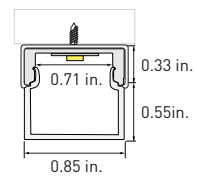
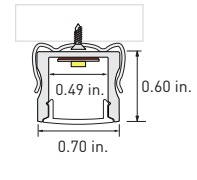
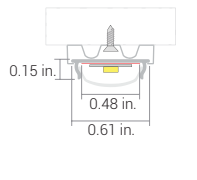
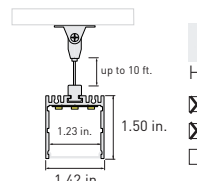
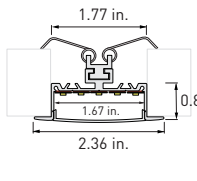
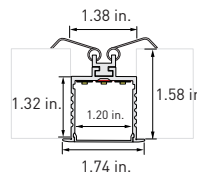
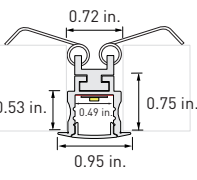
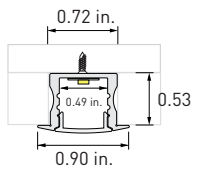
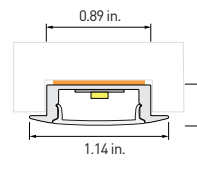
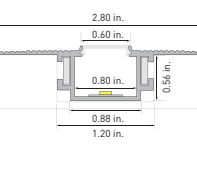
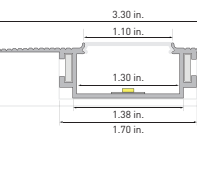
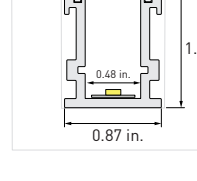
Holds wire in place securely
AL-01-99-9901-10 (10-pack)



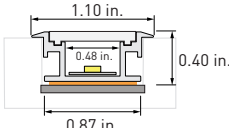
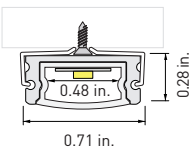
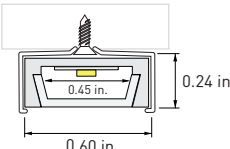
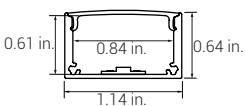
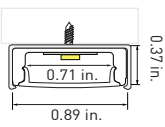
Tape Harness

Provides extra security for tape light, especially at the ends of a run
AL-01-99-9900-10 (10-pack)

Reduced Hotspot Pairings (Hotspot Rating from 0-5)

Surfa 2: Corner-Mount  Hotspot Rating: 1 ☒ Solder ☒ Connector ☐ TapeMate	Surfa 2X: Corner-Mount  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Surfa 6: Surface-Mount  Hotspot Rating: 2 ☒ Solder ☐ Connector ☐ TapeMate
Surfa 6 Surround: Surface-Mount  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Surfa 7: Surface-Mount  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	SurfaFlex 1: Bendable Surface-Mount  Hotspot Rating: 2 ☒ Solder ☒ Connector ☐ TapeMate
Suspan 1: Suspended  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Ankr 1: In-Wall  Hotspot Rating: 1 ☒ Solder ☒ Connector ☐ TapeMate	Ankr 2: In-Wall  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate
Ankr 3: In-Wall  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Ankr 4: Mud-In  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Naro 4: Recessed  Hotspot Rating: 1 ☒ Solder ☒ Connector ☐ TapeMate
Mudr 1: In-Wall  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Mudr 2: In-Wall  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Duro 1: In-Ground  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate

Other Compatible Pairings (Hotspot Rating from 0-5)

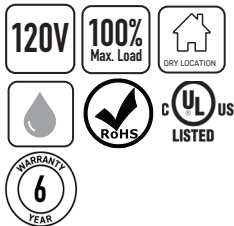
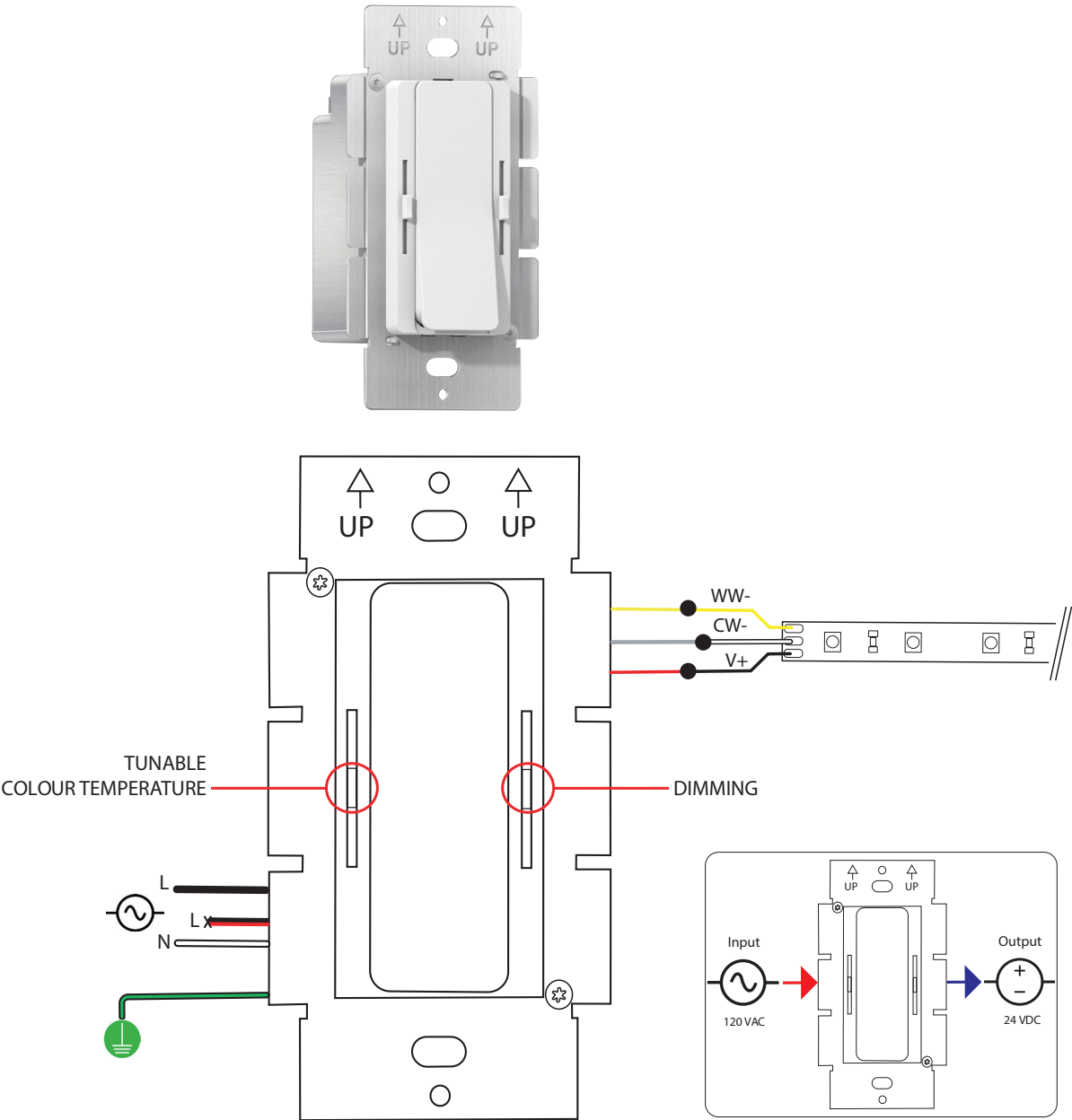
Duro 2: In-Ground  Hotspot Rating: 1 ☒ Solder ☒ Connector ☐ TapeMate	Surfa 1: Surface-Mount  Hotspot Rating: 3 ☒ Solder ☒ Connector ☐ TapeMate	Surfa 3: Surface-Mount  Hotspot Rating: 4 ☒ Solder ☒ Connector ☐ TapeMate
Surfa 8: Surface-Mount  Hotspot Rating: 0 ☒ Solder ☒ Connector ☐ TapeMate	Polymer LP: Surface-Mount  Hotspot Rating: 2 ☒ Solder ☒ Connector ☐ TapeMate	

ALLOY LED® Specifications

RECOMMENDED POWER SUPPLIES(SOLD SEPARATELY)



AdaptDrive VariTune Tunable White provides seamless control over both brightness and color temperature from a single interface.



Item Number	Output	Input	Wattage	Minimum Load	Dimensions (L x W x H)
AL-97-03-24096	24V	120Vac	96W	10%	4.13 x 2.12 x 1.59in.
AL-97-03-24160	24V	120Vac	160 W	10%	4.13 x 2.12 x 1.59in.

Note: Inspectors prefer power supply to be used with junction box.
For dimmer compatibility, refer to drivers specification sheet.

ALLOY LED® Specifications

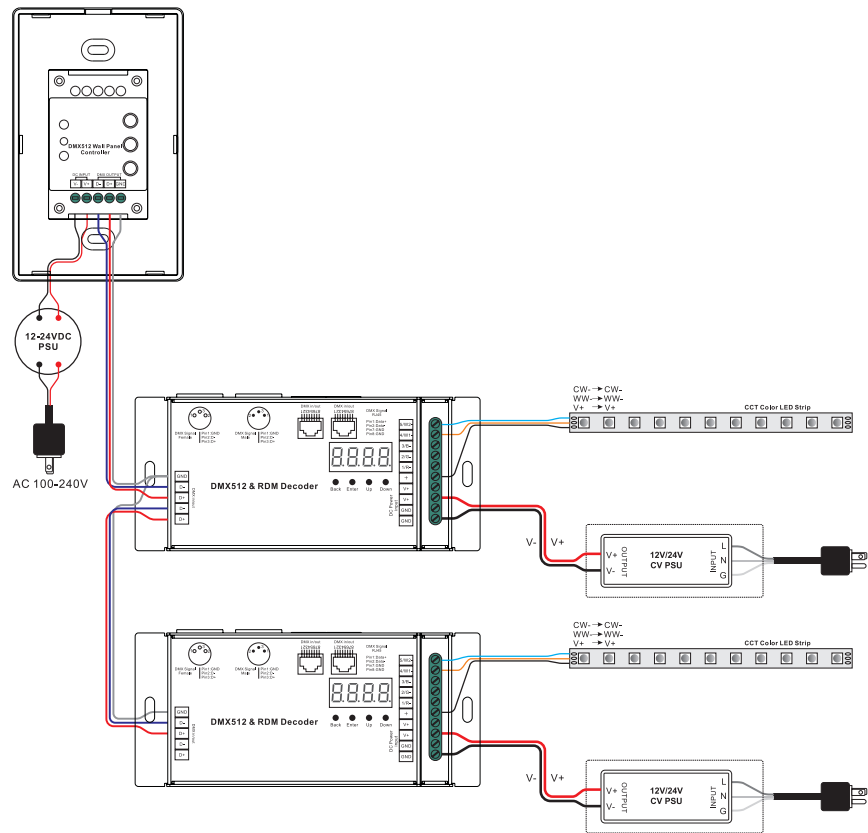
DIMMING ACCESORIES(SOLD SEPARATELY)

ALLOY'S



DMX TOUCH WALL CONTROLLER - 12 OR 24V DC

It's ideal for applications requiring precise control over color temperature and brightness from a single compact unit.



Wiring diagram is for reference only. Please refer to dimmer wiring specifications sheet for accurate directions.



Item Number	Output	Power consumption	Dimensions (L x W x H)	Class 2
AL-60-03-0011	DMX512	<20mA	4.72in x 2.95in. x 1.5in.	Yes

Note: Inspectors prefer power supply to be used with junction box.
For dimmer compatibility, refer to drivers specification sheet.

DIMMING ACCESORIES(SOLD SEPARATELY)

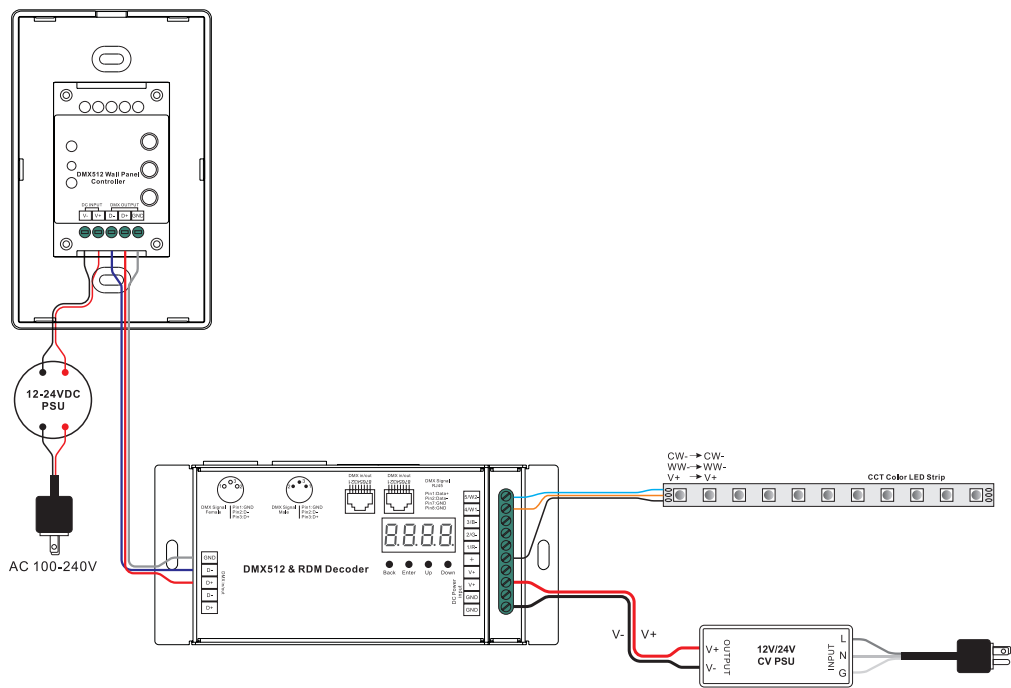
ALLOY'S



TOP CHOICE

DMX Decoder with RDM

It's ideal for applications requiring precise control over color temperature and brightness from a single compact unit.



Wiring diagram is for reference only. Please refer to dimmer wiring specifications sheet for accurate directions.

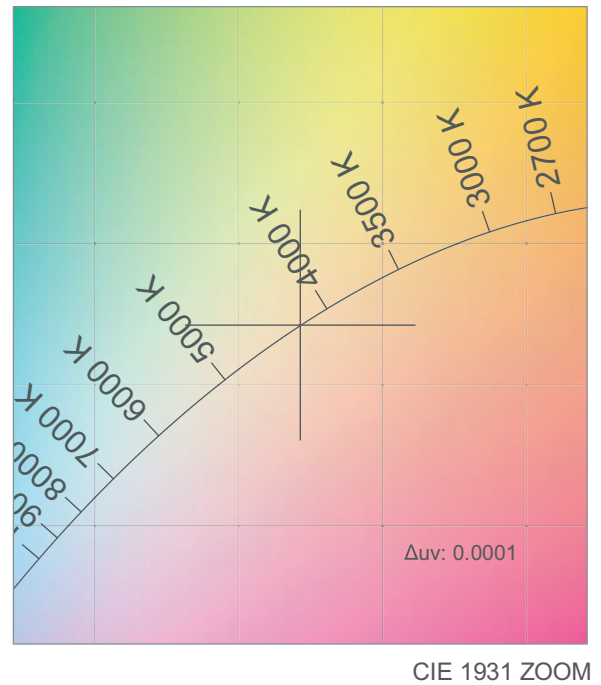
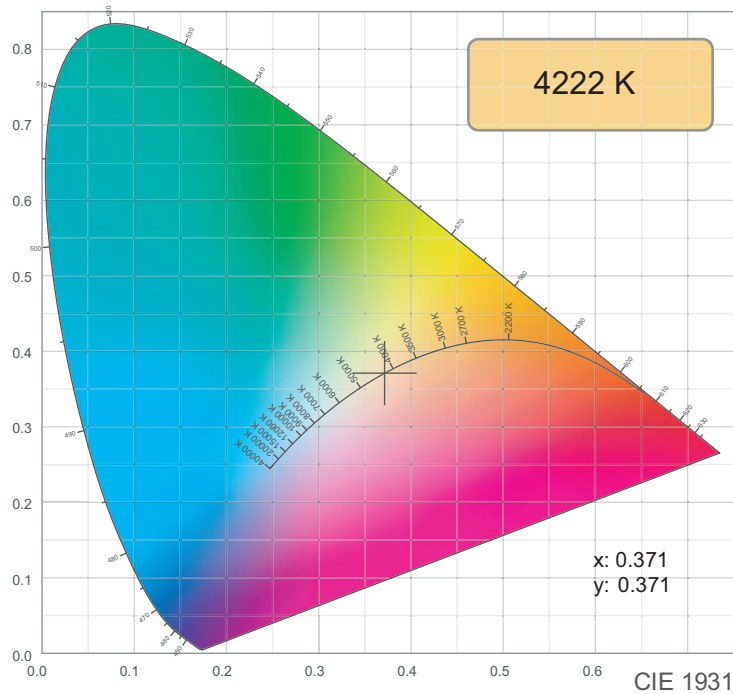


Item Number	Output	Power Source:	Dimensions (L x W x H)
AL-60-03-0007-RDM	5X(96-192W)	12-24V	6.46 x 2.87x 1.5 in..

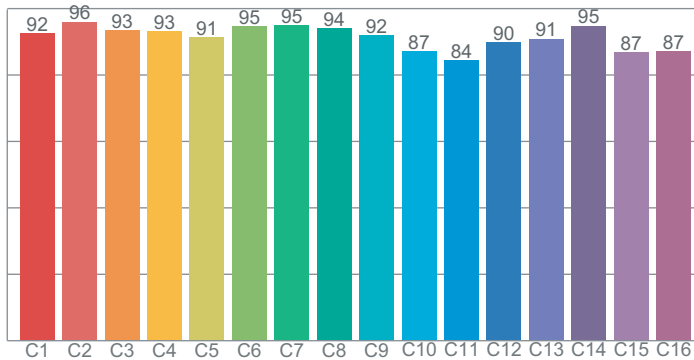
Note: Inspectors prefer power supply to be used with junction box.
For dimmer compatibility, refer to drivers specification sheet.

Note: specifications are representative of the diode type and not a particular tape light article.

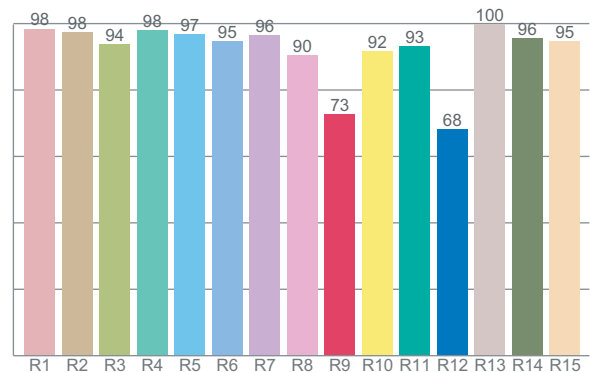
2700k-6500k



TM-30: 91.2



CRI: 95.8 (R1-R8)



CRI R values, only R1 -R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
98.5	97.5	93.7	98.0	96.9	94.7	96.4	90.4	72.8	91.6	93.3	68.3	99.7	95.5	94.7

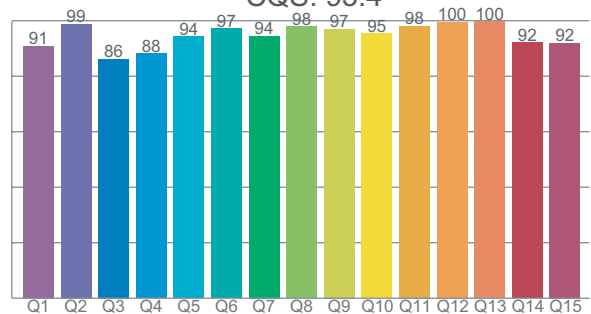
TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
92.4	96.0	93.3	93.2	91.3	94.6	94.9	94.1	91.9	87.2	84.4	89.9	90.9	94.8	86.8	87.2

CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
90.9	98.8	86.3	88.2	94.4	97.1	94.5	97.8	96.9	95.4	98.1	99.5	99.6	92.1	92.0

CQS: 93.4



Color parameters

Color temperature	Color rendering index	Red component	Color fidelity	Color gamut	Color quality scale	Color coordinate cie 1931	Color coordinate cie 1931	Color coordinate	Color coordinate	Color deviation from black body
CCT	CRI	CRI R9	TM30 Rf	TM30 Rg	CQS	x	y	u	v	Δuv
4222 K	95.8	72.8	91.2	100.4	93.4	0.371	0.371	0.221	0.332	0.0001

TM-30 details

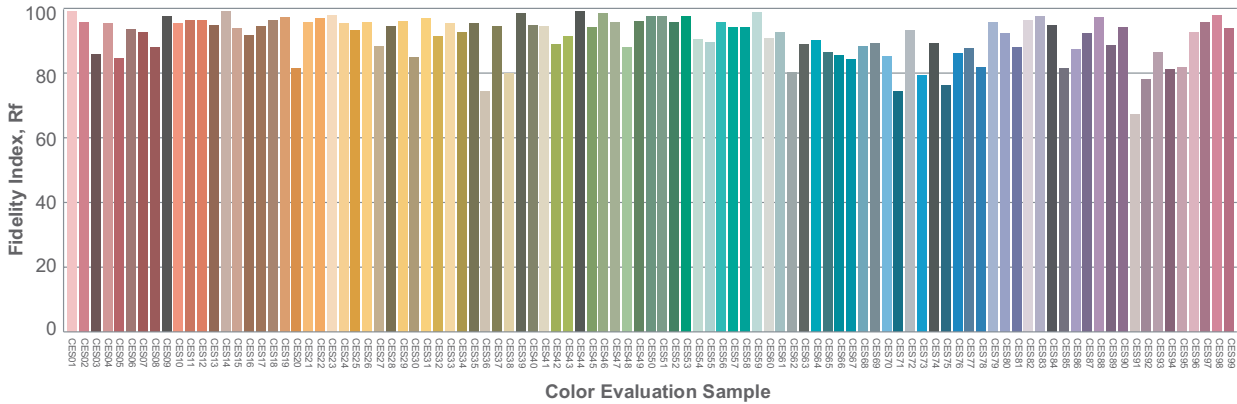
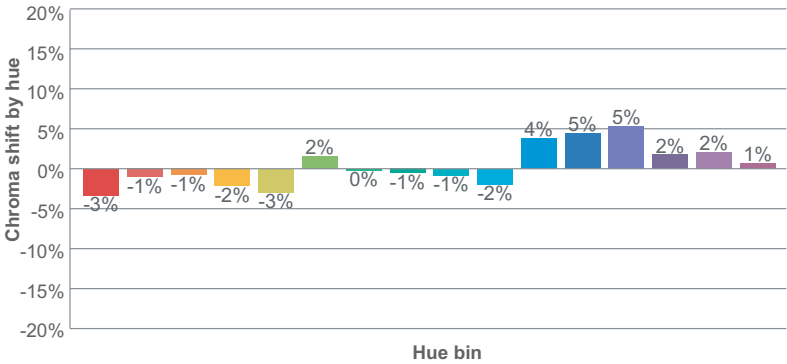
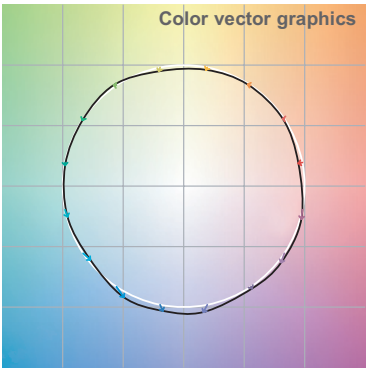
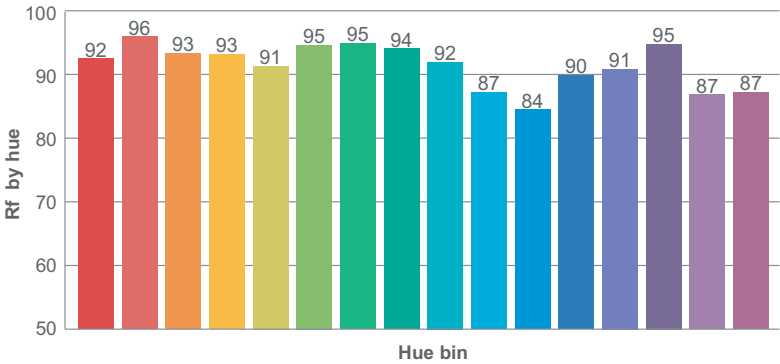
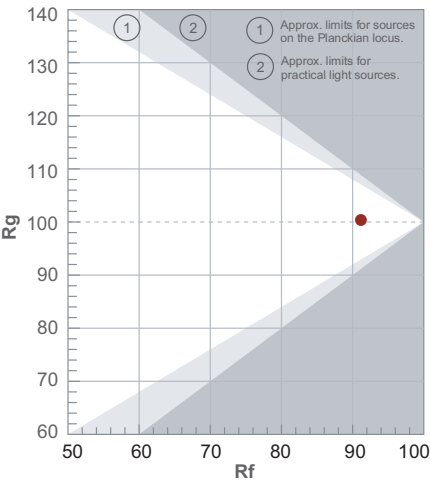
Rf 91.2

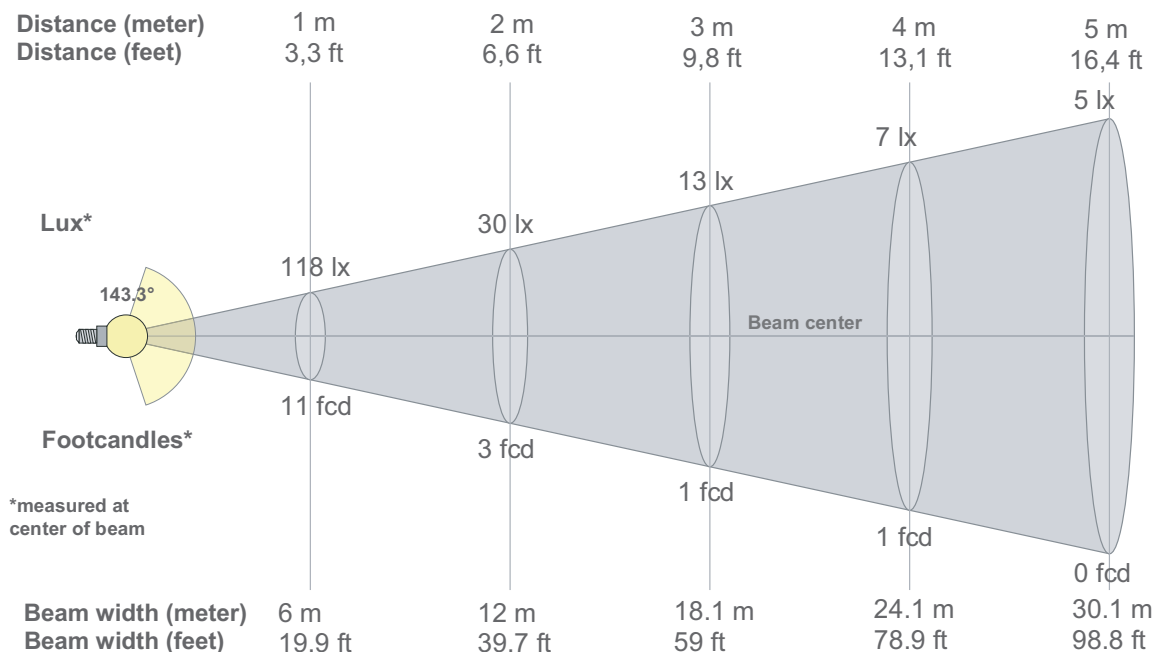
Fidelity index Rf

Rg 100.4

Gamut index Rg

Hue Bin	Rr	Shifts (%)	
		Chroma	Hue
1	92	-3%	0%
2	96	-1%	1%
3	93	-1%	3%
4	93	-2%	1%
5	91	-3%	2%
6	95	2%	2%
7	95	0%	1%
8	94	-1%	2%
9	92	-1%	6%
10	87	-2%	8%
11	84	4%	10%
12	90	5%	3%
13	91	5%	-4%
14	95	2%	0%
15	87	2%	-8%
16	87	1%	-8%





Beam intensities from 1-20m

1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m
3.3ft	6.6ft	9.8ft	13.1ft	16.4ft	19.7ft	23ft	26.2ft	29.5ft	32.8ft	36.1ft	39.4ft	42.7ft	45.9ft	49.2ft	52.5ft	55.8ft	59.1ft	62.3ft	65.6ft
118lx	30lx	13lx	7lx	5lx	3lx	2lx	2lx	1lx	1lx	1lx	1lx	1lx	1lx	1lx	0lx	0lx	0lx	0lx	0lx
11fcd	2.7fcd	1.2fcd	0.7fcd	0.4fcd	0.3fcd	0.2fcd	0.2fcd	0.1fcd	0.1fcd	0.1fcd	0.1fcd	0.1fcd	0.1fcd	0fcd	0fcd	0fcd	0fcd	0fcd	0fcd

Intensities in 0° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
118	117	114	109	103	96	88	80	72	62	47	8	1	1	1	1	1	1	1	1
100%	99%	97%	92%	87%	81%	74%	67%	61%	52%	40%	6%	1%	1%	1%	1%	1%	1%	1%	1%

Intensities in 90° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
118	117	112	106	97	84	70	52	33	14	2	1	1	1	1	1	1	1	1	1
100%	99%	95%	90%	82%	72%	59%	44%	28%	12%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%

Intensities in 180° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
118	117	114	109	103	96	88	80	72	62	47	8	1	1	1	1	1	1	1	1
100%	99%	97%	92%	87%	81%	74%	67%	61%	52%	40%	6%	1%	1%	1%	1%	1%	1%	1%	1%

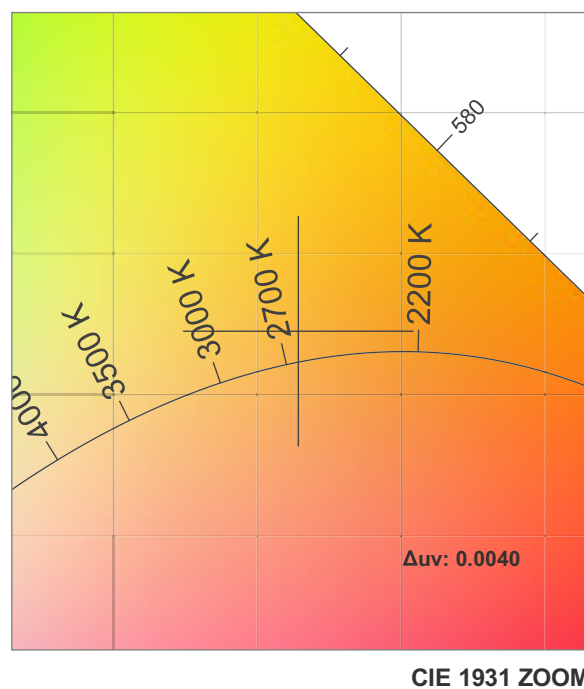
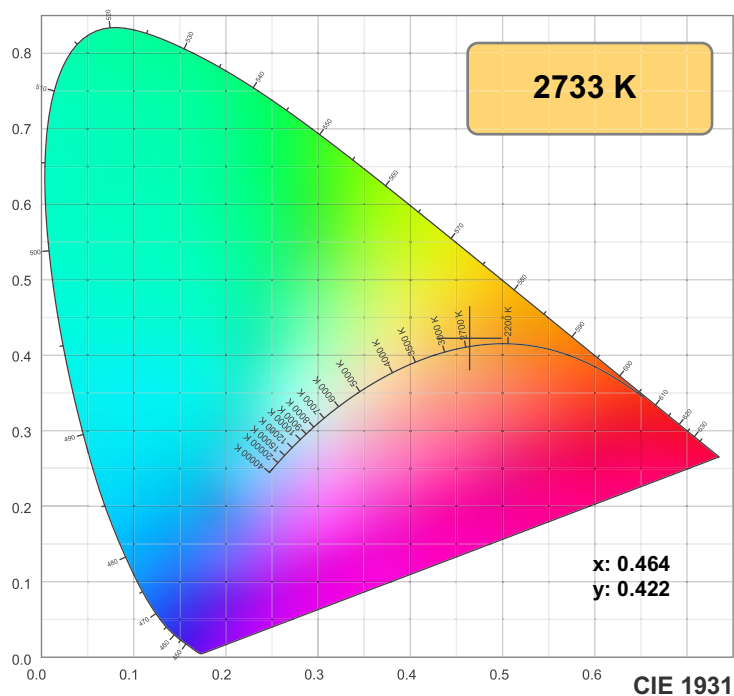
Intensities in 270° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
118	117	112	106	97	84	70	52	33	14	2	1	1	1	1	1	1	1	1	1
100%	99%	95%	90%	82%	72%	59%	44%	28%	12%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%

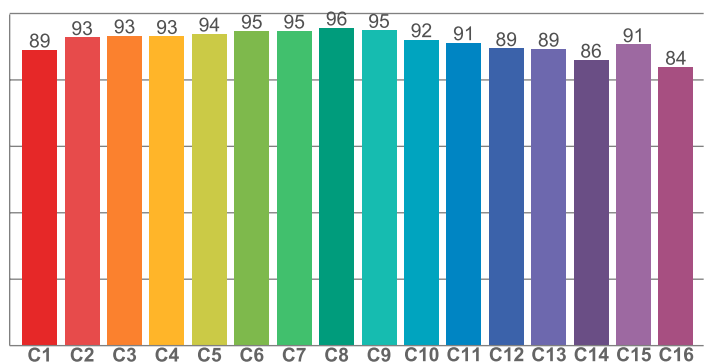
Beam angle 50%	Field angle 10%	Cutoff angle 2,5%	Intensity ratio in 120° cone	Intensity ratio in 90° cone
143.3°	186.6°	194.3°	62.2%	40.1%

Note: specifications are representative of the diode type and not a particular tape light article.

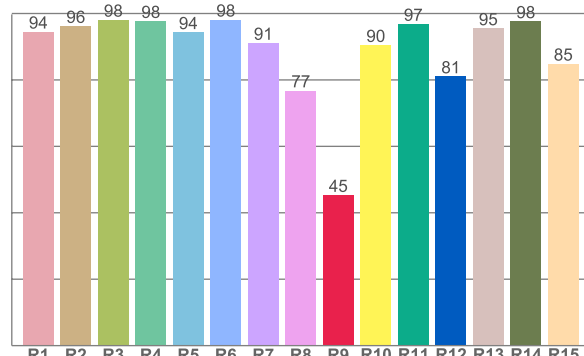
2700K -Warm White



TM-30: 91.5



CRI: 93.3 (R1-R8)



CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
94.5	96.2	98.1	97.7	94.3	98.1	91.1	76.8	45.3	90.5	96.8	81.0	95.5	97.6	84.8

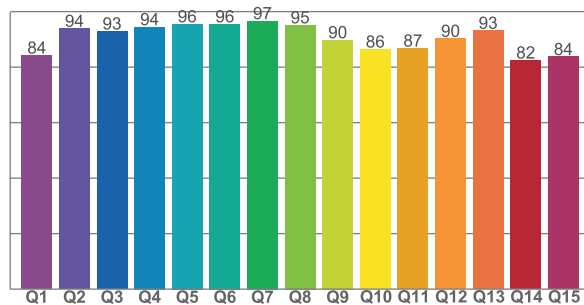
TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
89.0	92.8	93.3	93.1	93.8	94.7	94.8	95.7	95.0	92.1	91.2	89.4	89.3	86.0	90.6	83.8

CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
84.2	93.9	92.9	94.5	95.5	95.5	96.6	95.1	89.8	86.4	86.8	90.3	93.2	82.5	83.7

CQS: 89.3



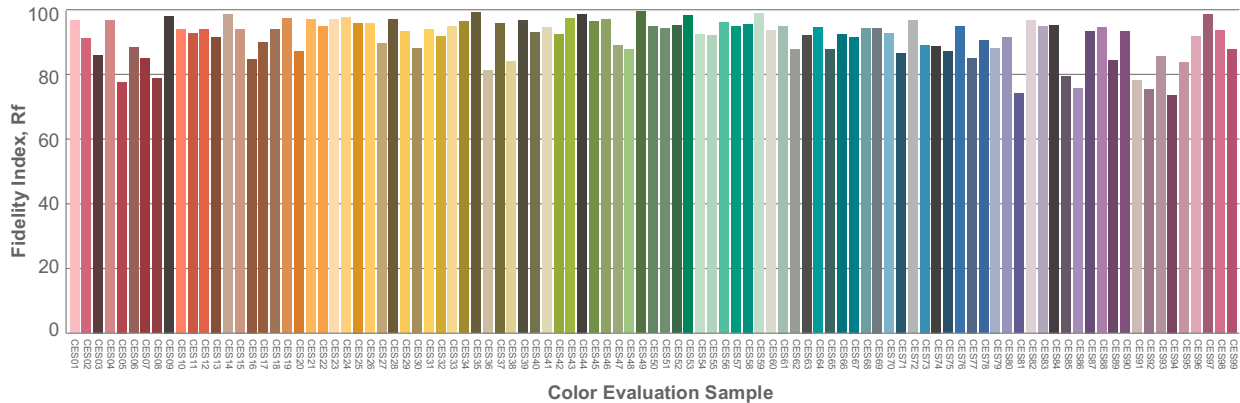
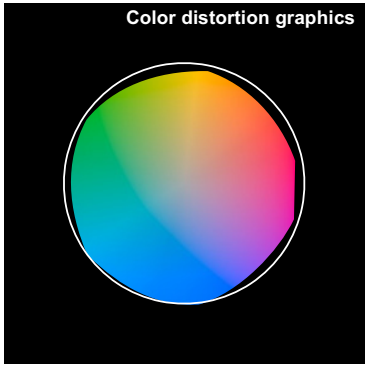
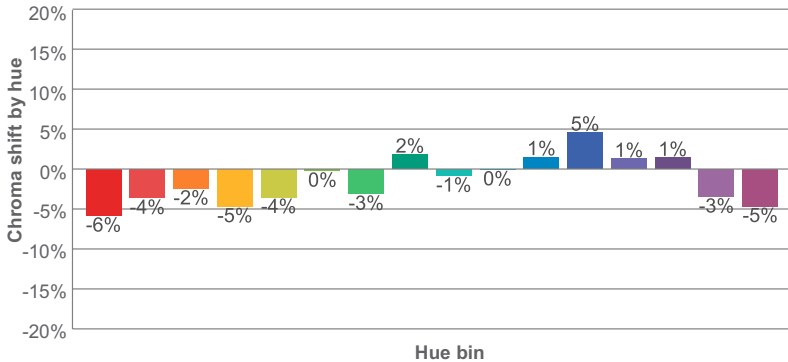
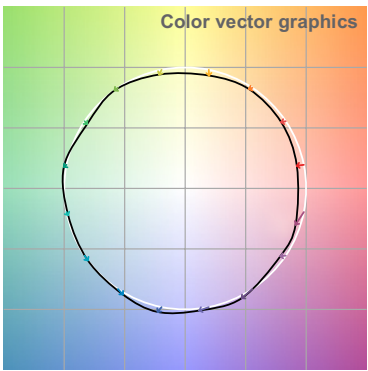
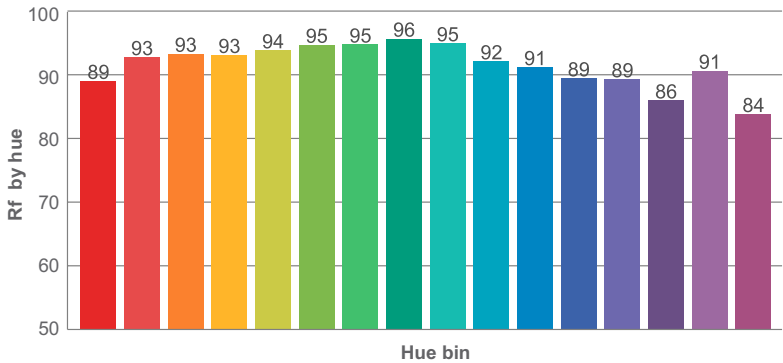
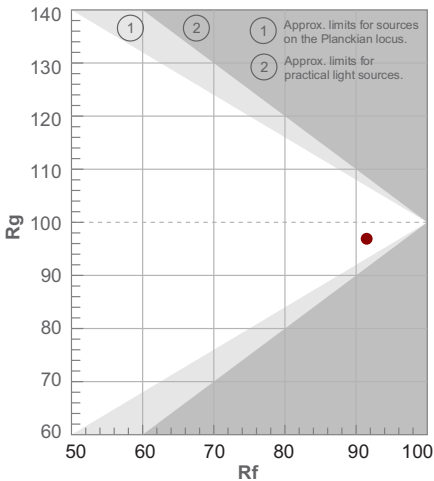
Color parameters

Color temperature	Color rendering index	Red component	Color fidelity	Color gamut	Color quality scale	Color coordinate cie 1931	Color coordinate cie 1931	Color coordinate	Color coordinate	Color divition from black body
CCT	CRI	CRI R9	TM30 Rf	TM30 Rg	CQS	x	y	u	v	Δuv
2733 K	93.3	45.3	91.5	96.9	89.3	0.464	0.422	0.260	0.355	0.0040

Rf 91.5
Fidelity index Rf

Rg 96.9
Gamut index Rg

Hue Bin	Rf	Shifts (%)	
		Chroma	Hue
1	89	-6%	0%
2	93	-4%	1%
3	93	-2%	2%
4	93	-5%	-1%
5	94	-4%	3%
6	95	0%	4%
7	95	-3%	1%
8	96	2%	2%
9	95	-1%	3%
10	92	0%	5%
11	91	1%	6%
12	89	5%	-2%
13	89	1%	-8%
14	86	1%	-12%
15	91	-3%	-3%
16	84	-5%	-11%



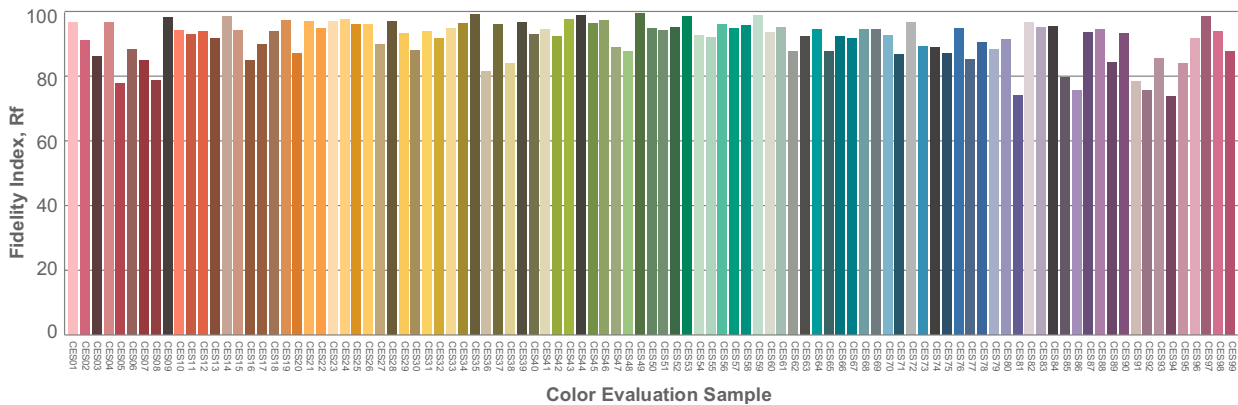
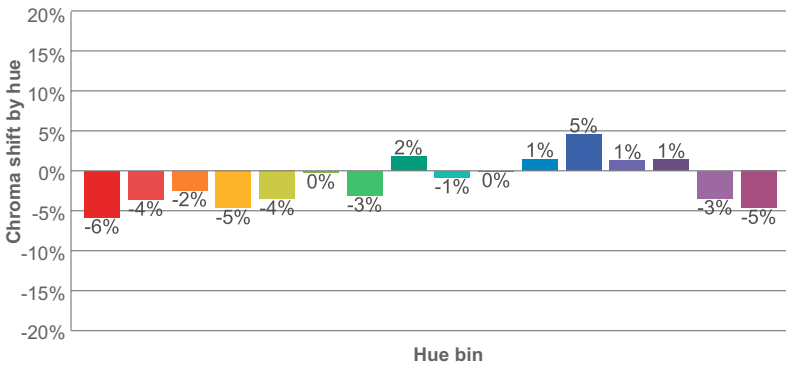
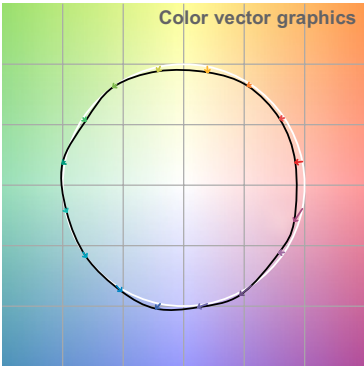
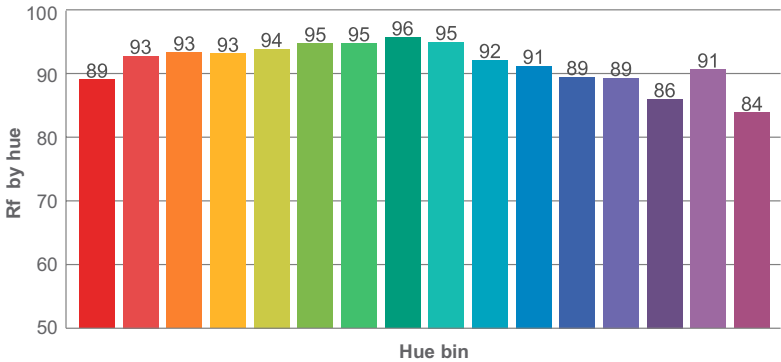
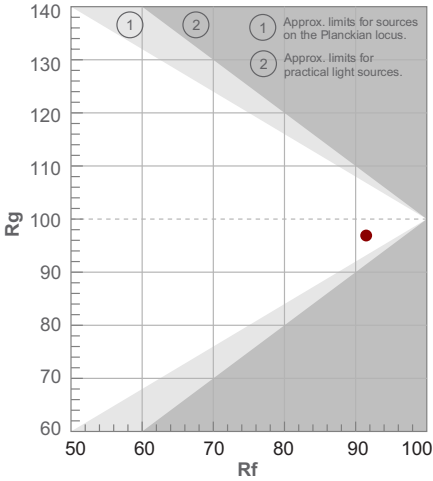
Rf 91.5

Fidelity index Rf

Rg 96.9

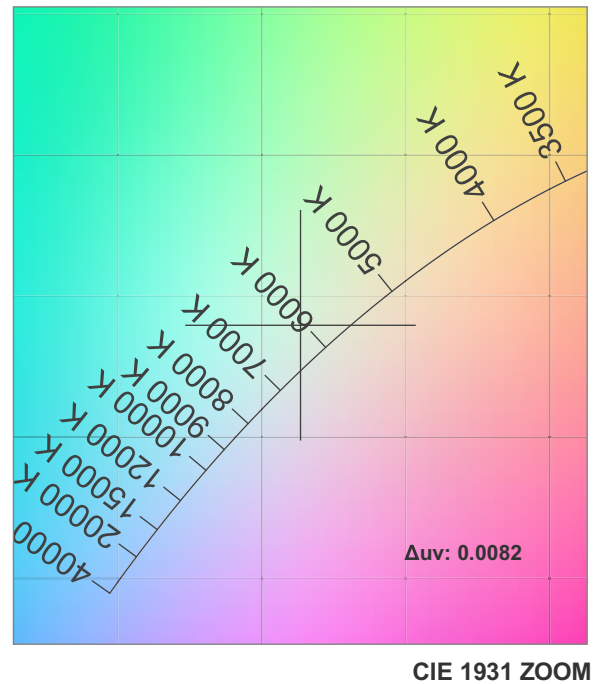
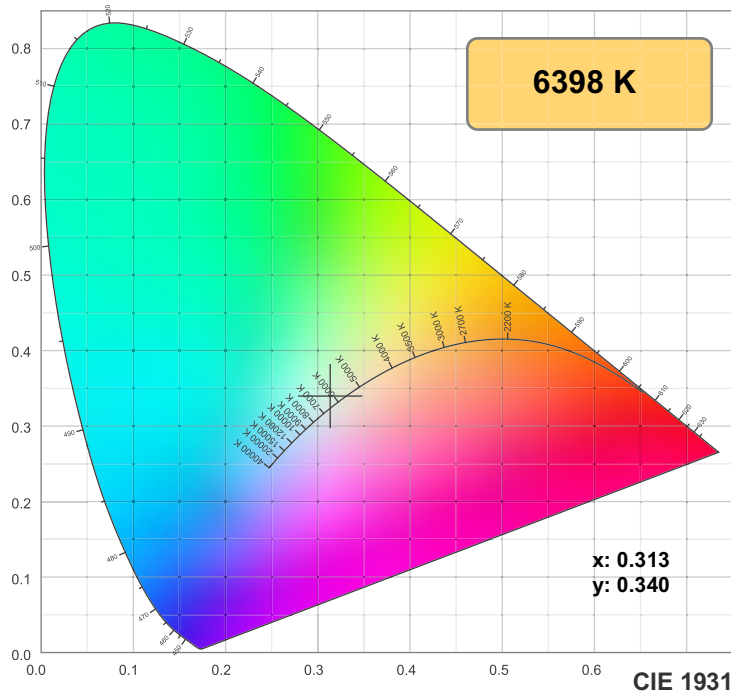
Gamut index Rg

Hue Bin	Rr	Shifts (%)	
		Chroma	Hue
1	89	-6%	0%
2	93	-4%	1%
3	93	-2%	2%
4	93	-5%	-1%
5	94	-4%	3%
6	95	0%	4%
7	95	-3%	1%
8	96	2%	2%
9	95	-1%	3%
10	92	0%	5%
11	91	1%	6%
12	89	5%	-2%
13	89	1%	-8%
14	86	1%	-12%
15	91	-3%	-3%
16	84	-5%	-11%

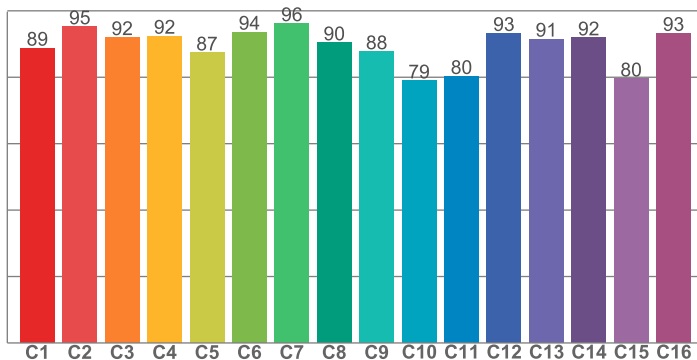


Note: specifications are representative of the diode type and not a particular tape light article.

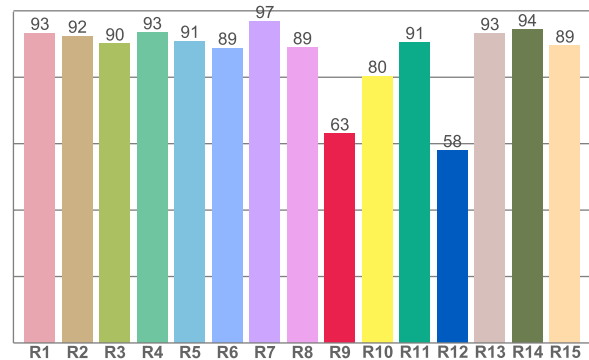
6500K-Warm White



TM-30: 89.1



CRI: 91.8 (R1-R8)



CRI R values, only R1-R8 are used to calculate final CRI value

R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11	R12	R13	R14	R15
93.3	92.4	90.1	93.5	90.9	88.8	96.8	89.0	63.0	80.4	90.5	58.0	93.2	94.3	89.5

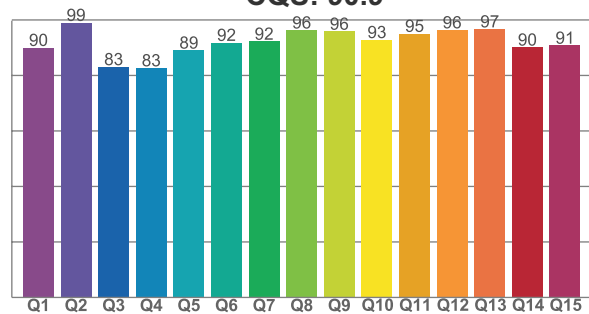
TM30 C values, 16 binned values out of total of 99 C values

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14	C15	C16
88.8	95.2	91.9	92.4	87.3	93.6	96.1	90.4	87.7	78.9	80.2	93.2	91.5	91.9	79.5	93.2

CQS Q values

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15
90.0	99.0	83.1	82.7	89.0	91.8	92.2	96.3	95.8	92.8	95.1	96.4	96.7	90.1	90.8

CQS: 90.9



Color parameters

Color temperature	Color rendering index	Red component	Color fidelity	Color gamut	Color quality scale	Color coordinate cie 1931	Color coordinate cie 1931	Color coordinate	Color coordinate	Color deviation from black body
CCT	CRI	CRI R9	TM30 Rf	TM30 Rg	CQS	x	y	u	v	Δuv
6398 K	91.8	63.0	89.1	98.4	90.9	0.313	0.340	0.194	0.316	0.0082

ALLOY LED® Specifications

6500K-Warm White

Alloy LED Light Lab™ Photometrics

Note: specifications are representative of the diode type and not a particular tape light article.

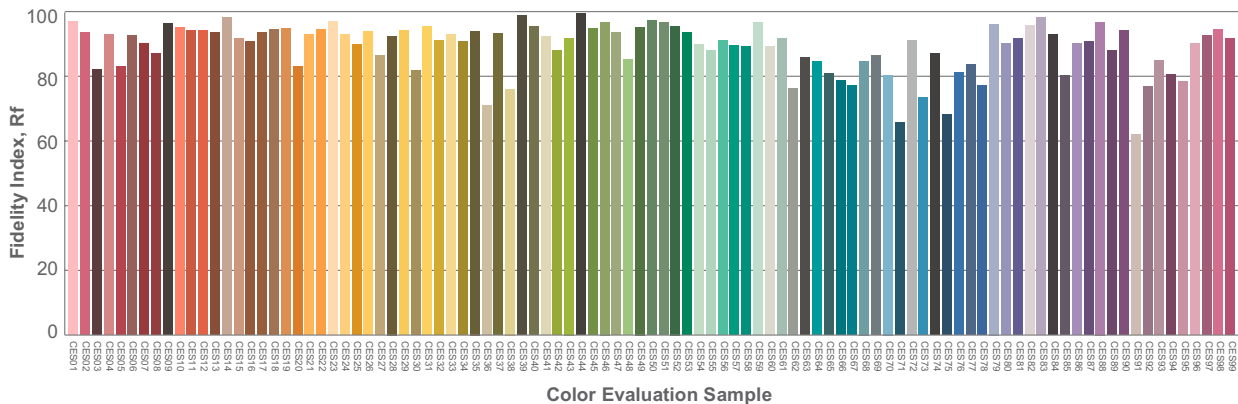
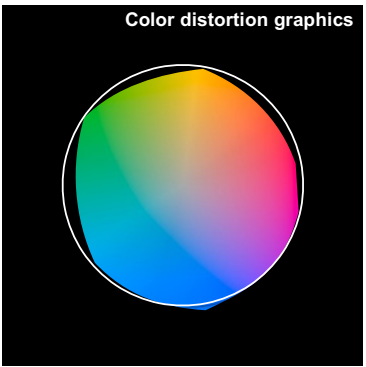
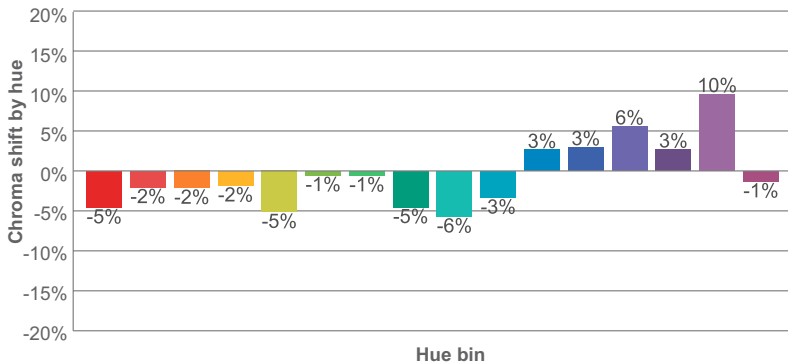
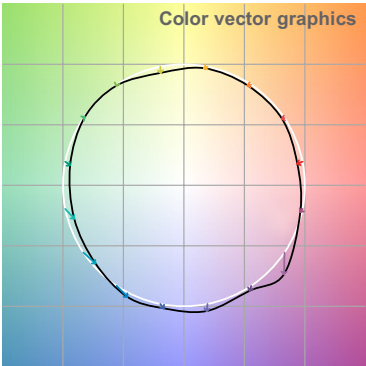
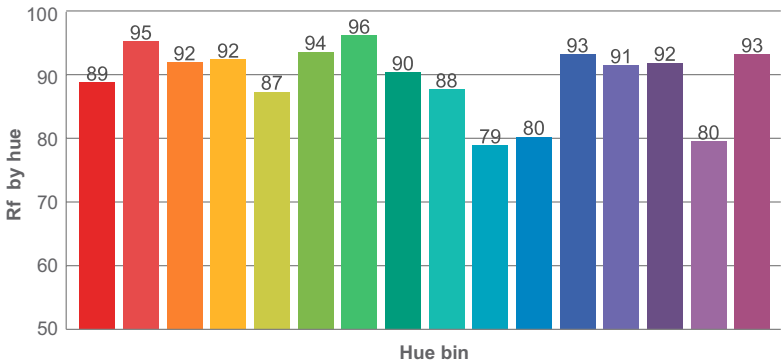
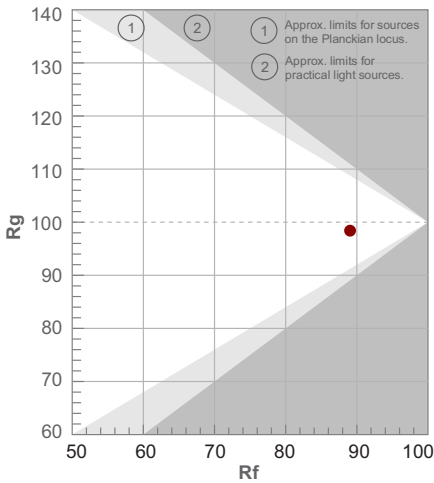
Rf 89.1

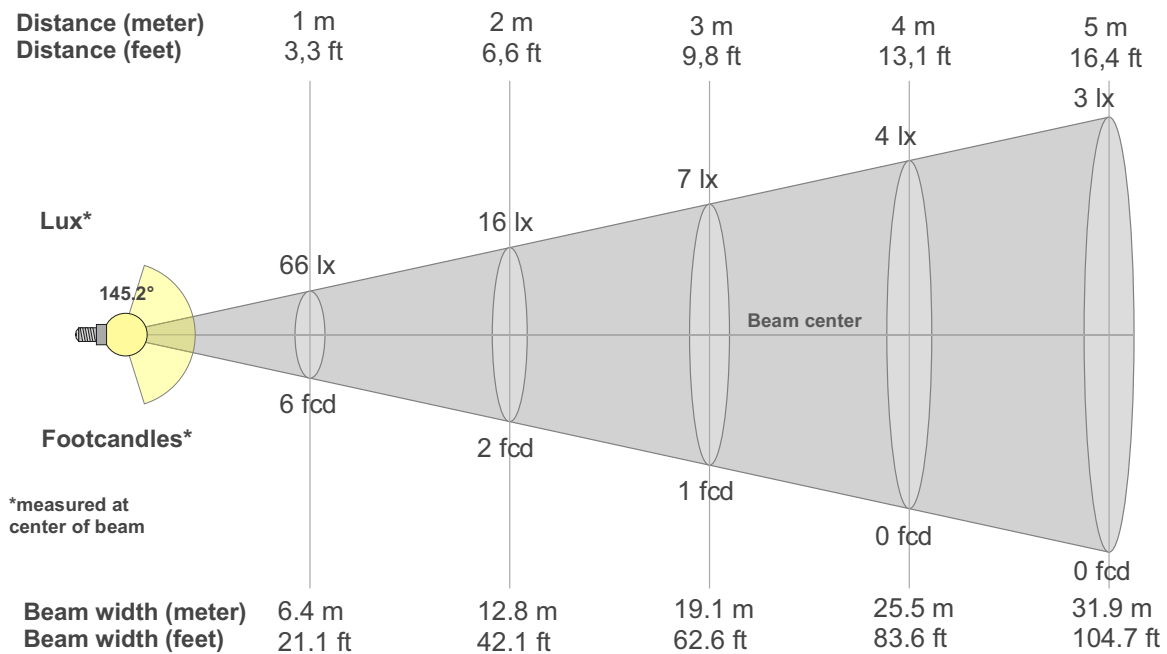
Fidelity index Rf

Rg 98.4

Gamut index Rg

Hue Bin	Rf	Shifts (%)	
		Chroma	Hue
1	89	-5%	-1%
2	95	-2%	1%
3	92	-2%	2%
4	92	-2%	2%
5	87	-5%	1%
6	94	-1%	1%
7	96	-1%	-1%
8	90	-5%	2%
9	88	-6%	9%
10	79	-3%	13%
11	80	3%	12%
12	93	3%	3%
13	91	6%	-2%
14	92	3%	-3%
15	80	10%	-15%
16	93	-1%	-3%





Beam intensities from 1-20m

1m	2m	3m	4m	5m	6m	7m	8m	9m	10m	11m	12m	13m	14m	15m	16m	17m	18m	19m	20m
3.3ft	6.6ft	9.8ft	13.1ft	16.4ft	19.7ft	23ft	26.2ft	29.5ft	32.8ft	36.1ft	39.4ft	42.7ft	45.9ft	49.2ft	52.5ft	55.8ft	59.1ft	62.3ft	65.6ft
66lx	16lx	7lx	4lx	3lx	2lx	1lx	1lx	1lx	1lx	1lx	0lx	0lx	0lx	0lx	0lx	0lx	0lx	0lx	0lx
6.1fcd	1.5fcd	0.7fcd	0.4fcd	0.2fcd	0.2fcd	0.1fcd	0.1fcd	0.1fcd	0.1fcd	0.1fcd	0fcd	0fcd	0fcd	0fcd	0fcd	0fcd	0fcd	0fcd	0fcd

Intensities in 0° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
66.0	65.4	63.7	61.0	57.7	53.9	49.6	45.2	41.1	35.8	27.2	4.1	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.4
100%	99%	97%	92%	88%	82%	75%	69%	62%	54%	41%	6%	1%	1%	1%	1%	1%	1%	1%	1%

Intensities in 90° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
66.0	65.3	63.2	59.6	54.4	47.6	39.4	29.7	18.8	8.0	1.1	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.5
100%	99%	96%	90%	82%	72%	60%	45%	29%	12%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%

Intensities in 180° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
66.0	65.4	63.7	61.0	57.7	53.9	49.6	45.2	41.1	35.8	27.2	4.1	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.4
100%	99%	97%	92%	88%	82%	75%	69%	62%	54%	41%	6%	1%	1%	1%	1%	1%	1%	1%	1%

Intensities in 270° c-plane

0°	9°	18°	27°	36°	45°	54°	63°	72°	81°	90°	99°	108°	117°	126°	135°	144°	153°	162°	171°
66.0	65.3	63.2	59.6	54.4	47.6	39.4	29.7	18.8	8.0	1.1	0.6	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.5
100%	99%	96%	90%	82%	72%	60%	45%	29%	12%	2%	1%	1%	1%	1%	1%	1%	1%	1%	1%

Beam angle 50%	Field angle 10%	Cutoff angle 2,5%	Intensity ratio in 120° cone	Intensity ratio in 90° cone
145.2°	186.9°	194.4°	61.8%	39.8%