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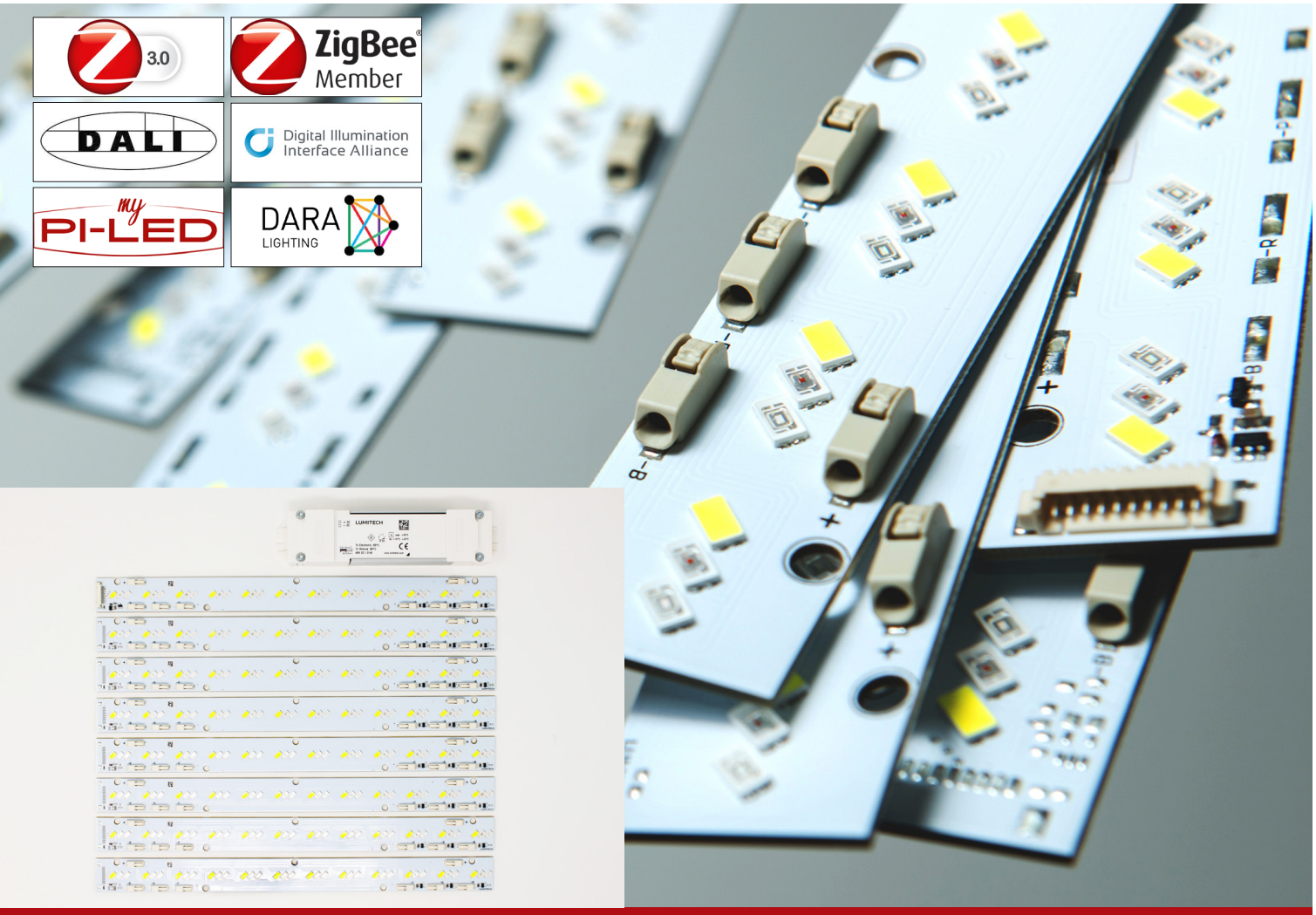
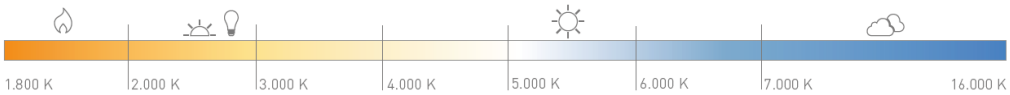


LINEAR SYSTEM M - ZHAGA

Human Centric Lighting
makes the day light.



Tunable white
1,800K - 16,000K

Brightness dimmable
1% - 100%

RGB/CIE-xy adjustable
Colour points and sequences

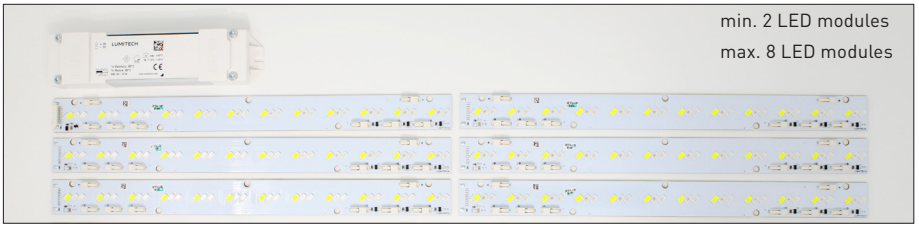
Biorhythmic lighting
Vitalisation and recreation

2 Control modes
DALI DT8, ZigBee 3.0

Excellent CRI
CRI>90

*According to IEEE 1789-2015 (valid for all dimming levels, CCT and colour settings)

TECHNICAL DATA	min. 2 LED modules	max. 8 LED modules
Luminous source	SMD LED modules	
Supply voltage	48V DC	
Typ. power	18W	72W
Luminous flux	2,000lm	8,000lm
Efficiency	111lm/W	
Control mode	ZigBee 3.0, DALI DT8	
Dimmable	1% - 100% Modular Dimming: no effects caused by Flicker*	
CCT and colour control	1,800 - 16,000K / adjustable CIE-xy-colours and RGB colours	
Ambient / storage temperature	+10°C ... +45°C / -20°C ... +80°C	
$t_{c,max}$ LED module / $t_{c,max}$ LMU	+75°C / +65°C	
Lifetime	50,000h L80B10	
Additional features	Low tolerance for colour temperature MacAdam 1 (typical/initial) Integrated overtemperature protection	



Last modified: 18.03.2020 PI-LED-Linear_System_M_Zhaga_LMU2_en

Notes concerning cabling, configuration, installation and operation of the PI-LED LINEAR SYSTEM M Zhaga can be found in the associated Application Note. The Application Note is enclosed with the product and can be downloaded from the Lumitech website.

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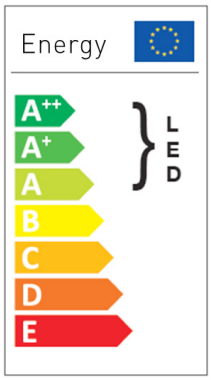
LINEAR SYSTEM M - ZHAGA

ORDERING DATA AND TECHNICAL DATA – LINEAR SYSTEM M

Type	Description	Control mode	Cable [mm]	Lum. flux [lm]	Voltage [V DC]	Power typ. | max. [W]
LTS-02020-15-LS	PI-LED Linear M 2000LM / 2x280mm / 18W / DALI DT8 / 140mm	DALI DT8	140	2.000	48	18 | 20
LTS-02020-15-LS1	PI-LED Linear M 2000LM / 2x280mm / 18W / DALI DT8 / 400mm	DALI DT8	400	2.000	48	18 | 20
LTS-02020-16-LS	PI-LED Linear M 2000LM / 2x280mm / 18W / ZigBee 3.0 / 140mm	ZigBee 3.0	140	2.000	48	18 | 20
LTS-02020-16-LS1	PI-LED Linear M 2000LM / 2x280mm / 18W / ZigBee 3.0 / 400mm	ZigBee 3.0	400	2.000	48	18 | 20
LTS-03020-15-LS	PI-LED Linear M 3000LM / 3x280mm / 27W / DALI DT8 / 140mm	DALI DT8	140	3,000	48	27 | 30
LTS-03020-15-LS1	PI-LED Linear M 3000LM / 3x280mm / 27W / DALI DT8 / 400mm	DALI DT8	400	3,000	48	27 | 30
LTS-03020-16-LS	PI-LED Linear M 3000LM / 3x280mm / 27W / ZigBee 3.0 / 140mm	ZigBee 3.0	140	3,000	48	27 | 30
LTS-03020-16-LS1	PI-LED Linear M 3000LM / 3x280mm / 27W / ZigBee 3.0 / 400mm	ZigBee 3.0	400	3,000	48	27 | 30
LTS-04020-15-LS	PI-LED Linear M 4000LM / 4x280mm / 36W / DALI DT8 / 140mm	DALI DT8	140	4,000	48	36 | 40
LTS-04020-15-LS1	PI-LED Linear M 4000LM / 4x280mm / 36W / DALI DT8 / 400mm	DALI DT8	400	4,000	48	36 | 40
LTS-04020-16-LS	PI-LED Linear M 4000LM / 4x280mm / 36W / ZigBee 3.0 / 140mm	ZigBee 3.0	140	4,000	48	36 | 40
LTS-04020-16-LS1	PI-LED Linear M 4000LM / 4x280mm / 36W / ZigBee 3.0 / 400mm	ZigBee 3.0	400	4,000	48	36 | 40
LTS-05020-15-LS	PI-LED Linear M 5000LM / 5x280mm / 45W / DALI DT8 / 140mm	DALI DT8	140	5,000	48	45 | 50
LTS-05020-15-LS1	PI-LED Linear M 5000LM / 5x280mm / 45W / DALI DT8 / 400mm	DALI DT8	400	5,000	48	45 | 50
LTS-05020-16-LS	PI-LED Linear M 5000LM / 5x280mm / 45W / ZigBee 3.0 / 140mm	ZigBee 3.0	140	5,000	48	45 | 50
LTS-05020-16-LS1	PI-LED Linear M 5000LM / 5x280mm / 45W / ZigBee 3.0 / 400mm	ZigBee 3.0	400	5,000	48	45 | 50
LTS-06020-15-LS	PI-LED Linear M 6000LM / 6x280mm / 54W / DALI DT8 / 140mm	DALI DT8	140	6,000	48	54 | 60
LTS-06020-15-LS1	PI-LED Linear M 6000LM / 6x280mm / 54W / DALI DT8 / 400mm	DALI DT8	400	6,000	48	54 | 60
LTS-06020-16-LS	PI-LED Linear M 6000LM / 6x280mm / 54W / ZigBee 3.0 / 140mm	ZigBee 3.0	140	6,000	48	54 | 60
LTS-06020-16-LS1	PI-LED Linear M 6000LM / 6x280mm / 54W / ZigBee 3.0 / 400mm	ZigBee 3.0	400	6,000	48	54 | 60
LTS-07020-15-LS	PI-LED Linear M 7000LM / 7x280mm / 63W / DALI DT8 / 140mm	DALI DT8	140	7,000	48	63 | 70
LTS-07020-15-LS1	PI-LED Linear M 7000LM / 7x280mm / 63W / DALI DT8 / 400mm	DALI DT8	400	7,000	48	63 | 70
LTS-07020-16-LS	PI-LED Linear M 7000LM / 7x280mm / 63W / ZigBee 3.0 / 140mm	ZigBee 3.0	140	7,000	48	63 | 70
LTS-07020-16-LS1	PI-LED Linear M 7000LM / 7x280mm / 63W / ZigBee 3.0 / 400mm	ZigBee 3.0	400	7,000	48	63 | 70
LTS-08020-15-LS	PI-LED Linear M 8000LM / 8x280mm / 72W / DALI DT8 / 140mm	DALI DT8	140	8,000	48	72 | 80
LTS-08020-15-LS1	PI-LED Linear M 8000LM / 8x280mm / 72W / DALI DT8 / 400mm	DALI DT8	400	8,000	48	72 | 80
LTS-08020-16-LS	PI-LED Linear M 8000LM / 8x280mm / 72W / ZigBee 3.0 / 140mm	ZigBee 3.0	140	8,000	48	72 | 80
LTS-08020-16-LS1	PI-LED Linear M 8000LM / 8x280mm / 72W / ZigBee 3.0 / 400mm	ZigBee 3.0	400	8,000	48	72 | 80

NOTES ON STANDARDS AND SECURITY POLICIES

EOS/ESD security police	The PI-LED LINEAR M SYSTEM contains components that are sensitive to electrostatic discharge. It may only be installed if appropriate EOS/ESD protection in manufacturing and in application is applied.	
CE - marking of the luminaire	The PI-LED LINEAR M SYSTEM is tested according to the applicable standards (see standards below). Corresponding standard tests of the final product must be carried out separately.	
Fulfilled standards Underlying standards	EN62031: 2013-09	LED modules for general lighting - Safety specifications
	EN62471: 2009-03	Photobiological safety of lamps and lamp systems
	EN61347-2-13	Particular requirements for d.c. or a.c. supplied electronic control gear for LED modules
	ETSI EN 300 328 V2.1.1	Wideband transmission systems - Data transmission equipment operating in the 2,4 GHz ISM band Electromagnetic compatibility and Radio spectrum Matters (ERM)
	EN 301 489-3	
	EEE 1789-2015	IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers



Notes:
- All values apply at ta=25°C, tc=45°C and 3,000K | Illumination specifications in accordance with CIE1931
- Tolerance ranges: illumination data +/-15% | electrical data +/-15% | supply voltage 48V DC +/- 5%
- If the supply voltage exceeds the max. permitted operating voltage, the PI-LED system will be overstressed. This will result in a highly reduced service life.
- If the maximum temperature limits are exceeded, the lifetime of the PI-LED system will be greatly reduced or the system may be damaged. Temperature measurements of the LED modules or PI-LED system have to be taken in the thermally stable state by means of a temperature sensor as per EN60598-1.
- The maximum system power of the PI-LED Linear M System is limited to the associated value above in column "Power typ. | max. (W)" due to its software.
- According to colour temperature and temperature of the PI-LED system, the Mac Adam tolerance takes on values < 4.
- All diagrams in this document show typical curves and not the exact behaviour of single LED modules.

Notes concerning cabling, configuration, installation and operation of the PI-LED LINEAR SYSTEM M Zhaga can be found in the associated Application Note. The Application Note is enclosed with the product and can be downloaded from the Lumitech website.

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TECHNICAL DRAWINGS AND DATA

Dimensions/Features of the LED modules			
L/W [mm]	Design type	Light spots P / B / R	Assembly of light spots
280 x 24	Zhaga (Book 7) L28W2	12 / 12 / 12	Linear, 45°

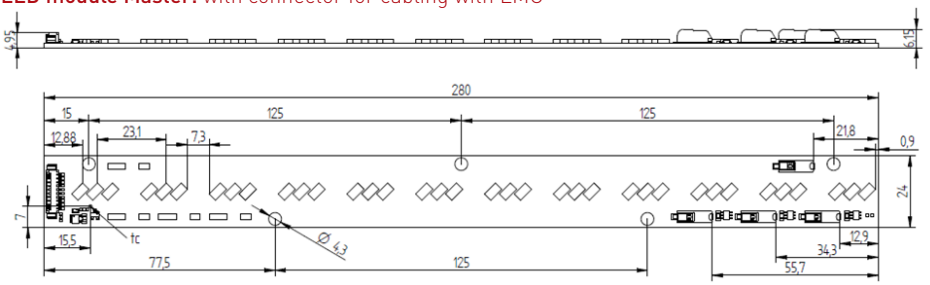
The PI-LED Linear System M must be operated only after complete configuration and cabling.
The PI-LED Linear System M must not be operated with less or more LED modules than provided for the system. Operation with a wrong number of LED modules can lead to destruction of the LED modules.

System type	Number of LED modules	
	Master	Slave
LTS-02020-1x-LSx	1	1
LTS-03020-1x-LSx	1	2
LTS-04020-1x-LSx	1	3
LTS-05020-1x-LSx	1	4
LTS-06020-1x-LSx	1	5
LTS-07020-1x-LSx	1	6
LTS-08020-1x-LSx	1	7

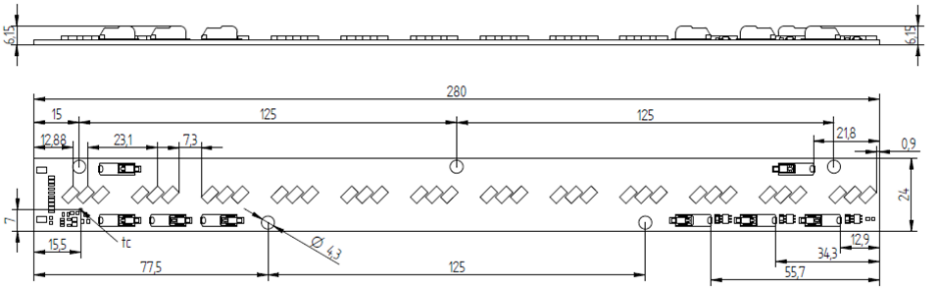
The connection of the LED modules within the PI-LED Linear System M has to be always in the order "1 x Master - 1-7 x Slave".
Other combinations are not possible due to the module specific placement. The order of the 1-7 LED Slave modules is defined by numbered labels.
The PI-LED Linear System M is delivered in a not prewired state.

LED module Master: with connector for cabling with LMU

Size in mm



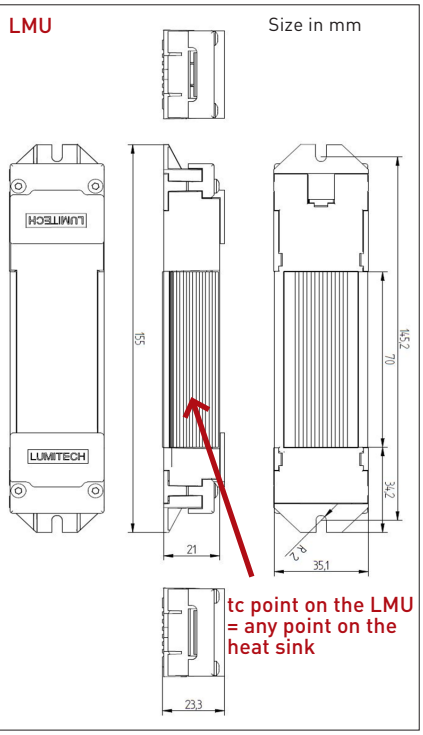
LED module Slave: no connector for cabling with LMU



The LED Master module is connected to the LMU by using the connection cable (length 140mm or 400mm).

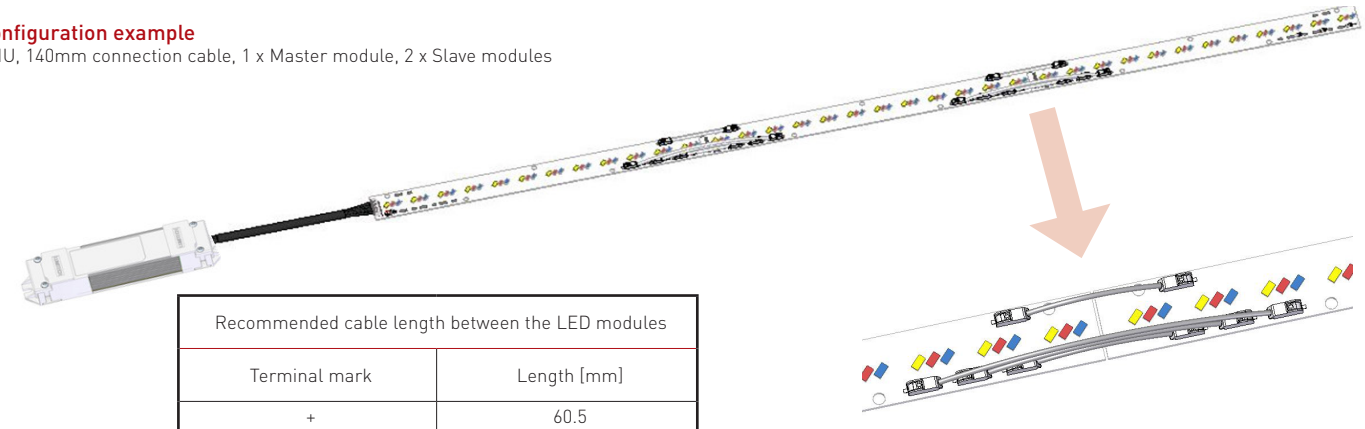
LMU

Size in mm



ASSEMBLY OF THE PI-LED LINEAR SYSTEM M

Configuration example
LMU, 140mm connection cable, 1 x Master module, 2 x Slave modules



Recommended cable length between the LED modules	
Terminal mark	Length [mm]
+	60.5
-B	60.5
-R	100
-P	135

Clamping area: 0.2 - 0.75mm² (solid and stranded conductors)

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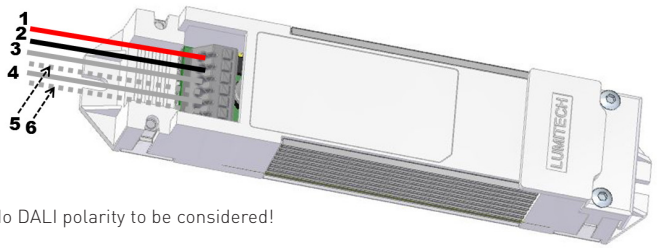
LINEAR SYSTEM M - ZHAGA

CONNECTION - DALI DT8



No DALI polarity to be considered!

Terminal connection

Terminal No.	Function
1	+ 48V DC
2	- 0V DC
3	DALI IN
4	DALI IN
5	DALI OUT
6	DALI OUT

FUNCTIONAL DESCRIPTION - DALI DT8*

Mode	CCT	RGB	CIE
Colour	1,800K-16,000K	Channels separately controllable	PI-LED colour space
Brightness	1% - 100%		

Information:
Colour accuracy in the colour mode is given only for CIE-xy points.

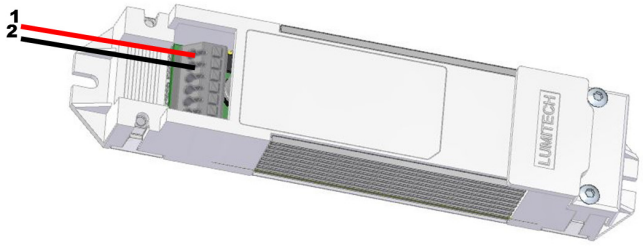
Possible assignment to a maximum of 16 groups and 16 light scenes

Recommended control units:
- LTP-1028 (DALI Touchpanel DT8)
- LTP-1029 (DALI Display 7'' DT8)
- K-WDALI-USB (DALI USB Stick), together with the PC-App myPI-LED
- K-DALI-CDC (DALI control for daylight curves)
- K-DALI-SEQ (DALI control for colour sequences)
- LTP-DARA0x (DARA L Device in various versions, x = 1-6)

A complete list of compatible DALI DT8 control devices is available on the Lumitech Website.

*PI-LED systems with DALI interface are DALI1 / DALI Device Type 8 registered where colour control with regard to DALI Device Type 8 is fully implemented according to the underlying DALI standard. Since there is currently no possibility for testing products for compliance with the DALI Device Type 8 standard (no official DALI tester exisiting or available), a formal verification can not be provided.
"The DALI colour control functionality (part 209/Device Type 8) of this product has not been verified."

CONNECTION - ZIGBEE 3.0



Terminal connection

Terminal No.	Function
1	+ 48V DC
2	- 0V DC

FUNCTIONAL DESCRIPTION - ZIGBEE 3.0

Mode	CCT	RGB	CIE
Colour	1,800K–16,000K	Channels separately controllable	PI-LED colour space
Brightness	1% - 100%		

Possible assignment to groups and light scenes depending on control unit

Possible control units:
- LTP-1026 (NeoLink Box) together with the myPI-LED App for Android/iOS
- K-ZWALLY-1.x/2.x/3.x/4.x
- K-Z1001014 (ZigBee USB Stick), together with the PC-App myPI-LED

A complete list of compatible ZigBee 3.0 control devices is available on the Lumitech Website.

Information:
Depending on the assembly situation of the LMU, the range of the ZigBee module can vary.
Mounting the LMU inside of a sealed metal case can dramatically reduce the ZigBee range!

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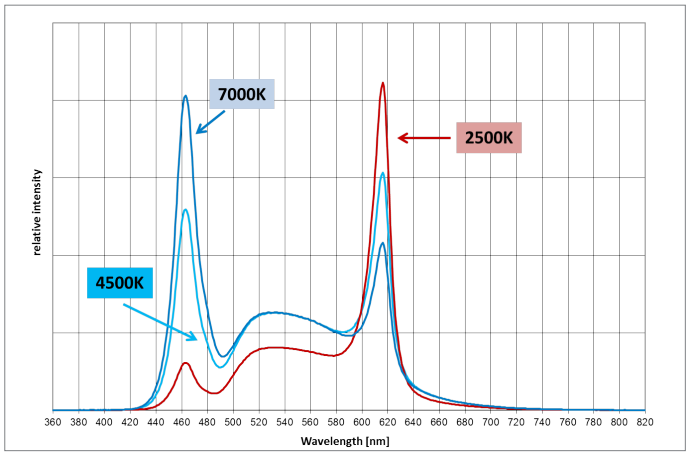
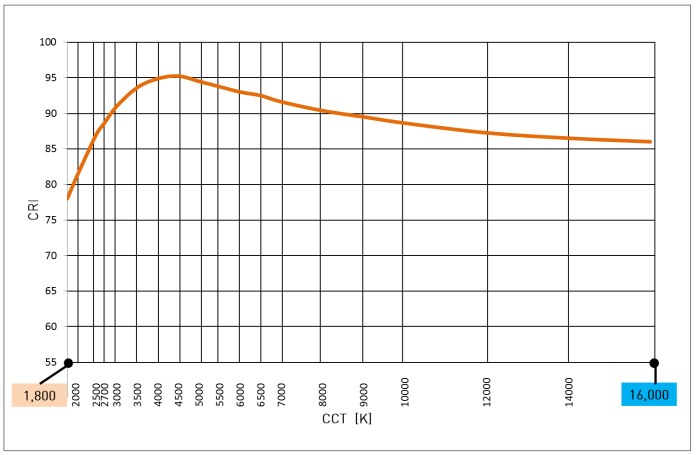
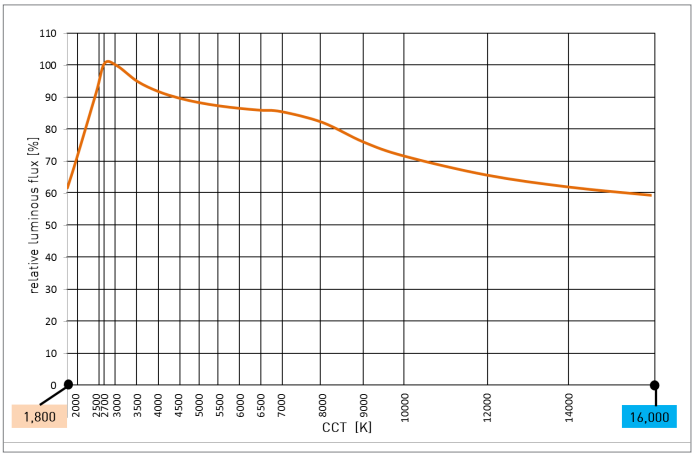
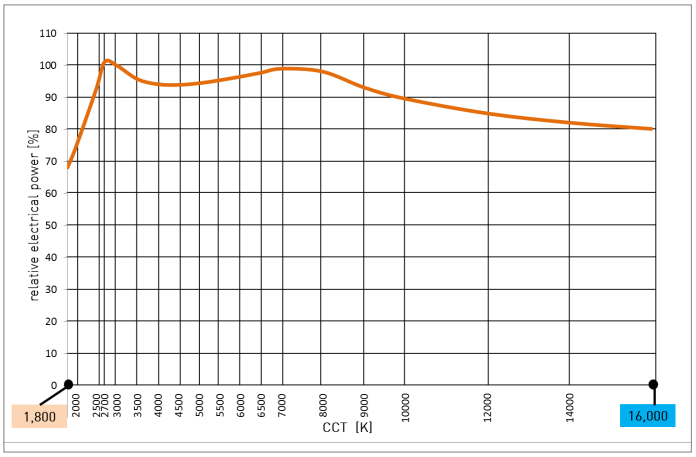
PHOTOMETRICAL PROPERTIES









CCT [K]	general data			visual data (exemplary for a PI-LED LINEAR SYSTEM with 4 LED modules)		melanopic values (relevant for melanopic light design)			
	CRI	CIE-x	CIE-y	Luminous flux [lm]	Efficiency [lm/W]	alpha (smel)	alpha (smel) x correction factor 1.103	Luminous flux (smel, d65) in %	Efficiency (smel, d65) in lm/W
1,800	76.3	0.5492	0.4082	2,470 / 62%	100	0.254	0.280	17	28
2,000	78.3	0.5268	0.4133	2,800 / 70%	104	0.293	0.323	23	34
2,500	82.6	0.4770	0.4137	3,660 / 92%	110	0.382	0.421	39	46
2,700	84.8	0.4599	0.4106	4,030 / 101%	110	0.415	0.458	46	51
3,000	87.5	0.4369	0.4041	4,000 / 100%	111	0.462	0.510	51	57
3,500	90.9	0.4053	0.3907	3,800 / 95%	110	0.535	0.590	56	65
4,000	92.6	0.3804	0.3767	3,680 / 92%	108	0.601	0.663	61	72
4,500	93.4	0.3608	0.3635	3,600 / 90%	106	0.659	0.727	65	77
5,000	92.5	0.3451	0.3516	3,540 / 88%	104	0.712	0.785	69	82
5,500	91.6	0.3324	0.3410	3,500 / 87%	102	0.759	0.837	73	85
6,000	90.9	0.3221	0.3318	3,470 / 87%	100	0.800	0.882	76	88
6,500	90.0	0.3135	0.3236	3,440 / 86%	98	0.838	0.924	80	90
7,000	89.3	0.3064	0.3165	3,430 / 86%	96	0.872	0.962	82	92
8,000	87.6	0.2952	0.3048	3,290 / 82%	93	0.929	1.025	84	95
9,000	86.6	0.2869	0.2956	3,050 / 76%	91	0.976	1.077	82	98
10,000	85.4	0.2806	0.2883	2,870 / 72%	89	1.014	1.118	80	99
12,000	84.0	0.2718	0.2776	2,630 / 66%	86	1.073	1.184	78	102
14,000	82.9	0.2659	0.2702	2,480 / 62%	84	1.117	1.232	76	103
16,000	82.3	0.2618	0.2648	2,380 / 59%	82	1.149	1.267	75	104

Remark: The coefficient alpha(smel) describes the melanopic effectiveness of the light source on humans and their circadian rhythm. To give the natural human biorhythm the best possible support, the melatonin production can be minimized by higher values of alpha(smel) throughout the day and stimulated by lower values in the evening.
PI-LED enables the implementation of an illumination that is not only visual butalso biological/melanopic effective. For a standard-conforming lighting design, Lumitech recommends the document DIN SPEC 5031-100 to be taken as a basis.

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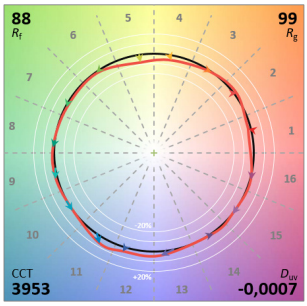
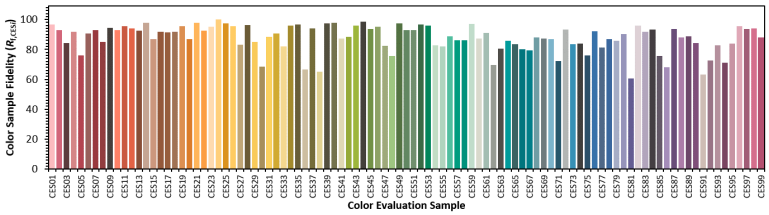
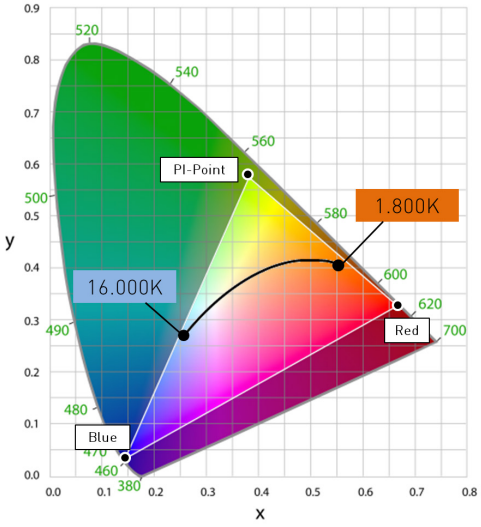
IES TM-30





COORDINATES AND TOLERANCES ACCORDING TO CIE 1931



Representable PI-LED colour space in the CIE 1931 system

If a colour point outside of the triangle (PI-LED colour space) is set, the closest colour point within the triangle is referenced.

LIFETIME

tp [°C]	L80B10 [h]
75°C	50,000

Notes:

- Value L is a statistical value, the actual drop in the luminous flux can vary across the delivered LED modules.
- tp-position = tc-position LED Module

THERMAL CHARACTERISTICS

Ambient temperature	+10°C ... +45°C
Storage temperature	-20°C.. +80°C
$t_{c, max}$ LED Module	+75°C
$t_{c, max}$ LMU	+65°C

Lumitech PI-LED systems are equipped with integrated overtemperature protection that protects the LED module against thermal overloads.
If the temperature tc at the LED module reaches 75°C, power is reduced by lowering the brightness. If the temperature remains at that level or reaches 80°C, the LED is totally switched off. The LED module is switched on again when the temperature tc drops to below 65°C again.