



# Goniophotometer with Moving Mirror (LSG-2000)

## Brochure

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**Leader in Lighting & Electrical Test Instruments**

Rev. 1/16/2020

# 1. System Configuration

## A. LSG-2000 Goniophotometric System:

- Goniometric Rotating Console: [Japanese Mitsubishi Motor and German Angle encoder System to keep the test accuracy.](#)
- High Reflective Moving Mirror: Special design and produced to keep high reflective value.
- Goniometric Rotating Control Instrument in 19inch cabinet: It connects to the PC and was controlled by the software.
- Goniometric Rotating Control Instrument in dark room: This can allow the customer to control the rotating in the dark room when install the luminaires but no need to control in the PC.
- Double Channel & High Precision Photometer
- [Germany produced Class L Constant Temperature Photo Detector](#)
- Cross-beam Laser System for Calibrating
- English Measuring Software
- Automatic Adjust Diaphragm: remote control to adjust the size of diaphragm for the different diameter size luminaries test
- Two sets of luminaries Clamps: multi-functions
- Oversea Delivery and Packing: all of the instruments and accessories will be packed with Fumigation free three plywood, include the delivery cost to Shanghai sea port

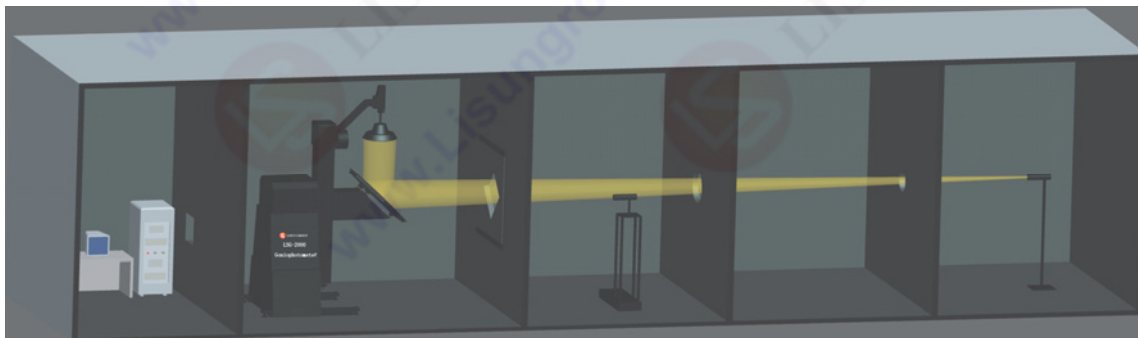
## B. SLS-150W DC Standard Light Intensity Lamp

C. **LS2010 Digital Power Meter:** High Accuracy to measure AC and DC voltage, current, power and power factor, also measure harmonic

D. **DC3010 CC & CV DC Power Source:** DC3010 output is 30V/10A, Option can be DC6010 (output is 60V/10A) and DC12010 (output is 120V/10A)

E. **LSP-1KVAR AC Power Source:** 1KVA Pure Sine Wave AC Power Source

F. **CASE-19IN 19inch Standard Instruments Cabinet**



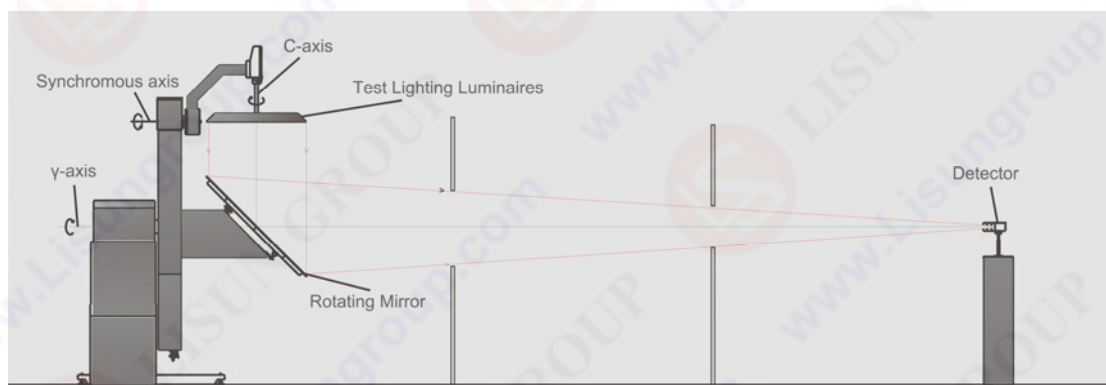
**Full View for LSG-2000 Goniophotometer with Moving Mirror**

Note: PC and Printer prepared by the customer (request at least one USB port)

## 2. Measurement Principle

Goniophotometer with Moving Mirror (also called Goniophotometer with Rotating Mirror) can test luminaires rotating in the prescribed burning position and around the vertical axle and a reflecting mirror rotates around the horizontal axle, meanwhile, a synchronous axle will rotate toward the opposite direction synchronously. The photometer head located at a fixed position of the limiting photometric distance in front of the reflecting mirror to gather the light in each direction.

The rotation priority is determined by the software. If mirror axle is took precedence of rotation, the goniophotometer will continuously measure the luminous intensity at each  $\gamma$  angle on a vertical plane determined by the C angle, the measuring trace is equivalent to the longitude. Similarly, while the luminaries axle is priority, the system will continuously measure the luminous intensity at each C angle on a conical surface determined by the  $\gamma$  angle, the trace can be looked upon the wolf. See the following figure.



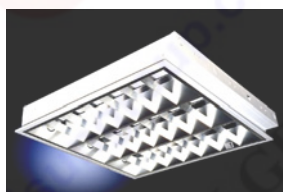
Measurement Principle

## 3. System Functions



LSG-2000 Goniophotometer with Moving Mirror

The LSG-2000 fully meet LM-79 Clause 9.3.1, CIE and GB standards for Goniophotometric of luminaires, this system is used to measure spatial luminous intensity distribution of luminaires for floodlight, street lighting and interior lighting, and other photometric parameters such as spatial iso-intensity curve, intensity distribution curve of each section (shown in rectangular coordinate system or polar coordinate system), iso-illuminance distribution curve, luminance limitation curve, luminaires efficiency, glare grade, effective beam angles, upward luminous flux ratio, downward luminous flux ratio, total luminous flux, effective luminous flux, utilization factor and electric parameters (wattage, power factor, voltage and current) of luminaires etc.



**LSG-2000 Can test all of the above luminaires**

#### 4. Specifications

- 1) The tested luminaire rotates around the mirror with an angle of  $(\gamma) \pm 180^\circ$  (or  $0-360^\circ$ ) and the tested luminaire rotates around itself with an angle of  $(C) \pm 180^\circ$  (or  $0-360^\circ$ )
- 2) The accuracy of angle: **0.05° Resolution of angle: 0.001°**
- 3) Luminosity Testing Range: Illuminance  $0.001\text{lx} \sim 99,999\text{lx}$ ; Light Intensity  $1.0\text{cd} \sim 10^7\text{cd}$  (detector)
- 4) Accuracy of photometry: **Germany produced constant temperature photo detector DIN5032-6/CIE pub1. No. 69 Class L**
- 5) Testing Accuracy: 2% (Under Standard lamp); Stray Light: less than 0.1%
- 6) English version software can run in Win7, Win8 or Win10

Model Number	LSG-2000B (Big Size)	LSG-2000 (Standard Size)	LSG-2000S (Small Size)
Measure Size (mm)	Diameter=1600	Diameter=1400	Diameter=1000
Measure Weight (Kg)	50	40	30
Measure Power(W)	600V/10A, AC/DC	600V/10A, AC/DC	600V/10A, AC/DC

## 5. Laboratory Requirements

### 1) Room Requirements according to CIE

Model	Dark Room (W*H*L)	Operation Room(W*L)
LSG-2000B	5*6*8~30m	4*4m
LSG-2000	4*5*8~30m	4*4m
LSG-2000S	4*4.2*8~30m	4*4m

- The dark room wall, ceiling and floor should be all coated with dull black paint or be covered by black cloth and black carpet.
- Air-conditioner: be set in the dark room to control the temperature around lamps to the standard value upon the CIE requirements.

Note: LISUN GROUP engineer dept will submit the Lab Design support documents according to the customer’s real lab size after the formal purchase order was confirmed

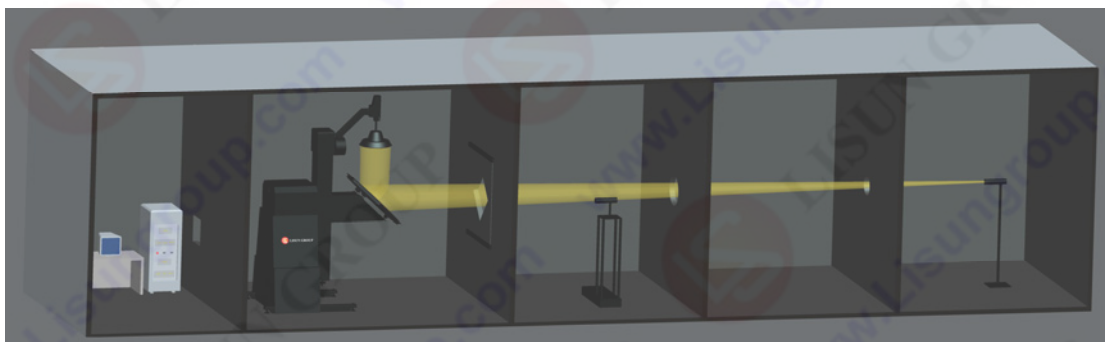
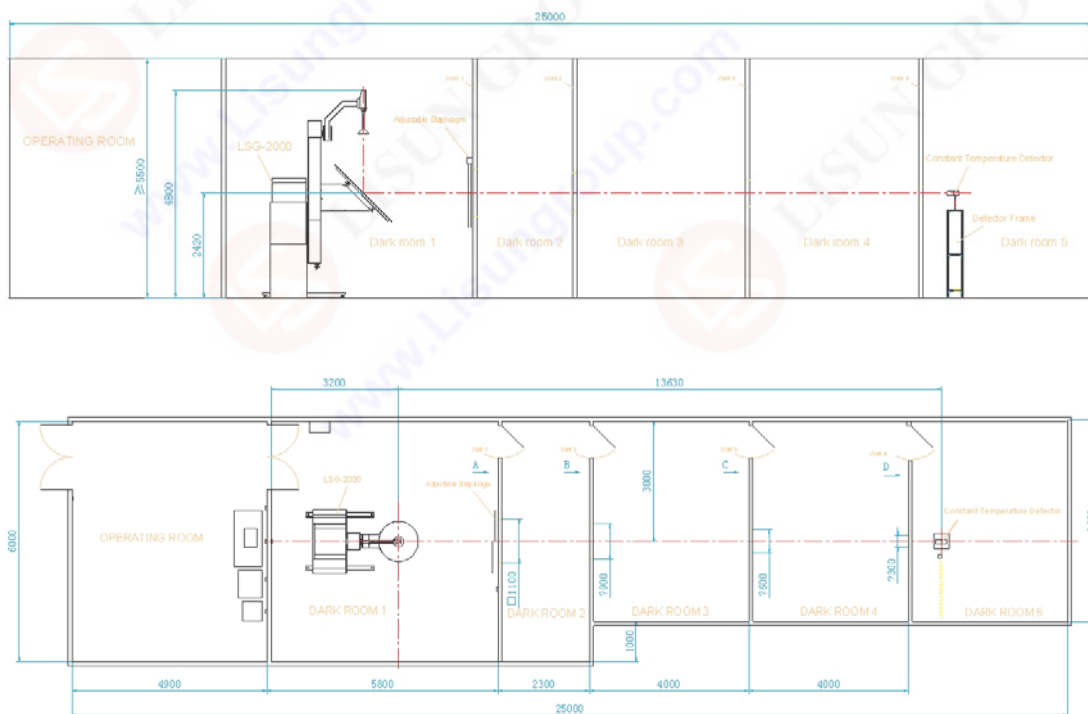


Fig: LSG-2000 lab dark room view



## 2) Requirements of Eliminating the stray Light

Luminaires must be where the photodetector can only receive the light reflected by the rotating mirror in the LSG-2000 system. The light given off directly by the luminaries and reflected by the wall and floor is warded off by the light fence. Internal surface of the dark room and dark path together with the surface of the light fence should be painted unpolished black or be covered by black cloth and black carpet.

## 3) Temperature of the Environment

Temperature around the lamp or luminaries must be  $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$  during the test. Exceptions can be given according to relative lamps as following.

- a. Tungsten Incandescent Lamp:  $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$
- b. Double-caps Fluorescent Lamp:  $25^{\circ}\text{C}\pm 1^{\circ}\text{C}$
- c. High Pressure Mercury Lamp:  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$
- d. Metal Halogen Lamp:  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$
- e. High Pressure Sodium Lamp:  $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$
- f. Low Pressure Sodium Lamp:  $25^{\circ}\text{C}\pm 2$

## 4) Airflow

Airflow may be induced by natural aeration, air conditioner or movement of the luminaries in the goniophotometer, but the speed of the airflow couldn't exceed 0.2m/s.

## 5) Vibration and shock

When the lamp is in lighting, the vibration couldn't exceed  $10\text{m/s}^2$  (4~3000Hz), or the moving scope of the lamp couldn't exceed 30mm (at most 4Hz)

## 6) Smoke, Dust and Moisture

The test environment must free from smoke, dust or moisture. At the same time, even not during the measurement, smoke, dust or moisture will also influence the reflectance of the reflecting mirror and induce more stray light. So, the test room must be kept clean, no smoke and dry. The humidity should be less than 60% RH.

# 6. Service

## 1) Installation and Training

LISUN GROUP engineers will take responsibility for installation and Training of the system at the customer's

## 2) Period of Guarantee: 24 months

The service is for free except technician's travel payment if the service provided by LISUN GROUP implement at the customer's.

## 3) Upgrading the applications software for free

## 7. Design Standard of Device

The construction, technical parameter, test & operate steps as well as data processing software of LSG-2000 Goniophotometer with Moving Mirror meet the following requirements:

- 3.1 CIE Pub. NO.70, "The Measurement of Absolute Luminous Intensity Distributions"
- 3.2 CIE DIV. II -TC10, "Photometry of Luminaires"
- 3.3 IES LM-35-1989, "IES Approved Method for Photometric Testing of Floodlights"
- 3.4 IES LM-31, "IES Approved Method for Photometric Testing of Roadway Luminaires"
- 3.5 IES-LM-79, "Electrical & Photometric Measurements of Solid-State Lighting Products"
- 3.6 GB/T 7002-1986, "Luminosity Test of Flood Luminaires"
- 3.7 GB/T 9467-1988, "Luminosity Test of Indoor Luminaires"
- 3.8 GB/T 9468-1988, "Luminosity Test of Street Luminaires"
- 3.9 IES 61341 "Method of Measurement of Center Beam Intensity and Beam Angle(s) of Reflector Lamp"
- 3.10 CIE Pub.NO.76, "Photometry-the CIE System of Physical Photometry"

## 8. Typical oversea market customers:

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There are many world famous company and lab institute choose Lisun Goniophotometer, Please get the reference customers' information from Lisun Group Oversea Sales Dept.

## 9. Application Software

This system can export data files as following formats:

IESNA Files (\*.ies)  
EULUMDAT Files (\*.ldt)  
CIEBSE TM14 Files (\*.cib)  
CIEBSE TM14 Files (\*.tm4)  
CIE Files (\*.cie)  
DIN CEN Files (\*.cen)  
Excel File (\*.csv)

This kind of format files can be transferred by other illumination and luminaire design software such as DiaLux

Application software can also implement essential calculation for lighting design as iso-illuminance distribution curve on a working plane, luminance limitation curve, luminaire efficiency, effective beam angle, upward luminous flux ratio, downward luminous flux ratio, effective luminous flux, utilization factor curve etc.

**The Next Page is the Test Report by the software of LSG-2000:**

Report No.: LS1127

Test Time: 2017-08-31 13:12

## Luminaire Property

Luminaire Manufacturer: W.K.LIGHTING

Luminaire Category: WK-71-83-8077-85-IP65

Lamp Catalog: LUMINUS

Number of Lamps: 1

Luminous Length (mm): 8.5

Luminous Height (mm): 12

Current: 0.071 A

Power Factor: 0.559

Lamp Description: Philips

Lumens per Lamp: 700

Luminous Width (mm): 8.5

Voltage: 220.6 V

Power: 8.69 W

## Photometric Results

CIE Class: Direct

Measurement Flux: 641.8 lm

Downward Ratio: 91.69%

Horizontal Diffuse Angle(50%): H34.6

Vertical Diffuse Angle(50%): V34.1

Luminaire Efficacy Rating (LER): 73.91

Max. Intensity: 1620.79 cd

S/MH(C0/C180): 0.57

Total Rated Lamp Lumens: 700.0 lm

Efficiency: 91.69%

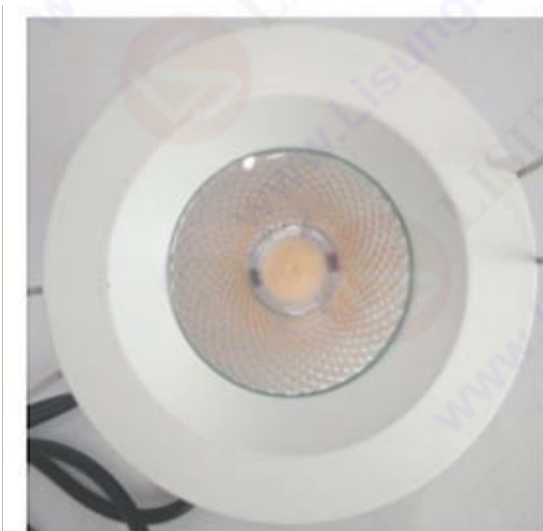
Upward Ratio: 0.00%

Central Intensity: 1617.64 cd

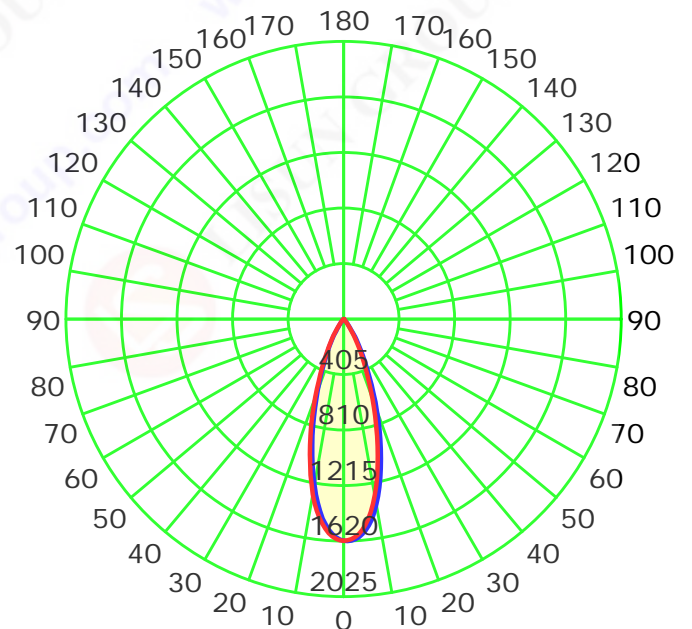
Pos of Max. Intensity: H22.5 V1

S/MH(C90/C270): 0.56

Picture Of Luminaire



Luminous Intensity Distribution Curve



Unit: cd

Average Diffuse Angle(50%): 34.3°

— C0-C180 — C90-C270

C Plane (°):0.0-360.0: 22.5

Test Lab: LISUN

Test Type: TYPE C

Temperature: 24.5

Operator: Joye

Gamma Plane (°):0.0-90.0: 1.0

Test Device: LSG-2000

Distance: 8.300 m

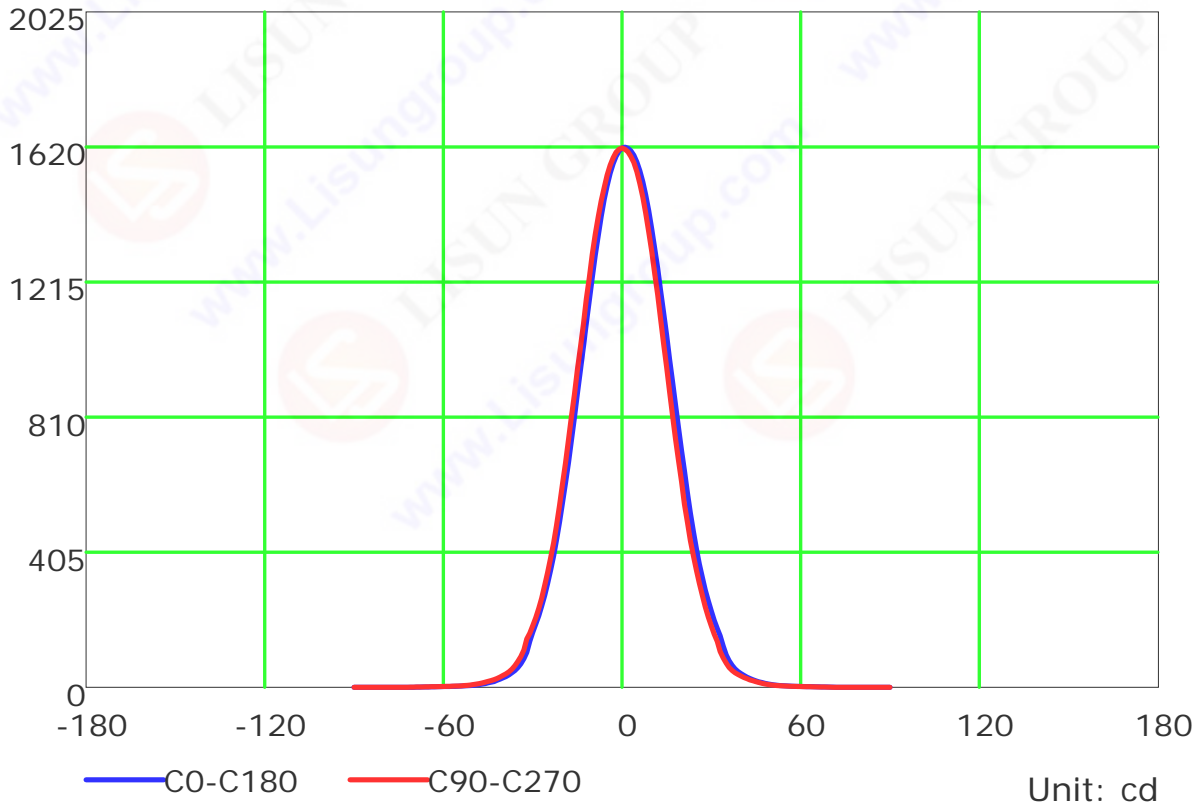
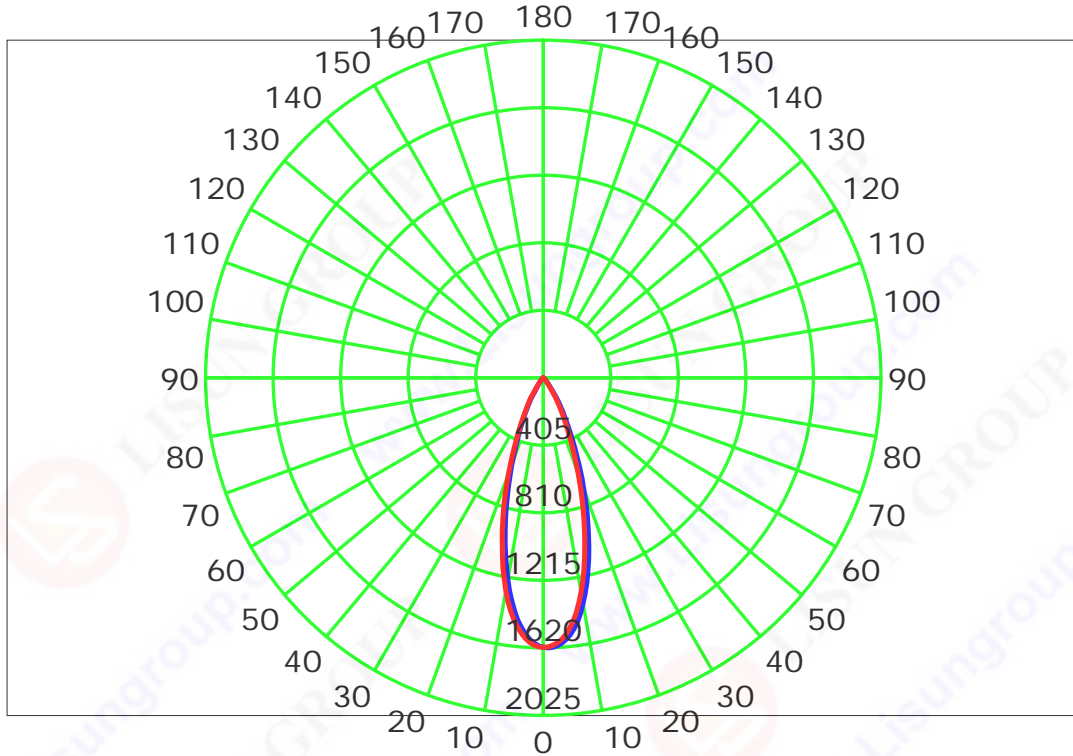
Humidity: 60%

Inspector:





### Luminous Intensity Distribution Curve

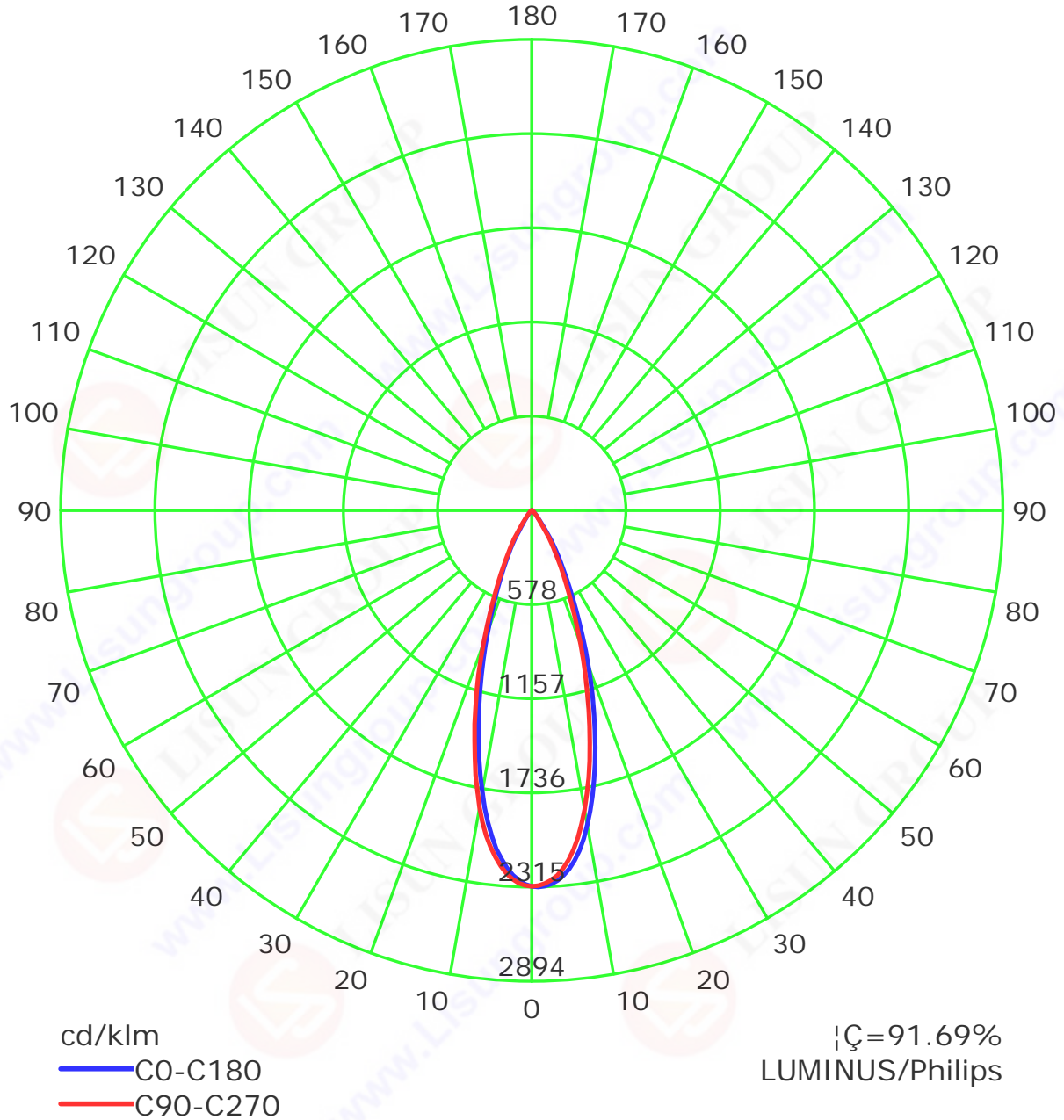


C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0:1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:



### Luminous Intensity Distribution Curve(cd/klm)



C Plane (°):0.0-360.0: 22.5  
Test Lab: LISUN  
Test Type: TYPE C  
Temperature: 24.5  
Operator: Joye

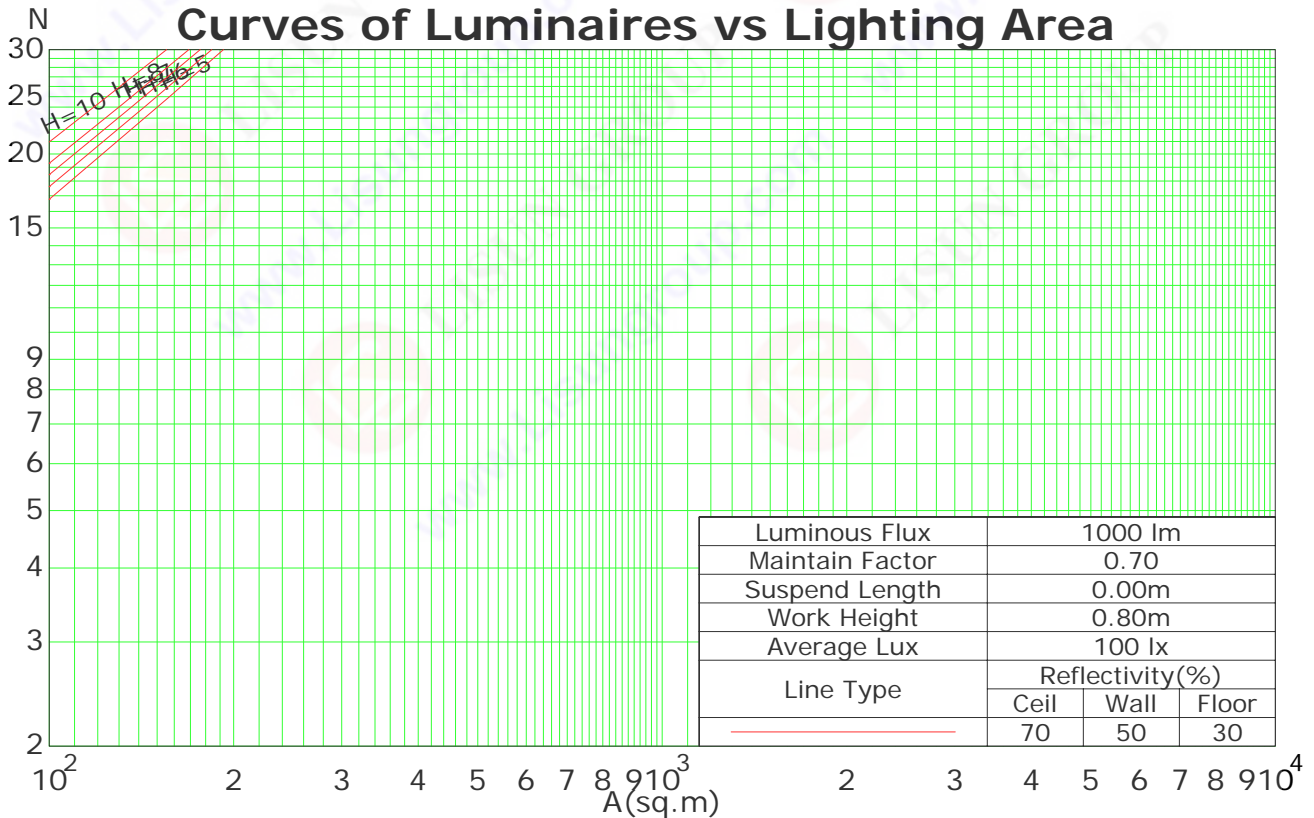
Gamma Plane (°):0.0-90.0:1.0  
Test Device: LSG-2000  
Distance: 8.300 m  
Humidity: 60%  
Inspector:

## Coefficients Of Utilization - Zonal Cavity Method

RC	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.3	0.3	0.3	0.1	0.1	0.1	0
RW	0.7	0.5	0.3	0.1	0.7	0.5	0.3	0.1	0.5	0.3	0.1	0.5	0.3	0.1	0.5	0.3	0.1	0
RCR	RF = 0.2																	
0	109	109	109	109	107	107	107	107	102	102	102	98	98	98	94	94	94	92
1	105	103	101	99	103	101	99	97	97	96	94	94	93	92	91	90	89	87
2	101	97	94	91	99	95	93	90	93	90	88	90	88	86	87	86	85	83
3	97	92	88	85	95	91	87	84	88	85	83	86	84	82	84	82	80	79
4	93	87	83	80	91	86	82	79	84	81	78	83	80	78	81	79	77	75
5	89	83	79	75	88	82	78	75	81	77	74	79	76	74	78	75	73	72
6	86	79	75	72	85	79	74	71	77	74	71	76	73	70	75	72	70	69
7	83	76	71	68	82	75	71	68	74	70	68	73	70	67	72	69	67	66
8	80	73	68	65	79	72	68	65	71	68	65	71	67	65	70	67	64	63
9	77	70	65	62	76	69	65	62	69	65	62	68	64	62	67	64	62	61
10	74	67	63	60	74	67	63	60	66	62	60	66	62	60	65	62	59	58

Spacing Criteria (0-180): 0.57  
 Spacing Criteria (90-270): 0.56  
 Spacing Criteria (Diagonal): 0.57

## Curves of Luminaires vs Lighting Area

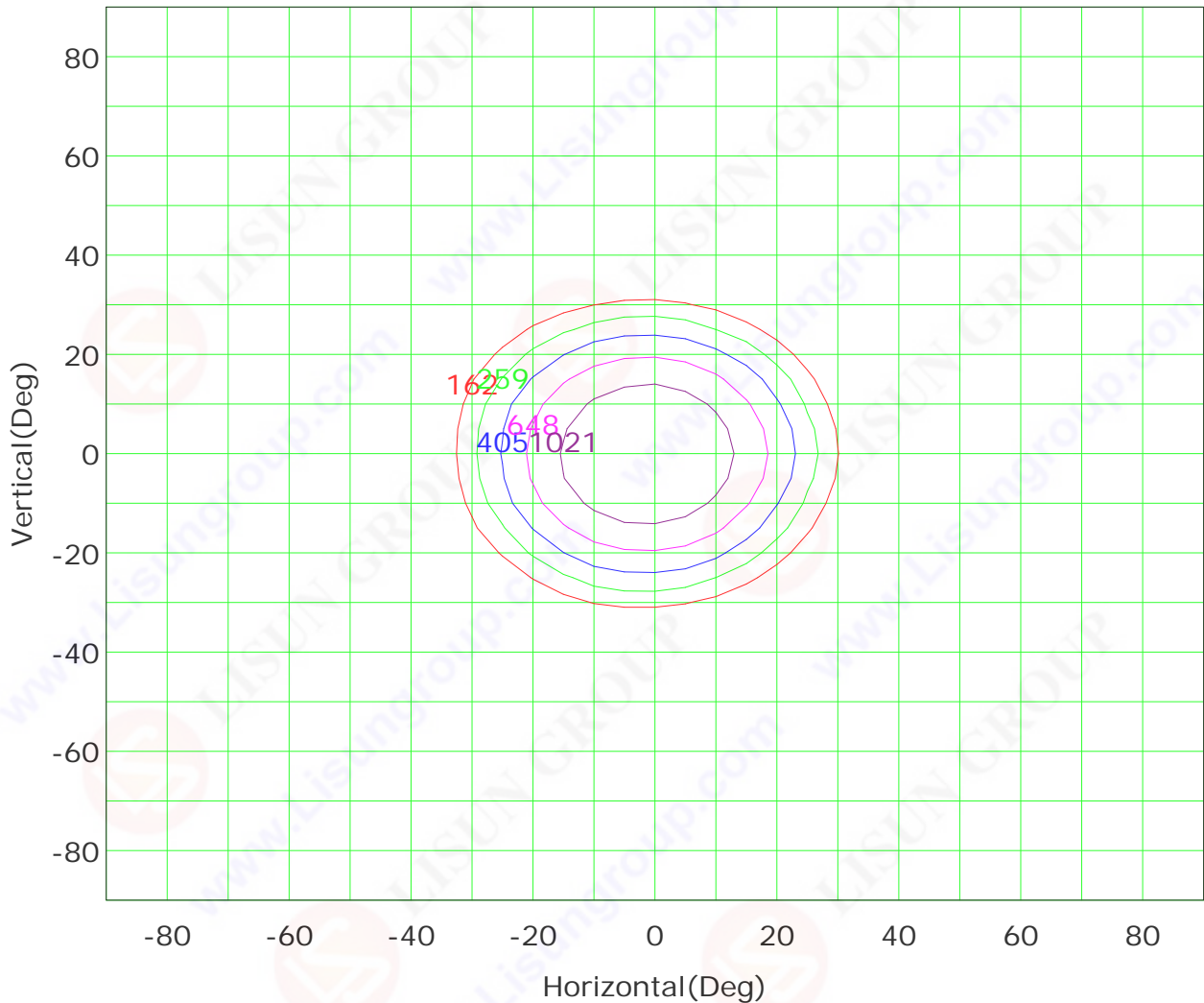


C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0: 1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:



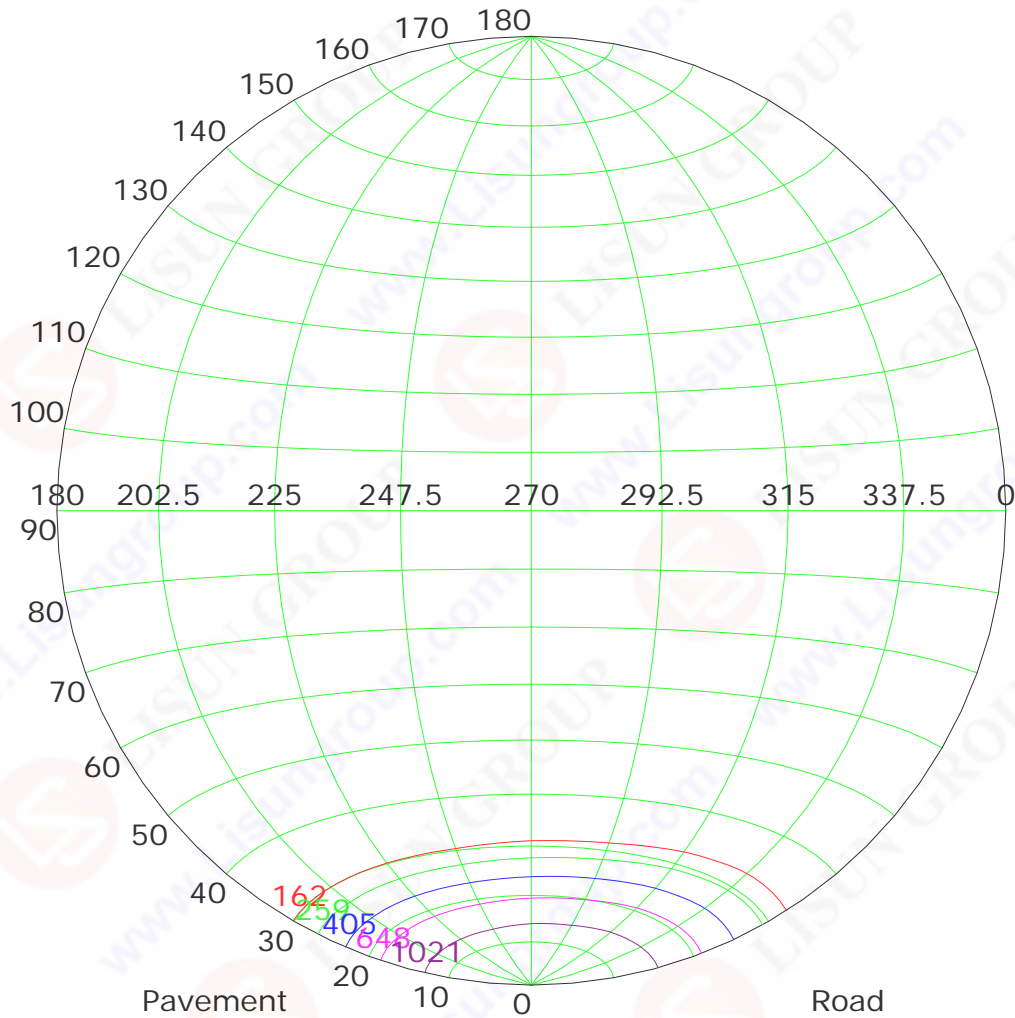
## Isocandela (rectangle)



Imax (100%): 1621 cd

- |                   |                   |
|-------------------|-------------------|
| — ( 10%): 162 cd  | — ( 16%): 259 cd  |
| — ( 25%): 405 cd  | — ( 40%): 648 cd  |
| — ( 63%): 1021 cd | — (100%): 1621 cd |

## Isocandela (sphere)

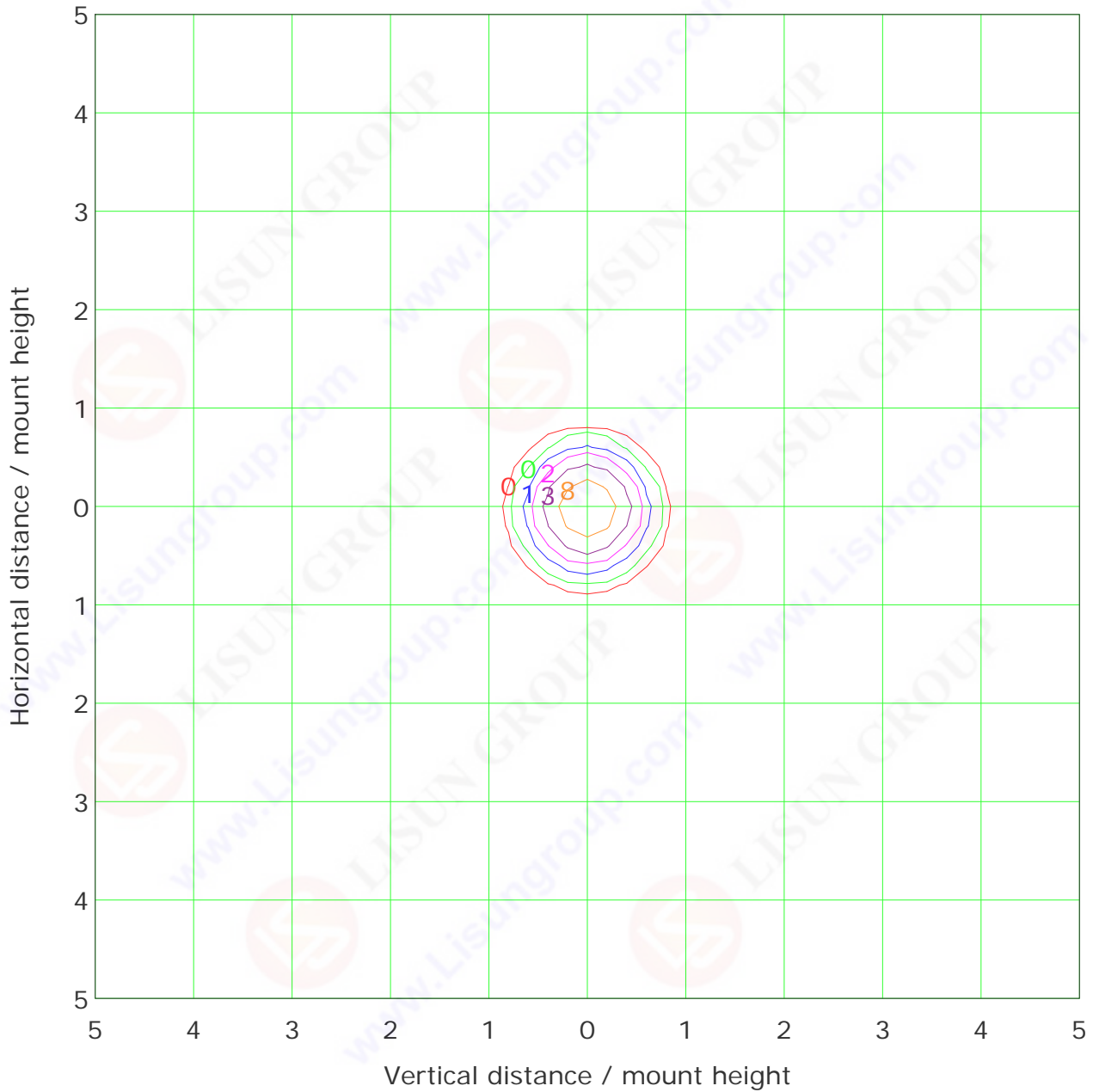


Imax (100%): 1621 cd

— ( 10%):	162 cd	— ( 16%):	259 cd
— ( 25%):	405 cd	— ( 40%):	648 cd
— ( 63%):	1021 cd	— (100%):	1621 cd



### IsoLux Plot



Mounting Height: 10.0m    Max Lux(100%): 16.2 lx

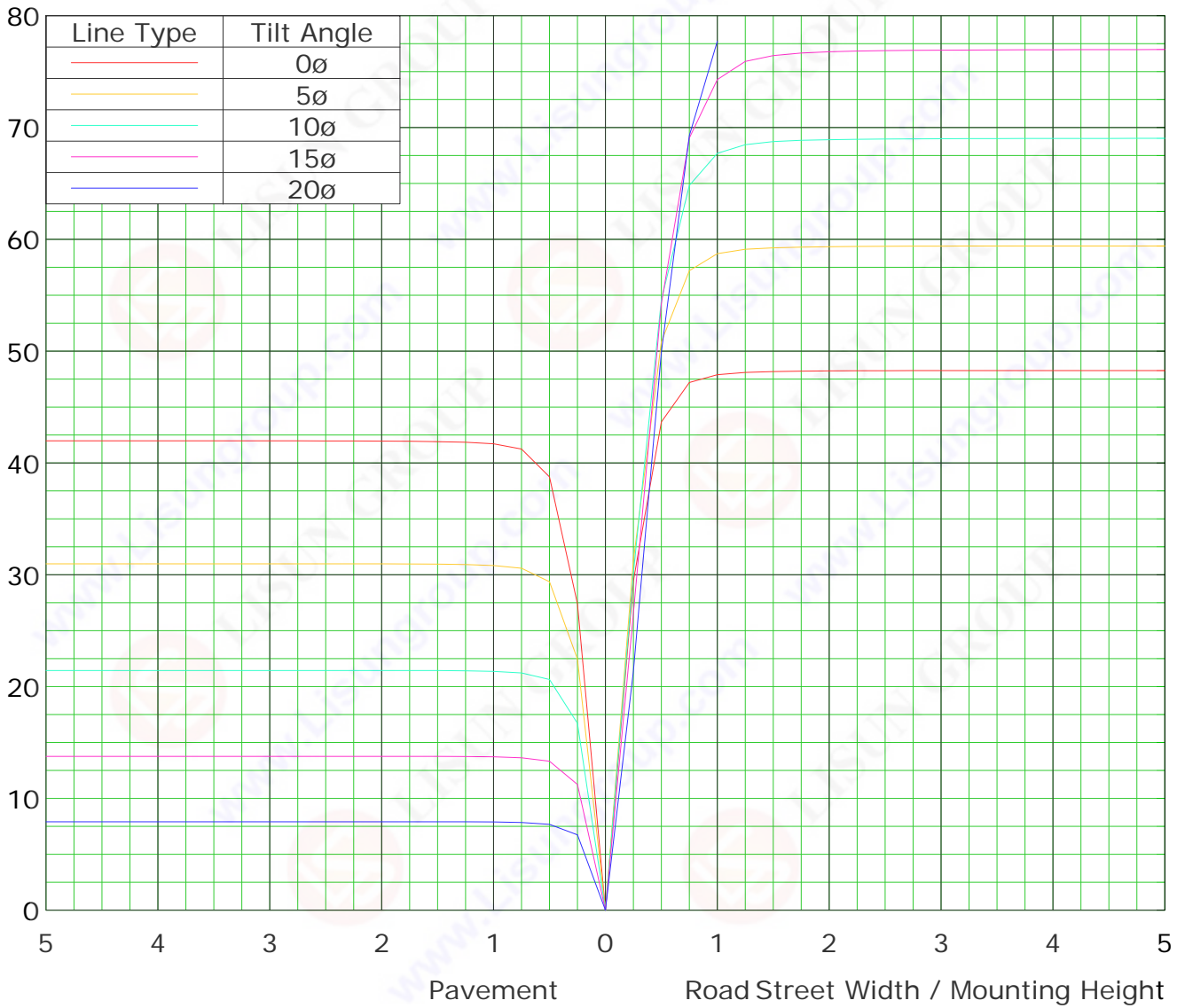
— ( 1%): 0.2 lx	— ( 2%): 0.3 lx
— ( 5%): 0.8 lx	— (10%): 1.6 lx
— (20%): 3.2 lx	— (50%): 8.1 lx
— (100%): 16.2 lx	

C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0: 1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:

## Roadway CU Curve

Efficiency(%)



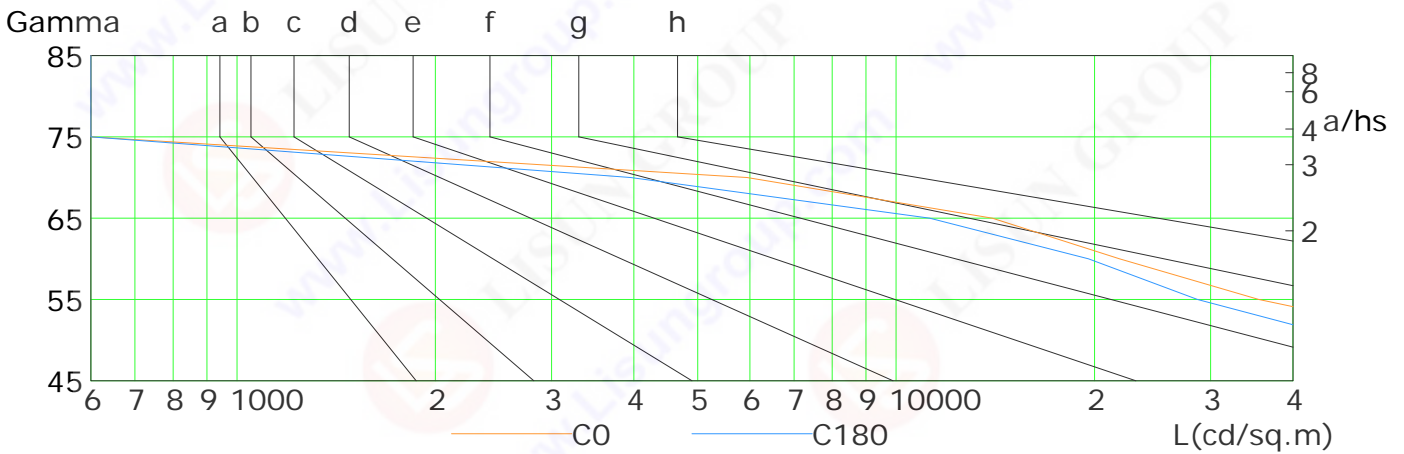
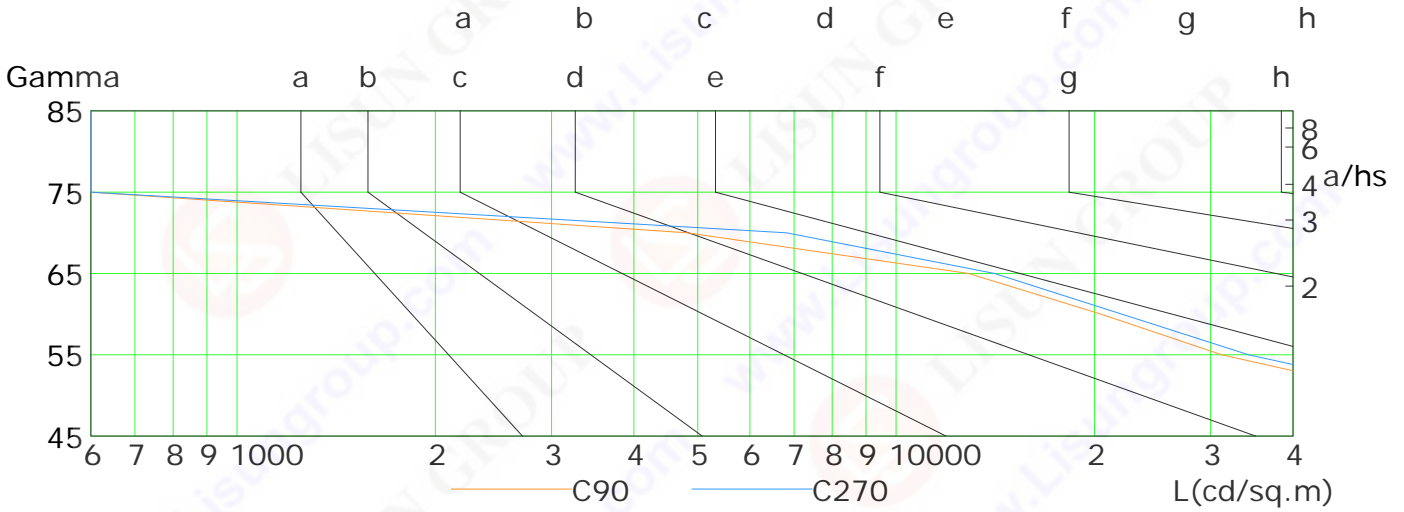
C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0: 1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:



## Lum Limit Curve

Dazzle	Quality	Illuminance (lx)								
		2000	1000	500	<=300					
1.15	A									
1.50	B		2000	1000	500	<=300				
1.85	C				2000	1000	500	<=300		
2.20	D					2000	1000	500	<=300	
2.55	E						2000	1000	500	<=300



L(cd/sq.m)	G45	G50	G55	G60	G65	G70	G75	G80	G85
C0	159528	70823	35498	21822	13994	5939	0	0	0
C90	139360	59055	31193	20456	12880	4819	0	0	0
C180	109233	49030	28649	19581	11246	3957	0	0	0
C270	145544	65983	34242	21991	14100	6818	0	0	0

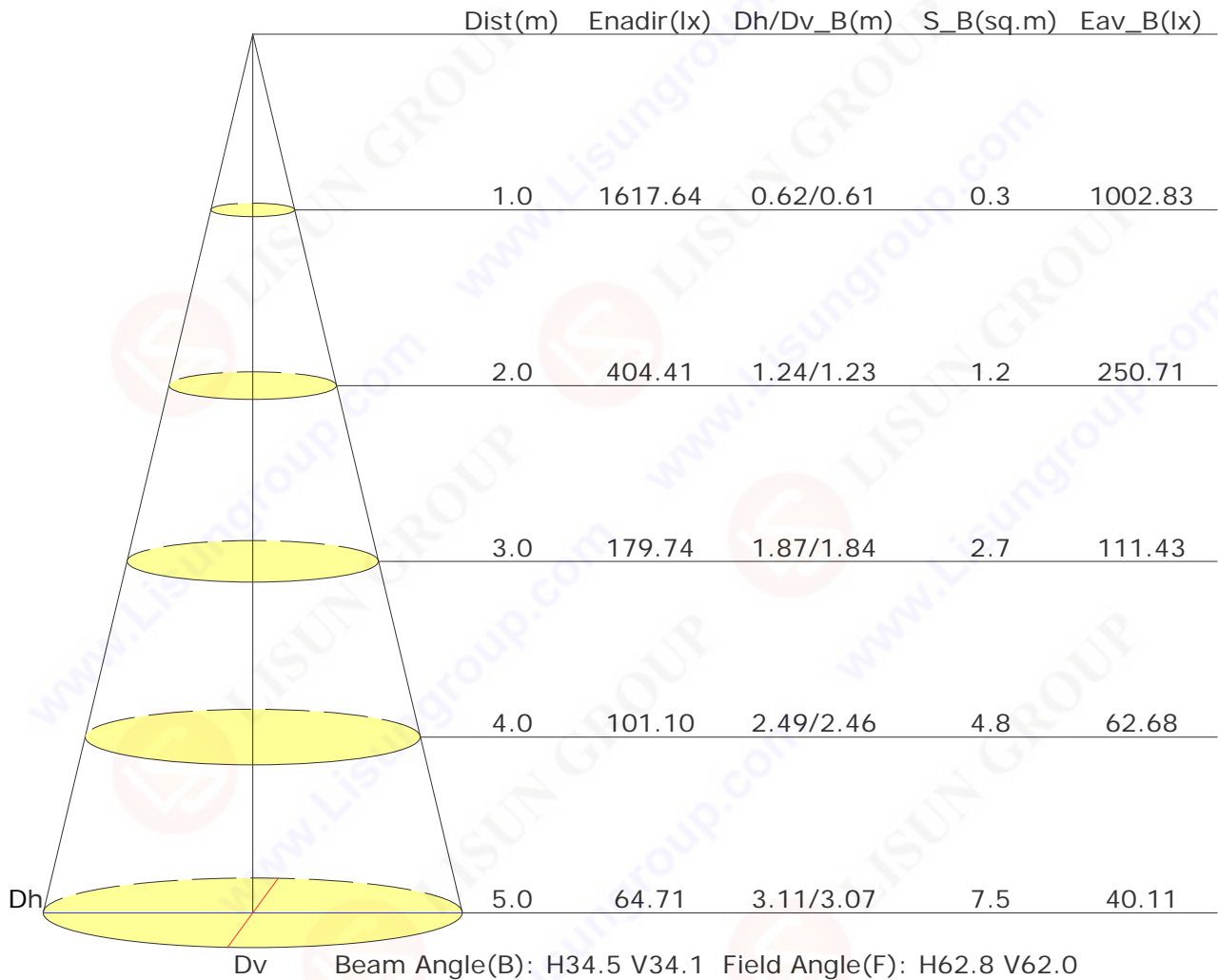
C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0:1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:



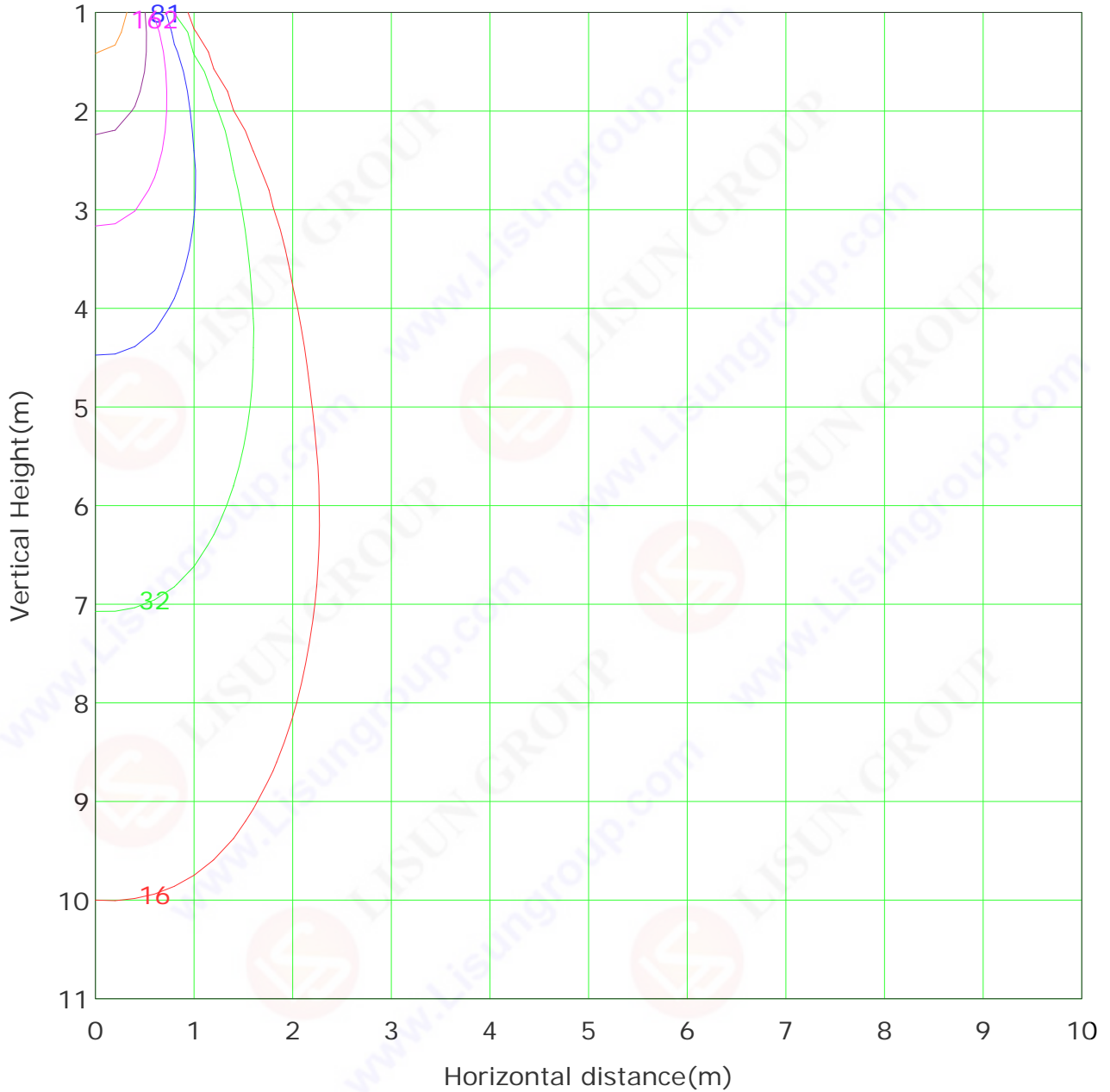


## Illuminance at a Distance





### Vertical IsoLux Plot



Lowest(m): 1.0m    Highest(m): 11.0m    Max Lux: 1617.6 lx

— ( 1%): 16.2 lx	— ( 2%): 32.4 lx
— ( 5%): 80.9 lx	— ( 10%): 161.8 lx
— ( 20%): 323.5 lx	— ( 50%): 808.8 lx
— (100%):1617.6 lx	

C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0:1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:



Area Flux Table

Unit: lm

Table with 19 columns (Vertical plane angles from -90 to 90) and 19 rows (Horizontal plane angles from -90 to 90). Values represent flux in lm. Includes marginal totals for Flux(E) and Flux(T).

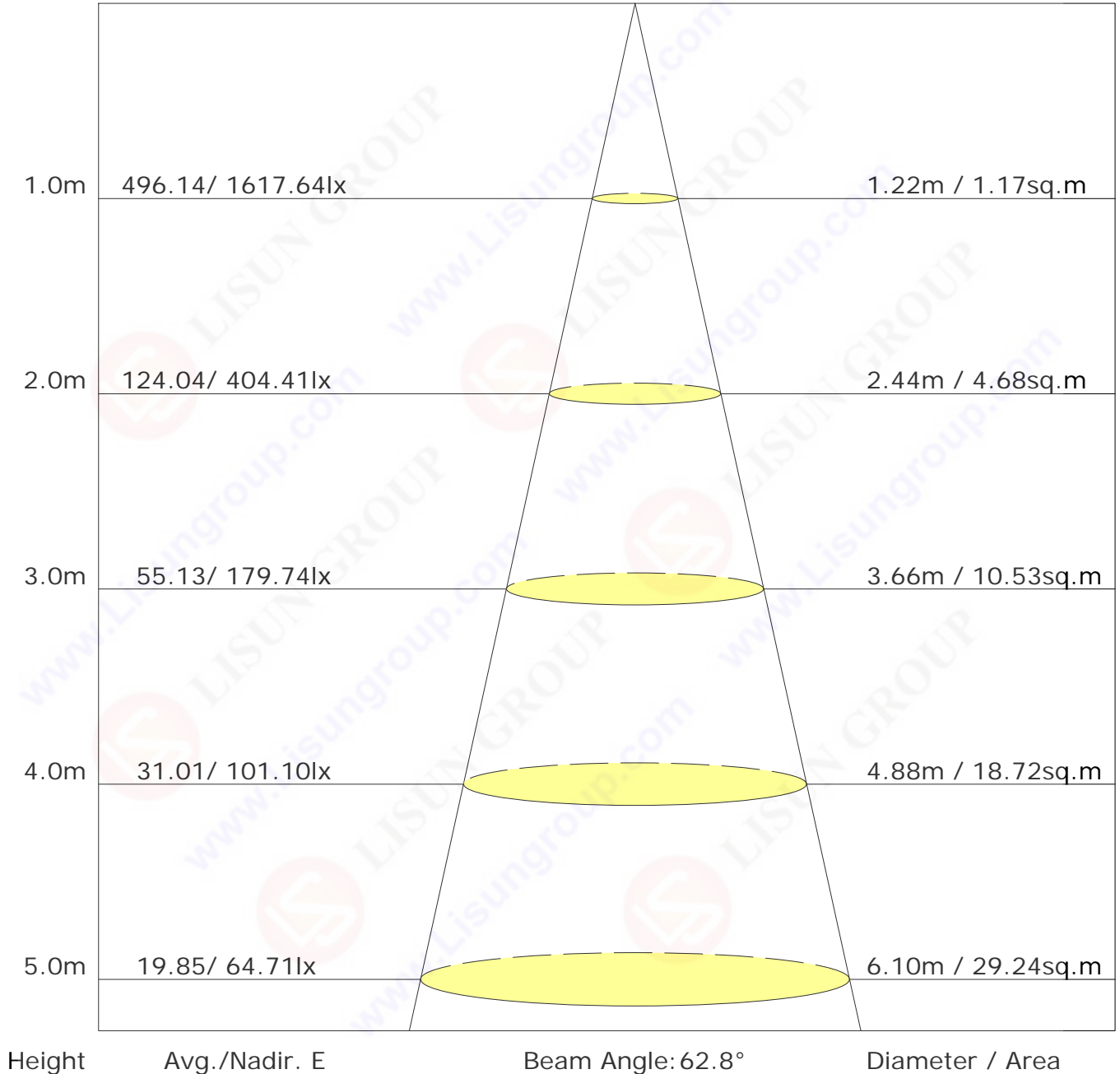
C Plane (°):0.0-360.0: 22.5
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5
Operator: Joye

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-2000
Distance: 8.300 m
Humidity: 60%
Inspector:



## The Average Illuminance Effective Figure

Flux Out: 580.34lm



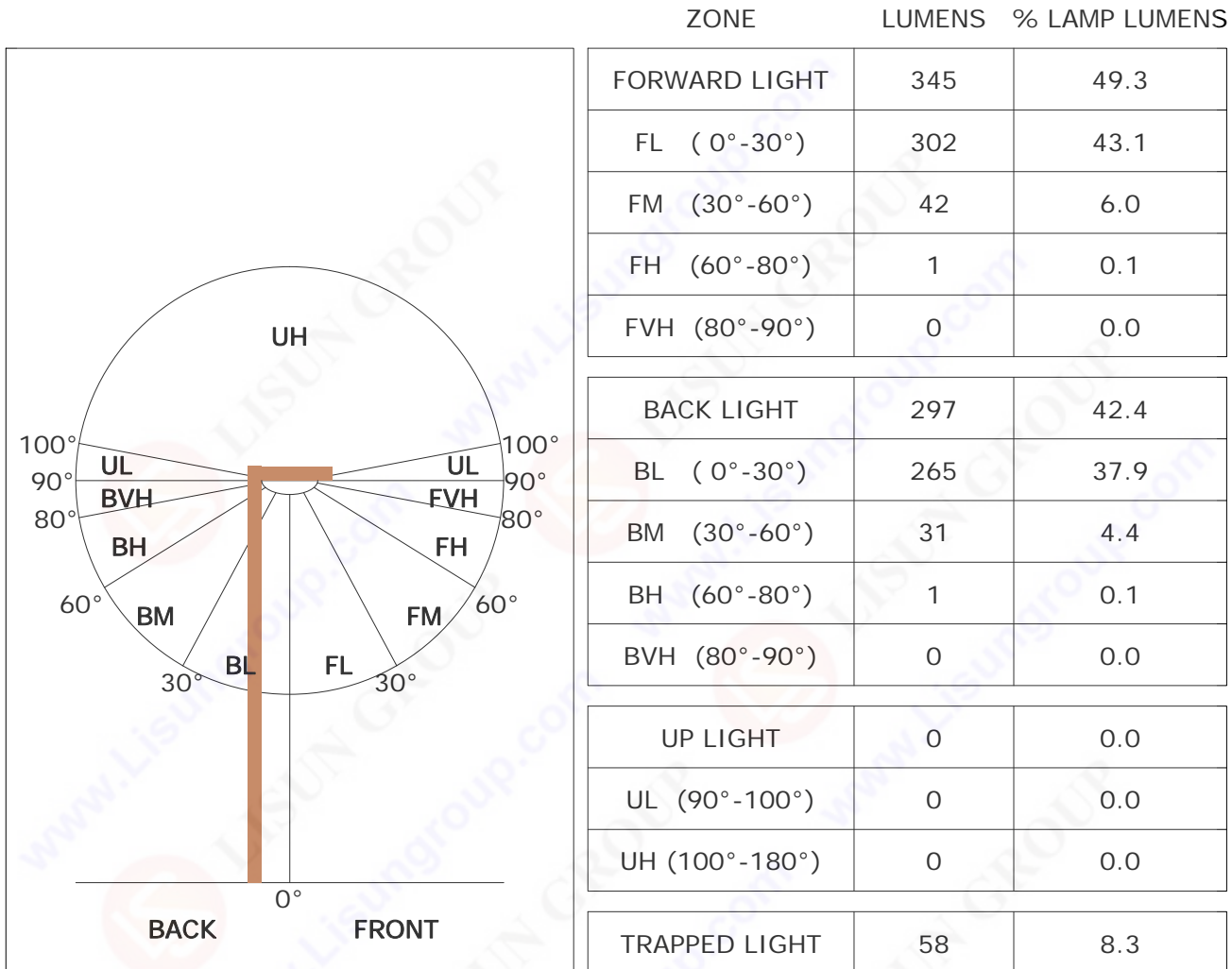
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Gamma Plane (°):0.0-90.0:1.0  
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Distance: 8.300 m  
Humidity: 60%  
Inspector:

## UGR Table

Reflectance:										
Ceiling (cavity)	0.7	0.7	0.5	0.5	0.3	0.7	0.7	0.5	0.5	0.3
Wall	0.5	0.3	0.5	0.3	0.3	0.5	0.3	0.5	0.3	0.3
Reference plane	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Room dimensions	Viewed crosswise					Viewed endwise				
X=2H Y=2H	24.7	25.5	25.0	25.7	25.8	23.4	24.2	23.7	24.3	24.5
3H	24.6	25.3	24.9	25.5	25.7	23.3	24.0	23.6	24.2	24.4
4H	24.5	25.1	24.8	25.4	25.7	23.2	23.9	23.5	24.1	24.4
6H	24.5	25.0	24.8	25.3	25.6	23.2	23.7	23.5	24.0	24.3
8H	24.4	25.0	24.8	25.3	25.6	23.1	23.7	23.5	24.0	24.3
12H	24.4	24.9	24.7	25.2	25.5	23.1	23.6	23.4	23.9	24.2
X=4H Y=2H	24.5	25.2	24.9	25.4	25.7	23.2	23.9	23.6	24.1	24.4
3H	24.4	24.9	24.8	25.2	25.5	23.1	23.6	23.5	23.9	24.3
4H	24.3	24.8	24.7	25.1	25.5	23.0	23.5	23.4	23.8	24.2
6H	24.2	24.6	24.6	25.0	25.4	22.9	23.4	23.4	23.7	24.1
8H	24.2	24.6	24.6	25.0	25.4	22.9	23.3	23.3	23.7	24.1
12H	24.1	24.5	24.6	24.9	25.3	22.9	23.2	23.3	23.6	24.0
X=8H Y=4H	24.2	24.6	24.6	25.0	25.4	22.9	23.3	23.3	23.7	24.1
6H	24.1	24.4	24.5	24.8	25.3	22.8	23.1	23.3	23.5	24.0
8H	24.0	24.3	24.5	24.8	25.2	22.8	23.0	23.2	23.5	23.9
12H	24.0	24.2	24.5	24.7	25.2	22.7	22.9	23.2	23.4	23.9
X=12H Y=4H	24.1	24.5	24.6	24.9	25.3	22.9	23.2	23.3	23.6	24.0
6H	24.0	24.3	24.5	24.8	25.2	22.8	23.0	23.2	23.5	23.9
8H	24.0	24.2	24.5	24.7	25.2	22.7	22.9	23.2	23.4	23.9
Variations with the observer position at spacings:										
S=1.0H	+5.9/-11.2					+5.6/-10.1				
S=1.5H	+8.7/-13.5					+8.4/-12.2				
S=2.0H	+10.7/-16.4					+10.4/-14.8				

Calculate in accordance with CIE Pub.117. The table is revised with  $700lm (8\log(F/F_0) = -1.2)$ .

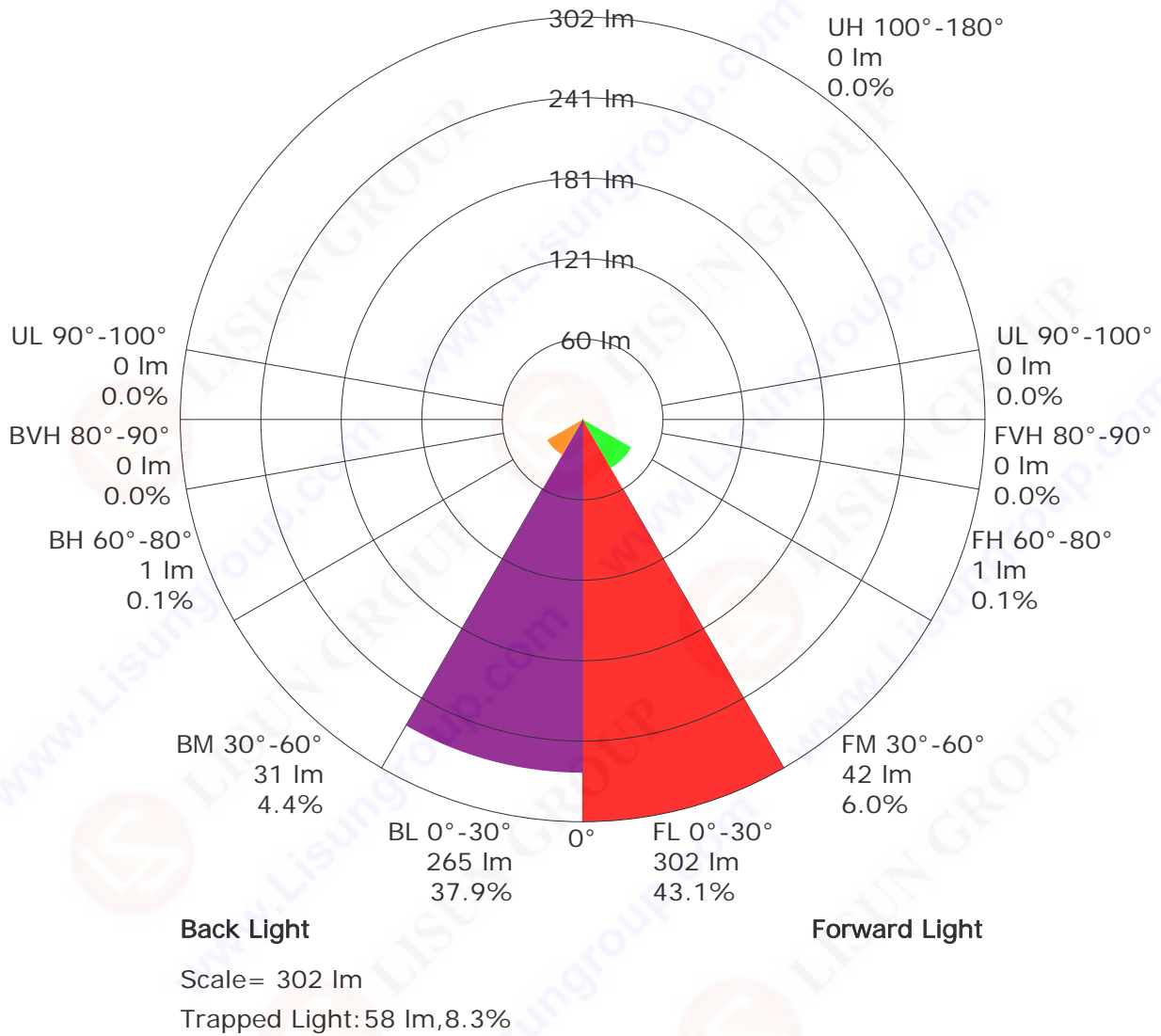
**FLUX DISTRIBUTION TABLE BASED ON THE IESNA LUMINAIRE CLASSIFICATION SYSTEM**


BUG(Backlight,Uplight,Glare) Rating Base On TM-15-07	
Asymmetrical Luminaire Types (Type I,II,III,IV)	B1 U0 G0
Quadrilateral Symmetrical Luminaire Types (Type V,Area Light)	B1 U0 G0

 C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

 Gamma Plane (°):0.0-90.0: 1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:

### LCS Graph





## Utilisation Factor Table(Floor cavity)

Utilisation Factors UF(F)			SHR NOM = 0.75								
Room Reflectance			Room Index(RI)								
Ceiling	Wall	Floor	0.75	1.00	1.25	1.50	2.00	2.50	3.00	4.00	5.00
0.70	0.50	0.20	0.86	0.90	0.93	0.95	0.98	0.99	1.01	1.02	1.03
	0.30		0.82	0.87	0.90	0.92	0.95	0.97	0.99	1.01	1.02
	0.20		0.80	0.84	0.87	0.90	0.93	0.95	0.97	0.99	1.01
0.50	0.50	0.20	0.85	0.89	0.91	0.93	0.95	0.97	0.98	0.99	1.00
	0.30		0.82	0.86	0.88	0.90	0.93	0.95	0.96	0.97	0.98
	0.20		0.80	0.84	0.86	0.88	0.91	0.93	0.94	0.96	0.97
0.30	0.50	0.20	0.84	0.87	0.89	0.91	0.93	0.94	0.95	0.96	0.96
	0.30		0.81	0.85	0.87	0.89	0.91	0.92	0.93	0.95	0.95
	0.20		0.79	0.83	0.86	0.87	0.90	0.91	0.92	0.94	0.95
0.00	0.00	0.00	0.78	0.81	0.84	0.85	0.87	0.88	0.89	0.90	0.90
<p>Rating: 9W Photometrically tested without ceiling board.            Multiply UF values by service correction factors            Calculate in accordance with CIBSE Technical Memorandum NO.5 1980</p>											





### Utilisation Factor Table(Wall)

Utilisation Factors UF(W)			SHR NOM = 0.75								
Room Reflectance			Room Index(RI)								
Ceiling	Wall	Floor	0.75	1.00	1.25	1.50	2.00	2.50	3.00	4.00	5.00
0.70	0.50	0.20	0.42	0.34	0.29	0.25	0.20	0.16	0.14	0.11	0.09
	0.30		0.35	0.29	0.25	0.22	0.18	0.15	0.13	0.10	0.08
	0.20		0.30	0.25	0.22	0.20	0.16	0.14	0.12	0.10	0.08
0.50	0.50	0.20	0.40	0.32	0.27	0.23	0.18	0.19	0.13	0.10	0.08
	0.30		0.33	0.28	0.24	0.21	0.16	0.14	0.12	0.09	0.08
	0.20		0.29	0.24	0.21	0.19	0.15	0.13	0.11	0.09	0.07
0.30	0.50	0.20	0.38	0.30	0.25	0.21	0.16	0.13	0.11	0.09	0.07
	0.30		0.32	0.26	0.22	0.19	0.15	0.13	0.11	0.08	0.07
	0.20		0.28	0.23	0.20	0.18	0.14	0.12	0.10	0.08	0.07
0.00	0.00	0.00	0.15	0.11	0.09	0.08	0.06	0.05	0.04	0.03	0.02
<p>Rating: 9W Photometrically tested without ceiling board.            Multiply UF values by service correction factors            Calculate in accordance with CIBSE Technical Memorandum NO.5 1980</p>											



## Utilisation Factor Table(Ceiling cavity)

Utilisation Factors UF(C)			SHR NOM = 0.75								
Room Reflectance			Room Index(RI)								
Ceiling	Wall	Floor	0.75	1.00	1.25	1.50	2.00	2.50	3.00	4.00	5.00
0.70	0.50	0.20	0.11	0.12	0.14	0.15	0.16	0.17	0.18	0.18	0.19
	0.30		0.08	0.10	0.11	0.12	0.14	0.15	0.16	0.17	0.18
	0.20		0.06	0.08	0.09	0.11	0.12	0.14	0.15	0.16	0.17
0.50	0.50	0.20	0.10	0.12	0.13	0.14	0.15	0.16	0.17	0.18	0.18
	0.30		0.08	0.10	0.11	0.12	0.14	0.15	0.15	0.17	0.17
	0.20		0.06	0.08	0.09	0.10	0.12	0.13	0.14	0.16	0.16
0.30	0.50	0.20	0.10	0.12	0.13	0.14	0.15	0.16	0.16	0.17	0.17
	0.30		0.08	0.09	0.11	0.12	0.13	0.14	0.15	0.16	0.17
	0.20		0.06	0.08	0.09	0.10	0.12	0.13	0.14	0.15	0.16
0.00	0.00	0.00	NA	NA	NA	NA	NA	NA	NA	NA	NA

Rating: 9W Photometrically tested without ceiling board.  
 Multiply UF values by service correction factors  
 Calculate in accordance with CIBSE Technical Memorandum NO.5 1980

## Zonal Lumen

Gamma [°]	I <sub>mean</sub> [cd]	Zonal Flux [lm]	Sum Zonal Flux [lm]	Rel Zonal Flux [%]	Sum Rel Zonal Flux [%]
0.0-1.0	1616.0	1.5	1.5	0.22	0.22
1.0-2.0	1609.9	4.6	6.2	0.66	0.88
2.0-3.0	1597.9	7.6	13.8	1.09	1.97
3.0-4.0	1579.8	10.6	24.4	1.51	3.48
4.0-5.0	1555.1	13.4	37.8	1.91	5.40
5.0-6.0	1523.4	16.0	53.8	2.29	7.68
6.0-7.0	1485.0	18.4	72.2	2.63	10.32
7.0-8.0	1439.9	20.6	92.8	2.94	13.26
8.0-9.0	1388.2	22.5	115.3	3.21	16.47
9.0-10.0	1330.7	24.1	139.4	3.44	19.92
10.0-11.0	1268.9	25.4	164.8	3.62	23.54
11.0-12.0	1203.9	26.3	191.1	3.76	27.30
12.0-13.0	1135.9	27.0	218.1	3.85	31.15
13.0-14.0	1066.3	27.3	245.3	3.90	35.05
14.0-15.0	996.3	27.4	272.7	3.91	38.96
15.0-16.0	925.7	27.1	299.8	3.88	42.83
16.0-17.0	855.3	26.6	326.5	3.81	46.64
17.0-18.0	785.9	25.9	352.4	3.70	50.34
18.0-19.0	718.0	25.0	377.4	3.57	53.91
19.0-20.0	652.9	23.9	401.3	3.41	57.32
20.0-21.0	590.2	22.7	423.9	3.24	60.56
21.0-22.0	530.1	21.3	445.2	3.04	63.61
22.0-23.0	474.0	19.9	465.1	2.84	66.45
23.0-24.0	423.1	18.5	483.6	2.64	69.09
24.0-25.0	376.5	17.1	500.8	2.45	71.54
25.0-26.0	333.6	15.8	516.5	2.25	73.79
26.0-27.0	295.0	14.4	530.9	2.06	75.85
27.0-28.0	260.1	13.2	544.1	1.88	77.73
28.0-29.0	229.1	12.0	556.1	1.71	79.44
29.0-30.0	201.5	10.9	567.0	1.55	81.00
30.0-31.0	176.1	9.8	576.8	1.40	82.40
31.0-32.0	151.0	8.7	585.4	1.24	83.63
32.0-33.0	127.0	7.5	592.9	1.07	84.70
33.0-34.0	104.6	6.3	599.3	0.90	85.61
34.0-35.0	84.9	5.3	604.5	0.75	86.36
35.0-36.0	70.0	4.5	609.0	0.64	87.00

C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0:1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:

## Zonal Lumen (Continue 1)

Gamma [°]	I <sub>mean</sub> [cd]	Zonal Flux [lm]	Sum Zonal Flux [lm]	Rel Zonal Flux [%]	Sum Rel Zonal Flux [%]
36.0-37.0	58.9	3.8	612.8	0.55	87.55
37.0-38.0	50.2	3.4	616.2	0.48	88.03
38.0-39.0	43.3	3.0	619.1	0.42	88.45
39.0-40.0	37.7	2.6	621.8	0.38	88.82
40.0-41.0	32.9	2.3	624.1	0.33	89.16
41.0-42.0	28.7	2.1	626.2	0.30	89.46
42.0-43.0	25.0	1.9	628.0	0.26	89.72
43.0-44.0	21.8	1.6	629.7	0.23	89.96
44.0-45.0	18.9	1.5	631.1	0.21	90.16
45.0-46.0	16.3	1.3	632.4	0.18	90.35
46.0-47.0	14.0	1.1	633.5	0.16	90.50
47.0-48.0	11.9	1.0	634.5	0.14	90.64
48.0-49.0	10.1	0.8	635.3	0.12	90.76
49.0-50.0	8.6	0.7	636.0	0.10	90.86
50.0-51.0	7.3	0.6	636.7	0.09	90.95
51.0-52.0	6.3	0.5	637.2	0.08	91.03
52.0-53.0	5.5	0.5	637.7	0.07	91.10
53.0-54.0	4.9	0.4	638.1	0.06	91.16
54.0-55.0	4.4	0.4	638.5	0.06	91.22
55.0-56.0	3.9	0.4	638.9	0.05	91.27
56.0-57.0	3.6	0.3	639.2	0.05	91.31
57.0-58.0	3.3	0.3	639.5	0.04	91.36
58.0-59.0	3.0	0.3	639.8	0.04	91.40
59.0-60.0	2.8	0.3	640.0	0.04	91.43
60.0-61.0	2.5	0.2	640.3	0.03	91.47
61.0-62.0	2.3	0.2	640.5	0.03	91.50
62.0-63.0	2.1	0.2	640.7	0.03	91.53
63.0-64.0	1.9	0.2	640.9	0.03	91.56
64.0-65.0	1.8	0.2	641.1	0.02	91.58
65.0-66.0	1.6	0.2	641.2	0.02	91.60
66.0-67.0	1.4	0.1	641.4	0.02	91.62
67.0-68.0	1.2	0.1	641.5	0.02	91.64
68.0-69.0	1.0	0.1	641.6	0.01	91.66
69.0-70.0	0.8	0.1	641.7	0.01	91.67
70.0-71.0	0.6	0.1	641.7	0.01	91.68
71.0-72.0	0.4	0.0	641.8	0.01	91.68

C Plane (°):0.0-360.0: 22.5  
 Test Lab: LISUN  
 Test Type: TYPE C  
 Temperature: 24.5  
 Operator: Joye

Gamma Plane (°):0.0-90.0:1.0  
 Test Device: LSG-2000  
 Distance: 8.300 m  
 Humidity: 60%  
 Inspector:





Candlepower Table

Unit: cd

Table with 11 columns (GVC, C0.0 to C202.5) and 37 rows (G0.0 to G36.0) containing candlepower values.

C Plane (°):0.0-360.0: 22.5
Test Lab: LISUN
Test Type: TYPE C
Temperature: 24.5
Operator: Joye

Gamma Plane (°):0.0-90.0:1.0
Test Device: LSG-2000
Distance: 8.300 m
Humidity: 60%
Inspector:



### Candlepower Table (Continue 1)

Unit: cd

GVC	C0.0	C22.5	C45.0	C67.5	C90.0	C112.5	C135.0	C157.5	C180.0	C202.5
G37.0	66.2	68.8	61.8	56.3	50.5	46.1	42.9	41.8	44.1	44.7
G38.0	55.3	57.9	52.6	48.4	44.0	40.7	37.8	36.2	37.9	39.2
G39.0	47.5	49.0	45.7	42.6	38.7	35.7	32.8	31.7	32.5	34.2
G40.0	41.1	42.5	39.8	37.8	34.0	31.5	28.9	27.6	28.4	29.8
G41.0	35.6	37.0	35.1	32.6	29.7	27.4	25.3	23.8	24.8	26.0
G42.0	30.4	32.4	30.5	28.5	26.0	24.0	21.9	20.7	21.2	22.6
G43.0	26.7	28.1	26.6	24.9	22.5	21.1	19.3	17.8	17.8	19.7
G44.0	22.9	24.4	23.0	21.8	19.8	18.3	16.6	15.3	15.7	17.1
G45.0	19.7	21.5	20.3	18.9	17.2	15.8	14.1	12.8	13.5	14.7
G46.0	16.7	18.7	17.5	16.4	14.7	13.3	11.7	10.7	11.4	12.3
G47.0	14.6	16.1	15.0	14.0	12.4	11.1	10.0	9.0	9.7	10.5
G48.0	12.2	13.5	12.6	11.7	10.4	9.4	8.3	7.6	8.3	8.9
G49.0	10.3	11.3	10.6	9.9	8.7	7.9	7.2	6.7	7.2	7.7
G50.0	8.8	9.7	8.9	8.3	7.4	6.7	6.1	5.8	6.1	6.5
G51.0	7.5	8.1	7.6	7.1	6.3	5.9	5.4	5.2	5.4	5.7
G52.0	6.3	6.8	6.2	6.1	5.5	5.1	4.8	4.6	4.9	5.1
G53.0	5.5	5.9	5.5	5.3	4.9	4.6	4.3	4.0	4.4	4.5
G54.0	4.9	5.1	4.8	4.7	4.3	4.1	3.9	3.8	3.9	4.1
G55.0	4.4	4.5	4.3	4.2	3.9	3.8	3.5	3.5	3.6	3.7
G56.0	3.9	4.0	3.8	3.8	3.6	3.4	3.2	3.2	3.2	3.4
G57.0	3.6	3.6	3.5	3.5	3.3	3.1	3.0	3.0	3.0	3.2
G58.0	3.3	3.3	3.2	3.2	2.9	2.9	2.7	2.7	2.8	2.9
G59.0	3.1	3.0	2.9	3.0	2.7	2.7	2.5	2.5	2.6	2.7
G60.0	2.7	2.8	2.6	2.7	2.5	2.5	2.4	2.3	2.4	2.5
G61.0	2.5	2.5	2.4	2.5	2.4	2.3	2.2	2.1	2.2	2.3
G62.0	2.3	2.3	2.2	2.3	2.1	2.1	2.0	1.9	2.0	2.1
G63.0	2.1	2.2	2.0	2.2	1.9	1.9	1.8	1.7	1.9	1.9
G64.0	2.0	1.9	1.8	2.0	1.8	1.7	1.6	1.6	1.5	1.7
G65.0	1.7	1.8	1.6	1.8	1.6	1.5	1.4	1.4	1.4	1.5
G66.0	1.5	1.5	1.5	1.6	1.3	1.4	1.3	1.2	1.3	1.3
G67.0	1.3	1.3	1.3	1.3	1.2	1.2	1.1	0.9	1.1	1.1
G68.0	1.2	1.1	1.1	1.3	1.0	1.0	0.9	0.8	0.9	1.0
G69.0	1.0	1.0	0.9	1.1	0.8	0.8	0.7	0.6	0.7	0.8
G70.0	0.7	0.8	0.7	0.8	0.6	0.6	0.5	0.4	0.5	0.6
G71.0	0.5	0.6	0.6	0.6	0.4	0.4	0.2	0.1	0.2	0.3
G72.0	0.3	0.5	0.4	0.4	0.1	0.1	0.0	0.0	0.0	0.1
G73.0	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0

C Plane (°):0.0-360.0: 22.5  
Test Lab: LISUN  
Test Type: TYPE C  
Temperature: 24.5  
Operator: Joye

Gamma Plane (°):0.0-90.0:1.0  
Test Device: LSG-2000  
Distance: 8.300 m  
Humidity: 60%  
Inspector:







### Candlepower Table (Continue 3)

Unit: cd

GVC	C225.0	C247.5	C270.0	C292.5	C315.0	C337.5	C360.0			
G0.0	1617.6	1617.6	1617.6	1617.6	1617.6	1617.6	1617.6			
G1.0	1609.5	1610.7	1614.2	1615.9	1618.8	1619.7	1620.7			
G2.0	1594.9	1598.3	1605.0	1608.3	1613.7	1615.0	1617.3			
G3.0	1575.4	1578.7	1588.8	1593.5	1601.9	1604.6	1609.6			
G4.0	1546.0	1554.2	1566.2	1572.6	1586.1	1590.2	1596.1			
G5.0	1512.3	1519.4	1536.4	1546.5	1562.1	1569.7	1575.2			
G6.0	1470.8	1478.5	1499.6	1512.7	1531.9	1540.1	1549.8			
G7.0	1423.5	1433.4	1459.3	1470.7	1492.8	1503.2	1516.5			
G8.0	1366.8	1385.4	1412.6	1423.8	1446.7	1458.7	1477.2			
G9.0	1306.1	1325.5	1359.2	1370.0	1393.2	1409.4	1429.5			
G10.0	1242.7	1262.3	1298.4	1311.2	1338.5	1356.0	1373.9			
G11.0	1175.9	1197.2	1229.2	1247.1	1279.4	1298.6	1317.0			
G12.0	1107.2	1128.7	1164.9	1178.6	1216.2	1233.2	1256.5			
G13.0	1036.3	1055.9	1089.2	1112.6	1150.7	1169.6	1190.0			
G14.0	964.5	986.7	1019.1	1044.2	1084.3	1103.3	1123.8			
G15.0	893.8	914.1	951.6	975.2	1016.7	1034.9	1055.6			
G16.0	824.1	844.7	879.1	906.4	947.2	966.6	984.2			
G17.0	754.1	773.3	811.9	839.9	881.5	898.5	916.0			
G18.0	686.9	707.8	743.9	770.3	810.1	831.0	848.4			
G19.0	622.8	639.5	672.8	703.9	745.2	766.2	778.5			
G20.0	560.9	576.1	609.6	640.8	683.9	700.9	709.7			
G21.0	504.0	516.3	546.4	579.5	618.0	639.1	649.7			
G22.0	452.6	462.4	486.2	521.2	558.8	578.3	582.2			
G23.0	402.5	411.4	433.6	466.8	501.4	521.4	523.0			
G24.0	358.2	367.9	388.0	414.7	449.0	467.9	467.6			
G25.0	317.5	327.1	344.2	369.2	400.6	416.2	415.2			
G26.0	278.3	288.2	306.0	328.4	357.9	370.4	369.8			
G27.0	242.4	252.3	267.3	289.8	317.2	331.6	329.6			
G28.0	212.6	220.6	237.1	255.2	281.7	296.6	292.0			
G29.0	186.8	193.5	208.8	223.5	251.2	265.2	259.3			
G30.0	164.3	169.1	184.4	196.4	222.8	234.8	228.6			
G31.0	142.7	147.6	162.4	172.4	196.0	209.0	201.0			
G32.0	111.4	118.6	145.0	150.4	172.3	182.5	176.6			
G33.0	91.9	94.6	112.3	123.4	151.3	162.0	155.0			
G34.0	75.6	78.9	92.2	94.0	118.6	135.0	124.2			
G35.0	63.5	66.2	77.4	77.4	93.5	105.1	97.4			
G36.0	53.9	56.6	64.9	65.1	76.4	86.6	79.7			

C Plane (°):0.0-360.0: 22.5  
Test Lab: LISUN  
Test Type: TYPE C  
Temperature: 24.5  
Operator: Joye

Gamma Plane (°):0.0-90.0:1.0  
Test Device: LSG-2000  
Distance: 8.300 m  
Humidity: 60%  
Inspector:



### Candlepower Table (Continue 4)

Unit: cd

GVC	C225.0	C247.5	C270.0	C292.5	C315.0	C337.5	C360.0			
G37.0	46.8	49.1	54.7	56.3	63.0	71.2	66.2			
G38.0	41.1	42.8	46.8	48.6	53.9	59.2	55.3			
G39.0	35.8	37.4	40.8	42.6	46.4	50.3	47.5			
G40.0	31.1	32.3	35.5	37.5	40.9	43.6	41.1			
G41.0	27.1	28.2	30.9	32.7	36.0	38.4	35.6			
G42.0	23.5	24.6	26.9	28.6	31.9	33.3	30.4			
G43.0	20.5	21.6	23.4	25.1	27.9	29.4	26.7			
G44.0	17.9	18.8	20.5	21.9	24.4	25.7	22.9			
G45.0	15.6	16.2	17.9	19.4	21.5	22.4	19.7			
G46.0	13.1	13.7	15.6	17.0	18.9	19.6	16.7			
G47.0	11.1	11.9	13.4	14.8	16.5	17.0	14.6			
G48.0	9.4	10.0	11.3	12.6	14.2	14.5	12.2			
G49.0	8.0	8.5	9.7	10.6	12.0	12.4	10.3			
G50.0	6.9	7.3	8.2	9.1	10.3	10.4	8.8			
G51.0	6.0	6.3	7.0	7.7	8.7	8.9	7.5			
G52.0	5.3	5.6	6.1	6.5	7.5	7.5	6.3			
G53.0	4.8	4.9	5.4	5.8	6.4	6.4	5.5			
G54.0	4.3	4.5	4.8	5.1	5.6	5.6	4.9			
G55.0	4.0	4.0	4.3	4.5	4.9	4.9	4.4			
G56.0	3.5	3.7	3.9	4.0	4.4	4.5	3.9			
G57.0	3.3	3.4	3.5	3.7	3.9	3.9	3.6			
G58.0	3.0	3.1	3.2	3.4	3.6	3.6	3.3			
G59.0	2.8	2.9	3.0	3.1	3.3	3.2	3.1			
G60.0	2.6	2.6	2.7	2.9	3.0	2.9	2.7			
G61.0	2.3	2.5	2.5	2.7	2.8	2.6	2.5			
G62.0	2.2	2.3	2.4	2.5	2.6	2.5	2.3			
G63.0	2.1	2.1	2.2	2.3	2.4	2.3	2.1			
G64.0	1.9	1.9	2.0	2.1	2.2	2.1	2.0			
G65.0	1.6	1.7	1.7	1.9	2.0	1.9	1.7			
G66.0	1.5	1.5	1.5	1.7	1.9	1.6	1.5			
G67.0	1.2	1.3	1.3	1.5	1.7	1.4	1.3			
G68.0	1.1	1.1	1.2	1.3	1.5	1.3	1.2			
G69.0	0.9	0.9	1.0	1.2	1.3	1.1	1.0			
G70.0	0.6	0.7	0.8	1.0	1.2	0.9	0.7			
G71.0	0.5	0.6	0.6	0.8	0.9	0.7	0.5			
G72.0	0.2	0.3	0.4	0.6	0.8	0.5	0.3			
G73.0	0.0	0.1	0.2	0.3	0.5	0.3	0.1			

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Distance: 8.300 m  
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Inspector:

