IESNA LM79-2008 Test Report

TÜV SÜD America

Photometric Testing and Evaluation in Accordance with LM79-2008

Report Prepared for:

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Sample Tested:	**Draco BS730 4100K Narrow 40W**
Manufacturer:	**Beghelli North America**
Technical Report Number:	**JI302916-11-LM79**
Report Issue Date:	**June 12th, 2013**
Total Number of Pages:	**9** (including this page)

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Summary of Key Test Results

Model#	Draco BS730 4100K Narrow 40W
Manufacturer	Beghelli North America
TÜV Sample#	712-7
Date of Test	June 10, 2013

Notes:

Tested in intended orientation

Parameter	Measured Result
Luminous Flux	**2451 Lumens**
Input Power	**34.54 Watts**
Efficacy	**70.97 Lumens/Watt**
C.C.T.	**4024 K**
C.R.I. (R_a)	**85.03**
Beam Angle	**11.1°**
Stabilization Time	**60 minutes**
In-Situ Temp Test (ISTMT)**	**70.7 °C**

The above results are recorded / derived from measurements in accordance with LM79-08

**ISTMT in accordance with "Energy Star Program Requirements for Integral LED Lamps – Version 1.4".

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Test Results –

The following results were obtained after stabilization of the sample in accordance with the requirements set forth in section 5.0 of IES LM79-2008. Stability is achieved when the variation of 3 readings of light output and electrical power over a period of 30 minutes, taken 15 minutes apart, is less than 0.5%.

Photometric Results	Draco BS730 4100K Narrow 40W	
	Integrating Sphere	Goniophotometer
Total Luminous Flux (Lumens)	2451.0	2461.5
Luminous Efficacy (Lumens/Watt)	70.97	71.08
Total Radiant Flux (Watts)	7.9	-
Correlated Color Temperature (CCT)	4024	-
Color Rendering Index (CRI – R_a)	85.03	-
R_9 Value	26.5	-
Chromaticity (Chroma x / Chroma y)	0.3802 / 0.3794	-
Chromaticity (Chroma u / Chroma v)	0.2239 / 0.3351	-
Chromaticity (Chroma u' / Chroma v')	0.2239 / 0.5027	-
D_{uv} Value	0.00130	-

Electrical Results	Draco BS730 4100K Narrow 40W	
	Integrating Sphere	Goniophotometer
Input Power (Watts)	34.54	34.63
Input Voltage (Volts AC)	120.01	120.12
Input Current (Amps)	0.289	0.290
Power Factor (120V / 277V)	0.996 / 0.915	0.994
Input Frequency (Hertz)	60.0	60.0
A-THD (Current %) (120V / 277V)	2.11 % / 5.51 %	2.39 %

Additional Parameters	Draco BS730 4100K Narrow 40W	
	Integrating Sphere	Goniophotometer
Stabilization Time (Light and Power)	60 minutes	62 minutes
Test Geometry Configuration	4π	Type C
Spectroradiometer	Labsphere CDS1100	Gigahertz Optik P9801
Ambient Temperature	25.3 °C	25.3 °C
ISTMT (In-Situ Temperature Measurement)	70.7 °C	
Spacing Criteria	0.18 (0° – 180°) / 0.26 (90° – 270°)	

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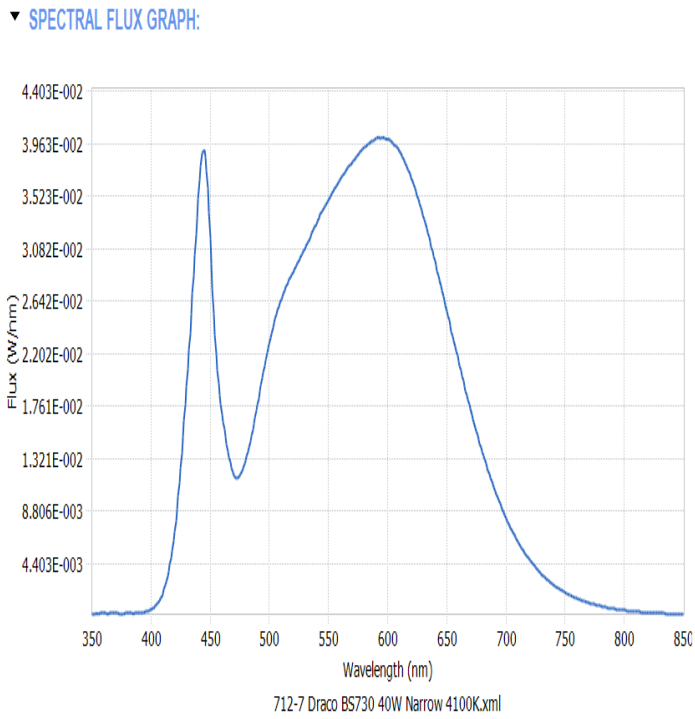
Spectral Flux and Chromaticity Diagram

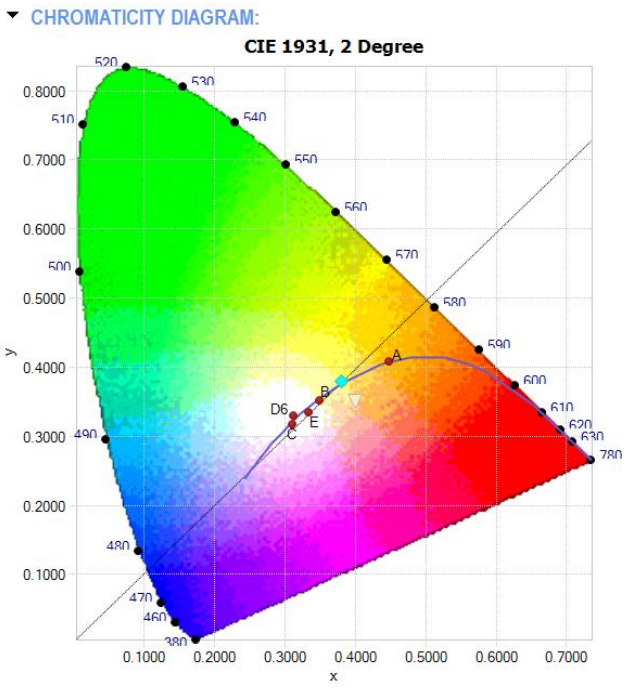
Spectral Flux



Spectral response of the Radiant Flux

(350nm to 850nm)

Chromaticity Diagram



Tristimulus values (from page 5):

x / y = 0.3802 / 0.3794

The locations on the diagram of the tristimulus coordinates are indicated by the blue diamond.

Zonal Lumen Summary

Zone	Lumens	% Lamp / Luminaire
0 - 60	2412.7	98.0 %
60 - 90	48.7	2.0 %
0 - 90	2461.5	100.0 %
90 - 180	0.0	0.0 %
0 - 180	2461.5	100.0 %

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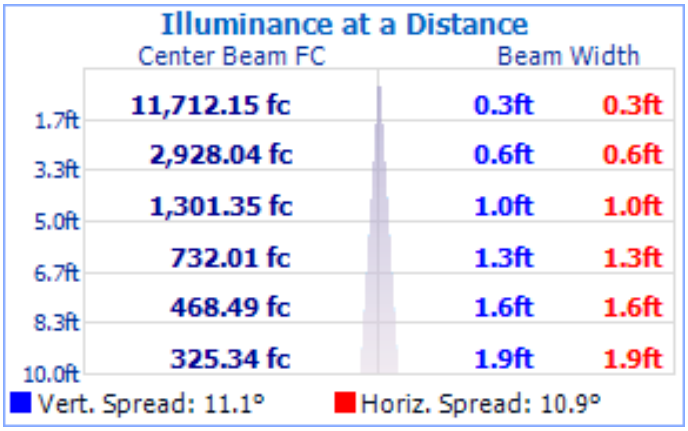
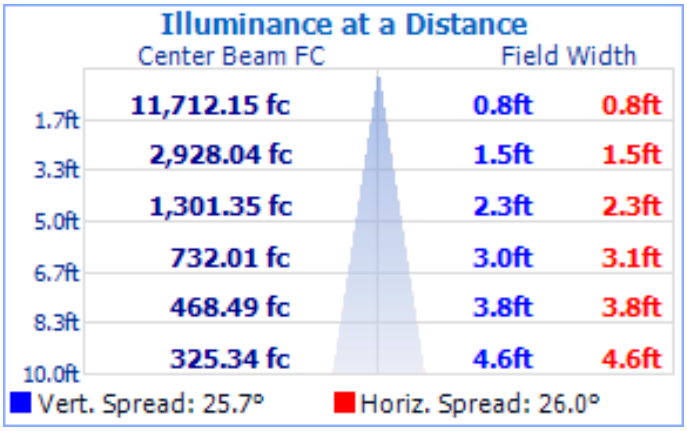
Test Results – Illuminance Plots

The following images depict the illuminance characteristics of the luminaire.



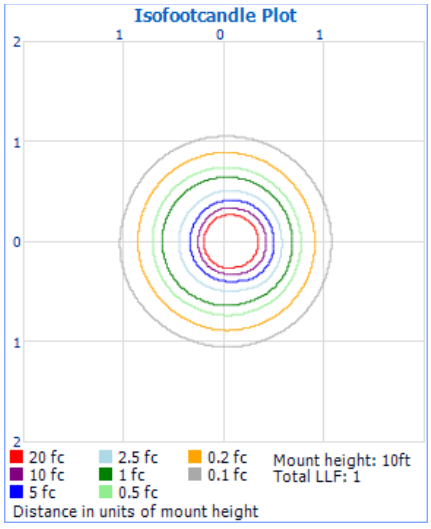


Beam Angle = 11.1°

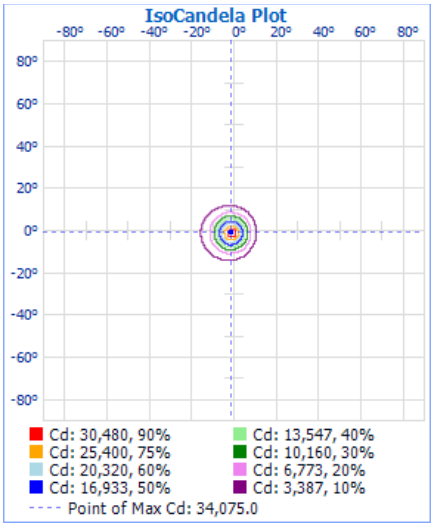
Field Angle = 25.7°

Test Results – Candela Plots

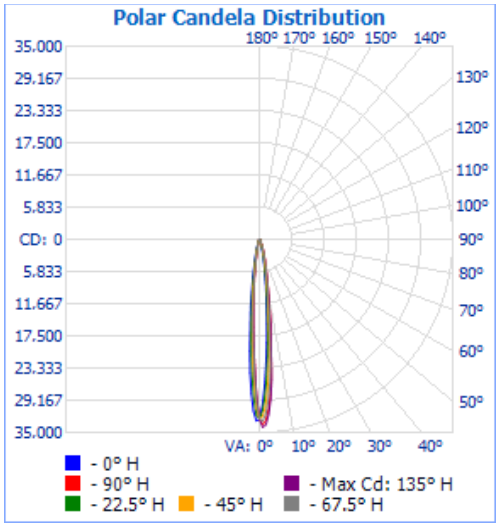
The following images depict the luminous intensity distribution characteristics of the luminaire:



Isofootcandle Plot



Isocandela Plot



Polar Candela

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Test Results – Candela Tabulation

The table below displays the tabulated Candela measurements from the IES file:
Horizontal (lateral) angles are shown in **red** across the top of the table, in increments of 22.5°.
Vertical (longitudinal) angles are shown in **blue** down the side of the table, in increments of 2.5°.

	0.0	22.5	45.0	67.5	90.0	112.5	135.0	157.5	180.0	202.5	225.0	247.5	270.0	292.5	315.0	337.5	360.0
0.0	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534	32534
1.0	30056	31056	32041	32951	33584	33971	**34075**	33715	32888	31837	30606	29474	28760	28346	28564	29110	30063
2.0	26512	28409	30292	31756	32795	33465	33572	32816	31136	28878	26606	24860	23858	23422	23832	24832	26522
3.0	22503	24934	27442	29496	30974	31754	31756	30523	28022	25066	22386	20450	19432	19039	19471	20607	22504
4.0	18672	21067	23920	26509	28273	29210	29032	27381	24236	21106	18551	16767	15838	15501	15866	16904	18667
5.0	15263	17369	20126	23042	25007	25932	25470	23322	20284	17453	15183	13571	12759	12450	12821	13757	15257
7.5	8830	10240	11975	13947	15590	16130	15533	14161	12201	10302	8594	7362	6780	6658	7076	7806	8825
10.0	4986	5960	7062	8204	8998	9318	9043	8222	6919	5581	4308	3579	3309	3350	3748	4282	4984
12.5	2895	3568	4382	5194	5747	5861	5532	4856	3940	3015	2236	1883	1788	1825	2086	2442	2895
15.0	1701	2196	2855	3507	3878	3911	3548	2968	2391	1808	1331	1151	1095	1103	1234	1435	1700
17.5	1045	1389	1975	2488	2710	2683	2345	1875	1524	1149	874	780	743	735	793	902	1044
20.0	687	894	1385	1761	1869	1831	1570	1220	990	751	610	560	536	540	555	612	687
22.5	485	600	961	1199	1249	1209	1046	818	672	519	456	421	406	412	418	446	485
25.0	365	425	654	800	821	789	703	568	478	387	353	329	318	322	329	342	364
27.5	283	318	458	540	541	527	480	404	345	302	280	264	259	262	262	268	283
30.0	214	241	322	372	365	356	337	291	258	243	225	213	205	206	207	203	214
32.5	159	163	199	238	228	226	213	202	190	177	168	158	157	148	148	147	159
35.0	105	114	136	142	137	148	137	140	125	125	118	110	105	102	104	98	105
37.5	74	81	92	92	97	93	96	92	91	86	84	78	71	74	71	72	74
40.0	54	55	59	62	64	66	63	64	64	60	58	53	51	48	47	49	54
42.5	40	42	44	44	45	44	44	46	46	43	41	40	39	39	38	39	40
45.0	33	33	35	35	35	36	37	36	36	35	34	32	33	32	32	31	33
47.5	27	28	29	29	30	30	30	30	30	29	28	27	28	29	28	27	27
50.0	24	24	25	25	26	26	26	26	26	25	25	24	25	25	25	23	24
52.5	22	22	23	23	22	23	23	23	23	23	22	22	23	23	22	22	22
55.0	20	20	21	21	21	21	21	21	21	21	21	20	21	22	21	20	20
57.5	19	19	20	20	20	20	20	20	20	20	20	19	20	20	20	19	19
60.0	19	19	19	19	19	19	20	20	20	19	19	19	19	19	19	19	19
62.5	18	18	18	19	19	19	19	19	19	18	18	18	18	18	18	18	18
65.0	17	17	18	18	18	18	18	18	18	18	17	17	17	17	17	17	17
67.5	16	17	17	17	17	17	18	18	17	17	17	17	16	17	17	16	16
70.0	16	16	16	16	17	17	17	17	17	17	16	16	16	16	16	16	16
72.5	15	15	16	16	16	16	17	17	16	16	16	15	15	16	16	15	15
75.0	15	15	15	15	15	16	16	16	16	16	15	15	15	15	15	15	15
77.5	14	14	15	15	15	16	16	16	16	15	15	14	14	14	14	14	14
80.0	14	14	15	15	15	15	16	16	16	15	15	14	14	14	14	14	14
82.5	13	13	14	14	14	16	16	16	15	15	14	14	13	14	13	13	13
85.0	13	13	13	14	14	14	14	14	14	14	13	13	13	14	14	13	13
87.5	13	13	13	13	13	14	14	14	14	13	13	13	13	13	13	13	13
90.0	13	13	13	13	14	13	14	14	13	13	13	13	13	13	13	13	13

Maximum Candela = **34,075.0** at Horizontal: 135.0°, Vertical: 1.0°

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TÜV SÜD Photometric Testing Information

Testing is performed in accordance with the procedures outlined in IESNA LM79-2008. The sample is evaluated for photometric and electrical characteristics using an integrating sphere and a goniophotometer, located in an accredited, temperature and humidity-controlled, draft free photometric laboratory.

Sphere Geometry

The integrating spheres used for measurement utilize a "4π geometry" configuration in accordance with section 9 of IES LM-79-2008 and is applicable for all types of SSL products (directional and non-directional light projections). The spectroradiometer is an array-type detector manufactured and calibrated by Labsphere (Model# CDS1100).

Self-Absorption Correction

The integrating sphere uses self-absorption correction to eliminate errors due to mismatches between the standard reference lamp and the test samples being measured. This auxiliary correction lamp is a halogen type lamp powered by a calibrated Lamp Power Supply manufactured and calibrated by Labsphere (model LPS150). Ambient temperature is measured using a thermocouple located inside the integrating sphere at the same height as the sample under test (UUT) and not more than 1 meter in horizontal distance away from the sample (section 2.2 of LM79-2008). The thermocouple is located behind a baffle in order to eliminate any direct optical radiation from the sample under test.

Sample Stabilization

The sample (UUT) is placed inside the integrating sphere and powered by a regulated and conditioned alternating or direct current supply. The stabilization times shown on the results pages of this report denote the time of the 3rd measurement (of the 3 consecutive readings) since this is the minimum time that the sample is assumed to have taken to reach stabilization in accordance with section 5.0 of LM79-2008.

Sphere Calibration

The integrating sphere is calibrated using a quartzline halogen lamp with the following specifications:

Manufacturer: EYE Lighting International
Model# J94/JD28V75W
Voltage = 28.0 Volts DC
Wattage = 75.0 Watts
Calibration Current = 2.679 Amperes
Luminous Flux = 1685 Lumens
Calibration Date = 2-17-2011 (calibrated by Labsphere – NIST traceable).

Continued…..

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TÜV SÜD Photometric Testing Information (continued)

Goniophotometer

The Goniophotometer is a Mirror based Type C optical measurement system in accordance with section 9.3.1 of IESNA LM79-2008.

Goniophotometer Calibration

The Goniophotometer is calibrated using a frosted tungsten filament FDS/DZE lamp with the following specifications:

Manufacturer: General Electric
Part Number: CSB-110
Lamp Number: 112-A
Voltage: 16.52 Volts DC
Wattage: 150.0 Watts
Calibration Current: 4.816 Amperes
Luminous Intensity: 151.5 Candelas
Calibration Date: 02-13-2011 (NIST traceable)

TÜV SÜD Test Equipment List:

TÜV SÜD Sphere System – contains the following:			
Description	**Manufacturer / Model#**	**TÜV SÜD Ref#**	**Calibration Due Date**
Integrating Sphere	Labsphere LM760	SPH003	weekly
Spectroradiometer	Labsphere CDS1100	ATLE0048	9/7/2016
Power Analyzer	Yokogawa WT210	ATLE0058	3/7/2014
Power Source	Chroma 61602	AC003	N/A
Thermometer	Fluke 52-II	ATLE0008	11/17/2013
TÜV SÜD Mirror Goniophotometer System – contains the following:			
Goniophotometer	M.E. GONC02	GON002	weekly
Spectroradiometer	Gigahertz Optik P9801	GIG002	weekly
Power Analyzer	Yokogawa WT210	ATLE0031	11/16/2013
Power Source	Chroma 61603	AC007	N/A