

Report Number	GNC-33498
Customer	Abtech Ltd
Contact	Thomas Cox
Product Type	Downlight
Test Purpose	Goniometric (Type C) Intensity Scan - IES/LDT Files & Report - Scan Increments 15 degrees Azimuth by 2.5 degrees inclination
Quote / PO Reference	Q-LUX-302243 / PO (P/079254)
Works Order Number	WO-33498
Test Standards	LM-79-19; (BS) EN 13032-4:2015 + A1 2019; CIE S025:2015
Testing Conducted at	LUX-TSI Limited Unit 1B Pencoed Technology Park, Pencoed, Bridgend, CF35 5AQ
Tested by	Andrew Boon
Date of Receipt of Test Item	12/12/2023
Date(s) of Test	12/12/2023
Analysed by	Gareth Jones
Number of products tested	1

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Signed: 



NIMO Submersible Luminaire

Date: 12/12/2023

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Nomenclature

Lamp Orientation described below relates to the position in which a lamp is designed to operate for maximum performance and safety, these include:

BD - Base Down (bulb is vertically positioned with the metal base at the bottom, glass up)

BU - Base Up (bulb is vertically positioned with the metal base at the top, glass hanging down)

Test Conditions

Measurements were made with an ambient temperature of 25°C +/- 1°C. Measurements were taken only after sufficient time for thermal stabilisation has been allowed. Thermal stabilisation according to LM-79-19 was achieved before measurements are measured and reported.

Calibrations

The far field Type C Goniophotometer is calibrated using an intensity lamp calibrated by a NVLAP accredited calibration laboratory.

Test Equipment

UL LSI Custom Far-Field Type C Moving Mirror Goniophotometer measures intensity as a function of angle. On-axis spectral measurements taken using Gooch and Housego OL770 spectrometer.

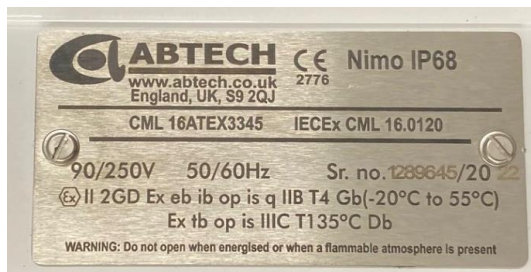
Data Formats

IES (15 deg azimuth and 2.5 deg inclination) and LDT (15 deg C planes and 2.5 deg gamma angles)

Spectral Data file from which the calculation of chromaticity and CRI etc. have been performed and the derived results from the LightMtrX software are provided as a text file format.

All photometric data for LED products will be provided in ABSOLUTE photometric format and all non-LED data will be in relative photometric format with lamp lumens measured separately, where possible, for LOR estimation.

Product Name	NIMO Submersible Luminaire
Part/Serial Number	N/A
Type of Product	Downlight
Lamp Base Type	Luminaire



Test Time	11 mins
Operating Orientation	Downlighting
Test Orientation	Downlighting
Ambient Temperature	25.5°C
Manufacturer	Abtech Ltd
Date of Manufacture	N/A
Thermal Management	Passive
Dimmable	No
Pre-Burning Time	0 hours
Stabilisation Time	27 minutes
Humidity	35.5% RH
Averaging Applied	NONE

Driver Details		
Manufacturer		N/A
Model		N/A
Part/Serial #		N/A
Driver Type		Internal Driver
Output	Voltage	N/A
	Current	N/A
	Power	N/A

Photometric Measurements	
Luminous Flux (lm)	2887 lm
Luminous Efficacy (lm/W)	133 lm/W

Electrical Measurements	
Frequency	50 Hz
Voltage	230 V
Current	0.189 A
Power	21.7 W
Power Factor	0.500
Apparent Power	43.5 VA

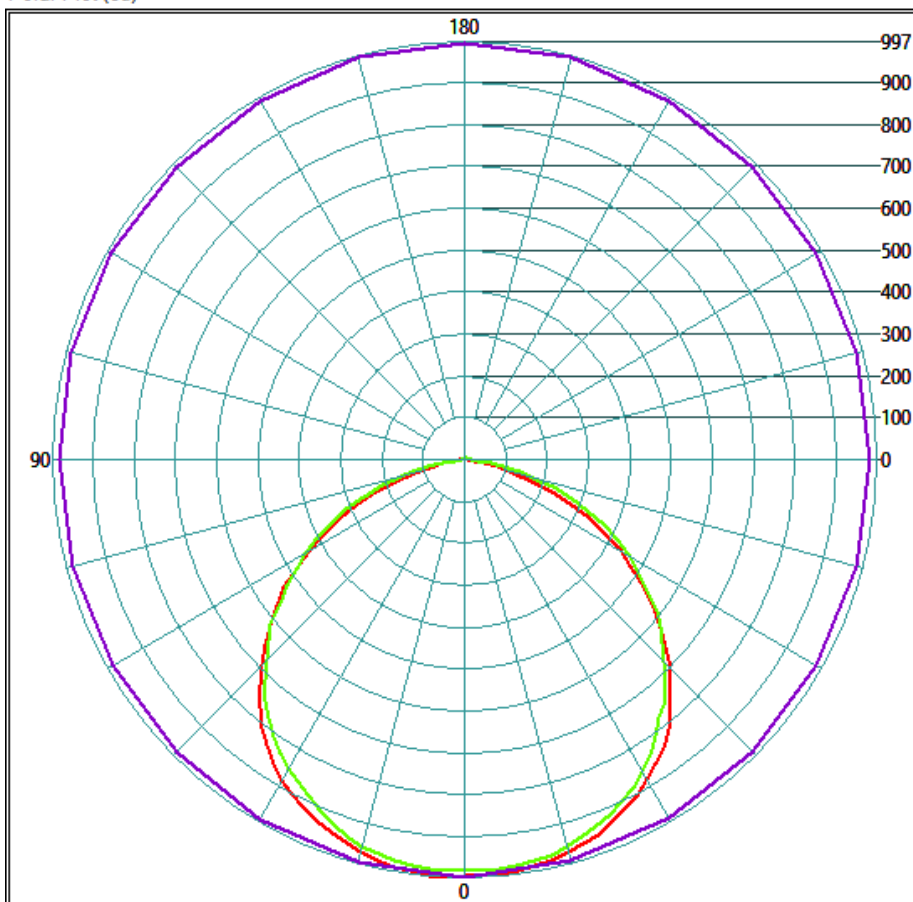
Dimension	Sample	Luminous Opening
Diameter/Width	115 mm	100 mm
Length	720 mm	590 mm
Height/Depth	mm	20 mm

NOTE - these dimensions may not be the same as IES/LDT file due to product geometry for best use in lighting design software

Goniophotometric Measurements

Beam Angle	Horizontal	114°
	Vertical	113°
On-axis Intensity		997 cd
Peak Intensity		997 cd
Peak Direction	Horizontal	0°
	Vertical	0°

Polar Plot (cd)



0.00	Red
180.00	Red
90.00	Green
270.00	Green
0.00	Purple

Mounting Height (m)	Beam Width (m)		Projected Illuminance (lux)
	C0-C180 plane	C90-270 plane	
0.5	1.5	1.5	3988
1	3.1	3.0	997
2	6.1	6.1	249
3	9.2	9.1	111
4	12.2	12.1	62
5	15.3	15.2	40
7.5	22.9	22.7	18
10	30.6	30.3	10
20	61.2	60.6	2

Colorimetric Measurement Results

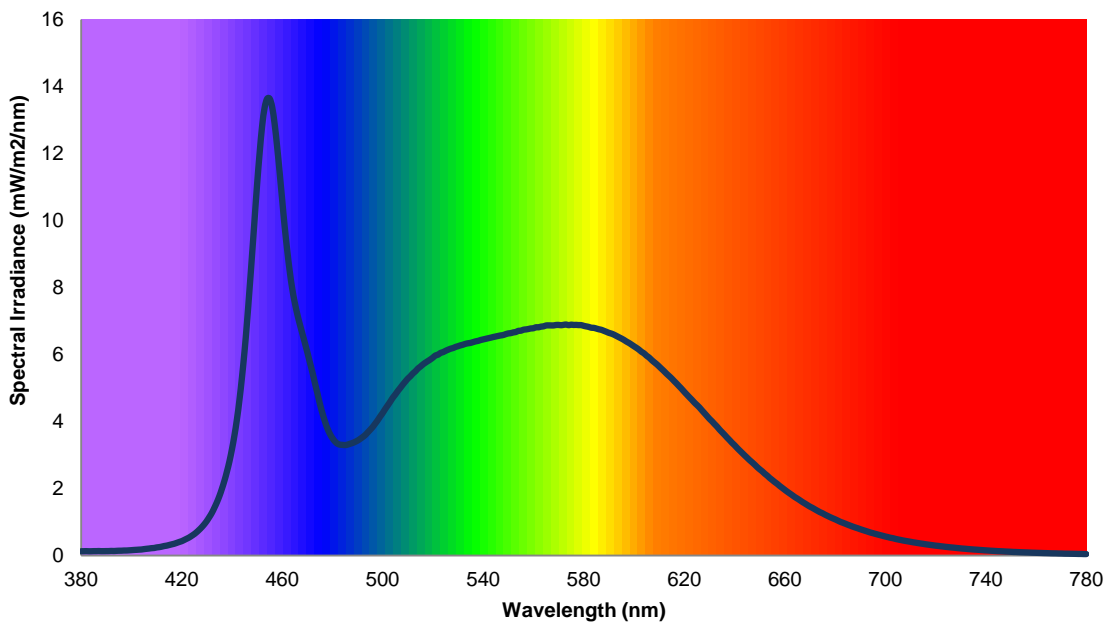
Obtained via On-axis Spectral Measurement

The following data was determined from an on-axis spectral measurement using a Gooch & Housego OLI770 spectrometer at a distance of 15.4m. Angle of mirror where spectrum is measured is 0 degrees. Results may differ if compared to spatially averaged colourimetric result (e.g. measured in an integrating sphere).

LM79 requires spatially averaged colourimetric results (i.e. from a sphere, or from a full gonio colourimetric scan). The colourimetric results in this report do not follow those requirements.

BS (EN) 13032 and CIE S025 do not state this requirement. Compliance with these standards is observed.

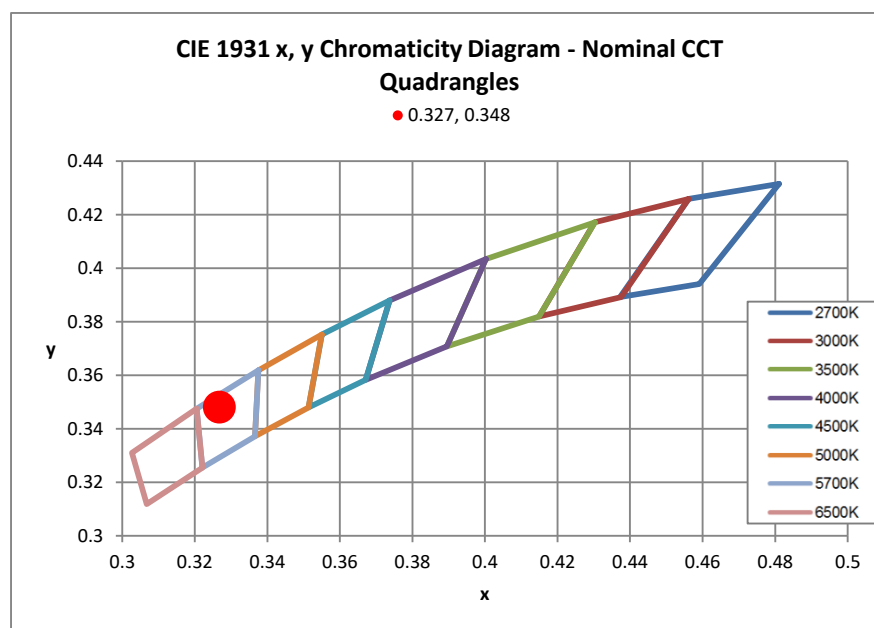
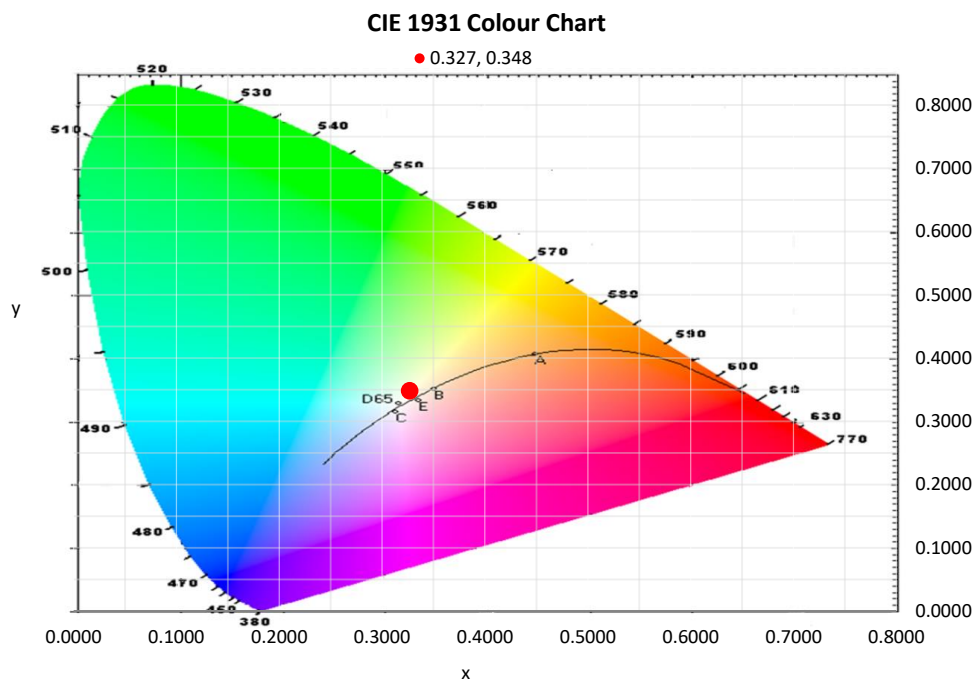
Spectral Irradiance versus Wavelength



Colour Rendering Index Detail			
R1	79	R8	63
R2	89	R9	-7
R3	94	R10	72
R4	78	R11	76
R5	79	R12	54
R6	83	R13	82
R7	86	R14	97

Colorimetric Details	
CCT	5745K
CRI (Ra)	81

Chromaticity Coordinates		
CIE 1931	x	0.3268
	y	0.3481
CIE 1960	u	0.2004
	v	0.3201
CIE 1976	u'	0.2004
	v'	0.4802
Duv		0.0061



Spectral Power Distribution

λ (nm)	mW/m ² /nm	λ (nm)	mW/m ² /nm	λ (nm)	mW/m ² /nm	λ (nm)	mW/m ² /nm
380	1.28E-01	430	1.03E+00	480	3.50E+00	530	6.25E+00
381	1.29E-01	431	1.15E+00	481	3.41E+00	531	6.28E+00
382	1.31E-01	432	1.27E+00	482	3.34E+00	532	6.30E+00
383	1.28E-01	433	1.42E+00	483	3.31E+00	533	6.32E+00
384	1.28E-01	434	1.59E+00	484	3.30E+00	534	6.34E+00
385	1.31E-01	435	1.77E+00	485	3.30E+00	535	6.35E+00
386	1.32E-01	436	1.99E+00	486	3.31E+00	536	6.37E+00
387	1.34E-01	437	2.23E+00	487	3.34E+00	537	6.39E+00
388	1.31E-01	438	2.50E+00	488	3.36E+00	538	6.41E+00
389	1.31E-01	439	2.81E+00	489	3.39E+00	539	6.43E+00
390	1.33E-01	440	3.17E+00	490	3.43E+00	540	6.45E+00
391	1.34E-01	441	3.59E+00	491	3.48E+00	541	6.47E+00
392	1.38E-01	442	4.07E+00	492	3.54E+00	542	6.49E+00
393	1.36E-01	443	4.65E+00	493	3.59E+00	543	6.51E+00
394	1.40E-01	444	5.33E+00	494	3.67E+00	544	6.52E+00
395	1.44E-01	445	6.09E+00	495	3.75E+00	545	6.54E+00
396	1.45E-01	446	6.97E+00	496	3.84E+00	546	6.56E+00
397	1.49E-01	447	7.95E+00	497	3.94E+00	547	6.57E+00
398	1.50E-01	448	8.97E+00	498	4.04E+00	548	6.58E+00
399	1.55E-01	449	1.00E+01	499	4.15E+00	549	6.61E+00
400	1.60E-01	450	1.11E+01	500	4.26E+00	550	6.63E+00
401	1.67E-01	451	1.20E+01	501	4.38E+00	551	6.64E+00
402	1.71E-01	452	1.28E+01	502	4.48E+00	552	6.66E+00
403	1.76E-01	453	1.34E+01	503	4.59E+00	553	6.67E+00
404	1.81E-01	454	1.36E+01	504	4.71E+00	554	6.71E+00
405	1.92E-01	455	1.36E+01	505	4.81E+00	555	6.71E+00
406	2.01E-01	456	1.34E+01	506	4.91E+00	556	6.74E+00
407	2.10E-01	457	1.29E+01	507	5.01E+00	557	6.75E+00
408	2.20E-01	458	1.22E+01	508	5.10E+00	558	6.76E+00
409	2.26E-01	459	1.14E+01	509	5.19E+00	559	6.78E+00
410	2.42E-01	460	1.06E+01	510	5.28E+00	560	6.79E+00
411	2.51E-01	461	9.81E+00	511	5.35E+00	561	6.82E+00
412	2.65E-01	462	9.11E+00	512	5.44E+00	562	6.81E+00
413	2.84E-01	463	8.49E+00	513	5.50E+00	563	6.83E+00
414	2.96E-01	464	7.96E+00	514	5.58E+00	564	6.84E+00
415	3.15E-01	465	7.55E+00	515	5.64E+00	565	6.87E+00
416	3.34E-01	466	7.21E+00	516	5.70E+00	566	6.87E+00
417	3.52E-01	467	6.91E+00	517	5.76E+00	567	6.87E+00
418	3.78E-01	468	6.63E+00	518	5.81E+00	568	6.87E+00
419	4.04E-01	469	6.35E+00	519	5.86E+00	569	6.88E+00
420	4.30E-01	470	6.07E+00	520	5.91E+00	570	6.88E+00
421	4.65E-01	471	5.77E+00	521	5.97E+00	571	6.88E+00
422	5.02E-01	472	5.48E+00	522	6.00E+00	572	6.89E+00
423	5.41E-01	473	5.16E+00	523	6.05E+00	573	6.90E+00
424	5.89E-01	474	4.84E+00	524	6.07E+00	574	6.88E+00
425	6.41E-01	475	4.53E+00	525	6.11E+00	575	6.89E+00
426	7.02E-01	476	4.25E+00	526	6.14E+00	576	6.88E+00
427	7.71E-01	477	4.01E+00	527	6.17E+00	577	6.89E+00
428	8.48E-01	478	3.79E+00	528	6.19E+00	578	6.88E+00
429	9.34E-01	479	3.63E+00	529	6.23E+00	579	6.88E+00
						580	6.86E+00

Spectral Power Distribution

λ (nm)	mW/m ² /nm	λ (nm)	mW/m ² /nm	λ (nm)	mW/m ² /nm	λ (nm)	mW/m ² /nm
581	6.84E+00	631	4.01E+00	681	1.05E+00	731	2.07E-01
582	6.83E+00	632	3.93E+00	682	1.01E+00	732	2.01E-01
583	6.80E+00	633	3.85E+00	683	9.82E-01	733	1.94E-01
584	6.80E+00	634	3.76E+00	684	9.54E-01	734	1.88E-01
585	6.78E+00	635	3.69E+00	685	9.23E-01	735	1.81E-01
586	6.75E+00	636	3.61E+00	686	8.94E-01	736	1.77E-01
587	6.74E+00	637	3.53E+00	687	8.66E-01	737	1.71E-01
588	6.71E+00	638	3.45E+00	688	8.40E-01	738	1.66E-01
589	6.68E+00	639	3.37E+00	689	8.15E-01	739	1.60E-01
590	6.65E+00	640	3.30E+00	690	7.88E-01	740	1.54E-01
591	6.63E+00	641	3.22E+00	691	7.63E-01	741	1.50E-01
592	6.60E+00	642	3.14E+00	692	7.39E-01	742	1.44E-01
593	6.56E+00	643	3.07E+00	693	7.15E-01	743	1.40E-01
594	6.52E+00	644	2.99E+00	694	6.90E-01	744	1.35E-01
595	6.48E+00	645	2.92E+00	695	6.69E-01	745	1.31E-01
596	6.44E+00	646	2.85E+00	696	6.48E-01	746	1.28E-01
597	6.39E+00	647	2.78E+00	697	6.29E-01	747	1.24E-01
598	6.35E+00	648	2.72E+00	698	6.08E-01	748	1.20E-01
599	6.30E+00	649	2.64E+00	699	5.90E-01	749	1.17E-01
600	6.25E+00	650	2.58E+00	700	5.69E-01	750	1.13E-01
601	6.20E+00	651	2.52E+00	701	5.52E-01	751	1.07E-01
602	6.15E+00	652	2.45E+00	702	5.32E-01	752	1.06E-01
603	6.08E+00	653	2.39E+00	703	5.18E-01	753	1.01E-01
604	6.04E+00	654	2.32E+00	704	4.99E-01	754	9.84E-02
605	5.97E+00	655	2.26E+00	705	4.81E-01	755	9.60E-02
606	5.91E+00	656	2.20E+00	706	4.67E-01	756	9.29E-02
607	5.84E+00	657	2.14E+00	707	4.51E-01	757	9.11E-02
608	5.77E+00	658	2.08E+00	708	4.37E-01	758	8.70E-02
609	5.71E+00	659	2.02E+00	709	4.24E-01	759	8.43E-02
610	5.64E+00	660	1.96E+00	710	4.11E-01	760	8.24E-02
611	5.57E+00	661	1.91E+00	711	3.97E-01	761	7.93E-02
612	5.50E+00	662	1.85E+00	712	3.85E-01	762	7.73E-02
613	5.43E+00	663	1.80E+00	713	3.73E-01	763	7.41E-02
614	5.36E+00	664	1.75E+00	714	3.61E-01	764	7.20E-02
615	5.29E+00	665	1.70E+00	715	3.50E-01	765	6.99E-02
616	5.21E+00	666	1.65E+00	716	3.37E-01	766	6.71E-02
617	5.13E+00	667	1.60E+00	717	3.27E-01	767	6.56E-02
618	5.05E+00	668	1.56E+00	718	3.17E-01	768	6.42E-02
619	4.97E+00	669	1.51E+00	719	3.07E-01	769	6.12E-02
620	4.89E+00	670	1.46E+00	720	2.96E-01	770	6.03E-02
621	4.81E+00	671	1.42E+00	721	2.88E-01	771	5.74E-02
622	4.73E+00	672	1.38E+00	722	2.78E-01	772	5.57E-02
623	4.65E+00	673	1.34E+00	723	2.70E-01	773	5.48E-02
624	4.57E+00	674	1.30E+00	724	2.61E-01	774	5.30E-02
625	4.50E+00	675	1.26E+00	725	2.52E-01	775	5.17E-02
626	4.42E+00	676	1.22E+00	726	2.44E-01	776	5.00E-02
627	4.34E+00	677	1.19E+00	727	2.38E-01	777	4.80E-02
628	4.25E+00	678	1.15E+00	728	2.30E-01	778	4.76E-02
629	4.17E+00	679	1.11E+00	729	2.21E-01	779	4.49E-02
630	4.09E+00	680	1.08E+00	730	2.14E-01	780	4.41E-02

Measurement Uncertainty

The following is the reported expanded uncertainty of the UL 6440T Type C Mirror Goniophotometer.

Parameter	Uncertainty
Total Luminous Flux (%)	± 4.9
Luminous Intensity (%)	± 4.9
Temperature (°C)	± 0.13
Voltage DC TY720 (%)	± 0.017
Current DC TY720 (%)	± 0.10
Voltage AC WT210 (%)	± 0.059
Current AC WT210 (%)	± 0.025
Power AC WT210 (%)	± 0.23
Frequency (50/60 Hz) WT210 (%)	± 0.004
Power Factor WT210 (%)	± 0.06

The reported expanded uncertainty is based on the combined standard uncertainty multiplied by a coverage factor of $k = 2$. This value of k gives a coverage probability of approximately 95%, assuming a normal distribution. This determination of the measurement uncertainty has been done in accordance with international requirements including UKAS, BIPM Guide to the Expression of Uncertainty in Measurement and CIE 198:2011 and CIE S 025/E:2015.

Electrical measurement equipment used for the determination of results for this report, are compliant and meet the performance requirements of the measurement standards used.

----- END OF REPORT -----