

Promoting Energy Efficient Lighting Education in Nepal and Bhutan [ELNAB]



Co-funded by the
Erasmus+ Programme
of the European Union



TECHNICAL SPECIFICATIONS For Supply, Delivery, Installation and Testing of Lighting Measurement Equipment

June, 2017

Technical Specification for procurement of equipment.

1. Illuminance Meter:

Measuring parameters: Illuminance, illuminance difference, illuminance ratio, integrated illuminance, integration time and average illuminance.

Technical requirements

S. No.	Description	Specification	Value/Range	Remarks
1	Receptor placement	Detachable		
2	Receptor sensor material	Silicon photocell		
3	Receptor cord length		> 1m	
4	Measurement range	Automatic and manual	0.01 to 2,90,000 Lux	
5	Relative spectral response	Percentage of CIE V(λ) for photopic vision	<6%	
6	Cosine correction		<3%	
7	Linearity limit		$\pm 2\%$	
8	Operating temperature		-10 to 40 °C	
9	Storage temperature		-20 to 55 °C	
10	Temperature humidity drift		$\pm 3\%$	
11	User calibration function	Color correction factor setting		
12	Output	Digital and analog		
13	Display	LCD with automatic backlight		
14	Power source	Battery and AC adaptor		

Should have port for both analog and digital output of measured data.

2. Luminance Meter:

Measuring parameters: Point illuminance measurement of light source and surface with measurement modes for instantaneous value, maximum/minimum value, luminance difference and luminance ratio.

Technical requirements

S. No.	Description	Specification	Value/Range	Remarks
1	Optical system	SLR viewing system		
2	Angle of view	With dipole adjustment	9 °	
3	Measuring angle		1 ° or 1/3 °	
4	Measurement range	Automatic and manual	0.01 to 999,900 cd/m ²	
5	Relative spectral response	Close to CIE V(λ)		
6	Spectral response mismatch	mismatch index (f1')	<3%	
7	Minimum measurement area		<14mm	
8	Operating temperature		0 to 40 °C	
9	Storage temperature		0 to 45 °C	
10	Accuracy		±2%	
11	User calibration	Calibration channel	10	
12	Output	Digital and analog		
13	Display	LCD with automatic backlight		
14	Power source	Battery and AC adaptor		

Should have port for digital interface.

3. Modular Spectroradiometer system with integrating sphere, AC and DC power source and power meter:

Measuring parameters: Spectral data and calculation of luminous flux, chromaticity coordinates, CCT, CRI, luminous efficacy, radiant power, Color purity, power factor, RSPDF.

Technical requirements:

3.1 Integrating sphere and Spectroradiometer:

S. No.	Description	Specification	Value/Range	Remarks
1	Sphere size	Diameter	1.5m	
2	Sphere coating	High reflectance diffused		
3	Sphere reflectance	Non selective in visible range	>90%	
4	Baffles location and coating	Inside the sphere with high disused reflectance		
5	Auxiliary lamp	Mounting on lamp to allow self-absorption measurement	Halogen lamp	
6	Luminous flux range		50-20000lm	
7	Luminous flux accuracy		3% f.s.+0.001lm	
8	Luminous flux resolution		0.001lm	
9	Color temperature range		1300-25000k	
10	Spectroradiometer entrance port of integrating sphere with cosine correction	Cosine correction with a value of f2	<15%	
11	Measuring wavelength range	Visible range	380nm to 780nm	
12	Wavelength uncertainty		<0.5nm	
13	Wavelength accuracy		±0.5nm	
14	Wavelength resolution		0.1nm	
15	Linearity correction		>99.8%	
16	Chromaticity coordinates accuracy	Under standard illuminant	± 0.002	
17	Chromaticity coordinate resolution		0.0001	

18	Bandwidth and scanning interval		<5nm	
19	Measurement standard	4 π measurement complying LM79		
20	Repeatability of measurement after opening and closing the sphere		$\pm 0.5\%$	
21	Calibration	Reference calibration standard traceable to SI. Capability of calibrating from both software and hardware end.		
22	Built in power source			
23	Power source	Constant current power source		
24	Current supply range		1-15000 mA	
25	Voltage range		0-20V	
26	Forward and reverse voltage accuracy		0.02V	
27	Constant current supply accuracy		0.02%+0.1mA	
28	Stability drift	Within 3 minutes	0.002	

3.2 Programmable DC power source:

Should be constant current and constant voltage power source for powering DC lamps and DC luminaires. Capability of adjusting from hardware and remotely from software of Spectroradiometer.

S. No.	Description	Parameter	Value/Range	Remarks
1	Rated output	Voltage/Current	0-32V/0-6A	
2	Load regulation	Voltage	$\leq 0.01\% + 5\text{mV}$	
		Current	$\leq 0.01\% + 3\text{mA}$	

3	Power source regulation	Voltage	$\leq 0.01\% + 5\text{mV}$	
		Current	$\leq 0.01\% + 3\text{mA}$	
4	Set point resolution	Voltage	1mV	
		Current	0.1mA	
5	Backward read resolution	Voltage	1mV	
		Current	0.1mA	
6	Set point accuracy 1 year (25°C±5°C)	Voltage	$\leq 0.04\% + 8\text{mV}$	
		Current	$\leq 0.1\% + 8\text{mA}$	
7	Backward read accuracy 1 year (25°C±5°C)	Voltage	$\leq 0.04\% + 8\text{mV}$	
		Current	$\leq 0.1\% + 8\text{mA}$	
8	Ripple and noise (20HZ-20M)	difference-mode voltage	$\leq 4\text{mVp-p}$ and 1mVrms	
		difference-mode current	$< 6\text{mA}_{\text{rms}}$	
		Common-mode current	$< 1.5\mu\text{A}_{\text{rms}}$	
9	Dynamic response time (return to 75mV)	50%-100% load	100	
		drop 10%-90%	$< 350\text{ms}$	

3.3 Programmable variable frequency AC power source:

S. No.	Description	Value/Range	Remarks
1	Power	1KVA	
2	AC input	single phase 220V±10% 50Hz±5Hz	
3	AC output	Downshift: 0-150V Top shift: 151-300V; resolution 0.1V	
4	Allowance error	±1%;	

5	Variable frequency range	45Hz -400Hz, resolution 0.1Hz	
6	Fixed frequency output	50 Hz	
7	Frequency stability	$\leq 0.1\%$	
8	Voltage stability	$\leq 1\%$	
9	Distortion	$\leq 2\%$ (resistive load)	
10	Crest factor	3:1	
11	Source voltage effect	$\leq 1\%$	
12	Loading effect	$\leq 1\%$	
13	Efficiency	$\geq 80\%$	
14	Frequency display	4 digits LED, resolution 0.1Hz	
15	Voltage display	4 digits LED, resolution 0.1V	
16	Current display	4 digits LED, resolution 0.001A/0.1A	
17	Power display	4 digits LED, resolution 0.01W/0.1Kw	
18	Power factor display	3 digits LED, resolution 0.01	
19	Preset function	Preset for output voltage, output frequency, float percentage of output voltage	
20	Shortcut function	Common voltage, frequency conversion and output voltage float choice	
21	Protection	Overload and overheat protection	

3.4 AC and DC digital power meter.

Should be capable of measuring voltage, current, power and power factors of AC, DC or AC+DC. Digital communication port with data acquisition system.

S. No.	Description	Value/Range	Remarks
1	Voltage measurement range	0-600 V AC and DC	
2	Voltage measurement error	<0.4%	
3	Current measurement range	0.005A-10.00A AC and DC	

4	Current measurement error	<0.4%	
5	Power factor measurement range	0.000 – 1.000	
6	Power factor measurement error	<0.4%	

4. Portable Goniophotometer:

Goniophotometer should be portable plug and play system with weight less than 10 Kg. Measurement and power supply unit should be modular with AC and DC power source and power meter.

Measuring parameters: Luminous intensity distribution, beam angle and lumen output

Technical requirements

4.1 Goniophotometer and measurement system:

S. No.	Description	Specification	Value/Range	Remarks
1	Average lumens error		<10%	
2	Intensity accuracy		<3%	
3	Measurement resolution		At least 0.1 degree	
4	Test sample rotation	Vertical rotation range	0 to 360 degree	
5	Test sample rotation	Horizontal rotation range	-90 to +90 degree	
6	LED base type support		E27, B22, E18 and GU10	
7	Computer interface	Digital interface with dedicated software		
8	Spectral range		380 to 780 nm	
9	Spectral resolution		<5nm	
10	Accuracy	Accuracy class 1		
11	Reference	Standard reference lamp		
12	Temperature sensor	High accuracy temperature		

		detector		
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4.2 Programmable DC power source:

Should be constant current and constant voltage power source for powering DC lamps and DC luminaires. Capability of adjusting from hardware and remotely from software of goniophotometer.

S. No.	Description	Parameter	Value/Range	Remarks
1	Rated output	Voltage/Current	0-32V/0-6A	
2	Load regulation	Voltage	$\leq 0.01\% + 5\text{mV}$	
		Current	$\leq 0.01\% + 3\text{mA}$	
3	Power source regulation	Voltage	$\leq 0.01\% + 5\text{mV}$	
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		difference-mode current	$< 6\text{mA}_{\text{rms}}$	
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2	AC input	single phase 220V \pm 10% 50Hz \pm 5Hz	
3	AC output	Downshift: 0-150V Top shift: 151-300V; resolution 0.1V	
4	Allowance error	\pm 1%;	
5	Variable frequency range	45Hz -400Hz, resolution 0.1Hz	
6	Fixed frequency output	50 Hz	
7	Frequency stability	\leq 0.1%	
8	Voltage stability	\leq 1%	
9	Distortion	\leq 2%(resistive load)	
10	Crest factor	3:1	
11	Source voltage effect	\leq 1%	
12	Loading effect	\leq 1%	
13	Efficiency	\geq 80%	
14	Frequency display	4 digits LED, resolution 0.1Hz	
15	Voltage display	4 digits LED, resolution 0.1V	
16	Current display	4 digits LED, resolution 0.001A/0.1A	
17	Power display	4 digits LED, resolution 0.01W/0.1Kw	
18	Power factor display	3 digits LED, resolution 0.01	
19	Preset function	Preset for output voltage, output frequency, float percentage of output voltage	
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2	Voltage measurement error	<0.4%	
3	Current measurement range	0.005A-10.00A AC and DC	
4	Current measurement error	<0.4%	
5	Power factor measurement range	0.000 – 1.000	
6	Power factor measurement error	<0.4%	