

Technical Specifications

For the supply, delivery, installation, and commissioning of laboratory equipment for measuring light sources in three EAC and SADC regional reference laboratories.

Project Title: “Energy Efficient Lighting and Appliances in Southern and Eastern Africa”

UNIDO Project ID: 190108

1. BACKGROUND INFORMATION

The Energy Efficient Lighting and Appliances (EELA) Project in East and Southern Africa is funded by the Government of Sweden through the Swedish International Development Cooperation Agency (Sida). The project is implemented by the United Nations Industrial Development Organization (UNIDO) in cooperation with two regional sustainable energy centers (GN-SEC), the East African Centre of Excellence for Renewable Energy and Efficiency (EACREEE) and the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE). The Swedish Energy Agency (SEA) and Collaborative Labeling and Appliance Standards Program (CLASP) are two main technical partners on the project. The project promotes a market transformation for energy efficient lighting and appliances in the East African Community (EAC) and Southern African Development Community (SADC) regions by supporting the creation of market and institutional conditions for the increased diffusion of EELA across all sectors.

The EAC and SADC regions are characterized by weak legislation and regulation for energy efficiency measures for lighting and appliances in both residential as well as commercial applications. In countries where standards for EELA have been introduced, porous borders contribute to imports of sub-standard products, effectively harming the formation of an emerging market. In the area of lighting, the transition to LED-based products has slowly taken off as several commercial players have voluntarily started to phase out incandescent lamps and in some cases even compact fluorescent lamps (CFLs). However, in general, it was found that the market offers lighting products of varying quality. Regulatory and policy institutions in the Member States, such as national bureaus of standards, started to address the issue of

sub-standard products but currently lack the capacity to enforce the required quality levels, including not having adequate lighting test equipment for verification of claimed performances by product packaging to set standards.

The project has developed and facilitated the adoption process of regionally harmonised MEPS for lighting products in the EAC and SADC regions. Both regions have now adopted the new MEPS for lighting (EAS 1064-1&2:2022 and SADC HT109-2021). The project has also developed a Regional Compliance Framework, a strategy and action plan to assist Member States in the implementation of energy efficiency standards and policies developed under the project. Building regional testing capacity is one of the five main Elements of the proposed Framework, along with strengthening regional centres and coordination mechanisms, developing and adopting regional product registration system, kicking off intelligence sharing and enforcement collaboration, and designing and implementing national programmes.

Laboratory testing plays a critical role in the conformity assessments to ensure that regulated products and appliances conform to the new MEPS. However, these can be cost intensive and hard to sustain if there is not sufficient demand for testing. For this reason, as stated in the project document, the EELA project is to capacitate two to three regional reference laboratories in the EAC and SADC regions. The regional reference laboratories will service the testing requirements in their respective regions and, in parallel, they will need to assume an integral role in the collaborative network of knowledge sharing between national test laboratories and be accessible to these laboratories for capacity building activities that the EELA project is planning to subsequently guide.

2. AIM OF THIS ENGAGEMENT

UNIDO intends to procure laboratory equipment for measuring light sources in the three EAC and SADC regional reference laboratories, namely the Uganda National Bureau of Standards (UNBS) in Uganda, the Instituto Nacional de Normalização e Qualidade (INNOQ) in Mozambique, and the Zambia Bureau of Standards (ZABS) in Zambia. The equipment will allow to screen the lighting products in the market and verify conformity with the adopted regional MEPS (EAS 1064-1&2:2022 and SADC HT109-2021).

UNIDO seeks to identify a suitable supplier to supply, deliver, install, and commission laboratory equipment and provide training and after sales services to the laboratories as per the minimum specifications stated in these Technical Specifications, and the Lots below:

- **LOT 1:** Instituto Nacional de Normalização e Qualidade (INNOQ), Mozambique;
- **LOT 2:** Uganda National Bureau of Standards (UNBS), Uganda;

- **LOT 3:** Zambia Bureau of Standards (ZABS), Zambia.

The supplier will work in coordination with UNIDO, SACREEE based in Windhoek, Namibia and EACREEE based in Kampala, Uganda.

3. THE SCOPE OF SUPPLY

3.1 LOT 1: Instituto Nacional de Normalização e Qualidade

3.1.1 Equipment to be supplied:

The supplier is required to supply the following equipment in the quantities specified for the below rooms:

A. Goniometer room

Item #	Equipment	Quantity
1.1	Goniometer system	1
1.2	AC/DC power analyser	1
1.3	Goniometer AC/DC power supply for DUT	1
1.4	WiFi router for connecting to smart lighting DUT	1
1.5	Self-leveling laser for DUT alignment	1
1.6	Reference Lamp AC or DC, powered by goniometer power supply	1
1.7	Flicker meter	1
1.8	Handheld contact free temperature measurement tool	1
1.9	Computer for goniometer	1
1.10	Screen for computer	1
1.11	Color Laser Printer/copier/scanner - Three in one	1
1.12	Desk for the computer	1

B. Lamp aging room

Item #	Equipment	Quantity
1.13	AC/DC power supplies for aging room	1
1.14	PV Hybrid grid and battery connected inverter	1
1.15	Battery backup	1
1.16	PV array (optional)	1

3.1.2 Specifications for the rooms and equipment

The supplied equipment should be compliant with the following parameters.

UNIDO will engage with a local company to complete the required civil and electrical works to comply with the below room parameters. This will include partitioning of the provided space to allow for optimal utilization of testing areas and storage of samples; installation of roof and deck, partitioning sections to enclose and create a temperature-controlled environment suitable for installation of the goniometer, painting of walls and the floor, etc.; and extending of power supply line to provide enough power outlets for the equipment and other associated accessories in the partitioned space. The supplier may provide additional requirements as needed for the installation of the supplied equipment.

Room	Specification	Unit	Standard / Parameters	Min	Max
Goniometer room	Temperature	Celsius (°C)		24	26
	Humidity		IEC 60969, EN 62612 or equivalent		
	Air velocity		CIE S 025		
	Room Length	Metre (m)		11	11
	Room Width	Metre (m)		4.5	4.5
	Room Height	Metre (m)		6	6
	Floor, construction		Concrete		
	Floor, surface		Matte, dark plastic carpet		
	Walls		Matte, dark		
	Ceiling		Matte, dark		
	Available power		Single phase, 230V, 50Hz		
	Available power sockets		Round Pin, Type M		
	Standby measurement	Watt (W)	IEC 63103 or equivalent		
Lamp aging room	Temperature	Celsius (°C)	DEAS 1064-2 2021 A.2.1 or equivalent	15	35
	Humidity		IEC 60969, EN 62612 or equivalent		
	Air velocity		CIE S 025 or equivalent		
	Length	Metre (m)		4.3	4.3
	Width	Metre (m)		2.0	2.0
	Height	Metre (m)		2.4	2.4
	Floor, construction		Concrete		
	Floor, surface		Plastic carpet		

	Walls		Matte, white		
	Ceiling		Matte, white		
	Available power	Watt (W)	Single phase, 230V, 50Hz	4000	
	Available power sockets		Round pin Type M		
	Project life time according to		TM-21, LM-79, LM-80		

Equipment	Specification	Unit	Standard / Parameters	Min	Max
1.1 Goniometer system (Type C Gonio-spectroradiometer with an auxiliary Photometer/spectral meter with moving detector and stationary DUT . Laser aided DUT positioning or better system. The main goniospectroradiometer components must include at minimum: Photometer, a luminance camera Spectroradiometer, AC and DC power source, Power analyzer)	Max luminaire diameter for proposed goniometer	Centimetre (cm)		60	200
	Luminous flux	Lumen (lm)	IEC 62722-2-1, CIE S 025, IEC 62722-2 series, CIE 84 CIE 121 or equivalent	1	
	Intensity	Candela		1	∞
	Beam angle		EN 61341, IES LM-79, CIE S 025 or equivalent		
	Colour coordinates (x,y)		CIE 015 or equivalent		
	Correlated colour temperature (CCT)	Kelvin (K)	IEC 62722-2-1 CIE S 025, CIE 015, ANSI C78.377 or equivalent	2200	6500
	Colour rendering	Color Rendering Index (CRI), Ra	IEC 62722-2-1, CIE S 025, CIE 13.3, IES TM-30-15 or equivalent	0	100
	Colour consistency	Standard Deviation Colour Matching (SDCM)	IEC 62722-2-1, CIE S 025, CIE 015 or equivalent	3	
	Spectral intensity range	Nanometers (nm)	DEAS 1064-1 2021 §5.3.2.2 or equivalent	250	800
	Goniometer control software:				
	<ul style="list-style-type: none"> Installed on the supplied computer Local data storage Graphical output of light intensity distribution (LID) Graphical output of spectral 				

	<p>intensity distribution</p> <ul style="list-style-type: none"> Graphical output of black body locus and chromaticity x,y coordinates Report generator included Report formatting included Energy class calculation included Data export to excel Averaging data from 10 measurements available 				
1.2 AC/DC power analyser	AC Input power	Volt (50/60Hz)		200	300
	AC Power	Watt (W)	IEC 62722-2-1, CIE S 025, EC 62722-2 series CIE 84 CIE 121 or equivalent	1000	
	AC Voltage	Volt (V)	CIE S 025 or equivalent	400	
	AC Current	Ampere (A)	CIE S 025 or equivalent	20	
	AC displacement factor		IEC 62722-2-1 or equivalent	0	1
	AC Channels	Each		3	
	DC Power	Watt (W)	CIE S 025 or equivalent	100	
	DC Voltage	Volt (V)	CIE S 025 or equivalent	48	
	DC Current	Ampere (A)	CIE S 025 or equivalent	10	
	DC Channels			3	
	Standby measurement	Watt (W)	IEC 63103 or equivalent		
1.3 Goniometer AC/DC power supply for device under test (DUT)	AC Power output	Watt (W)	CIE S 025 or equivalent	500	2000
	AC Voltage output	Volt (V)	CIE S 025, IEC TR 61547 or equivalent	220	240
	AC Current output	Ampere (A)	CIE S 025 or equivalent	0	20

	Power quality output	Total Harmonic Distortion (THD)	IEC 61000-4-11, IEC 61000-4-5, IEC 61000-4-7 IEC 61000-3-2 or equivalent		
	DC Power output	Watt (W)	CIE S 025 or equivalent	0	100
	DC Voltage output	Volt (V)	CIE S 025 or equivalent	0	48
	DC Current output	Ampere (A)	CIE S 025 or equivalent		10
	AC Voltage input	Volt (V)		180	250
	AC frequency	Hertz (Hz)		50	60
1.4 WiFi router for connecting to smart lighting DUT	<ul style="list-style-type: none"> • Protocol 802.11n • Frequency 2.4GHz and 5GHz • Maximum data rate up to 450Mbps 				
1.5 Self-leveling laser for DUT alignment	Laser (x and y)	pieces (pcs)		1	1
	Tripod for the laser	pieces (pcs)		1	1
1.6 Reference Lamp AC or DC, powered by goniometer power supply	Reference lamp, luminous flux	Lumen (lm)	CIE 84, CIE S 025 or equivalent		
	Calibration included				
1.7 Flicker meter	Tripod for flicker meter head	pieces		1	1
	Short Term Flicker Perceptibility - P_{ST} (Mandatory requirement)		CIE:TN-006, CIE:TN-012, IEC TR 61547-1 or equivalent		
	Stroboscopic Effect Visibility Measure - SVM (Mandatory requirement)		CIE:TN-006, CIE:TN-012, IEC TR 63158 or equivalent		
	Flicker percent		IEEE Std 1789-2015, IES: RP-16-10, CIE:TN-006, CIE:TN-012 or equivalent		
	Flicker index		IEEE Std 1789-2015, IES: RP-16-10, CIE:TN-006, CIE:TN-012 or equivalent		
	PC interface included				
	Measurement software included				
	Guiding laser pointer				

1.8 Handheld contact free temperature measurement tool	Temperature range	Celsius (°C)		10	200
1.9 Computer for goniometer	Windows Operating system				
	Processor	Cores		5	
	RAM	Gigabyte (Gb)		8	
	Harddisk	Gigabyte (Gb)		1000	
	CD and DVD reader				
	Ethernet port				
	Wifi connection				
	Bluetooth connection				
1.10 Screen for computer	Free standing with <ul style="list-style-type: none"> at least 27 inch TFT screen 2xHDMI ports 2 x 2.0 USB ports 1x RS232 connection 100 - 240V, 50/60Hz ac power source 				
1.11 Color Laser Printer/copier/scanner - Three in one HP LaserJet Pro 500 color MFP M570dw or equivalent	<ul style="list-style-type: none"> Automatic duplex printing/copying/scanning Supported operating systems: Windows (compatible with item 1.9) Print: minimum 30 ppm on A4-size paper Copy: minimum 20 ppm Copy resolution: minimum 300 dpi Scan resolution in b/w up to 1200 dpi, in color minimum 300 dpi 				
1.12 Computer desk	<ul style="list-style-type: none"> Core i5 and above 2 x 500GB SSD or better 8GB RAM Read/write CD/DVD disc drive Ethernet port 				

	<ul style="list-style-type: none"> At least 2x 2.0 USB ports Licensed Windows 10 operating system, 64 Bit Microsoft office 2019 with a life time license <ul style="list-style-type: none"> 100-240V, 50/60Hz 				
1.13 AC/DC power supplies for aging room	Wire floor shelves for holding streetlights and other large luminaires	pieces		2	2
	Bars with 200 E27 sockets attached to ceiling	pieces	1 bar: 3000x2, 25 sockets per 5-6 m, 8 bars in total	10	10
	3000 mm bars	pieces		16	16
	joints	pieces		8	8
	90 deg angle	pieces		40	40
	E27 Sockets	pieces		200	200
	Adapters from E27 to E14	pieces		20	20
	Adapters from E27 to B22	Pieces		20	20
	Cabling Requirements (230V AC L-N-GND)	meter (m)		100	
1.14 PV Hybrid grid and battery connected inverter	PV Hybrid inverter		IEC 62109-2:2011		
	Charge battery from grid				
	Charge battery from PV Array				
	Switch time from grid to battery	Millisecond (ms)			10000
	Output requirement: 200 lamps x 20W	Watt (W)		4000	
	AC 230V, 50Hz output from inverter	AC		4000	
	Web or app interface				
1.15 Battery backup	200 lamps x 20 W	Watt (W)		4000	
	Battery backup time	Hour (h)		1	
	Battery energy per day	watt-hour (Wh)		4000	
	Additional time for autonomy/margin	Hour (h)		0	
	Total battery energy	watt-hour (Wh)		4000	

1.16 PV Array (optional)	Discharge to 20%				
	Final battery energy	watt-hour (Wh)	IEC 62133-2:2017	5000	
	Solar hours per day	Hour (h)		5	
	PV Array	Watt (W)	IEC 61730-1:2016, IEC 61730-2:2016	1000	
	Energy from PV array in one day	watt-hour (Wh)		5000	
	W per panel	Watt (W)		420	
	Panels (bifacials)	pieces	UL 1703, 3rd Edition	12	12

3.2 LOT 2: Uganda National Bureau of Standards

3.2.1 Equipment to be supplied:

The supplier is required to supply the following equipment in the quantities specified for the below rooms:

A. Goniometer room

Item #	Equipment	Quantity
1.1	Goniometer system	1
1.2	AC/DC power analyser	1
1.3	Goniometer AC/DC power supply for DUT	1
1.4	WiFi router for connecting to smart lighting DUT	1
1.5	Self-leveling laser for DUT alignment	1
1.6	Reference Lamp AC or DC, powered by goniometer power supply	1
1.7	Flicker meter	1
1.8	Handheld contact free temperature measurement tool	1
1.9	Computer for goniometer	1
1.10	Screen for computer	1
1.11	Color Laser Printer/copier/scanner - Three in one	1
1.12	Desk for the computer	1

B. Lamp aging room

Item #	Equipment	Quantity
1.13	AC/DC power supplies for aging room	1
1.14	PV Hybrid grid and battery connected inverter	1
1.15	Battery backup	1
1.16	PV array (optional)	1

3.2.2 Specifications for the rooms and equipment

The supplied equipment should be compliant with the following parameters.

UNIDO will engage with a local company to complete the required civil and electrical works to comply with the below room parameters. This will include partitioning of the provided space to allow for optimal utilization of testing areas and storage of samples; installation of roof and deck, partitioning sections to enclose and create a temperature-controlled environment suitable for installation of the goniometer, painting of walls and the floor, etc.; and extending of power supply line to provide enough power outlets for the equipment and other associated accessories in the partitioned space. The supplier may provide additional requirements as needed for the installation of the supplied equipment.

Room	Specification	Unit	Standard / Parameters	Min	Max
Goniometer room	Temperature	Celsius (°C)		24	26
	Humidity		IEC 60969, EN 62612 or equivalent		
	Air velocity		CIE S 025		
	Room Length	Metre (m)		7	7
	Room Width	Metre (m)		4	4
	Room Height	Metre (m)		2.4	2.4
	Floor, construction		Concrete		
	Floor, surface		Matte, dark plastic carpet		
	Walls		Matte, dark		
	Ceiling		Matte, dark		
	Available power		Single phase, 230V, 50Hz		
	Available power sockets		Round Pin, Type M		
	Standby measurement	Watt (W)	IEC 63103 or equivalent		
Lamp aging room	Temperature	Celsius (°C)	DEAS 1064-2 2021 A.2.1 or equivalent	15	35
	Humidity		IEC 60969, EN 62612 or equivalent		
	Air velocity		CIE S 025 or equivalent		
	Length	Metre (m)		5.3	5.3
	Width	Metre (m)		2.4	2.4
	Height	Metre (m)		2.4	2.4
	Floor, construction		Concrete		

Floor, surface		Plastic carpet		
Walls		Matte, white		
Ceiling		Matte, white		
Available power	Single phase, 230V, 50Hz	Single phase, 230V, 50Hz	4000	
Available power sockets		Round pin Type M		
Project lifetime according to		TM-21, LM-79, LM-80		

Equipment	Specification	Unit	Standard / Parameters	Min	Max
1.1 Goniometer system	Max luminaire diameter for proposed goniometer	Centimetre (cm)		60	200
	Luminous flux	Lumen (lm)	IEC 62722-2-1, CIE S 025, IEC 62722-2 series, CIE 84 CIE 121 or equivalent	1	
	Intensity	Candela		1	∞
	Beam angle		EN 61341, IES LM-79, CIE S 025 or equivalent		
	Colour coordinates (x,y)		CIE 015 or equivalent		
	Correlated colour temperature (CCT)	Kelvin (K)	IEC 62722-2-1 CIE S 025, CIE 015, ANSI C78.377 or equivalent	2200	6500
	Colour rendering	Color Rendering Index (CRI), Ra	IEC 62722-2-1, CIE S 025, CIE 13.3, IES TM-30-15 or equivalent	0	100
	Colour consistency	Standard Deviation Colour Matching (SDCM)	IEC 62722-2-1, CIE S 025, CIE 015	3	
	Spectral intensity range	Nanometers (nm)	DEAS 1064-1 2021 §5.3.2.2 or equivalent	250	800
	Goniometer Control software: <ul style="list-style-type: none"> Installed on the supplied computer; Local data storage Graphical output of light intensity distribution (LID) 				

	<ul style="list-style-type: none"> Graphical output of spectral intensity distribution Graphical output of black body locus and chromaticity x,y coordinates Report generator included Report formatting included Energy class calculation included Data export to excel Averaging data from 10 measurements available 				
1.2 AC/DC power analyser	AC Input power	Volt (50/60Hz)		200	300
	AC Power	Watt (W)	IEC 62722-2-1, CIE S 025, EC 62722-2 series CIE 84 CIE 121 or equivalent	1000	
	AC Voltage	Volt (V)	CIE S 025 or equivalent	400	
	AC Current	Ampere (A)	CIE S 025 or equivalent	20	
	AC displacement factor		IEC 62722-2-1 or equivalent	0	1
	AC Channels	Each		3	
	DC Power	Watt (W)	CIE S 025 or equivalent	100	
	DC Voltage	Volt (V)	CIE S 025 or equivalent	48	
	DC Current	Ampere (A)	CIE S 025 or equivalent	10	
	DC Channels			3	
	Standby measurement	Watt (W)	IEC 63103 or equivalent		
1.3 Goniometer AC/DC power supply for DUT	AC Power output	Watt (W)	CIE S 025 or equivalent	500	2000
	AC Voltage output	Volt (V)	CIE S 025, IEC TR 61547 or equivalent	220	240
	AC Current output	Ampere (A)	CIE S 025 or equivalent	0	20

	Power quality output	Total Harmonic Distortion (THD)	IEC 61000-4-11, IEC 61000-4-5, IEC 61000-4-7 IEC 61000-3-2 or equivalent		
	DC Power output	Watt (W)	CIE S 025 or equivalent	0	100
	DC Voltage output	Volt (V)	CIE S 025 or equivalent	0	48
	DC Current output	Ampere (A)	CIE S 025 or equivalent		10
	AC Voltage input	Volt (V)		180	250
	AC frequency	Hertz (Hz)		50	60
1.4 WiFi router for connecting to smart lighting DUT	<ul style="list-style-type: none"> Protocol 802.11n Frequency 2.4GHz and 5GHz Maximum data rate up to 450Mbps 				
1.5 Self-leveling laser for DUT alignment	Laser (x and y)	pieces (pcs)		1	1
	Tripod for the laser	pieces (pcs)		1	1
1.6 Reference Lamp AC or DC, powered by goniometer power supply	Reference lamp, luminous flux	Lumen (lm)	CIE 84, CIE S 025 or equivalent		
	Calibration included				
1.7 Flicker meter	Tripod for flicker meter head	pieces		1	1
	Short Term Flicker Perceptibility - P_{ST} (Mandatory requirement)		CIE:TN-006, CIE:TN-012, IEC TR 61547-1 or equivalent		
	Stroboscopic Effect Visibility Measure - SVM (Mandatory requirement)		CIE:TN-006, CIE:TN-012, IEC TR 63158 or equivalent		
	Flicker percent		IEEE Std 1789-2015, IES: RP-16-10, CIE:TN-006, CIE:TN-012 or equivalent		
	Flicker index		IEEE Std 1789-2015, IES: RP-16-10, CIE:TN-006, CIE:TN-012 or equivalent		
	PC interface included				
	Measurement software included				
	Guiding laser pointer				

1.8 Handheld contact free temperature measurement tool	Temperature range	Celsius (°C)		10	200
1.9 Computer for goniometer	Windows Operating system				
	Processor	Cores		5	
	RAM	Gigabyte (Gb)		8	
	Harddisk	Gigabyte (Gb)		1000	
	CD and DVD reader				
	Ethernet port				
	Wifi connection				
	Bluetooth connection				
1.10 Screen for computer	Free standing with <ul style="list-style-type: none"> at least 27 inch TFT screen 2xHDMI ports 2 x 2.0 USB ports 1x RS232 connection 100 - 240V, 50/60Hz ac power source 				
1.11 Color Laser Printer/copier/scanner - Three in one HP LaserJet Pro 500 color MFP M570dw or equivalent	<ul style="list-style-type: none"> Automatic duplex printing/copying/scanning Supported operating systems: Windows (compatible with item 1.9) Print: minimum 30 ppm on A4-size paper Copy: minimum 20 ppm Copy resolution: minimum 300 dpi Scan resolution in b/w up to 1200 dpi, in color minimum 300 dpi 				
1.12 Computer desk	<ul style="list-style-type: none"> Core i5 and above 2 x 500GB SSD or better 8GB RAM Read/write CD/DVD disc drive Ethernet port 				

	<ul style="list-style-type: none"> At least 2x 2.0 USB ports Licensed Windows 10 operating system, 64 bit Microsoft office 2019 with a lifetime license 100-240V, 50/60Hz 				
1.13 AC/DC power supplies for aging room	Wire floor shelves for holding streetlights and other large luminaires	pieces		2	2
	Bars with 200 E27 sockets attached to ceiling	pieces	1 bar: 3000x2, 25 sockets per 5-6 m, 8 bars in total	10	10
	3000 mm bars	pieces		16	16
	joints	pieces		8	8
	90 deg angle	pieces		40	40
	E27 Sockets	pieces		200	200
	Adapters from E27 to E14	pieces		20	20
	Adapters from E27 to B22	Pieces		20	20
	Cabling Requirements (230V AC L-N-GND)	meter (m)		100	
1.14 PV Hybrid grid and battery connected inverter	PV Hybrid inverter		IEC 62109-2:2011 or equivalent		
	Charge battery from grid				
	Charge battery from PV Array				
	Switch time from grid to battery	Millisecond (ms)			10000
	Output requirement: 200 lamps x 20W =	Watt (W)		4000	
	AC 230V, 50Hz output from inverter	AC		4000	
	Web or app interface				
1.15 Battery backup	200 lamps x 20 W	Watt (W)		4000	
	Battery backup time	Hour (h)		1	
	Battery energy per day	watt-hour (Wh)		4000	
	Additional time for autonomy/margin	Hour (h)		0	
	Total battery energy	watt-hour (Wh)		4000	
	Discharge to 20%				

	Final battery energy	watt-hour (Wh)	IEC 62133-2:2017 or equivalent	5000	
1.16 PV Array (optional)	Solar hours per day	Hour (h)		5	
	PV Array	Watt (W)	IEC 61730-1:2016, IEC 61730-2:2016 or equivalent	1000	
	Energy from PV array in one day	watt-hour (Wh)		5000	
	W per panel	Watt (W)		420	
	Panels (bifacials)	pieces	UL 1703, 3rd Edition or equivalent	12	12

3.3 LOT 3: Zambia Bureau of Standards

3.3.1 Equipment to be supplied:

The supplier is required to supply the following equipment in the quantities specified for the below rooms:

A. Goniometer room

Item #	Equipment	Quantity
1.1	Goniometer system	1
1.2	AC/DC power analyser	1
1.3	Goniometer AC/DC power supply for DUT	1
1.4	WiFi router for connecting to smart lighting DUT	1
1.5	Self-leveling laser for DUT alignment	1
1.6	Reference Lamp AC or DC, powered by goniometer power supply	1
1.7	Flicker meter	1
1.8	Handheld contact free temperature measurement tool	1
1.9	Computer for goniometer	1
1.10	Screen for computer	1
1.11	Color Laser Printer/copier/scanner - Three in one	1
1.12	Desk for the computer	1

B. Lamp aging room

Item #	Equipment	Quantity
1.13	AC/DC power supplies for aging room	1
1.14	PV Hybrid grid and battery connected inverter	1
1.15	Battery backup	1
1.16	PV array (optional)	1

3.3.2 Specifications for the rooms and equipment

The supplied equipment should be compliant with the following parameters.

UNIDO will engage with a local company to complete the required civil and electrical works to comply with the below room parameters. This will include partitioning of the provided space to allow for optimal utilization of testing areas and storage of samples; installation of roof and deck, partitioning sections to enclose and create a temperature-controlled environment suitable for installation of the goniometer, painting of walls and the floor, etc.; and extending of power supply line to provide enough power outlets for the equipment and other associated accessories in the partitioned space. The supplier may provide additional requirements as needed for the installation of the supplied equipment.

Room	Specification	Unit	Standard / Parameters	Min	Max
Goniometer room	Temperature	Celsius (°C)		24	26
	Humidity		IEC 60969, EN 62612 or equivalent		
	Air velocity		CIE S 025 or equivalent		
	Room Length	Metre (m)		7	7
	Room Width	Metre (m)		4.6	4.6
	Room Height	Metre (m)		2.4	2.8
	Floor, construction		Concrete		
	Floor, surface		Matte, dark plastic carpet		
	Walls		Matte, dark		
	Ceiling		Matte, dark		
	Available power		Single phase, 230V, 50Hz		
	Available power sockets		Round Pin, Type M		
	Standby measurement	Watt (W)	IEC 63103 or equivalent		
Lamp aging room	Temperature	Celsius (°C)	DEAS 1064-2 2021 A.2.1 or equivalent	15	35
	Humidity		IEC 60969, EN 62612 or equivalent		
	Air velocity		CIE S 025 or equivalent		
	Length	Metres (m)		4.3	4.3
	Width	Metres (m)		2.0	2.0

Height	Metres (m)		2.4	2.4
Floor, construction		Concrete		
Floor, surface		Plastic carpet		
Walls		Matte, white		
Ceiling		Matte, white		
Available power	Single phase, 230V, 50Hz	Single phase, 230V, 50Hz	4000	
Available power sockets		Round pin Type M		
Project life time according to		TM-21, LM-79, LM-80		

Equipment	Specification	Unit	Standard / Parameters	Min	Max
1.1 Goniometer system	Max luminaire diameter for proposed goniometer	Centimetre (cm)		60	200
	Luminous flux	Lumen (lm)	IEC 62722-2-1, CIE S 025, IEC 62722-2 series, CIE 84 CIE 121 or equivalent	1	
	Intensity	Candela		1	∞
	Beam angle		EN 61341, IES LM-79, CIE S 025 or equivalent		
	Colour coordinates (x,y)		CIE 015 or equivalent		
	Correlated colour temperature (CCT)	Kelvin (K)	IEC 62722-2-1 CIE S 025, CIE 015, ANSI C78.377 or equivalent	2200	6500
	Colour rendering	Color Rendering Index (CRI), Ra	IEC 62722-2-1, CIE S 025, CIE 13.3, IES TM-30-15 or equivalent	0	100
	Colour consistency	Standard Deviation Colour Matching (SDCM)	IEC 62722-2-1, CIE S 025, CIE 015 or equivalent	3	
	Spectral intensity range	Nanometers (nm)	DEAS 1064-1 2021 §5.3.2.2 or equivalent	250	800
	Goniometer Control software:				
	<ul style="list-style-type: none"> Installed on the supplied computer Local data storage 				

	<ul style="list-style-type: none"> Graphical output of light intensity distribution (LID) Graphical output of spectral intensity distribution Graphical output of black body locus and chromaticity x,y coordinates Report generator included Report formatting included Energy class calculation included Data export to excel Averaging data from 10 measurements available 				
1.2 AC/DC power analyser	AC Input power	Volt (50/60Hz)		200	300
	AC Power	Watt (W)	IEC 62722-2-1, CIE S 025, EC 62722-2 series CIE 84 CIE 121 or equivalent	1000	
	AC Voltage	Volt (V)	CIE S 025 or equivalent	400	
	AC Current	Ampere (A)	CIE S 025 or equivalent	20	
	AC displacement factor		IEC 62722-2-1 or equivalent	0	1
	AC Channels	Each		3	
	DC Power	Watt (W)	CIE S 025 or equivalent	100	
	DC Voltage	Volt (V)	CIE S 025 or equivalent	48	
	DC Current	Ampere (A)	CIE S 025 or equivalent	10	
	DC Channels			3	
	Standby measurement	Watt (W)	IEC 63103 or equivalent		
1.3 Goniometer AC/DC power supply for DUT	AC Power output	Watt (W)	CIE S 025 or equivalent	500	2000
	AC Voltage output	Volt (V)	CIE S 025, IEC TR 61547 or equivalent	220	240
	AC Current output	Ampere (A)	CIE S 025 or equivalent	0	20

	Power quality output	Total Harmonic Distortion (THD)	IEC 61000-4-11, IEC 61000-4-5, IEC 61000-4-7 IEC 61000-3-2 or equivalent		
	DC Power output	Watt (W)	CIE S 025 or equivalent	0	100
	DC Voltage output	Volt (V)	CIE S 025 or equivalent	0	48
	DC Current output	Ampere (A)	CIE S 025 or equivalent		10
	AC Voltage input	Volt (V)		180	250
	AC frequency	Hertz (Hz)		50	60
1.4 WiFi router for connecting to smart lighting DUT	<ul style="list-style-type: none"> Protocol 802.11n Frequency 2.4GHz and 5GHz Maximum data rate up to 450Mbps 				
1.5 Self-leveling laser for DUT alignment	Laser (x and y)	pieces (pcs)		1	1
	Tripod for the laser	pieces (pcs)		1	1
1.6 Reference Lamp AC or DC, powered by goniometer power supply	Reference lamp, luminous flux	Lumen (lm)	CIE 84, CIE S 025 or equivalent		
	Calibration included				
1.7 Flicker meter	Tripod for flicker meter head	pieces		1	1
	Short Term Flicker Perceptibility - P_{ST} (Mandatory requirement)		CIE:TN-006, CIE:TN-012, IEC TR 61547-1 or equivalent		
	Stroboscopic Effect Visibility Measure - SVM (Mandatory requirement)		CIE:TN-006, CIE:TN-012, IEC TR 63158 or equivalent		
	Flicker percent		IEEE Std 1789-2015, IES: RP-16-10, CIE:TN-006, CIE:TN-012 or equivalent		
	Flicker index		IEEE Std 1789-2015, IES: RP-16-10, CIE:TN-006, CIE:TN-012 or equivalent		
	PC interface included				
	Measurement software included				
	Guiding laser pointer				

1.8 Handheld contact free temperature measurement tool	Temperature range	Celsius (°C)		10	200
1.9 Computer for goniometer	Windows Operating system				
	Processor	Cores		5	
	RAM	Gigabyte (Gb)		8	
	Harddisk	Gigabyte (Gb)		1000	
	CD and DVD reader				
	Ethernet port				
	Wifi connection				
	Bluetooth connection				
1.10 Screen for computer	Free standing with <ul style="list-style-type: none"> at least 27 inch TFT screen 2xHDMI ports 2 x 2.0 USB ports 1x RS232 connection 100 - 240V, 50/60Hz ac power source 				
1.11 Color Laser Printer/copier/scanner - Three in one HP LaserJet Pro 500 color MFP M570dw or equivalent	<ul style="list-style-type: none"> Automatic duplex printing/copying/scanning Supported operating systems: Windows (compatible with item 1.9) Print: minimum 30 ppm on A4-size paper Copy: minimum 20 ppm Copy resolution: minimum 300 dpi Scan resolution in b/w up to 1200 dpi, in color minimum 300 dpi 				
1.12 Computer desk	<ul style="list-style-type: none"> Core i5 and above 2 x 500GB SSD or better 8GB RAM Read/write CD/DVD disc drive Ethernet port At least 2x 2.0 USB ports 				

	<ul style="list-style-type: none"> Licensed Windows 10 operating system, 64 bit Microsoft office 2019 with a lifetime license 100-240V, 50/60Hz 				
1.13 AC/DC power supplies for aging room	Wire floor shelves for holding streetlights and other large luminaires	pieces		2	2
	Bars with 200 E27 sockets attached to ceiling	pieces	1 bar: 3000x2, 25 sockets per 5-6 m, 8 bars in total	10	10
	3000 mm bars	pieces		16	16
	joints	pieces		8	8
	90 deg angle	pieces		40	40
	E27 Sockets	pieces		200	200
	Adapters from E27 to E14	pieces		20	20
	Adapters from E27 to B22	Pieces		20	20
	Cabling Requirements (230V AC L-N-GND)	metre (m)		100	
1.14 PV Hybrid grid and battery connected inverter	PV Hybrid inverter		IEC 62109-2:2011 or equivalent		
	Charge battery from grid				
	Charge battery from PV Array				
	Switch time from grid to battery	Millisecond (ms)			10000
	Output requirement: 200 lamps x 20W =	Watt (W)		4000	
	AC 230V, 50Hz output from inverter	AC		4000	
	Web or app interface				
1.15 Battery backup	200 lamps x 20 W	Watt (W)		4000	
	Battery backup time	Hour (h)		1	
	Battery energy per day	watt-hour (Wh)		4000	
	Additional time for autonomy/margin	Hour (h)		0	
	Total battery energy	watt-hour (Wh)		4000	
	Discharge to 20%				
	Final battery energy	watt-hour (Wh)	IEC 62133-2:2017 or equivalent	5000	
	Solar hours per day	Hour (h)		5	

1.16 PV Array (optional)			IEC 61730-1:2016, IEC 61730-2:2016 or equivalent		
	PV Array	Watt (W)		1000	
	Energy from PV array in one day	watt-hour (Wh)		5000	
	W per panel	Watt (W)		420	
	Panels (bifacials)	pieces	UL 1703, 3rd Edition or equivalent	12	12

3.4 Associated Services

3.4.1 Training on supplied equipment

After the delivery of the equipment, the supplier shall prepare training materials including but not limited to training program presentations in power point format and supporting materials and manuals and conduct a training for trainers over **5 days** for a selected group of personnel identified by UNIDO, EACREEE and SACREEE on all the supplied equipment.

The supplier should arrange for **hands-on training** on the installation, operations, calibration, troubleshooting and maintenance of the equipment.

The training should include:

- Method of installation and correct mounting of sensors.
- Measurement standards, procedure and frequency.
- Results interpretation, collecting and exporting data and reporting.
- Troubleshooting of measurements problems.
- Troubleshooting issues when measurement results are not as expected.
- Equipment calibration procedure, intervals of calibration and recommendations.

3.5 Taxes and Duty

Bids must be exclusive of VAT and other applicable taxes.

3.6 Warranty and Other General Requirements

- All items should be guaranteed for a minimum period of 12 months standard and as per warranty given by the manufacturer. The supplier should guarantee the quality and completeness of equipment as specified under above mentioned Equipment Specifications and Safety Considerations.
- Mechanical, electrical, performance and safety guarantee for supplied should be quoted for at least 12 months after delivery and acceptance of the equipment.

- c) All measuring equipment/instruments should have a calibration certificate valid for 12 months from the date of purchase.
- d) The list for the standard set of spare parts such as cable connectors and fittings for 12 months must be organic part of the offer.
- e) The supplier must have a local representative/agent located in Sri Lanka who can maintain the equipment (if needed) and supply any required spare parts.
- f) All programme software (e.g. operating system CDs) must be included.
- g) Equipment charging packs must be configured for the Sri Lanka power socket configuration.
- h) The following technical documentation have to be supplied in together with the bid:
 - a. Catalogues of the equipment
 - b. Local representative/agent/authorized dealers contact details
- i) The following technical documentation have to be supplied in both hard and soft formats at the delivery of the goods.
 - Catalogues of the equipment
 - Assembling instructions
 - Operation manual
 - Maintenance manual
 - Safety maintenance and servicing manual
 - Local representative/agent/authorized dealers contact details
 - Licenses and all needed documentation for proper handling and operations

4. DELIVERY AND LOCATION

All listed equipment is to be delivered to the below address (**Delivered at Place Unloaded (DPU) – Incoterms 2020**):

LOT 1	LOT 2	LOT 3
Instituto Nacional de Normalização e Qualidade (INNOQ, IP) Av. de Moçambique Parcela 7168/D1/7 CP: 2983 Linha verdo:800300600	Uganda National Bureau of Standards (UNBS) Standard House Plot 2-12 byPass link Bweyogerere Industrial and Business Park Wakiso	Zambia Bureau of Standards (ZABS) National Institute for Scientific and Industrial Research (NISIR) Offices PO Box 50259, Lusaka,

MAPUTO MOZAMBIQUE	P.O.BOX 6329 Kampala UGANDA	ZAMBIA NB: Equipment to be installed at National Institute for Scientific and Industrial Research (NISIR) Offices, International Airport Road Lusaka, Zambia
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4.1 DELIVERY PERIOD

Bidders should indicate the earliest possible delivery of the equipment. Delivery time and terms will be used as evaluation criteria.

5. LANGUAGE REQUIREMENTS

All required manuals and certificates need to be provided in **English for Uganda (LOT 2) and Zambia (LOT 3) and English and Portuguese for Mozambique (LOT 1)**. Additionally, the supplier is required to communicate verbally and in writing in the required languages for any installation, commissioning, training, and after-sales purposes.

6. QUALIFICATION REQUIREMENTS AND EVALUATION CRITERIA

- i. Recognized and/or registered as a legal entity (copy of Certificate of Incorporation) with **at least five (5) years'** experience in supplying similar equipment;
- ii. Completed UNIDO Financial Statement Form;
 - *Profitability*
A profit Margin Ratio or Return on Assets Ratio should be preferably positive. In case of negative profit margin ratio, UNIDO may request additional documents and/or adapt payment terms and conditions.
 - *Solvency*
A solvency ratio should be preferably more than one (1). In case of negative solvency, UNIDO may request additional documents and/or adapt payment terms and conditions.
 - *Turnover*
The average annual turnover for the past three (3) years (or for the period the bidder has been in business, if it has not yet reached three (3) years) should be at least 1 time more than the anticipated value of the contract.
- iii. Audited Financial Statements/Balance Sheets of the past 3 years;
- iv. Completed UNIDO Bank Information Form;
- v. Completed UNIDO Statement of Confirmation.
 - Compliance with the Technical Specifications;

- Authorized dealer/suppliers;
- Local/regional representation;
- Delivery terms and period;
- Training methodology and profile of trainers;
- Complete technical proposal including catalogues and information on the offered equipment including origin of goods.

7. AWARD CONDITIONS

UNIDO reserves the right to split an award between any suppliers in any combination, as it may deem appropriate. If the bid is submitted on an “all-or-none” basis, it should be clearly stated as such in your response to this tender.

8. APPLICATION PROCEDURES SUBMISSION

Interested and qualified bidders shall submit their bids in English using the template table provided below.

Additional information on the associated services shall be provided, including the training methodology, detailed CVs of proposed trainers, copies of university degrees, certifications, licenses as well as proven track record of implemented assignments as required.

Bidders are requested to submit their bids by registering on the UNIDO eProcurement Portal (<https://procurement.unido.org>). In case of technical difficulties, please contact UNIDO Help Desk at procurement@unido.org.

Note to suppliers: A circular economy is an economic system that tackles global environmental challenges like climate change, biodiversity loss, waste, and pollution. It is a framework of four principles, driven by design: eliminate waste and pollution, keep products and materials in use, regenerate natural ecosystems and use of renewable energy. **Bidders are encouraged** to display the products’ circularity and sustainability compliance with the Economic, Social and Governance principles under the UN Compact (<https://www.unglobalcompact.org/takeaction/leadership/integrate-sustainability/roadmap/supply-chain>).

DISCLAIMER: All information, figures and data presented in this Terms of Reference are the property of UNIDO and protected by copyrights. No part or parts of this document shall be used for purposes other than preparing the proposal.

8.1 LOT 1: Instituto Nacional de Normalização e Qualidade

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE BIDDER			
Item	Name	Qty	Unit price Euro	Total item price Euro	Compliance to specifications Yes/no (*)	Remarks (**)
1	Equipment Description					
1.1	Goniometer system	1 unit				
1.2	AC/DC power analyser	1 unit				
1.3	Goniometer AC/DC power supply for DUT	1 unit				
1.4.	WiFi router for connecting to smart lighting DUT	1 unit				
1.5.	Self-leveling laser for DUT alignment	1 unit				
1.6	Reference Lamp AC or DC, powered by goniometer power supply	1 unit				
1.7.	Flicker meter	1 unit				
1.8	Handheld contact free temperature measurement tool	1 unit				
1.9	Computer for goniometer	1 unit				
1.10	Screen for computer	1 unit				

1.11	Color Laser Printer/copier/scanner - Three in one	1 unit				
1.12	Desk for the computer	1 unit				
1.13	AC/DC power supplies for aging room	1 unit				
1.14	PV Hybrid grid and battery connected inverter	1 unit				
1.15	Battery backup	1 unit				
1.16	PV array (optional)	1 unit				
2	Cost of transportation (DPU – Incoterms 2020) [in Euro]					
3	Cost of Insurance at 110% value of the equipment total costs [in Euro]					
4	Cost of installation and commissioning [in Euro]					
5	Cost of Training on-site [in Euro]					
	Total Price [in Euro]					

*) compliance must be confirmed in detail by the contractor's offer and technical documentation and will be verified by UNIDO during technical evaluation.

**) if not compliant with UNIDO's required parameters, the invitee must indicate their parameters in this column.

8.2 LOT 2: Uganda National Bureau of Standards (UNBS)

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE BIDDER			
Item	Name	Qty	Unit price Euro	Total item price Euro	Compliance to specifications Yes/no (*)	Remarks (**)
1.	Equipment Description					
1.1	Goniometer system	1 unit				
1.2	AC/DC power analyser	1 unit				
1.3	Goniometer AC/DC power supply for DUT	1 unit				
1.4.	WiFi router for connecting to smart lighting DUT	1 unit				
1.5.	Self-leveling laser for DUT alignment	1 unit				
1.6	Reference Lamp AC or DC, powered by goniometer power supply	1 unit				
1.7.	Flicker meter	1 unit				
1.8	Handheld contact free temperature measurement tool	1 unit				
1.9	Computer for goniometer	1 unit				
1.10	Screen for computer	1 unit				

1.11	Color Laser Printer/copier/scanner - Three in one	1 unit				
1.12	Desk for the computer	1 unit				
1.13	AC/DC power supplies for aging room	1 unit				
1.14	PV Hybrid grid and battery connected inverter	1 unit				
1.15	Battery backup	1 unit				
1.16	PV array (optional)	1 unit				
2	Cost of transportation (DPU – Incoterms 2020) [in Euro]					
3	Cost of Insurance at 110% value of the equipment total costs [in Euro]					
4	Cost of installation and commissioning [in Euro]					
5	Cost of Training on-site [in Euro]					
	Total Price [in Euro]					

*) compliance must be confirmed in detail by the contractor's offer and technical documentation and will be verified by UNIDO during technical evaluation.

**) if not compliant with UNIDO's required parameters, the invitee must indicate their parameters in this column.

8.3 LOT 3: Zambia Bureau of Standards (ZABS)

UNIDO REQUIREMENTS			TO BE COMPLETED BY THE BIDDER			
Item	Name	Qty	Unit price Euro	Total item price Euro	Compliance to specifications Yes/no (*)	Remarks (**)
1.	Equipment Description					
1.1	Goniometer system	1 unit				
1.2	AC/DC power analyser	1 unit				
1.3	Goniometer AC/DC power supply for DUT	1 unit				
1.4.	WiFi router for connecting to smart lighting DUT	1 unit				
1.5.	Laser (x and y) Self-leveling laser for DUT alignment	1 unit				
1.6	Reference Lamp AC or DC, powered by goniometer power supply	1 unit				
1.7.	Flicker meter	1 unit				
1.8	Handheld contact free temperature measurement tool	1 unit				
1.9	Computer for goniometer	1 unit				
1.10	Screen for computer	1 unit				

1.11	Color Laser Printer/copier/scanner - Three in one	1 unit				
1.12	Desk for the computer	1 unit				
1.13	AC/DC power supplies for aging room	1 unit				
1.14	PV Hybrid grid and battery connected inverter	1 unit				
1.15	Battery backup	1 unit				
1.16	PV array (optional)	1 unit				
2	Cost of transportation (DPU – Incoterms 2020) [in Euro]					
3	Cost of Insurance at 110% value of the equipment total costs [in Euro]					
4	Cost of installation and commissioning [in Euro]					
5	Cost of Training on-site [in Euro]					
	Total Price [in Euro]					

*) compliance must be confirmed in detail by the contractor's offer and technical documentation and will be verified by UNIDO during technical evaluation.

**) if not compliant with UNIDO's required parameters, the invitee must indicate their parameters in this column.