National Institute of Metrology (Thailand)
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Price List

Item No.	Description	Range	Accuracy / Uncertainty	Price (THB)	Remark	Code
Calibration Fee						
Photometry Metrology						
1	Luminous intensity of a tungsten lamp	10 cd ≤ I_v ≤ 3 000 cd 2 000 K ≤ CCT ≤ 3 400 K	0.98%	15,000	Detector-based method against a set of reference photometer	13011-11011
2	Luminous intensity of an incandescent lamp	10 cd ≤ I_v ≤ 3 000 cd 2 000 K ≤ CCT ≤ 3 400 K	0.79%	18,750 for the first lamp + 8,500 for any additional lamp of the same type	Substitution method against two national reference standard lamps	13015-11011
			0.93%	12,500 for the first lamp + 6,250 for any additional lamp of the same type	Substitution method against two working standard lamps	13016-11011
3	Illuminance responsivity of a photo-detector head	12 lx ≤ E_v ≤ 300 lx 2 000 K ≤ CCT ≤ 3 400 K	0.70%	6,250	Source-based measurements using national reference standard lamps applying the inverse-square law.	13015-11021
			0.80%	3,130	Source-based measurements using working standard lamps applying the inverse-square law.	13016-11021
4	Illuminance responsivity of an illuminance meter or a lux meter	2 lx ≤ E_v ≤ 10 000 lx 2 000 K ≤ CCT ≤ 3 400 K	Greater than or equal to 0.91% varied with illuminance level and UUC	2,500 for the first range + 630 for any additional range	Detector-based comparison against reference photometers	13011-11021
5	Total luminous flux of an incandescent lamp	5 lm ≤ Φ_v ≤ 9 000 lm 2 000 K ≤ CCT ≤ 3 400 K	0.66%	18,000	Detector-based method by using a gonio-photometer with a standard photometer	13010-11031
6	Luminous flux of an LED lamp	5 lm ≤ Φ_v ≤ 9 000 lm Full, white	1.2%	18,000	Gonio-photometric method	13010-11032
7	Total luminous flux of an incandescent lamp	5 lm ≤ Φ_v ≤ 9 000 lm 2 000 K ≤ CCT ≤ 3 400 K	0.80%	17,750 for the first lamp + 7,880 for any additional lamp of the same type	Substitution method inside a 2-meter integrating sphere against two national reference standard lamps	13015-11031
			0.98%	12,500 for the first lamp + 6,250 for any additional lamp of the same type	Substitution method inside a 2-meter integrating sphere against two working standard lamps	13016-11031

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8	Total luminous flux of a non-directional LED lamp	20 lm ≤ Φ_v ≤ 4 000 lm Full (non-directional), white	0.79%	17,750 for the first lamp + 7,880 for any additional lamp of the same type	Substitution method inside a 2-meter integrating sphere against two national reference standard lamps	13015-11032
			1.0%	13,750 for the first lamp + 6,880 for any additional lamp of the same type	Substitution method inside a 2-meter integrating sphere against two working standard lamps	13016-11032
9	Total luminous flux of a linear fluorescent lamp	800 lm ≤ Φ_v ≤ 4 000 lm 2 600 K ≤ CCT ≤ 6 200 K	0.88%	18,750 for the first lamp + 8,750 for any additional lamp of the same type	Substitution method inside a 2-meter integrating sphere against two national reference standard lamps	13015-11033
			1.2%	12,500 for the first lamp + 6,250 for any additional lamp of the same type	Substitution method inside a 2-meter integrating sphere against two working standard lamps	13016-11033
10	Luminance of a tungsten-based source	1 cd/m^2 ≤ L_v ≤ 10 000 cd/m^2 2 000 K ≤ CCT ≤ 3 400 K	1.4%	10,000 for the first calibration point + 5,000 for any additional point	Detector-based method against a reference luminance meter	13012-11051
11	Luminance responsivity of a luminance meter	10 cd/m^2 ≤ L_v ≤ 10 000 cd/m^2 2 000 K ≤ CCT ≤ 3 400 K	0.85%	10,000 for the first point + 5,000 for any additional point	Detector-based comparison against reference photometers	13011-11060
		1 cd/m^2 ≤ L_v < 10 cd/m^2 2 000 K ≤ CCT ≤ 3 400 K	1.2%		Detector-based comparison against reference photometers and a monitor detector	
12	Total spectral radiant flux of a tungsten lamp	0.001 W/nm ≤ Φ_e ≤ 0.05 W/nm 360 nm ≤ λ ≤ 830 nm at 5 nm interval	2.9% to 4.6%	20,000 (+ 500 for total radiant flux)	Gonio-spectroradiometric method	13010-13051
13	Total radiant flux of a tungsten lamp	5.5 W ≤ Φ_e ≤ 15 W	1.1%	20,000	Gonio-spectroradiometric method	13010-15080
14	Correlated color temperature of a tungsten lamp and a general light source (fluorescent lamp, LED lamp, etc.)	2 600 K to 3 200 K (tungsten lamp) 2 600 K to 7 500 K (general light source)	18 K (tungsten lamp) 21 K to 79 K (general light source)	6,500	Sphere-spectroradiometric method	13015-15021
15	Regular spectral transmittance of a transmitting filter or film. *Measured transmittance values will be reported at 5 nm interval from 200 nm to 900 nm and 50 nm interval from 900 nm to 2 500 nm.*	31.6% < %T ≤ 97.7% (0.01 ≤ OD < 0.5)	200 nm to 2000 nm: Greater than or equal to 0.48%	6,250 for the first piece + 3,750 for any additional piece Fee will be scaled down for selected partial wavelength range.	By comparison against a reference ND filters using the reference spectrophotometer. *Measurement uncertainties shown are percent relative of transmittance values and they are varied by wavelengths and dependent of UCC.*	13025-14011
		10.0% < %T ≤ 31.6% (0.5 ≤ OD < 1.0)	200 nm to 2000: Greater than or equal to 0.57%			
		1.00% < %T ≤ 10.00% (1.0 ≤ OD <2.0)	200 nm to 2000: Greater than or equal to 0.61%			
		0.01% < %T ≤1.00% (2.0 ≤ OD <4.0)	200 nm to 1800: Greater than or equal to 0.81%			

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16	Diffuse spectral transmittance of a diffusely transmitting material	380 nm to 780 nm	For 20% haze plate, typical uncertainties in diffuse spectral transmittance are 0.13% to 0.18% throughout the spectrum	4,000/sample	Direct measurement by single-beam primary reference spectrophtometer	13025-14021
17	Specular excluded spectral diffuse reflectance of a glossy color sample (8°:de) *Measured diffused reflectance values will be reported at 5 nm interval from 380 nm to 780 nm.*	75% < %R ≤ 100%	380 nm to 400 nm: 1.7% 405 nm to 460 nm: 1.2% 465 nm to 780 nm: 0.86%	6,250 for the first piece + 3,750 for any additional piece Fee will be scaled down for selected partial wavelength range.	By comparison against a reference glossy ceramic color standard using the reference spectrophotometer with integrating sphere accessory. *Measurement uncertainties shown are percent relative of reflectance values and they are varied by wavelengths and dependent of UCC.*	13025-14051
		40% < %R ≤ 75%	380 nm to 400 nm: 1.7% 405 nm to 460 nm: 1.2% 465 nm to 780 nm:0.84%			
		20% < %R ≤ 40%	380 nm to 400 nm: 1.8% 405 nm to 460 nm: 1.3% 465 nm to 780 nm: 0.90%			
		10% < %R ≤ 20%	380 nm to 400 nm: 1.9% 405 nm to 460 nm: 1.5% 465 nm to 780 nm: 1.1%			
		5% ≤ %R ≤ 10%	380 nm to 400 nm: 2.1% 405 nm to 460 nm: 1.6% 465 nm to 780 nm: 1.5%			
18	Specular excluded spectral diffuse reflectance of a matte color sample (8°:de) *Measured diffused reflectance values will be reported at 5 nm interval from 380 nm to 780 nm.*	75% < %R ≤ 100%	380 nm to 400 nm: 1.7% 405 nm to 460 nm: 1.2% 465 nm to 780 nm: 0.86%	6,250 for the first piece + 3,750 for any additional piece Fee will be scaled down for selected partial wavelength range.	By comparison against a reference matte ceramic color standard using the reference spectrophotometer with integrating sphere accessory. *Measurement uncertainties shown are percent relative of reflectance values and they are varied by wavelengths and dependent of UCC.*	13026-14051
		40% < %R ≤ 75%	380 nm to 400 nm: 1.7% 405 nm to 460 nm: 1.2% 465 nm to 780 nm:0.84%			
		20% < %R ≤ 40%	380 nm to 400 nm: 1.8% 405 nm to 460 nm: 1.3% 465 nm to 780 nm: 0.90%			
		10% < %R ≤ 20%	380 nm to 400 nm: 1.9% 405 nm to 460 nm: 1.5% 465 nm to 780 nm: 1.1%			
		5% ≤ %R ≤ 10%	380 nm to 400 nm: 2.1% 405 nm to 460 nm: 1.6% 465 nm to 780 nm: 1.5%			

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19	Regular spectral reflectance	5 ≤ %R ≤ 100% 200 nm ≤ λ ≤ 2 500 nm at 5 nm interval	0.32% to 0.42% for the wavelength range from 200 nm to 885 nm 1.0% to 1.4% for the wavelength range from 890 nm to 2 500 nm *Typical values for a high reflective aluminum mirror. Uncertainties for other materials are likely higher.	11,250 for full-range. Price for partial-range will be scaled down accordingly.	Absolute method by a double-subtractive double-beam spectrophotometer (Perkin-Elmer Lambda 1050) equipped with a variable-angle reflectance accessory (URA)	13025-14061
20	Specular included spectral diffuse reflectance of a glossy color sample (8°:di) *Measured diffused reflectance values will be reported at 5 nm interval from 380 nm to 780 nm.*	75% < %R ≤ 100%	380 nm to 400 nm: 1.7%	6,250 for the first piece + 3,750 for any additional piece Fee will be scaled down for selected partial wavelength range.	By comparison against a reference glossy ceramic color standard using the reference spectrophotometer with integrating sphere accessory. *Measurement uncertainties shown are percent relative of reflectance values and they are varied by wavelengths and dependent of UCC.*	13025-14071
			405 nm to 460 nm: 1.2%			
			465 nm to 780 nm: 0.86%			
		40% < %R ≤ 75%	380 nm to 400 nm: 1.7%			
			405 nm to 460 nm: 1.2%			
			465 nm to 780 nm:0.84%			
		20% < %R ≤ 40%	380 nm to 400 nm: 1.8%			
			405 nm to 460 nm: 1.3%			
			465 nm to 780 nm: 0.90%			
		7.5% < %R ≤ 20%	380 nm to 400 nm: 1.9%			
			405 nm to 460 nm: 1.5%			
			465 nm to 780 nm: 1.1%			
		2.5% ≤ %R ≤ 7.5%	380 nm to 400 nm: 2.1%			
			405 nm to 460 nm: 1.6%			
			465 nm to 780 nm: 1.5%			

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21	Specular included spectral diffuse reflectance of a matte color sample (8°:di) *Measured diffused reflectance values will be reported at 5 nm interval from 380 nm to 780 nm.*	75% < %R ≤ 100%	380 nm to 400 nm: 1.7% 405 nm to 460 nm: 1.2% 465 nm to 780 nm: 0.86%	6,250 for the first piece + 3,750 for any additional piece Fee will be scaled down for selected partial wavelength range.	By comparison against a reference matte ceramic color standard using the reference spectrophotometer with integrating sphere accessory. *Measurement uncertainties shown are percent relative of reflectance values and they are varied by wavelengths and dependent of UCC.*	13026-14071
		40% < %R ≤ 75%	380 nm to 400 nm: 1.7% 405 nm to 460 nm: 1.2% 465 nm to 780 nm:0.84%			
		20% < %R ≤ 40%	380 nm to 400 nm: 1.8% 405 nm to 460 nm: 1.3% 465 nm to 780 nm: 0.90%			
		7.5% < %R ≤ 20%	380 nm to 400 nm: 1.9% 405 nm to 460 nm: 1.5% 465 nm to 780 nm: 1.1%			
		2.5% ≤ %R ≤ 7.5%	380 nm to 400 nm: 2.1% 405 nm to 460 nm: 1.6% 465 nm to 780 nm: 1.5%			
22	Wavelength calibration of a transmitted wavelength standard (holmium oxide solution, holmium oxide filter, dydimium oxide filter etc.)	200 nm to 2 000 nm	200 nm to 830 nm: 0.08 nm 830 nm to 2 000 nm: 0.50 nm	2,500 for first peak identification + 1,250 for any additional peak	Measurement by reference spectrometer	13025-14150
23	Wavelength calibration of a reflectance wavelength standard (holmium oxide doped ceramic tile etc.)	200 nm to 2 000 nm	200 nm to 830 nm: 0.15 nm 830 nm to 2 000 nm: 0.70 nm	3,750 for first peak identification + 1,250 for any additional peak	Measurement by reference spectrometer with integrating sphere accessory	13025-14151
24	Surface color of general reflecting material, x, y, Y, u', v', L*, a*, b*	Varied be parameter of interest, please contact a laboratory staff for full details.	Varied by parameter of interest and color of UUC, please contact a laboratory staff for full details.	For general material: 7,500 THB for the first piece and 4,000 THB for an additional piece. For a set of color standards: 7,500 THB for the first piece and 2,000 THB for an additional piece.	Spectral diffuse reflectance measurement by single-beam substitution method against a reference color standard	13025-16010

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25	Transmitted color of a transmitting material	360 nm to 860 nm	Values and uncertainties vary depending on sample's color. Contact the Colorimetry Laboratory for details	3,500/sample	Direct measurement by single-beam primary reference spectrophtometer	13025-16030
26	Gloss of a gloss sample	20°, 60° and 85°	At 20° U_{rel} = 0.77% At 60° U_{rel} = 0.49% At 85° U_{rel} = 0.20%	3,750/sample	Reflectance measurement by spectrophotometer and applying Fresnel Equation	13025-16060
27	Haze and luminous transmittance of a diffusely transmitting material	380 nm to 780 nm	For 20% haze plate, typical uncertainty in transmission haze is 0.16%.	5,000/sample	Based on ASTM D1003 standard method	13025-16070
28	Whiteness and Tint	380 nm to 780 nm W greater than 40 and less than 5Y-280	1.5	6,500/sample	Spectral diffuse reflectance measurement by single-beam substitution method against a reference white diffuse reflectance standard	13025-16120
29	Absolute spectral irradiance responsivity of a scanning spectroradiometer with irradiance probe	250 nm to 2 500 nm	Greater than or equal to 2.5%	11,250	Direct measurement against a set of two FEL working standard lamps	13038-12023
30	Absolute spectral irradiance responsivity of a diode array spectroradiometer with irradiance probe	250 nm to 2 500 nm	Greater than or equal to 2.4%	6,250	Direct measurement against a set of two FEL working standard lamps	13039-12023
31	Relative spectral radiance responsivity of a scanning spectroradiometer with radiance probe	250 nm to 2 500 nm	Greater than or equal to 2.5%	11,250	Direct measurement against a set of two FEL working standard lamps	13038-12030
32	Relative spectral radiance responsivity of a diode array spectroradiometer with radiance probe	250 nm to 2 500 nm	Greater than or equal to 2.4%	6,250	Direct measurement against a set of two FEL working standard lamps	13039-12030
33	Power responsivity of a trap detector	356.4 nm, 406.7 nm, 413.1 nm, 476.2 nm, 530.9 nm, 562.2 nm, 647.1 nm, 799.3 nm	0.018%	20,000 per wavelength point	Absolute calibration based on electrical substitution responsivity at the cryogenic temperature	13030-12040
34	Solar irradiance responsivity of a Si-pyranometer	Wavelength: 400 nm to 1 100 nm Power Level: 50 $W.m^{-2}$ to 380 $W.m^{-2}$	2.0%	6,250	Comparison against a working standard spectroradiometer applying 300 W Xe arc lamp with 1.5 global airmassfilter	13034-12716

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35	Solar irradiance responsivity of a thermopile-detector pyranometer	400 nm to 1 100 nm (160 W.m^2 to 520 W.m^2)	2.1%	9,000	Soruce based calibration against a working standard spectroradiometer applying a solar simulator system	13034-12717
36	Intregrated irradiance responsivity of broadband radiometer	315 nm to 400 nm (UVA)	4.4%	6,250 per probe for the first irradiance level point + 3,130 for any additional irradiance level point	Source based calibration against a reference spectroradiometer using filtered 500 W Hg(Xe) as light source	13034-12090
		280 nm to 315 nm (UVB)	6.3%			13034-12091
		280 nm to 400 nm (UVA+UVB)	6.0%			13034-12092
		Arbitary range within 280 nm to 1 020 nm	Varied by selected range			13034-12099
37	Intregrated irradiance responsivity of narrowband radiometer	365 nm ± 10 nm	4.4%	6,250 per probe for the first irradiance level point + 3,130 for any additional irradiance level point	Source based calibration against a reference spectroradiometer using filtered 500 W Hg(Xe) as light source	13034-12110
		254 nm ± 10 nm	10%			13034-12113
		Arbitary range within 280 nm to 1 020 nm	Varied by selected range			13034-12119
38	Responsivity of PAR radiometer	400 nm to 700 nm	2.0%	6,250	Direct measurement against a set of two FEL working standard lamps	13038-12120
39	Spectral irradiance of a tungsten-halogen lamp (FEL and Ushio type)	250 nm ≤ λ ≤ 320 nm, BW = 5 nm	4.3% to 7.6%	11,250 for the first range of the first lamp + 5,630 for the first range of any additional lamp of the same type + 3,750 for any additional range	By scanning measurements against a set of two spectral irradiance standard lamps using a double subtractive monochromator	13037-13011
		320 nm < λ ≤ 400 nm, BW = 5 nm	2.5% to 3.8%			
		400 nm < λ ≤ 1 100 nm, BW = 5 nm	2.2% to 2.3%			
		1 100 nm < λ ≤ 1 800 nm, BW = 5 nm	2.7% to 2.9%			
		1 800 nm < λ ≤ 2 300 nm, BW = 10 nm	3.6% to 4.5%			
			4.9% to 10%			
40	Spectral irradiance of a duterium lamp	240 nm to 400 nm	3.8% to 10%	13,750 for the first lamp + 5,630 for any additional lamp	By scanning measurements against a spectral irradiance reference national standard lamp using a double subtractive monochromator	13037-13012

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41	Measurement of absolute / relative spectral irradiance of a light source	250 nm to 1 020 nm	Greater than or equal to 2.4%	6,250 for the first lamp + 3,130 for any additional lamp of the same type	Measurement by a working standard diode array spectroradiometer	13034-13013
42	Measurement of integrated absolute irradiance of a light source	320 nm to 400 nm (UVA)	4.2%	6,250 for the first lamp (per range) + 3,130 for any additional lamp of the same type (per range)	Measurement by a working standard radiometer	13035-15090
		260 nm to 320 nm (UVB)	6.4%			13035-15091
		400 nm to 500 nm	3.6%			13035-15098
43	Measurement of linearity response of a photo-detector	At discrete wavelengths from 200 nm to 2 500 nm Beam size ranges from 25 micron to 5 mm	200 nm to 400 nm: ± 0.1% 400 nm to 2 500 nm: ± 0.05%	4,375 for one combination of wavelength and beam size of one photo-detector	Flux superposition method	13032-12900
44	Measurement of uniformity of response of a photo-detector	At discrete wavelengths from 200 nm to 2 500 nm Beam size ranges from 25 micron to 5 mm	201 nm to 400 nm: ± 0.2% 400 nm to 2 500 nm: ± 0.1%	6,250 for one combination of wavelength and beam size of one photo-detector	x-y linear scan	13032-12910
45	Luminous intensity of a single packaged LED	0.1 cd to 100 cd	2.3% to 3.4% varied with LED color	15,000 for the first LED (CIE condition A and B) + 7,500 for any additional LED of the same type	Spectroradiometric method against two spectral irradiance standard lamps for CIE condition A and B	13045-11012
46	Luminous flux of a single-packaged LED	0.1 lm to 200 lm	1.8% to 2.3% varied with LED color	12,500 for the first LED + 6,250 for any additional LED of the same type	Absolute integrating sphere method against two spectral irradiance standard lamps	13045-11032
47	Distribution temperature of tungsten lamp	2 600 K to 3 200 K	20 K* varied by UUC	6,500 (+ 500 for chromaticity coordinate)	Measurement by a working standard spectroradiometer	13041-15010

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48	Correlated colour temperature of general light source	2 600 K to 6 600 K	21 K* varied by UUC	6,500 (+ 500 for chromaticity coordinate)	Measurement by a working standard spectroradiometer	13041-15021
49	Chromaticity coordinate of general light source	0 to 0.9 at approximately 1 nm bandwidth	$U(x)$=0.001 7* $U(y)$=0.000 6* $U(u)$=0.001 0* $U(v)$=0.000 3* $U(u')$=0.001 0* $U(v')$=0.000 5* varied by UUC	6,500 (+ 500 for correlated color temperature)	Measurement by a working standard spectroradiometer	13041-15040
50	Correlated color temperature response of a color temperature meter	2 600 K to 10 000 K	45 K to 140 K	6,500 for the first calibration point + 1,000 for any additional point	Spectroradiometric method	13041-15030
51	Chromaticity response of a colorimeter	x : 0.122 3 to 0.696 2 y : 0.089 3 to 0.693 5 u' : 0.051 7 to 0.530 4 v' : 0.210 1 to 0.565 5	0.002 in (x,y) and (u',v')	6,500 for the first calibration point + 1,000 for any additional point	Spectroradiometric method	13041-15050
On-site Calibration						
52	Measurement of absolute / relative spectral irradiance of a light source	250 nm to 1020 nm	3.4% to 9.8%	6,250	Measurement by a working standard diode array spectroradiometer	13034-33013
53	Measurement of integrated absolute irradiance of a light source	320 nm to 400 nm (UVA)	4.2%	6,130 (per range)	Measurement by a working standard radiometer	13035-35090
		260 nm to 320 nm (UVB)	6.4%			13035-35091
		400 nm to 500 nm	3.6%			13035-35098
54	Solar simulator performance testing according to IEC 60904-9	400 nm to 1,100 nm for spectral match evaluation	0.006* to 0.02*	6,250/irradiance level/DUT	Measurements based on IEC 60904-9	13034-33014
		≥ 6,606 cm^2 for designated test area of non-uniformity evaluation	0.10%	10,000 for 64 test positions + 500/additional test position		
		Data sampling time of DUT ≥ 2 ms for instability evaluation	0.05%	6,250/DUT		

Note: 1. If the lamp aging is required, the fee is 500 Baht per hour per lamp.

2. If the customer requests an adjustment for the unit under calibration, there will be an additional charge to cover for the adjustment fee.

3. The uncertainties in the above table are expanded relative measurement uncertainties unless marked with *.

4. For any measurand related to the spectral property or spectrally integrated property, the measurement uncertainty varies by wavelength range of interest and depends on the UUC.