



National Institute of Metrology (Thailand)

3/4-5 Moo 3, Klong 5, Klong Luang, Pathumthani, 12120, Thailand

Tel. +66 2577 5100 (Please contact customer Service Section: Ext. 3101, 3102 and 3103), Fax. +66 2577 3659, E-mail: cs@nimt.or.th, Website: http://www.nimt.or.th

Price List

Electrical Metrology Department						
Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
1	DC Voltage Standard	1.018 V	0.9 μ V/V	12,500/piece		09010-10110
		10 V	0.4 μ V/V	+ 6,750/next point		
	Standard Cell	1 V / 1.018 V	0.9 μ V/V	12,500/piece		09010-10111
2	DC Voltage Standard	1 V / 1.018 V	0.09 μ V/V	36,000/piece	Compared against JJVS maintained by NIMT.	09010-10112
		10 V	0.03 μ V/V			
3	Picoampmeter	2 pA to 200 mA	0.1 mA/A to 0.01 mA/A	6,750 to 11,250/piece	Used volt-ampere method.	09010-10320
4	Electrometer	2 nC to 200 μ C	0.1 mC/C	6,750 to 11,250/ piece		09010-10321
5	AC/DC Transfer Standard	AC-DC Transfer Difference 2 mV to 20 V Frequency: 10 Hz to 1 MHz	8 μ V/V to 0.22 mV/V	90,000/item		09020-10510
		AC-DC Transfer Difference > 20 V to 1000 V Frequency: 10 Hz to 100 kHz				
6	Thermal Transfer Standard	AC-DC Transfer Difference 0.5 V to 20 V Frequency: 10 Hz to 1 MHz	8 μ V/V to 0.22 mV/V	67,500/item		09020-10511
		AC-DC Transfer Difference > 20 V to 1000 V Frequency: 10 Hz to 100 kHz				
7	Thermal Voltage Converter Standard	AC-DC Transfer Difference 0.5 V to 20 V Frequency: 10 Hz to 1 MHz	8 μ V/V to 0.22 mV/V	9,000/item		09020-10512
		AC-DC Transfer Difference > 20 V to 1000 V Frequency: 10 Hz to 100 kHz				
8	AC Measurement Standard	AC-DC Transfer Difference 10 mV to 20 V Frequency: 10 Hz to 1 MHz	8 μ V/V to 0.12 mV/V	67,500 to 78,750 /item	Excluded WB option.	09020-10520
		AC-DC Transfer Difference > 20 V to 1000 V Frequency: 10 Hz to 100 kHz				
		AC Voltage 10 mV to 20 V Frequency: 10 Hz to 1 MHz	11 μ V/V to 0.18 mV/V	78,750 to 85,500 /item	Included WB option.	09020-10521
		AC Voltage > 20 V to 1000 V Frequency: 10 Hz to 100 kHz				
9	Alternating Voltage Measurement Standard	AC Voltage 100 mV to 20 V Frequency: 10 Hz to 1 MHz	11 μ V/V to 0.18 mV/V	67500/item		09020-10522
		AC Voltage > 20 V to 1000 V Frequency: 10 Hz to 100 kHz				



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10	AC Voltage Current Standard	AC Voltage 100 mV to 1000V Frequency 60 Hz and 400 Hz	18 μ V/V to 0.58 mV/V	18,130 to 21,700/item		09020-10560
		AC Current 100 mA to 30 A Frequency 60 Hz and 400 Hz	50 μ A/A to 0.12 mA/A			



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
11	Multifunction Transfer Standard	AC Voltage 100 mV to 20 V Frequency: 10 Hz to 1 MHz	11 μ V/V to 0.18 mV/V	78750/item		09020-10561
		AC Voltage > 20 V to 1000 V Frequency: 10 Hz to 100 kHz				
		AC Current 100 μ V to 10 A Frequency: 10 Hz to 10 kHz	50 μ A/A to 0.12 mA/A			
12	AC Current Shunt	AC-DC Transfer Difference 5 mA to 100 A Frequency: 10 Hz to 100 kHz	18 μ A/A to 0.20 mA/A	6,750 to 11,250/item		09020-10610
13	DC Standard Resistor	1 k Ω	0.14 $\mu\Omega/\Omega$	42,500/item	Compared against QHR standard maintain by NIMT using automatic resistance bridge.	09030-10210
14	Standard Resistor 1 Ω	1 Ω at 50 mA	$\geq 0.21 \mu\Omega/\Omega$	8,625/piece	Used a group of 1 Ω standard.	09030-10211
15	Standard Resistor 10 k Ω	10 k Ω at 0.3 mA	$\geq 1.4 \mu\Omega/\Omega$	8,625/piece	Used a group of 10 k Ω standard.	09030-10212
16	Standard Resistor 0 Ω to 10 T Ω	100 $\mu\Omega$ at 200 A	As Specification	10,000/piece	Used DCC bridge and 400 Amp range extender.	09030-10213
17	Standard Resistor (Calibrate in oil or in air)	1 m Ω to 10 k Ω	As specification	6,750/item	Used DCC bridge and 100 Amp range extender. Using Automatic High Resistance Bridge Using Dual Source High Resistance Ratio Bridge	09030-10214
		>10 k Ω to 1G Ω	$\leq 500 \mu\Omega/\Omega$	7,880/item		09030-10215
		1 G Ω to 1 T Ω	37 $\mu\Omega/\Omega$ to 1.25 m Ω/Ω	7,880/item		09030-10216
		1 T Ω to 100 T Ω	>1.25 m Ω/Ω to 24.4 m Ω/Ω	7,880/item		
		0 Ω to 1 T Ω	As specification	2,250/point test		09030-10217
		10 T Ω at 100 V, 200 V 500 V and 1000 V	3 m Ω/Ω	2,250/point test		
18	Decade Resistance Box	1 m Ω to 10 M Ω	As specification	4,500 first decade + 3,380/next step		09030-10218
		10 M Ω to 1 T Ω	As specification	9,900 first decade + 6,750/next step		09030-10219
19	Resistance Calibrator	0 Ω to 100 M Ω	As specification	20,000/piece		09031-10210
20	Standard Resistor	Test Voltage: maximum 2500 V Range 100 M Ω to 1 T Ω	As Specification	2,250 / point	Used Volt Amp Method	09031-10211
21	High Resistance Meter	Upto 1 T Ω	As specification	2,250 / point	Direct	09030-10220
22	Digital Thermometer (indicator)	up to 10 M Ω	$\leq 5 \mu\Omega/\Omega$	(22,500 to 29,250)/item		09030-10221



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			$\geq 5 \mu\Omega/\Omega$	(9,000 to 18,000)/item		09030-10222
23	Low Resistance meter	Range 1 k Ω maximum Current 0.5 A	As Specification	2,250 / point	Direct measurement	09030-10223
		Range 100 Ω maximum Current 1 A				
		Range 10 Ω maximum Current 5 A				
		Range 1 Ω maximum Current 10 A				
		Range 0.1 Ω maximum Current 20 A				
		Range 0.01 Ω maximum Current 30 A				
		Range 1 m Ω maximum Current 100 A				
24	High Resistance Meter	Test Voltage: maximum 5000 V	As Specification	2,250 / point		09030-10224
		Range 10 M Ω , 20 M Ω and 50 M Ω				
		Range 100 M Ω , 200 M Ω and 500 M Ω				
		Range 1 G Ω , 2 G Ω and 5 G Ω				
		Range 10 G Ω , 20 G Ω and 50 G Ω				
		Range 100 G Ω , 200 G Ω and 500 G Ω				
25	Low Resistance meter (High Current)	:100 m Ω , 200 m Ω , 400 n Ω , 600 m Ω and 800 m Ω @ Max.120 A	As Specification	2,250 / point		09030-10225
		: 1 m Ω , 2 m Ω , 4 m Ω , 6 m Ω and 8 m Ω @ Max 100 A				
		: 10 m Ω , 20 m Ω , 40 m Ω , 60 m Ω and 80 m Ω @ Max 60 A				
		: 0.1 Ω , 0.2 Ω , 0.4 Ω , 0.6 Ω and 0.8 Ω @ Max 10 A				



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		: 1 Ω, 2 Ω, 4 Ω, 6 Ω, 8 Ω and 16 Ω @ Max 1 A				
		: 40 Ω, 80 Ω @ Max 1 A				
	Low Resistance Meter	Range 10 mΩ to 10 MΩ	As Specification	2,250 / point		09030-10226
	High Resistance meter	Range 10 MΩ to 10 TΩ Maximum test Voltage: 5 kV	As Specification	2,250 / point		09030-10227
26	Standard Watt Converter	Volt : 600 V Current : 100 A AC Power : 60 kW Frequency : 50 Hz, 60 Hz Power Factor : ± 0 to 1	> 60 μW/VA	18,000 to 39,500/item		09050-10710
27	AC Wattmeter, Digital Power Meter	Volt : 1000 V Current : 80 A AC Power : 80 kW Frequency : 15 Hz to 450 Hz Power Factor : ± 0 to 1	> 100 μW/VA	6,750 to 13,500/Channel		09050-10711
28	Energy Meter	Energy 1.5 Ws to 3600 kW Voltage 15 V to 600 V Current 0.1 A to 100 A Power Factor 1 to 0 (Inductive or Capacitive)	≥ 100 μWh/ VAh	6,750 to 13,500/Channel		09050-10712



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
		Frequency 50 Hz to 60 Hz Measurement time 1s to 60 s				
29	Electrical Power Source	Power 1.5 W to 60 kW Frequency 50 Hz to 60 Hz Power Factor 1 to 0 (Inductive or Capacitive) Voltage 3 V to 1000 V Current 0.05 A to 100 A Frequency 15 Hz to 6 kHz	Power $\geq 70 \mu\text{W}/\text{VA}$ Voltage $\geq 30 \mu\text{V}/\text{V}$ Current $\geq 30 \mu\text{A}/\text{A}$ Phase $\geq 0.005^\circ$	9,000 to 45,000/item		09050-10713
30	DC Power Meter	Power: 1mW to 20 kW Voltage : 100 mV to 1000 V Current : 10 mA to 20 A	$\geq 40 \mu\text{W}/\text{W}$	6,750 to 13,500/Channel		09050-10714
31	Energy Source	Energy 41.67 mWh to 3.333 kWh Power: 0.5 W to 20 kW Voltage: 10 V to 1000 V Current: 0.05 A to 20 A Power Factor: 1 Frequency: 50 Hz to 60 Hz Time : 5 minute to 10 minute	$> 0.12 \%$	5,000 to 15,000 / item		09050-10715



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
32	Three Phase Watt Meter, Three Phase AC Power Meter, Three Phase Comparator	Power : 4.5 W to 240 kW Voltage : 15 V to 1000 V Current : 0.1 A to 80 A Power Factor : 1 to 0 (Inductive, Capacitive) Frequency : 50 Hz to 60 Hz	100 μ W/VA to 370 μ W/VA	5,000 to 55,500 /Channel		09050-10716
33	Single phase / Three phase energy meter	Energy : (0.0625 Wh to 5000 kWh) / phase Power : (0.75 W to 50 kW) / phase Voltage : 15 V to 1000 V Current : 0.1 A to 50 A Power Factor : 1 to 0.5 (Inductive ,Capacitive) Frequency : 50 Hz to 60 Hz Time : 300 sec to 100 hours	Single phase @ 300 s 515 μ Wh/Wh to 565 μ Wh/Wh Three phase @ 300 s 570 μ Wh/Wh to 665 μ Wh/Wh	5,000 to 30,000 /Channel		09050-10717



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
34	Single Phase / Three Phase Watt Meter	AC Power : 0 W to 172.8 kW (three phase) : 0 W to 57.6 kW (per phase) Voltage : 10 V to 480 V Current : 0.001 A to 120 A Power Factor : 1 to 0 (Inductive, capacitive) Frequency : 50 Hz to 60 Hz	0.12 % for single phase 0.20 % for three phase	5,000 to 25,000 / channel	High burden Direct measurement	09050-10718
35	AC Power Source (On-site)	AC Power : 0.15 W to 76.8 kW Voltage : 60 V to 480 V Current : 0.005 A to 160 A Power Factor : 1 to 0.5 (Inductive) Frequency : 50 Hz to 60 Hz	100 μ W/W to 215 μ W/W	5,000 to 28,000 /Channel	Direct measurement	09050-30710
36	Single phase energy meter, Single phase power meter,	Energy : (0.01875 Wh to 76.8 kWh)/phase Power : (0.0375 W to 76.8 kW)/phase	<u>Single/Three phase (\leq 5 A)</u> Power \geq 400/450 μ W/W	2,500 to 10,000 /Channel	Comparison measurement 1. \leq 5 A : single and three phases	09050-30711



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	Three phase energy meter, Three phase power meter (On-site)	Voltage: 15 V to 480 V Current : 0.005 A to 160 A PF : 1 to 0.5 (Inductive) Frequency : 50 Hz to 60 Hz Time : 30 min to 1 hour	Energy \geq 400/550 μ Wh/Wh <u>Single phase (> 5 A to 50 A)</u> Power \geq 200 μ W/W Energy \geq 400 μ Wh/Wh <u>Single phase (> 50 A to 160 A)</u> Power \geq 300 μ W/W Energy \geq 500 μ Wh/Wh		2. > 5 A to 160 A : single phase	
37	Phase Meter	Phase Angle : 0.000° to + 360.000° Frequency : 15 Hz to 100 kHz Amplitude (rms) : 50 mV to 120 V	> 0.01°	9,000 to 27,000/item		09050-10920
	Phase Source	Phase Angle : 0.000° to 999.999° Frequency : 10 Hz to 100 kHz Amplitude (rms) : 50 mV to 120 V	> 0.005 °	18,000 to 45,000/item		09050-10921
38	Phase Meter Current Shunt	Range : 0.1 A to 50 A Phase Angle : 0.000° to \pm 180°	\geq 0.002 °	5,000 (5 pts) + 800 / point		09050-10922



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
		Frequency : 16 Hz to 850 Hz				
39	Power Analyzer, Harmonics and Flicker	Output Voltage : 1020 V Output Current : 80 A Frequency : 20 Hz and up to 1 kHz Harmonics : 100 th , up to 6 kHz Flicker : 16 Hz to 9 kHz	Voltage > 100 μ V/V Current > 150 μ A/A Power > 200 μ W/VA Frequency > 50 μ Hz/Hz	6,750 to 13,500/channel		09050-10930
40	Power Analyzer, Dips/ Swells	Voltage: 10 V to 1000 V Current Current : 0.05 A to 20A Dip/Swell amplitude : 10 % to 140 % of nominal amplitude Time : 1 ms to 1 minute Frequency : 16 Hz to 850 Hz	≥ 0.07 %	2,250 to 9,000/ channel		09050-10931
41	Harmonic Current Meter	Current : 1 A to 120 A Fund. Frequency : 50 Hz and 60 Hz Harmonic current : 0.1 % to 10 % of fundamental Harmonics : 1st to 40th, Har. Frequency : 50 Hz to 2.4 kHz	Harmonic < 1 % of <u>Fundamental</u> 0.07 % Harmonic ≥ 1 % of <u>Fundamental</u> 5.80 %	5,000 to 27,500/ channel	High burden Direct measurement	09050-10932



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
42	Harmonics Power Source	Harmonics Power (0.0025 to 10) % of Fundamental Power Power Factor of Harmonics 1 to 0.5, Inductive or Capacitive Harmonics order : 2nd to 100th Total Power : 20 W to 50 kW Total Voltage : 50 V to 1000 V Total Current : 0.8 A to 50 A Power Factor of Fundamental 1 to 0.5, Inductive or Capacitive Fundamental Frequency : 50 Hz to 60 Hz	0.32 mW/W to 8.2 mW/W	10,000 THB/channel (10 points)	1) Additional fee: 750 THB/ additional point 2) Digital sampling technique	09050-10933
43	DC Power Meter (20 A to 200 A)	Power: 200 W to 200 kW Voltage : 10 V to 1000 V Current : 20 A to 200 A	160 μ W/W to 325 μ W/W	7,500 THB (2 points) / channel	7,500 THB for 2 points 2,500 THB/point for additional point	09050-10719
44	Wattmeter AC Power Meter Power Comparator (Single Phase)	Power : 0 W to 12 kW Voltage: 60 V to 480 V Current : 0.1 A to 50 A PF: 1 to 0 (Inductive or Capacitive) Frequency : 50 Hz to 60 Hz	50 μ W/VA to 65 μ W/VA	5,000 THB to 25,000 THB / channel	Comparison measurement	09050-10720



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
45	Energy Meter with Pulse (Single phase or Three phase)	Energy: 1.05 mWh to 833.3 Wh per phase Power: 0.75 W to 50 kW per phase Voltage: 15 V to 1000 V Current : 0.1 A to 50 A PF: 1 to 0.5 (inductive or Capacitive) Frequency : 50 Hz to 60 Hz Time : 5 s to 60 s	90 μ Wh/Wh to 160 μ Wh/Wh	5,000 THB to 30,000 THB / channel	Pulse comparison	09050-10721
46	Wattmeter AC Power Meter Wattmeter with AC Current Clamp AC Power Meter with AC Current Clamp (80 A to 120 A) (1 phase or 3 phase)	Power : 0 W to 120 kW per phase Voltage: 15 V to 1000 V Current : 80 A to 120 A PF: 1 to 0 (inductive or Capacitive) Frequency : 50 Hz to 60 Hz	135 μ W/VA to 205 μ W/VA	5,000 THB to 25,000 THB / channel		09050-10722
47	Wattmeter with AC Current Clamp AC Power Meter with AC Current Clamp (500 A to 6000 A)	Power : 3.75 kW to 6000 kW per phase Voltage: 15 V to 1000 V Current : 500 A to 6000 A	5.6 mW/W to 6.8 mW/W	7,500 THB for 1st point 3,750 THB/point for additional point	Current coil used	09050-10723



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	(1 phase or 3 phase)	PF: 1 to 0.5 (inductive) Frequency : 50 Hz to 60 Hz		/ channel		
48	Single Phase AC Wattmeter Single Phase AC Power Meter	Reactive Power : 0 var to 50 kvar Voltage: 15 V to 1000 V Current : 0.1 A to 50 A QF: 1 to 0 (inductive or capacitive) Frequency : 50 Hz to 60 Hz	60 μ var/VA to 125 μ var/VA	5,000 THB to 25,000 THB / channel	Direct measurement	09050-10724
49	Three Phase AC Wattmeter Three Phase AC Power Meter Three Phase Power Comparator	Reactive Power : 0 var to 150 kvar Voltage: 15 V to 1000 V Current : 0.1 A to 50 A QF: 1 to 0 (inductive or capacitive) Frequency : 50 Hz to 60 Hz	60 μ var/VA to 125 μ var/VA	5,000 THB to 25,000 THB	Direct measurement	09050-10725
50	Single Phase Energy Meter with Pulse Output	Reactive Energy: 1.05 mvarh to 833.33 varh Power: 0.75 var to 50 kvar Voltage: 15 V to 1000 V Current : 0.1 A to 50 A	90 μ varh/varh to 160 μ varh/varh	5,000 THB to 30,000 THB / channel	Pulse comparison	09050-10726



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		QF: 1 to 0.5 (inductive or capacitive) Frequency : 50 Hz to 60 Hz Time : 5 s to 60 s				
51	Three Phase Energy Meter with Pulse Output	Reactive Energy: 3.15 mvarh to 2.5 kvarh Power: 0.75 var to 50 kvar Voltage: 15 V to 1000 V Current : 0.1 A to 50 A QF: 1 to 0.5 (inductive or capacitive) Frequency : 50 Hz to 60 Hz Time : 5 s to 60 s	90 μ varh/varh to 160 μ varh/varh	5,000 THB to 30,000 THB	Pulse comparison	09050-10727
52	Single Phase Energy Meter (No Pulse)	Reactive Energy: 0.0625 varh to 16.667 kvarh Power: 0.75 var to 50 kvar Voltage: 15 V to 1000 V Current : 0.1 A to 50 A QF: 1 to 0.5 (inductive or capacitive) Frequency : 50 Hz to 60 Hz	200 μ varh/varh to 600 μ varh/varh	5,000 THB to 15,000 THB / channel	Energy Packet	09050-10728



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		Time : 300 s to 1200 s				
53	Three Phase Energy Meter (No Pulse)	Reactive Energy: 0.1875 varh to 50 kvarh Power: 0.75 var to 50 kvar Voltage: 15 V to 1000 V Current : 0.1 A to 50 A QF: 1 to 0.5 (inductive or capacitive) Frequency : 50 Hz to 60 Hz	200 μ varh/varh to 600 μ varh/varh	5,000 THB to 15,000 THB	Energy Packet	09050-10729
54	AC Voltage of Electrical Power Source	AC Voltage 0.1 V to 1000 V Frequency 10 Hz to 1 kHz	30 μ V/V	5,000 THB to 50,000 THB / channel	Digital Sampling Watt Meter, DSWM Method	09050-10730
55	AC Current of Electrical Power Source	AC Current 0.01A to 100 A Frequency 10 Hz to 1 kHz	40 μ A/A	5,000 THB to 50,000 THB / channel	Digital Sampling Watt Meter, DSWM Method	09050-10731
56	AC Voltage of AC power meter, or AC wattmeter	Voltage: 5 V to 1000 V Frequency: 16 Hz to 850 Hz	0.049 mV/V to 0.31 mV/V	2,500 THB to 25,000 THB / channel	Direct measurement Method	09050-10732
57	AC Current of AC power meter, or AC wattmeter	Current: 0.01 A to 20 A Frequency: 16 Hz to 850 Hz Current: > 20 A to 80 A	0.061 mA/A to 0.177 mA/A	2,500 THB to 25,000 THB / channel	Direct measurement Method	09050-10733



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
		Frequency: 40 Hz to 850 Hz				
58	DC Power of Wattmeter	Power : 0.01 mW to 20 kW Voltage: 0.01 V to 1000 V Current : 0.001 mA to 20 A	0.15 mW/W to 1.2 mW/W	2,500 THB to 25,000 THB / channel	Direct measurement Method	09050-10734
59	DC Voltage of Wattmeter	Voltage: 0.01 V to 1000 V	0.02 mV/V to 0.16 mV/V	2,500 THB to 25,000 THB / channel	Direct measurement Method	09050-10735
60	DC Current of Wattmeter	Current: 0.01 A to 20 A	0.15 mA/A to 1.2 mA/A	2,500 THB to 25,000 THB / channel	Direct measurement Method	09050-10736
61	Calibrator	DC Voltage : 0 V to 1 kV	40 μ V/V to 0.6 μ V/V	13,500 to 33,750/item	2,000 to 9,000 THB/item for additional adjustment.	09110-11310
		AC Voltage : 10 mV to 1 kV @ 10 Hz to 1 MHz	3.03 mV/V to 20 μ V/V			
		AC Voltage : 30 V to 1 kV @ 10 Hz to 100 kHz				
		DC Current : 0 A to 20 A	150 μ A/A to 4.5 μ A/A			
		AC Current : 100 mA to 20 A @ 10 Hz to 100 kHz	1.1 mA/A to 65 μ A/A			
		Resistance : 0 Ω to 1 G Ω	1.3 m Ω / Ω to 1.8 μ Ω / Ω			
		Wideband Option	Up to 30 MHz			



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
					adjustment.	
	Power Option	As specification	As specification	6,750/option	2,500 THB/option for additional adjustment.	09110-11312
	Scope Option	300 MHz	As specification	13,500/option	2,000 to 6,500 THB/option for additional	09110-11313
		600 MHz to 1 GHz	As specification	18,000/option	adjustment.	09110-11314
	High Current	DC Current : 30 A	22 μ A/A	11,250/piece		09110-11315
		AC Current : 30 A @ 10 Hz to 10 kHz	85 μ A/A to 114 μ A/A			
	Power Quality	AC Voltage		18,000/option		09110-11316
		-Delta Amplitude Verification, Static Condition 30 V, 300 V @ 50 Hz, 60 Hz	3.20×10^{-5} to 4.10×10^{-5}			
		-Delta Amplitude Verification, Flicker Condition 230 V@ 50 Hz	4.13×10^{-5}			
		Composite Harmonic Verification - Voltage 0.12 V to 450 V @ 50 Hz, 60 Hz Type Wave : I, II, III, IV, Square and NRC 7030	1.87×10^{-3} to 2.90×10^{-1}			
		- Current 0.11 A to 9.5 A @ 50 Hz, 60 Hz Type Wave : VI, VII, IECA, IECD and NRC 7030	1.83×10^{-3} to 1.52×10^{-1}			



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
62	Oscilloscope Calibrator	Up to 600 MHz	As specification	40,000/item	2,000 to 13,500 THB/item for additional adjustment.	09110-11317
		Up to 2.1 GHz	As specification	45,000/item		09110-11318
63	Amplifier / Precision Power Amplifier	Up to 1kV 10 Hz up to 100 kHz	As specification	9,000/item	2,500 THB/function for additional adjustment.	09110-11319
64	Digital Multimeter	6 1/2 digit	As specification	9,000 to 13,500/item	5,400 THB for additional adjustment.	09110-11320
		7 1/2 digit	As specification	13,500 to 22,500/item	6,750 THB for additional calibrate with AC/DC Shunt using direct measurement method	09110-11321
		8 1/2 digit	As specification	22,500 to 27,000/item		09110-11322
65	Nano Voltmeter	DC Voltage: 1 mV to 100 mV	As specification	11,250 to 13,500/item	2,500 THB for additional adjustment.	09110-10120
66	DC High Voltage Divider	-10 kV to 10 kV	30×10^{-6} (Ratio)	≤ 10 kV 4,500 first point + 2,250 next point	Compared against DC high voltage reference system.	09060-10810
		>10 kV to 100 kV	30×10^{-6} (Ratio)	> 10 kV 5,630 first point + 2,250 next point		09060-10811
67	DC High Voltage Divider (On-site), DC High Voltage Measuring System (On-site)	200 kV	$\geq 30 \times 10^{-6}$ (Ratio)	60,000/item (5 voltage levels)	Additional fee: (1) 7,500/additional voltage level (2) Linearity Test: 10,000 /for 5 voltage level	09060-30810
68	DC High Voltage Source	-10 kV to 100 kV	$30 \mu\text{V/V}$	9,000 to 18,000/item	Compared against DC high voltage reference system.	09060-10812
69	DC High Voltage Source (On-site)	200 kV	$\geq 170 \mu\text{V/V}$	60,000/item	Additional fee:	09060-30811



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				(5 voltage levels)	(1) 7,500/additional voltage level (2) Linearity Test: 10,000 /for 5 voltage level	
70	DC High Voltage Meter	-10 kV to 100 kV	As specification	6,750 to 18,000/item	Compared against DC high voltage reference system.	09060-10813
71	DC High Voltage Meter (On-site)	200 kV	$\geq 30 \mu\text{V/V}$	60,000/item (5 voltage levels)	Additional fee: (1) 7,500/additional voltage level (2) Linearity Test: 10,000 /for 5 voltage level	09060-30812
72	High Voltage Capacitance & Dissipation Factor	Capacitance 10 pF to 1000 pF Voltage:10 kV to 100 kV Frequency : 50 Hz Dissipation Factor: 50×10^{-6} to 1×10^{-3}	$\geq 80 \mu\text{F/F}$ for Capacitance $\geq 50 \times 10^{-6}$ for Dissipation Factor	12,500/item	Compared against standard capacitor using AC high voltage capacitance and inductance bridge.	09060-10820
		Capacitance 10 pF to 1000 pF Voltage:10 kV to 200 kV Frequency : 50 Hz Dissipation Factor: 50×10^{-6} to 1×10^{-3}		17,500/item		09060-10821
73	AC High Voltage Divider	1 kV to 200 kV @ 50 Hz	$\geq 0.3 \%$ (Scale Factor)	11,500 to 27,500/item	Compared against AC high voltage reference system.	09060-10830
74	AC High Voltage Meter	1 kV to 200 kV @ 50 Hz	As specification	9,000 to 27,000/item	Compared against AC high voltage reference system.	09060-10831
75	AC High Voltage Meter, AC High Voltage Measuring System	100 kV	$\geq 0.3 \%$	67,500/item (5 voltage levels)	Additional fee: (1) 7,500/additional voltage level	09060-30830



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
	(Vrms, Vpeak, Vpeak/√2 @ 50 Hz) (On-site)	200 kV	≥ 0.3 %	82,500/item (5 voltage levels)	(2) Linearity Test: 10,000 /for 5 voltage level	09060-30831
76	AC High Voltage Source	1 kV to 200 kV @ 50 Hz	≥ 0.3 %	11,500 to 23,000/item		09060-10832
77	Voltage Transformer	3.3 kV to 33 kV @ 50Hz/60 Hz	Ratio error ≥ 0.01 % Phase displacement ≥ 0.3 min	7,500 first tap + 1,900 next tap per frequency, burden and power factor	Compared against voltage transformer reference system. 850 THB for additional point	09060-10833
78	Transformer Loss Measuring System (On-site)	up to 200 kV, up to 5 kA, 50/60 Hz	0.03 % @ p.f. = 1.0 0.14 % @ p.f. = 0.1 1.4 % @ p.f. = 0.01	56,250 for 3 power factors (4 points/power factor) +2,500 for each additional point	On-site calibration of voltage transducers, and current transducers of the transformer loss measuring system are a prerequisite for this service.	09060-30834
79	Lightning Impulse Voltage Measuring System 1.2/50 μs	100 kV	Scale factor ≥ 1.1 % Time parameter ≥ 1.7 %	23,750/ item	Additional fee for time to chopping (2.0 to 6.0) μs: 5,000 THB/point for MS rated ≤200 kV, and 10,000 THB/ point for MS rated ≤ 500 kV.	09060-10840
		200 kV		26,250/ Item		
		300 kV		31,250/ item		
		400 kV		33,750/ item		
		500 kV		36,250/ item		
80	Lightning Impulse Voltage Measuring System 1.2/50 μs (On-site)	100 kV	Scale factor ≥ 1.1 % Time parameter ≥ 2.2 %	71,250/ item (5 voltage levels)	Additional fee: (1) 15,000/additional voltage level (2) Linearity Test: 20,000/for 5 voltage levels	09060-30840
		200 kV		78,750/ Item (5 voltage levels)		09060-30841
		300 kV		93,750/ item (5 voltage levels)		09060-30842
		400 kV		101,250/ item (5 voltage levels)		09060-30843



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
		500 kV		108,750/ item (5 voltage levels)		09060-30844
81	Switching Impulse Voltage Measuring System 250/2500 μs	100 kV	Scale factor ≥ 0.8 % Time parameter ≥ 1.7 %	23,750/ item		09060-10841
		200 kV		26,250/ Item		
		300 kV		31,250/ item		
		400 kV		33,750/ item		
82	Switching Impulse Voltage Measuring System 250/2500 μs (On-site)	100 kV	Scale factor ≥ 1.1 % Time parameter ≥ 2.2 %	71,250/ item (5 voltage levels)	Additional fee: (1) 15,000/additional voltage levels (2) Linearity Test: 20,000/for 5 voltage levels	09060-30845
		200 kV		78,750/ Item (5 voltage levels)		09060-30846
		300 kV		93,750/ item (5 voltage levels)		09060-30847
		400 kV		101,250/ item (5 voltage levels)		09060-30848
83	Partial Discharge Calibrator	1 pC-1000 pC	≥ 1.7 %	15,000/ item (7 points x 2 polarities)	Additional fee: 1,500 /item for additional (1 point x 2 polarities)	09060-10850
84	Current Transformer	5 A to 1500 A @ 50 Hz/60 Hz	Ratio error ≥ 0.01 % Phase displacement ≥ 0.3 min	7,500 first tap + 1,900 next tap per frequency, burden and power factor	Compared against current transformer reference system. 850 THB for additional point	09060-10860
85	Rogowski Coil (current transducer), Rogowski Current Transducer	10 A to 1500 A @ 50 Hz/60 Hz	≥ 0.5 %	7500/item (5 current levels) frequency 50 Hz or 60 Hz	Compared against current transformer reference system. Additional fee: 7500/additional 5 current levels	09060-10861
86	AC Resistance	1 Ω, 25 Ω, 100 Ω, 400 Ω at 60 Hz or 75 Hz	As Specification	9,000/piece		09040-10410
87	AC Resistor	1 Ω to 100 kΩ @ 1000 Hz	> 0.20 mΩ/Ω	5,000/piece	Measured by RLC digibridge and/or precision LCR meter, direct measurement	09040-10411



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Electrical Metrology Department						
Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
	Additional Measurement at another Frequency	1 Ω to 100 kΩ @ 100 Hz to 100 kHz	> 0.20 mΩ/Ω	1,250 per frequency	precision LCR meter, direct measurement, at desired frequencies.	09040-10412
88	Decade AC Resistor	1 Ω to 100 kΩ @ 1000 Hz	> 0.20 mΩ/Ω	5,000 first decade + 1,250 next step	Measured by RLC digibridge and/or precision LCR meter, direct measurement, at desired frequencies.	09040-10413
	Additional Measurement at another Frequency	1 Ω to 100 kΩ @ 100 Hz to 100 kHz	> 0.20 mΩ/Ω	(4,500 first decade + 1,250 next step) per one frequency		09040-10414
89	Fixed, Fused Silica Dielectric Standard Capacitors	10 pF @ 1000 Hz	0.087 μF/F	20,000/piece/frequency	Comparing with a group of 10 pF standards	09040-10420
		1 pF @ 1000 Hz	0.71 μF/F	17,500/piece/frequency	Applied direct substitution method with the reference standard capacitors.	09040-10421
		10 pF @ 1000 Hz	0.70 μF/F			
		100 pF @ 1000 Hz	0.70 μF/F			
90	Fixed Three Terminal, Nitrogen Dielectric Standard Capacitors	10 pF 100 pF @ 1000 Hz and 1592 Hz	1.2 μF/F	12,500/piece/frequency	Applied a null method using the basic ratio bridge.	09040-10422
		1000 pF @ 1000 Hz and 1592 Hz	3.5 μF/F			
91	Two or Three Terminal Mica Dielectric Standard Capacitors	0.001 μF, 0.01 μF, 0.1 μF and 1 μF @ 1000 Hz	> 0.12 mF/F	5,630/piece	Applied a null method using the basic ratio bridge.	09040-10423
	Additional Measurement at another Frequency	0.001 μF, 0.01 μF, 0.1 μF and 1 μF @ 100, 120, 200, 400, 500 Hz, 2 kHz, 5 kHz, 10 kHz	> 0.12 mF/F	1,250/frequency	Applied a null method using the basic ratio bridge.	09040-10424
92	2 Terminal Pair Capacitance Standard	1 pF, 10 pF, 100 pF, 1000 pF at 1000 Hz to 10 MHz	> 100 μF/F	10,000/Item	S-parameter with resonance frequency	09040-10437
93	4 Terminal Pair Capacitance Standard	1 pF, 10 pF, 100 pF, 1000 pF at 1000 Hz to 30 MHz	> 63 μF/F	12,500/Item	S-parameter with resonance frequency	09040-10438
94	Four-Terminal Pair Capacitance Standard	1 pF, 10 pF, 100 pF, 1000 pF, 0.01 μF, 0.1 μF and 1 μF @ 1000 Hz	> 0.12 mF/F	5,630/piece	Measured by precision capacitance bridge, direct measurement, at desired frequency.	09040-10425
95	Additional Measurement at another Frequency	1 pF, 10 pF, 100 pF, 1000 pF, 0.01 μF, 0.1 μF and 1 μF @ 100 Hz to 100 kHz	> 0.20 mF/F	1,250/frequency	Measured by RLC Digibridge and/or Precision LCR Meter, direct measurement, at desired frequency.	09040-10426
96	Fixed Standard Capacitors	1 pF to 1 F @ 1000 Hz	> 0.20 mF/F	4,500/piece	Measured by RLC Digibridge and/or Precision LCR Meter, direct measurement,	09040-10427



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
	Additional Measurement at another Frequency	1 pF to 1 F @ 12 Hz to 1 MHz	> 0.20 mF/F	1,250/frequency		09040-10428
97	Decade capacitor	1 pF to 10 mF @ 1000 Hz	> 0.12 mF/F	5,000 first decade + 1,250 next step	Applied a null method using the basic ratio bridge.	09040-10429
		1 pF to 1 F @ 1000 Hz	> 0.20 mF/F	4,500 first decade + 1,250 next step	Measured by RLC digibridge and/or precision LCR meter, direct measurement, at desired frequencies.	09041-10420
	Additional Measurement at another Frequency	1 pF to 1 F @ 12 Hz to 1 MHz	> 0.20 mF/F	(4,500 first decade + 1,250 next step) per one frequency		09041-10421
						09041-10422
98	Precision Capacitance Bridge	1 pF, 10 pF, 100 pF @ 1000 Hz or 1592 Hz	≥ 0.40 μF/F	27,500/item	Calibrated by comparing its reading against the reference standard capacitors. The correction functions are used to correct additional error due to the test fixture and test leads before measurement.	09041-10423
99	Fixed Standard Inductors	100 μH, 1 mH, 10 mH, 100 mH, 1 H and 10 H @ 1000 Hz	> 0.16 mH/H	12,500/piece	Measured by the direct substitution method with the reference standard inductors.	09040-10430
	Additional Measurement at another Frequency	100 μH, 1 mH, 10 mH, 100 mH, 1 H and 10 H @ 12 Hz to 1 MHz	> 0.20 mH/H	1,250/frequency	Measured by RLC digibridge and/or precision LCR meter, direct measurement, at desired frequencies.	09040-10431
100	Fixed standard Inductor	1 μH to 10 H @ 1 kHz	> 0.20 mH/H	5,630/piece	Measured by RLC digibridge and/or precision LCR meter, direct measurement, at desired frequencies.	09040-10432
	Additional Measurement at another Frequency	1 μH to 10 H @ 12 Hz to 1 MHz	> 0.20 mH/H	1,250/frequency		09040-10433
101	Decade Inductors	1 μH to 10 H @ 1000 Hz	> 0.20 mH/H	4,500 first decade + 1,250 next step	Measured by RLC digibridge and/or precision LCR meter, direct measurement, at desired frequencies.	09040-10434
	Additional Measurement at another Frequency	1 μH to 10 H @ 12Hz to 1 MHz	> 0.20 mH/H	(4,500 first decade + 1,250 next step) per one frequency		09040-10435



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102	LCR Meter with 4 terminal pair configuration/without 4 terminal pair configuration	0.001 μ F, 0.01 μ F, 0.1 μ F and 1 μ F @ 100, 120, 200, 400, 500 Hz, 1 kHz, 2 kHz, 5 kHz, 10 kHz	> 0.12 mF/F	To be determined	Calibrated by comparing its reading against the standard capacitors, standard inductors and standard resistors. The correction functions are used to correct additional error due to the test fixture and test leads before measurement.* For 4 terminal pair configuration	09040-10436
		1 pF, 10 pF, 100 pF, 1000 pF @ 1000 Hz*	> 0.12 mF/F			
		100 μ H, 1 mH, 10 mH, 100 mH, 1 H and 10 H @ 1000 Hz	> 0.16 mH/H			
		1 Ω , 10 Ω , 100 Ω , 1000 Ω @ 1 kHz	> 0.20 m Ω / Ω			
103	Power Sensor with reflection coefficient	9 kHz to 18 GHz	1.0 % to 2.0 %	20,000/item	Using DC substitution Method	09090-11150
		9 kHz to 26.5 GHz	As Specification	25,000/item	Using Direct Method	09090-11151
104	Power meter	As specification	As specification	11,250/item		09090-11111
105	Feedthrough Mount	100 kHz to 18 GHz, 1 mW	0.5 % to 1.3 %	21,000/item	Using DC substitution Method	09090-11130
		9 kHz to 26.5 GHz, 1 mW	As Specification	23,000/item		09090-11131
106	RF Attenuator					
	- Fix Attenuator/Step Attenuator	10 MHz to 18 GHz, 10 dB to 80 dB	3 dB to 0.22 dB upto frequency range	3,200/Freq. Point	IF substitution Method (1)	09090-11120
	- Attenuation in Coaxial line/Passive	100 kHz to 18 GHz, 10 dB to 80 dB	7 dB to 0.20 dB upto frequency range	3,000/Freq. Point	IF substitution Method (2)	09090-11121
107	Audio Attenuator	31.5 Hz to 100 kHz	As Specification	3,500/Freq.Point		09090-11122
108	Electrical Field Strength	Frequency 100 kHz to 6 GHz	0.7 dB to 1.1 dB	25,000/item	Using Direct measurement by comparing to their reference standard field	09090-11030
109	Oscilloscope	As specification	As specification	15,000/item		09090-11160
110	Spectrum Analyzer	As specification	As specification	50,000/item		09090-11161
111	Network Analyzer	As specification	As specification	67,500/item		09090-11162
112	Synthesizer Signal Generator	Up to 225 MHz	As specification	8,000 to 10,000/item		09090-11163
113	Function Generator	As specification up to 200 MHz	As specification	10,000/item		09090-11164
114	RF Signal Generator	As specification	As specification	22,500/item	Excluded AM, FM and phase modulation. Included AM and FM modulation	09090-11170
				33,750/item		
115	Scalar Reflection Coefficient	40 kHz to 18 GHz	As specification	15,000/ item	Magnitude	09090-11210
116	RF Voltmeter	10 MHz to 1 GHz	0.4%	11,250/item	Comparison with TVC standard	09090-11172



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Item No.	Description	Range	Accuracy / Uncertainty	Calibration Fee (THB)	Remark	Code
117	RF Voltage Source	As specification	As specification	13,500/item		09090-11173
118	Directional Coupler/ power splitter	100 kHz to 18 GHz	As Specification	15,000/ item	Magnitude	09090-11250
		10 MHz to 18 GHz	As Specification	18,000/item	Vectors	09090-11350
119	Measuring Receiver	As specification	As specification	30,000 to 40000 /item	direct measurement	09090-09322
120	Audio Filter	As specification	As specification	2,500/Freq.point	direct measurement	09090-09323
121	Audio Analyzer	As specification	As specification	17,500 to 27,500 /item	direct measurement	09090-09321
122	Pulse and sine wave generator	Frequency Range : 9 kHz to 1 GHz	As specification	50,000THB/item	Direct measurement method with sampling method	09090-11611
123	Standard Optical Power Meter	1 mW to 20 mW @ 488 nm,515 nm 50 uW to 20 mW @ 633 nm. 10 uW to 3 mW @ 1310 nm Band 10 uW to 10 mW @ 1550 nm Band	≥ 0.5 %	9,380 first point + 3,500 next point	Applied direct comparison method with standard calorimeter.	09100-12400
124	Optical Power Meter	1 mW to 20 mW @ 488nm,515nm 50 uW-to 20 mW @ 633 nm 10 uW to 3 mW @ 1310 nm Band 10 uW to 10 mW @ 1550 nm Band	≥ 0.7 %	5,500 first point + 1,750 next point	Applied direct comparison method with standard power meter.	09100-12401
	Optical Power Meter	100 mW to 10 W @10600 nm	≥ 4 %	7,500 first point+2,500 next point	Substitutional Method monitor or beam splitter method	09100-12402
	Laser Energy Meter	1mJ to 100 mJ @ 532 nm, 1064 nm	≥ 2.4 %	7,500 first point+2,500 next point	Substitutional Method monitor or beam splitter method	09100-12403
	Average pulse power for laser energy meter	10 mW to 1 W @ 532 nm, 1064 nm	≥ 2.4 %	7,500 first point+2,500 next point	Substitutional Method monitor or beam splitter method	09100-12404
125	DC magnetic flux density / Reference magnet	0.1 mT < B < 5 mT	≥ 0.8 %	9,000/item	Compared with the standard maintained by NIMT Megnetic Laboratory.	09070-11020
		5 mT < B < 20 mT	≥ 0.2 %			
		20 mT < B < 30 mT	≥ 0.1 %			
		30 mT < B < 2.4 T	≥ 0.1 %			
126	DC magnetic flux density /	0.1 mT < B < 5 mT	≥ 0.8 %	9,000 first point +	Compared with the standard	09070-11021



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	Magnetic field generator	5 mT < B < 20 mT	≥ 0.2 %	next point 630	maintained by NIMT Megnetic Laboratory.	
		20 mT < B < 30 mT	≥ 0.1%			
127	DC magnetic flux density / Gauss / Tesla meter	0.1 mT < B < 5 mT	≥ 0.8 %	9,000 first point + next point 630	Compared with the standard maintained by NIMT Megnetic Laboratory.	09070-11022
		5 mT < B < 20 mT	≥ 0.2 %			
		20 mT < B < 30 mT	≥ 0.1 %			
		30 mT < B < 2.4 T	≥ 0.08 %			
128	Frequency Source - Rubidium - Quartz, Others	1 MHz, 5 MHz, 10 MHz, 1 PPS	≤ 1 x 10 ⁻¹²	13,500/item		09080-10221
129	Frequency Counter Timer Counter	Up to 1 GHz	1 x 10 ⁻⁸ to 1 x 10 ⁻⁶	4,500/item		09080-10231
130	Frequency Meter	10 kHz to 225 MHz	3 x 10 ⁻¹³ to 5 x 10 ⁻¹⁰	6,250/item		09080-10232
131	Tachometer	As specification	As specification	3,380/item		09080-10322
132	Stopwatch	As specification	As specification	2,250/item		09080-10331
133	Lidar Speed Meter (Lidar Gun)	60 km/h,80 km/h, 100 km/h and 120 km/h	0.58 km/h	15,000/item	Compare with Reference Speed Generator	09120-00001
On-site Calibration						
134	Standard Frequency Source for Remote Frequency Standard	1 MHz, 5 MHz, 10 MHz	≤ 1 x 10 ⁻¹²	13,500/item		09080-30212