Name of Accreditation Program	JCSS Accreditation Program
Accreditation Identification	JCSS 0050 Calibration
Name of Conformity Assessment Body	Japan Electric Meters Inspection Corporation Kansai
Name of Legal Entity	Japan Electric Meters Inspection Corporation JCN 4010405002454
Inquiry Point	Calibration Service Section of JEMIC Kansai Branch TEL: +81-6-6451-2355 FAX: +81-6-6451-2357

*JCN: Japan Corporate Number

23・01・31-NITE-010
2023-06-29

Certificate of Accreditation

International Accreditation Japan (IAJapan) hereby accredits the following conformity assessment body as a calibration laboratory of Japan Calibration Service System.

Accreditation Identification: JCSS 0050 Calibration

Name of Conformity Assessment Body: Japan Electric Meters Inspection Corporation Kansai

Name of Legal Entity: Japan Electric Meters Inspection Corporation

Location of Conformity Assessment Body: 1-6-110 Oyodokita, Kita-ku, Osaka-shi, Osaka 531-0077, JAPAN

Scope of Accreditation: Time & Frequency & Rotational speed, Temperature, Electricity (Direct Current & Low Frequency)
(as the following pages)

Accreditation Requirement: ISO/IEC 17025:2017*
* The relevant accreditation requirements described in the Accreditation Scheme Document for JCSS are also applied.

Effective Date of Accreditation: 2023-06-29

Expiry Date of Accreditation: 2027-06-28

Date of Initial Accreditation: 1995-06-21

SAITO Kazunori
Chief Executive, International Accreditation Japan (IAJapan)
National Institute of Technology and Evaluation

- International Accreditation Japan (IAJapan) is a laboratory accreditation body which has signed MRAs of ILAC (International Laboratory Accreditation Cooperation) and APAC (Asia Pacific Accreditation Cooperation).
- MRA requirements are, in addition to relevant international standards and guides, requirements for participation in proficiency testing programs, surveillance and reassessment, and the policy for the traceability of measurement for MRA purpose.
- This laboratory fulfills ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. This accreditation means this laboratory meets both the technical competence requirements and management system requirements that are necessary for it to consistently deliver technically valid test results and calibrations (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).
- The latest accreditation information is publicly available on IAJapan Website as an accreditation certificate.

General Field of Calibration: Time & Frequency & Rotational speed
Date of Initial Accreditation of the Field: 2017-07-31
Laboratory's permanent facility/On-site Calibration: Laboratory's permanent facility
Calibration and Measurement Capabilities

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Time & Frequency Counter, etc.	Frequency Generator	From 1 Hz up to 10 MHz		2.4×10^{-7} (Relative expanded uncertainty)
	Frequency Counter	From 1 Hz up to 10 MHz		2.4×10^{-7} (Relative expanded uncertainty)
	Time-Interval Source	From 1 s up to 60 s		0.01 s
	Time-Interval Measuring Equipment	Calibration by Frequency Measurement (rate)*1	From -32.4 s up to 32.4 s	0.023 s
		Calibration by Time-Interval Measurement	From 100 ms less than 10 s	0.000 1 s
			From 10 s up to 60 s	0.001 s
			More than 60 s up to 3600 s	0.09 s
	Tachometer	From 60 rpm up to 100 000 rpm		4 ppm + 0.02 rpm

#All Calibration Procedures are in-house procedures developed by this laboratory.
*1 : Limited to the frequency of Crystal oscillator 32.768 kHz.
Note: The above CMC columns, the values include sources of uncertainty attributed to a unit under test.

Laboratory's permanent facility/On-site Calibration: On-site Calibration
Calibration and Measurement Capabilities

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Time & Frequency Counter, etc.	Frequency Generator	From 1 Hz up to 10 MHz		2.4×10^{-7} (Relative expanded uncertainty)
	Frequency Counter	From 1 Hz up to 10 MHz		2.4×10^{-7} (Relative expanded uncertainty)
	Time-Interval Source	From 1 s up to 60 s		0.01 s
	Time-Interval Measuring Equipment	Calibration by Time-Interval Measurement	From 100 ms less than 10 s	0.000 1 s
			From 10 s up to 60 s	0.001 s
			More than 60 s up to 3600 s	0.09 s
	Tachometer	From 60 rpm up to 100 000 rpm		4 ppm + 0.02 rpm

#All Calibration Procedures are in-house procedures developed by this laboratory.
Note: The above CMC columns, the values include sources of uncertainty attributed to a unit under test.

General Field of Calibration: Temperature
Date of Initial Accreditation of the Field: 2016-10-20
Laboratory's permanent facility/On-site Calibration: Laboratory's permanent facility
Calibration and Measurement Capabilities

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Contact Type Thermometer	Thermocouple (Comparison calibration)	From -30 ˚C less than 0 ˚C		0.5 ˚C (*1)
		0 ℃		0.2 ℃ (*1)
		More than 0 ˚C less than 100 ˚C		0.4 ˚C (*1)
		From 100 ˚C up to 250 ˚C		0.3 ˚C (*1)
		More than 250 ˚C up to 1100 ˚C		0.7 ˚C (*1)
	Temperature sensors with display unit (Comparison calibration)	From -30 ˚C less than 0 ˚C		0.14 ˚C
		0 ℃		0.05 ℃
		More than 0 ℃ up to 250 ℃		0.14 ℃
		Equipped within temperature controlled enclosures	From -30 ˚C up to 200 ˚C	0.25 ˚C
	Thermometer calibration equipment	From -40˚C up to 250 ˚C		0.060 ˚C

#All Calibration Procedures are in-house procedures developed by this laboratory.
(*1) Temperature converted from Electromotive Force (EMF)

Laboratory's permanent facility/On-site Calibration: On-site Calibration
Calibration and Measurement Capabilities

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Contact Type Thermometer	Temperature sensors with display unit (Comparison calibration)	From -30 ˚C up to 250 ˚C		0.14 ˚C
		0 ℃		0.05 ℃
		More than 0 ℃ up to 250 ℃		0.14 ℃
		Equipped within temperature controlled enclosures	From -30 ˚C up to 200 ˚C	0.25 ˚C
	Thermometer calibration equipment	From -40˚C up to 250 ˚C		0.060 ˚C

#All Calibration Procedures are in-house procedures developed by this laboratory.

General Field of Calibration : Electricity（Direct Current & Low Frequency）

Date of Initial Accreditation of the Field: 1995-06-21

Laboratory's permanent facility/On-site Calibration: Laboratory's permanent facility

Calibration and Measurement Capabilities

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range	Expanded Uncertainty (Level of Confidence Approximately 95 %)
Direct Current & Low Frequency Measuring Equipment, etc.	DC Resistor	0.001 Ω	0.000 03 mΩ
		0.01 Ω	0.000 2 mΩ
		More than 0.01 Ω less than 0.1 Ω	0.001 Ω
		0.1 Ω	0.001 0 mΩ
		More than 0.1 Ω less than 1 Ω	0.10 mΩ
		1 Ω	0.005 mΩ
		More than 1 Ω less than 10 Ω (except 1.9 Ω)	0.000 20 Ω
		1.9 Ω	0.000 10 Ω
		10 Ω	0.05 mΩ
		More than 10 Ω less than 100 Ω (except 19 Ω)	0.002 0 Ω
		19 Ω	0.001 0 Ω
		100 Ω	0.40 mΩ
		More than 100 Ω less than 1 kΩ (except 190 Ω)	0.020 Ω
		190 Ω	0.010 Ω
		1 kΩ	4.0 mΩ
		More than 1 kΩ less than 10 kΩ (except 1.9 kΩ)	0.20 Ω
		1.9 kΩ	0.10 Ω
		10 kΩ	0.040 Ω
		More than 10 kΩ less than 100 kΩ (except 19 kΩ)	2.0 Ω
		19 kΩ	1.0 Ω
		100 kΩ	0.40 Ω
		More than 100 kΩ less than 1 MΩ (except 190 kΩ)	0.020 kΩ
		190 kΩ	0.010 kΩ
		1 MΩ	0.005 0 kΩ
		More than 1 MΩ up to 10 MΩ (except 1.9 MΩ)	0.000 3 MΩ
		1.9 MΩ	0.000 2 MΩ
		More than10 MΩ up to 30 MΩ (except 19 MΩ)	0.020 MΩ
		19 MΩ	0.006 MΩ
		More than 30 MΩ less than 100 MΩ	0.060 MΩ
		100 MΩ	0.005 MΩ
		More than 100 MΩ up to 110 MΩ	0.30 MΩ
		More than 110 MΩ less than 1 GΩ	0.7 %
		1 GΩ	1.0 MΩ
		More than 1 GΩ up to 10 GΩ	0.05 %
		More than 10 GΩ up to 100 GΩ	0.10 %
	DC Resistance Measuring Equipment	0.001 Ω	0.10 μΩ
		0.01 Ω	0.50 μΩ
		0.1 Ω	2.0 μΩ
		1 Ω	7.0 μΩ
		More than 1 Ω less than 10 Ω	0.20 mΩ
		10 Ω	40 μΩ
		More than 10 Ω less than 100 Ω	1.0 mΩ
		100 Ω	0.40 mΩ
		More than 100 Ω up to 400 Ω	4.0 mΩ
		More than 400 Ω less than 1 kΩ	10 mΩ
		1 kΩ	4.0 mΩ
		More than 1 kΩ less than 10 kΩ	0.10 Ω

		10 kΩ	40 mΩ
		More than 10 kΩ up to 19 kΩ	1.0 Ω
		More than 19 kΩ less than 100 kΩ	2.0 Ω
		100 kΩ	0.40 Ω
		More than 100 kΩ up to 190 kΩ	10 Ω
		More than 190 kΩ less than 1 MΩ	20 Ω
		1 MΩ	5.0 Ω
		More than 1 MΩ up to 1.9 MΩ	0.4 kΩ
		More than 1.9 MΩ up to10 MΩ	0.5 kΩ
		More than 10 MΩ less than 11 MΩ	2 kΩ
		From 11 MΩ up to 19 MΩ	10 kΩ
		More than 19 MΩ less than 33 MΩ	20 kΩ
		From 33 MΩ less than 100 MΩ	30 kΩ
		100 MΩ	5 kΩ
		More than 100 MΩ less than 110 MΩ	0.1 MΩ
		From 110 MΩ less than 330 MΩ	2.0 MΩ
		From 330 MΩ less than 1 GΩ	5.0 MΩ
		1 GΩ	1.0 MΩ
		More than 1 GΩ up to 100 GΩ	0.3 %
	DC Voltage Source	From 0 V up to 100 mV	4.5 ppm＋0.7 μV
		More than 0.1 V up to 1 V	5.5 ppm＋0.6 μV
		More than 1 V up to 10 V	5.5 ppm＋2 μV
		More than 10 V up to 100 V	7.5 ppm＋0.05 mV
		More than 100 V up to 600 V	13 ppm
		More than 600 V up to 1000 V	34 ppm－12.6 mV
		More than 1 kV up to 10 kV	0.15 %
		More than 10 kV up to 30 kV	0.2 %
	DC Voltage Measuring Equipment	From 0 V up to 1 V	5.5 ppm＋0.5 μV
		More than 1 V up to10 V	5.5 ppm＋2 μV
		More than 10 V up to 100 V	7.5 ppm＋0.05 mV
		More than 100 V up to 600 V	13 ppm
		More than 600 V up to 1000 V	34 ppm－12.6 mV
		More than 1 kV up to 10 kV	0.15 %
		More than 10 kV up to 30 kV	0.2 %
	Direct Current Source	From 0 μA up to 100 μA	10 ppm＋0.001 0 μA
		More than 0.1 mA up to 1 mA	10 ppm＋0.015 μA
		More than 1 mA up to 10 mA	10 ppm＋0.15 μA
		More than 10 mA up to 100 mA	10 ppm＋2.0 μA
		More than 0.1 A up to 1 A	30 ppm＋0.010 mA
		More than 1 A up to 30 A	35 ppm＋0.15 mA
	Direct Current Measuring Equipment	From 0 μA up to 100 μA	10 ppm＋0.001 0 μA
		More than 0.1 mA up to 1 mA	10 ppm＋0.015 μA
		More than 1 mA up to 10 mA	10 ppm＋0.15 μA
		More than 10 mA up to 100 mA	10 ppm＋2.0 μA
		More than 0.1 A up to 1 A	30 ppm＋0.010 mA
		More than 1 A up to 30 A	35 ppm＋0.15 mA
		More than 30 A up to 40 A	0.60 A
		More than 40 A up to 1000 A	1.5 %
	Direct Current Standard Shunt	From 1 A up to 100 A	70 ppm
		More than 100 A up to 1000 A	95 ppm

#All Calibration Procedures are in-house procedures developed by this laboratory.

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Direct Current & Low Frequency Measuring Equipment, etc.	AC Voltage Source	From 10 mV up to 20 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	0.005 mV
		More than 20 mV up to 60 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	0.025 %
		More than 60 mV up to 200 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	0.015 %
		More than 200 mV up to 600 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	95 ppm
		From 300 mV up to 600 mV	10 kHz	95 ppm
		300 mV, 600 mV	100 kHz	0.015 %
		More than 600 mV up to 200 V	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz, 10 kHz	50 ppm
		1 V, 2 V, 6 V, 10 V,20 V, 60 V, 100 V, 200 V	100 kHz	0.010 %
		600 V	100 kHz	0.040 %
		More than 200 V up to 1000 V	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz, 10 kHz	60 ppm
		More than 1 kV up to 10 kV	50 Hz, 60 Hz	0.30 %
	AC Voltage Measuring Equipment	From 10 mV up to 20 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	0.005 mV
		More than 20 mV up to 60 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	0.025 %
		More than 60 mV up to 200 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	0.015 %
		More than 200 mV up to 600 mV	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz	95 ppm
		From 300 mV up to 600 mV	10 kHz	95 ppm
		300 mV, 600 mV	100 kHz	0.015 %
		More than 600 mV up to 200 V	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz, 10 kHz	50 ppm
		1 V, 2 V, 6 V, 10 V,20 V, 60 V, 100 V, 200 V	100 kHz	0.010 %
		600 V	100 kHz	0.040 %
		More than 200 V up to 1000 V	40 Hz, 50 Hz, 60 Hz, 400 Hz, 1 kHz, 10 kHz	60 ppm
		More than 1 kV up to 10 kV	50 Hz, 60 Hz	0.15 %
	Alternating Current Source	From 0.001 A up to 0.006 A	50 Hz, 60 Hz	0.025 %＋0.1 μA
		More than 0.006 A less than 0.01 A	50 Hz, 60 Hz	0.025 %＋0.5 μA
		From 0.01 A up to 0.02 A	50 Hz, 60 Hz	0.015 %＋0.3 μA
		More than 0.02 A up to 0.2 A	50 Hz, 60 Hz	0.015 %＋3 μA
		More than 0.2 A up to 2 A	50 Hz, 60 Hz	0.028 %＋0.03 mA
		More than 2 A up to 10 A	50 Hz, 60 Hz	0.038 %＋0.2 mA
		More than 10 A up to 20 A	50 Hz, 60 Hz	0.045 %＋0.5 mA
		More than 20 A up to 60 A	50 Hz, 60 Hz	0.045 %＋1 mA
	Alternating Current Measuring Equipment	From 0.001 A less than 0.01 A	50 Hz, 60 Hz	0.030 %＋0.5 μA
		From 0.01 A up to 0.02 A	50 Hz, 60 Hz	0.015 %＋0.3 μA
		More than 0.02 A up to 0.2 A	50 Hz, 60 Hz	0.015 %＋3 μA
		More than 0.2 A up to 2 A	50 Hz, 60 Hz	0.028 %＋0.03 mA
		More than 2 A up to 10 A	50 Hz, 60 Hz	0.038 %＋0.2 mA
		More than 10 A up to 20 A	50 Hz, 60 Hz	0.15 %
		More than 20 A up to 60 A	50 Hz, 60 Hz	0.18 %＋0.01 A
		More than 60 A up to 100 A	50 Hz, 60 Hz	0.2 %

		More than 100 A up to 1000 A	50 Hz, 60 Hz	1.5 %

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Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Direct Current&Low Frequency Measuring Equipment, etc.	Temperature Indicator	Thermocouple B, with Reference Junction	From 291 μV up to 13820 μV (From 250 ˚C up to 1820 ˚C)	4 μV
		Thermocouple R, with Reference Junction	From -226 μV up to 21003 μV (From -50 ˚C up to 1760 ˚C)	4 μV
		Thermocouple S, with Reference Junction	From -236 μV up to 18609 μV (From -50 ˚C up to 1760 ˚C)	4 μV
		Thermocouple N, with Reference Junction	From -3990 μV up to 47513 μV (From -200 ˚C up to 1300 ˚C)	20 μV
		Thermocouple K, with Reference Junction	From -5891 μV up to 54819 μV (From -200 ˚C up to 1370 ˚C)	21 μV
		Thermocouple E, with Reference Junction	From -8825 μV up to 76373 μV (From -200 ˚C up to 1000 ˚C)	25 μV
		Thermocouple J, with Reference Junction	From -8095 μV up to 69553 μV (From -210 ˚C up to 1200 ˚C)	23 μV
		Thermocouple T, with Reference Junction	From -5603 μV up to 20872 μV (From -200 ˚C up to 400 ˚C)	22 μV
		Thermocouple B, Without Reference Junction	From 291 μV up to 13820 μV (From 250 ˚C up to 1820 ˚C)	2 μV
		Thermocouple R, without Reference Junction	From -226 μV up to 21003 μV (From -50 ˚C up to 1760 ˚C)	2 μV
		Thermocouple S, without Reference Junction	From -236 μV up to 18609 μV (From -50 ˚C up to 1760 ˚C)	2 μV
		Thermocouple N, without Reference Junction	From -3990 μV up to 47513 μV (From -200 ˚C up to 1300 ˚C)	4 μV
		Thermocouple K, without Reference Junction	From -5891 μV up to 54819 μV (From -200 ˚C up to 1370 ˚C)	4 μV
		Thermocouple E, without Reference Junction	From -8825 μV up to 76373 μV (From -200 ˚C up to 1000 ˚C)	6 μV
		Thermocouple J, without Reference Junction	From -8095 μV up to 69553 μV (From -210 ˚C up to 1200 ˚C)	5 μV
		Thermocouple T, without Reference Junction	From -5603 μV up to 20872 μV (From -200 ˚C up to 400 ˚C)	5 μV
		Resistance thermometer Sensor Pt100	From 18.52 Ω up to 390.48 Ω (From -200 ˚C up to 850 ˚C)	0.010 Ω
		Resistance thermometer Sensor JPt100	From 17.14 Ω up to 287.40 Ω (From -200 ˚C up to 500 ˚C)	0.010 Ω
	Temperature Indicator calibration equipment	Thermocouple B, with Reference Junction	From 291 μV up to 13820 μV (From 250 ˚C up to 1820 ˚C)	4 μV
		Thermocouple R, with Reference Junction	From -226 μV up to 21003 μV (From -50 ˚C up to 1760 ˚C)	4 μV
		Thermocouple S, with Reference Junction	From -236 μV up to 18609 μV (From -50 ˚C up to 1760 ˚C)	4 μV
		Thermocouple N, with Reference Junction	From -3990 μV up to 47513 μV (From -200 ˚C up to 1300 ˚C)	20 μV
		Thermocouple K, with Reference Junction	From -5891 μV up to 54819 μV (From -200 ˚C up to 1370 ˚C)	21 μV
		Thermocouple E, with Reference Junction	From -8825 μV up to 76373 μV (From -200 ˚C up to 1000 ˚C)	25 μV
		Thermocouple J, with Reference Junction	From -8095 μV up to 69553 μV (From -210 ˚C up to 1200 ˚C)	23 μV

		Thermocouple T, with Reference Junction	From -5603 μV up to 20872 μV （From -200 ˚C up to 400 ˚C）	22 μV
		Resistance thermometer Sensor Pt100	From 18.52 Ω up to 390.48 Ω （From -200 ˚C up to 850 ˚C）	0.010 Ω
		Resistance thermometer Sensor JPt100	From 17.14 Ω up to 287.40 Ω （From -200 ˚C up to 500 ˚C）	0.010 Ω
		Thermocouple B, without Reference Junction	From 291 μV up to 13820 μV （From 250 ˚C up to 1820 ˚C）	2 μV
		Thermocouple R, without Reference Junction	From -226 μV up to 21003 μV （From -50 ˚C up to 1760 ˚C）	2 μV
		Thermocouple S, without Reference Junction	From -236 μV up to 18609 μV （From -50 ˚C up to 1760 ˚C）	2 μV
		Thermocouple N, without Reference Junction	From -3990 μV up to 47513 μV （From -200 ˚C up to 1300 ˚C）	2 μV
		Thermocouple K, without Reference Junction	From -5891 μV up to 54819 μV （From -200 ˚C up to 1370 ˚C）	2 μV
		Thermocouple E, without Reference Junction	From -8825 μV up to 76373 μV （From -200 ˚C up to 1000 ˚C）	2 μV
		Thermocouple J, without Reference Junction	From -8095 μV up to 69553 μV （From -210 ˚C up to 1200 ˚C）	2 μV
		Thermocouple T, without Reference Junction	From -5603 μV up to 20872 μV （From -200 ˚C up to 400 ˚C）	2 μV

#All Calibration Procedures are in-house procedures developed by this laboratory.

<table>
<tr><th colspan="2">Calibration Procedures# and Type of Instruments/Materials to be calibrated</th><th colspan="3">Range</th><th>Expanded Uncertainty (Level of Confidence Approximately 95 %)</th></tr>
<tr><td rowspan="6">Electric Power Measuring Equipment, etc.</td><td rowspan="3">Power Meter</td><td colspan="3">From 10 V up to 300 V
From 250 mA up to 30 A
50 Hz, 60 Hz
Power factor, whole range</td><td>0.28 mW/VA
～ 0.32 mW/VA
(Appendix 1)</td></tr>
<tr><td rowspan="2">100 V
50 Hz, 60 Hz</td><td>100 mA</td><td>Power factor 1</td><td>0.010 W</td></tr>
<tr><td>200 mA</td><td>Power factor 1</td><td>0.018 W</td></tr>
<tr><td>Reactive Power Meter</td><td colspan="3">From 10 V up to 300 V
From 250 mA up to 30 A
50 Hz, 60 Hz
Power factor, whole range</td><td>0.30 mvar/VA
～ 0.38 mvar/VA
(Appendix 1)</td></tr>
<tr><td rowspan="3">Energy Meter</td><td rowspan="3">110 V, 100 V
5 A
50 Hz, 60 Hz</td><td>Three phase three wire (including unbalanced load)</td><td>Power factor 1
Power factor 0.866 lag*
Power factor 0.866 lead*
Power factor 0.5 lag
Power factor 0.5 lead
(*110 V only)</td><td rowspan="3">0.02 %</td></tr>
<tr><td>Single phase three wire (including unbalanced load)</td><td>Power factor 1
Power factor 0.5 lag
Power factor 0.5 lead</td></tr>
<tr><td>Single phase two wire</td><td>Power factor 1
Power factor 0.5 lag
Power factor 0.5 lead</td></tr>
</table>

	AC Voltage Transformer	Primary voltage 110 V, 220 V, 440 V, 1100 V, 2200 V, 3300 V	Secondary voltage From 27.5 V up to 132 V 50 Hz, 60 Hz	Ratio error 0.01 % Phase angle 0.6′
		Primary voltage 6600 V, 11000 V	Secondary voltage From 27.5 V up to 132 V 50 Hz, 60 Hz	Ratio error 0.01 % Phase angle 0.4′
		Primary voltage 22 kV, 33 kV	Secondary voltage From 27.5 V up to 132 V 50 Hz, 60 Hz	Ratio error 0.01 % Phase angle 0.5′
		Primary voltage 66 kV, 77 kV	Secondary voltage From 5.5 V up to 132 V 50 Hz, 60 Hz	Ratio error 0.02 % Phase angle 0.6′
		Primary voltage 110 kV	Secondary voltage From 11 V up to132 V 50 Hz, 60 Hz	Ratio error 0.03 % Phase angle 0.7′
		Primary voltage 110/√3 kV, 154/√3 kV, 187/√3 kV, 220/√3 kV, 275/√3 kV	Secondary voltage From 5.5/√3 V up to 132/√3 V 50 Hz, 60 Hz	Ratio error 0.04 % Phase angle 0.8′
	Alternating Current Transformer	Primary current From 0.1 A up to 200 A	Secondary current From 0.25 A up to 6 A 50 Hz, 60 Hz	Ratio error 0.01 % Phase angle 0.3′
		Primary current More than 200 A up to 3000 A	Secondary current From 0.25 A up to 6 A 50 Hz, 60 Hz	Ratio error 0.01 % Phase angle 0.4′
		Primary current More than 3000 A up to 5000 A	Secondary current From 0.25 A up to 5 A 50 Hz, 60 Hz	Ratio error 0.02 % Phase angle 0.5′

#All Calibration Procedures are in-house procedures developed by this laboratory.

Appendix 1

Category	Calibration Scope						Expanded Uncertainty (Level of Confidence Approximately 95 %)
	Type	Phase wire	Frequency	Voltage	Current	Power factor	
Power Meter	Active power	Single phase two wire	50 Hz, 60 Hz	100 V	5 A	1	0.30 mW/VA
						0.5 lag	0.28 mW/VA
						0.5 lead	0.28 mW/VA
						0 lag	0.28 mW/VA
						0 lead	0.28 mW/VA
				300 V	5 A	1	0.31 mW/VA
				100 V	0.5 A	1	0.32 mW/VA
		Single phase three wire	50 Hz, 60 Hz	100 V	5 A	1	0.29 mW/VA
		Three phase three wire	50 Hz, 60 Hz	100 V	5 A	1	0.29 mW/VA
Reactive Power Meter	Reactive power	Single phase two wire	50 Hz, 60 Hz	100 V	5 A	1	0.30 mvar/VA
						0.5 lag	0.30 mvar/VA
						0.5 lead	0.30 mvar/VA
						0 lag	0.30 mvar/VA
						0 lead	0.30 mvar/VA
				300 V	5 A	0 lag	0.38 mvar/VA
				100 V	0.5 A	0 lag	0.32 mvar/VA
		Single phase three wire	50 Hz, 60 Hz	100 V	5 A	0 lag	0.30 mvar/VA
		Three phase three wire	50 Hz, 60 Hz	100 V	5 A	0 lag	0.30 mvar/VA

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Low Frequency Impedance Measuring Equipment, etc.	AC Resistance Measuring Equipment	1 kHz	100 kΩ	0.17 %
			10 kΩ	0.16 %
			1 kΩ	0.16 %
			100 Ω	0.16 %
			10 Ω	0.30 %
			1 Ω	0.47 %
			100 mΩ	0.13 %
			10 mΩ	0.4 %

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Laboratory's permanent facility/On-site Calibration: On-site Calibration
Calibration and Measurement Capabilities

Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Direct Current & Low Frequency Measuring Equipment, etc.	DC Resistance Measuring Equipment	1 mΩ		0.050 %
		10 mΩ		0.050 %
		100 mΩ		0.050 %
		1 Ω		0.050 %
		More than 1 Ω less than 4 Ω		0.002 Ω
		From 4 Ω less than 10 Ω		0.05 %
		From 10 Ω up to 1 MΩ		0.050 %
		More than 1 MΩ up to 10 MΩ		0.10 %
		More than 10 MΩ up to 100 MΩ		0.50 %
		More than 100 MΩ up to 4000 MΩ		1.0 %
	DC Voltage Source	From 0 μV up to 1000 V		The larger one of the two 0.010 % or 0.010 mV
		More than 1 kV up to 10 kV		0.60 %
	DC Voltage Measuring Equipment	From 0 μV up to 1000 V		The larger one of the two 0.050 % or 5 μV
	Direct Current Source	From 0 μA up to 30 A		The larger one of the two 0.10 % or 0.05 μA
	Direct Current Measuring Equipment	From 0 μA up to 100 μA		0.005 %＋0.009 μA
		More than 100 μA up to 1 mA		0.005 %＋0.03 μA
		More than 1 mA up to 10 mA		0.005 %＋0.3 μA
		More than 10 mA up to 100 mA		0.005 %＋3 μA
		More than 0.1 A up to 1 A		0.008 %＋0.04 mA
		More than 1 A up to 10 A		0.03 %＋0.5 mA
		More than 10 A up to 30 A		0.04 %＋1.5 mA
		More than 30 A up to 40 A		0.60 A
		More than 40 A up to 1000 A		1.5 %
	AC Voltage Source	From 10 mV less than 20 mV	50 Hz, 60 Hz, 400 Hz, 1 kHz	0.010 mV
		From 20 mV up to 1000 V		0.050 %
		More than 1 kV up to 10 kV	50 Hz, 60 Hz	0.30 %
	AC Voltage Measuring Equipment	From 10 mV up to 1 kV	50 Hz, 60 Hz, 400 Hz, 1 kHz	The larger one of the two 0.10 % or 0.10 mV
	Alternating Current Source	From 1 mA up to 60 A	50 Hz, 60 Hz	0.10 %
	Alternating Current Measuring Equipment	From 1 mA less than 10 mA	50 Hz, 60 Hz	0.30 %
		From 10 mA up to 100 A	50 Hz, 60 Hz	0.2 %
		More than 100 A up to 1000 A	50 Hz, 60 Hz	1.5 %

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Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Direct Current & Low Frequency Measuring Equipment, etc.	Temperature Indicator	Thermocouple B, with Reference Junction	From 291 μV up to 13820 μV (From 250 ˚C up to 1820 ˚C)	10 μV
		Thermocouple R, with Reference Junction	From -226 μV up to 21003 μV (From -50 ˚C up to 1760 ˚C)	10 μV
		Thermocouple S, with Reference Junction	From -236 μV up to 18609 μV (From -50 ˚C up to 1760 ˚C)	10 μV
		Thermocouple N, with Reference Junction	From -3990 μV up to 47513 μV (From -200 ˚C up to 1300 ˚C)	22 μV
		Thermocouple K, with Reference Junction	From -5891 μV up to 54819 μV (From -200 ˚C up to 1370 ˚C)	23 μV
		Thermocouple E, with Reference Junction	From -8825 μV up to 76373 μV (From -200 ˚C up to 1000 ˚C)	27 μV
		Thermocouple J, with Reference Junction	From -8095 μV up to 69553 μV (From -210 ˚C up to 1200 ˚C)	25 μV
		Thermocouple T, with Reference Junction	From -5603 μV up to 20872 μV (From -200 ˚C up to 400 ˚C)	24 μV
		Thermocouple B, Without Reference Junction	From 291 μV up to 13820 μV (From 250 ˚C up to 1820 ˚C)	9 μV
		Thermocouple R, without Reference Junction	From -226 μV up to 21003 μV (From -50 ˚C up to 1760 ˚C)	9 μV
		Thermocouple S, without Reference Junction	From -236 μV up to 18609 μV (From -50 ˚C up to 1760 ˚C)	9 μV
		Thermocouple N, without Reference Junction	From -3990 μV up to 47513 μV (From -200 ˚C up to 1300 ˚C)	11 μV
		Thermocouple K, without Reference Junction	From -5891 μV up to 54819 μV (From -200 ˚C up to 1370 ˚C)	11 μV
		Thermocouple E, without Reference Junction	From -8825 μV up to 76373 μV (From -200 ˚C up to 1000 ˚C)	13 μV
		Thermocouple J, without Reference Junction	From -8095 μV up to 69553 μV (From -210 ˚C up to 1200 ˚C)	12 μV
		Thermocouple T, without Reference Junction	From -5603 μV up to 20872 μV (From -200 ˚C up to 400 ˚C)	12 μV
		Resistance thermometer Sensor Pt100	From 18.52 Ω up to 390.48 Ω (From -200 ˚C up to 850 ˚C)	0.10 Ω
		Resistance thermometer Sensor JPt100	From 17.14 Ω up to 287.40 Ω (From -200 ˚C up to 500 ˚C)	0.10 Ω

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Calibration Procedures# and Type of Instruments/Materials to be calibrated		Range		Expanded Uncertainty (Level of Confidence Approximately 95 %)
Low Frequency Impedance Measuring Equipment, etc.	AC Resistance Measuring Equipment	1 kHz	100 kΩ	0.17 %
			10 kΩ	0.16 %
			1 kΩ	0.16 %
			100 Ω	0.16 %
			10 Ω	0.30 %
			1 Ω	0.47 %
			100 mΩ	0.13 %
			10 mΩ	0.4 %

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