

(English Translation)



Certificate of Accreditation

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

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:

6-110,1-chome,Oyodokita,Kita-ku,Osaka-shi,Osaka
531-0077, Japan

Scope of Accreditation:

Time & Frequency & Rotational speed, Temperature,
Electricity (Direct Current & Low Frequency) (as attached)

Accreditation Requirement:

ISO/IEC 17025: 2017

Accreditation Requirements in the Section 6 of
Accreditation Scheme (JCSS) 2nd Edition

Effective Date of Accreditation : 2019-08-01

Expiry Date of Accreditation : 2023-07-31

(Date of Initial Accreditation : 1995-06-21)

Kenichi Yamamoto

Chief Executive, 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).
with its pertinent requirements.

General Field of Calibration : Time & Frequency & Rotational speed

Date of Initial Accreditation of the Field : 2017-07-31

Permanent Laboratory/On-site Calibration : Permanent Laboratory

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | CMC (Level of Confidence Approximately 95 %) |
|--|-----------------------------------|-----------------------------|---|
| Time & Frequency Counter, etc. | Frequency Generator | From 1 Hz up to 10 MHz | 2.4×10^{-7} |
| | Frequency Counter | From 1 Hz up to 10 MHz | 2.4×10^{-7} |
| | Time-Interval Source | From 1 s up to 60 s | 0.01 s |
| | Time-Interval Measuring Equipment | 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 |

#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.

Permanent Laboratory/On-site Calibration : On-site Calibration

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | CMC (Level of Confidence Approximately 95 %) |
|--|-----------------------------------|-----------------------------|---|
| Time & Frequency Counter, etc. | Frequency Generator | From 1 Hz up to 10 MHz | 2.4×10^{-7} |
| | Frequency Counter | From 1 Hz up to 10 MHz | 2.4×10^{-7} |
| | Time-Interval Source | From 1 s up to 60 s | 0.01 s |
| | Time-Interval Measuring Equipment | 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 |

#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

Permanent Laboratory/On-site Calibration : Permanent Laboratory

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | CMC (Level of Confidence Approximately 95 %) |
|--|---|------------------------------|---|
| Contact Type Thermometer | Thermocouple (Comparison calibration) | 0 °C | 0.4 °C (*1) |
| | | More than 0 °C up to 1100 °C | 0.7 °C (*1) |
| | Temperature sensors with display unit (Comparison calibration) | From -30 °C up to 250 °C | 0.14 °C |
| | Thermometer calibration equipment | From -40 °C up to 250 °C | 0.080 °C |

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

(*1) Temperature converted from Electromotive Force (EMF).

Permanent Laboratory/On-site Calibration : On-site Calibration

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | CMC (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 |
| | Thermometer calibration equipment | From -40 °C up to 250 °C | 0.080 °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 : 1995-06-21Permanent Laboratory/On-site Calibration : Permanent Laboratory

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | Range | CMC (Level of Confidence Approximately 95%) |
|--|--|--|
| Direct Current & Low Frequency Measuring Equipment, etc. | 0.001 Ω | 0.000 03 m Ω |
| | 0.01 Ω | 0.000 2 m Ω |
| | More than 0.01 Ω less than 0.1 Ω | 0.001 Ω |
| | 0.1 Ω | 0.001 0 m Ω |
| | More than 0.1 Ω less than 1 Ω | 0.10 m Ω |
| | 1 Ω | 0.005 m Ω |
| | 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 m Ω |
| | 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 m Ω |
| | More than 100 Ω less than 1 k Ω (except 190 Ω) | 0.020 Ω |
| | 190 Ω | 0.010 Ω |
| | 1 k Ω | 4.0 m Ω |
| | More than 1 k Ω less than 10 k Ω (except 1.9 k Ω) | 0.20 Ω |
| | 1.9 k Ω | 0.10 Ω |
| | 10 k Ω | 0.040 Ω |
| | More than 10 k Ω less than 100 k Ω (except 19 k Ω) | 2.0 Ω |
| | 19 k Ω | 1.0 Ω |
| | 100 k Ω | 0.40 Ω |
| | More than 100 k Ω less than 1 M Ω (except 190 k Ω) | 0.020 k Ω |
| | 190 k Ω | 0.010 k Ω |
| | 1 M Ω | 0.005 0 k Ω |
| | More than 1 M Ω up to 10 M Ω (except 1.9 M Ω) | 0.000 3 M Ω |
| | 1.9 M Ω | 0.000 2 M Ω |
| | More than 10 M Ω up to 30 M Ω (except 19 M Ω) | 0.020 M Ω |
| | 19 M Ω | 0.006 M Ω |
| | More than 30 M Ω less than 100 M Ω | 0.060 M Ω |
| | 100 M Ω | 0.005 M Ω |
| More than 100 M Ω up to 110 M Ω | 0.30 M Ω | |
| More than 110 M Ω less than 1 G Ω | 0.7 % | |
| 1 G Ω | 1.0 M Ω | |
| More than 1 G Ω up to 10 G Ω | 0.05 % | |
| More than 10 G Ω up to 100 G Ω | 0.10 % | |

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

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | CMC (Level of Confidence Approximately 95%) |
|--|---|---|--|
| Direct Current & Low Frequency Measuring Equipment, etc. | DC Resistance Measuring Equipment | 0.001 Ω | 0.10 $\mu\Omega$ |
| | | 0.01 Ω | 0.50 $\mu\Omega$ |
| | | 0.1 Ω | 2.0 $\mu\Omega$ |
| | | 1 Ω | 7.0 $\mu\Omega$ |
| | | More than 1 Ω less than 10 Ω | 0.20 m Ω |
| | | 10 Ω | 40 $\mu\Omega$ |
| | | More than 10 Ω less than 100 Ω | 1.0 m Ω |
| | | 100 Ω | 0.40 m Ω |
| | | More than 100 Ω up to 400 Ω | 4.0 m Ω |
| | | More than 400 Ω less than 1 k Ω | 10 m Ω |
| | | 1 k Ω | 4.0 m Ω |
| | | More than 1 k Ω less than 10 k Ω | 0.10 Ω |
| | | 10 k Ω | 40 m Ω |
| | | More than 10 k Ω up to 19 k Ω | 1.0 Ω |
| | | More than 19 k Ω less than 100 k Ω | 2.0 Ω |
| | | 100 k Ω | 0.40 Ω |
| | | More than 100 k Ω up to 190 k Ω | 10 Ω |
| | | More than 190 k Ω less than 1 M Ω | 20 Ω |
| | | 1 M Ω | 5.0 Ω |
| | | More than 1 M Ω up to 1.9 M Ω | 0.4 k Ω |
| | | More than 1.9 M Ω up to 10 M Ω | 0.5 k Ω |
| | | More than 10 M Ω less than 11 M Ω | 2 k Ω |
| | | From 11 M Ω up to 19 M Ω | 10 k Ω |
| | | More than 19 M Ω less than 33 M Ω | 20 k Ω |
| | | From 33 M Ω less than 100 M Ω | 30 k Ω |
| | | 100 M Ω | 5 k Ω |
| | | More than 100 M Ω less than 110 M Ω | 0.1 M Ω |
| | | From 110 M Ω less than 330 M Ω | 2.0 M Ω |
| | From 330 M Ω less than 1 G Ω | 5.0 M Ω | |
| | 1 G Ω | 1.0 M Ω | |
| | More than 1 G Ω up to 100 G Ω | 0.3 % | |
| | DC Voltage Source | From 0 V up to 100 mV | 4.5 ppm + 0.7 μ V |
| | | More than 0.1 V up to 1 V | 5.5 ppm + 0.6 μ V |
| | | More than 1 V up to 10 V | 5.5 ppm + 2 μ V |
| | | 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 | | 0.60 % | |
| DC Voltage Measuring Equipment | From 0 V up to 1 V | 5.5 ppm + 0.5 μ V | |
| | More than 1 V up to 10 V | 5.5 ppm + 2 μ V | |
| | 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 | |

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

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | CMC (Level of Confidence Approximately 95%) | |
|--|------------------------------------|--|--|----------|
| Direct Current & Low Frequency Measuring Equipment, etc. | Direct Current Source | From 0 μ A up to 100 μ A | 10 ppm + 0.001 0 μ A | |
| | | More than 0.1 mA up to 1 mA | 10 ppm + 0.015 μ A | |
| | | More than 1 mA up to 10 mA | 10 ppm + 0.15 μ A | |
| | | More than 10 mA up to 100 mA | 10 ppm + 2.0 μ A | |
| | | 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 μ A up to 100 μ A | 10 ppm + 0.001 0 μ A | |
| | | More than 0.1 mA up to 1 mA | 10 ppm + 0.015 μ A | |
| | | More than 1 mA up to 10 mA | 10 ppm + 0.15 μ A | |
| | | More than 10 mA up to 100 mA | 10 ppm + 2.0 μ A | |
| | | 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 | |
| | 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 % | |

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

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | | CMC (Level of Confidence Approximately 95%) | |
|--|---|---|--|--|-----------------------|
| Direct Current & Low Frequency Measuring Equipment, etc. | 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 μ A |
| | More than 0.006 A less than 0.01 A | | 50 Hz, 60 Hz | 0.025 % + 0.5 μ A | |
| | From 0.01 A up to 0.02 A | | 50 Hz, 60 Hz | 0.015 % + 0.3 μ A | |
| | More than 0.02 A up to 0.2 A | | 50 Hz, 60 Hz | 0.015 % + 3 μ A | |
| | 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 μ A |
| | | | From 0.01 A up to 0.02 A | 50 Hz, 60 Hz | 0.015 % + 0.3 μ A |
| | | | More than 0.02 A up to 0.2 A | 50 Hz, 60 Hz | 0.015 % + 3 μ A |
| | | | 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 % | | |

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

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

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

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | | CMC (Level of Confidence Approximately 95 %) |
|--|---|--|---|--|
| Direct Current & Low Frequency Measuring Equipment, etc. | Temperature Indicator calibration equipment | Thermocouple B, without Reference Junction | From 1792 μ V up to 13820 μ V (From 600 °C up to 1820 °C) | 2 μ V |
| | | Thermocouple R, without Reference Junction | From -226 μ V up to 21101 μ V (From -50 °C up to 1768 °C) | 2 μ V |
| | | Thermocouple S, without Reference Junction | From -236 μ V up to 18693 μ V (From -50 °C up to 1768 °C) | 2 μ V |
| | | Thermocouple N, without Reference Junction | From -3990 μ V up to 47513 μ V (From -200 °C up to 1300 °C) | 2 μ V |
| | | Thermocouple K, without Reference Junction | From -5891 μ V up to 54886 μ V (From -200 °C up to 1372 °C) | 2 μ V |
| | | Thermocouple E, without Reference Junction | From -8825 μ V up to 76373 μ V (From -200 °C up to 1000 °C) | 2 μ V |
| | | Thermocouple J, without Reference Junction | From -8095 μ V up to 69553 μ V (From -210 °C up to 1200 °C) | 2 μ V |
| | | Thermocouple T, without Reference Junction | From -5603 μ V up to 20872 μ V (From -200 °C up to 400 °C) | 2 μ V |

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

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | | CMC (Level of Confidence Approximately 95 %) | |
|--|----------------------|--|---|---|---------|
| Electric Power Measuring Equipment, etc. | Power Meter | From 10 V up to 300 V From 250 mA up to 30 A 50 Hz, 60 Hz Power factor, whole range | | 0.28 mW/VA ~ 0.32 mW/VA (Appendix 1) | |
| | | 100 V 50 Hz, 60 Hz | 100 mA | Power factor 1 | 0.010 W |
| | | | 200 mA | Power factor 1 | 0.018 W |
| | Reactive Power Meter | From 10 V up to 300 V From 250 mA up to 30 A 50 Hz, 60 Hz Power factor, whole range | | 0.30 mvar/VA ~ 0.38 mvar/VA (Appendix 1) | |
| | Energy Meter | 110 V, 100 V 5 A 50 Hz, 60 Hz | Three phase three wire (including unbalanced load) | 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) | 0.02 % |
| | | | Single phase three wire (including unbalanced load) | Power factor 1 Power factor 0.5 lag Power factor 0.5 lead | |
| Single phase two wire | | | Power factor 1 Power factor 0.5 lag Power factor 0.5 lead | | |

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

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | | CMC (Level of Confidence Approximately 95%) |
|--|---------------------------------|--|--|--|
| Electric Power Measuring Equipment, etc. | 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 to 132 V 50 Hz, 60 Hz | Ratio error 0.03 % Phase angle 0.7' |
| | | Primary voltage 110/ $\sqrt{3}$ kV, 154/ $\sqrt{3}$ kV, 187/ $\sqrt{3}$ kV, 220/ $\sqrt{3}$ kV, 275/ $\sqrt{3}$ kV | Secondary voltage From 5.5/ $\sqrt{3}$ V up to 132/ $\sqrt{3}$ 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 250 A, 300 A, 400 A, 500 A, 600 A, 750 A, 800 A, 1000 A, 1200 A, 1500 A, 2000 A, 2400 A, 2500 A, 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 4000 A, 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 | | | | | | CMC (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 |
| 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 | | | | | | |
| 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 |

Permanent Laboratory/On-site Calibration : On-site Calibration

| Calibration Procedures# and Type of Instruments/Materials to be calibrated | | Range | | CMC (Level of Confidence Approximately 95%) |
|--|---|---|-----------------------------|--|
| Direct Current & Low Frequency Measuring Equipment, etc. | DC Resistance Measuring Equipment | From 1 Ω up to 1000 Ω | | 5 % |
| | | From 0.01 M Ω up to 0.02 M Ω | | 0.000 3 M Ω |
| | | More than 0.02 M Ω up to 2000 M Ω | | 1.0 % |
| | DC Voltage Source | From 0 μ V 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 μ V up to 1000 V | | The larger one of the two 0.050 % or 5 μ V |
| | Direct Current Source | From 0 μ A up to 30 A | | The larger one of the two 0.10 % or 0.05 μ A |
| | Direct Current Measuring Equipment | From 0 μ A up to 100 μ A | | 0.005 % + 0.009 μ A |
| | | More than 100 μ A up to 1 mA | | 0.005 % + 0.03 μ A |
| | | More than 1 mA up to 10 mA | | 0.005 % + 0.3 μ A |
| | | More than 10 mA up to 100 mA | | 0.005 % + 3 μ A |
| | | 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 |
| | AC Voltage Source | From 0.5 kV up to 1 kV | 50 Hz, 60 Hz | 0.004 kV |
| | | 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 100 mA | 50 Hz, 60 Hz | 0.6 % |
| | 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 % | |

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

Permanent Laboratory/On-site Calibration : On-site Calibration

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

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