



INTERNATIONAL  
ACCREDITATION  
SERVICE®

# CERTIFICATE OF ACCREDITATION

*This is to attest that*

## **QATAR AIRWAYS**

HAMAD INTERNATIONAL AIRPORT  
DOHA 22550, QATAR

### **Calibration Laboratory CL-205**

has met the requirements of AC204, *IAS Accreditation Criteria for Calibration Laboratories*, and has demonstrated compliance with ISO/IEC Standard 17025:2017, *General requirements for the competence of testing and calibration laboratories*. This organization is accredited to provide the services specified in the scope of accreditation.

Effective Date October 28, 2024

Expiration Date May 1, 2026



A handwritten signature in black ink, reading "Raj Nathan".

**President**

Visit [www.iasonline.org](http://www.iasonline.org) for current accreditation information.

# SCOPE OF ACCREDITATION

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## QATAR AIRWAYS

[www.qatarairways.com](http://www.qatarairways.com)

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**Accredited to** ISO/IEC 17025:2017

**Effective Date** October 28, 2024

### CALIBRATION AND MEASUREMENT CAPABILITY (CMC)\*

| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED | RANGE                                                                                     | UNCERTAINTY <sup>1,2</sup><br>(±)              | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL) |
|---------------------------------------------------|-------------------------------------------------------------------------------------------|------------------------------------------------|-------------------------------------------------------------------------|
| <i>Dimensional</i>                                |                                                                                           |                                                |                                                                         |
| Micrometer                                        | 0 mm to 25 mm<br>25 mm to 50 mm<br>50 mm to 100 mm<br>75 mm to 100 mm<br>100 mm to 200 mm | 1.0 µm<br>1.3 µm<br>1.5 µm<br>1.9 µm<br>2.7 µm | Using Grade 0 Gage<br>Blocks By Direct method                           |
| Length Measuring<br>Machine                       | 0.5 mm to 50 mm<br>50 mm to 200 mm                                                        | 0.16 µm<br>0.25 µm                             | Using Grade 0 Gage<br>Blocks by Direct method                           |
| Vernier Caliper<br>(External Jaws)                | 0 mm to 300 mm                                                                            | 6.2 µm                                         | Using Grade 0 Gage Block<br>by Direct Method                            |
| Dial Gauges for Linear<br>Measurement (Plunger)   | 0 mm to 25 mm                                                                             | 1.3 µm                                         | Using Length Measuring<br>Machine by Direct Method                      |
| Dial Test Indicators<br>(Lever)                   | 0 mm to 2 mm                                                                              | 0.5 µm                                         | Using Length Measuring<br>Machine by Direct Method                      |
| Depth Gauge                                       | Up to 200 mm                                                                              | 6 µm                                           | Using Grade 0 Gage Block<br>by Direct method                            |
| Setting Rod,<br>Pin Gage,<br>Plug Gage            | 0.1 mm to 100 mm<br>100 mm to 200 mm                                                      | 0.7 µm<br>1.5 µm                               | Using Length Measuring<br>Machine by Direct Method                      |
| Setting Ring                                      | 6 mm to 20 mm<br>20 mm to 90 mm                                                           | 0.2 µm<br>0.3 µm                               | Using Length Measuring<br>Machine by Direct Method                      |
| 3 Point (Bore)<br>Micrometers                     | 6 mm to 40 mm<br>40 mm to 95 mm                                                           | 1.1 µm<br>2.2 µm                               | Using Setting Rings by<br>Direct method                                 |
| Inclinometer                                      | 0° to 45°                                                                                 | 36"                                            | Using Gage blocks and<br>Sine bar by Direct method                      |

\* If information in this CMC is presented in non-SI units, the conversion factors stated in NIST Special Publication 811 "Guide for the Use of the International System of Units (SI)" apply.

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| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED                             | RANGE                                                                                                                                                                           | UNCERTAINTY <sup>1,2</sup><br>(±)                                                                                                        | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL)                                        |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Mechanical</b>                                                             |                                                                                                                                                                                 |                                                                                                                                          |                                                                                                                |
| Pressure Pneumatic <sup>5</sup><br>(Pressure Gauge /<br>Pressure Transmitter) | 1 kPa to 5 kPa<br>5 kPa to 350 kPa<br>350 kPa to 700 kPa<br>700 kPa to 1750 kPa<br>1750 kPa to 3500 kPa<br>3500 kPa to 5.6 MPa<br>5.6 MPa to 14 MPa                             | 2.5 %<br>0.1 %<br>0.05 %<br>0.06 %<br>0.02 %<br>0.06 %<br>0.04 %                                                                         | Using Reference Gauge by<br>Comparison Method                                                                  |
| Pressure Hydraulic <sup>5</sup><br>(Pressure Gauge /<br>Pressure Transmitter) | 2 MPa to 4 MPa<br>4 MPa to 7 MPa<br>7 MPa to 12 MPa<br>12 MPa to 20 MPa<br>20 MPa to 140 MPa<br><br>0.1 MPa to 5 MPa<br>5 MPa to 10 MPa<br>10 MPa to 30 MPa<br>30 MPa to 70 MPa | 0.14 %<br>0.08 %<br>0.06 %<br>0.03 %<br>0.05 %<br><br>0.4 %<br>0.2 %<br>0.1 %<br>0.05 %                                                  | Using Electronic<br>Deadweight Tester by<br>Direct Method<br><br>Using Reference Gauge by<br>Comparison Method |
| Vacuum Gauge <sup>5</sup>                                                     | 0.1 kPa to 20 kPa<br>20 KPa to 30 KPa<br>30 KPa to 80 KPa                                                                                                                       | 0.3 %<br>0.2 %<br>0.1 %                                                                                                                  | Using Reference Gauge by<br>Comparison Method                                                                  |
| Torque (CW and CCW)                                                           | 0.2 N.m to 1 N.m<br>1 N.m to 110 N.m<br>110 N.m to 1100 N.m                                                                                                                     | 0.76 %<br>0.6 %<br>0.5 %                                                                                                                 | Method:<br>QTR/CAL/054/014<br>(ISO 6789:2017)<br>Torque Transducers                                            |
| Force-Compression<br>(Aircraft Scales)                                        | 26 kN to 267 kN                                                                                                                                                                 | 0.06 %                                                                                                                                   | Using Reference load cell<br>and Indicator & Force<br>Generation Machine by<br>Comparison Method               |
| Hanging Balances<br>Spring Balances<br>Push-Pull Gauges                       | 10 N to 1000 N                                                                                                                                                                  | 0.06 %                                                                                                                                   | Using Suspension weights<br>by Direct Method                                                                   |
| Weighing scales <sup>5</sup>                                                  | 10 g to 200 g<br>201 g to 500 g<br>501 g to 1 kg<br>1 kg to 10 kg<br>10 kg to 60 kg                                                                                             | 5 mg + 0.58R<br>10 mg + 0.58R<br>68 mg + 0.8R<br>0.14 g + 0.8R<br>0.76 g + 0.8R<br>where R is resolution<br>of unit under<br>calibration | Using F1 Class Weights by<br>ABBA Method                                                                       |
| Sound Level Meter @ 1<br>kHz                                                  | 94 dB and 114 dB                                                                                                                                                                | 0.17 dB                                                                                                                                  | Using Sound level<br>Calibrator by Direct<br>Method                                                            |

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| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED                                     | RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | UNCERTAINTY <sup>1,2</sup><br>(±)                                                                                                                                                                                                                                                                                                 | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL)                         |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| <b>Thermal</b>                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                   |                                                                                                 |
| Temperature Sensors/<br>Thermometer with or<br>without Indicators <sup>5</sup>        | -25 °C to 100 °C<br>100 °C to 400 °C<br>400 °C to 600 °C                                                                                                                                                                                                                                                                                                                                                                                                               | 0.08 °C<br>0.12 °C<br>0.58 °C                                                                                                                                                                                                                                                                                                     | Using Reference PRT with<br>readout & Drywell<br>Temperature Calibrator by<br>Comparison Method |
| Pyrometers /<br>Non-contact<br>Thermometers <sup>5</sup>                              | 35 °C to 50 °C<br>50 °C to 100 °C<br>100 °C to 200 °C<br>200 °C to 300 °C<br>300 °C to 400 °C                                                                                                                                                                                                                                                                                                                                                                          | 0.4 °C<br>0.7 °C<br>1.0 °C<br>1.6 °C<br>2.1 °C                                                                                                                                                                                                                                                                                    | Using Infrared Calibrator<br>by Direct Method                                                   |
| Temperature Sourcing<br>Devices and Enclosures <sup>5</sup><br>(Single Sensor Method) | -25 °C to 200 °C<br>200 °C to 400 °C<br>400 °C to 500 °C<br>500 °C to 600 °C                                                                                                                                                                                                                                                                                                                                                                                           | 0.02 °C<br>0.03 °C<br>0.04 °C<br>0.78 °C                                                                                                                                                                                                                                                                                          | Using PRT/ N Type<br>Thermocouple and<br>Readout<br>By Direct Method                            |
| RH Meter/ Sensors                                                                     | 20 %RH to 30 %RH<br>(@ 40 °C)<br><br>30 %RH to 75 %RH<br>(@ 25 °C)                                                                                                                                                                                                                                                                                                                                                                                                     | 1.4 %RH<br><br>1.8 %RH                                                                                                                                                                                                                                                                                                            | Using Reference Sensor<br>by Comparison Method                                                  |
| <b>Electrical – DC/LF</b>                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                   |                                                                                                 |
| DC Voltage Generate <sup>3,5</sup>                                                    | 0 mV to 3.29999 mV<br>3.29999 mV to 329.9999 mV<br>329.9999 mV to 3.299999 V<br>3.299999 V to 32.99999 V<br>32.99999 V to 329.9999 V<br>329.9999 V to 1000.000 V                                                                                                                                                                                                                                                                                                       | 0.0016 % + 0.93 µV<br>0.0016 % + 3.2 µV<br>0.00085 % + 16 µV<br>0.00093 % + 190 µV<br>0.0014 % + 2.6 mV<br>0.0014 % + 8.1 mV                                                                                                                                                                                                      | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                                |
| DC Resistance<br>Generate <sup>3,5</sup>                                              | 0 Ω to 10.9999 Ω<br>10.9999 Ω to 32.9999 Ω<br>32.9999 Ω to 109.9999 Ω<br>109.9999 Ω to 1.099999 kΩ<br>1.099999 kΩ to 3.299999 kΩ<br>3.299999 kΩ to 10.99999 kΩ<br>10.99999 kΩ to 32.99999 kΩ<br>32.99999 kΩ to 109.9999 kΩ<br>109.9999 kΩ to 329.9999 kΩ<br>329.9999 kΩ to 1.099999 MΩ<br>1.099999 MΩ to 3.299999 MΩ<br>3.299999 MΩ to 10.99999 MΩ<br>10.99999 MΩ to 32.99999 MΩ<br>32.99999 MΩ to 109.9999 MΩ<br>109.9999 MΩ to 329.9999 MΩ<br>329.9999 MΩ to 1000 MΩ | 0.0031 % + 0.98 mΩ<br>0.0023 % + 1.5 mΩ<br>0.0022 % + 1.9 mΩ<br>0.0022 % + 8.3 mΩ<br>0.0022 % + 35 mΩ<br>0.0022 % + 84 mΩ<br>0.0022 % + 0.40 Ω<br>0.0022 % + 0.84 Ω<br>0.0025 % + 5.1 Ω<br>0.0025 % + 50 Ω<br>0.0047 % + 0.28 kΩ<br>0.010 % + 1.0 kΩ<br>0.019 % + 15 kΩ<br>0.039 % + 80 kΩ<br>0.23 % + 0.14 MΩ<br>1.2 % + 0.71 MΩ | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                                |
| DC Current Generate <sup>3,5</sup>                                                    | 0 µA to 329.999 µA<br>329.999 µA to 3.29999 mA<br>3.29999 mA to 32.9999 mA                                                                                                                                                                                                                                                                                                                                                                                             | 0.012 % + 20 nA<br>0.0078 % + 86 nA<br>0.0078 % + 0.78 µA                                                                                                                                                                                                                                                                         | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                                |

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| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED | RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | UNCERTAINTY <sup>1,2</sup><br>(±)                                                                                                                                                                                                                                                              | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL)                    |
|---------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| DC Current Generate <sup>3,5</sup><br>(continued) | 32.9999 mA to 329.999 mA<br>329.999 mA to 1.09999 A<br>1.09999 A to 2.99999 A<br>2.99999 A to 10.0000 A<br>10.0000 A to 20.0000 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.0078 % + 7.9 µA<br>0.016 % + 59 µA<br>0.029 % + 0.24 mA<br>0.039 % + 0.89 mA<br>0.078 % + 0.58 mA                                                                                                                                                                                            | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                           |
| DC Current Generate <sup>3,5</sup>                | 10 A to 100 A<br>100 A to 500 A<br>500 A to 1000 A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0.40 % + 0.07 A<br>0.44 % + 0.099 A<br>0.40 % + 0.14 A                                                                                                                                                                                                                                         | Using Electrical<br>Multifunction Calibrator &<br>50 Turn Current Coil by<br>Direct Method |
| Capacitance Generate <sup>3,5</sup>               | 220.0 pF to 399.9 pF<br>(10 Hz to 10 kHz)<br><br>399.9 pF to 1.0999 nF<br>(10 Hz to 10 kHz)<br><br>1.0999 nF to 3.2999 nF<br>(10 Hz to 3 kHz)<br><br>3.2999 nF to 10.9999 nF<br>(10 Hz to 1 kHz)<br><br>10.9999 nF to 32.9999 nF<br>(10 Hz to 1 kHz)<br><br>32.9999 nF to 109.999 nF<br>(10 Hz to 1 kHz)<br><br>109.999 nF to 329.999 nF<br>(10 Hz to 1 kHz)<br><br>329.99 nF to 1.09999 µF<br>(10 Hz to 600 Hz)<br><br>1.09999 µF to 3.29999 µF<br>(10 Hz to 300 Hz)<br><br>3.29999 µF to 10.9999 µF<br>(10 Hz to 150 Hz)<br><br>10.9999 µF to 32.9999 µF<br>(10 Hz to 120 Hz)<br><br>32.9999 µF to 109.999 µF<br>(10 Hz to 80 Hz)<br><br>109.999 µF to 329.999 µF<br>(0 Hz to 50 Hz) | 0.39 % + 8.0 pF<br><br>0.39 % + 7.9 pF<br><br>0.39 % + 11 pF<br><br>0.19 % + 14 pF<br><br>0.19 % + 63 pF<br><br>0.19 % + 99 pF<br><br>0.19 % + 0.63 nF<br><br>0.19 % + 1.2 nF<br><br>0.19 % + 6.7 nF<br><br>0.19 % + 13 nF<br><br>0.31 % + 75 nF<br><br>0.35 % + 97 nF<br><br>0.35 % + 0.63 µF | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                           |

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| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED  | RANGE                                                                                                                               | UNCERTAINTY <sup>1,2</sup><br>(±)                                                                    | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL) |
|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| Capacitance Generate <sup>3,5</sup><br>(continued) | 329.999 µF to 1.09999 mF<br>(0 Hz to 20 Hz)                                                                                         | 0.35 % + 1 nF                                                                                        | Using Electrical<br>Multifunction Calibrator by<br>Direct Method        |
|                                                    | 1.09999 mF to 3.29999 mF<br>(0 Hz to 6 Hz)                                                                                          | 0.35 % + 6.3 µF                                                                                      |                                                                         |
|                                                    | 3.29999 mF to 10.9999 mF<br>(0 Hz to 2 Hz)                                                                                          | 0.35 % + 10 µF                                                                                       |                                                                         |
|                                                    | 10.9999 mF to 32.9999 mF<br>(0 Hz to 0.6 Hz)                                                                                        | 0.58 % + 63 µF                                                                                       |                                                                         |
|                                                    | 32.9999 mF to 100.00 mF<br>(0 Hz to 0.2 Hz)                                                                                         | 0.85 % + 0.17 mF                                                                                     |                                                                         |
| AC Voltage Generate <sup>3,5</sup>                 | 10.0 mV to 32.999 mV<br>(45 Hz to 1 kHz)<br>(1 kHz to 10 kHz)<br>(10 kHz to 20 kHz)<br>(20 kHz to 50 kHz)<br>(50 kHz to 100 kHz)    | 0.062 % + 5 µV<br>0.016 % + 5 µV<br>0.62 % + 5 µV<br>0.27 % + 10 µV<br>0.62 % + 39 µV                | Using Electrical<br>Multifunction Calibrator by<br>Direct Method        |
|                                                    | 32.999 mV to 329.999 mV<br>(45 Hz to 1 kHz)<br>(1 kHz to 10 kHz)<br>(10 kHz to 20 kHz)<br>(20 kHz to 50 kHz)<br>(50 kHz to 100 kHz) | 0.011 % + 11 µV<br>0.012 % + 11 µV<br>0.027 % + 11 µV<br>0.062 % + 26 µV<br>0.16 % + 55 µV           |                                                                         |
|                                                    | 329.999 mV to 3.29999 V<br>(45 Hz to 1 kHz)<br>(1 kHz to 10 kHz)<br>(10 kHz to 20 kHz)<br>(20 kHz to 50 kHz)<br>(50 kHz to 100 kHz) | 0.012 % + 0.10 mV<br>0.015 % + 0.10 mV<br>0.023 % + 0.10 mV<br>0.054 % + 0.13 mV<br>0.19 % + 0.48 mV |                                                                         |
|                                                    | 3.29999 V to 32.9999 V<br>(45 Hz to 1 kHz)<br>(1 kHz to 10 kHz)<br>(10 kHz to 20 kHz)<br>(20 kHz to 50 kHz)<br>(50 kHz to 100 kHz)  | 0.012 % + 0.10 mV<br>0.019 % + 0.98 mV<br>0.027 % + 1.0 mV<br>0.070 % + 1.5 mV<br>0.070 % + 1.5 mV   |                                                                         |
|                                                    | 32.9999 V to 329.999 V<br>(45 Hz to 1 kHz)<br>(1 kHz to 10 kHz)<br>(10 kHz to 20 kHz)                                               | 0.016 % + 10 mV<br>0.019 % + 10 mV<br>0.023 % + 10 mV                                                |                                                                         |

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|---------------------------------------------------|---------------------------------------------------------------------|------------------------------------|--------------------------------------------------------------------------------------------|
| AC Voltage Generate <sup>3,5</sup><br>(continued) | 32.9999 V to 329.999 V<br>(20 kHz to 50 kHz)<br>(50 kHz to 100 kHz) | 0.16 % + 41 mV<br>0.16 % + 41 mV   | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                           |
|                                                   | 329.999 V to 1000.00 V<br>(45 Hz to 1 kHz)<br>(1 kHz to 10 kHz)     | 0.023 % + 30 mV<br>0.023 % + 30 mV |                                                                                            |
| AC Current Generate <sup>3,5</sup>                | 100 µA to 329.99 µA<br>(45 Hz to 1 kHz)                             | 0.078 % + 0.16 µA                  | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                           |
|                                                   | 329.99 µA to 3.29999 mA<br>(45 Hz to 1 kHz)                         | 0.031 % + 1.8 µA                   |                                                                                            |
|                                                   | 3.29999 mA to 32.9999 mA<br>(45 Hz to 1 kHz)                        | 0.031 % + 18 µA                    |                                                                                            |
|                                                   | 32.9999 mA to 100.000 mA<br>(45 Hz to 1 kHz)                        | 0.039 % + 0.018 mA                 |                                                                                            |
|                                                   | 100.000 mA to 1.00000 A<br>(45 Hz to 1 kHz)                         | 0.039 % + 0.15 mA                  |                                                                                            |
|                                                   | 1.00000 A to 2.99999 A<br>(45 Hz to 1 kHz)                          | 0.047 % + 3.0 mA                   |                                                                                            |
|                                                   | 2.99999 A to 10.0 A<br>(45 Hz to 1 kHz)                             | 0.078 % + 3.4 mA                   |                                                                                            |
|                                                   | 10.0 A to 20.0 A<br>(45 Hz to 1 kHz)                                | 0.12 % + 7.2 mA                    |                                                                                            |
| AC Current Generate <sup>3,5</sup>                | 1 A to 10 A<br>(45 Hz to 100 Hz)<br>(100 Hz to 440 Hz)              | 0.67 % + 58 mA<br>1.0 % + 58 mA    | Using Electrical<br>Multifunction Calibrator &<br>50 Turn Current Coil by<br>Direct Method |
|                                                   | 10 A to 100 A<br>(45 Hz to 100 Hz)<br>(100 Hz to 440 Hz)            | 0.82 % + 58 mA<br>1.2 % + 58 mA    |                                                                                            |
|                                                   | 100 A to 200 A<br>(45 Hz to 100 Hz)<br>(100 Hz to 440 Hz)           | 0.78 % + 58 mA<br>1.4 % + 58 mA    |                                                                                            |
|                                                   | 200 A to 300 A<br>(45 Hz to 100 Hz)<br>(100 Hz to 440 Hz)           | 0.67 % + 0.16 A<br>1.3 % + 0.16 A  |                                                                                            |

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| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED      | RANGE                                                                                                                                                                                                                                                                        | UNCERTAINTY <sup>1,2</sup><br>(±)                                                                                                                   | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL)                    |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| AC Current Generate <sup>3,5</sup><br>(continued)      | 300 A to 400 A<br>(45 Hz to 100 Hz)<br>(100 Hz to 440 Hz)<br><br>400 A to 500 A<br>(45 Hz to 100 Hz)<br><br>500 A to 1000 A<br>(45 Hz to 100 Hz)                                                                                                                             | 0.61 % + 0.16 A<br>1.2 % + 0.16 A<br><br>0.92 % + 0.16 A<br><br>0.92 % + 0.31 A                                                                     | Using Electrical<br>Multifunction Calibrator &<br>50 Turn Current Coil by<br>Direct Method |
| Temperature<br>Simulation <sup>5</sup><br>Thermocouple |                                                                                                                                                                                                                                                                              |                                                                                                                                                     | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                           |
| Type - B                                               | 600 °C to 1750 °C                                                                                                                                                                                                                                                            | 0.67 °C                                                                                                                                             |                                                                                            |
| Type - E                                               | -250 °C to 200 °C                                                                                                                                                                                                                                                            | 0.39 °C                                                                                                                                             |                                                                                            |
| Type - J                                               | -210 °C to 1190 °C                                                                                                                                                                                                                                                           | 0.21 °C                                                                                                                                             |                                                                                            |
| Type - K                                               | -200 °C to 1370 °C                                                                                                                                                                                                                                                           | 0.31 °C                                                                                                                                             |                                                                                            |
| Type - N                                               | -200 °C to 600 °C                                                                                                                                                                                                                                                            | 0.31 °C                                                                                                                                             |                                                                                            |
| Type - R                                               | 0 °C to 500 °C                                                                                                                                                                                                                                                               | 0.45 °C                                                                                                                                             |                                                                                            |
| Type - S                                               | 600 °C to 1200 °C                                                                                                                                                                                                                                                            | 0.44 °C                                                                                                                                             |                                                                                            |
| Type - T                                               | -250 °C to 200 °C                                                                                                                                                                                                                                                            | 0.49 °C                                                                                                                                             |                                                                                            |
| Insulation DC Resistance<br>Generate <sup>3,5</sup>    | 100 KΩ to 10 GΩ<br>(Discrete steps)                                                                                                                                                                                                                                          | 1.3 %                                                                                                                                               | Using Standard Resistors<br>by Direct Method                                               |
| DC Resistance<br>Generate <sup>3,5</sup>               | 50 μΩ to 200 μΩ<br>200 μΩ to 1 mΩ<br>1 mΩ to 2 mΩ<br>2 mΩ to 5 mΩ<br>5 mΩ to 10 mΩ<br>10 mΩ to 15 mΩ<br>15 mΩ to 20 mΩ<br>20 mΩ to 50 mΩ<br>50 mΩ to 100 mΩ<br>100 mΩ to 150 mΩ<br>150 mΩ to 200 mΩ<br>200 mΩ to 500 mΩ<br>500 mΩ to 1000 mΩ<br>1 Ω to 1.5 Ω<br>1.5 Ω to 2 Ω | 0.12 μΩ<br>0.7 μΩ<br>0.85 μΩ<br>1.3 μΩ<br>2.1 μΩ<br>3.0 μΩ<br>4.0 μΩ<br>9.7 μΩ<br>20 μΩ<br>30 μΩ<br>39 μΩ<br>96 μΩ<br>0.19 mΩ<br>0.29 mΩ<br>0.40 mΩ | Using Standard Resistors<br>and DMM by Comparison                                          |

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| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED                                     | RANGE                                                                                                                                                                                     | UNCERTAINTY <sup>1,2</sup><br>(±)                                                                                                                                                           | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL)                                                                       |
|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| AC Power (Active)<br>Generate <sup>3,5</sup>                                          | 10 W to 1000 W<br>(45 Hz to 1 kHz,<br>Power factor = 1)<br><br>10 W to 1000 W<br>(45 Hz to 1 kHz,<br>Power factor = 0.5)                                                                  | 0.08 % + 0.58R<br><br>0.41 % + 0.58R<br><br>Where R is resolution<br>of unit under<br>calibration                                                                                           | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                                                                              |
| Power Factor Generate <sup>3,5</sup><br>(Lead and Lag)                                | 0.2 to 0.6<br>0.6 to 1                                                                                                                                                                    | 0.007<br>0.006                                                                                                                                                                              | Using Electrical<br>Multifunction Calibrator by<br>Direct Method                                                                              |
| Oscilloscopes <sup>5</sup><br>Time Base<br><br>Amplitude (Sine Wave)<br><br>Bandwidth | 100 ns to 20 ms<br><br>100 mVp-p to 30 Vp-p<br>(1 kHz)<br><br>1 MHz to 300 MHz                                                                                                            | 0.0005 %<br><br>0.079 % + 0.058 mV<br><br>0.00019 %                                                                                                                                         | Using Electrical<br>Multifunction Calibrator<br>with Scope by Direct<br>Method                                                                |
| DC Voltage Measure <sup>4,5</sup>                                                     | 0 mV to 100 mV<br>100 mV to 1 V<br>1 V to 10 V<br>10 V to 100 V<br>100 V to 1000 V                                                                                                        | 0.0010 % + 0.36 µV<br>0.00092 % + 1.1 µV<br>0.00092 % + 10 µV<br>0.0012 % + 0.11 mV<br>0.0012 % + 1.1 mV                                                                                    | Using Digit Multimeter by<br>Direct Method                                                                                                    |
| DC Resistance Measure <sup>4,5</sup>                                                  | 0 Ω to 10 Ω<br>10 Ω to 100 Ω<br>100 Ω to 1 kΩ<br>1 kΩ to 10 kΩ<br>10 kΩ to 100 kΩ<br>100 kΩ to 1 MΩ<br>1 MΩ to 10 MΩ<br>10 MΩ to 100 MΩ<br>100 MΩ to 1 GΩ                                 | 0.0017 % + 0.11 mΩ<br>0.0014 % + 1.2 mΩ<br>0.0012 % + 9.1 mΩ<br>0.0012 % + 52 mΩ<br>0.0012 % + 0.51 Ω<br>0.0018 % + 9.5 Ω<br>0.0058 % + 0.83 kΩ<br>0.058 % + 13 kΩ<br>1.6 % + 1.0 MΩ        | Using Digit Multimeter by<br>Direct Method                                                                                                    |
| DC Current Measure <sup>4,5</sup>                                                     | 0 µA to 100 µA<br>100 µA to 1 mA<br>1 mA to 10 mA<br>10 mA to 100 mA<br>100 mA to 1 A<br>1 A to 1.9 A<br>1.9 A to 5 A<br>5 A to 10 A<br><br>10 A to 20 A<br>20 A to 50 A<br>50 A to 100 A | 0.0023 % + 1.1 nA<br>0.0023 % + 7.6 nA<br>0.0023 % + 76 nA<br>0.0040 % + 0.77 µA<br>0.013 % + 17 µA<br>0.12 % + 0.70 mA<br>0.17 % + 3.1 mA<br>0.17 % + 3.1 mA<br><br>5 mA<br>30 mA<br>60 mA | Using Digit Multimeter by<br>Direct Method<br><br><br><br><br><br><br><br>Using AC/DC Current<br>Shunt & Digit Multimeter<br>by Direct Method |

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| MEASURED<br>QUANTITY or DEVICE<br>TYPE CALIBRATED               | RANGE                                                                                                                                       | UNCERTAINTY <sup>1,2</sup><br>(±)                                                                                                 | CALIBRATION METHOD<br>OR PROCEDURE,<br>STANDARD EQUIPMENT<br>(OPTIONAL) |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
| DC Current Measure <sup>4,5</sup><br>(continued)                | 100 A to 500 A<br>500 A to 1000 A                                                                                                           | 12 A<br>24 A                                                                                                                      | Using Calibrated Clamp<br>meter & Digit Multimeter by<br>Direct Method  |
| AC Voltage Measure <sup>4,5</sup>                               | (40 Hz to 1 kHz)<br>0 mV to 10 mV<br>10 mV to 100 mV<br>100 mV to 1 V<br>1 V to 10 V<br>10 V to 100 V<br>100 V to 700 V                     | 0.04 % + 1.5 µV<br>0.008 % + 5.2 µV<br>0.008 % + 38 µV<br>0.008 % + 0.56 mV<br>0.03 % + 4.3 mV<br>0.05 % + 39 mV                  | Using Digit Multimeter by<br>Direct Method                              |
| AC Current Measure <sup>4,5</sup>                               | (10 Hz to 1 kHz)<br>10 µA to 100 µA<br>100 µA to 1 mA<br>1 mA to 10 mA<br>10 mA to 100 mA<br>100 mA to 1 A<br>1 A to 1.9 A<br>1.9 A to 10 A | 0.07 % + 41 nA<br>0.04 % + 0.29 µA<br>0.04 % + 2.7 µA<br>0.04 % + 27 µA<br>0.12 % + 0.29 mA<br>0.17 % + 4.7 mA<br>0.17 % + 5.5 mA | Using Digit Multimeter by<br>Direct Method                              |
|                                                                 | (45 Hz to 500 Hz)<br>100 A to 500 A<br>500 A to 1000 A<br>1000 A to 2000 A                                                                  | 19 A<br>47 A<br>79 A                                                                                                              | Using Calibrated Clamp<br>meter & Digit Multimeter by<br>Direct Method  |
| Capacitance Measure <sup>4,5</sup><br>@ 1 kHz                   | 1 nF to 10 nF<br>10 nF to 10 mF<br>10 mF to 100 mF                                                                                          | 1.6 % + 23 pF<br>0.8 % + 49 pF<br>3.1 % + 0.96 mF                                                                                 | Using Digit Multimeter by<br>Direct Method                              |
| Inductance Measure <sup>4,5</sup><br>@ 1kHz using Ls-Rs<br>Mode | 1 mH to 3 mH<br>3 mH to 5 mH                                                                                                                | 0.30 %<br>0.22 %                                                                                                                  | Using Reference LCR<br>meter by Direct Method                           |
| Inductance Measure <sup>4,5</sup><br>@ 1kHz using Ls-Q Mode     | 1 mH to 10 mH                                                                                                                               | 0.22 %                                                                                                                            |                                                                         |
| <b>Time and Frequency</b>                                       |                                                                                                                                             |                                                                                                                                   |                                                                         |
| Frequency Generate <sup>3,5</sup>                               | 10.0 Hz to 1199 kHz                                                                                                                         | 0.00019 %                                                                                                                         | Using Electrical<br>Multifunction Calibrator by<br>Direct Method        |
| Frequency Measure <sup>4,5</sup>                                | 10 Hz to 10 MHz                                                                                                                             | 0.012 %                                                                                                                           | Using Digit Multimeter by<br>Direct Method                              |
| Tachometer (Non-contact<br>Type) <sup>5</sup>                   | 60 rpm to 90000 rpm                                                                                                                         | 0.00019 %                                                                                                                         | Using Electrical<br>Multifunction Calibrator by<br>Direct Method        |

<sup>1</sup>The uncertainty covered by the Calibration and Measurement Capability (CMC) is expressed as the expanded uncertainty having a coverage probability of approximately 95 %. It is the smallest measurement uncertainty that a laboratory can achieve within its scope of accreditation when performing calibrations of a best existing device. The

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measurement uncertainty reported on a calibration certificate may be greater than that provided in the CMC due to the behavior of the calibration item and other factors that may contribute to the uncertainty of a specific calibration.

<sup>2</sup>When uncertainty is stated in relative terms (such as percent, a multiplier expressed as a decimal fraction or in scientific notation), it is in relation to instrument reading or instrument output, as appropriate, unless otherwise indicated.

<sup>3</sup>Capability is suitable for the calibration of measuring devices in the stated ranges.

<sup>4</sup>Capability is suitable for the calibration of devices intended to generate the indicated quantity in the stated ranges.

<sup>5</sup>Also available as on-site calibration. Note that actual measurement uncertainties achievable at site outside the laboratory can normally be expected to be larger than the uncertainties listed on this Scope of Accreditation.

Notes:

CW = clockwise

CCW = counter-clockwise

p-p = peak to peak