# CERTIFICATE OF ACCREDITATION

## The ANSI National Accreditation Board

Hereby attests that

## Transcat – San Diego
**7726 Arjons Drive**
**San Diego, CA 92126**

Fulfills the requirements of

## ISO/IEC 17025:2017

and national standard

## ANSI/NCSL Z540-1-1994 (R2002)

In the field of

## CALIBRATION

This certificate is valid only when accompanied by a current scope of accreditation document.
The current scope of accreditation can be verified at www.anab.org.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 01 September 2022
Certificate Number: L2214

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

# SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017 AND ANSI/NCSL Z540-1-1994 (R2002)


## Transcat – San Diego

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San Diego, CA 92126
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## CALIBRATION

Valid to: **September 1, 2022** Certificate Number: **L2214**

**Electrical – DC/Low Frequency**

| Parameter/Equipment | Range | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment |
|---|---|---|---|
| DC Current – Source [2] | Up to 220 µA<br>(0.22 to 2.2) mA<br>(2.2 to 22) mA<br>(22 to 220) mA<br>(0.22 to 2.2) A | 45 µA/A + 6.9 nA<br>39 µA/A + 8.1 nA<br>39 µA/A + 46nA<br>58 µA/A + 0.7 µA<br>0.24 mA/A + 12 µA | Fluke 5720A Multiproduct Calibrator |
| DC Voltage – Source [2] | Up to 220 mV<br>(0.22 to 2.2) V<br>(2.2 to 11) V<br>(11 to 22) V<br>(22 to 220) V<br>(220 to 1 000) V | 9.1 µV/V + 0.4 µV<br>5.7 µV/V + 0.7 µV<br>4.4 µV/V + 2.5 µV<br>4 µV/V + 4 µV<br>6.3 µV/V + 40 µV<br>7.6 µV + 0.4 mV | Fluke 5720A Multiproduct Calibrator |
| AC Current – Source [2] | Up to 220 µA<br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz<br>(0.22 to 2.2) mA<br>(10 to 20) Hz<br>(20 to 40) Hz<br>40 Hz to 1 kHz<br>(1 to 5) kHz<br>(5 to 10) kHz | <br>0.032 % of reading + 16 nA<br>0.019 % of reading + 10 nA<br>0.014 % of reading + 8 nA<br>0.026 % of reading + 10 nA<br>0.11 % of reading + 65 nA<br><br>0.031 % of reading + 40 nA<br>0.019 % of reading + 35 nA<br>0.014 % of reading + 35 nA<br>0.026 % of reading + 0.11 µA<br>0.11 % of reading + 0.65 µA | Fluke 5720A Multiproduct Calibrator |

**Electrical – DC/Low Frequency**

| Parameter/Equipment | Range | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment |
|---|---|---|---|
| AC Current – Source [2] | (2.2 to 22) mA | | Fluke 5720A Multiproduct Calibrator |
| | (10 to 20) Hz | 0.033 % of reading + 0.4 µA | |
| | (20 to 40) Hz | 0.02 % of reading + 0.35 µA | |
| | 40 Hz to 1 kHz | 0.015 % of reading + 0.35 µA | |
| | (1 to 5) kHz | 0.022 % of reading + 0.55 µA | |
| | (5 to 10) kHz | 0.11 % of reading + 5 µA | |
| | (22 to 220) mA | | |
| | (10 to 20) Hz | 0.033 % of reading + 4 µA | |
| | (20 to 40) Hz | 0.018 % of reading + 3.5 µA | |
| | 40 Hz to 1 kHz | 0.014 % of reading + 2.5 µA | |
| | (1 to 5) kHz | 0.021 % of reading + 3.5 µA | |
| | (5 to 10) kHz | 0.11 % of reading + 10 µA | |
| | (0.22 to 2.2) A | | |
| | 20 Hz to 1 kHz | 0.047 % of reading + 0.17 mA | |
| | (1 to 5) kHz | 0.095 % of reading + 0.38 mA | |
| | (5 to 10) kHz | 0.36 % of reading + 0.16 mA | |
| AC Voltage – Source [2] | Up to 2.2 mV | | Fluke 5720A Multiproduct Calibrator |
| | (10 to 20) Hz | 0.16 % of reading + 4 µV | |
| | (20 to 40) Hz | 0.1 % of reading + 4 µV | |
| | 40 Hz to 20 kHz | 0.077 % of reading + 4 µV | |
| | (20 to 50) kHz | 0.12 % of reading + 4 µV | |
| | (50 to 100) kHz | 0.17 % of reading + 5 µV | |
| | (100 to 300) kHz | 0.33 % of reading + 10 µV | |
| | (300 to 500) kHz | 0.47 % of reading + 20 µV | |
| | 500 kHz to 1 MHz | 0.58 % of reading + 20 µV | |
| | (2.2 to 22) mV | | |
| | (10 to 20) Hz | 0.044 % of reading + 4 µV | |
| | (20 to 40) Hz | 0.031 % of reading + 4 µV | |
| | 40 Hz to 20 kHz | 0.015 % of reading + 4 µV | |
| | (20 to 50) kHz | 0.031 % of reading + 4 µV | |
| | (50 to 100) kHz | 0.059 % of reading + 5 µV | |
| | (100 to 300) kHz | 0.12 % of reading + 10 µV | |
| | (300 to 500) kHz | 0.16 % of reading + 20 µV | |
| | 500 kHz to 1 MHz | 0.3 % of reading + 20 µV | |

**Electrical – DC/Low Frequency**

| Parameter/Equipment | Range | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment |
|---|---|---|---|
| AC Voltage – Source [2] | (22 to 220) mV | | Fluke 5720A Multiproduct Calibrator |
| | (10 to 20) Hz | 0.028 % of reading + 12 µV | |
| | (20 to 40) Hz | 0.011 % of reading + 7 µV | |
| | 40 Hz to 20 kHz | 0.009 % of reading + 7 µV | |
| | (20 to 50) kHz | 0.021 % of reading + 7 µV | |
| | (50 to 100) kHz | 0.047 % of reading + 17 µV | |
| | (100 to 300) kHz | 0.092 % of reading + 20 µV | |
| | (300 to 500) kHz | 0.14 % of reading + 25 µV | |
| | 500 kHz to 1 MHz | 0.28 % of reading + 45 µV | |
| | (0.22 to 2.2) V | | |
| | (10 to 20) Hz | 0.028 % of reading + 40 µV | |
| | (20 to 40) Hz | 0.01 % of reading + 15 µV | |
| | 40 Hz to 20 kHz | 0.005 % of reading + 8 µV | |
| | (20 to 50) kHz | 0.008 % of reading + 10 µV | |
| | (50 to 100) kHz | 0.012 % of reading + 30 µV | |
| | (100 to 300) kHz | 0.043 % of reading + 80 µV | |
| | (300 to 500) kHz | 0.1 % of reading + 0.2 mV | |
| | 500 kHz to 1 MHz | 0.18 % of reading + 0.3 mV | |
| | (2.2 to 22) V | | |
| | (10 to 20) Hz | 0.028 % of reading + 0.4 mV | |
| | (20 to 40) Hz | 0.01% of reading + 0.15 mV | |
| | 40 Hz to 20 kHz | 0.005 % of reading + 0.05 mV | |
| | (20 to 50) kHz | 0.008 % of reading + 0.1 mV | |
| | (50 to 100) kHz | 0.011 % of reading + 0.2 mV | |
| | (100 to 300) kHz | 0.03 % of reading + 0.6 mV | |
| | (300 to 500) kHz | 0.1 % of reading + 2 mV | |
| | 500 kHz to 1 MHz | 0.17 % of reading + 3.2 mV | |
| | (22 to 220) V | | |
| | (10 to 20) Hz | 0.028 % of reading + 4 mV | |
| | (20 to 40) Hz | 0.01% of reading + 1.5 mV | |
| | 40 Hz to 20 kHz | 0.006 % of reading + 0.6 mV | |
| | (20 to 50) kHz | 0.009 % of reading + 1 mV | |
| | (50 to 100) kHz | 0.016 % of reading + 2.5 mV | |
| | (100 to 300) kHz | 0.09 % of reading + 16 mV | |
| | (300 to 500) kHz | 0.44 % of reading + 40 mV | |
| | 500 kHz to 1 MHz | 0.8 % of reading + 80 mV | |
| | (220 to 750) V | | |
| | (30 to 50) kHz | 0.061 % of reading + 11 mV | |
| | (50 to 100) kHz | 0.23 % of reading + 45 mV | |

## Electrical – DC/Low Frequency

| Parameter/Equipment | Range | Expanded Uncertainty of Measurement (+/-) | Reference Standard, Method, and/or Equipment |
|---|---|---|---|
| DC Resistance – Source [2] (Fixed-Simulated Values) | 1 Ω | 98 μΩ/Ω | Fluke 5720A Multiproduct Calibrator |
| | 1.9 Ω | 96 μΩ/Ω | |
| | 10 Ω | 24 μΩ/Ω | |
| | 19 Ω | 25 μΩ/Ω | |
| | 100 Ω | 11 μΩ/Ω | |
| | 190 Ω | 11 μΩ/Ω | |
| | 1 kΩ | 9.4 mΩ/kΩ | |
| | 1.9 kΩ | 10 mΩ/kΩ | |
| | 10 kΩ | 10 mΩ/kΩ | |
| | 19 kΩ | 10 mΩ/kΩ | |
| | 100 kΩ | 12.6 mΩ/kΩ | |
| | 190 kΩ | 29.5 mΩ/kΩ | |
| | 1 MΩ | 22 Ω/MΩ | |
| | 1.9 MΩ | 125 Ω/MΩ | |
| | 10 MΩ | 74 Ω/MΩ | |
| | 19 MΩ | 0.65 kΩ/MΩ | |
| | 100 MΩ | 0.6 kΩ/MΩ | |

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ($k$=2), corresponding to a confidence level of approximately 95%.

Notes:

1. On-site calibration service is available for this parameter, since on-site conditions are typically more variable than those in the laboratory, larger measurement uncertainties are expected on-site than what is reported on the accredited scope.
2. Based on an accredited calibration by the manufacturer, used at the temperature in which the Multiproduct Calibrator was calibrated (tcal = ± 5 °C) and assuming the instrument is zeroed at least every seven days or when the ambient temperature changes more than 5 °C.
3. This scope is formatted as part of a single document including Certificate of Accreditation No. L2214.

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