



Program for Accreditation of Laboratories – Canada
Programme d'accréditation des laboratoires – Canada



National Research
Council Canada

Conseil national de
recherches Canada

Calibration Laboratory Assessment Service
Service d'évaluation de laboratoires d'étalonnage

Certificate
of Accreditation

Certificat
d'accréditation

Transcat Canada, Inc.

4043 Carling Avenue, Ottawa, ON K2K 2A4

having been assessed by the National Research Council of Canada (NRC), under the authority of the Standards Council of Canada (SCC), and found to conform with the requirements of ISO/IEC 17025:2017 and conditions established by SCC, and the NRC Calibration Laboratory Assessment Service (CLAS), and having demonstrated the capability of calibrating measurement instruments and standards for specific calibration and measurement capabilities, providing verified metrological traceability to the International System of Units (SI), is hereby recognized as an



ACCREDITED CALIBRATION LABORATORY
For specific measurement capabilities which are hereby CERTIFIED by CLAS

as listed in the Directory of the accredited calibration laboratories maintained by NRC and approved by SCC. The national measurement standards of Canada are realized, maintained and disseminated by NRC under the authority of the *National Research Council Act* and the *Weights and Measurements Act*. The International Committee for Weights and Measures Mutual Recognition Arrangement (CIPM MRA) is the framework through which National Metrology Institutes demonstrate the international equivalence of their measurement standards and the calibration and measurement certificates they issue. NRC, Canada's National Metrology Institute, is a participating member of the CIPM MRA

ayant fait l'objet d'une évaluation par le Conseil national de recherches du Canada (CNRC), sous l'autorité du Conseil canadien des normes (CCN), et ayant été trouvé conforme aux exigences d'ISO/IEC 17025:2017, ainsi qu'aux conditions établies par le CCN et le Service d'évaluation de laboratoires d'étalonnage (CLAS) du CNRC, et ayant prouvé ses compétences en matière d'étalonnage des instruments de mesure et des étalons, pour des aptitudes en matière de mesures et d'étalonnages spécifiques, en assurant une traçabilité métrologique au système international des unités (SI) vérifiée, est de ce fait reconnu comme étant un



LABORATOIRE D'ÉTALONNAGE ACCRÉDITÉ
CERTIFIÉ par le CLAS pour des capacités précises de mesurage

indiquées dans le Répertoire des laboratoires d'étalonnage accrédités établi par le CNRC et approuvé par le CCN. Les étalons nationaux du Canada sont établis, maintenus et émis par le CNRC en vertu de la *Loi sur le Conseil national de recherches* et de la *Loi sur les poids et mesures*. L'Arrangement de reconnaissance mutuelle du Comité international des poids et mesures (CIPM MRA) est la structure permettant aux laboratoires nationaux de métrologie de démontrer l'équivalence internationale de leurs étalons de mesure et des certificats d'étalonnage et de mesurage qu'ils émettent. Le CNRC, l'Institut national de métrologie du Canada, est un membre participant du CIPM MRA.

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SCC file number: / Dossier du CCN n° : 151044

Initial accreditation date: / Date de la première accréditation: 2016-05-20

NRC CLAS Certificate No. / Numéro du certificat CNRC CLAS : 2016-02

Vice-President – Accreditation Services / Vice-président – Services d'accréditation

Issued on: / Délivré le : 2021-12-20

Director General – Metrology (NRC) / Directrice générale – Métrologie (CNRC)

The validity of this certificate, including the date of last re-accreditation and its expiry can be confirmed by the accompanying Scope of Accreditation document in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017. The 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).

Pour vérifier la validité du présent certificat, y compris la date de la dernière réaccréditation et la date d'expiration du certificat, consulter la portée d'accréditation qui se trouve dans le répertoire des laboratoires accrédités dans le site Web du CCN au www.ccn.ca.

Ce laboratoire est accrédité conformément à la Norme internationale reconnue ISO/IEC 17025:2017. Cette accréditation démontre la compétence technique d'un organisme pour une portée définie et l'exploitation d'un système de management de la qualité de laboratoire (cf. communiqué conjoint ISO-ILAC-IAF date d'avril 2017).



Canada



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Dear Valued Customer,

We are pleased to provide this letter of clarification in reference to the information on our current ISO 17025 certificates of accreditation.

Our laboratories have been audited and assessed by the National Research Council of Canada (NRC) through its Calibration Laboratory Assessment Service (CLAS). Based on the successful completion of our audits, we are confirmed as accredited by the Standards Council of Canada (SCC) who provides our ISO 17025 certificates of accreditation. These frameable paper certificates are formally issued by the Standards Council of Canada and indicate our SCC laboratory number, our CLAS certificate number, the date of our initial accreditation and the date on which the paper certificate was printed.

For the period of validity of our **current scope of accreditation**, including the **date on which the scope was issued and the expiry date**, these are published on the SCC website at scc.ca.

For the list of our full measurement capabilities, our detailed scope of accreditation is outlined on the NRC website at nrc.canada.ca in the directory of accredited calibration laboratories.

If you have any questions, please do not hesitate to contact our Quality Manager, David Llorens via email at david.llorens@transcat.ca or via telephone at 1-800-828-1470 extension 7232.

We appreciate being your trusted calibration partner, and we thank you for your business!



TESTING AND CALIBRATION LABORATORY ACCREDITATION PROGRAM (LAP)

Scope of Accreditation

Accredited Laboratory No. 827

Legal Name of Accredited Laboratory: Transcat Canada, Inc.

Contact Name: Francis Kane

Address: 4043 Carling Avenue, Ottawa, ON K2K 2A4

Telephone: 613 591 8140

Fax: 613 591 6318

Website: <http://www.transcat.com>

Email: francis.kane@transcat.ca

SCC File Number:	151044
Provider:	NRC-CLAS
Provider File Number:	524
Accreditation Standards:	ISO/IEC 17025:2017
Clients Served:	All interested parties Some calibration services are available on-site. These services are indicated in the "Remarks" column of the following pages.
Field of Calibration:	Dimensional Electrical Force Humidity Mass Pressure Thermometry Time and frequency
Program Specialty Area:	Calibration
Initial Accreditation:	2016-05-20
Most Recent Accreditation:	2019-05-29
Accreditation Valid to:	2024-05-20



*Remarque: La présente portée d'accréditation existe également en français, sous la forme d'un document distinct.
Note: This scope of accreditation is also available in French as a separately issued document.*

CALIBRATION OF MEASURING AND TEST EQUIPMENT

For calibration measurement capability, please refer to the Canadian Calibration Network web page at the National Research Council of Canada. This laboratory is accredited by the Standards Council of Canada as part of the Calibration Laboratory Assessment Service (CLAS) program and is listed at nrc.canada.ca.

This document forms part of the Certificate of Accreditation issued by the Standards Council of Canada (SCC). The original version is available in the Directory of Accredited Laboratories on the SCC website at www.scc.ca.

Elias Rafoul
Vice-President, Accreditation Services
Publication on: 2020-05-13

CLAS Certificate Number 2016-02

From: National Research Council Canada

Company name	Transcat Canada - Ottawa
Company address	4043 Carling Avenue Ottawa, Ontario Canada K2K 2A4
Contact	Francis Kane Tel: 613-591-8140 Fax: 613-591-6318 Email: Francis.Kane@transcat.ca
Clients served	• All interested parties • Some calibration services are available on-site. These services are indicated in the "Remarks" column of the following pages.
Fields of calibration	• <u>Dimensional</u> • <u>Electrical</u> • <u>Force</u> • <u>Time and Frequency</u> • <u>Mass</u> • <u>Pressure</u> • <u>Thermometry</u> • <u>Humidity</u>

**SCC
accreditation
(ISO/IEC
17025)**

- Accredited Laboratory N° 827
- First issued 2016-05-20
- Issue 3.0e 2021-12-20

i This scope of calibration capabilities is published by the CLAS program of the National Research Council of Canada (NRC) in close co-operation with the laboratory accreditation program of the Standards Council of Canada (SCC), Canada's accreditation body for calibration and testing laboratories. The SCC accredits the capability of the named laboratory for being able to perform the listed calibrations at the given Calibration Measurement Capability (see Supplementary **note C** and **note D**) with traceability to the International System of Units (SI) or to standards acceptable to the CLAS program.

Type II Capability

Dimensional

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (See <u>supplementary notes</u>)	Remarks

Micrometers: Outside, Inside, Depth

0.0 to 0.05 inches	7.5 μ inch	Comparison to gauge blocks. On-site calibration available.
0.05 to 0.45 inches	(7 + 7L) μ inch (Note: L in 'inches')	
0.45 to 1.0 inch	(5 + 12L) μ inch (Note: L in 'inches')	
1.0 to 4.0 inches	(2 + 15L) μ inch (Note: L in 'inches')	
4.0 to 40 inches	(9 + 16L) μ inch (Note: L in 'inches')	

Anvil Flatness:

0 to 1 inch diameter	6.3 μ inch	On-site calibration available.
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Calipers: Outside, Inside, Depth

0.0 to 0.05 inches	7.5 μ inch	Comparison to gauge blocks with surface plate and ring gauge. On-site calibration available.
0.05 to 0.45 inches	(7 + 7L) μ inch (Note: L in 'inches')	
0.45 to 1.0 inch	(5 + 12L) μ inch (Note: L in 'inches')	

1.0 to 4.0 inches	(2 + 15L) μinch (Note: L in 'inches')	
4.0 to 40 inches	(9 + 16L) μinch (Note: L in 'inches')	
Dial Indicators:		
0.0 to 0.45 inches	(18 + 3L) μinch (Note: L in 'inches')	Comparison to Dial Indicator Tester.
0.45 to 1.0 inch	(15 + 8L) μinch (Note: L in 'inches')	
1.0 to 4.0 inches	(9 + 14L) μinch (Note: L in 'inches')	
4.0 to 6 inches	(9 + 16L) μinch (Note: L in 'inches')	
Height Equipment and Measure:		
0.0 to 0.45 inches	(48 + 1L) μinch (Note: L in 'inches')	Comparison to gauge blocks with surface plate.
0.45 to 1.0 inch	(46 + 4L) μinch (Note: L in 'inches')	

1.0 to 4.0 inches	(40 + 10L) μinch (Note: L in 'inches')
4.0 to 24 inches	(21 + 15L) μinch (Note: L in 'inches')

Electrical

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (±) (See <u>supplementary notes</u>)	Remarks
Current, AC			
0 μA to 220 μA	10 Hz to 20 Hz	0.031 % + 16 nA	Fluke 5700A-EP or an equivalent standard. Source. For the calibration of sinewave current measurement devices. On- site calibration available.
	20 Hz to 40 Hz	0.019 % + 10 nA	
	40 Hz to 1 kHz	0.015 % + 8 nA	
	1 kHz to 5 kHz	0.030 % + 12 nA	

	5 kHz to 10 kHz	0.11 % + 65 nA
0.22 mA to 2.2 mA	10 Hz to 20 Hz	0.03 % + 40 nA
	20 Hz to 40 Hz	0.018 % + 35 nA
	40 Hz to 1 kHz	0.013 % + 35 nA
	1 kHz to 5 kHz	0.021 % + 0.11 μ A
	5 kHz to 10 kHz	0.11 % + 0.65 μ A
2.2 mA to 22 mA	10 Hz to 20 Hz	0.039 % + 0.40 μ A
	20 Hz to 40 Hz	0.019 % + 0.35 μ A
	40 Hz to 1 kHz	0.014 % + 0.35 μ A
	1 kHz to 5 kHz	0.021 % + 0.55 μ A
	5 kHz to 10 kHz	0.11 % + 5 μ A
22 mA to 220 mA	10 Hz to 20 Hz	0.033 % + 4 μ A
	20 Hz to 40 Hz	0.018 % + 3.5 μ A

	40 Hz to 1 kHz	0.014 % + 2.5 μ A	
	1 kHz to 5 kHz	0.021 % + 3.5 μ A	
	5 kHz to 10 kHz	0.11 % + 10 μ A	
0.22 A to 2.2 A	20 Hz to 1 kHz	0.027 % + 35 μ A	
	1 kHz to 5 kHz	0.046 % + 80 μ A	
	5 kHz to 10 kHz	0.7 % + 0.16 mA	
2.2 A to 11 A	40 Hz to 1 kHz	0.048 % + 0.17 mA	Fluke 5700A-EP and 5725A or equivalent standards. Source. For the calibration of sinewave current measurement devices. On-site calibration available.
	1 kHz to 5 kHz	0.096 % + 0.38 mA	
	5 kHz to 10 kHz	0.36 % + 0.75 mA	
11 A to 20.5 A	45 Hz to 100 Hz	0.097 % + 3.9 mA	Fluke 5520A or equivalent standards. Source. For the calibration of sinewave current measurement devices. On-site calibration available.
	100 Hz to 1 kHz	0.18 % + 3.9 mA	
	1 kHz to 5 kHz	2.3 % + 3.9 mA	
29 μ A to 330 μ A	10 kHz to 30 kHz	1.2 % + 0.31 μ A	

330 μ A to 3.3 mA	10 kHz to 30 kHz	0.78 % + 0.47 μ A	Keysight 3458A or equivalent standard. Measure. For the calibration of current sources using a digital multimeter. On-site calibration available
3.3 mA to 33 mA	10 kHz to 30 kHz	0.31 % + 3.1 μ A	
33 mA to 330 mA	10 kHz to 30 kHz	0.31 % + 0.16 mA	
0 μ A to 100 μ A	10 Hz to 20 Hz	0.46 % + 35 nA	
	20 Hz to 45 Hz	0.17 % + 35 nA	
	45 Hz to 100 Hz	0.072 % + 35 nA	
	100 Hz to 5 kHz	0.072 % + 35 nA	
100 μ A to 1 mA	10 Hz to 20 Hz	0.46 % + 0.23 μ A	
	20 Hz to 45 Hz	0.17 % + 0.23 μ A	
	45 Hz to 100 Hz	0.071 % + 0.23 μ A	
	100 Hz to 5 kHz	0.038 % + 0.23 μ A	
1 mA to 10 mA	10 Hz to 20 Hz	0.46 % + 2.3 μ A	
	20 Hz to 45 Hz	0.17 % + 2.3 μ A	

	45 Hz to 100 Hz	0.071 % + 2.3 μ A	
	100 Hz to 5 kHz	0.038 % + 2.3 μ A	
10 mA to 100 mA	10 Hz to 20 Hz	0.48 % + 23 μ A	
	20 Hz to 45 Hz	0.17 % + 23 μ A	
	45 Hz to 100 Hz	0.071 % + 23 μ A	
	100 Hz to 5 kHz	0.037 % + 23 μ A	
100 mA to 1 A	10 Hz to 20 Hz	0.46 % + 0.23 mA	
	20 Hz to 45 Hz	0.19 % + 0.23 mA	
	45 Hz to 100 Hz	0.097 % + 0.23 mA	
	100 Hz to 5 kHz	0.12 % + 0.23 mA	
1 A to 2 A	10 Hz to 45 Hz	0.12 % + 4 mA	Yokogawa WT310EH or equivalent standard. Measure. For the calibration of current sources using a digital multimeter. On-site calibration available
	45 Hz to 66 Hz	0.12 % + 1 mA	
	66 Hz to 1 kHz	0.12 % + 4 mA	

2 A to 5 A	10 Hz to 45 Hz	0.13 % + 10 mA
	45 Hz to 66 Hz	0.13 % + 2.5 mA
	66 Hz to 1 kHz	0.13 % + 10 mA
5 A to 10 A	10 Hz to 45 Hz	0.13 % + 20 mA
	45 Hz to 66 Hz	0.13 % + 5 mA
	66 Hz to 1 kHz	0.13 % + 20 mA
10 A to 20 A	10 Hz to 45 Hz	0.16 % + 40 mA
	45 Hz to 66 Hz	0.16 % + 10 mA
	66 Hz to 1 kHz	0.18 % + 40 mA
20 A to 40 A	10 Hz to 45 Hz	0.20 % + 80 mA
	45 Hz to 66 Hz	0.20 % + 20 mA
	66 Hz to 1 kHz	0.23 % + 80 mA

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
Current, DC		
0 μ A to 220 μ A	0.0040 % + 6 nA	Fluke 5700A-EP with 5725A or equivalent standards. Source. For the calibration of DC current measuring devices. On-site calibration available
220 μ A to 2.2 mA	0.0036 % + 7 nA	
2.2 mA to 22 mA	0.0035 % + 40 nA	
22 mA to 100 mA	0.0045 % + 0.7 μ A	
100 mA to 150 mA	0.0045 % + 5.2 μ A	
150 mA to 200 mA	0.0045 % + 8.7 μ A	
200 mA to 220 mA	0.0045 % + 10 μ A	
220 mA to 1 A	0.0080 % + 12 μ A	

1 A to 1.5 A	0.0080 % + 35 μ A	
1.5 A to 2 A	0.0080 % + 52 μ A	
2 A to 2.2 A	0.0080 % + 60 μ A	
2.2 A to 11 A	0.036 % + 0.48 mA	
11 A to 20.5 A	0.084 % + 0.58 mA	Fluke 5520A or equivalent standard. Source. For the calibration of DC current measuring devices. On-site calibration available.
0 μ A to 100 μ A	0.0033 % + 0.92 nA	Keysight 3458A or equivalent standard. Measure. For the calibration of DC current generating devices. On-site calibration available.
100 μ A to 1 mA	0.0029 % + 5.8 nA	
1 mA to 10 mA	0.0029 % + 58 nA	
10 mA to 100 mA	0.0046 % + 0.58 μ A	
100 mA to 1 A	0.0130 % + 12 μ A	
1 A to 50 A	0.03 %	Yokogawa 2792 with Keysight 3458A or equivalent standards. Measure. For the calibration of DC current generating devices. On-site calibration available.

50 A to 100 A	0.30 %	Empro HA-100-50 with Keysight 3458A or equivalent standards. Measure. For the calibration of DC current generating devices. On-site calibration available.
100 A to 1000 A	0.20 %	Empro LAB-1000-100 with Keysight 3458A or equivalent standards. Measure. For the calibration of DC current generating devices. On-site calibration available.

Voltage, DC

0 V to 220 mV	0.00085 % + 0.44 μ V	Fluke 5700A-EP or equivalent standard. Source. For the calibration of DC voltage measuring devices. On-site calibration available.
220 mV to 2.2 V	0.00051 % + 0.7 μ V	
2.2 V to 11 V	0.00040 % + 2.5 μ V	
11 V to 22 V	0.00040 % + 4 μ V	
22 V to 220 V	0.00062 % + 40 μ V	
220 V to 1100 V	0.00076 % + 0.40 mV	
0 V to 100 mV	0.00083 % + 0.58 μ V	Keysight 3458A or equivalent standard. Measure. For the calibration of DC voltage generating devices. On-site calibration available.
100 mV to 1 V	0.00053 % + 0.58 μ V	

1 V to 10 V	0.00053 % + 0.58 μ V	
10 V to 100 V	0.00077 % + 35 μ V	
100 V to 500 V	0.0015 % + 0.12 mV	
500 V to 800 V	0.0018 % + 0.12 mV	
800 V to 1000 V	0.0021 % + 0.12 mV	
1 kV to 10 kV	0.0374 % + 0.035 V	Vitrek 4700 or/with HVL-100 probe or equal standard. Measure. For the calibration of DC voltage generating devices. On-site calibration available.
10 kV to 100 kV	0.0625 % + 0.35 V	

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
Voltage, AC			
0 mV to 2.2 mV	10 Hz to 20 Hz	0.16 % + 4 μ V	Fluke 5700A-EP or equivalent standard. Source. For the

	20 Hz to 40 Hz	0.1 % + 4 μ V	calibration of sinewave voltage measurement devices. On-site calibration available.
	40 Hz to 20 kHz	0.078 % + 4 μ V	
	20 kHz to 50 kHz	0.13 % + 4 μ V	
	50 kHz to 100 kHz	0.17 % + 5 μ V	
	100 kHz to 300 kHz	0.33 % + 10 μ V	
	300 kHz to 500 kHz	0.47 % + 20 μ V	
	500 kHz to 1 MHz	0.58 % + 20 μ V	
2.2 mV to 22 mV	10 Hz to 20 Hz	0.042 % + 4 μ V	
	20 Hz to 40 Hz	0.03 % + 4 μ V	
	40 Hz to 20 kHz	0.014 % + 4 μ V	
	20 kHz to 50 kHz	0.03 % + 4 μ V	
	50 kHz to 100 kHz	0.058 % + 5 μ V	
	100 kHz to 300 kHz	0.12 % + 10 μ V	

	300 kHz to 500 kHz	0.16 % + 20 μ V
	500 kHz to 1 MHz	0.27 % + 20 μ V
22 mV to 220 mV	10 Hz to 20 Hz	0.028 % + 12 μ V
	20 Hz to 40 Hz	0.011 % + 7 μ V
	40 Hz to 20 kHz	0.0085 % + 7 μ V
	20 kHz to 50 kHz	0.021 % + 7 μ V
	50 kHz to 100 kHz	0.047 % + 17 μ V
	100 kHz to 300 kHz	0.091 % + 20 μ V
	300 kHz to 500 kHz	0.14 % + 25 μ V
	500 kHz to 1 MHz	0.28 % + 45 μ V
220 mV to 2.2 V	10 Hz to 20 Hz	0.027 % + 40 μ V
	20 Hz to 40 Hz	0.010 % + 15 μ V
	40 Hz to 20 kHz	0.0048 % + 8 μ V

	20 kHz to 50 kHz	0.008 % + 10 μ V
	50 kHz to 100 kHz	0.012 % + 30 μ V
	100 kHz to 300 kHz	0.043 % + 80 μ V
	300 kHz to 500 kHz	0.01 % + 200 μ V
	500 kHz to 1 MHz	0.18 % + 300 μ V
2.2 V to 22 V	10 Hz to 20 Hz	0.028 % + 0.4 mV
	20 Hz to 40 Hz	0.010 % + 0.15 mV
	40 Hz to 20 kHz	0.005 % + 50 μ V
	20 kHz to 50 kHz	0.0083 % + 0.1 mV
	50 kHz to 100 kHz	0.012 % + 0.2 mV
	100 kHz to 300 kHz	0.030 % + 0.6 mV
	300 kHz to 500 kHz	0.11 % + 2 mV
	500 kHz to 1 MHz	0.17 % + 3.2 mV

22 V to 220 V	10 Hz to 20 Hz	0.028 % + 4 mV	
	20 Hz to 40 Hz	0.01 % + 1.5 mV	
	40 Hz to 20 kHz	0.0057 % + 0.6 mV	
	20 kHz to 50 kHz	0.0093 % + 1 mV	
	50 kHz to 100 kHz	0.017 % + 2.5 mV	
	100 kHz to 300 kHz	0.091 % + 16 mV	
	300 kHz to 500 kHz	0.44 % + 40 mV	
	500 kHz to 1 MHz	0.8 % + 80 mV	
220 V to 1100 V	40 Hz to 1 kHz	0.011 % + 4 mV	Fluke 5700A-EP with Fluke 5725A or an equivalent standard. Source. For the calibration of sinewave voltage measurement devices. On-site calibration available.
	1 kHz to 20 kHz	0.017 % + 6 mV	
	20 kHz to 30 kHz	0.061 % + 11 mV	
220 V to 750 V	30 kHz to 50 kHz	0.061 % + 11 mV	
	50 kHz to 100 kHz	0.23 % + 45 mV	

0 mV to 10 mV	1 Hz to 40 Hz	0.039 % + 3.5 μ V	Keysight 3458A or equivalent standard. Measure. For the calibration of voltage sources using a digital multimeter. On-site calibration available.
	40 Hz to 1 kHz	0.029 % + 1.2 μ V	
	1 kHz to 20 kHz	0.039 % + 1.2 μ V	
	20 kHz to 50 kHz	0.15 % + 1.2 μ V	
	50 kHz to 100 kHz	0.59 % + 1.2 μ V	
	100 kHz to 300 kHz	4.7 % + 2.3 μ V	
	300 kHz to 1 MHz	1.5 % + 5.8 μ V	
10 mV to 100 mV	1 Hz to 40 Hz	0.013 % + 4.6 μ V	
	40 Hz to 1 kHz	0.0095 % + 2.3 μ V	
	1 kHz to 20 kHz	0.017 % + 2.3 μ V	
	20 kHz to 50 kHz	0.037 % + 2.3 μ V	
	50 kHz to 100 kHz	0.093 % + 2.3 μ V	
	100 kHz to 300 kHz	0.36 % + 12 μ V	

	300 kHz to 1 MHz	1.2 % + 12 μ V
	1 MHz to 2 MHz	1.9 % + 12 μ V
	2 MHz to 4 MHz	4.7 % + 81 μ V
	4 MHz to 8 MHz	4.7 % + 92 μ V
100 mV to 1 V	1 Hz to 40 Hz	0.0098 % + 46 μ V
	40 Hz to 1 kHz	0.0094 % + 23 μ V
	1 kHz to 20 kHz	0.017 % + 23 μ V
	20 kHz to 50 kHz	0.036 % + 23 μ V
	50 kHz to 100 kHz	0.093 % + 23 μ V
	100 kHz to 300 kHz	0.35 % + 0.12 mV
	300 kHz to 1 MHz	1.2 % + 0.12 mV
	1 MHz to 2 MHz	1.9 % + 0.12 mV
	2 MHz to 4 MHz	4.7 % + 0.81 mV

	4 MHz to 8 MHz	4.7 % + 0.92 mV
1V to 10 V	1 Hz to 40 Hz	0.0095 % + 0.46 mV
	40 Hz to 1 kHz	0.0095 % + 0.23 mV
	1 kHz to 20 kHz	0.017 % + 0.23 mV
	20 kHz to 50 kHz	0.036 % + 0.23 mV
	50 kHz to 100 kHz	0.093 % + 0.23 mV
	100 kHz to 300 kHz	0.35 % + 1.2 mV
	300 kHz to 1 MHz	1.7 % + 1.2 mV
	1 MHz to 2 MHz	1.8 % + 1.2 mV
	2 MHz to 4 MHz	4.7 % + 8.1 mV
	4 MHz to 8 MHz	4.7 % + 9.3 mV
10 V to 100 V	1 Hz to 40 Hz	0.024 % + 4.6 mV
	40 Hz to 1 kHz	0.024 % + 2.3 mV

	1 kHz to 20 kHz	0.024 % + 2.3 mV	
	20 kHz to 50 kHz	0.042 % + 2.3 mV	
	50 kHz to 100 kHz	0.14 % + 2.3 mV	
	100 kHz to 300 kHz	0.46 % + 12 mV	
	300 kHz to 1 MHz	1.7 % + 12 mV	
100 V to 700 V	1 Hz to 40 Hz	0.047 % + 46 mV	
	40 Hz to 1 kHz	0.047 % + 23 mV	
	1 kHz to 20 kHz	0.071 % + 23 mV	
	20 kHz to 50 kHz	0.14 % + 23 mV	
	50 kHz to 100 kHz	0.35 % + 23 mV	
700 V to 10 kV	10 Hz to 200 Hz	0.14 % + 0.12 V	Vitretek 4700 or/with HVL-100 probe or equal standard. Measure. For the calibration of voltage sources. On-site calibration available.
	200 Hz to 450 Hz	0.46 % + 0.12 V	
10 kV to 70 kV	30 Hz to 70 Hz	0.14 % + 0.7 V	

	70 Hz to 200 Hz	1.2 % + 0.7 V	
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Current clamp calibration

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (±) (See <u>supplementary notes</u>)	Remarks
Clamp-on Ammeter Toroidal Type: Effective AC current output			
20.5 A to 150 A	45 Hz to 65 Hz	0.30 % + 0.026 A	Fluke 5520A with 5500A Current Coil or equivalent standard. Source using a multifunction calibrator and a 50 turn coil. For the calibration of clamp meters. On-site calibration available.
	65 Hz to 440 Hz	0.83 % + 0.047 A	
150 A to 1025 A	45 Hz to 65 Hz	0.35 % + 0.12 A	
	65 Hz to 440 Hz	1.1 % + 0.22 A	
Clamp-on Ammeter Non-Toroidal Type: Effective AC current output			
20.5 A to 150 A	45 Hz to 65 Hz	0.57 % + 0.25 A	Fluke 5520A with 5500A Current Coil or equivalent standard. Source using a multifunction calibrator and a

	65 Hz to 440 Hz	1.0 % + 0.25 A	50 turn coil. For the calibration of clamp meters. On-site calibration available.
150 A to 1025 A	45 Hz to 65 Hz	0.60 % + 0.9 A	
	65 Hz to 440 Hz	1.3 % + 0.92 A	

Clamp-on Ammeter Non-Toroidal Type: Effective DC current output

20 A to 150 A		0.51 % + 0.14 A	Fluke 5520A with 5500A Current Coil or equivalent standard. Source using a multifunction calibrator and a 50 turn coil. For the calibration of clamp meters. On-site calibration available.
150 A to 1000 A		0.51 % + 0.50 A	

Power, DC

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
0.33 mA to 330 mA			
11 μ W to 1.1 mW	DC	0.024 %	Fluke 5520A or equivalent standard. Source. For the

1.1 mW to 110 mW	DC	0.027 %	calibration of measurement devices using multifunction calibrators. On-site calibration available.
0.11 W to 110 W	DC	0.024 %	
110 W to 330 W	DC	0.018 %	
0.33 A to 3 A			
11 W to 110 mW	DC	0.044 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. On-site calibration available.
0.11 W to 990 W	DC	0.053 %	
1 W to 3 kW	DC	0.0096 %	
3 A to 20.5 A			
0.099 W to 0.99 W	DC	0.088 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. On-site calibration available.
0.99 W to 6.8 kW	DC	0.07 %	
6.8 kW to 20.5 kW	DC	0.04 %	

Power, AC

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (±) (See <u>supplementary notes</u>)	Remarks
3.3 mA to 9 mA			
0.11 mW to 3 mW	10 Hz to 65 Hz	0.13 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. (PF = 1). See Note 1. On-site calibration available.
3 mW to 9 W	10 Hz to 65 Hz	0.077 %	
9 mA to 33 mA			
0.3 mW to 10 mW	10 Hz to 65 Hz	0.089 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. (PF = 1). See Note 1. On-site calibration available.
10 mW to 33 W	10 Hz to 65 Hz	0.077 %	
33 mA to 90 mA			
1 mW to 30 mW	10 Hz to 65 Hz	0.071 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement

			devices using multifunction calibrators. (PF = 1). See Note ¹ . On-site calibration available.
30 mW to 90 W	10 Hz to 65 Hz	0.057 %	
90 mA to 330 mA			
3.0 mW to 100 mW	10 Hz to 65 Hz	0.089 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. (PF = 1). See Note ¹ . On-site calibration available.
100 mW to 300 W	10 Hz to 65 Hz	0.078 %	
0.33 A to 0.9 A			
11 mW to 300 mW	10 Hz to 65 Hz	0.071 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. (PF = 1). See Note ¹ . On-site calibration available.
300 mW to 900 W	10 Hz to 65 Hz	0.081 %	
0.9 A to 2.2 A			
30 mW to 720 mW	10 Hz to 65 Hz	0.089 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. (PF = 1). See Note ¹ . On-site calibration available.
720 mW to 2 kW	10 Hz to 65 Hz	0.079 %	
2.2 A to 4.5 A			

80 mW to 1.4 W	10 Hz to 65 Hz	0.088 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. (PF = 1). See Note ¹ . On-site calibration available.
1.4 W to 4.5 kW	10 Hz to 65 Hz	0.18 %	

4.5 A to 20.5 A

150 mW to 6.7 W	10 Hz to 65 Hz	0.17 %	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. (PF = 1). See Note ¹ . On-site calibration available.
6.7 W to 20 kW	10 Hz to 65 Hz	0.17 %	

Phase

0 ° to 179.99 °	10 Hz to 65 Hz	0.11 °	Fluke 5520A or equivalent standard. Source. For the calibration of measurement devices using multifunction calibrators. On-site calibration available.
	65 Hz to 500 Hz	0.20 °	
	500 Hz to 1 kHz	0.39 °	
	1 kHz to 5 kHz	1.9 °	
	5 kHz to 10 kHz	3.9 °	
	10 kHz to 30 kHz	7.8 °	

Capacitance

0.19 nF to < 1.1 nF	10 Hz to 10 kHz	0.39 % + 7.8 pF	Fluke 5520A or equivalent standard. Source synthesized capacitance using a multiproduct calibrator. For the calibration of capacitance measuring devices. On-site calibration available.
1.1 nF to < 3.3 nF	10 Hz to 3 kHz	0.39 % + 7.8 pF	
3.3 nF to < 11 nF	10 Hz to 1 kHz	0.21 % + 7.8 pF	
11 nF to < 33 nF	10 Hz to 1 kHz	0.21 % + 78 pF	
33 nF to < 110 nF	10 Hz to 1 kHz	0.21 % + 78 pF	
110 nF to < 330 nF	10 Hz to 1 kHz	0.21 % + 0.23 nF	
0.33 µF to < 1.1 µF	10 Hz to 600 Hz	0.20 % + 0.78 nF	
1.1 µF to < 3.3 µF	10 Hz to 300 Hz	0.20 % + 2.3 nF	
3.3 µF to < 11 µF	10 Hz to 150 Hz	0.20 % + 7.8 nF	
11 µF to < 33 µF	10 Hz to 120 Hz	0.32 % + 23 nF	
33 µF to < 110 µF	10 Hz to 80 Hz	0.35 % + 78 nF	
110 µF to < 330 µF	DC to 50 Hz	0.35 % + 0.23 µF	

0.33 mF to < 1.1 mF	DC to 20 Hz	0.35 % + 0.78 μ F	
1.1 mF to < 3.3 mF	DC to 6 Hz	0.35 % + 2.3 μ F	
3.3 mF to < 11 mF	DC to 2 Hz	0.35 % + 7.8 μ F	
11 mF to < 33 mF	DC to 0.6 Hz	0.58 % + 23 μ F	
33 mF to < 110 mF	DC to 0.2 Hz	0.86 % + 78 μ F	
0.001 μ F	1 kHz	0.065 %	Standard Capacitors. For the calibration of capacitance measuring devices. On-site calibration available.
0.01 μ F	1 kHz	0.063 %	
0.05 μ F	1 kHz	0.063 %	
0.1 μ F	1 kHz	0.063 %	
1 μ F	1 kHz	0.063 %	

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
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Resistance		
10 M Ω to 100 M Ω	0.08 %	IET HRRS-B-7-100K-5KV or equivalent standard. Source. For the calibration of resistance measurement devices On-site calibration available.
100 M Ω to 1 G Ω	0.24 %	
1 G Ω to 10 G Ω	0.41 %	
10 G Ω to 100 G Ω	0.84 %	
100 G Ω to 1 T Ω	2.50 %	
1 Ω	98 $\mu\Omega$	Fluke 5700A-EP or equivalent standard. Source. For the calibration of resistance measurement devices. On-site calibration available.
1.9 Ω	182 $\mu\Omega$	
10 Ω	240 $\mu\Omega$	
19 Ω	475 $\mu\Omega$	
100 Ω	1.1 m Ω	
190 Ω	2.1 m Ω	
1 k Ω	9.4 m Ω	
1.9 k Ω	17.9 m Ω	
10 k Ω	94 m Ω	
19 k Ω	179 m Ω	
100 k Ω	1.2 Ω	
190 k Ω	2.28 Ω	

1 M Ω	22 Ω	
1.9 M Ω	43.7 Ω	
10 M Ω	430 Ω	
19 M Ω	931 Ω	
100 M Ω	10.8 k Ω	
100 $\mu\Omega$,	0.10 $\mu\Omega$,	Fixed Resistors. Source. For the calibration of resistance measurement devices On-site calibration available.
500 $\mu\Omega$,	1.25 $\mu\Omega$,	
1 m Ω ,	130 n Ω	
10 m Ω	1.16 $\mu\Omega$	
100 m Ω	10 $\mu\Omega$	
0 Ω to 10 Ω	0.0018 % + 58 $\mu\Omega$	Keysight 3458A with decade resistance or equivalent standards. Measure and Source capability using a digital multimeter. On-site calibration available.
10 Ω to 100 Ω	0.0015 % + 0.58 m Ω	
100 Ω to 1 k Ω	0.0012 % + 0.58 m Ω	
1 k Ω to 10 k Ω	0.0012 % + 5.8 m Ω	
10 k Ω to 100 k Ω	0.0012 % + 58 m Ω	
100 k Ω to 1 M Ω	0.0019 % + 2.3 Ω	

1 M Ω to 10 M Ω	0.0062 % + 0.12 k Ω
10 M Ω to 100 M Ω	0.059 % + 1.2 k Ω
100 M Ω to 1 G Ω	0.58 % + 12 k Ω

Electrical Calibration of Temperature Indicators and Simulators

Thermocouple simulation

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (See <u>supplementary notes</u>)	Remarks
Type B:		
250 °C to 350 °C	1.0 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
350 °C to 445 °C	0.77 °C	
445 °C to 580 °C	0.61 °C	

580 °C to 750 °C	0.47 °C	
750 °C to 1000 °C	0.39 °C	
1000 °C to 1820 °C	0.31 °C	
Type C:		
0 °C to 250 °C	0.21 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
250 °C to 1000 °C	0.17 °C	
1000 °C to 1500 °C	0.19 °C	
1500 °C to 1800 °C	0.22 °C	
1800 °C to 2000 °C	0.24 °C	
2000 °C to 2250 °C	0.30 °C	
2250 °C to 2315 °C	0.33 °C	
Type E:		
-270 °C to -245°C	2.1 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process

-245 °C to -195 °C	0.20 °C	calibrators by electrical stimulation of temperature. On-site calibration available.
-195 °C to -155 °C	0.11 °C	
-155 °C to -90 °C	0.09 °C	
-90 °C to 0 °C	0.08 °C	
0 °C to 15 °C	0.08 °C	
15 °C to 890 °C	0.07 °C	
890 °C to 1000 °C	0.08 °C	
Type J:		
-210 °C to -180 °C	0.13 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
-180 °C to -120 °C	0.11 °C	
-120 °C to -50 °C	0.09 °C	
-50 °C to 990 °C	0.08 °C	
990 °C to 1200 °C	0.08 °C	
Type K:		

-270 °C to -255 °C	2.3 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
-255 °C to -195 °C	0.73 °C	
-195 °C to -115 °C	0.14 °C	
-115 °C to -55 °C	0.10 °C	
-55 °C to 1000 °C	0.08 °C	
1000 °C to 1372 °C	0.09 °C	

Type N:

-270 °C to -260 °C	5.1 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
-260 °C to -200 °C	1.1 °C	
-200 °C to -140 °C	0.25 °C	
-140 °C to -70 °C	0.16 °C	
-70 °C to 25 °C	0.13 °C	
25 °C to 160 °C	0.11 °C	

160 °C to 1300 °C	0.10 °C	
Type R:		
-50 °C to -30 °C	0.68 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
-30 °C to 45 °C	0.58 °C	
45 °C to 160 °C	0.42 °C	
160 °C to 380 °C	0.31 °C	
380 °C to 775 °C	0.28 °C	
775 °C to 1768 °C	0.23 °C	
Type S:		
-50 °C to -30 °C	0.65 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
-30 °C to 45 °C	0.59 °C	
45 °C to 105 °C	0.42 °C	
105 °C to 310 °C	0.35 °C	

310 °C to 615 °C	0.31 °C	
615 °C to 1768 °C	0.27 °C	
Type T:		
-270 °C to -255 °C	1.8 °C	Ectron 1140A or equivalent standard. Source and Measure. For the calibration of temperature indicators and process calibrators by electrical stimulation of temperature. On-site calibration available.
-255 °C to -240 °C	0.52 °C	
-240 °C to -210 °C	0.32 °C	
-210 °C to -150 °C	0.19 °C	
-150 °C to -40 °C	0.13 °C	
-40 °C to 100 °C	0.09 °C	
100 °C to 400 °C	0.08 °C	

Oscilloscope

Parameters	Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty (±) (See <u>supplementary notes</u>)	Remarks
Amplitude DC			
into 50 Ω Load	(-6.6 to 6.6) V	0.20 % + 31 μV	Fluke 5520A / SC1100 or equivalent standard. Source. On-site calibration available.
into 1 MΩ Load	(-130 to 130) V	0.039 % + 31 μV	
Amplitude Square Wave			
into 50 Ω Load Rate: 10 Hz to 10 kHz	1 mV (pk-pk) to 6.6 V (pk-pk)	0.19 % + 31 μV	Fluke 5520A / SC1100 or equivalent standard. Source. On-site calibration available.
into 1 MΩ Load Rate: 10 Hz to 1 kHz	1 mV (pk-pk) to 6.6 V (pk-pk)	0.078 % + 31 μV	
into 1 MΩ Load Rate: 1 kHz to 10 kHz	1 mV (pk-pk) to 6.6 V (pk-pk)	0.19 % + 31 μV	
Timing - Generate			
50 Ω Load	5 s	0.30 %	Fluke 5520A / SC1100

	2 s	0.12 %	or equivalent standard. Source. On-site calibration available.
	1 s	0.062 %	
	500 ms	0.032 %	
	200 ms	0.014 %	
	100 ms	0.0076 %	
	50 ms	0.0046 %	
	20 ms to 1 ns	0.00022 %	

Rise Time

5.0 mV (pk-pk) to 2.5 V (pk-pk) Rate: 1kHz to 10 MHz	250 ps (nominal)	50 ps	Fluke 5520A / SC1100 or equivalent standard. Source. On-site calibration available. See Note 2.
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Leveled Sine Wave

into 50 Ω Load 5.0 mV (pk-pk) to 5.5 V (pk-pk)	50 kHz	1.8 % + 230 μ V	Fluke 5520A / SC1100 or equivalent standard. Source. On-site calibration available.
	50 kHz to 100 MHz	2.8 % + 230 μ V	
	100 MHz to 300 MHz	3.2 % + 230 μ V	
	300 MHz to 600 MHz	4.0 % + 230 μ V	
into 50 Ω Load 5.0 mV (pk-pk) to 3.5 V (pk-pk)	600 MHz to 1 GHz	5.5 % + 230 μ V	

Bandwidth /Flatness

into 50 Ω Load (50 kHz Reference) 5.0 mV (pk-pk) to 5.5 V (pk-pk)	50 kHz to 100 MHz	1.4 % + 78 μ V	Fluke 5520A / SC1100 or equivalent standard. Source. On- site calibration available.
	100 MHz to 300 MHz	1.8 % + 78 μ V	
	300 MHz to 600 MHz	3.2 % + 78 μ V	
into 50 Ω Load (50 kHz Reference) 5.0 mV (pk-pk) to 3.5 V (pk-pk)	600 MHz to 1 GHz	4.0 % + 78 μ V	

Input Impedance

50 Ω Load	40 Ω to 60 Ω	0.082 %	Fluke 5520A / SC1100 or equivalent standard. Source. On- site calibration available.
1 M Ω Load	500 k Ω to 1.5 M Ω	0.081 %	

Input Capacitance

	5.0 pF to 50 pF	3.9 % + 0.39 pF	Fluke 5520A / SC1100 or equivalent standard. Source. On- site calibration available.
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Wave Generator – Amplitude Sine, Square, Triangle

50 Ω Load	1.8 mV (pk-pk) to 2.5 V (pk-pk)	2.3 % + 78 μV(pk-pk)	Fluke 5520A / SC1100 or equivalent standard. Source. On-site calibration available.
1 MΩ Load	1.8 mV (pk-pk) to 55 V (pk-pk)	2.3 % + 78 μV(pk-pk)	
Wave Generator – Frequency Sine, Square, Triangle			
	10 Hz to 10 kHz	0.0019 % + 0.012 Hz	Fluke 5520A / SC1100 or equivalent standard. Source. On-site calibration available.

Time and Frequency

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
Frequency		

10 MHz	5.9×10^{-10}	Rubidium Oscillator or equivalent standard. Source. For the calibration of frequency measuring devices. Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise, and gating errors.
10 MHz	2.3×10^{-9}	Keysight 53132A or equivalent standard. Measure capability. For the calibration of frequency sources. On-site calibration available. Uncertainty values of derivatives of 10 MHz will differ due to resolution, noise, and gating errors.
1 μ Hz to 80 MHz	2.3 μ Hz/Hz	Keysight 33250A or equivalent standard. Source capability for frequency measuring devices and non-contact tachometers. On-site calibration available.
Timer/Stopwatch	0.058 s/day	Vibograf 4500 or equivalent standard. Measure capability for Timers and Stopwatches. On-site calibration available.

Force

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
Tension		
1 lbf to 400 lbf	0.013 %	For the calibration of force measuring instruments using NIST Class F Weights
Compression		
1 lbf to 200 lbf	0.013 %	For the calibration of force measuring instruments using NIST Class F Weights
Torque		
20 ozf-in to 100 ozf-in	0.6 % + 0.06 ozf-in	CDI 5000-ST / CDI 1001-O-ETT Torque Calibration system or equivalent standard. For the calibration of torque tools by comparison to a reference torque transducer.
4 lbf-in to 600 lbf-ft	0.30 % + 0.6R Where R is the resolution of the device under test.	

Mass

Balances

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
Specific values		
30 kg	82 mg	ASTM Class 1 weights or equal standard. See note ³ . On-site calibration available.
25 kg	70 mg	
20 kg	55 mg	
10 kg	28 mg	
5 kg	12.3 mg	
2 kg	5.3 mg	
1 kg	2.6 mg	
500 g	1.9 mg	
200 g	0.53 mg	
100 g	280 μ g	
50 g	135 μ g	
20 g	94 μ g	
10 g	67 μ g	
5 g	55 μ g	

3 g	55 µg	
2 g	55 µg	
1 g	55 µg	
500 mg	44 µg	
200 mg	44 µg	
100 mg	44 µg	
50 mg	44 µg	
20 mg	44 µg	
10 mg	44 µg	
5 mg	44 µg	
1 mg	44 µg	
Other values		
1 lb to 400 lb	0.012 %	NIST Class F weight or equal standard. See note ³ . On-site calibration available.

Pressure

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
0 psia to 7.5 psia	0.00075 psia	Mensor CPC6050 or equivalent. For the calibration of pressure measuring devices using a reference pressure transducer. Pneumatic: Absolute. On-site calibration available.
7.5 psia to 15 psia	0.01 %	
15 psia to 24.7 psia	0.0017 psia	
24.7 psia to 29.7 psia	0.0021 psia	
29.7 psia to 48 psia	0.0030 psia	
48 psia to 114.7 psia	0.0081 %	
114.7 psia to 179.7 psia	0.013 psia	
179.7 psia to 514.7 psia	0.008 %	

514.7 psia to 1015 psia	0.01 %	
-15 psig to 0 psig	0.00075 psig	Mensor CPC6050 or equivalent. For the calibration of pressure measuring devices. Pneumatic: Gauge. On-site calibration available.
0 in H ₂ O to 7 in H ₂ O	0.0030 in H ₂ O	
7 in H ₂ O to 40 in H ₂ O	0.0023 in H ₂ O	Fluke P3012 Deadweight Tester or equivalent. For the calibration of pressure measuring devices. Pneumatic: Gauge. On-site calibration available.
40 in H ₂ O to 14.5 psig	0.0060 %	
14.5 psig to 15 psig	0.01%	Mensor CPC6050 or equivalent. For the calibration of pressure measuring devices. Pneumatic: Gauge. On-site calibration available.
15 psig to 33 psig	0.0027 psig	
33 psig to 100 psig	0.008 %	
100 psig to 165 psig	0.013 psig	
165 psig to 500 psig	0.008%	
500 psig to 1000 psig	0.01 %	
10 psig to 50 psig	0.004 psig	

50 psig to 500 psig	0.0079 %	Hydraulic: Gauge. On-site calibration available.
500 psig to 1000 psig	0.08 psig	
1000 psig to 10000 psig	0.0082 %	

Thermometry

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
Digital Thermometers, thermometers, RTD, PRT and Thermistor probes		
-80 °C to 0 °C	0.018 °C	Liquid Bath/Dry Block with HART 5628 Black Stack or equivalent standard. Source. For the calibration of temperature measuring equipment. On-site calibration available.
0 °C to 150 °C	0.033 °C	
150 °C to 300 °C	0.042 °C	
300 °C to 660 °C	0.24 °C	

0.01 °C	0.0018 °C	Comparison against Triple Point of Water Cell. For the calibration of temperature measuring equipment.
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Dry Blocks, Liquid Baths, Temperature Controlled Chambers

-195 °C to 0 °C	0.012 °C	HART 5628 Black Stack or equivalent standard. For the calibration of temperature sourcing equipment and Temperature Chambers.. On-site calibration available.
0 °C to 420 °C	0.026 °C	
420 °C to 660 °C	0.037 °C	

Thermocouples Wires and Probe – Type J, K, E, T

-80 °C to 0 °C	0.22 °C	Liquid Bath/Dry Block with HART 5628 Black Stack and Ectron 1140A or equivalent standard. For the calibration of Thermocouple wires and probes. On-site calibration available.
0 °C to 100 °C	0.22 °C	
100 °C to 150 °C	0.26 °C	
150 °C to 300 °C	0.41 °C	
300 °C to 660 °C	0.74 °C	

Infrared Thermometers

-15 °C to 0 °C	0.79 °C	Fluke 4180/4181 Blackbody Source. For the calibration of Infrared Temperature measuring devices.
0 °C to 50 °C	0.53 °C	

50 °C to 100 °C	0.68 °C	$\lambda = (8 \text{ to } 14) \mu\text{m},$ $\varepsilon = (0.9 \text{ to } 1)$
100 °C to 120 °C	0.75 °C	
120 °C to 200 °C	0.98 °C	
200 °C to 350 °C	1.7 °C	
350 °C to 500 °C	2.3 °C	

Humidity

Measured Quantity & Range or Instrument	Calibration Measurement Capability expressed as an Uncertainty ($\pm$) (See <u>supplementary notes</u>)	Remarks
Relative Humidity		
0 °C to 15 °C 10% to 75 % RH	0.50 % RH	Thunder 2500 or equivalent standard. Source. For the calibration of relative humidity and temperature measuring instruments.

0 °C to 15 °C 75 % to 95 % RH	0.65 % RH
15 °C to 35 °C 10 % to 95 % RH	0.50 % RH
35 °C to 70°C 10 % to 50 % RH	0.50 % RH
35 °C to 70 °C 50 % to 75 % RH	0.70% RH
35 °C to 70 °C 75 % to 95 % RH	0.85% RH

Relative Humidity Controlled Chambers

-40°C to -20°C 8 % RH to 97 % RH	1.80 % RH	Vaisala HM70/HMP77 or equivalent standard. Measure. For the calibration of humidity controlled chambers. On-site calibration available.
-20°C to 40°C 8 % RH to 90 % RH	1.26 % RH	
-20°C to 40°C 90 % RH to 97 % RH	2.03 % RH	
40°C to 100°C 8 % RH to 97 % RH	1.80 % RH	

- 1 The uncertainties shown are for the most favorable conditions. There is an increase in uncertainty that corresponds to the laboratory's AC voltage and current uncertainties at different frequencies other than the ones shown. Power factors (PF) other than the one shown contribute to the power uncertainty. PF is related to the cosine of phase. Therefore, uncertainties track the laboratory's phase uncertainty closely at PF near one but are magnified heavily as PF approaches zero. The lab may also report reactive power, apparent power, and power factor under this accreditation. If needed, contact laboratory for more information regarding uncertainties at frequency and power factor combinations other than the ones shown.

- 2 The stated uncertainty is the laboratory's ability to source a fast rise pulse that is approximately 250 ps. In the typical application of measuring rise time of an oscilloscope, this value is one of the contributing factors, but other factors are derived from the DUT.

3 The Calibration Measurement Capability listed can be achieved only if the balances being calibrated are suitable for such a measurement. The Calibration Measurement Capability is based upon the use of ASTM Class 1 or NIST Class F reference weights. The Calibration Measurement Capability reflects the uncertainty contribution of the weights including co-variances. It also includes the repeatability and readability of the best balances that the laboratory calibrates routinely in the given measurement ranges. The Calibration Measurement Capabilities for measurements between 500 g and 30 kg are dominated by the performances of the best balances calibrated by the laboratory, rather than by the laboratory's reference standards and measurement processes. The uncertainty stated on the calibration report will include the uncertainty contribution of the balances that were calibrated. All values are expressed in conventional mass, as defined above. On-site calibration available.

Date modified:

2021-12-24