



Standards Council of Canada
Conseil canadien des normes



National Research
Council Canada

Conseil national
de recherches Canada

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

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

CERTIFICATE OF ACCREDITATION

CERTIFICAT D'ACCREDITATION

Transcat Canada Inc., Ulrich Metrology Division 9900 Côte-de-Liesse Montréal, QC H8T 1A1

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 and providing verified traceability to the national measurement standards of Canada, in specified fields and specified uncertainty limits, is hereby recognized as an

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, et de raccordement aux étalons nationaux du Canada, dans des domaines précis et des limites établies d'incertitude, est de ce fait reconnu comme étant un

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

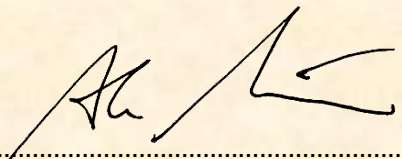


LABORATOIRE D'ÉTALONNAGE ACCRÉDITÉ
CERTIFIÉ par le CLAS pour des capacités précises de mesurage

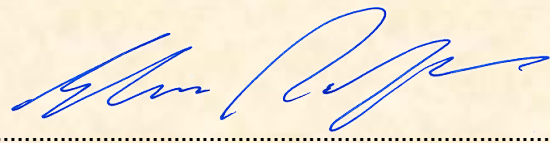
as listed in the Directory of the Canadian Calibration Network maintained by NRC and approved by SCC. The national measurement standards of Canada are realized, maintained and disseminated by NRC under the authority of the *National Research Council Act* and the *Weights and Measurements Act*. Bilateral agreements recognizing the equivalence of national measurement standards exist between NRC and other national metrology institutes. Copies of these agreements are available from NRC.

indiquées dans le Répertoire du réseau canadien d'étalonnage 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*. Il existe entre le CNRC et d'autres instituts nationaux de métrologie des accords bilatéraux qui reconnaissent l'équivalence des étalons nationaux de mesure. Le CNRC tient à la disposition du public des exemplaires de ces accords.




Chief Metrologist (NRC) / Métrologue en chef (CNRC)

Accredited laboratory number: / Numéro de laboratoire accrédité : 220
SCC file number: / Dossier du CCN n° : 15298
NRC CLAS Certificate No. / Numéro du certificat CNRC CLAS : 96-01
Initial accreditation date: / Date de la première accréditation : 1995-10-03


Vice-President – Accreditation Services / Vice-président – Services d'accréditation
Issued on: / Délivré le : 2020-08-24

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 de avril 2017).



9900 Cote-de-Liesse, Montreal, QC H8T 1A1 • Phone: 514.631.6653 • Fax: 514.631.6122 • Transcat.ca

January 18, 2021

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!

Yours very truly,

A handwritten signature in blue ink that reads "Ingrid Ulrich".

Ingrid M. Ulrich, CA, CPA, MBA
Vice-President, Operations & Administration
Transcat Canada Inc.



TESTING AND CALIBRATION LABORATORY ACCREDITATION PROGRAM (LAP)

Scope of Accreditation

Accredited Laboratory No. 220

Legal Name of Accredited Laboratory: Transcat Canada Inc.
Location Name or Operating as (if applicable): Ulrich Metrology Division
Contact Name: David Llorens
Address: 9900 Côte-de-Liesse Montréal, QC H8T 1A1
Telephone: 514 631 6653
Fax: 514 631 6122
Website: www.transcat.ca/calibration-services/lab-locations/calibration-lab-montreal
Email: David.Llorens@transcat.ca

SCC File Number:	15298
Provider:	NRC-CLAS
Provider File Number:	440
Accreditation Standards:	ISO/IEC 17025:2017
Clients Served:	All interested parties Some calibration services are available on-site
Field of Calibration:	Acoustics and vibration Dimensional Electrical Force Humidity Pressure Thermometry Time and frequency
Program Specialty Area:	Calibration
Initial Accreditation:	1995-10-03
Most Recent Accreditation:	2020-08-15
Accreditation Valid to:	2023-10-03



*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: 2020-08-24

CLAS Certificate Number 96-01

From: National Research Council Canada

Company name	Transcat Canada Inc. Ulrich Metrology Division
Company address	9900 Côte-de-Liesse Montréal, Québec H8T 1A1
Contact	David Llorens Telephone: 514-631-6653 Fax: 514-631-6122 Email: David.Llorens@transcat.ca
Clients served	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Dimensional • Force • Pressure • Electrical • Thermometry • Humidity • Time and Frequency • Acoustic and Vibration
SCC accreditation (ISO/IEC 17025)	<ul style="list-style-type: none"> • Accredited Laboratory N° 220 • First issued 1995-10-03 • Issue 11.0e 2020-07-21

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.

Dimensional

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Gauge block, length: Steel, rectangular and square			
Inch, up to 4 inches	(0.5 + 1.6L) μ inch or 2 μ inch, whichever greater (Note: L in 'inches')	I	Calibration procedure is Canadian Forces Technical Order TO 33K6-4-1-1 issued 15 March 1992, as amended by Ulrich Metrology Inc.
Inch, 5 to 20 inches	(2.3 + 1.1L) μ inch (Note: L in 'inches')		
Metric, up to 100 mm	(0.019 + 0.0018L) μ m or 0.064 μ m, whichever greater (Note: L in 'mm')		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Metric, 125 to 500 mm	(0.062 + 0.0011L) μm (Note: L in 'mm')		
Variation in length of gauge blocks (parallelism)	1 μinch or \pm 0.025 μm		This measured quantity is commonly known as parallelism of gauge blocks.
Cylindrical ring gauge, diameter			
Inch up to 12 inches	(16 + 5.0L) μinch (Note: L in 'inches')	I	ANSI/ASME B89.1.6
Metric up to 300 mm	(0.41 + 0.005L) μm (Note: L in 'mm')		ANSI/ASME B89.1.6
Cylindrical plug gauge, diameter			
Inch up to 12 inches	(16 + 5.0L) μinch (Note: L in 'inches')	I	ASME B89.1.5
Metric up to 300 mm	(0.41 + 0.005L) μm (Note: L in 'mm')		ASME B89.1.5

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Cylindrical pin gauge, diameter			
Inch up to 1 inch	25 μ inch	I	ASME B89.1.5
Metric up to 25.4 mm	0.64 μ m		ASME B89.1.5
Thread wire, diameter			
Inch up to 1 inch	13 μ inch	I	ASME B89.1.17
Metric up to 25 mm	0.33 μ m		ASME B89.1.17
60 degree thread plug gauge and thread setting plug gauge			
Pitch diameter (measured over thread wires)			
Inch up to 1.5 inches	100 μ inch	I	ASME B89.1.17 B.S. 919 and DIN 13
over 1.5 to 6 inches	200 μ inch		In normal commercial gauging practice, the pitch diameter of a thread plug gauge is determined by measuring the diameter over thread wires inserted in the thread groove on opposite sides of the axis. The preferred term for this measurement is 'thread groove diameter'. Other names for this measurement are 'simple effective diameter' and 'simple pitch diameter'.
over 6 to 12 inches	300 μ inch		
Metric up to 35 mm	2.5 μ m		
over 35 to 150 mm	5.1 μ m		
over 150 to 300 mm	7.6 μ m		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Major diameter			
Inch up to 12 inches	(16 + 5L) μ inch (Note: L in 'inches')	I	ASME B89.1.17 B.S. 919 and DIN 13
Metric up to 300 mm	(0.41 + 0.005L) μ m (Note: L in 'mm')		
60 degree adjustable thread ring gauge			
Set to thread setting plug			
Inch up to 12 inches Metric up to 300 mm	The adjustable thread ring gauge is set to the functional diameter of the thread setting plug	I	ASME B89.1.17. On-site calibration available.
Minor diameter			
Inch up to 5 inches	250 μ inch	I	ASME B89.1.17. On-site calibration available.
Metric up to 130 mm	6.4 μ m		
Pipe thread plug gauge			
Pitch Diameter			

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Inch up to 1.5 inches	100 μ inch	II	ASME B1.20.1 and ASME B1.20.5
over 1.5 to 6 inches	200 μ inch		ASME B1.20.1 and ASME B1.20.5
Step Height			
	40 μ inch	II	ASME B1.20.1 and ASME B1.20.5
Pipe thread ring gauge: Inch up to 6 inches			
Standoff to master plug	0.001 inch	II	ASME B1.20.1 and ASME B1.20.5
Thickness	0.0001 inch		ASME B1.20.1 and ASME B1.20.5
Indicators			
Inch, 0.001 inch graduations	160 μ inch	II	ANSI/ASME B89.1.10M On-site calibration available.
Inch, 0.0001 inch graduations	25 μ inch		ANSI/ASME B89.1.10M On-site calibration available
Inch, 0.00001 inch graduations	10 μ inch		ANSI/ASME B89.1.10M
Metric, 0.02 mm graduations	4 μ m		ANSI/ASME B89.1.10M On-site calibration available

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Metric, 0.002 mm graduations	0.65 μm		ANSI/ASME B89.1.10M On-site calibration available
Metric, 0.0002 mm graduations	0.25 μm		ANSI/ASME B89.1.10M
Electronic linear dimensional probe			
Up to 100 mm	(0.18 + 0.0031L) μm (Note: L in ' μm ')	II	Comparison to gauge blocks
Step gauges			
Inch up to 60 inches	(3 + 3.0L) μinch (Note: L in 'inches')	II	Comparison to master step gauge
Metric up to 1500 mm	(0.08 + 0.003L) μm (Note: L in 'mm')		
Height gauges			
Inch up to 40 inches	(240 + 1.2L) μinch (Note: L in 'inches')	II	Comparison to height master

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Metric up to 1000 mm	(6.1 + 0.0012L) μm (Note: L in 'mm')		
Height Masters			
Inch up to 24 inches	(3 + 3.0L) μinch (Note: L in 'inches')	II	Comparison to gauge blocks
Metric up to 300 mm	(0.08 + 0.003L) μm (Note: L in 'mm')		
Riser Blocks			
Inch up to 24 inches	(3 + 3.0L) μinch (Note: L in 'inches')	II	Comparison to gauge blocks
Metric up to 300 mm	(0.08 + 0.003L) μm (Note: L in 'mm')		
Micrometers: Outside			
Inch up to 6 inches	(30 + 2L) μinch (Note: L in 'inches')	II	CAN/CGSB-39.18 and GGG-C-105. On-site calibration available.

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
over 6 to 60 inches	(60 + 5L) μ inch (Note: L in 'inches')		
Metric up to 150 mm	(0.8 + 0.002L) μ m (Note: L in 'mm')		
over 150 to 1500 mm	(1.5 + 0.005L) μ m (Note: L in 'mm')		
Micrometers: Inside			
Inch up to 24 inches	300 μ inch	II	CAN/CGSB-39.18 and GGG-C-105.
over 24 to 60 inches	400 μ inch		
Metric up to 600 mm	8 μ m		
over 600 to 1500 mm	10 μ m		
Micrometers: Internal			
Inch up to 8 inches	(75 + 2L) μ inch (Note: L in 'inches')	II	Manufacturer's specifications

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Metric up to 200 mm	(2 + 0.002L) μm (Note: L in 'mm')		
Micrometers: Depth			
Inch up to 12 inches	350 μinch	II	CAN/CGSB-39.18 and GGG-C-105
Metric up to 300 mm	9 μm		
Micrometer setting standards			
Inch up to 60 inches	(35 + 3.2L) μinch (Note: L in 'inches')	II	CAN/CGSB-39.18 and GGG-C-105
Metric up to 1500 mm	(0.89 + 0.0032L) μm (Note: L in 'mm')		
Caliper outside			
Inch up to 12 inches	300 μinch	II	Manufacturer's specifications. On-site calibration available.
over 12 to 24 inches	430 μinch		
over 24 to 40 inches	460 μinch		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Metric up to 300 mm	7.6 μm		
over 300 to 600 mm	11 μm		
over 600 to 1000 mm	12 μm		
Caliper inside			
Inch up to 12 inches	300 μinch	II	Manufacturer's specifications. On-site calibration available.
Metric up to 300 mm	7.6 μm		
Caliper depth			
Inch up to 12 inches	300 μinch	II	Manufacturer's specifications. On-site calibration available.
Metric up to 300 mm	7.6 μm		

Force

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

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Torque wrenches & screwdrivers: Clockwise and Counterclockwise			
10 in•oz to 1000 ft•lb	1.2 % of reading	II	ASME B107.300 and equivalent standards. On-site calibration available.
0.14 N•m to 1356 N•m	1.2 % of reading		

Pressure

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Pressure gauges			
0 psi to 300 psi	0.02 % FS	II	Comparison to a reference pressure transducer. On-site calibration available. Pneumatic. Gauge and absolute pressure.
300 psi to 1000 psi	0.02 % of reading		
0 psi to 600 psi	0.04 % FS	II	Comparison to a reference pressure transducer with 6000 psi range. On-site calibration available. Hydraulic. Gauge and absolute pressure.
600 psi to 6000 psi	0.04 % of reading		
0 psi to 3000 psi	0.06 % FS	II	Comparison to a reference pressure transducer with 30000 psi range. On-site calibration available. Hydraulic. Gauge and absolute pressure.
3000 psi to 30000 psi	0.06 % of reading		

Electrical

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Voltage, DC			
0 mV to 220 mV	7.5 $\mu\text{V}/\text{V}$ + 0.4 μV	II	Source. For the calibration of dc voltage measuring devices using a multifunction calibrator. On-site calibration available.
220 mV to 2.2 V	5 $\mu\text{V}/\text{V}$ + 0.7 μV		
2.2 V to 11 V	3.5 $\mu\text{V}/\text{V}$ + 2.5 μV		
11 V to 22 V	3.5 $\mu\text{V}/\text{V}$ + 4 μV		
22 V to 220 V	5 $\mu\text{V}/\text{V}$ + 40 μV		
220 V to 1100 V	6.5 $\mu\text{V}/\text{V}$ + 400 μV		
1 kV to 10 kV	0.25 %		Source. For the calibration of dc voltage measuring devices by comparison to a voltage source. On site calibration available.
0 mV to 1 mV	0.005 % + 20 nV		Measure. For the calibration of dc voltage generating devices using a digital multimeter. On-site calibration available
1 mV to 10 mV	0.005 % + 30 nV		
10 mV to 100 mV	0.0005 % + 0.3 μV		
100 mV to 1 V	0.0004 % + 0.3 μV		
1 V to 10 V	0.0004 % + 0.5 μV		
10 V to 100 V	0.0006 % + 30 μV		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
100 V to 1000 V	0.0006 % + 100 μ V		Measure: For the calibration of voltage sources using a high voltage divider and digital multimeter. On-site calibration available.
1 kV to 10 kV	0.02 %		
5 kV to 60 kV	0.23 %		
60 kV to 150 kV	0.18 %		
Current, DC			
0 A to 220 μ A	40 μ A/A + 6 nA	II	Source. For the calibration of dc voltage measuring devices using a multifunction calibrator. On-site calibration available.
220 μ A to 2.2 mA	35 μ A/A + 7 nA		
2.2 mA to 22 mA	35 μ A/A + 40 nA		
22 mA to 100 mA	45 μ A/A + 0.7 μ A		
100 mA to 220 mA	45 μ A/A + 0.7 μ A + 200I ² μ A/A (Where I is the current in A)		
220 mA to 1 A	80 μ A/A + 12 μ A		
1 A to 2.2 A	80 μ A/A + 12 μ A + 10I ² μ A/A (Where I is the current in A)		
2.2 A to 11 A	360 μ A/A + 480 μ A		
11 A to 20.5 A	0.1 % + 750 μ A		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
0 to 100 nA	0.03 % + 0.04 nA		Measure. For the calibration of dc current generating devices using a digital multimeter. On-site calibration available
100 nA to 1 μ A	0.002 % + 0.04 nA		
1 μ A to 10 μ A	0.002 % + 0.1 nA		
10 μ A to 100 μ A	0.002 % + 0.8 nA		
100 μ A to 1 mA	0.002 % + 5 nA		
1 mA to 10 mA	0.003 % + 50 nA		
10 mA to 100 mA	0.0035 % + 500 nA		
100 mA to 1 A	0.011 % + 10 μ A		
1 A to 3 A	0.2 % + 0.6 mA		
3 A to 10 A	0.12 % + 1 mA		
Resistance			
1 k Ω , 10 k Ω , 100 k Ω , 1 M Ω	0.002 %	II	For the calibration of resistance measurement devices using fixed resistors. On-site calibration available.
10 M Ω	0.005 %		
100 M Ω	0.01 %		
1 G Ω , 10 G Ω	0.5 %		
100 G Ω	1 %		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
1 T Ω	2 %		
0 Ω to 32.999 Ω	0.003 % + 0.001 Ω		Source. For the calibration of resistance measurement devices using a multifunction calibrator. On-site calibration available.
33 Ω to 109.9999 k Ω	0.0028 % + 0.015 Ω		
110 k Ω to 1.099999 M Ω	0.0032 % + 2 Ω		
1.1 M Ω to 3.29999 M Ω	0.006 % + 30 Ω		
3.3 M Ω to 10.99999 M Ω	0.013 % + 50 Ω		
11 M Ω to 32.99999 M Ω	0.025 % + 2500 Ω		
33 M Ω to 109.9999 M Ω	0.05 % + 3000 Ω		
110 M Ω to 329.9999 M Ω	0.3 % + 100000 Ω		
330 M Ω to 1100 M Ω	1.5 % + 500000 Ω		
0 Ω	40 $\mu\Omega$		
1 Ω	95 $\mu\Omega/ \Omega$		
1.9 Ω	95 $\mu\Omega/ \Omega$		
10 Ω	23 $\mu\Omega/ \Omega$		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
19 Ω	23 $\mu\Omega / \Omega$		
100 Ω	10 $\mu\Omega / \Omega$		
190 Ω	10 $\mu\Omega / \Omega$		
1 k Ω	8.5 $\mu\Omega / \Omega$		
1.9 k Ω	8.5 $\mu\Omega / \Omega$		
10 k Ω	8.5 $\mu\Omega / \Omega$		
19 k Ω	8.5 $\mu\Omega / \Omega$		
100 k Ω	11 $\mu\Omega / \Omega$		
190 k Ω	11 $\mu\Omega / \Omega$		
1 M Ω	20 $\mu\Omega / \Omega$		
1.9 M Ω	21 $\mu\Omega / \Omega$		
10 M Ω	40 $\mu\Omega / \Omega$		
19 M Ω	47 $\mu\Omega / \Omega$		
100 M Ω	100 $\mu\Omega / \Omega$		
0.1 m Ω to 10 Ω	(0.0015 % + 50 $\mu\Omega$)		Measure capability using a digital multimeter. On-site calibration available.
10 Ω to 100 Ω	(0.0012 % + 0.5 m Ω)		
100 Ω to 1 k Ω	(0.001 % + 0.5 m Ω)		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
1 k Ω to 10 k Ω	(0.001 % + 5 m Ω)		
10 k Ω to 100 k Ω	(0.001 % + 50 m Ω)		
100 k Ω to 1 M Ω	(0.0015 % + 2 Ω)		
1 M Ω to 10 M Ω	(0.005 % + 100 Ω)		
10 M Ω to 100 M Ω	(0.05 % + 1 k Ω)		
100 M Ω to 1G Ω	(0.5 % + 10 k Ω)		

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Voltage, AC				
220 μ V to 1100 V	10 Hz to 1 MHz	49 μ V/V to 8 %	II	Source. For the calibration of sinewave voltage measurement devices using a multifunction calibrator. See Annex A for details. On-site calibration available.

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
1 mV to 700 V	1 Hz to 8 MHz	0.007 % to 1.5 %		Measure. For the calibration of voltage sources using a digital multimeter. See Annex C for details. On-site calibration available.
1 kV to 40 kV	60 Hz	1.1 %		Measure: For the calibration of voltage sources using a high voltage divider and digital multimeter. On-site calibration available.
40 kV to 100 kV	60 Hz	0.87 %		
Current, AC				
22 μ A to 11 A	10 Hz to 10 kHz	0.77 % to 130 μ A/A	II	Source. For the calibration of sinewave current measurement devices using a multifunction calibrator. See Annex B for details. On-site calibration available.
3.0 A to 20.5 A	45 Hz to 5 kHz	0.15 % to 3 %		
10 μ A to 1 A	10 Hz to 100 kHz	0.03 % to 1 %		Measure. For the calibration of current sources using a digital multimeter. See Annex D for details. On-site calibration available.
1 A to 3 A	3 Hz to 5 kHz	0.23 % + 1.2 mA		Measure. For the calibration of current sources using a digital multimeter. On-site calibration available.
3 A to 10 A	3 Hz to 5 kHz	0.15 % + 4 mA		
Capacitance				

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
10 pF	1 kHz	0.1 %	II	For the calibration of capacitance measuring devices using a reference capacitor. On-site calibration available.
100 pF to 1.111 μ F	1 kHz	0.07 % + 0.05 pF		For the calibration of capacitance measuring devices using a decade capacitor. On-site calibration available.
0.19 nF to 1.1 nF	10 Hz to 10 kHz	0.5 % + 0.01 nF		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	0.5 % + 0.01 nF		
3.3 nF to 11 nF	10 Hz to 1 kHz	0.25 % + 0.01 nF		
11 nF to 110 nF	10 Hz to 1 kHz	0.25 % + 0.1 nF		
110 nF to 330 nF	10 Hz to 1 kHz	0.25 % + 0.3 nF		
0.33 μ F to 1.1 μ F	10 Hz to 600 Hz	0.25 % + 1 nF		
1.1 μ F to 3.3 μ F	10 Hz to 300 Hz	0.25 % + 3 nF		
3.3 μ F to 11 μ F	10 Hz to 150 Hz	0.25 % + 10 nF		
11 μ F to 33 μ F	10 Hz to 120 Hz	0.40 % + 30 nF		

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
33 μ F to 110 μ F	10 Hz to 80 Hz	0.45 % + 100 nF		
110 μ F to 330 μ F	DC to 50 Hz	0.45 % + 300 nF		
0.33 mF to 1.1 mF	DC to 20 Hz	0.45 % + 1 μ F		
1.1 mF to 3.3 mF	DC to 6 Hz	0.45 % + 3 μ F		
3.3 mF to 11 mF	DC to 2 Hz	0.45 % + 10 μ F		
11 mF to 33 mF	DC to 0.6 Hz	0.75 % + 30 μ F		
33 mF to 110 mF	DC to 0.2 Hz	1.1 % + 100 μ F		

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Current clamp calibration				
Effective DC current output				
10 to 16.5 A Turns		0.5 % + 20 mA	II	Source using a multifunction calibrator and a 50 turn coil. For

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
				the calibration of clamp meters. On-site calibration available.
16.5 to 150 A Turns		0.5 % + 140 mA		
150 to 1025 A Turns		0.5 % + 500 mA		
Effective AC current output				
20 to 150 A Turns	45 to 440 Hz	0.32 % + 50 mA	II	Source using a multifunction calibrator and a 50 turn coil. For the calibration of clamp meters. On-site calibration available.
150 to 1000 A Turns	45 to 440 Hz	0.35 % + 90 mA		
Oscilloscope				
Amplitude				
1.8 mV to 55 V p-p (1 MΩ) 1.8 mV to 2.5 V (50 Ω)	10 Hz to 100 kHz	3 % of p-p output + 100 μ V	II	Source. For the calibration of oscilloscopes using a multifunction calibrator. On-site calibration available.
Flatness				
Leveled Sine Wave 5 mV to 5.5 V relative to 50 kHz	50 kHz to 100 MHz	1.5 % + 100 μ V	II	Source. For the calibration of oscilloscopes using a multifunction calibrator. On-site calibration available.
	100 MHz to 300 MHz	2 % + 100 μ V		
	300 MHz to 600 MHz	4 % + 100 μ V		

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
	600 MHz to 1.1 GHz	5 % + 100 μ V		
Time Marker				
1 ns to 20 ms		(25 + 1000T) ppm	II	Source. For the calibration of oscilloscopes using a multifunction calibrator. On-site calibration available.
50 ms to 5 s		(Note: T in seconds)		
Rise Time				
1 kHz to 2 MHz		300 ps	II	Source. For the calibration of oscilloscopes using a multifunction calibrator. On-site calibration available.
2 MHz to 10 MHz		350 ps		
Input Resistance				
40 Ω to 60 Ω		0.1 %	II	Source. For the calibration of oscilloscopes using a multifunction calibrator. On-site calibration available.
500 K Ω to 1.5 M Ω		0.1 %		
Input Capacitance				
5 pF to 50 pF (1 M Ω)		5 % + 0.5 pF	II	Source. For the calibration of oscilloscopes using a multifunction calibrator. On-site calibration available.

Electrical calibration of temperature indicators and simulators

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Electrical calibration of temperature indicators and simulators			
Thermocouple simulation			
Type B			
600 °C to 800 °C	0.35 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
800 °C to 1550 °C	0.28 °C		
1550 °C to 1820 °C	0.22 °C		
Type C			
0 °C to 1000 °C	0.16 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
1000 °C to 1800 °C	0.23 °C		
1800 °C to 2000 °C	0.26 °C		
2000 °C to 2316 °C	0.35 °C		
Type E			
-250 °C to -200 °C	0.25 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-200 °C to -100 °C	0.12 °C		
-100 °C to 0 °C	0.09 °C		

0 °C to 600 °C	0.08 °C		
600 °C to 1000 °C	0.10 °C		
Type J			
-210 °C to -100 °C	0.14 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-100 °C to 800 °C	0.09 °C		
800 °C to 1200 °C	0.10 °C		
Type K			
-250 °C to -200 °C	0.25 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-200 °C to -100 °C	0.16 °C		
-100 °C to 500 °C	0.10 °C		
500 °C to 800 °C	0.10 °C		
800 °C to 1372 °C	0.13 °C		
Type L			
-200 °C to -100 °C	0.10 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-100 °C to 900 °C	0.09 °C		
Type N			
-250 °C to -200 °C	0.73 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-200 °C to -100 °C	0.23 °C		

-100 °C to 0 °C	0.12 °C		
0 °C to 100 °C	0.11 °C		
100 °C to 800 °C	0.10 °C		
800 °C to 1300 °C	0.12 °C		
Type R			
-50 °C to -25 °C	0.55 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-25 °C to 0 °C	0.45 °C		
0 °C to 100 °C	0.39 °C		
100 °C to 400 °C	0.28 °C		
400 °C to 600 °C	0.22 °C		
600 °C to 1000 °C	0.21 °C		
1000 °C to 1600 °C	0.19 °C		
1600 °C to 1767 °C	0.23 °C		
Type S			
-50 °C to -25 °C	0.51 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-25 °C to 0 °C	0.43 °C		
0 °C to 100 °C	0.38 °C		
100 °C to 400 °C	0.29 °C		
400 °C to 600 °C	0.23 °C		
600 °C to 1000 °C	0.22 °C		

1000 °C to 1600 °C	0.22 °C		
1600 °C to 1767 °C	0.26 °C		
Type T			
-250 °C to -200 °C	0.35 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-200 °C to -100 °C	0.16 °C		
-100 °C to 0 °C	0.11 °C		
0 °C to 200 °C	0.09 °C		
200 °C to 400 °C	0.09 °C		
Type U			
-200 °C to 0 °C	0.16 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
0 °C to 200 °C	0.10 °C		
200 °C to 600 °C	0.10 °C		
Type XK			
-200 °C to -100 °C	0.11 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
-100 °C to 0 °C	0.09 °C		
0 °C to 600 °C	0.08 °C		
600 °C to 800 °C	0.09 °C		
Type BP			
0 °C to 200 °C	0.18 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.
200 °C to 600 °C	0.16 °C		

600 °C to 800 °C	0.17 °C		
800 °C to 1600 °C	0.23 °C		
1600 °C to 2000 °C	0.28 °C		
2000 °C to 2500 °C	0.40 °C		
RTD simulation			
-200 °C to 630 °C	0.04 °C to 0.23 °C	II	Source. For the calibration of temperature indicators and process calibrators by electrical simulation of temperature. On-site calibration available.

Acoustic and Vibration

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Vibration				
Accelerometers				
0.1 g to 10 g	5 Hz to 9 Hz	2.20 %	II	ISO 16063-21. On-site calibration available.
	10 Hz to 99 Hz	1.70 %		
	100 Hz	1.25 %		
	101 Hz to 920 Hz	1.40 %		

Measured Quantity & Range or Instrument	Frequency	Calibration Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
	921 Hz to 5000 Hz	1.70 %		
	5001 Hz to 9999 Hz	2.20 %		
	10 kHz to 15 kHz	3.65 %		

Time and Frequency

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Frequency			
1 Hz to 40 Hz	0.05 %	II	Measure. For the calibration of frequency generating devices using a digital multimeter. On-site calibration available.
40 Hz to 10 MHz	0.01 %		
DC to 3 GHz	0.1 ppm		

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
0.01 Hz to 2 MHz	2.5 ppm + 5 μ Hz		Source. For the calibration of frequency measuring devices using a multifunction calibrator. On-site calibration available.
Tachometers			
Contact			
55-350 RPM	0.12 RPM	II	Source: for calibration of contact tachometers using a tachometer tester. On-site calibration available.
351-1499 RPM	0.11 RPM		
1500-3000 RPM	0.29 RPM		
3001-5000 RPM	0.37 RPM		
5001-10000 RPM	0.78 RPM		
10001-15000 RPM	1.8 RPM		
15001-40000 RPM	3.3 RPM		
Non-Contact			
6-60 RPM	53 ppm	II	Source: for calibration of non-contact tachometers using a multifunction calibrator. On-site calibration available.
60-600 RPM	7.5 ppm		
600-99999 RPM	3 ppm		

Thermometry

Measured Quantity & Range or Instrument	Calibration and Measurement Capability expressed as an Uncertainty (\pm) (See <u>supplementary notes</u>)	Type of Service	Remarks
Liquid bath and dry well			
-200°C to 630°C	0.1°C	II	Comparison to a reference PRT. On-site calibration available.
Thermometers, RTD, PRT and thermistor probes			
50°C to 150°C	0.17°C	II	Comparison to a reference PRT in a liquid bath. On-site calibration available.
150°C to 450°C	0.5°C		
450°C to 650°C	0.65°C		
-30°C to 155°C	0.15°C		
Digital thermometers (thermocouples)			
50°C to 660°C	0.7°C to 1.1°C	II	Comparison to a reference PRT in a liquid bath. On-site calibration available.
-30°C to 50°C	0.3°C		
50°C to 155°C	0.4°C		
Relative Humidity			
Relative Humidity 10 % to 95% RH	0.6 % RH	II	Source. For the calibration of relative humidity and temperature measuring instruments using a two temperature, two pressure humidity generator. Ulrich Metrology calibration procedure CP-82. On-site calibration available.

Temperature Air Bath -10 °C to 70 °C	0.1°C		
Relative Humidity Controlled Chambers			
10 % to 90 % RH	3.0 % RH	II	Measure. For the calibration of humidity controlled chambers using a reference relative humidity probe. Ulrich Metrology calibration procedure CP-85. On-site calibration available.
90 % to 95 % RH	4.4 % RH		

Annex A

Calibration Measurement Capability for the Calibration of Sinewave Voltage Measuring Devices, expressed as $\pm \{ (\% \text{ of reading}) + \text{residual in } \mu\text{V} \}$

Frequency								
Voltage, AC	10 Hz to 20 Hz	20 Hz to 40 Hz	40 Hz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz	100 kHz to 300 kHz	300 kHz to 500 kHz	500 kHz to 1 MHz
220 μV to 2.2 mV	0.0240 % + 4 μV	0.009 % + 4 μV	0.008 % + 4 μV	0.020 % + 5 μV	0.050 % + 5 μV	0.11 % + 10 μV	0.14 % + 20 μV	0.27 % + 20 μV
2.2 mV to 22 mV	0.024 % + 4 μV	0.009 % + 4 μV	0.008 % + 4 μV	0.020 % + 4 μV	0.05 % + 5 μV	0.11 % + 10 μV	0.14 % + 20 μV	0.27 % + 20 μV
22 mV to 220 mV	0.024 % + 12 μV	0.009 % + 7 μV	0.008 % + 7 μV	0.02 % + 7 μV	0.046 % + 17 μV	0.09 % + 20 μV	0.14 % + 25 μV	0.27 % + 45 μV
220 mV to 2.2 V	0.024 % + 40 μV	0.009 % + 15 μV	0.0045 % + 8 μV	0.0075 % + 10 μV	0.011 % + 30 μV	0.042 % + 80 μV	0.10 % + 200 μV	0.17 % + 300 μV
2.2 V to 22 V	0.024 % + 400 μV	0.009 % + 150 μV	0.0045 % + 50 μV	0.0075 % + 100 μV	0.010 % + 200 μV	0.0275 % + 600 μV	0.10 % + 2000 μV	0.15 % + 3200 μV

Frequency								
Voltage, AC	10 Hz to 20 Hz	20 Hz to 40 Hz	40 Hz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz	100 kHz to 300 kHz	300 kHz to 500 kHz	500 kHz to 1 MHz
22 V to 220 V	0.024 % + 4 mV	0.009 % + 1.5 mV	0.0052 % + 0.6 mV	0.008 % + 1 mV	0.015 % + 2.5 mV	0.09 % + 16 mV	0.44 % + 40 mV	0.8 % + 80 mV

Frequency			
Voltage, ac	40 Hz to 1 kHz	1 kHz to 20 kHz	20 kHz to 30 kHz
220 V to 1100 V	0.009 % + 4 mV	0.017 % + 6 mV	0.06 % + 11 mV

Frequency		
Voltage, ac	30 kHz to 50 kHz	50 Hz to 100 kHz
220 V to 750 V	0.06 % + 11 mV	0.23 % + 45 mV

Annex B

Calibration Measurement Capability for the Calibration of Sinewave Current Measuring Devices, expressed as $\pm \{ (\% \text{ of reading}) + \text{residual} \}$

Frequency					
Current, AC	10 Hz to 20 Hz	20 Hz to 40 Hz	40 Hz to 1 kHz	1 kHz to 5 kHz	5 kHz to 10 kHz
22 μ A to 220 μ A	0.025 % + 16 nA	0.016 % + 10 nA	0.012 % + 8 nA	0.028 % + 12 nA	1.1 % + 65 nA
220 μ A to 2.2 mA	0.025 % + 40 nA	0.016 % + 35 nA	0.012 % + 35 nA	0.02 % + 110 nA	1.1 % + 650 nA
2.2 mA to 22 mA	0.025 % + 400 nA	0.016 % + 350 nA	0.012 % + 350 nA	0.02 % + 550 nA	1.1 % + 5000 nA
22 mA to 220 mA	0.025 + 4 μ A	0.016 % + 3.5 μ A	0.012 % + 2.5 μ A	0.02 % + 3.5 μ A	0.11 % + 10 μ A

Frequency					
Current, AC	10 Hz to 20 Hz	20 Hz to 40 Hz	40 Hz to 1 kHz	1 kHz to 5 kHz	5 kHz to 10 kHz
220 mA to 2.2 A	N/A	0.026 % + 35 μ A	0.026 % + 35 μ A	0.045 % + 80 μ A	0.7 % + 160 μ A
2.2 A to 11 A	N/A	N/A	0.046 % + 170 μ A	0.095 % + 380 μ A	0.36 % + 750 μ A

Frequency			
Current, AC	45 Hz to 100 Hz	100 Hz to 1 kHz	1 kHz to 5 kHz
11 A to 20.5 A	0.12 + 5000 μ A	0.15 + 5000 μ A	3 + 5000 μ A

Annex C

Calibration Measurement Capability for the Calibration of Sinewave Voltage Generating Devices, expressed as $\pm \{ (\% \text{ of reading}) + \text{residual in } \mu\text{V} \}$

Frequency						
Voltage, ac	1 Hz to 40 Hz	40 Hz to 1 kHz	1 kHz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz	100 kHz to 300 kHz
1 mV to 10 mV	0.03 + 3	0.02 + 1.1	0.03 + 1.1	0.1 + 1.1	0.5 + 1.1	4 + 2
10 mV to 100 mV	0.007 + 4	0.007 + 2	0.014 + 2	0.03 + 2	0.08 + 2	0.3 + 10
100 mV to 1 V	0.007 + 40	0.007 + 20	0.014 + 20	0.03 + 20	0.08 + 20	0.3 + 100
1 V to 10 V	0.007 + 400	0.007 + 200	0.014 + 200	0.03 + 200	0.08 + 200	0.3 + 1000
10 V to 100 V	0.02 + 4000	0.02 + 2000	0.02 + 2000	0.035 + 2000	0.12 + 2000	0.4 + 10000
100 V to 700 V	0.04 + 40000	0.04 + 20000	0.06 + 20000	0.12 + 20000	0.3 + 20000	

Frequency					
Voltage, ac	300 kHz to 1 MHz	1 MHz to 2 MHz	2 MHz to 4 MHz	4 MHz to 8 MHz	8 MHz to 10 MHz
1 mV to 10 mV	1.2 + 5	7 + 7	7 + 7	20 + 8	
10 mV to 100 mV	1 + 10	1.5 + 10	4 + 70	4 + 80	15 + 100
100 mV to 1 V	1 + 100	1.5 + 100	4 + 700	4 + 800	15 + 1000
1 V to 10 V	1 + 1000	1.5 + 1000	4 + 7000	4 + 8000	15 + 10000
10 V to 100 V	1.5 + 10000				

Annex D

Calibration Measurement Capability for the Calibration of Sinewave Current Generating Devices, expressed as \pm { (% of reading) + residual in μ A }

Frequency							
Voltage, ac	10 Hz to 20 Hz	20 Hz to 45 Hz	45 Hz to 100 Hz	100 Hz to 5 kHz	5 kHz to 20 kHz	20 kHz to 50 kHz	50 kHz to 100 kHz
10 μA to 100 μA	0.4 + 0.03	0.15 + 0.03	0.06 + 0.03	0.06 + 0.03			
100 μA to 1 mA	0.4 + 0.2	0.15 + 0.2	0.06 + 0.2	0.03 + 0.2	0.06 + 0.2	0.4 + 0.4	0.55 + 1.5
1 mA to 10 mA	0.4 + 2	0.15 + 2	0.06 + 2	0.03 + 2	0.06 + 2	0.4 + 4	0.55 + 15
10 mA to 100 mA	0.4 + 20	0.15 + 20	0.06 + 20	0.03 + 20	0.06 + 20	0.4 + 40	0.55 + 150
100 mA to 1 A	0.4 + 200	0.16 + 200	0.08 + 200	0.1 + 200	0.3 + 200	1 + 400	

Date modified:

2019-10-17

