Schedule of Accreditation

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8211

Accredited to ISO/IEC 17025:2017

DM Systems and Test Limited

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Calibration performed at the above address only

Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
Values and uncertainties listed below are applicable for the calibration of both measurement instruments and for instruments with an output. the method used is by direct comparison unless otherwise stated in the remarks column			
DC VOLTAGE	0 V to 100 mV 100 mV to 1 V 1 V to 10 V 10 V to 100 V 100 V to 1000 V	5.8 µV/V + 1.5 µV 15 µV/V 6 µV/V 11 µV/V 21 µV/V	
DC CURRENT	0 to 100 nA 100 nA to 1 µA 1 µA to 10 µA 10 µA to 100 µA 100 µA to 1 mA 1 mA to 10 mA 10 mA to 100 mA 100 mA to 1 A 1 A to 20 A	35 µA/A + 60 pA 520 µA/A 175 µA/A 120 µA/A 85 µA/A 85 µA/A 100 µA/A 250 µA/A 650 µA/A	
Simulation	20 A to 1000 A	0.20 % + 100 mA	Simulation using a multiturn coil – for the calibration of clampmeters only
DC RESISTANCE	0 Ω to 100 mΩ 100 mΩ to 10 Ω 10 Ω to 100 Ω 100 Ω to 1kΩ 1 kΩ to 10 kΩ 10 kΩ to 100 kΩ 100 kΩ to 1 MΩ 1 MΩ to 10 MΩ 10 MΩ to 100 MΩ 100 MΩ to 1 GΩ	660 µΩ/Ω + 0.15 µΩ 18 µΩ/Ω + 60 µΩ 15 µΩ/Ω + 0.6 mΩ 20 µΩ/Ω 20 µΩ/Ω 20 µΩ/Ω 45 µΩ/Ω 180 µΩ/Ω 700 µΩ/Ω 0.60 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC VOLTAGE			
	1 Hz to 40 Hz		
	3 µV to 10 mV	350 µV/V + 3.6 µV	
	10 mV to 100 mV	550 µV/V	
	100 mV to 1 V	550 µV/V	
	1 V to 10 V	550 µV/V	
	10 V to 100 V	700 µV/V	
	100 V to 700 V	930 µV/V	
	40 Hz to 1 kHz		
	1 µV to 10 mV	240 µV/V + 1.5 µV	
	10 mV to 100 mV	320 µV/V	
	100 mV to 1 V	320 µV/V	
	1 V to 10 V	320 µV/V	
	10 V to 100 V	470 µV/V	
	100 V to 700 V	700 µV/V	
	1 kHz to 20 kHz		
	1 µV to 10 mV	350 µV/V + 1.5 µV	
	10 mV to 100 mV	400 µV/V	
	100 mV to 1 V	400 µV/V	
	1 V to 10 V	400 µV/V	
	10 V to 100 V	470 µV/V	
	100 V to 700 V	930 µV/V	
	20 kHz to 100 kHz		
	1 µV to 10 mV	0.58 % + 1.5 µV	
	10 mV to 100 mV	0.12 %	
	100 mV to 1 V	0.12 %	
	1 V to 10 V	0.12 %	
	10 V to 100 V	0.17 %	
	100 V to 700 V	0.37 %	
	100 kHz to 300 kHz		
	1 µV to 10 mV	4.6 % + 1.5 µV	
	10 mV to 100 mV	0.47 %	
	100 mV to 1 V	0.47 %	
	1 V to 10 V	0.47 %	
	10 V to 100 V	0.58 %	
	300 kHz to 1 MHz		
	1 µV to 100 mV	1.2 % + 2.5 µV	
	100 mV to 1 V	1.30 %	
	1 V to 10 V	1.30 %	
	10 V to 100 V	1.90 %	
Generation only	*45 Hz to 10 kHz*		
	700 V to 1020 V	0.24 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC CURRENT			
	10 Hz to 20 Hz		
	0.01 µA to 100 µA	0.47 % + 50 nA	
	100 µA to 1 mA	0.70 %	
	1 mA to 10 mA	0.70 %	
	10 mA to 100 mA	0.70 %	
	100 mA to 1 A	0.70 %	
	20 Hz to 45 Hz		
	0.01 µA to 100 µA	0.18 % + 50 nA	
	100 µA to 1 mA	0.41 %	
	1 mA to 10 mA	0.41 %	
	10 mA to 100 mA	0.41 %	
	100 mA to 1 A	0.42 %	
	45 Hz to 100 Hz		
	0.01 µA to 100 µA	700 µA/A + 50 nA	
	100 µA to 0.5 mA	0.31 %	
	0.5 mA to 1 mA	0.13 %	
	1 mA to 5 mA	0.31 %	
	5 mA to 10 mA	0.12 %	
	10 mA to 50 mA	0.18 %	
	50 mA to 100 mA	0.12 %	
	100 mA to 1 A	0.065 %	
	1 A to 20 A	0.075 %	
	100 Hz to 1 kHz		
	0.01 µA to 100 µA	700 µA/A + 50 nA	
	100 µA to 0.5 mA	0.27 %	
	0.5 mA to 1 mA	0.088 %	
	1 mA to 5 mA	0.27 %	
	5 mA to 10 mA	0.082 %	
	10 mA to 50 mA	0.27 %	
	50 mA to 100 mA	0.082 %	
	100 mA to 1 A	0.065 %	
	1 A to 20 A	0.075%	
	1 kHz to 5 kHz		
	0.01 µA to 100 µA	700 µA/A + 50 nA	
	100 µA to 1 mA	0.27 %	
	1 mA to 10 mA	0.27 %	
	10 mA to 100 mA	0.27 %	
	100 mA to 1 A	0.35 %	
	5 kHz to 20 kHz		
	100 µA to 1 mA	770 µA/A + 0.40 µA	
	1 mA to 10 mA	0.31 %	
	10 mA to 100 mA	0.31 %	
	100 mA to 1 A	0.58 %	
	20 kHz to 50 kHz		
	100 µA to 1 mA	0.47 % + 0.60 µA	
	1 mA to 10 mA	0.93 %	
	10 mA to 100 mA	0.93 %	
	100 mA to 1 A	1.6 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC CURRENT (continued)			
	50 kHz to 100 kHz		
	100 µA to 1 mA	0.64 % + 1.8 µA	
	1 mA to 10 mA	2.4 %	
	10 mA to 100 mA	2.4 %	
Simulation	*45 Hz to 60 Hz*		Simulation using a multiturn coil – for the calibration of clampmeters only
	20 A to 500 A	0.50 % + 100 mA	
CAPACITANCE			
Generation	*DC, 50 Hz to 1 kHz*		
	500 pF to 1.1 nF	2.9 %	
	1.1 nF to 3.3 nF	1.7 %	
	3.3 nF to 11 nF	0.94 %	
	11 nF to 33 nF	1.4 %	
	33 nF to 110 nF	0.66 %	
	110 nF to 330 nF	0.61 %	
	330 nF to 1.1 µF	0.66 %	
	1.1 µF to 3.3 µF	0.73 %	
	DC, 50 Hz to 400 Hz		
	3.3 µF to 11 µF	0.76 %	
	11 µF to 33 µF	0.79 %	
	DC, 50 Hz to 100 Hz		
	33 µF to 110 µF	0.94 %	
	110 µF to 330 µF	1.2 %	
FREQUENCY			
	0.1 Hz to 1 Hz	1 x 10-3	
	1 Hz to 10 Hz	1 x 10-4	
	10 Hz to 100 Hz	1 x 10-5	
	100 Hz to 1 kHz	1 x 10-6	
	1 kHz to 10 kHz	2 x 10-7	
	10 kHz to 1 MHz	2 x 10-8	
	1 MHz to 10 GHz	2 x 10-9	
	10 GHz to 40 GHz	2 x 10-10	
	1 MHz and 10 MHz	5 x 10-12	Calibration of stable fixed value oscillators.
TIME INTERVAL			
	1 s to 12 days	40 nS	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
OSCILLOSCOPE CHARACTERISTICS			
Vertical deflection as a Voltage	0 to 25 mV 25 mV to 110 mV 110 mV to 2.2 V 2.2 V to 11 V 11 V to 130 V	580 µV/V + 52 µV 0.25 % 0.15 % 800 µV/V 0.13 %	Into 1 MΩ
	0 to 25 mV 25 mV to 110 mV 110 mV to 2.2 V 2.2 V to 6.6 V	0.29 % + 47 µV 0.48 % 0.35 % 0.30 %	Into 50 Ω
Square wave peak to peak Voltage	0 V to 25 mV 25 mV to 110 mV 110 mV to 2.2 V 2.2 V to 11 V 11 V to 130 V	580 µV/V + 52 µV 0.31 % 0.19 % 0.13 % 0.16 %	Into 1 MΩ
	0 to 25 mV 25 mV to 110 mV 110 mV to 2.2 V 2.2 V to 6.6 V	0.29 % + 53 µV 0.48 % 0.35 % 0.30 %	Into 50 Ω
Level sine wave flatness for bandwidth with respect to set point value.	50 kHz to 100 MHz 50 kHz to 300 MHz 100 kHz to 2 GHz	2.5 % 3.0 % 3.0 %	3 dB point uncertainty will be reported as a frequency
Resistance			
	40 Ω to 60 Ω 500 kΩ to 1.5 MΩ	0.12 % 0.12 %	
Capacitance			
	5 pF to 50 pF	0.90 pF	
Time Markers			
	2 ns to 20 ns 50 ns to 100 ns 100 ns to 1 s 1 s to 5 s	4.0 µs/s 150 µs/s 0.12 % 0.59 %	
Risetime			
	250 ps Nominal *1 kHz to 10 MHz* *250 mV to 500 mV pp*	100 ps	
ELECTRICAL SIMULATION			
PRT Indicators			
Resistance thermometer (PT 100)			
	0 °C to 250 °C	0.42 °C	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
TEMPERATURE INDICATORS BY ELECTRICAL SIMULATION Including Reference junction compensation			
Type K	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 1000 °C 1000 °C to 1372 °C	0.42 °C 0.27 °C 0.25 °C 0.34 °C 0.49 °C	
Type J	-210 °C to -100 °C -100 °C to -30 °C -30 °C to 150 °C 150 °C to 760 °C 760 °C to 1200 °C	0.36 °C 0.25 °C 0.23 °C 0.26 °C 0.31 °C	
Type E	-250 °C to -100 °C -100 °C to -25 °C -25 °C to 350 °C 350 °C to 650 °C 650 °C to 1000 °C	0.61 °C 0.25 °C 0.23 °C 0.25 °C 0.29 °C	
Type B	600 °C to 800 °C 800 °C to 1000 °C 1000 °C to 1550 °C 1550 °C to 1820 °C	0.58 °C 0.46 °C 0.41 °C 0.43 °C	
Type N	-200 °C to -100 °C -100 °C to -25 °C -25 °C to 120 °C 120 °C to 410 °C 410 °C to 1300 °C	0.51 °C 0.31 °C 0.28 °C 0.27 °C 0.35 °C	
Type R	0 °C to 250 °C 250 °C to 400 °C 400 °C to 1000 °C 1000 °C to 1767 °C	0.72 °C 0.46 °C 0.43 °C 0.50 °C	
Type S	0 °C to 250 °C 250 °C to 1000 °C 1000 °C to 1400 °C 1400 °C to 1767 °C	0.61 °C 0.47 °C 0.47 °C 0.57 °C	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
TEMPERATURE INDICATORS BY ELECTRICAL SIMULATION (continued)			
Including Reference junction compensation (continued)			
Type T			
	-250 °C to -150 °C	0.77 °C	
	-150 °C to 0 °C	0.33 °C	
	0 °C to 120 °C	0.25 °C	
	120 °C to 400 °C	0.23 °C	
Excluding reference junction compensation			
Type K			
	-200 °C to -150 °C	0.16 °C	
	-150 °C to -100 °C	0.12 °C	
	-100 °C to 1370 °C	0.10 °C	
Type J			
	-200 °C to -150 °C	0.12 °C	
	-150 °C to -100 °C	0.10 °C	
	-100 °C to 1200 °C	0.090 °C	
Type T			
	-250 °C to -200 °C	0.36 °C	
	-200 °C to -100 °C	0.15 °C	
	-100 °C to 400 °C	0.11 °C	
Type N			
	-250 °C to -200 °C	0.77 °C	
	-200 °C to -100 °C	0.24 °C	
	-100 °C to 1300 °C	0.13 °C	
Type E			
	-250 °C to -200 °C	0.24 °C	
	-200 °C to -100 °C	0.11 °C	
	-100 °C to 1300 °C	0.080 °C	
Type B			
	300 °C to 500 °C	0.76 °C	
	500 °C to 1000 °C	0.46 °C	
	1000 °C to 1820 °C	0.26 °C	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
TEMPERATURE INDICATORS BY ELECTRICAL SIMULATION (continued)			
Excluding Reference junction compensation (continued)			
Type R			
	-50 °C to 100 °C	0.62 °C	
	100 °C to 300 °C	0.32 °C	
	300 °C to 1768 °C	0.25 °C	
Type S			
	-50 °C to 100 °C	0.59 °C	
	100 °C to 300 °C	0.32 °C	
	300 °C to 1768 °C	0.26 °C	
Measurement of ambient in support of temperature simulation	18 °C to 30 °C	0.10 °C	
RF ELECTRICAL MEASUREMENTS			
RF Power			
1 mW reference			For outputs with a VRC of up to 0.05
	1 mW		
	50 MHz	0.30 %	
Flatness at nominal 1 mW (0.8 mW to 1.2 mW)	100 kHz to 50 MHz	0.95 %	
	50 MHz to 5 GHz	1.0 %	
	5 GHz to 15 GHz	1.1 %	
	15 GHz to 18 GHz	1.3 %	
RF Power	*100 KHz to 10 MHz*		
	0.01 mW to 0.12 mW	1.6 %	
	0.12 mW to 0.8 mW	1.2 %	
	1.2 mW to 10 mW	1.6 %	
	10 mW to 100 mW	4.3 %	
	10 MHz to 18 GHz		
	0.01 µW to 1.2 µW	2.9 %	
	1.2 µW to 10 µW	4.9 %	
	0.01 mW to 0.12 mW	1.8 %	
	0.12 mW to 0.8 mW	1.5 %	
	1.2 mW to 10 mW	1.8 %	
	10 mW to 100 mW	4.4 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
RF ELECTRICAL MEASUREMENTS (continued)			
Calibration factor Nominal 1 mW	0.1 MHz 0.3 MHz 0.5 MHz 1 MHz 3 MHz 5 MHz 10 MHz 30 MHz 0.1 GHz 0.3 GHz 0.5 GHz 1.0 GHz 1.5 GHz 2.0 GHz 3.0 GHz 4.0 GHz 5.0 GHz 6.0 GHz 7.0 GHz 8.0 GHz 9.0 GHz 10.0 GHz 11.0 GHz 12.0 GHz 12.4 GHz 13.0 GHz 14.0 GHz 15.0 GHz 16.0 GHz 17.0 GHz 18.0 GHz	0.90 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.85 % 0.90 % 1.1 % 1.0 % 1.1 % 1.1 % 1.3 % 1.5 % 1.5 % 1.3 % 1.3 % 1.2 % 1.2 % 1.2 % 1.1 % 1.2 % 1.3 %	N type Male connectors with a VRC of less than 0.01 sensors with other connector types can be calibrated but at larger uncertainties.
MODULATION Carrier 10 MHz to 1.3 GHz Amplitude modulation Rate 50 Hz to 50 kHz Modulation Factor Frequency modulation Rate 50 Hz to 100 kHz Deviation	 0.05 to 0.10 0.10 to 0.40 0.40 to 0.60 0.60 to 0.99 1 kHz to 400 kHz	 0.0020 0.0050 0.0075 0.012 1.2 %	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
MODULATION (continued)			
Phase modulation Rate 200 Hz to 20 kHz			
Deviation	0.4 rad to 4 rad 4 rad to 400 rad	3.7 % 3.5 %	
VOLTAGE REFLECTION COEFFICIENT	*300 kHz to 3 GHz* 0 to 0.1 0.1 to 0.2 0.2 to 0.3 0.3 to 0.4 0.4 to 0.5 0.5 to 0.6 0.6 to 0.7 0.7 to 0.8 0.8 to 0.9 0.9 to 1.0	 0.010 0.011 0.012 0.014 0.016 0.019 0.023 0.026 0.031 0.036	
	3 GHz to 8 GHz 0 to 0.1 0.1 to 0.2 0.2 to 0.3 0.3 to 0.4 0.4 to 0.5 0.5 to 0.6 0.6 to 0.7 0.7 to 0.8 0.8 to 0.9 0.9 to 1.0	 0.015 0.016 0.017 0.019 0.021 0.024 0.027 0.031 0.035 0.040	
	8 GHz to 18 GHz 0 dB to 0.1 0.1 dB to 0.2 0.2 dB to 0.3 0.3 dB to 0.4 0.4 dB to 0.5 0.5 dB to 0.6 0.6 dB to 0.7 0.7 dB to 0.8 0.8 dB to 0.9 0.9 dB to 1.0	 0.015 0.016 0.018 0.021 0.025 0.029 0.034 0.040 0.047 0.054	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
ATTENUATION			
	300 kHz to 3 GHz		System A
	0 dB to 20 dB	0.080 dB	
	20 dB to 40 dB	0.080 dB	
	40 dB to 60 dB	0.13 dB	
	60 dB to 70 dB	0.33 dB	
	2.5 MHz to 1.3 GHz		System B
	0 dB to 10 dB	0.060 dB	
	10 dB to 40 dB	0.080 dB	
	40 dB to 80 dB	0.080 dB	
	80 dB to 110 dB	0.080 dB	
	1.3 GHz to 8 GHz		
	0 dB to 10 dB	0.17 dB	
	10 dB to 40 dB	0.13 dB	
	40 dB to 95 dB	0.13 dB	
	95 dB to 100 dB	0.25 dB	
	8 GHz to 18 GHz		
	0 dB to 10 dB	0.24 dB	
	10 dB to 40 dB	0.17 dB	
	40 dB to 90 dB	0.17 dB	
	90 dB to 100 dB	0.27 dB	
Impedance and Voltage division factor (LISNs and CDNs)			
IMPEDANCE			
3 Ω to 250 Ω	9 kHz to 100 kHz	2.5 %	
	100 kHz to 10 MHz	2.5 %	
	10 MHz to 100 MHz	3.5 %	
	100 MHz to 230 MHz	4.5 %	
	230 MHz to 400 MHz	8.5%	
IMPEDANCE PHASE			
3 Ω to 100 Ω	9 kHz to 100 kHz	0.46 ^{0}	
	100 kHz to 10 MHz	0.48 ^{0}	
	10 MHz to 100 MHz	1.6 ^{0}	
INSERTION LOSS / VDF			
0 dB to 40 dB	9 kHz to 100 kHz	0.10 dB	
	100 kHz to 10 MHz	0.20 dB	
	10 MHz to 100 MHz	0.30 dB	
	100 MHz to 200 MHz	0.50 dB	
	200 MHz to 400 MHz	0.70 dB	
40 dB to 60 dB	9 kHz to 100 kHz	0.50 dB	
	100 kHz to 10 MHz	0.50 dB	
	10 MHz to 100 MHz	0.60 dB	
	100 MHz to 200 MHz	0.70 dB	
	200 MHz to 400 MHz	0.80 dB	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
INSERTION LOSS / VDF (continued) 60 dB to 80 dB	9 kHz to 100 kHz 100 kHz to 10 MHz 10 MHz to 100 MHz 100 MHz to 200 MHz 200 MHz to 400 MHz	0.90 dB 0.90 dB 1.0 dB 1.0 dB 1.1 dB	
END			

Appendix - Calibration and Measurement Capabilities

Introduction

The definitive statement of the accreditation status of a calibration laboratory is the Accreditation Certificate and the associated Schedule of Accreditation. This Schedule of Accreditation is a critical document, as it defines the measurement capabilities, ranges and boundaries of the calibration activities for which the organisation holds accreditation.

Calibration and Measurement Capabilities (CMCs)

The capabilities provided by accredited calibration laboratories are described by the Calibration and Measurement Capability (CMC), which expresses the lowest measurement uncertainty that can be achieved during a calibration. If a particular device under calibration itself contributes significantly to the uncertainty (for example, if it has limited resolution or exhibits significant non-repeatability) then the uncertainty quoted on a calibration certificate will be increased to account for such factors.

The CMC is normally used to describe the uncertainty that appears in an accredited calibration laboratory's schedule of accreditation and is the uncertainty for which the laboratory has been accredited using the procedure that was the subject of assessment. The measurement uncertainty is calculated according to the procedures given in the GUM and is normally stated as an expanded uncertainty at a coverage probability of 95 %, which usually requires the use of a coverage factor of $k = 2$. An accredited laboratory is not permitted to quote an uncertainty that is smaller than the published measurement uncertainty in certificates issued under its accreditation.

Expression of CMCs - symbols and units

It should be noted that the percentage symbol (%) represents the number 0.01. In cases where the measurement uncertainty is stated as a percentage, this is to be interpreted as meaning percentage of the measurand.
Thus, for example, a measurement uncertainty of 1.5 % means $1.5 \times 0.01 \times q$, where q is the quantity value.

The notation Q[a, b] stands for the root-sum-square of the terms between brackets: $Q[a, b] = [a^2 + b^2]^{1/2}$