Schedule of Accreditation

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Accredited to ISO/IEC 17025:2017

Horiba MIRA 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
PRESSURE			Methods consistent with EURAMET CG17.
<u>Gas Pressure Gauge</u>			
Calibration of pressure indicating instruments and gauges	-90 kPa to 0 Pa 0 to 2 MPa	0.024 % + 0.59 kPa 0.024 % + 0.59 kPa	Calibration of pressure devices with an electrical output can be undertaken
<u>Gas Pressure Absolute</u>			
Calibration of pressure indicating instruments and gauges	10 kPa to 200 kPa 200 kPa to 2.1 MPa	0.15 kPa 0.022 % + 0.59 kPa	
<u>Hydraulic Pressure Gauge</u>			
Calibration of pressure indicating instruments and gauges	0 to 50 MPa	0.016 % + 0.11 MPa	
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.			
ELECTRICAL			
DC VOLTAGE			
Generation	0 mV to 330 mV 330 mV to 3.3 V 3.3 V to 33 V 33 V to 330 V 330 V to 1000 V	20 µV/V + 1.0 µV 11 µV/V + 2.0 µV 12 µV/V + 20 µV 18 µV/V + 150 µV 18 µV/V + 1.5 mV	
Measurement	0 mV to 200 mV 200 mV to 2 V 2 V to 20 V 20 V to 200 V 200 V to 1000 V	47 µV/V + 1.2 µV 31 µV/V + 4.0 µV 31 µV/V + 80 µV 47 µV/V + 600 µV 51 µV/V + 6.0 mV	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC VOLTAGE			
Generation	1 mV to 33 mV		
	0.2 Hz to 10 Hz	800 µV/V + 100 µV	
	10 Hz to 45 Hz	800 µV/V + 100 µV	
	45 Hz to 10 kHz	150 µV/V + 100 µV	
	10 kHz to 20 kHz	200 µV/V + 100 µV	
	20 kHz to 50 kHz	0.10 % + 100 µV	
	50 kHz to 100 kHz	0.35 % + 110 µV	
	100 kHz to 500 kHz	0.80 % + 150 µV	
	33 mV to 330 mV		
	0.2 Hz to 10 Hz	300 µV/V + 120 µV	
	10 Hz to 45 Hz	300 µV/V + 120 µV	
	45 Hz to 10 kHz	150 µV/V + 120 µV	
	10 kHz to 20 kHz	160 µV/V + 120 µV	
	20 kHz to 50 kHz	350 µV/V + 120 µV	
	50 kHz to 100 kHz	800 µV/V + 140 µV	
	100 kHz to 500 kHz	0.20 % + 190 µV	
	0.33 V to 3.3 V		
	0.2 Hz to 10 Hz	300 µV/V + 400 µV	
	10 Hz to 45 Hz	300 µV/V + 400 µV	
	45 Hz to 10 kHz	150 µV/V + 400 µV	
	10 kHz to 20 kHz	190 µV/V + 400 µV	
	20 kHz to 50 kHz	300 µV/V + 400 µV	
	50 kHz to 100 kHz	700 µV/V + 460 µV	
	100 kHz to 500 kHz	0.24 % + 1.2 mV	
	3.3 V to 10.23 V		
	0.2 Hz to 10 Hz	300 µV/V + 4.5 mV	
	3.3 V to 33 V		
	10 Hz to 45 Hz	300 µV/V + 4.0 mV	
	45 Hz to 10 kHz	150 µV/V + 4.0 mV	
	10 kHz to 20 kHz	240 µV/V + 4.0 mV	
	20 kHz to 50 kHz	350 µV/V + 4.0 mV	
	50 kHz to 100 kHz	900 µV/V + 5.0 mV	
	33 V to 330 V		
	10 Hz to 45 Hz	190 µV/V + 30 mV	
	45 Hz to 10 kHz	200 µV/V + 30 mV	
	10 kHz to 20 kHz	250 µV/V + 30 mV	
	20 kHz to 50 kHz	300 µV/V + 30 mV	
	50 kHz to 100 kHz	0.20 % + 80 mV	
	330 V to 1020 V		
	45 Hz to 1 kHz	300 µV/V + 120 mV	
	1 kHz to 5 kHz	250 µV/V + 120 mV	
	5 kHz to 10 kHz	300 µV/V + 120 mV	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC VOLTAGE (cont'd) Measurement	20 mV to 200 mV		
	0.2 Hz to 10 Hz	0.40 %	
	1 mV to 200 mV		
	10 Hz to 50 Hz	0.30 % + 30 µV	
	50 Hz to 100 Hz	0.080 % + 30 µV	
	100 Hz to 30 kHz	0.060 % + 30 µV	
	30 kHz to 50 kHz	0.070 % + 30 µV	
	50 kHz to 100 kHz	0.36 % + 30 µV	
	100 kHz to 200 kHz	0.91 % + 50 µV	
	200 kHz to 1 MHz	2.0 % + 200 µV	
	1 MHz to 2 MHz	5.0 % + 400 µV	
	0.2 V to 2 V		
	0.2 Hz to 10 Hz	0.40 %	
	10 Hz to 50 Hz	0.31 % + 300 µV	
	50 Hz to 100 Hz	0.080 % + 300 µV	
	100 Hz to 30 kHz	0.060 % + 300 µV	
	30 kHz to 50 kHz	0.060 % + 300 µV	
	50 kHz to 100 kHz	0.36 % + 300 µV	
	100 kHz to 200 kHz	0.91 % + 500 µV	
	200 kHz to 1 MHz	2.0 % + 2.0 mV	
	1 MHz to 2 MHz	5.0 % + 4.0 mV	
	2 V to 20 V		
	0.2 Hz to 10 Hz	0.40%	
	10 Hz to 50 Hz	0.30 % + 3.0 mV	
	50 Hz to 100 Hz	0.080 % + 3.0 mV	
	100 Hz to 2 kHz	0.070 % + 3.0 mV	
	2 kHz to 10 kHz	0.10 % + 3.0 mV	
	30 kHz to 50 kHz	0.060 % + 30 µV	
	50 kHz to 100 kHz	0.30 % + 300 µV	
	10 kHz to 30 kHz	0.15 % + 3.0 mV	
	30 kHz to 50 kHz	0.16 % + 3.0 mV	
	50 kHz to 100 kHz	0.36 % + 3.0 mV	
	100 kHz to 200 kHz	0.90 % + 5.0 mV	
	200 kHz to 1 MHz	4.0 % + 40 mV	
	1 MHz to 2 MHz	7.0 % + 40 mV	
	20 V to 200 V		
	0.2 Hz to 10 Hz	0.40%	
	10 Hz to 50 Hz	0.31 % + 30 mV	
	50 Hz to 100 Hz	0.08 % + 30 mV	
	100 Hz to 2 kHz	0.08 % + 30 mV	
	2 kHz to 10 kHz	0.11 % + 30 mV	
	10 kHz to 30 kHz	0.15 % + 30 mV	
	30 kHz to 50 kHz	0.16 % + 30 mV	
	50 kHz to 100 kHz	0.37 % + 30 mV	
	100 kHz to 200 kHz	0.90 % + 5.0 mV	
	200 kHz to 1 MHz	4.0 % + 40 mV	
	1 MHz to 2 MHz	4.0 % + 40 mV	
	200 V to 750 V		
	50 Hz to 100 Hz	0.39 % + 110 mV	
	100 Hz to 2 kHz	0.19 % + 110 mV	
	2 kHz to 10 kHz	0.23 % + 110 mV	
	10 kHz to 25 kHz	0.28 % + 110 mV	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
DC CURRENT			
Generation	0 µA to 330 µA	150 µA/A + 25 nA	
	330 µA to 3.3 mA	110 µA/A + 100 nA	
	3.3 mA to 33 mA	100 µA/A + 2.0 µA	
	33 mA to 330 mA	100 µA/A + 20 µA	
	330 mA to 1.1 A	210 µA/A + 80 µA	
	1.1 A to 3 A	390 µA/A + 1.0 mA	
	3 A to 11 A	510 µA/A + 2.5 mA	
	11 A to 20.5 A	0.10 % + 4.0 mA	
	10 A to 16.5 A	0.25 % + 3.0 mA	For the calibration of toroidal clamp-on ammeters
	16.5 A to 150 A	0.25 % + 1.0 A	
	150 A to 1025 A	0.25 % +1.5 A	
Measurement	0 µA to 200 µA	610 µA/A + 5.0 nA	
	200 µA to 2 mA	480 µA/A + 40 nA	
	2 mA to 20 mA	480 µA/A + 0.40 µA	
	20 mA to 200 mA	600 µA/A + 4.0 µA	
	200 mA to 2 A	0.11 % + 40 µA	
AC CURRENT			
Generation	29 µA to 330 µA		
	10 Hz to 20 Hz	0.20 % + 730 nA	
	20 Hz to 45 Hz	0.15 % + 700 nA	
	45 Hz to 1 kHz	0.13 % + 700 nA	
	1 kHz to 5 kHz	0.30 % + 700 nA	
	5 kHz to 10 kHz	0.80 % + 870 nA	
	10 kHz to 30 kHz	1.6 % + 2.0 µA	
	330 µA to 3.3 mA		
	10 Hz to 20 Hz	0.20 % + 2,0 µA	
	20 Hz to 45 Hz	0.13 % + 2.0 µA	
	45 Hz to 1 kHz	0.10 % + 2.0 µA	
	1 kHz to 5 kHz	0.20 % + 2.0 µA	
	5 kHz to 10 kHz	0.50 % + 2.2 µA	
	10 kHz to 30 kHz	1.0 % + 2.5 µA	
	3.3 mA to 33 mA		
	10 Hz to 20 Hz	0.18 % + 10 µA	
	20 Hz to 45 Hz	0.090 % + 10 µA	
	45 Hz to 1 kHz	0.040 % + 10 µA	
	1 kHz to 5 kHz	0.080 % + 10 µA	
	5 kHz to 10 kHz	0.20 % + 15 µA	
	10 kHz to 30 kHz	0.40 % + 15 µA	
	33 mA to 330 mA		
	10 Hz to 20 Hz	0.18 % + 100 µA	
	20 Hz to 45 Hz	0.090 % + 100 µA	
	45 Hz to 1 kHz	0.040 % + 100 µA	
	1 kHz to 5 kHz	0.10 % + 120 µA	
	5 kHz to 10 kHz	0.20 % + 200 µA	
	10 kHz to 30 kHz	0.40 % + 300 µA	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC CURRENT (cont'd)			
Generation (cont'd)	330 mA to 1.1 A		
	10 Hz to 45 Hz	0.18 % + 780 µA	
	45 Hz to 1 kHz	0.050 % + 780 µA	
	1 kHz to 5 kHz	0.60 % + 1.8 mA	
	5 kHz to 10 kHz	2.5 % + 6.0 mA	
	1.1 A to 3 A		
	10 Hz to 45 Hz	0.18 % + 1.3 mA	
	45 Hz to 1 kHz	0.060 % + 1.3 mA	
	1 kHz to 5 kHz	0.60 % + 2.2 mA	
	5 kHz to 10 kHz	2.5 % + 6.2 mA	
	3 A to 11 A		
	45 Hz to 100 Hz	0.060 % + 9.0 mA	
	100 Hz to 1 kHz	0.10 % + 9.0 mA	
	1 kHz to 5 kHz	3.0 % + 9.0 mA	
	11 A to 20 A		
	45 Hz to 100 Hz	0.12 % + 15 mA	
	100 Hz to 1 kHz	0.15 % + 15 mA	
	1 kHz to 5 kHz	3.0 % + 15 mA	
	10 A to 16.5 A		
	45 Hz to 65 Hz	0.28 % + 3.0 mA	For the calibration of toroidal clamp-on ammeters
	65 Hz to 440 Hz	0.79 % + 3.0 mA	
	16.5 A to 150 A		
	45 Hz to 65 Hz	0.28 % + 13 mA	For the calibration of toroidal clamp-on ammeters
	65 Hz to 440 Hz	0.79 % + 13 mA	
	150 A to 1025 A		
	45 Hz to 65 Hz	0.28 % + 40 mA	For the calibration of toroidal clamp-on ammeters
	65 Hz to 440 Hz	0.79 % + 40 mA	
Measurement	0 µA to 200 µA		
	40 Hz to 50 Hz	0.42 % + 30 nA	
	50 Hz to 200 Hz	0.24 % + 30 nA	
	200 Hz to 1 kHz	0.48 % + 30 nA	
	1 kHz to 10 kHz	0.57 % + 30 nA	
	200 µA to 2 mA		
	40 Hz to 50 Hz	0.36 % + 300 nA	
	50 Hz to 1 kHz	0.18 % + 300 nA	
	1 kHz Hz to 10 kHz	0.15 % + 300 nA	
	10 kHz to 30 kHz	0.15 % + 300 nA	
	30 kHz to 50 kHz	0.30 % + 300 nA	
	50 kHz to 100 kHz	0.50 % + 300 nA	
	2 mA to 20 mA		
	40 Hz to 50 Hz	0.36 % + 3.0 µA	
	50 Hz to 200 Hz	0.18 % + 3.0 µA	
	200 Hz to 1 kHz	0.15 % + 3.0 µA	
	1 kHz to 10 kHz	0.15 % + 3.0 µA	
	10 kHz to 30 kHz	0.25 % + 3.0 µA	
	30 kHz to 50 kHz	0.30 % + 3.0 µA	
	50 kHz to 100 kHz	0.50 % + 3.0 µA	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
AC CURRENT (cont'd)			
Measurement (cont'd)	20 mA to 200 mA		
	40 Hz to 50 Hz	0.36 % + 30 µA	
	50 Hz to 200 Hz	0.18 % + 30 µA	
	200 Hz to 1 kHz	0.15 % + 30 µA	
	1 kHz to 10 kHz	0.21 % + 30 µA	
	10 kHz to 30 kHz	0.50 % + 30 µA	
	30 kHz to 50 kHz	1.0 % + 30 µA	
	50 kHz to 100 kHz	3.0 % + 30 µA	
	0.2 A to 2 A		
	40 Hz to 50 Hz	0.42 % + 300 µA	
	50 Hz to 200 Hz	0.24 % + 300 µA	
	200 Hz to 1 kHz	0.36 % + 300 µA	
	1 kHz to 10 kHz	0.52 % + 300 µA	
	10 kHz to 30 kHz	1.5 % + 300 µA	
	30 kHz to 50 kHz	4.0 % + 300 µA	
DC RESISTANCE			
Generation	0 Ω to 11 Ω	40 µΩ/Ω + 2.0 mΩ	
	11 Ω to 33 Ω	30 µΩ/Ω + 3.1 mΩ	
	33 Ω to 110 Ω	28 µΩ/Ω + 4.0 mΩ	
	110 Ω to 330 Ω	28 µΩ/Ω + 6.3 mΩ	
	330 Ω to 1.1 kΩ	28 µΩ/Ω + 20 mΩ	
	1.1 kΩ to 3.3 kΩ	28 µΩ/Ω + 51 mΩ	
	3.3 kΩ to 11 kΩ	28 µΩ/Ω + 150 mΩ	
	11 kΩ to 33 kΩ	28 µΩ/Ω + 480 mΩ	
	33 kΩ to 110 kΩ	28 µΩ/Ω + 550 mΩ	
	110 kΩ to 330 kΩ	32 µΩ/Ω + 14 Ω	
	330 kΩ to 1.1 MΩ	32 µΩ/Ω + 24 Ω	
	1.1 MΩ to 3.3 MΩ	60 µΩ/Ω + 110 Ω	
	3.3 MΩ to 11 MΩ	130 µΩ/Ω + 360 Ω	
	11 MΩ to 33 MΩ	250 µΩ/Ω + 4.1 kΩ	
	33 MΩ to 110 MΩ	500 µΩ/Ω + 19 kΩ	
	110 MΩ to 330 MΩ	0.30 % + 230 kΩ	
	330 MΩ to 1.1 GΩ	1.5 % + 1.2 MΩ	
Measurement	0 Ω to 20 Ω	94 µΩ/Ω + 6.1 mΩ	
	20 Ω to 200 Ω	67 µΩ/Ω + 7.4 mΩ	
	200 Ω to 2 kΩ	59 µΩ/Ω + 14 mΩ	
	2 kΩ to 20 kΩ	69 µΩ/Ω + 80 mΩ	
	20 kΩ to 200 kΩ	120 µΩ/Ω + 900 mΩ	
	200 kΩ to 2 MΩ	190 µΩ/Ω + 9.0 Ω	
	2 MΩ to 20 MΩ	0.11 % + 90 Ω	
	20 MΩ to 200 MΩ	2.4 % + 20 kΩ	
	200 MΩ to 1 GΩ	4.0 % + 200 kΩ	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
CALIBRATION OF CHARGE AMPLIFIERS	*1 pC to 33 pC*		
	200 mHz to 10 Hz	1.2 %	
	10 Hz to 45 Hz	0.093 % + 0.0060 pC	
	63 Hz to 10 kHz	0.020 % + 0.0060 pC	
	33 pC to 330 pC		
	200 mHz to 10 Hz	1.2 %	
	10 Hz to 45 Hz	0.036 % + 0.0080 pC	
	63 Hz to 10 kHz	0.020 % + 0.0080 pC	
	330 pC to 3300 pC		
	200 mHz to 10 Hz	1.2 %	
	10 Hz to 45 Hz	0.036 % + 0.050 pC	
	63 Hz to 10 kHz	0.020 % + 0.060 pC	
	3300 pC to 33000 pC		
	200 mHz to 10 Hz	1.2 %	
	10 Hz to 45 Hz	0.036 % + 0.65 pC	
	63 Hz to 10 kHz	0.020 % + 0.60 pC	
	33000 pC to 100000 pC		
	200 mHz to 10 Hz	1.2 %	
	10 Hz to 45 Hz	0.024 % + 2.0 pC	
	63 Hz to 10 kHz	0.025 % + 6.0 pC	
Attenuation			
With reference to a set value of 3 V	0 dB to 30 dB		
	DC and 3 Hz to 10 kHz	0.020 dB	
TEMPERATURE SIMULATION			
Thermocouple type			
K	-200 °C to +1300 °C	0.30 °C	Including reference junction compenstation
J	-210 °C to +1200 °C	0.26 °C	
N	-200 °C to +1300 °C	0.36 °C	
T	-250 °C to -150 °C	0.31 °C	
T	-150 °C to +400 °C	0.25 °C	
K	-200 °C to +1300 °C	0.23 °C	Excluding reference junction compenstation
J	-210 °C to +1200 °C	0.16 °C	
N	-200 °C to +1300 °C	0.30 °C	
T	-250 °C to -150 °C	0.23 °C	
T	-150 °C to +400 °C	0.16 °C	

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty (k = 2)	Remarks
FREQUENCY			
Generation	10 mHz to 30 MHz	2.0 in 10^{11}	
Measurement	1 mHz to 225 MHz	0.05 µHz/Hz	
ANGULAR VELOCITY			
Calibration of angular velocity sensors			Ambient temperature 18 °C to 22 °C.
Applied angular velocity	10 °/s to 2000 °/s	0.13 % of angular velocity	
Output voltage measurement	0 V to 200 mV 200 mV to 2 V 2 V to 20 V	560 µV/V + 150 µV 560 µV/V + 150 µV 560 µV/V + 170 µV	
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: $Q[a, b] = [a^2 + b^2]^{1/2}$