


# Schedule of Accreditation

issued by

## United Kingdom Accreditation Service

2 Pine Trees, Chertsey Lane, Staines-upon-Thames, TW18 3HR, UK

 <b>UKAS</b> CALIBRATION  <b>0556</b>  Accredited to ISO/IEC 17025:2017	<b>Horiba MIRA Limited</b>	
	<b>Issue No: 032    Issue date: 13 January 2025</b>	
	<b>Calibration Centre</b> Watling Street Nuneaton Warwickshire CV10 0TU	<b>Contact: Mr Philip Macleod</b> Tel: +44 (0)2476 355643 Fax: +44 (0)2476 358225 E-Mail: calibration.centre@horiba-mira.com Website: www.horiba-mira.com
<b>Calibration performed by the Organisation at the locations specified</b>		

### Locations covered by the organisation and their relevant activities

#### Laboratory locations:

Location details	Activity	Location code
<b>Address</b> Calibration Centre Watling Street Nuneaton Warwickshire CV10 0TU  <b>Local contact</b> Contact: Mr Philip Macleod Tel: +44 (0)2476 355643 E-Mail: calibration.centre@horiba-mira.com Website: www.horiba-mira.com	Pressure Force Measuring Devices Accelerometry Electrical Angular rate Temperature Simulation	A

#### Site activities performed away from the locations listed above:

Location details	Activity	Location code
HORIBA Mira Limited other departments. Mr Philip Macleod Tel: +44 (0)2476 355643	Electrical Temperature Simulation	B



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Calibration and Measurement Capability (CMC)

Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
<b>PRESSURE</b>			Methods consistent with EURAMET CG17.	A
<u>Gas Pressure Gauge</u>  Calibration of pressure indicating instruments and gauges	-90 kPa to 0 Pa 0 to 2 MPa 2 MPa to 21 MPa	0.024 % + 0.59 kPa 0.024 % + 0.59 kPa 0.030 % + 2.1 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 2.1 MPa to 21.1 MPa	0.15 kPa 0.024 % + 0.60 kPa 0.030 % + 3.0 kPa		
<u>Hydraulic Pressure Gauge</u>  Calibration of pressure indicating instruments and gauges	0 to 50 MPa	0.016 % + 90 kPa		
<b>FORCE MEASURING DEVICES</b>				A
Calibration of force measuring devices (e.g. strain gauged load cells, push pull gauges, and load measuring rings) but excluding proving devices by masses in tension and compression	9.8 N to 58.8 N 58.8 N to 978 N	0.11 % 0.28 %	Calibrated to documented in house methods	
Calibration of force measuring devices (e.g. strain gauged load cells, push pull gauges, and load measuring rings) but excluding proving devices by force proving instruments in tension and compression	978 N to 1.2 kN 1.2 kN to 30 kN	0.90 % 0.70 %	Calibrated to documented in house methods	
Calibration of force measuring devices (e.g. strain gauged load cells, push pull gauges, and load measuring rings) but excluding proving devices by force proving instruments in tension	30 kN to 300 kN	1.1 % + 0.00083 %FS	Calibrated to documented in house methods	
Calibration of force measuring devices (e.g. strain gauged load cells, push pull gauges, and load measuring rings) but excluding proving devices by force proving instruments in compression	30 kN to 600 kN	1.1 % + 0.00083 %FS	Calibrated to documented in house methods	



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
<p><b>ACCELEROMETRY</b></p> <p>ACCELERATION TRANSDUCERS</p> <p>Transducer at 20 °C</p> <p>Accelerometer Types: Piezo electric minimum sensitivity &gt;1 pC/m/s<sup>2</sup> Integral electronic minimum sensitivity &gt;1 mV/m/s<sup>2</sup> Piezo resistive minimum sensitivity &gt;1 mV/m/s<sup>2</sup></p> <p>All types with a nominal mass of up to 100 grams, a nominal Peak Acceleration of 1.9 ms<sup>-2</sup> to 147.1 ms<sup>-2</sup> and a minimum sensitivity of 0.04 mV ms<sup>-2</sup></p>	<p>1 Hz to 5 Hz 5 Hz to 5 kHz</p>	<p>2.0 % 1.7 %</p>	<p>Calibration method is by direct comparison against laboratory references</p>	<p>A</p>
<p>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.</p> <p><b>ELECTRICAL</b></p> <p>DC VOLTAGE</p> <p>Generation</p> <p>Measurement</p> <p>AC VOLTAGE</p> <p>Generation</p>	<p>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</p> <p>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</p> <p>1 mV to 33 mV 0.2 Hz to 10 Hz 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz</p>	<p>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</p> <p>12 µV/V + 1.2 µV 6.0 µV/V 5.0 µV/V 12 µV/V 12 µV/V</p> <p>800 µV/V + 100 µV 800 µV/V + 100 µV 150 µV/V + 100 µV 200 µV/V + 100 µV 0.10 % + 100 µV 0.35 % + 110 µV 0.80 % + 150 µV</p>		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
<b>ELECTRICAL</b> (continued) AC VOLTAGE (continued) Generation (continued)				A
	33 mV to 330 mV 0.2 Hz to 10 Hz 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz	300 $\mu$ V/V + 120 $\mu$ V 300 $\mu$ V/V + 120 $\mu$ V 150 $\mu$ V/V + 120 $\mu$ V 160 $\mu$ V/V + 120 $\mu$ V 350 $\mu$ V/V + 120 $\mu$ V 800 $\mu$ V/V + 140 $\mu$ V 0.20 % + 190 $\mu$ V		
	0.33 V to 3.3 V 0.2 Hz to 10 Hz 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz 100 kHz to 500 kHz	300 $\mu$ V/V + 400 $\mu$ V 300 $\mu$ V/V + 400 $\mu$ V 150 $\mu$ V/V + 400 $\mu$ V 190 $\mu$ V/V + 400 $\mu$ V 300 $\mu$ V/V + 400 $\mu$ V 700 $\mu$ V/V + 460 $\mu$ V 0.24 % + 1.2 mV		
	3.3 V to 10.23 V 0.2 Hz to 10 Hz	300 $\mu$ V/V + 4.5 mV		
	3.3 V to 33 V 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	300 $\mu$ V/V + 4.0 mV 150 $\mu$ V/V + 4.0 mV 240 $\mu$ V/V + 4.0 mV 350 $\mu$ V/V + 4.0 mV 900 $\mu$ V/V + 5.0 mV		
	33 V to 330 V 10 Hz to 45 Hz 45 Hz to 10 kHz 10 kHz to 20 kHz 20 kHz to 50 kHz 50 kHz to 100 kHz	190 $\mu$ V/V + 30 mV 200 $\mu$ V/V + 30 mV 250 $\mu$ V/V + 30 mV 300 $\mu$ V/V + 30 mV 0.20 % + 80 mV		
	330 V to 1020 V 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	300 $\mu$ V/V + 120 mV 250 $\mu$ V/V + 120 mV 300 $\mu$ V/V + 120 mV		
AC Voltage Measurement	1 mV to 200 mV 20 Hz to 1 kHz 1 kHz to 10 kHz	0.057 % 0.046 %		
	200 mV to 2 V 20 Hz to 1 kHz 1 kHz to 10 kHz	0.057 % 0.054 %		
	2 V to 20 V 20 Hz to 1 kHz 1 kHz to 10 kHz	0.029 % 0.025 %		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
AC VOLTAGE (continued)	20 V to 200 V 20 Hz to 1 kHz 1 kHz to 10 kHz	0.041 % 0.031 %		A
Measurement (continued)	200 V to 1 kV 55 Hz to 1 kHz 1 kHz to 10 kHz	0.046 % 0.047 %		
DC CURRENT				
Generation	0 $\mu$ A to 330 $\mu$ A 330 $\mu$ A to 3.3 mA 3.3 mA to 33 mA 33 mA to 330 mA 330 mA to 1.1 A 1.1 A to 3 A 3 A to 11 A 11 A to 20.5 A	150 $\mu$ A/A + 25 nA 110 $\mu$ A/A + 100 nA 100 $\mu$ A/A + 2.0 $\mu$ A 100 $\mu$ A/A + 20 $\mu$ A 210 $\mu$ A/A + 80 $\mu$ A 390 $\mu$ A/A + 1.0 mA 510 $\mu$ A/A + 2.5 mA 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 150 A to 1025 A	0.25 % + 1.0 A 0.25 % + 1.5 A		
Measurement	0 $\mu$ A to 200 $\mu$ A 200 $\mu$ A to 2 mA 2 mA to 20 mA 20 mA to 200 mA 200 mA to 2 A	75 $\mu$ A/A + 1.4 nA 38 $\mu$ A/A 55 $\mu$ A/A 79 $\mu$ A/A 92 $\mu$ A/A		



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ELECTRICAL (continued) DC Current (continued) AC CURRENT Generation				A
	29 $\mu$ A to 330 $\mu$ A 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.20 % + 730 nA 0.15 % + 700 nA 0.13 % + 700 nA 0.30 % + 700 nA 0.80 % + 870 nA 1.6 % + 2.0 $\mu$ A		
	330 $\mu$ A to 3.3 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.20 % + 2.0 $\mu$ A 0.13 % + 2.0 $\mu$ A 0.10 % + 2.0 $\mu$ A 0.20 % + 2.0 $\mu$ A 0.50 % + 2.2 $\mu$ A 1.0 % + 2.5 $\mu$ A		
	3.3 mA to 33 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.18 % + 10 $\mu$ A 0.090 % + 10 $\mu$ A 0.040 % + 10 $\mu$ A 0.080 % + 10 $\mu$ A 0.20 % + 15 $\mu$ A 0.40 % + 15 $\mu$ A		
	33 mA to 330 mA 10 Hz to 20 Hz 20 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz 10 kHz to 30 kHz	0.18 % + 100 $\mu$ A 0.090 % + 100 $\mu$ A 0.040 % + 100 $\mu$ A 0.10 % + 120 $\mu$ A 0.20 % + 200 $\mu$ A 0.40 % + 300 $\mu$ A		
	330 mA to 1.1 A 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.18 % + 780 $\mu$ A 0.050 % + 780 $\mu$ A 0.60 % + 1.8 mA 2.5 % + 6.0 mA		
	1.1 A to 3 A 10 Hz to 45 Hz 45 Hz to 1 kHz 1 kHz to 5 kHz 5 kHz to 10 kHz	0.18 % + 1.3 mA 0.060 % + 1.3 mA 0.60 % + 2.2 mA 2.5 % + 6.2 mA		
	3 A to 11 A 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz	0.060 % + 9.0 mA 0.10 % + 9.0 mA 3.0 % + 9.0 mA		



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AC CURRENT (continued)				A
Generation (continued)	11 A to 20 A 45 Hz to 100 Hz 100 Hz to 1 kHz 1 kHz to 5 kHz	0.12 % + 15 mA 0.15 % + 15 mA 3.0 % + 15 mA		
	10 A to 16.5 A 45 Hz to 65 Hz 65 Hz to 440 Hz	0.28 % + 3.0 mA 0.79 % + 3.0 mA	For the calibration of toroidal clamp-on ammeters	
	16.5 A to 150 A 45 Hz to 65 Hz 65 Hz to 440 Hz	0.28 % + 13 mA 0.79 % + 13 mA	For the calibration of toroidal clamp-on ammeters	
	150 A to 1025 A 45 Hz to 65 Hz 65 Hz to 440 Hz	0.28 % + 40 mA 0.79 % + 40 mA	For the calibration of toroidal clamp-on ammeters	
Measurement	20 nA to 200 $\mu$ A 55 Hz to 1 kHz 1 kHz to 5 kHz	0.034 % + 2.0 nA 0.074 % + 2.0 nA		
	200 $\mu$ A to 2 mA 55 Hz to 1 kHz 1 kHz to 5 kHz	0.23 % + 20 nA 0.67 % + 20 nA		
	2 mA to 20 mA 55 Hz to 1 kHz 1 kHz to 5 kHz	0.030 % + 200 nA 0.067 % + 200 nA		
	20 mA to 200 mA 55 Hz to 1 kHz 1 kHz to 5 kHz	0.031 % + 2.0 $\mu$ A 0.064 % + 2.0 $\mu$ A		
	0.2 A to 2 A 55 Hz to 1 kHz 1 kHz to 5 kHz	0.071 % + 20 $\mu$ A 0.28 % + 20 $\mu$ A		



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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
<b>ELECTRICAL</b> (continued)				A
DC RESISTANCE				
Generation	0 $\Omega$ to 11 $\Omega$ 11 $\Omega$ to 33 $\Omega$ 33 $\Omega$ to 110 $\Omega$ 110 $\Omega$ to 330 $\Omega$ 330 $\Omega$ to 1.1 k $\Omega$ 1.1 k $\Omega$ to 3.3 k $\Omega$ 3.3 k $\Omega$ to 11 k $\Omega$ 11 k $\Omega$ to 33 k $\Omega$ 33 k $\Omega$ to 110 k $\Omega$ 110 k $\Omega$ to 330 k $\Omega$ 330 k $\Omega$ to 1.1 M $\Omega$ 1.1 M $\Omega$ to 3.3 M $\Omega$ 3.3 M $\Omega$ to 11 M $\Omega$ 11 M $\Omega$ to 33 M $\Omega$ 33 M $\Omega$ to 110 M $\Omega$ 110 M $\Omega$ to 330 M $\Omega$ 330 M $\Omega$ to 1.1 G $\Omega$	40 $\mu\Omega/\Omega$ + 2.0 m $\Omega$ 30 $\mu\Omega/\Omega$ + 3.1 m $\Omega$ 28 $\mu\Omega/\Omega$ + 4.0 m $\Omega$ 28 $\mu\Omega/\Omega$ + 6.3 m $\Omega$ 28 $\mu\Omega/\Omega$ + 20 m $\Omega$ 28 $\mu\Omega/\Omega$ + 51 m $\Omega$ 28 $\mu\Omega/\Omega$ + 150 m $\Omega$ 28 $\mu\Omega/\Omega$ + 480 m $\Omega$ 28 $\mu\Omega/\Omega$ + 550 m $\Omega$ 32 $\mu\Omega/\Omega$ + 14 $\Omega$ 32 $\mu\Omega/\Omega$ + 24 $\Omega$ 60 $\mu\Omega/\Omega$ + 110 $\Omega$ 130 $\mu\Omega/\Omega$ + 360 $\Omega$ 250 $\mu\Omega/\Omega$ + 4.1 k $\Omega$ 500 $\mu\Omega/\Omega$ + 19 k $\Omega$ 0.30 % + 230 k $\Omega$ 1.5 % + 1.2 M $\Omega$		
Measurement	0 $\Omega$ to 1 $\Omega$ 1 $\Omega$ to 20 $\Omega$ 20 $\Omega$ to 200 $\Omega$ 200 $\Omega$ to 2 k $\Omega$ 2 k $\Omega$ to 20 k $\Omega$ 20 k $\Omega$ to 200 k $\Omega$ 200 k $\Omega$ to 2 M $\Omega$ 2 M $\Omega$ to 20 M $\Omega$ 20 M $\Omega$ to 200 M $\Omega$ 200 M $\Omega$ to 1 G $\Omega$	21 $\mu\Omega/\Omega$ + 24 $\mu\Omega$ 36 $\mu\Omega/\Omega$ + 24 $\mu\Omega$ 10 $\mu\Omega/\Omega$ + 24 $\mu\Omega$ 14 $\mu\Omega/\Omega$ 16 $\mu\Omega/\Omega$ 14 $\mu\Omega/\Omega$ 22 $\mu\Omega/\Omega$ 41 $\mu\Omega/\Omega$ 0.030 %  0.28 %		
<b>CALIBRATION OF CHARGE AMPLIFIERS</b>	1 pC to 33 pC 200 mHz to 10 Hz 10 Hz to 45 Hz 63 Hz to 10 kHz  33 pC to 330 pC 200 mHz to 10 Hz 10 Hz to 45 Hz 63 Hz to 10 kHz  330 pC to 3300 pC 200 mHz to 10 Hz 10 Hz to 45 Hz 63 Hz to 10 kHz  3300 pC to 33000 pC 200 mHz to 10 Hz 10 Hz to 45 Hz 63 Hz to 10 kHz  33000 pC to 100000 pC 200 mHz to 10 Hz 10 Hz to 45 Hz 63 Hz to 10 kHz	1.2 % 0.093 % + 0.0060 pC 0.020 % + 0.0060 pC  1.2 % 0.036 % + 0.0080 pC 0.020 % + 0.0080 pC  1.2 % 0.036 % + 0.050 pC 0.020 % + 0.060 pC  1.2 % 0.036 % + 0.65 pC 0.020 % + 0.60 pC  1.2 % 0.024 % + 2.0 pC 0.025 % + 6.0 pC		





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Measured Quantity Instrument or Gauge	Range	Expanded Measurement Uncertainty ( $k = 2$ )	Remarks	Location Code
<b>CALIBRATION OF CHARGE AMPLIFIERS</b> (continued)				A
Attenuation				
With reference to a set value of 3 V	0 dB to 30 dB <i>DC and 3 Hz to 10 kHz</i>	0.020 dB		
<b>TEMPERATURE SIMULATION</b>				
Thermocouple type				
K	-200 °C to +1300 °C	0.30 °C	Including reference junction compensation	
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	Excluding reference junction compensation	
T	-150 °C to +400 °C	0.25 °C		
K	-200 °C to +1300 °C	0.23 °C		
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		
Platinum resistance thermometry				
Simulation	-50 °C to 800 °C	0.10 °C		
Measurement	-50 °C to 800 °C	0.10 °C		
<b>FREQUENCY</b>				
Generation	10 mHz to 30 MHz	2.0 in 10 <sup>11</sup>		
Measurement	1 mHz to 225 MHz	0.05 μHz/Hz		
<b>ANGULAR VELOCITY</b>				A
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		



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<b>ELECTRICAL</b> on site				B
Generation and measurement				
DC Volts	0 V to 60 V	12 $\mu$ V/V + 5.0 $\mu$ V		
DC Current	0 A to 40 mA	10 $\mu$ A		
Resistance	0 $\Omega$ to 5 k $\Omega$	30 $\mu\Omega/\Omega$ + 55 m $\Omega$		
Frequency	1 Hz to 50 kHz	1.0 mHz		
<b>TEMPERATURE SIMULATION</b>				
Thermocouple type				
K	-200 °C to +1300 °C	0.33 °C	Including reference junction compensation	
J	-210 °C to +1200 °C	0.28 °C		
N	-200 °C to +1300 °C	0.39 °C		
T	-250 °C to -150 °C	0.33 °C	Excluding reference junction compensation	
T	-150 °C to +400 °C	0.27 °C		
K	-200 °C to +1300 °C	0.25 °C		
J	-210 °C to +1200 °C	0.18 °C		
N	-200 °C to +1300 °C	0.30 °C		
T	-250 °C to -150 °C	0.25 °C		
T	-150 °C to +400 °C	0.18 °C		
Platinum resistance thermometry				
Simulation	-50 °C to 800 °C	0.12 °C		
Measurement	-50 °C to 800 °C	0.12 °C		
<b>END</b>				



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**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:  $Q[a, b] = [a^2 + b^2]^{1/2}$