

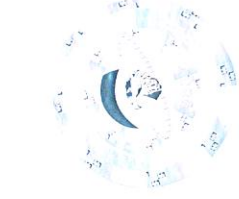
Certificate of Accreditation

جري ماكنزي للخدمات الهندسية (NAL 148)
118 الجداف - دبي، الإمارات العربية المتحدة
حاصل على الإعتماد في طرق المعايرة المذكورة في وثيقة المجال المرفقة وفقاً للمواصفة الدولية ISO/IEC 17025₁

Gray Mackenzie Engineering Services L.L.C (NAL 148)
118 Al Jadaf - Dubai, UAE

Accredited according to the ISO/IEC 17025 Standard to undertake calibrations as specified in the attached Accreditation Scope.

مدير إلتزامية الإعتدالية الوطني
الدكتورة رحمة فخر العائري



Accredited on 2021/01/10 تاريخ منح الإعتدالية
Expires on 2024/01/09 تاريخ الإنتهاء

Accreditation in accordance to the ISO/IEC 17025:2017 Standard "General requirements for the competence of testing and calibration laboratories" and the relevant ENAS and ILAC requirements.

This certificate is invalid without the attached scope of accreditation, which is subjected to annual surveillances as per ENAS procedure. Certificate can be updated or re-issued until the expiry date defined above. The validity of the certificate is subjected to continuous compliance with the requirements of the accreditation system. The lab is responsible for the results of its calibrations.

Initial Accreditation Date: 10/01/2021

ACF 11-21; Rev 3;

تاريخ منح الإعتماد لأول مرة: 2021/01/10

1 وفقاً لمطبات المواصفة الدولية "ISO/IEC 17025:2017 لمطبات العامة لكفاءة مختبرات الفحص والمعايرة" والمطبات ذات العلاقة الخاصة بنظام الإعتماد الوطني الإماراتي ENAS والمخبر الدولية لاعتماد المختبرات ILAC .

مجال الإعتماد جزء أساسي من هذه الشهادة حيث تخضع مجالات الإعتماد المذكورة في الوثيقة المرفقة لعمليات متابعة لاحقة من قبل نظام الإعتماد الوطني الإماراتي ENAS. وتعتبر هذه الشهادة صالحة وقابلة للتحديث وإعادة الإصدار حتى تاريخ الإنتهاء المدون اعلاه شرطه استمرار المختبر المذكور أعلاه في تطبيق متطلبات نظام الإعتماد سالفة الذكر. يتحمل المختبر مسؤولية نتائج المعايرة الصادرة عنه.

Gray Mackenzie Engineering Services

Al Jadaf, Dubai , UAE

NAL 148

Calibration Laboratory (ISO/IEC 17025:2017)

Issue Date:

Issue No.:

Expiry Date:

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
Electrical	DC Voltage - Source	(0 to 329.9999) mV	$16 \times 10^{-6} U + 0.77 \mu V$	GMES-LAB-ECP-01:2018	P/S
		(330 mV to 3.299999) V	$8.5 \times 10^{-6} U + 6.6 \mu V$		
		(3.3 to 32.99999) V	$9.3 \times 10^{-6} U + 21 \mu V$		
		(33 to 329.9999) V	$14 \times 10^{-6} U + 0.12 mV$		
		(330 to 1020) V	$14 \times 10^{-6} U + 1.2 mV$		
Electrical	DC Current - Source	(0 to 329.999) μA	$0.12 \times 10^{-3} I + 16 nA$	GMES-LAB-ECP-02:2018	P/S
		(330 μA to 3.29999 mA)	$78 \times 10^{-6} I + 39 nA$		
		(3.3 to 32.9999) mA	$78 \times 10^{-6} I + 0.19 \mu A$		
		(33 to 329.999) mA	$78 \times 10^{-6} I + 1.9 \mu A$		
		(330 mA to 1.09999) A	$0.15 \times 10^{-3} I + 31 \mu A$		
		(1.1 to 2.99999) A	$0.29 \times 10^{-3} I + 31 \mu A$		
		(3 to 10.9999) A	$0.39 \times 10^{-3} I + 0.39 mA$		
		(11 to 20.5) A	$0.78 \times 10^{-3} I + 0.58 mA$		
Electrical	Resistance - Source	(0 to 10.9999) Ω	$31 \times 10^{-6} R + 7.8 m\Omega$	GMES-LAB-ECP-03:2018	P/S
		(11 to 32.9999) Ω	$23 \times 10^{-6} R + 12 m\Omega$		
		(33 to 109.9999) Ω	$22 \times 10^{-6} R + 12 m\Omega$		
		(110 to 329.9999) Ω	$22 \times 10^{-6} R + 16 m\Omega$		
		(330 Ω to 1.099999) k Ω	$22 \times 10^{-6} R + 16 m\Omega$		
		(1.1 to 3.299999) k Ω	$22 \times 10^{-6} R + 0.16 \Omega$		
		(3.3 to 10.99999) k Ω	$22 \times 10^{-6} R + 78 m\Omega$		
		(11 to 32.99999) k Ω	$22 \times 10^{-6} R + 0.78 \Omega$		
		(33 to 109.9999) k Ω	$22 \times 10^{-6} R + 0.78 \Omega$		
		(110 to 329.9999) k Ω	$25 \times 10^{-6} R + 7.8 \Omega$		
		(330 to 1.099999) M Ω	$25 \times 10^{-6} R + 7.8 \Omega$		
		(1.1 to 3.299999) M Ω	$47 \times 10^{-6} R + 0.12 k\Omega$		
		(3.3 to 10.99999) M Ω	$11 \times 10^{-3} R + 0.19 k\Omega$		
		(11 to 32.99999) M Ω	$0.19 \times 10^{-3} R + 1.9 k\Omega$		
		(33 to 109.9999) M Ω	$0.39 \times 10^{-3} R + 2.3 k\Omega$		
		(110 to 329.9999) M Ω	$2.3 \times 10^{-3} R + 78 k\Omega$		
(330 to 1100) M Ω	$12 \times 10^{-3} R + 0.39 M\Omega$				
Electrical	AC Voltage - Source	(1.0 to 32.999) mV		GMES-LAB-ECP-01:2018	P/S
		(10 to 45) Hz	$0.62 \times 10^{-3} U + 10 \mu V$		
		> 45 Hz to 10 kHz	$0.12 \times 10^{-3} U + 10 \mu V$		
		(> 10 to 20) kHz	$0.16 \times 10^{-3} U + 10 \mu V$		
		(> 20 to 50) kHz	$0.78 \times 10^{-3} U + 10 \mu V$		
		(> 50 to 100) kHz	$2.7 \times 10^{-3} U + 14 \mu V$		
		(> 100 to 500) kHz	$6.2 \times 10^{-3} U + 44 \mu V$		
		(33 to 329.999) mV			
		(10 to 45) Hz	$0.23 \times 10^{-3} U + 11 \mu V$		
		> 45 Hz to 10 kHz	$0.11 \times 10^{-3} U + 11 \mu V$		
		(> 10 to 20) kHz	$0.12 \times 10^{-3} U + 11 \mu V$		
		(> 20 to 50) kHz	$0.27 \times 10^{-3} U + 11 \mu V$		
		(> 50 to 100) kHz	$0.62 \times 10^{-3} U + 30 \mu V$		
		(> 100 to 500) kHz	$1.6 \times 10^{-3} U + 59 \mu V$		
		(0.33 to 3.29999) V			
		(10 to 45) Hz	$0.23 \times 10^{-3} U + 44 \mu V$		

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
		> 45 Hz to 10 kHz	$0.12 \times 10^{-3} U + 52 \mu V$		
		(> 10 to 20) kHz	$0.15 \times 10^{-3} U + 52 \mu V$		
		(> 20 to 50) kHz	$0.23 \times 10^{-3} U + 44 \mu V$		
		(> 50 to 100) kHz	$0.54 \times 10^{-3} U + 0.11 mV$		
		(> 100 to 500) kHz	$1.9 \times 10^{-3} U + 0.51 mV$		
		(3.3 to 32.9999) V			
		(10 to 45) Hz	$0.23 \times 10^{-3} U + 0.51 mV$		
		> 45 Hz to 10 kHz	$0.12 \times 10^{-3} U + 0.51 mV$		
		(> 10 to 20) kHz	$0.19 \times 10^{-3} U + 0.51 mV$		
		(> 20 to 50) kHz	$0.27 \times 10^{-3} U + 0.51 mV$		
		(> 50 to 100) kHz	$0.69 \times 10^{-3} U + 1.2 mV$		
		(33 to 329.999) V			
		45 Hz to 1 kHz	$0.15 \times 10^{-3} U + 1.6 mV$		
		(> 1 to 10) kHz	$0.16 \times 10^{-3} U + 4.6 mV$		
		(> 10 to 20) kHz	$0.19 \times 10^{-3} U + 4.6 mV$		
		(> 20 to 50) kHz	$0.23 \times 10^{-3} U + 4.6 mV$		
		(> 50 to 100) kHz	$1.6 \times 10^{-3} U + 39 mV$		
		(330 to 1020) V			
		45 Hz to 1 kHz	$0.23 \times 10^{-3} U + 7.8 mV$		
		(> 1 to 5) kHz	$0.19 \times 10^{-3} U + 7.8 mV$		
(> 5 to 10) kHz	$0.23 \times 10^{-3} U + 7.8 mV$				
Electrical	AC Current - Source	(29 to 329.99) μA		GMES-LAB-ECP-02:2018	P/S
		(10 to 20) Hz	$1.6 \times 10^{-3} I + 78 nA$		
		(> 20 to 45) Hz	$1.2 \times 10^{-3} I + 78 nA$		
		> 45 Hz to 1 kHz	$0.97 \times 10^{-3} I + 78 nA$		
		(> 1 to 5) kHz	$2.3 \times 10^{-3} I + 0.12 \mu A$		
		(> 5 to 10) kHz	$6.2 \times 10^{-3} I + 0.16 \mu A$		
		(> 10 to 30) kHz	$12 \times 10^{-3} I + 0.31 \mu A$		
		(0.33 to 3.29999) mA			
		(10 to 20) Hz	$1.6 \times 10^{-3} I + 0.12 \mu A$		
		(> 20 to 45) Hz	$0.96 \times 10^{-3} I + 0.12 \mu A$		
		> 45 Hz to 1 kHz	$0.77 \times 10^{-3} I + 0.12 \mu A$		
		(> 1 to 5) kHz	$1.6 \times 10^{-3} I + 0.16 \mu A$		
		(> 5 to 10) kHz	$3.9 \times 10^{-3} I + 0.23 \mu A$		
		(> 10 to 30) kHz	$7.8 \times 10^{-3} I + 0.46 \mu A$		
		(3.3 to 32.9999) mA			
		(10 to 20) Hz	$1.4 \times 10^{-3} I + 1.6 \mu A$		
		(> 20 to 45) Hz	$0.69 \times 10^{-3} I + 1.6 \mu A$		
		> 45 Hz to 1 kHz	$0.31 \times 10^{-3} I + 1.6 \mu A$		
		(> 1 to 5) kHz	$0.62 \times 10^{-3} I + 1.6 \mu A$		
		(> 5 to 10) kHz	$1.6 \times 10^{-3} I + 2.3 \mu A$		
		(> 10 to 30) kHz	$3.1 \times 10^{-3} I + 3.1 \mu A$		
		(33 to 329.999) mA		GMES-LAB-ECP-02:2018	P/S
		(10 to 20) Hz	$1.4 \times 10^{-3} I + 16 \mu A$		
		(> 20 to 45) Hz	$0.69 \times 10^{-3} I + 16 \mu A$		
		> 45 Hz to 1 kHz	$0.31 \times 10^{-3} I + 16 \mu A$		
		(> 1 to 5) kHz	$0.78 \times 10^{-3} I + 39 \mu A$		
		(> 5 to 10) kHz	$1.6 \times 10^{-3} I + 78 \mu A$		
		(> 10 to 30) kHz	$3.1 \times 10^{-3} I + 0.15 mA$		
		(0.33 to 1.09999) A			
		(10 to 45) Hz	$1.4 \times 10^{-3} I + 78 \mu A$		
		> 45 Hz to 1 kHz	$0.39 \times 10^{-3} I + 78 \mu A$		
		(> 1 to 5) kHz	$4.6 \times 10^{-3} I + 0.78 mA$		
		(> 5 to 10) kHz	$19 \times 10^{-3} I + 39 mA$		

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
		(1.1 to 2.99999) A			
		(10 to 45) Hz	$1.4 \times 10^{-3} I + 78 \mu A$		
		> 45 Hz to 1 kHz	$0.46 \times 10^{-3} I + 78 \mu A$		
		(> 1 to 5) kHz	$4.6 \times 10^{-3} I + 0.78 \text{ mA}$		
		(> 5 to 10) kHz	$19 \times 10^{-3} I + 3.9 \text{ mA}$		
		(3 to 10.9999) A			
		(45 to 100) Hz	$0.46 \times 10^{-3} I + 1.6 \text{ mA}$		
		>100 Hz to 1 kHz	$0.78 \times 10^{-3} I + 1.6 \text{ mA}$		
		(>1 to 5) kHz	$23 \times 10^{-3} I + 1.6 \text{ mA}$		
		(11 to 20.5) A			
		(45 to 100) Hz	$0.93 \times 10^{-3} I + 3.9 \text{ mA}$		
		> 100 Hz to 1 kHz	$1.2 \times 10^{-3} I + 3.9 \text{ mA}$		
		(> 1 to 5) kHz	$23 \times 10^{-3} I + 3.9 \text{ mA}$		
Electrical	Capacitance - Source	(0.22 to 0.3999) nF	$3.9 \times 10^{-3} C + 7.8 \text{ pF}$	GMES-LAB-ECP-07:2018	P/S
		(0.4 to 1.0999) nF	$3.9 \times 10^{-3} C + 7.8 \text{ pF}$		
		(1.1 to 3.2999) nF	$3.9 \times 10^{-3} C + 7.8 \text{ pF}$		
		(3.3 to 10.9999) nF	$1.9 \times 10^{-3} C + 7.8 \text{ pF}$		
		(11 to 32.9999) nF	$1.9 \times 10^{-3} C + 7.8 \text{ pF}$		
		(33 to 109.999) nF	$1.9 \times 10^{-3} C + 7.8 \text{ pF}$		
		(110 to 329.999) nF	$1.9 \times 10^{-3} C + 23 \text{ pF}$		
		(0.33 to 1.09999) μF	$1.9 \times 10^{-3} C + 0.78 \text{ nF}$		
		(1.1 to 3.29999) μF	$1.9 \times 10^{-3} C + 2.3 \text{ nF}$		
		(3.3 to 10.9999) μF	$1.9 \times 10^{-3} C + 7.8 \text{ nF}$		
		(11 to 32.9999) μF	$3.1 \times 10^{-3} C + 23 \text{ nF}$		
		(33 to 109.999) μF	$3.5 \times 10^{-3} C + 78 \text{ nF}$		
		(110 to 329.999) μF	$3.5 \times 10^{-3} C + 0.23 \mu F$		
		(0.33 to 1.09999) mF	$3.5 \times 10^{-3} C + 0.78 \mu F$		
		(1.1 to 3.29999) mF	$3.5 \times 10^{-3} C + 2.3 \mu F$		
		(3.3 to 10.9999) mF	$3.5 \times 10^{-3} C + 7.8 \mu F$		
		(11 to 32.9999) mF	$5.8 \times 10^{-3} C + 23 \mu F$		
		(33 to 110) mF	$8.5 \times 10^{-3} C + 80 \mu F$		
Electrical	Frequency - Source	(0.01 to 119.99) Hz	$1.9 \times 10^{-6} + 3.9 \mu \text{Hz}$	GMES-LAB-ECP-07:2018	P/S
		(120.0 to 1199.9) Hz	$1.9 \times 10^{-6} + 3.9 \mu \text{Hz}$		
		(1.200 to 11.999) kHz	$1.9 \times 10^{-6} + 3.9 \mu \text{Hz}$		
		(12.00 to 119.99) kHz	$1.9 \times 10^{-6} + 3.9 \mu \text{Hz}$		
		(120.0 to 1199.9) kHz	$1.9 \times 10^{-6} + 3.9 \mu \text{Hz}$		
		(1.200 to 2.000) MHz	$1.9 \times 10^{-6} + 3.9 \mu \text{Hz}$		
Electrical	DC Current / Clamp Meters	(0 to 54.9995) A	$2.5 \times 10^{-3} I + 50 \text{ mA}$	GMES-LAB-ECP-05:2018	P/S
		(55 to 149.9995) A	$2.5 \times 10^{-3} I + 50 \text{ mA}$		
		(150 to 549.995) A	$2.5 \times 10^{-3} I + 60 \text{ mA}$		
		(550 to 1025) A	$2.7 \times 10^{-3} I + 60 \text{ mA}$		
Electrical	AC Current / Clamp Meters	Frequency: (45 to 65) Hz		GMES-LAB-ECP-05 :2018	P/S
		(0 to 54.9995) A	$2.5 \times 10^{-3} I + 50 \text{ mA}$		
		(55 to 149.9995) A	$2.6 \times 10^{-3} I + 50 \text{ mA}$		
		(150 to 549.995) A	$2.6 \times 10^{-3} I + 0.11 \text{ A}$		
		(550 to 1025) A	$2.8 \times 10^{-3} I + 0.25 \text{ A}$		
Electrical	DC Voltage - Measure	(0 to 100) mV	$40 \times 10^{-6} U + 8.7 \mu V$	GMES-LAB-ECP-04 :2018	P/S
		> 100 mV to 1 V	$20 \times 10^{-6} U + 9.1 \mu V$		
		(> 1 to 10) V	$16 \times 10^{-6} U + 25 \mu V$		
		(> 10 to 100) V	$38 \times 10^{-6} U + 0.61 \text{ mV}$		
		> 100 V to 1 kV	$38 \times 10^{-6} U + 6.1 \text{ mV}$		
		(> 1 to 20) kv	$38 \times 10^{-6} U + 6.1 \text{ mV}$		
Electrical	DC Current - Measure	(0 to 1) μA	$0.51 \times 10^{-3} I + 0.11 \text{ nA}$	GMES-LAB-ECP-05:2018	P/S
		(> 1 to 10) μA	$0.51 \times 10^{-3} I + 0.21 \text{ nA}$		

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
		(> 10 to 100) μ A	$0.51 \times 10^{-3} I + 1.1 \text{ nA}$		
		> 100 μ A to 1 mA	$0.51 \times 10^{-3} I + 0.11 \mu\text{A}$		
		(> 1 to 10) mA	$0.51 \times 10^{-3} I + 2.1 \mu\text{A}$		
		(> 10 to 100) mA	$0.51 \times 10^{-3} I + 5.1 \mu\text{A}$		
		> 100 mA to 1 A	$0.82 \times 10^{-3} I + 0.12 \text{ mA}$		
		(> 1 to 3) A	$2.1 \times 10^{-3} I + 0.63 \text{ mA}$		
		(> 3 to 10) A	$1.2 \times I + 1 \text{ mA}$		
		> 10 to 2 kA	$1.2 \times I + 1 \text{ mA}$		
Electrical	Resistance - Measure	(0 to 100) Ω	$60 \times 10^{-6} R + 42 \text{ m}\Omega$	GMES-LAB-ECP-06:2018	P/S
		> 100 Ω to 1 k Ω	$40 \times 10^{-6} R + 52 \text{ m}\Omega$		
		(> 1 to 10) k Ω	$40 \times 10^{-6} R + 50 \text{ m}\Omega$		
		(> 10 to 100) k Ω	$40 \times 10^{-6} R + 0.51 \Omega$		
		> 100 k Ω to 1 M Ω	$70 \times 10^{-6} R + 5.1 \Omega$		
		(> 1 to 10) M Ω	$0.31 \times 10^{-3} R + 0.12 \text{ k}\Omega$		
		(> 10 to 100) M Ω	$3.1 \times 10^{-3} R + 1.2 \text{ k}\Omega$		
Electrical	AC Voltage - Measure	(> 1 to 20) kv @50Hz to 1kHz	$0.71 \times 10^{-3} U + 0.21 \text{ V}$	GMES-LAB-ECP-04:2018	P/S
		(1 to 100) mV		GMES-LAB-ECP-04:2018	P/S
		(3 to 5) Hz	$5.1 \times 10^{-3} U + 20 \mu\text{V}$		
		(> 5 to 10) Hz	$1.1 \times 10^{-3} U + 20 \mu\text{V}$		
		> 10 Hz to 20 kHz	$0.51 \times 10^{-3} U + 20 \mu\text{V}$		
		(> 20 to 50) kHz	$0.71 \times 10^{-3} U + 40 \mu\text{V}$		
		(> 50 to 100) kHz	$1.5 \times 10^{-3} U + 60 \mu\text{V}$		
		(> 100 to 300) kHz	$10 \times 10^{-3} U + 0.11 \text{ mV}$		
		> 100 mV to 1 V			
		(3 to 5) Hz	$5.1 \times 10^{-3} U + 0.21 \text{ mV}$		
		(> 5 to 10) Hz	$1.1 \times 10^{-3} U + 0.21 \text{ mV}$		
		> 10 Hz to 20 kHz	$0.51 \times 10^{-3} U + 0.21 \text{ mV}$		
		(> 20 to 50) kHz	$0.71 \times 10^{-3} U + 0.31 \text{ mV}$		
		(> 50 to 100) kHz	$1.5 \times 10^{-3} U + 0.51 \text{ mV}$		
		(> 100 to 300) kHz	$10 \times 10^{-3} U + 11 \text{ mV}$		
		> 1 to 10) V			
		(3 to 5) Hz	$5.1 \times 10^{-3} U + 21 \text{ mV}$		
		(> 5 to 10) Hz	$1.1 \times 10^{-3} U + 21 \text{ mV}$		
		> 10 Hz to 20 kHz	$0.51 \times 10^{-3} U + 21 \text{ mV}$		
		(> 20 to 50) kHz	$0.71 \times 10^{-3} U + 31 \text{ mV}$		
		(> 50 to 100) kHz	$1.5 \times 10^{-3} U + 51 \text{ mV}$		
		(> 100 to 300) kHz	$10 \times 10^{-3} U + 11 \text{ mV}$		
		> 10 to 100) V			
		(3 to 5) Hz	$5.1 \times 10^{-3} U + 21 \text{ mV}$		
		(> 5 to 10) Hz	$1.1 \times 10^{-3} U + 21 \text{ mV}$		
		> 10 Hz to 20 kHz	$0.51 \times 10^{-3} U + 21 \text{ mV}$		
		(> 20 to 50) kHz	$0.71 \times 10^{-3} U + 31 \text{ mV}$		
		(> 50 to 100) kHz	$1.5 \times 10^{-3} U + 51 \text{ mV}$		
		(> 100 to 300) kHz	$10 \times 10^{-3} U + 0.11 \text{ V}$		
		> 100 V to 1 kV			
		(3 to 5) Hz	$5.1 \times 10^{-3} U + 0.21 \text{ V}$		
		(> 5 to 10) Hz	$1.1 \times 10^{-3} U + 0.21 \text{ V}$		
		> 10 Hz to 20 kHz	$0.51 \times 10^{-3} U + 0.21 \text{ V}$		
		(> 20 to 50) kHz	$0.71 \times 10^{-3} U + 0.21 \text{ V}$		
(> 50 to 100) kHz	$1.5 \times 10^{-3} U + 0.38 \text{ V}$				
(> 100 to 300) kHz	$10 \times 10^{-3} U + 0.75 \text{ V}$				
Electrical	AC Current - Measure	(0 to 100) μ A		GMES-LAB-ECP-05:2018	P/S
		3 Hz to 5 kHz	$1.1 \times 10^{-3} I + 40 \text{ nA}$		

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
		(> 5 to 10) kHz	$1.1 \times 10^{-3} I + 40 \text{ nA}$	GMES-LAB-ECP-05:2018	P/S
		> 100 μA to 1 mA			
		3 Hz to 5 kHz	$1.1 \times 10^{-3} I + 0.41 \mu\text{A}$		
		(> 5 to 10) kHz	$1.1 \times 10^{-3} I + 0.41 \mu\text{A}$		
		(> 1 to 10) mA			
		3 Hz to 5 kHz	$1.1 \times I + 4.1 \mu\text{A}$		
		(> 1 to 10) mA			
		(> 5 to 10) kHz	$1.1 \times I + 4.1 \mu\text{A}$		
		(> 10 to 100) mA			
		3 Hz to 5 kHz	$1.1 \times 10^{-3} I + 41 \mu\text{A}$		
		(> 5 to 10) kHz	$1.1 \times 10^{-3} I + 41 \mu\text{A}$		
		> 100 mA to 1 A			
		3 Hz to 5 kHz	$1.1 \times 10^{-3} I + 0.41 \text{ mA}$		
		(> 5 to 10) kHz	$1.1 \times 10^{-3} I + 0.41 \text{ mA}$		
		(> 1 to 3) A			
		3 Hz to 5 kHz	$2.3 \times 10^{-3} I + 1.2 \text{ mA}$		
		(> 5 to 10) kHz	$2.3 \times 10^{-3} I + 1.2 \text{ mA}$		
		(> 3 to 10) A			
		3 Hz to 5 kHz	$1.5 \times I + 4.1 \text{ mA}$		
		(> 5 to 10) kHz	$1.5 \times I + 4.1 \text{ mA}$		
> 10 A to 2 kA		GMES-LAB-ECP-05:2018	P/S		
(50 to 1) kHz	$1.5 \times I + 4.1 \text{ mA}$				
Electrical	Capacitance - Measure	(0 to 1) nF	$5.1 \times 10^{-3} C + 51 \text{ pF}$	GMES-LAB-ECP-07:2018	P/S
		(> 1 to 10) nF	$4.1 \times 10^{-3} C + 10 \text{ pF}$		
		(> 10 to 100) nF	$4.1 \times 10^{-3} C + 0.11 \text{ pF}$		
		> 100 to 1) μF	$4.1 \times 10^{-3} C + 11 \text{ nF}$		
		(> 1 to 10) μF	$4.1 \times 10^{-3} C + 10 \text{ nF}$		
		(> 10 to 100) μF	$4.1 \times 10^{-3} C + 0.11 \mu\text{F}$		
Electrical	Frequency - Measure	(3 to 40) Hz	$0.71 \times 10^{-3} f$	GMES-LAB-ECP-07:2018	P/S
		(> 40 to 100) Hz	$0.31 \times 10^{-3} f$		
		(> 100 to 1) kHz	$0.11 \times 10^{-3} f$		
		(> 1 to 300) kHz	$0.11 \times 10^{-3} f$		
Electrical	DC Power - Source	(0 to 336.5) W	$0.18 \times 10^{-3} P$	GMES-LAB-ECP-10:2018	P/S
		> 336.5 W to 3.06 kW	$0.17 \times 10^{-3} P$		
		(> 3.06 to 20.9) kW	$0.54 \times 10^{-3} P$		
Electrical	Defibrillator	(0 to 360) J	$0.5\% * J$	GMES-LAB-ECP-17:2018	P/S
Electrical	AC Power - Source	Frequency: (45 to 65) Hz, PF=1		GMES-LAB-ECP-10:2018	P/S
		(0 to 2.97) mW	$1.1 \times 10^{-3} P$		
		(> 2.97 to 10.89) mW	$0.81 \times 10^{-3} P$		
		(> 10.89 to 29.69) mW	$1.1 \times 10^{-3} P$		
		(> 29.69 to 108.89) mW	$0.81 \times 10^{-3} P$		
		(> 108.89 to 296.97) mW	$1.1 \times 10^{-3} P$		
		(> 296.97 to 725.96) mW	$0.81 \times 10^{-3} P$		
		> 725.96 mW to 1.48 W	$1.1 \times 10^{-3} P$		
		(> 1.48 to 6.76) W	$0.81 \times 10^{-3} P$		
		(> 6.76 to 9.17) W	$0.92 \times 10^{-3} P$		
		(> 9.17 to 33.66) W	$0.63 \times 10^{-3} P$		
		(> 33.66 to 91.79) W	$0.92 \times 10^{-3} P$		
		(> 91.79 to 336.59) W	$0.63 \times 10^{-3} P$		
		(> 336.59 to 917.90) W	$0.82 \times 10^{-3} P$		
		> 917.90 W to 2.24 kW	$0.75 \times 10^{-3} P$		
		(> 2.24 to 4.59) kW	$0.92 \times 10^{-3} P$		
(> 4.59 to 20.9) kW	$0.82 \times 10^{-3} P$				

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
Electrical	Thermocouple – Simulation (source / Measurement)	B Type		GMES-LAB-ECP-13:2018 GMES-LAB-ECP-14:2018	P/S
		(600 to 1820) °C	0.5 °C		
		C Type			
		0 to 2316 °C	0.5 °C		
		E Type			
		(-250 to 1000) °C	0.5 °C		
		J Type			
		(-210 to -100) °C	0.21 °C		
		(> -100 to -30) °C	0.12 °C		
		(> -30 to 150) °C	0.11 °C		
		(> 150 to 760) °C	0.13 °C		
		(> 760 to 1200) °C	0.18 °C		
		K Type			
		(-200 to 1372) °C	0.5 °C		
		L Type			
		(-200 to 900) °C	0.5 °C		
		N Type			
		(-200 to 1300) °C	0.5 °C		
		R Type			
		(0 to 1767) °C	0.5 °C		
S Type					
(0 to 1767) °C	0.5 °C				
T Type					
(-250 to 400) °C	0.5 °C				
U Type					
(-200 to 600) °C	0.43 °C				
Electrical	RTD - Simulation	Pt 385, 100 Ω		GMES-LAB-ECP-13:2018 GMES-LAB-ECP-14:2018	P/S
		(-200 to 800) °C	0.5 °C		
		Pt 3926, 100 Ω			
		(-200 to 630) °C	0.04 °C		
		Pt 3916, 100 Ω			
		(-200 to 630) °C	0.5 °C		
		Pt 385, 200 Ω			
		(-200 to 630) °C	0.5 °C		
		Pt 385, 500 Ω			
		(-200 to 630) °C	0.5 °C		
		Pt 385, 1000 Ω			
		(-200 to 630) °C	0.5 °C		
		Pt-Ni 385, 120 Ω (Ni120)			
		(-80 to 260) °C	0.5 °C		
Cu 427, 10 Ω					
(-100 to 260) °C	0.5 °C				
Electrical	Oscilloscope	(0 to 100) V	0.6%	GMES-LAB-ECP-01:2018 GMES-LAB-ECP-07:2018	P/S
		10 ns to 5 s (0 to 600) MHz			
Time	Timer / stopwatch	(60 to 36000) s	0.6 s	GMES-LAB-ECP-16:2018	P/S
Rotational speed	Tachometer/ Rotation instrument speed (non-contact)	(60 to 99000) rpm	1 rpm + 1 digit	GMES-LAB-ECP-15:2018	P/S

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
Dimensional	Calipers	(0 – 300) mm	0.02 mm	GMES-LAB-DCP-02:2018	P
	External Micrometer	(0 – 25) mm	3.5 µm	GMES-LAB-DCP-01:2018	P
	Dial Gauge	(0 – 25) mm	3.5 µm	GMES-LAB-DCP-03:2018	P
Pressure - Pneumatic	Pressure gauges Transducers	(0 to 28) bar	1.0 * 10 ⁻⁴ * Pe + 0.5 mbar	DKD-R-6-1:2014	P
		(0 to 350) bar	0.02 %		P/S
Pressure - Hydraulic	Calibrators Switches	(1 to 60) bar	2.0 * 10 ⁻⁴ * Pe + 2.0 mbar		P
		(> 60 to 1200) bar	3.5 * 10 ⁻⁴ * Pe + 15 mbar		
Pressure - Vacuum		(0 to 350) bar	0.02 %	DKD-R-6-2:2014	P/S
		(-0.9 to 0) bar	0.02 %		
Flow	Gas Flow	(0 to 1) L/min (> 1 to 20) L/min (> 20 to 500) L/min	0.5 %	GMES-LAB-FCP-02:2018	P/S
Temperature	Dry Block Calibrators	(-40 to 150) °C	0.08 °C	GMES-LAB-TCP-02:2018	P/S
		(> 150 to 400) °C	0.15 °C		
		(> 400 to 500) °C	0.25 °C		
		(> 500 to 660) °C	0.5 °C		
	Calibration of Thermocouple / RTD with indicator	(-40 to 300) °C	0.08 °C	GMES-LAB-TCP-06:2018	P/S
		(> 300 to 660) °C	0.15 °C		
	IR Thermometer	(35 to 120) °C	1.5 °C	GMES-LAB-TCP-04:2018	P
		(> 120 to 500) °C	3.5 °C		
	Air Temperature Sensors	(-40 to 150) °C	0.20 °C	GMES-LAB-TCP-07:2018	P
	(single point measurement) Liquid bath	(-30 to 250) °C	0.10 °C	GMES-LAB-TCP-01:2018	P/S
(16 points measurements) Freezers, Refrigerator, Incubator, cold room, cold storage box, Autoclave, Oven, dryer, chamber	(-40 to 50) °C	0.3 °C	GMES-LAB-TCP-01:2018	P/S	
	(> 50 to 400) °C	0.6 °C	GMES-LAB-TCP-01:2018	P/S	
Humidity	Relative Humidity Sensors	Air Temperature: (20 to 30) °C		GMES-LAB-TCP-07:2018	P
		(10 to 90) %RH	2 % RH		
Mass	Weighing Balance	(0 to 50) g	0.3 mg	GMES-LAB-WCP-01:2018	S
		(> 50 to 200) g	1 mg		
		(> 200 to 500) g	2.5 mg		
		> 500 g to 1 kg	5 mg		
		(> 1 to 20) kg	3 g		
		(> 20 to 50) kg	8 g		
		(> 50 to 100) kg	16 g		
		(> 100 to 200) kg	30 g		
(> 200 to 300) kg	46 g				

Calibration Field/ Quantity/ Property	Measurand / Equipment	Measuring Range	CMC (k=2)	Calibration Method (standard/ internal procedure)	Permanent lab (P) / Client-site (S)
Volume	Micropipette Glass wares Pipettes Burettes Flasks Beakers Measuring Cylinder Measuring Jar	(10 to 100) μ l > 100 μ l to 1 ml (> 1 to 10) ml (> 10 to 20) ml (> 20 to 50) ml (> 50 to 100) ml	4 μ l 6 μ l 6 μ l 6 μ l 6 μ l 6 μ l	GMES-LAB-VCP-01:2018	P
End					

U= Measured Voltage Value

I= Measured Current Value

R= Measured Resistance Value

C= Measured Capacitance Value

f= Sourced Frequency Value

P= Measured Power Value

Pe = Measured pressure value