



NATIONAL
ACCREDITATION
CENTER

ACCREDITATION Certificate

TO BE ACTIVE AS CALIBRATION LABORATORY

Rezonans Biyomedikal Kalibrasyon Elektronik Teknolojileri San. ve Tic. Ltd.Şti.

Yazlık yeni mah. Osmanlı Cad. No:5 D:1 Gölcük / KOCAELİ- TÜRKİYE

As a result of the assessment conducted by the NAC National Accreditation Center LLC, this laboratory is accredited in accordance with the ISO/IEC 17025:2017 standard, which specifies the general requirements for the competence of testing and calibration laboratories, as detailed in the annexes.

Accreditation Number : NAC-008- CL

Initial Accreditation Date : 14.September .2023

Current Accreditation Cycle : 14. September .2023- 14. September .2027

This certificate is valid until 14. September 2027, provided that the above-mentioned name and address continue to comply with the relevant standards, as well as international and regional regulations, in addition to the organization's documented compliance with ISO/IEC 17025:2017 General Requirements for the competence of testing and calibration laboratories.




This certificate is given by NAC. The certificate becomes invalid in case of suspension and cancellation of accreditation. For current accreditation information, visit www.nac-us.org or communicate with NAC on info@nac-us.org.



Gaynor
PRESIDENT

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SCOPE OF ACCREDITATION


 <p>CALIBRATION LABORATORY ISO/IEC 17025:2017 NAC-008-CL</p>	NAC ACCREDITATION NUMBER	NAC-008-CL		
	COMPANY NAME	Rezonans Biyomedikal Kalibrasyon Elektronik Teknolojileri San. ve Tic. Ltd.Şti.		
	ADDRESS	Yazlık yeni mah. Osmanlı Cad. No:5 D:1 Gölcük / KOCAELİ		
	CONTACT NAME	Alper ÖZBEK		
	TELEPHONE	+ 90 262 412 88 86		
	CURRENT ACCREDITATION DATE	14.09.2023		
	ACCREDITATION STANDARD	ISO/IEC 17025:2017		
Accreditation Area		General requirements for the competence of testing and calibration laboratories		
Accreditation Standard		ISO/IEC 17025:2017		
CALIBRATION & MEASUREMENT CAPABILITY (CMC)				
CALIBRATION AREA	RANGE & RESOLUTION	MEASUREMENT REQUIREMENTS	EXPANDED UNCERTAINTY (±)	TECHNIQUE. REFERENCE STANDARD. EQUIPMENT

Caliper (outside diameter, inside diameter, depth, step measurements)	$0\text{ mm} < L \leq 100\text{ mm}$	Resolution 0,01 mm	$(15,9 + 7,2 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Part 9.1 and DIN 862 <i>L</i> : measured value
Caliper (outside diameter, inside diameter, depth, step measurements)	$100\text{ mm} < L \leq 1000\text{ mm}$	Resolution 0,01 mm	$(15,9 + 29,5 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Part 9.1 and DIN 862 <i>L</i> : measured value
Depth Caliper	$0\text{ mm} < L \leq 100\text{ mm}$	Resolution 0,01 mm	$(15,9 + 7,2 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Part 9.2 and DIN 862 <i>L</i> : measured value
Depth Caliper	$100\text{ mm} < L \leq 1000\text{ mm}$	Resolution 0,01 mm	$(15,9 + 29,5 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Part 9.2 and DIN 862 <i>L</i> : measured value



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Height Gauge	$0\text{ mm} < L \leq 100\text{ mm}$	Resolution 0,01 mm	$(15,9 + 7,2 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Part 9.3 L: measured value
Height Gauge	$100\text{ mm} < L \leq 1000\text{ mm}$	Resolution 0,01 mm	$(15,9 + 29,5 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Part 9.3 L: measured value
Outside Micrometer	$0\text{ mm} < L \leq 100\text{ mm}$	Resolution 0,001 mm	$(2,1 + 31,9 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Parts 10.1 and 10.3 L: measured value
Outside Micrometer	$100\text{ mm} < L \leq 1000\text{ mm}$	Resolution 0,001 mm	$(2,1 + 46,9 \cdot L)\ \mu\text{m}$	Calibration procedure prepared per VDI/VDE/DGQ 2618 Parts 10.1 and 10.3 L: measured value



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Steel Rule, Workshop Rule	$0\text{ mm} < L \leq 2000\text{ mm}$	Length measurement by comparison with reference ruler	$L = [m] (435,4 + 84,5 \cdot L) \mu\text{m}$	Calibration procedure per DIN 865 and DIN 866 L: measured value
Tape Measure (field/workshop/pi type), (Geodetic) Wire	$0\text{ mm} < L \leq 50000\text{ mm}$	Length measurement by comparison with reference ruler	$L = [m] (436 + 85 \cdot L) \mu\text{m}$	Calibration procedure per TS 9505 L: measured value
Thickness Gauge (Feeler gauge, etc.)	$0,01\text{ mm} \leq L \leq 2\text{ mm}$	Thickness measurement	$L = [m] (2,5 + 3,7 \cdot L) \mu\text{m}$	Calibration procedure per DIN 2275 L: measured value
Lever Dial Indicator External contact probes	$0\text{ mm} \leq L \leq 100\text{ mm}$	0,001mm 0,01mm	$(2 + 31,8 \cdot L) \mu\text{m}$ $(10,2 + 10,7) \mu\text{m}$	L: measured length (m). VDI/VDE/DGQ 2618 Part 12.1. Performed in laboratory
Dial Indicator (Comparator)	$L \leq 25\text{ mm}$	0,002mm	2,1 μm	Calibration procedure per VDI/VDE/DGQ 2618 Part 11.1 and DIN 878 L: measured value



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Coating Thickness Standard Foil	≤5mm	Thickness measurement	2,0µm	DIN EN ISO 2178 / DIN EN ISO 2360 Performed in laboratory
Coating Thickness Gauge	5µm<L≤5000µm	Resolution 0,0001mm	1,2µm	DIN EN ISO 2178 / DIN EN ISO 2360 Performed in laboratory
Ultrasonic Thickness Gauge	1 mm ≤ L ≤ 200 mm		L: m (1,3 + 29,5·L) µm	Comparison with parallel gauge blocks L: measured value
Ultrasonic Thickness Block	0,1m < L ≤ 50mm		2,5 µm	DIN EN ISO 2400 Direct measurement Performed in laboratory
Laser Distance Meter	0,1m < L ≤ 50m		4 mm	Comparison method with reference laser distance meter. Performed in laboratory
Sieve	5mm<L≤125mm	Determination of aperture size and wire diameter	30µm	ISO 3310-1 / ISO 3310-2 / EN 933-3. Performed in laboratory



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Balance –Non-automatic Weighing Instruments	0,001 g ≤ m ≤ 500 g 1 g ≤ m ≤ 40 kg 10 kg ≤ m ≤ 1000 kg 1000 kg ≤ m ≤ 5000 kg	E ₂ sınıfı Kütle F ₁ sınıfı Kütle M ₁ sınıfı Kütle ile İkame Kütlelerle	1,9·10 ⁻⁶ 1·10 ⁻⁵ 9,5·10 ⁻⁵ 1,1·10 ⁻³	Calibration performed at the location of use per EURAMET cg-18. m: mass. Performed on-site
Temperature – Controlled Volumes (Temperature Distribution) – Muffle Furnace	300°C ≤ T ≤ 600°C 600°C ≤ T ≤ 1200°C	Axial temperature distribution	3,26 °C 3,61 °C	Per EURAMET cg-20 and DKD-R 5-7 guides. Performed on-site with portable calibration system. T: Temperature
Temperature – Controlled Volumes (Temperature Distribution) – Oven / Incubator / Cold Room (deep freezer, etc.) / Climatic Chamber / Liquid Bath / Furnace / Autoclave / Infant Incubator / Radiant Warmer	-30°C ≤ T ≤ 95°C 95°C ≤ T ≤ 250°C		0,50°C 0,84°C	Per EURAMET cg-20 and DKD-R 5-7 guides. Performed on-site with portable calibration system. T: Temperature



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Resistance Thermometers – Industrial Platinum Resistance Thermometer (PRT)	-80 °C ≤ T ≤ -40 °C	Liquid bath	0,15 °C	Comparison with reference PRT 100 Ω thermometer. Performed in laboratory or on-site. T: Temperature
	-40 < T ≤ 50 °C	Liquid bath	0,07 °C	
	50 < T ≤ 450 °C	Dry-block calibrator	0,17 °C	
Thermocouples	-80 °C ≤ T ≤ -40 °C	Liquid bath	0,16 °C	Comparison with reference PRT 100 Ω thermometer. Performed in laboratory or on-site. T: Temperature
	-40 < T ≤ 50 °C	Liquid bath	0,08 °C	
	50 < T ≤ 450 °C	Dry-block calibrator	0,18 °C	
	450 °C < T ≤ 1200 °C	Dry-block calibrator Type K	3,4 °C	



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Temperature Indicators with Display (with resistance sensor)	-80 °C ≤ T ≤ -40 °C	Liquid bath	0,15 °C	Comparison with reference PRT 100 Ω thermometer. Performed in laboratory or on-site. T: Temperature
	-40 < T ≤ 50 °C	Liquid bath	0,07 °C	
	50 < T ≤ 450 °C	Dry-block calibrator	0,17 °C	
Temperature Indicators with Display (with thermistor, resistance, or thermocouple sensor)	-80 °C ≤ T ≤ -40 °C	Liquid bath	0,15 °C	Comparison with reference PRT 100 Ω thermometer. Performed in laboratory or on-site. T: Temperature
	-40 < T ≤ 50 °C	Liquid bath	0,07 °C	
	50 < T ≤ 450 °C	Dry-block calibrator	0,17 °C	
	450 °C < T ≤ 1200 °C	Dry-block calibrator	3,4 °C	



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Temperature Indicators and Calibrators – Temperature Indicator	100°C≤T≤ 1820°C	B	0,6°C	Calibration procedure per EURAMET cg-11. Electrical simulation. Performed on-site or in laboratory. T: Temperature
	-270°C≤T≤1000°C	E	0,4°C	
	-210°C≤T≤1200°C	J	0,4°C	
	-270°C≤T≤1372°C	K	0,4°C	
	-270°C≤T≤1300°C	N	0,4°C	
	-50°C≤T≤1760°C	R	0,6°C	
	-50°C≤T≤1760°C	S	0,6°C	
	-270°C≤T≤400°C	T	0,4°C	
	-200°C≤T≤800°C	Pt385 100Ω	0,26°C	
Hygrometers – Analog & Digital Thermometers	5°C≤ T ≤ 35°C		0,5°C	Comparative calibration using humidity chamber and reference temperature-humidity meter T: measured temperature Performed in laboratory



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Hygrometers – Relative Humidity Meters (capacitive, resistive, thermograph, mechanical, wet/dry bulb) – Analog & Digital	20%rh ≤ RH ≤ 80%rh		1,90 %rh	Humidity chamber and reference temperature-humidity meter. RH: Measured relative humidity value. Comparative calibration at 23 ± 3 °C. Calibration performed in the laboratory.
Industrial Radiation Thermometers – Thermal Camera / IR Thermometer	50°C ≤ T ≤ 200°C 200°C < T ≤ 500°C	ε = 0,95 emissivity	2,7 °C 2,8°C	Comparative calibration with reference blackbody. Performed in laboratory.
Gauge Pressure – Analog Manometer, Digital Manometer, Differential Pressure Gauge, Pressure Transmitter, Pressure Sensors	-0,85bar ≤ p ≤ 0,1bar 0,1bar ≤ p < 20bar 20 bar ≤ p < 600bar 100 bar ≤ p ≤ 700bar	pneumatic – negative pneumatic Hydraulic / Deionized Water Hydraulic / Deionized Water	0,0006bar 0,0022bar 0,102 bar 0,4 bar	Calibration procedure per EURAMET cg-17 and DKD-R 6-1. Performed on-site and in laboratory. p: Pressure



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Torque – Torque Hand Tools (devices within ISO 6789 scope)	5N·m ≤ M ≤ 1000N·m	Clockwise and counterclockwise	1,0 %	Calibration per ISO 6789-1 and ISO 6789-2. Performed in laboratory. M: Measurement value
LCR – AC Resistance Meters / LCR Meter (AC Resistance)	10,0 Ω ≤ R ≤ 100k Ω	1 kHz	7,4·10 ⁻³ · R	LCR meter. R: applied value; f: applied value. Performed on-site and in laboratory
LCR – Capacitance Capacitors / Capacitance Standards / Capacitance Boxes / LCR Meter	1nF ≤ C ≤ 1 μF	1 kHz	1,1·10 ⁻² · C	LCR meter. C: applied value; f: applied value. Performed on-site and in laboratory
LCR – Inductance (Inductance Meters / Inductor / Inductor Standard / Inductance Box)	100 mH ≤ L ≤ 1 H	1 kHz	2,0 · 10 ⁻³ · L	LCR meter. L: applied value; f: applied value. Performed on-site and in laboratory



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Frequency Meters – Optical (non-contact) Tachometer	60rpm ≤ ω ≤ 1000rpm	r : 0,01 rpm	1,2·10 ⁻³ ω+0,2 rpm	ω: Measured Speed (rpm); r: Resolution. Comparison using frequency source and optical transducer. Calibration performed in the laboratory.
	60 rpm ≤ ω ≤ 100000rpm		1,6·10 ⁻³ ω+0,1 rpm	
Frequency Meters – Optical (non-contact) Tachometer RPM Generators (centrifuge, mixers, rotating machines, stroboscope, etc.)	60 rpm ≤ ω ≤ 99999rpm	r :0,1rpm	6,0·10 ⁻⁴ ω+0,2 rpm	ω: Measured Speed (rpm); r: Resolution. Comparative measurement using reference tachometer. Calibration performed in the laboratory.
Electrical – RF Power Absolute RF Power RF Power Sources RF Power Meters Spectrum Analyzers EMC Sources RF Antenna meters	1 nW ≤ P ≤ 100 mW (-60 dBm ≤ P ≤ +20 dBm)	100kHz ≤ f ≤ 30 MHz	80 mW/W (0,35 dBm)	HP 8482A Power Sensor HP/Agilent E4418B Power Meter – Direct and comparative measurement. Calibration performed in the laboratory and on-site.
		30 MHz < f ≤ 100 MHz	71 mW/W (0,31 dBm)	
		100 MHz < f ≤ 500 MHz	71,1 mW/W (0,31 dBm)	
		500 MHz < f ≤ 1 GHz	70,8 mW/W (0,30 dBm)	
		1 GHz < f ≤ 2 GHz	66,1 mW/W (0,28 dBm)	
		2 GHz < f ≤ 3 GHz	82,9 mW/W (0,35 dBm)	



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RF site master		3 GHz < f ≤ 4 GHz	97,7 mW/W (0,42 dBm)	HP 8481B Power Sensor
GSM test set		4 GHz < f ≤ 5 GHz	104,1 mW/W (0,442 dBm)	
Attenuators		5 GHz < f ≤ 6 GHz	104,3 mW/W (0,442 dBm)	
Network Analyzer		6 GHz < f ≤ 18 GHz	109,5 mW/W (0,46 dBm)	
Electrical				
DC Voltage Sources	0mV ≤ U < 100mV 0,1V ≤ U < 1V 1V ≤ U < 10V		8,1·10 ⁻⁵ ·U + 5,4μV 6,6·10 ⁻⁵ ·U + 9,4μV 7,1·10 ⁻⁵ ·U + 39μV	Direct measurement with Fluke 8846A DMM.
Calibrators: DC Voltage	10V ≤ U < 100V 100V ≤ U ≤ 1000V		8,3·10 ⁻⁵ ·U + 0,58 mV 7,9·10 ⁻⁵ ·U + 10mV	Performed in laboratory.



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	COMPANY NAME	Rezonans Biyomedikal Kalibrasyon Elektronik Teknolojileri San. ve Tic. Ltd.Şti.		
	ADDRESS	Yazlık yeni mah. Osmanlı Cad. No:5 D:1 Gölcük / KOCAELİ		
	CONTACT NAME	Alper ÖZBEK		
	TELEPHONE	+ 90 262 412 88 86		
	CURRENT ACCREDITATION DATE	14.09.2023		
	ACCREDITATION STANDARD	ISO/IEC 17025:2017		
Accreditation Area		General requirements for the competence of testing and calibration laboratories		
Accreditation Standard		ISO/IEC 17025:2017		
CALIBRATION & MEASUREMENT CAPABILITY (CMC)				
CALIBRATION AREA	RANGE & RESOLUTION	MEASUREMENT REQUIREMENTS	EXPANDED UNCERTAINTY (±)	TECHNIQUE. REFERENCE STANDARD. EQUIPMENT
DC Voltage – DC Voltage Meters Multimeter: DC Voltage Multifunction Transfer Standard: DC Voltage Microvoltmeter, Millivoltmeter, DC Voltmeter	$0mV \leq U < 200mV$ $0,2V \leq U < 2V$ $2V \leq U < 10V$ $10V \leq U < 30V$ $30V \leq U < 100V$ $100V \leq U < 300V$ $300V \leq U < 600V$ $300V \leq U \leq 1000V$		$3,5 \cdot 10^{-4} \cdot U + 46 \text{ mV}$ $3,5 \cdot 10^{-4} \cdot U + 0,47 \text{ mV}$ $3,5 \cdot 10^{-4} \cdot U + 2,3 \text{ mV}$ $3,5 \cdot 10^{-4} \cdot U + 7 \text{ mV}$ $3,5 \cdot 10^{-4} \cdot U + 23 \text{ mV}$ $3,5 \cdot 10^{-4} \cdot U + 70 \text{ mV}$ $3,5 \cdot 10^{-4} \cdot U + 0,14 \text{ V}$ $3,5 \cdot 10^{-4} \cdot U + 0,23 \text{ V}$	With electrical calibrator. U: applied value. Performed on-site and in laboratory
AC Voltage – AC Voltage Sources Multimeter: AC Voltage AC Voltmeter	$10mV \leq U < 100mV$ $0,1V \leq U < 1V$ $1V \leq U < 10V$ $10V \leq U < 100V$ $100V \leq U < 1000V$	$50Hz \leq f \leq 20 \text{ kHz}$	$7,0 \cdot 10^{-4} \cdot U + 47 \mu V$ $5,0 \cdot 10^{-5} \cdot U + 9,5 \text{ mV}$ $3,9 \cdot 10^{-4} \cdot U + 11 \text{ mV}$ $1,1 \cdot 10^{-3} \cdot U + 33 \text{ mV}$ $3,2 \cdot 10^{-3} \cdot U + 27 \text{ mV}$	U: Measured Voltage (V). Direct measurement with Fluke 8846A DMM. Calibration performed in the laboratory.



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AC Voltage Meters – Multimeter (AC Voltage) AC Voltmeter Oscilloscope	20mV≤ U<200mV 0,2V≤ U<2V 2V≤U<10V 10V≤U<30V 30V≤ U<100V 100V≤ U<300V 300V≤ U<600V 600V≤ U≤1000V	45 Hz ≤ f ≤ 1 kHz	7,4·10 ⁻⁴ ·U +64μV 7,4·10 ⁻⁴ · U +0,42 mV 1,5·10 ⁻³ · U +1,4mV 7,6 ·10 ⁻⁴ · U +6 mV 1,9·10 ⁻³ ·U +12 mV 9,8 ·10 ⁻⁴ · U +54 mV 7,8 ·10 ⁻⁴ · U +0,12V 6,5 ·10 ⁻⁴ · U +0,26V	With electrical calibrator. U: applied value. Performed on-site and in laboratory.
DC High Voltage – DC High Voltage Sources	1kV ≤U≤40 kV		0,57 %	High-voltage divider and HV probe. Performed in laboratory.
AC High Voltage - AC High Voltage Sources	1kV ≤U≤40 kV	50Hz	0,76 %	High-voltage divider and HV probe. Performed in laboratory.



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CALIBRATION AREA	RANGE & RESOLUTION	MEASUREMENT REQUIREMENTS	EXPANDED UNCERTAINTY (±)	TECHNIQUE. REFERENCE STANDARD. EQUIPMENT

DC Current – DC Current Sources (DC Current Source, Calibrator; DC High-Current Sources, Welding Machine)	0µA ≤ I < 100µA		5,6.10 ⁻⁴ . I + 40 nA	Direct with Fluke 8846A DMM or Fluke 376 clamp meter. Performed in laboratory. I: Applied current
	0,1mA ≤ I < 1mA		1,3.10 ⁻³ . I + 0,2 µA	
	1mA ≤ I < 10mA		6,0.10 ⁻⁴ . I + 2,3 µA	
	10mA ≤ I < 100mA		5,5.10 ⁻⁴ . I + 18 µA	
	100mA ≤ I < 400mA		5,8.10 ⁻⁴ . I + 23µA	
	0,1A ≤ I < 1A		1,2.10 ⁻³ . I + 0,17 mA	
	0,3A ≤ I < 3A		2,2.10 ⁻³ . I + 0,46 mA	
	3A ≤ I < 10A		2,5.10 ⁻³ . I + 0,46 mA	
	30A ≤ I ≤ 1000A		2,1.10 ⁻² . I + 0,45A	



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CALIBRATION AREA	RANGE & RESOLUTION	MEASUREMENT REQUIREMENTS	EXPANDED UNCERTAINTY (±)	TECHNIQUE. REFERENCE STANDARD. EQUIPMENT

DC Current	0µA ≤ I < 20µA		3,5.10 ⁻⁴ . I + 4,7 nA	With electrical calibrator and 25/50-turn coil.
DC Current Meters	20µA ≤ I < 200µA		3,5.10 ⁻⁴ . I + 47 nA	
Multimeter: DC Current	0,2mA ≤ I < 2mA		3,5.10 ⁻⁴ . I + 0,47 mA	Performed on-site and in laboratory. I: Applied value
	2mA ≤ I < 20mA		3,5.10 ⁻⁴ . I + 4,6 mA	
	20mA ≤ I < 200mA		4,6.10 ⁻⁴ . I + 44 mA	
	0,2A ≤ I < 2A		8,8.10 ⁻⁴ . I + 0,36 mA	
	2A ≤ I < 10A		6,8.10 ⁻⁴ . I + 2,3 mA	
Clampmeter	10 A ≤ I < 30A		1,1.10 ⁻³ . I + 5,3 Ma	
	0,5A ≤ I < 5A	With 25-turn coil	2,4.10 ⁻³ . I + 0,05 A	
	5A ≤ I < 50A		3,9.10 ⁻³ . I + 0,11A	
50A ≤ I < 750A	3,9.10 ⁻³ . I + 0,39A			
EMC Sources	1A ≤ I < 10A	With 50-turn coil	3,7.10 ⁻³ . I + 85 mA	
	10A ≤ I < 100A		3,9.10 ⁻³ . I + 0,11A	
	100A ≤ I < 1500A		3,9.10 ⁻³ . I + 0,39A	



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AC Current	30µA ≤ I < 100µA	50Hz ≤ f ≤ 1 kHz	3,2.10 ⁻¹ . I + 4,5 µA	Direct measurement with Fluke 8846A DMM or Fluke 376 clamp meter.
	0,1mA ≤ I < 1mA		2,4.10 ⁻² . I + 2,7 µA	
AC Current Sources	1mA ≤ I < 10mA	50Hz ≤ f ≤ 1 kHz	2,8.10 ⁻³ . I + 8,3 µA	Performed in laboratory.
	10mA ≤ I < 100mA		3,7.10 ⁻³ . I + 27µA	
AC Current Source, Calibrator: AC Current	0,1A ≤ I < 1A	45Hz - 65Hz	1,1.10 ⁻² . I + 0,37mA	I: Applied current, A
	1A ≤ I < 3A		3,6.10 ⁻³ . I + 0,5 mA	
	3A ≤ I < 10A		2,2.10 ⁻³ . +11mA	
	30A ≤ I ≤ 1000A		1,2.10 ⁻² . I + 3,5 mA	



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AC Current	0,2mA ≤ I < 2mA 2mA ≤ I < 20mA	45Hz ≤ f ≤ 1 kHz	1,0·10 ⁻³ / +1,2 μA 1,4·10 ⁻³ / +3,5 μA	With electrical calibrator and 25/50-turn coil. Performed on-site and in laboratory. I: Applied value
AC Current Meters – Multimeter (AC Current)	20mA ≤ I < 200mA 0,2A ≤ I < 1A 1A ≤ I < 2A 2A ≤ I ≤ 5A 5A ≤ I ≤ 30A		1,6·10 ⁻³ / +28μA 8,7·10 ⁻⁴ / +0,28mA 3,4·10 ⁻⁴ / +22μA 2,2·10 ⁻⁴ / +0,35mA 1,4·10 ⁻⁴ / +7,2mA	
Clamp Meter	0,5A ≤ I < 5A 5A ≤ I < 50A 50A ≤ I < 750A		With 25-turn coil	
	1A ≤ I < 10A 10A ≤ I < 100A 100A ≤ I < 1500A	With 50-turn coil	7,6·10 ⁻³ / +27mA 7,8·10 ⁻³ / +0,2A 7,8·10 ⁻³ / +0,7A	



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AC Power and Energy Active Power: Single Phase Power Meter Wattmeter	1,2 mW ≤ P ≤ 120 W	6-600V / 0,2mA- 200mA	5,1 mW/W	Electrical calibrator with 25/50-turn coil. Performed on-site and in laboratory. /: Applied value
	1,2 W ≤ P ≤ 3000W	6-600V / 0,2A- 5A	4,9 mW/W	
	66 W ≤ P ≤ 18000W	6-600V / 0,11A- 30A	154 mW/W	
	30 W ≤ P ≤ 450 Kw	6-600V / 5A- 750A (With 25-turn coil)	19 mW/W	
	60 W ≤ P ≤ 900 kW	6-600V / 10A- 1500A (With 50-turn coil)	37 mW/W	
		45Hz ≤ f ≤ 65 Hz		



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DC Resistance DC Resistance – Sources Multimeter Multifunction Transfer Standard Ohmmeter	$1\Omega \leq R < 10\Omega$ $10\Omega \leq R < 100\Omega$ $0,1k\Omega \leq R < 1k\Omega$ $1k\Omega \leq R < 10k\Omega$ $10k\Omega \leq R < 100k\Omega$ $0,1M\Omega \leq R < 1M\Omega$ $1M\Omega \leq R < 10M\Omega$ $10M\Omega \leq R < 100M\Omega$		$4,5 \cdot 10^{-4} \cdot R + 37\text{ mOhm}$ $5,5 \cdot 10^{-5} \cdot R + 21\text{ mOhm}$ $2,1 \cdot 10^{-4} \cdot R + 41\text{ mOhm}$ $2,1 \cdot 10^{-4} \cdot R + 0,4\text{ Ohm}$ $1,8 \cdot 10^{-4} \cdot R + 4,4\text{ Ohm}$ $2,6 \cdot 10^{-4} \cdot R + 36\text{ Ohm}$ $1,3 \cdot 10^{-3} \cdot R + 0,4\text{ kOhm}$ $1,3 \cdot 10^{-2} \cdot R + 13\text{ Mohm}$	Direct measurement with Fluke 8846A DMM. Performed in laboratory.
DC Resistance –DC Resistance Meters Multimeter, Resistance Meter, Ohmmeter, Insulation Test Devices	$0\Omega \leq R < 100\Omega$ $100\Omega \leq R < 300\Omega$ $0,3k\Omega \leq R < 1k\Omega$ $1k\Omega \leq R < 3k\Omega$ $3k\Omega \leq R < 10k\Omega$ $10k\Omega \leq R < 30k\Omega$ $30k\Omega \leq R < 100k\Omega$ $100k\Omega \leq R < 300k\Omega$ $0,3M\Omega \leq R < 1M\Omega$ $1M\Omega \leq R < 10M\Omega$ $10M\Omega \leq R < 100M\Omega$ $100M\Omega \leq R < 200M\Omega$		$3,4 \cdot 10^{-4} \cdot R + 24\text{ mOhm}$ $3,5 \cdot 10^{-4} \cdot R + 70\text{ mOhm}$ $3,5 \cdot 10^{-4} \cdot R + 0,23\text{ Ohm}$ $3,5 \cdot 10^{-4} \cdot R + 0,7\text{ Ohm}$ $3,5 \cdot 10^{-4} \cdot R + 2,3\text{ Ohm}$ $3,5 \cdot 10^{-4} \cdot R + 6,9\text{ Ohm}$ $3,5 \cdot 10^{-4} \cdot R + 23\text{ Ohm}$ $1,3 \cdot 10^{-3} \cdot R + 41\text{ Ohm}$ $1,3 \cdot 10^{-3} \cdot R + 41\text{ Ohm}$ $7,1 \cdot 10^{-4} \cdot R + 4,8\text{ kOhm}$ $3,5 \cdot 10^{-3} \cdot R + 230\text{ kOhm}$ $3,1 \cdot 10^{-3} \cdot R + 460\text{ kOhm}$	With electrical calibrator. Performed on-site and in laboratory. R: Applied value.



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DC Resistance - DC Resistance Meters Multimeter, Resistance Meter, Ohmmeter, Insulation Test Devices	1 MΩ	10kV	1,6. 10 ⁻² .R	With insulation resistance box. Performed on-site and in laboratory. R: Applied value
	2MΩ			
	5 MΩ			
	10 MΩ			
	25 MΩ			
	50 MΩ			
	100 MΩ			
	200 MΩ			
	500 MΩ			
	1 GΩ			
	2 GΩ			
	5 GΩ			
	10 GΩ			
	20 GΩ			
	50 GΩ			
	100 GΩ			
	500 GΩ			
	1 TΩ		8,1. 10 ⁻² .R	
	2 TΩ		1,6. 10 ⁻¹ .R	
	3 TΩ		2,4. 10 ⁻¹ .R	



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Capacitance – Capacitors Capacitance Standards LCR Meter Multimeter	100pF≤C <1μF	100 Hz ≤ f ≤ 1 kHz	5,1. 10 ⁻³ . C	With reference capacitance box; direct measurement
Frequency Meters – Frequency Counters, Analyzers, Sources	1Hz≤f<6 GHz	Square waves Sine waves	9,4·10 ⁻⁸ . f 9,4·10 ⁻⁸ . f	Performed in laboratory and on-site f: Measured frequency (Hz)
Frequency Meters – Time Counters, Oscilloscope, EMC Sources	1ns ≤ t <1 s		9,6·10 ⁻⁸ . t	Performed in laboratory and on-site t: Measured time



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Frequency Sources – Signal Generator, Function Generator	10Hz≤f<225MHz 225MHz≤f<580MHz 620MHz≤f≤18GHz		5,3.10 ⁻⁴ .f 1,8.10 ⁻⁶ .f 1,8.10 ⁻⁶ .f	Performed in laboratory and on-site f: Measured frequency (Hz)
AC Voltage Ratio – AC Voltage Ratios (Real Component), Transformer Turns Ratio Calibration	1:1 ≤ Nx ≤ 1:2000	50 Hz	0,03 %	Performed in laboratory and on-site.
Frequency Meters – Transformer Switching Time Meters (Open/Close Timing Meters)	1ms ≤ t < 200ms		0,02 ms	Performed in laboratory and on-site t: Measured time
Time Interval – Time Interval Meters, Time Difference Meters (Frequency Counter, Stopwatch, Timer), Calibration of Stopwatches and Time Measuring Devices	1 s ≤ t ≤ 36000 s		42 ms	Performed in laboratory and on-site t: Measured time



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	COMPANY NAME	Rezonans Biyomedikal Kalibrasyon Elektronik Teknolojileri San. ve Tic. Ltd.Şti.		
	ADDRESS	Yazlık yeni mah. Osmanlı Cad. No:5 D:1 Gölcük / KOCAELİ		
	CONTACT NAME	Alper ÖZBEK		
	TELEPHONE	+ 90 262 412 88 86		
	CURRENT ACCREDITATION DATE	14.09.2023		
	ACCREDITATION STANDARD	ISO/IEC 17025:2017		
Accreditation Area		General requirements for the competence of testing and calibration laboratories		
Accreditation Standard		ISO/IEC 17025:2017		
CALIBRATION & MEASUREMENT CAPABILITY (CMC)				
CALIBRATION AREA	RANGE & RESOLUTION	MEASUREMENT REQUIREMENTS	EXPANDED UNCERTAINTY (±)	TECHNIQUE. REFERENCE STANDARD. EQUIPMENT

ECG Device (Electrocardiography)				
Amplitude	0,1-10 mV		$8,1 \cdot 10^{-5} \cdot U + 5,4 \mu V$	Electrical Reference Calibrator
High-Level Output Amplitude Calibrator and Test Device	0,05-10 V		$7,1 \cdot 10^{-5} \cdot U + 39 \mu V$	
Performance Test	0,1-500 Hz		$9,4 \cdot 10^{-8} \cdot f$	
NSR (Normal Sinus Rhythm)	30-300 BPM		1 % BPM	
Medical Bedside Monitor				
Amplitude	0,1-10 mV		$8,1 \cdot 10^{-5} \cdot U + 5,4 \mu V$	Electrical Reference Calibrator
High-Level Output Amplitude	0,05-10 V		$7,1 \cdot 10^{-5} \cdot U + 39 \mu V$	
Performance Test	0,1-500 Hz		$9,4 \cdot 10^{-8} \cdot f$	
NSR (Normal Sinus Rhythm)	30-300 BPM		1 % BPM	
Pulse Oximeter (SpO ₂)	35%-100%		1 % SpO ₂	
Blood Pressure (BP)	0-300 mmHg		0,1 % mmHg	



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Temperature Sensor	20-45 °C 0,1-5000 Ω		0,2°C 2,1. 10 ⁻⁴ .R +0,4 Ohm	
SpO ₂ Simulator Test Load	0,1-5000 Ω 35%-100%		0,1 Ω 1 % SpO ₂	Electrical Reference Calibrator
Defibrillator Test Load Energy Measurement Voltage Measurement Current Measurement ECG Ratio Performance Test	1-200 Ω 1-400 J 50-5000 V 1 -100 A 30-300 BPM 0,1-500 Hz		3,4. 10 ⁻⁴ .R +40 mOhm 1 % J 0,57 % V 2,5.10 ⁻² . I +0,46 mA 1 % BPM 9,4.10 ⁻⁸ . f	Electrical Reference Calibrator
Electrocautery (Electrosurgical Analyzer) Test Load Energy Measurement Insulation Resistance Test Current Leakage Current Grounding Test	10 - 1000 Ω 0,1 - 5 kW 1-200 MΩ 0,1-50 A 10 -10000 µA 0,1 - 10 Ω		2,1. 10 ⁻⁴ .R +41 mOhm 50 mW/W 1,6. 10 ⁻² .R 5.10 ⁻² . I +1,9 mA 5 µA 4,5. 10 ⁻⁴ .R +37 mOhm	Electrical Reference Calibrator



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CALIBRATION AREA	RANGE & RESOLUTION	MEASUREMENT REQUIREMENTS	EXPANDED UNCERTAINTY (±)	TECHNIQUE. REFERENCE STANDARD. EQUIPMENT

Patient Simulator Amplitude High-Level Output Amplitude Performance Test NSR (Normal Sinus Rhythm) Pulse Oximeter (SpO ₂) Blood Pressure (BP, mmHg) Temperature Sensor Basic Respiratory Impedance Measurement	0,1-10 mV 0,05-10 V 0,1-500 Hz 30-300 BPM 35%-100% 0-300 mmHg 20-45 °C 0,1-5000 Ω		$8,1 \cdot 10^{-5} \cdot U + 5,4 \mu V$ $7,1 \cdot 10^{-5} \cdot U + 39 \mu V$ $9,4 \cdot 10^{-8} \cdot f$ 1 % BPM 1 % SpO ₂ 0,1 % mmHg 0,2 °C $2,1 \cdot 10^{-4} \cdot R + 0,4 \text{ Ohm}$	Electrical Reference Calibrator
Fetal Simulator ECG Ratio Amplitude	30-300 BPM 0,1-10 mV		1 % BPM $8,1 \cdot 10^{-5} \cdot U + 5,4 \mu V$	Electrical Reference Calibrator
Defibrillator Analyzer Test Load Energy Measurement Voltage Measurement Current Measurement ECG Ratio Performance Test SpO ₂ Simulator Test Load	1-200 Ω 1-400 J 50-5000 V 1 -100 A 30-300 BPM 0,1-500 Hz 0,1 - 100 kΩ		$3,8 \cdot 10^{-4} \cdot R + 40 \text{ mOhm}$ 1 % J 0,57 % V $3 \cdot 10^{-2} \cdot I + 0,46 \text{ mA}$ 1 % BPM $9,5 \cdot 10^{-8} \cdot f$ $3 \cdot 10^{-4} \cdot R + 0,6 \text{ Ohm}$	Electrical Reference Calibrator



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NST Device (Non-Stress Test Device)				
ECG Ratio	30-300 BPM		1 % BPM	Electrical Reference Calibrator
Amplitude	0,1-10 mV		$8,1 \cdot 10^{-5} \cdot U + 5,4 \mu V$	
Electrical Medical Safety Analyzer				Electrical Reference Calibrator
Test Load	0,1 - 5 kW		20 mW/W	
Insulation Resistance	1-500 MΩ		$1,6 \cdot 10^{-2} \cdot R$	
Test Current	$10mA \leq I < 100mA$		$5,5 \cdot 10^{-4} \cdot I + 18 \mu A$	
	$100mA \leq I < 400mA$		$5,8 \cdot 10^{-4} \cdot I + 23 \mu A$	
	$0,1A \leq I < 1A$		$1,2 \cdot 10^{-3} \cdot I + 0,17 mA$	
	$0,3A \leq I < 3A$		$2,2 \cdot 10^{-3} \cdot I + 0,46 mA$	
	$3A \leq I < 10A$		$2,5 \cdot 10^{-3} \cdot I + 0,46 mA$	
Leakage Current	$10A \leq I < 75A$		$3 \cdot 10^{-2} \cdot I + 0,5 mA$	
	$10 \mu A - 1mA$		$2 \cdot 10^{-3} \cdot I + 0,4 \mu A$	
Grounding Test	$1mA \leq I < 10mA$		$6,0 \cdot 10^{-4} \cdot I + 2,3 \mu A$	
	0,1 - 10 Ω		$4,5 \cdot 10^{-4} \cdot R + 37 mOhm$	
Infrared Medical Thermometer	$30^{\circ}C \leq T \leq 45^{\circ}C$	Forehead/Ear Thermometer	2,0 °C	Comparative calibration with reference blackbody. Performed in the laboratory.
Digital Thermometer with Display	$30^{\circ}C \leq T \leq 45^{\circ}C$	Body Temperature Thermometer (with Display)	0,3°C	



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Flowmeter	0,1 – 20 l/min		1,7 %	Reference Calibrator
Doppler	30-300 BPM		1 % BPM	Electrical Reference Calibrator
pH meter	Up to 14 PH		0,05 pH	Reference Buffer Solutions
Conductivity	84 µS/cm to 12.880 µS/cm		1,50 % µS/cm	Reference Buffer Solutions

Note: The uncertainty covered by the CMC shall be expressed as the expanded uncertainty having a coverage probability of approximately 95% .



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