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Accreditation Scope

Kalibrasyon
TS EN ISO/IEC 17025
AB-0016-K

METKAL ÖLÇÜ VE TEST SİSTEMLERİ SAN. VE TİC. LTD. ŞTİ.
Kalibrasyon Laboratuvarı

Accreditation Nr: AB-0016-K
Revision Nr: 015 Date: 19.11.2019

As a Calibration Laboratory

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Measured Quantity/Calibrated Items	Range	Measurement Conditions	Calibration and Measurement Capability (k=2)	Remarks/ Calibration Method
GAS MIXTURES **Gas Analyzer** Carbon monoxide	98,9 µmol/mol ≤ *C* ≤ 100,9 µmol/mol	By using traceable gas mixtures of N_2 matrix	% 2,4	*C* : Gas concentration Comparison method with certified gas mixtures used as working standard
Nitrogen monoxide	804 µmol/mol ≤ *C* ≤ 820 µmol/mol	By using traceable gas mixtures of N_2 matrix	% 2,3	*C* : Gas concentration Comparison method with certified gas mixtures used as working standard
Oxygen	20,9 cmol/mol ≤ *C* ≤ 21,3 cmol/mol	By using traceable gas mixtures of N_2 matrix	% 2,3	C : Gas concentration Comparison method with certified gas mixtures used as working standard
Sulfur dioxide	966 µmol/mol ≤ *C* ≤ 985 µmol/mol	By using traceable gas mixtures of N_2 matrix	% 2,3	*C* : Gas concentration Comparison method with certified gas mixtures used as working standard
OPTICAL QUANTITIES **Illuminance** Lux Meter, Light Meter, Illuminance Meter	0,1 lx ≤ E_v ≤ 5000 lx	2856 K	% 0,96	E_v : Illuminance Reference method: CIE S023 / ISO19476

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Radiometry UV-A Detector, UV-A Radiometry	19 µW/cm² ≤ E_e ≤ 20000 µW/cm²	Meters used within UV-A range	% 4,3	E_e: Radiometry Reference method: CIE 202
ACOUSTIC **Sound Pressure Response Level** Sound Level Meter	70 dB-130 dB	31,5 Hz ≤ f ≤ 16000 Hz	0,3 dB	f: Frequency Calibration by comparison method with multifunction acoustic calibrator
ELECTRICAL **DC Voltage (≤ 1100 V)** DC Voltage Source	0,2 mV ≤ U < 200 mV 0,2 V ≤ U < 2 V 2 V ≤ U < 20 V 20 V ≤ U < 200 V 200 V ≤ U < 1000 V		$6{,}2 \cdot 10^{-6} \cdot U + 0{,}12$ µV $2{,}1 \cdot 10^{-6} \cdot U + 6{,}0$ µV $2{,}2 \cdot 10^{-6} \cdot U + 60$ µV $6{,}6 \cdot 10^{-6} \cdot U + 0{,}04$ mV $9{,}0 \cdot 10^{-6} \cdot U$	U: Voltage
DC High Voltage (> 1100 V) DC Voltage Source	1 kV ≤ U < 40 kV		% 1,0	U: Voltage By means of high voltage probe
DC Voltage (≤ 1100 V) DC Voltage Measuring Instrument, Multimeter, Voltmeter	0 mV ≤ U < 329,99 mV 0,33 V ≤ U < 3,299999 V 3,3 V ≤ U < 32,99999 V 33 V ≤ U < 329,9999 V 330 V ≤ U < 1000 V		$5{,}1 \cdot 10^{-5} \cdot U + 2{,}4$ µV $4{,}5 \cdot 10^{-5} \cdot U + 3{,}5$ µV $4{,}5 \cdot 10^{-5} \cdot U + 37$ µV $4{,}8 \cdot 10^{-5} \cdot U + 0{,}36$ mV $4{,}9 \cdot 10^{-5} \cdot U + 1{,}0$ mV	U: Voltage

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DC Current DC Current Source, Calibrator	0,2 µA ≤ I < 200 µA 0,2 mA ≤ *I* < 2 mA 2 mA ≤ *I* < 20 mA 20 mA ≤ *I* < 200 mA 0,2 A ≤ *I* < 2 A 2 A ≤ *I* < 20 A		$1{,}7 \cdot 10^{-5} \cdot I + 0{,}41$ nA $1{,}8 \cdot 10^{-5} \cdot I + 3{,}56$ nA $1{,}9 \cdot 10^{-5} \cdot I + 37$ nA $5{,}0 \cdot 10^{-5} \cdot I + 0{,}9$ µA $1{,}9 \cdot 10^{-4} \cdot I + 17$ µA $4{,}1 \cdot 10^{-4} \cdot I + 0{,}45$ mA	*I*: Current
DC Current DC Current Source, Calibrator	10 A ≤ *I* < 100 A 100 A ≤ *I* ≤ 900 A		$1{,}4 \cdot 10^{-2} \cdot I + 0{,}17$ A $1{,}2 \cdot 10^{-3} \cdot I + 0{,}53$ A	*I*: Current
DC Current DC Current Measuring Instrument, Multimeter: DC Current, Ammeter, Clamp Meter (Current Clamp)	0 µA ≤ I < 329,999 µA 0,33 mA ≤ I < 3,29999 mA 3,3 mA ≤ I < 32,9999 mA 33 mA ≤ *I* < 329,999 mA 0,33 A ≤ *I* < 2,99999 A 3 A ≤ I < 10,9999 A 11 A ≤ *I* < 20,5 A		$1{,}2 \cdot 10^{-4} \cdot I + 19$ nA $8{,}6 \cdot 10^{-5} \cdot I + 0{,}06$ µA $1{,}0 \cdot 10^{-4} \cdot I + 0{,}20$ µA $8{,}6 \cdot 10^{-5} \cdot I + 2{,}0$ µA $2{,}9 \cdot 10^{-4} \cdot I + 50$ µA $4{,}7 \cdot 10^{-4} \cdot I + 0{,}38$ mA $6{,}4 \cdot 10^{-4} \cdot I + 5{,}5$ mA	*I*: Current

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DC Current DC Current Measuring Instrument, Multimeter: DC Current, Ammeter, Clamp Meter (Current Clamp)	10 A ≤ *I* < 16,5 A 16,5 A ≤ *I* < 150 A 150 A ≤ *I* < 550 A 550 A ≤ *I* < 1000 A		$2{,}9 \cdot 10^{-3} \cdot I + 2{,}3$ mA $2{,}9 \cdot 10^{-3} \cdot I + 17$ mA $3{,}0 \cdot 10^{-3} \cdot I + 70$ mA $3{,}0 \cdot 10^{-3} \cdot I + 68$ mA	*I*: Current 50 turn coil Toroidal type meter
DC Current DC Current Measuring Instrument, Multimeter: DC Current, Ammeter, Clamp Meter (Current Clamp)	10 A ≤ *I* < 16,5 A 16,5 A ≤ *I* < 150 A 150 A ≤ *I* < 550 A 550 A ≤ *I* < 1000 A		$5{,}8 \cdot 10^{-3} \cdot I + 23$ mA $5{,}8 \cdot 10^{-3} \cdot I + 0{,}16$ A $5{,}8 \cdot 10^{-3} \cdot I + 0{,}58$ A $5{,}9 \cdot 10^{-3} \cdot I + 0{,}57$ A	*I*: Current 50 turn coil Non-toroidal type meter
DC Power Power meter, Wattmeter	10,9 W ≤ *P* < 726 W 72,6 W ≤ *P* < 3630 W 220 W ≤ *P* < 11000 W 1100 W ≤ *P* < 20500 W	33 V - 330 V 0,33 A - 2,2 A 33 V - 330 V 2,2 A - 11 A 100 V - 1000 V 2,2 A - 11 A 100 V - 1000 V 11 A - 20,5 A	$3{,}3 \cdot 10^{-4} \cdot P + 0{,}9$ mW $8{,}4 \cdot 10^{-4} \cdot P - 37$ mW $5{,}1 \cdot 10^{-4} \cdot P - 43$ mW $4{,}9 \cdot 10^{-4} \cdot P + 24$ mW	*P*: Power
DC Power Power meter, Wattmeter	0,54 kW ≤ *P* < 36,3 kW 3,6 kW ≤ *P* < 181,5 kW 11 kW ≤ *P* < 1000 kW	33 V - 330 V 16,5 A - 110 A 33 V - 330 V 110 A - 550 A 100 V - 1000 V 550 A - 1000 A	$3{,}0 \cdot 10^{-3} \cdot P + 0{,}8$ W $3{,}0 \cdot 10^{-3} \cdot P + 0{,}2$ W $3{,}0 \cdot 10^{-3} \cdot P + 5{,}1$ W	*P*: Power 50 turn coil Toroidal type meter

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DC Power Power meter, Wattmeter	0,54 kW ≤ P < 36,3 kW	33 V - 330 V 16,5 A - 110 A	$7{,}7 \cdot 10^{-3} \cdot P + 6{,}6$ W	P: Power 50 turn coil Non-toroidal type meter
	3,6 kW ≤ P < 181,5 kW	33 V - 330 V 110 A - 550 A	$6{,}1 \cdot 10^{-3} \cdot P + 4{,}3$ W	
	11 kW ≤ P < 1000 kW	100 V - 1000 V 550 A - 1000 A	$6{,}4 \cdot 10^{-3} \cdot P + 9{,}9$ W	
AC Voltage (≤ 1100 V) AC Voltage Source	0,2 mV ≤ U < 200 mV	10 Hz - 10 kHz	$1{,}6 \cdot 10^{-4} \cdot U + 4{,}1$ µV	U: Voltage
		10 kHz - 30 kHz	$3{,}6 \cdot 10^{-4} \cdot U + 8{,}2$ µV	
		30 kHz - 100 kHz	$7{,}9 \cdot 10^{-4} \cdot U + 20$ µV	
	0,2 V ≤ U < 2 V	10 Hz - 10 kHz	$1{,}3 \cdot 10^{-4} \cdot U + 0{,}02$ mV	
		10 kHz - 30 kHz	$2{,}3 \cdot 10^{-4} \cdot U + 0{,}04$ mV	
		30 kHz - 100 kHz	$5{,}9 \cdot 10^{-4} \cdot U + 0{,}20$ mV	
AC Voltage (≤ 1100 V) AC Voltage Source	2 V ≤ U < 20 V	10 Hz - 10 kHz	$1{,}3 \cdot 10^{-4} \cdot U + 0{,}20$ mV	U: Voltage
		10 kHz - 30 kHz	$2{,}3 \cdot 10^{-4} \cdot U + 0{,}41$ mV	
		30 kHz - 100 kHz	$5{,}9 \cdot 10^{-4} \cdot U + 2{,}0$ mV	
	20 V ≤ U < 200 V	10 Hz - 10 kHz	$1{,}3 \cdot 10^{-4} \cdot U + 2{,}0$ mV	
		10 kHz - 30 kHz	$2{,}3 \cdot 10^{-4} \cdot U + 4{,}0$ mV	
		30 kHz - 100 kHz	$5{,}9 \cdot 10^{-4} \cdot U + 20$ mV	
AC Voltage (≤ 1100 V) AC Voltage Source	200 V ≤ U < 1000 V	10 Hz - 10 kHz	$1{,}5 \cdot 10^{-4} \cdot U + 0{,}02$ V	U: Voltage
		10 kHz - 30 kHz	$2{,}9 \cdot 10^{-4} \cdot U - 0{,}01$ V	

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AC Voltage (≤ 1100 V) AC Voltage Source	30 mV ≤ *U* < 30 V	100 kHz - 60 MHz	% 4	*U*: Voltage Measuring by oscilloscope
AC High Voltage (> 1100 V) AC Voltage Source	1 kV ≤ *U* < 28 kV	50 Hz	% 1,0	*U*: Voltage By means of high voltage probe
AC Voltage (≤ 1100 V) AC Voltage Measuring Instrument, Multimeter, Voltmeter	1 mV ≤ *U* < 32,999 mV	10 Hz - 45 Hz 45 Hz - 20 kHz 20kHz - 100 kHz 100 kHz - 500 kHz	$1{,}2 \cdot 10^{-3} \cdot U + 16\ \mu V$ $1{,}2 \cdot 10^{-3} \cdot U + 16\ \mu V$ $2{,}8 \cdot 10^{-3} \cdot U + 26\ \mu V$ $7{,}9 \cdot 10^{-3} \cdot U + 42\ \mu V$	*U*: Voltage
AC Voltage (≤ 1100 V) AC Voltage Measuring Instrument, Multimeter, Voltmeter	33 mV ≤ *U* < 329,999 mV	10 Hz - 45 Hz 45 Hz - 10 kHz 10 kHz - 50 kHz 50 kHz - 100 kHz 100 kHz - 500 kHz	$3{,}9 \cdot 10^{-4} \cdot U + 16\ \mu V$ $2{,}4 \cdot 10^{-4} \cdot U + 16\ \mu V$ $7{,}9 \cdot 10^{-4} \cdot U + 31\ \mu V$ $1{,}8 \cdot 10^{-3} \cdot U + 0{,}13\ mV$ $3{,}9 \cdot 10^{-3} \cdot U + 0{,}26\ mV$	*U*: Voltage
AC Voltage (≤ 1100 V) AC Voltage Measuring Instrument, Multimeter, Voltmeter	0,33 V ≤ *U* < 3,29999 V	10 Hz - 45 Hz 45 Hz - 10 kHz 10 kHz - 50 kHz 50 kHz - 100 kHz 100 kHz - 500 kHz	$4{,}0 \cdot 10^{-4} \cdot U + 0{,}05\ mV$ $2{,}4 \cdot 10^{-4} \cdot U + 0{,}47\ mV$ $7{,}9 \cdot 10^{-4} \cdot U + 0{,}04\ mV$ $1{,}8 \cdot 10^{-3} \cdot U + 0{,}2\ mV$ $4{,}0 \cdot 10^{-3} \cdot U + 0{,}7\ mV$	*U*: Voltage

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AC Voltage (≤ 1100 V) AC Voltage Measuring Instrument, Multimeter, Voltmeter	3,3 V ≤ *U* < 32,9999 V	10 Hz - 45 Hz 45 Hz - 10 kHz 10 kHz - 20 kHz 20 kHz - 50 kHz 50 kHz - 100 kHz	$4{,}0 \cdot 10^{-4} \cdot U + 0{,}6$ mV $2{,}4 \cdot 10^{-4} \cdot U + 0{,}46$ mV $5{,}5 \cdot 10^{-4} \cdot U + 0{,}5$ mV $7{,}9 \cdot 10^{-4} \cdot U + 0{,}45$ mV $1{,}8 \cdot 10^{-3} \cdot U + 1{,}5$ mV	*U*: Voltage
AC Voltage (≤ 1100 V) AC Voltage Measuring Instrument, Multimeter, Voltmeter	33 V ≤ *U* < 329,999 V	45 Hz - 1 kHz 1 kHz - 10 kHz 10 kHz - 20 kHz	$4{,}0 \cdot 10^{-4} \cdot U + 2{,}2$ mV $6{,}3 \cdot 10^{-4} \cdot U + 7{,}0$ mV $7{,}1 \cdot 10^{-4} \cdot U + 7{,}0$ mV	*U*: Voltage
AC Voltage (≤ 1100 V) AC Voltage Measuring Instrument, Multimeter, Voltmeter	330 V ≤ *U* < 1020 V	45 Hz - 1 kHz 1 kHz - 10 kHz	$4{,}4 \cdot 10^{-4} \cdot U + 13$ mV $7{,}1 \cdot 10^{-4} \cdot U + 15$ mV	*U*: Voltage
AC Current AC Current Source, Calibrator	20 µA ≤ *I* < 200 µA 0,2 mA ≤ *I* < 2 mA 2 mA ≤ *I* < 20 mA 20 mA ≤ *I* < 200 mA	10 Hz - 10 kHz 10 Hz - 10 kHz 10 Hz - 10 kHz 10 Hz - 10 kHz	$5{,}9 \cdot 10^{-4} \cdot I + 20$ nA $3{,}3 \cdot 10^{-4} \cdot I + 0{,}2$ µA $3{,}4 \cdot 10^{-4} \cdot I + 2{,}0$ µA $3{,}3 \cdot 10^{-4} \cdot I + 20$ µA	*I*: Current
AC Current AC Current Source, Calibrator	0,2 A ≤ *I* < 2 A 2 A ≤ *I* < 20 A	10 Hz - 10 kHz 10 Hz - 10 kHz	$7{,}7 \cdot 10^{-4} \cdot I + 0{,}2$ mA $8{,}6 \cdot 10^{-4} \cdot I + 2{,}0$ mA	*I*: Current

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AC Current	10 A ≤ *I* < 100 A	50 Hz	$1{,}3 \cdot 10^{-2} \cdot I + 0{,}18$ A	*I*: Current
AC Current Source, Calibrator	100 A ≤ *I* < 900 A	50 Hz	$1{,}2 \cdot 10^{-2} \cdot I + 0{,}51$ A	
	250 A ≤ *I* < 2500 A	50 Hz	$9{,}2 \cdot 10^{-4} \cdot I + 0{,}57$ A	
AC Current	29 µA ≤ *I* < 329,99 µA	10 Hz - 1 kHz	$1{,}6 \cdot 10^{-3} \cdot I + 0{,}08$ µA	*I*: Current
AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp)		1 kHz - 10 kHz	$6{,}2 \cdot 10^{-3} \cdot I + 0{,}16$ µA	
		10 kHz - 30 kHz	$1{,}2 \cdot 10^{-2} \cdot I + 0{,}31$ µA	
AC Current	0,33 mA ≤ *I* < 3,29999 mA	10 Hz - 20 Hz	$1{,}6 \cdot 10^{-3} \cdot I + 0{,}12$ µA	*I*: Current
AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp)		20 Hz - 1 kHz	$1{,}0 \cdot 10^{-3} \cdot I + 0{,}12$ µA	
		1 kHz - 5 kHz	$1{,}6 \cdot 10^{-3} \cdot I + 0{,}16$ µA	
		5 kHz - 10 kHz	$3{,}9 \cdot 10^{-3} \cdot I + 0{,}23$ µA	
		10 kHz - 30 kHz	$7{,}8 \cdot 10^{-3} \cdot I + 0{,}47$ µA	
AC Current	3,3 mA ≤ *I* < 32,9999 mA	10 Hz - 20 Hz	$1{,}4 \cdot 10^{-3} \cdot I + 1{,}6$ µA	*I*: Current
AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp)		20 Hz - 1 kHz	$3{,}6 \cdot 10^{-4} \cdot I + 1{,}5$ µA	
		1 kHz - 5 kHz	$6{,}5 \cdot 10^{-4} \cdot I + 1{,}6$ µA	
		5 kHz - 10 kHz	$1{,}6 \cdot 10^{-3} \cdot I + 2{,}4$ µA	
		10 kHz - 30 kHz	$6{,}9 \cdot 10^{-3} \cdot I + 3{,}5$ µA	

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AC Current AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp)	33 mA ≤ *I* < 329,999 mA	10 Hz - 20 Hz	$1{,}4 \cdot 10^{-3} \cdot I + 15\ \mu A$	*I*: Current
		20 Hz - 1 kHz	$7{,}2 \cdot 10^{-4} \cdot I + 15\ \mu A$	
		1 kHz - 5 kHz	$3{,}6 \cdot 10^{-4} \cdot I + 15\ \mu A$	
		5 kHz - 10 kHz	$8{,}0 \cdot 10^{-4} \cdot I + 39\ \mu A$	
		10 kHz - 30 kHz	$3{,}1 \cdot 10^{-3} \cdot I + 0{,}16\ mA$	
AC Current AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp)	0,33 A ≤ *I* < 2,99999 A	10 Hz - 45 Hz	$1{,}4 \cdot 10^{-3} \cdot I + 0{,}08\ mA$	*I*: Current
		45 Hz - 1 kHz	$4{,}7 \cdot 10^{-4} \cdot I + 0{,}09\ mA$	
		1 kHz - 5 kHz	$4{,}7 \cdot 10^{-3} \cdot I + 0{,}8\ mA$	
		5 kHz - 10 kHz	$1{,}9 \cdot 10^{-2} \cdot I + 3{,}9\ mA$	
AC Current AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp)	3 A ≤ *I* < 10,9999 A	45 Hz - 1 kHz	$1{,}0 \cdot 10^{-3} \cdot I + 0{,}9\ mA$	*I*: Current
		1 kHz - 5 kHz	$2{,}3 \cdot 10^{-2} \cdot I + 1{,}5\ mA$	
	11 A ≤ *I* < 20,5 A	45 Hz - 1 kHz	$1{,}2 \cdot 10^{-3} \cdot I + 3{,}9\ mA$	
		1 kHz - 5 kHz	$2{,}3 \cdot 10^{-2} \cdot I + 3{,}9\ mA$	
AC Current AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp), Weld-Tester	10 A ≤ *I* < 16,5 A	45 Hz - 65 Hz	$3{,}3 \cdot 10^{-3} \cdot I + 3{,}5\ mA$	*I*: Current 50 turn coil Toroidal type meter
		65 Hz - 440 Hz	$9{,}2 \cdot 10^{-3} \cdot I + 3{,}5\ mA$	
	16,5 A ≤ *I* < 150 A	45 Hz - 65 Hz	$9{,}3 \cdot 10^{-4} \cdot I + 0{,}38\ A$	
		65 Hz - 440 Hz	$9{,}2 \cdot 10^{-3} \cdot I + 0{,}03\ A$	
	150 A ≤ *I* < 550 A	45 Hz - 65 Hz	$3{,}4 \cdot 10^{-3} \cdot I + 0{,}13\ A$	
		65 Hz - 440 Hz	$9{,}2 \cdot 10^{-3} \cdot I + 0{,}13\ A$	
	550 A ≤ *I* < 1000 A	45 Hz - 65 Hz	$3{,}4 \cdot 10^{-3} \cdot I + 0{,}16\ A$	
		65 Hz - 440 Hz	$9{,}2 \cdot 10^{-3} \cdot I + 0{,}14\ A$	

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AC Current AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp), Weld-Tester	10 A ≤ *I* < 16,5 A	45 Hz - 65 Hz 65 Hz - 440 Hz	$6{,}5 \cdot 10^{-3} \cdot I + 35$ mA $1{,}2 \cdot 10^{-2} \cdot I + 35$ mA	*I*: Current 50 turn coil Non-toroidal type meter
	16,5 A ≤ *I* < 150 A	45 Hz - 65 Hz 65 Hz - 440 Hz	$6{,}5 \cdot 10^{-3} \cdot I + 0{,}29$ A $1{,}2 \cdot 10^{-2} \cdot I + 0{,}29$ A	
	150 A ≤ *I* < 550 A	45 Hz - 65 Hz 65 Hz - 440 Hz	$6{,}5 \cdot 10^{-3} \cdot I + 1{,}0$ A $1{,}2 \cdot 10^{-2} \cdot I + 1{,}0$ A	
	550 A ≤ *I* < 1000 A	45 Hz - 65 Hz 65 Hz - 440 Hz	$6{,}6 \cdot 10^{-3} \cdot I + 1{,}1$ A $1{,}2 \cdot 10^{-2} \cdot I + 1{,}1$ A	
AC Current AC Current Measuring Instrument, Multimeter: AC Current, AC Ammeter, Clamp Meter (Current Clamp), Weld-Tester	550 A ≤ *I* < 2000 A	50 Hz	% 2,4	*I*: Current
	2 kA ≤ *I* < 15 kA	50 Hz	% 2,4	
AC Power and Energy **Active Power: Single Phase, Three Phase** Power meter, Wattmeter	10,9 W ≤ P < 726 W	*U*: 33 V - 330 V *I*: 0,33 A - 2,2 A *F*: 45 Hz - 65 Hz	$6{,}7 \cdot 10^{-4} \cdot P + 1{,}2$ mW	*P*: Power Only for sine wave
	72,6 W ≤ *P* < 3630 W	*U*: 33 V - 330 V *I*: 2,2 A - 11 A *F*: 45 Hz - 65 Hz	$7{,}7 \cdot 10^{-4} \cdot P - 5{,}8$ mW	
	220 W ≤ *P* < 11000 W	*U*: 100 V - 1000 V *I*: 2,2 A - 11 A *F*: 45 Hz - 65 Hz	$7{,}4 \cdot 10^{-4} \cdot P - 4{,}8$ mW	
	11000 W ≤ *P* < 20500 W	*U*: 100 V - 1000 V *I*: 11 A - 20,5 A *F*: 45 Hz - 65 Hz	$1{,}2 \cdot 10^{-3} \cdot P + 0{,}18$ mW	

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Measured Quantity/Calibrated Items	Range	Measurement Conditions	Calibration and Measurement Capability (k=2)	Remarks/ Calibration Method
AC Power and Energy **Active Power:** **Single Phase, Three Phase** Power meter, Wattmeter	0,54 kW ≤ *P* < 36,3 kW 3,6 kW ≤ *P* < 181,5 kW 11 kW ≤ *P* < 550 kW	*U*: 33 V - 330 V *I*: 16,5 A - 110 A *F*: 45 Hz - 65 Hz *U*: 33 V - 330 V *I*: 110 A - 550 A *F*: 45 Hz - 65 Hz *U*: 100 V - 1000 V *I*: 110 A - 550 A *F*: 45 Hz - 65 Hz	$3{,}6 \cdot 10^{-3} \cdot P + 0{,}2$ W $4{,}0 \cdot 10^{-3} \cdot P - 1{,}3$ W $3{,}3 \cdot 10^{-3} \cdot P + 4{,}1$ W	*P*: Power Only for sine wave Toroidal type meter
AC Power and Energy Active Power: Single Phase, Three Phase Power meter, Wattmeter	0,54 kW ≤ P < 36,3 kW 3,6 kW ≤ P < 181,5 kW 11 kW ≤ P < 550 kW	U: 33 V - 330 V I: 16,5 A - 110 A F: 45 Hz - 65 Hz U: 33 V - 330 V I: 110 A - 550 A F: 45 Hz - 65 Hz U: 100 V - 1000 V I: 110 A - 550 A F: 45 Hz - 65 Hz	$9{,}2 \cdot 10^{-3} \cdot P - 0{,}2$ W $8{,}6 \cdot 10^{-3} \cdot P + 2{,}0$ W $7{,}5 \cdot 10^{-3} \cdot P + 19$ W	*P*: Power Only for sine wave Non-toroidal type meter
AC Power and Energy **Active Power:** **Single Phase, Three Phase** Power meter, Wattmeter	0,5 kW ≤ *P* < 10 kW 10 kW ≤ *P* < 100 kW 100 kW ≤ *P* < 121 kW	50 Hz 50 Hz 50 Hz	$2{,}4 \cdot 10^{-2} \cdot P + 14$ W $2{,}4 \cdot 10^{-2} \cdot P + 34$ W $2{,}3 \cdot 10^{-2} \cdot P + 0{,}4$ kW	*P*: Power Direct measurement Calibration on-site

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Measured Quantity/Calibrated Items	Range	Measurement Conditions	Calibration and Measurement Capability (k=2)	Remarks/ Calibration Method
DC Resistance DC Resistance Measuring Instrument, Multimeter: Resistance, Ohmeter, Wheatstone Bridge, Insulation Tester	100 µΩ 1 mΩ 10 mΩ 100 mΩ 1 Ω 10 Ω		$8{,}8 \cdot 10^{-2}$ µΩ $8{,}7 \cdot 10^{-4}$ mΩ $8{,}7 \cdot 10^{-3}$ mΩ $8{,}7 \cdot 10^{-2}$ mΩ $9{,}0 \cdot 10^{-4}$ Ω $9{,}0 \cdot 10^{-3}$ Ω	4-wire Direct measurement
DC Resistance DC Resistance Measuring Instrument, Multimeter: Resistance, Ohmeter, Wheatstone Bridge, Insulation Tester	0 Ω ≤ *R* < 10,999 Ω 11 Ω ≤ *R* < 32,999 Ω 33 Ω ≤ *R* < 109,999 Ω 110 Ω ≤ *R* < 329,999 Ω		$7{,}5 \cdot 10^{-5} \cdot R$ + 10 mΩ $8{,}7 \cdot 10^{-5} \cdot R$ + 13 mΩ $6{,}8 \cdot 10^{-5} \cdot R$ + 13 mΩ $7{,}1 \cdot 10^{-5} \cdot R$ + 16 mΩ	*R*: Resistance 4-wire
DC Resistance DC Resistance Measuring Instrument, Multimeter: Resistance, Ohmeter, Wheatstone Bridge, Insulation Tester	0,33 kΩ ≤ *R* < 1,09999 kΩ 1,1 kΩ ≤ *R* < 3,29999 kΩ 3,3 kΩ ≤ *R* < 10,9999 kΩ 11 kΩ ≤ *R* < 32,9999 kΩ 33 kΩ ≤ *R* < 109,999 kΩ		$5{,}2 \cdot 10^{-5} \cdot R$ + 58 mΩ $7{,}1 \cdot 10^{-5} \cdot R$ + 0,16 Ω $4{,}9 \cdot 10^{-5} \cdot R$ + 0,55 Ω $7{,}0 \cdot 10^{-5} \cdot R$ + 0,92 Ω $6{,}4 \cdot 10^{-5} \cdot R$ + 5,2 Ω	*R*: Resistance 4-wire

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DC Resistance DC Resistance Measuring Instrument, Multimeter: Resistance, Ohmeter, Wheatstone Bridge, Insulation Tester	110 kΩ ≤ *R* < 329,999 kΩ		$1{,}0 \cdot 10^{-4} \cdot R + 8{,}5\ \Omega$	*R*: Resistance 2-wire
	330 kΩ ≤ *R* < 1,09999 MΩ		$1{,}0 \cdot 10^{-4} \cdot R + 47\ \Omega$	
	1,1 MΩ ≤ *R* < 3,29999 MΩ		$1{,}6 \cdot 10^{-4} \cdot R + 0{,}08\ k\Omega$	
	3,3 MΩ ≤ *R* < 10,9999 MΩ		$4{,}7 \cdot 10^{-4} \cdot R + 0{,}35\ k\Omega$	
	11 MΩ ≤ *R* < 32,9999 MΩ		$8{,}0 \cdot 10^{-4} \cdot R + 1{,}8\ k\Omega$	
	33 MΩ ≤ *R* < 109,999 MΩ		$4{,}0 \cdot 10^{-3} \cdot R + 2{,}7\ k\Omega$	
	110 MΩ ≤ *R* < 329,999 MΩ		$4{,}1 \cdot 10^{-3} \cdot R + 0{,}06\ M\Omega$	
	330 MΩ ≤ *R* < 1100,00 MΩ		$1{,}3 \cdot 10^{-2} \cdot R + 0{,}12\ M\Omega$	
DC Resistance DC Resistance Measuring Instrument, Multimeter: Resistance, Ohmeter, Wheatstone Bridge, Insulation Tester	1 Ω ≤ *R* < 100 Ω		$3{,}2 \cdot 10^{-4} \cdot R + 0{,}9\ m\Omega$	*R*: Resistance Substitution Method
	0,1 kΩ ≤ *R* < 1 kΩ		$3{,}4 \cdot 10^{-4} \cdot R + 1{,}1\ m\Omega$	
	1 kΩ ≤ *R* < 10 kΩ		$3{,}4 \cdot 10^{-4} \cdot R + 5{,}7\ m\Omega$	
	10 kΩ ≤ *R* < 100 kΩ		$3{,}4 \cdot 10^{-4} \cdot R + 0{,}06\ \Omega$	
	100 kΩ ≤ *R* < 1 MΩ		$3{,}4 \cdot 10^{-4} \cdot R + 0{,}6\ \Omega$	

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DC Resistance	10 MΩ	≤ 5 kV	$8{,}0 \cdot 10^{-3} \cdot R$	*R*: Resistance Substitution Method
DC Resistance Measuring Instrument, Multimeter: Resistance, Ohmeter, Wheatstone Bridge, Insulation Tester	100 MΩ		$8{,}0 \cdot 10^{-3} \cdot R$	
	1 GΩ		$8{,}1 \cdot 10^{-3} \cdot R$	
	10 GΩ		$8{,}5 \cdot 10^{-3} \cdot R$	
DC Resistance		Within (23±3)°C		4-wire measurement comparison with reference
DC Resistance Standard, Calibrator: Resistance, DC Current Shunt, Resistance Box	100 µΩ	10 A	$4{,}9 \cdot 10^{-2}$ µΩ	
	1 mΩ	10 A	$7{,}5 \cdot 10^{-2}$ µΩ	
	10 mΩ	1 A	$9{,}2 \cdot 10^{-1}$ mΩ	
	100 mΩ	1 A	$6{,}3 \cdot 10^{-3}$ mΩ	
	1 Ω	1 A	$2{,}4 \cdot 10^{-3}$ mΩ	
	10 Ω	100 mA	$2{,}4 \cdot 10^{-3}$ Ω	

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DC Resistance	0 Ω ≤ R < 2 Ω		$2{,}1 \cdot 10^{-6} \cdot R + 4{,}1$ µΩ	*R*: Resistance Direct measurement
DC Resistance Standard, Calibrator: Resistance, DC Current Shunt, Resistance Box	2 Ω ≤ R < 20 Ω		$1{,}1 \cdot 10^{-6} \cdot R + 14$ µΩ	
	20 Ω ≤ R < 200 Ω		$9{,}0 \cdot 10^{-6} \cdot R + 48$ µΩ	
	0,2 kΩ ≤ R < 2 kΩ		$8{,}9 \cdot 10^{-6} \cdot R + 0{,}5$ mΩ	
	2 kΩ ≤ R < 20 kΩ		$1{,}5 \cdot 10^{-6} \cdot R + 2{,}7$ mΩ	
	20 kΩ ≤ R < 200 kΩ		$1{,}1 \cdot 10^{-5} \cdot R + 34$ mΩ	
	0,2 MΩ ≤ R < 2 MΩ		$1{,}3 \cdot 10^{-5} \cdot R + 0{,}6$ Ω	
	2 MΩ ≤ R < 20 MΩ		$2{,}5 \cdot 10^{-5} \cdot R + 95$ Ω	
	20 MΩ ≤ R < 200 MΩ		$1{,}3 \cdot 10^{-4} \cdot R + 10{,}2$ kΩ	
	0,2 GΩ ≤ R < 2 GΩ		$1{,}6 \cdot 10^{-3} \cdot R + 1{,}1$ MΩ	
	2 GΩ ≤ R < 20 GΩ		$1{,}6 \cdot 10^{-3} \cdot R + 10{,}2$ MΩ	
Capacitance	220,0 pF ≤ *C* < 399,9 pF	1 kHz	$4{,}1 \cdot 10^{-3} \cdot C + 7{,}7$ pF	*C*: Capacitance
Capacitance Measuring Instruments, LCR Meter	0,4 nF ≤ *C* < 1,0999 nF	1 kHz	$4{,}0 \cdot 10^{-3} \cdot C + 8$ pF	
	1,1 nF ≤ *C* < 3,2999 nF	1 kHz	$4{,}0 \cdot 10^{-3} \cdot C + 8$ pF	
	3,3 nF ≤ *C* < 10,999 nF	1 kHz	$2{,}1 \cdot 10^{-3} \cdot C + 8$ pF	
	11 nF ≤ *C* < 32,999 nF	1 kHz	$2{,}0 \cdot 10^{-3} \cdot C + 0{,}08$ nF	
	33 nF ≤ *C* < 109,99 nF	1 kHz	$2{,}1 \cdot 10^{-3} \cdot C + 0{,}07$ nF	
	110 nF ≤ *C* < 329,99 nF	1 kHz	$2{,}1 \cdot 10^{-3} \cdot C + 0{,}23$ nF	
	0,33 µF ≤ *C* < 1,0999 µF	1 kHz	$2{,}3 \cdot 10^{-3} \cdot C + 0{,}75$ nF	
	1,1 µF ≤ *C* < 3,2999 µF	1 kHz	$2{,}2 \cdot 10^{-3} \cdot C + 2{,}3$ nF	
	3,3 µF ≤ *C* < 10,999 µF	1 kHz	$2{,}5 \cdot 10^{-3} \cdot C + 7$ nF	

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Capacitance Capacitance Measuring Instruments, LCR Meter	11 µF ≤ C < 32,999 µF 33 µF ≤ C < 109,99 µF 110 µF ≤ C < 329,99 µF	100 Hz 100 Hz 100 Hz	$3{,}5 \cdot 10^{-3} \cdot C + 0{,}023$ µF $3{,}9 \cdot 10^{-3} \cdot C + 0{,}07$ µF $4{,}1 \cdot 10^{-3} \cdot C + 0{,}20$ µF	C: Capacitance
TIME and FREQUENCY **Frequency** Frequency Sources, Frequency Generator	1 Hz ≤ f ≤ 3GHz		$7{,}1 \cdot 10^{-6} \cdot f + 11$ mHz	f: Frequency Direct Measurement
Frequency Frequency Measuring Instruments, Frequency Counter	1 Hz ≤ f < 100 kHz 100 kHz ≤ f ≤ 6 GHz		$2{,}4 \cdot 10^{-5} \cdot f + 4$ mHz $1{,}3 \cdot 10^{-7} \cdot f + 0{,}2$ mHz	f: Frequency Direct Measurement
Frequency Frequency Measuring Instruments, Frequency Counter	10 Hz ≤ f < 120 Hz 120 Hz ≤ f < 1200 Hz 1,2 kHz ≤ f < 12 kHz 12 kHz ≤ f < 120 kHz		$4{,}0 \cdot 10^{-6} \cdot f + 9$ mHz $2{,}8 \cdot 10^{-6} \cdot f + 85$ mHz $1{,}5 \cdot 10^{-5} \cdot f + 50$ mHz $1{,}9 \cdot 10^{-5} \cdot f + 10$ mHz	f: Frequency Direct measurement with FLUKE 5500A
Time Interval Time Interval Measuring Instruments, Time Difference Measuring Instruments, Frequency Counter	4ns - 0,1 s 10 s ≤ t ≤ 3600 s		$1{,}0 \cdot 10^{-9}$ s $9{,}0 \cdot 10^{-5}$ s	t: Time Comparison method

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Time Interval Time Interval Measuring Instruments, Time Difference Measuring Instruments, Stopwatch (chronometer), Timer	10 s ≤ *t* ≤ 36000 s		0,03 s	*t*: Time
Radio Frequency (RF) Power	100 pW - 10 µW (between -70 dBm and -30 dBm)	0,05 - 18 GHz	% 9 · *P*	*P*: Power
Absolute RF Power	3 µW - 100 mW (between -25 dBm and +20 dBm)	0,01 - 18 GHz	% 6 · *P*	
RF Power Source RF Power Source, Reference Power Output of RF Power Measuring Instruments, Signal Generator etc.				

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Radio Frequency (RF) Power **Absolute RF Power** **RF Power Meter** Power measurement functions of Spectrum Analyzer, Test Set, Site Analyzer etc.	100 pW - 10 µW (between -70 dBm and -30 dBm) 3 µW - 100 mW (between -25 dBm and +20 dBm)	0,05 - 6 GHz 0,01 - 6 GHz	% 11 · *P* % 11 · *P*	*P*: Power
Signal and Pulse Characteristics Horizontal Deflection (Time) Oscilloscope	2 ns ≤ *t* < 5 s	> 1 V pk	% 1,0	*t*: Time Sawtooth Pulse
Signal and Pulse Characteristics Vertical Deflection (Gain) Oscilloscope	5 mV ≤ *U* ≤ 5 V 5 mV ≤ *U* ≤ 33 V 5 mV ≤ *U* ≤ 2,0 V	10 Hz - 10 kHz DC 1 MΩ DC 50 Ω	% 1,2 % 1,0 % 1,2	*U*: Voltage Square wave Direct measurement
Signal and Pulse Characteristics Rise Time Oscilloscope	1,4 ns - 7 s		% 3,0	
Signal and Pulse Characteristics Band Width Oscilloscope	*BW* ≤ 250 MHz 250 MHz < *BW* ≤ 1GHz		% 3,0 % 2,8	*BW*: Band width

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Time and Frequency **Frequency** Revolution source, Centrifuge, Stroboscope	15 rpm < w ≤ 99,999 rpm 100 rpm < w ≤ 999,99 rpm 1000 rpm < w ≤ 9999,9 rpm 10000 rpm < w ≤ 99999 rpm		$1{,}6 \cdot 10^{-4} \cdot w + 0{,}012$ rpm $2{,}6 \cdot 10^{-4} \cdot w + 0{,}002$ rpm $2{,}6 \cdot 10^{-4} \cdot w + 0{,}008$ rpm $4{,}9 \cdot 10^{-5} \cdot w + 2{,}2$ rpm	w: Revolution
Time and Frequency **Frequency** Optical Tachometer	15 rpm < w ≤ 100000 rpm		$5{,}6 \cdot 10^{-6} \cdot w + 0{,}06$ rpm	w: Revolution
TEMPERATURE Direct Reading Thermometer Resistance Thermometer Thermocouple Thermometer	-30 °C ≤ T ≤ +200 °C		0,06 °C	T: Temperature Calibration in liquid baths including ice point uncertainty Comparison method with standard platinum resistance thermometer
Direct Reading Thermometer Resistance Thermometer Thermocouple Thermometer	-90 °C ≤ T ≤ -25 °C -25 °C < T ≤ +50 °C +50 °C < T ≤ +650 °C		0,11 °C 0,08 °C 0,11 °C	T: Temperature Calibration on-site(field) by dry block calibrators Comparison method with standard platinum resistance thermometer

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Direct Reading Thermometer Resistance Thermometer Thermocouple Thermometer	+650 °C < *T* ≤ +1150 °C		2,1 °C	*T*: Temperature Calibration on-site(field) by dry block calibrators Comparison method with standard type-S thermocouple
Liquid-In-Glass Thermometer	-30 °C ≤ *T* ≤ +200 °C		0,06 °C	*T*: Temperature Calibration in liquid baths including ice point uncertainty Comparison method
Controlled Enclosures (Temperature Distribution) Test Chamber, Incubator, Oven, Steriliser, Deep Freeze, Fridge, Cold Chamber Room, etc.	-70 °C ≤ *T* ≤ -30 °C -30 °C < *T* ≤ +100 °C +100 °C < *T* ≤ +200 °C +200 °C < *T* ≤ +350 °C		0,7 °C 0,45 °C 0,7 °C 1,2 °C	*T*: Temperature On-site(field) calibration, temperature distribution of test chamber according to EN 60068-3-5, EN 60068-3-6, EN 60068-3-7, EN 60068-3-11, EURAMET cg-20, DKD R5-7
Controlled Enclosures (Temperature and/or Humidity Distribution) Climatic Chamber, Stability Chamber, Humidity Chamber, Stability Room etc.	70 °C ≤ *T* ≤ -30 °C -30 °C < *T* ≤ +100 °C +100 °C < *T* ≤ +200 °C +200 °C < *T* ≤ +350 °C 10 %rh ≤ *RH* ≤ 50 %rh 50 %rh < *RH* ≤ 80 %rh 80 %rh < *RH* ≤ 95 %rh	 10 °C.. 50°C 10 °C.. 50°C 10 °C.. 50°C	0,7 °C 0,45 °C 0,7 °C 1,2 °C 0,60 %rh 0,85 %rh 0,95 %rh	*T*: Temperature , *RH*: Humidity On-site(field) calibration, temperature and/or humidity distribution of test chamber according to EN 60068-3-5, EN 60068-3-6 EN 60068-3-7, EN 60068-3-11 EURAMET cg-20 DKD R5-7

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Controlled Enclosures (Temperature Distribution) Furnace (Ashing Furnace)	+200 °C ≤ *T* ≤ +1150 °C		1,1 °C	*T*: Temperature On-site(Field) calibration
Controlled Enclosures (Temperature Distribution) Liquid Baths (Calibration Baths)	-90 °C ≤ *T* ≤ -30 °C -30 °C < *T* ≤ +200 °C		0,13 °C 0,08 °C	*T*: Temperature Determination of temperature distribution of bath On-site(field) calibration
Dry Block Calibrators	-90 °C ≤ *T* ≤ +140 °C +140 °C < *T* ≤ +650 °C +650 °C < *T* ≤ +1150 °C		0,09 °C 0,1 °C 1,7 °C	*T*: Temperature In accordance with Euramet cg-13 / v:02 By standard platinum resistance thermometer for single or poly holed types By standard S-type thermocouple for single or poly holed types

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Temperature Indicator		Cold junction "Off"		*T*: Temperature By electrical simulation method using electrical references in accordance with IEC 584-1, DIN 43710, EURAMET cg-8 v2.1, EURAMET cg-11
PT100	-200 °C ≤ *T* ≤ +650 °C	At permenant laboratory facility or on-site(field)	0,4 °C	
Type B Thermocouple	+600 °C ≤ *T* ≤ +1800 °C		1,6 °C	
Type R Thermocouple	0 °C ≤ *T* ≤ +1700 °C		1,6 °C	
Type S Thermocouple	0 °C ≤ *T* ≤ +1700 °C		1,5 °C	
Type J Thermocouple	-200 °C ≤ *T* ≤ +1200 °C		0,5 °C	
Type K Thermocouple	-200 °C ≤ *T* ≤ +1300 °C		0,7 °C	
Type T Thermocouple	-200 °C ≤ *T* ≤ +400 °C		0,9 °C	

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Temperature Calibrator		Cold junction "Off"		*T*: Temperature By electrical simulation method using electrical references in accordance with IEC 584-1, DIN 43710, EURAMET cg-8 v2.1
PT100	-200 °C ≤ *T* ≤ +650 °C	At permenant laboratory facility	0,2 °C	
Type B Thermocouple	+600 °C ≤ *T* ≤ +1800 °C		0,9 °C	
Type R Thermocouple	0 °C ≤ *T* ≤ +1700 °C		0,9 °C	
Type S Thermocouple	0 °C ≤ *T* ≤ +1700 °C		0,8 °C	
Type J Thermocouple	-200 °C ≤ *T* ≤ +1200 °C		0,4 °C	
Type K Thermocouple	-200 °C ≤ *T* ≤ +1300 °C		0,6 °C	
Type T Thermocouple	-200 °C ≤ *T* ≤ +400 °C		0,8 °C	
RADIATION THERMOMETRY	-30 °C ≤ *T* ≤ +0 °C	For Emissivity = %95	2,25 °C	*T*: Temperature Comparison method Calibration with blackbody
Pyrometer, Thermal Camera, IR Thermometer, IR Ear Thermometer	+0 °C < *T* ≤ +100 °C		2,20 °C	
	+100 °C < *T* ≤ +300 °C		3,60 °C	
	+300 °C < *T* ≤ +500 °C		5,45 °C	

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HUMIDITY				
Direct Reading Thermometer,	-70 °C ≤ *T* ≤ -30 °C	Inside Temperature and/or Humidity Chamber	0,8 °C	*T*: Temperature *RH*: Humidity Comparison method
Direct Reading Thermo Hygrometer,	-30 °C < *T* ≤ +10 °C		0,27 °C	
Direct Reading Hygrometer,	+10 °C < *T* ≤ +60 °C		0,17 °C	
Hygrometer, Relative Humidity Meter,	+60 °C < *T* ≤ +180 °C		0,55 °C	
Dew Point Temperature Measuring Instrument	10 %rh ≤ *RH* ≤ 50 %rh	10 °C.. 50°C	0,65 %rh	
	50 %rh < *RH* ≤ 80 %rh	10 °C.. 50°C	0,85 %rh	
	80 %rh < *RH* ≤ 95 %rh	10 °C.. 50°C	1,05 %rh	
Dew Point Temperature Dew Point Temperature Measuring Instrument	+10°C ≤ *DP* ≤ +60°C	+10°C..+60°C	0,60 °C	*DP* : Dew Point Comparison
PRESSURE **Relative Pressure** Analogue Pressure Gauge, Digital Pressure Gauge, Differential Pressure Gauge, Presssure Transmitter, Pressure Switch	-99 kPa ≤ p ≤ - 10 kPa	Pneumatic	300 Pa	Calibrations are performed according to basic and standard calibration procedure defined in Euramet cg-17/v4.0 "Guidelines on the Calibration of Electromechanical and Mechanical Manometers" *p*: Pressure (Pa)
	5 Pa ≤ p ≤ 100 Pa	Pneumatic	0,8 Pa	
	100 Pa < p ≤ 3750 Pa	Pneumatic	$6{,}0\cdot10^{-3}\cdot p$ + 1,8 Pa	
	3,75 kPa < p ≤ 10 kPa	Pneumatic	$6{,}0\cdot10^{-3}\cdot p$ + 5 Pa	
	10 kPa < p ≤ 34,5 kPa	Pneumatic	$7{,}0\cdot10^{-3}\cdot p$ + 20 Pa	
	34,5 kPa < p ≤ 3,5 MPa	Pneumatic	$6{,}0\cdot10^{-4}\cdot p$ + 200 Pa	
	200 kPa ≤ p ≤ 70 MPa	Hydraulic	$6{,}0\cdot10^{-4}\cdot p$ + 400 Pa	

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Absolute Pressure Analogue Pressure Gauge, Digital Pressure Gauge, Presssure Transmitter	1,5 kPa ≤ p ≤ 1,6 MPa 1,6 MPa < p ≤ 3,5 MPa	Pneumatic	$5{,}0 \cdot 10^{-4} \cdot p$ + 300 Pa $6{,}0 \cdot 10^{-4} \cdot p$ + 300 Pa	Calibrations are performed according to basic and standard calibration procedure defined in Euramet cg-17/v4.0 "Guidelines on the Calibration of Electromechanical and Mechanical Manometers" p: Pressure (Pa)
TORQUE Hand Torque Tools, Reference Torque Wrenches	0,2 N·m ≤ M ≤ 1 N·m 1 N·m < M ≤ 1000 N·m	Clockwise and Counter-Clockwise direction	% 1,5 % 1,0	M: Torque Calibration procedure in accordance with TS EN ISO 6789-1 and TS EN ISO 6789-2
HARDNESS Shore Hardness Tester, Durometer	 0 Shore A ≤ *Shore* ≤ 100 Shore A 10 Shore D ≤ *Shore* ≤ 100 Shore D	Depth of Indentation Spring Force Shore A Spring Force Shore D Diameter Angle	2 µm 7,5 mN 44,5 mN (2 + 17 · D) µm 3' 1 Shore A 1 Shore D	*Shore*: Hardness Value D: Diameter, m Calibration procedure in accordance with ISO 48-9
DIMENSION Caliper (Outside, inside, depth, step measurements)	L ≤ 1500 mm	Inside and Outside Measurements Depth Measurements Step	(10 + 9 · L) µm	L: Length, m Calibration procedure in accordance with DAkkS-DKD-R 4-3 Blatt 09.1

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Depth Caliper	$L \leq 1000$ mm		$(11 + 8 \cdot L)$ µm	L: Length, m Calibration procedure in accordance with DAkkS-DKD-R 4-3 Blatt 09.2
Outside Micrometer	$L \leq 1000$ mm		$(1,5 + 13 \cdot L)$ µm	L: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.10.1
Depth Micrometer	$L \leq 300$ mm		$(1,5 + 12 \cdot L)$ µm	L: Length, m Calibration procedure in accordance with VDI/VDE/DGQ 2618 Bl.10.5
Height Measuring Instrument (Height Gauge)	$L \leq 1000$ mm		$(4 + 11 \cdot L)$ µm	L: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.9.3
Dial Gauge, Digital Dial Gauge (Comparator)	$L \leq 100$ mm		$(0,7 + 40 \cdot L)$ µm	L: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.11.1
Lever Gauge	$L \leq 2$ mm		0,7 µm	L: Length Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.11.3

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Dial Indicator, Digital Indicator	$L \leq 2$ mm		0,7 µm	L: Length Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.11.2
Pin Gauge (Thread measuring wires)	0,1 mm ≤ D ≤ 20 mm		0,5 µm	D: Diameter Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.04.02
Micrometer Setting Gauge	25 mm ≤ L ≤ 675 mm		(0,5 + 9 · L) µm	L: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.04.04
Thickness Gauge, Feeler Gauge	0,03 mm ≤ L ≤ 2 mm		0,5 µm	L: Gauge dimension Calibration procedure in accordance with DIN 2275
Radius Gauge, Fillet Gauge, Radius Template	0,03 mm ≤ r ≤ 100 mm		9 µm	r: Radius Optical Measurement Method
Test Sieve	0,02 mm ≤ L ≤ 125 mm		(5 + 32 · L) µm	L: Measured Opening, m Calibration procedure in accordance with TS ISO 3310-1
Bevel Protractor, Protractor	$\alpha \leq 360°$	Measuring arm up to 400mm	0,6’ (Angle) 3,5 µm (Flatness) 3,8 µm (Parallelism)	α: Angle Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.07.2

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Square 90°	L ≤ 400 mm (Squareness) L ≤ 500 mm (Straightness/Flatnes s)		3 µm (0,6 + 1,2 · *L*) µm	*L*: Square Length, m Calibration procedure in accordance with VDI/VDE/DGQ 2618 Bl.7.1
Knife Edge	L ≤ 500 mm (Straigthness/Flatnes s)		(0,6 + 1,2 · *L*) µm	*L*: Knife Edge Length, m Calibration procedure in accordance with VDI/VDE/DGQ 2618 Bl.5.2
Gauge Block	0,5 mm ≤ *L* ≤ 100 mm	Centeral Length Deviation Variation	(0,1 + 0,6 · *L*) µm (steel) (0,1 + 0,6 · *L*) µm (ceramic) (0,1 + 2,2 · *L*) µm (tungsten carbide) 0,06 µm	*L*:Gauge Block Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.03.01
Gauge Block	0,1 mm ≤ *L* ≤ 500 mm	Steel, Ceramic and Tungsten Carbide	(1 + 9 · *L*) µm	*L*:Gauge Block Length, m Measuring of central length deviation by comparison method. Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.03.01.

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Steel Rule	$L \leq 150$ mm	Calibration by measuring microscope	25 µm	L: Length, m Calibration procedure in accordance with DIN 866
	150 mm ≤ $L \leq 2000$ mm	Calibration by measuring microscope	(25 + 125 · L) µm	
	$L \leq 3000$ mm	Comparison with reference steel rule	(250 + 100 · L) µm	
Tape measure (surveying, workshop), Circometer (Pi tape), Grade rod, Telescopic measure, Flexible tape measure, Wooden measure, Plastic measure, Folding measure	$L \leq 100$ m		(770 + 40 · L) µm	L: Length, m Calibration procedure in accordance with TS 9505 ve OIML R35-1
Profile Projector, Measuring Microscope	$L \leq 300$ mm (Axial measurements)		(1,7 + 9 · L) µm	L: Length, m α: Angle r: Radius Comparison method with glass scale
	$\alpha \leq 180°$ (Angle measuruments)		1,5 '	
	$r \leq 10$ mm (Radius measurements)		10 µm	
Inside Cylindrical Ring Gauge (Reference, go & nogo, etc.)	1 mm ≤ $D \leq 150$ mm		(0,6 + 6 · D) µm	D: Diameter, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.4.01
	150 mm ≤ $D \leq 250$ mm		(1,6 + 4 · D) µm	

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Outside Cylindrical Plug Gauge (Reference, go & nogo, etc.)	1 mm ≤ *D* ≤ 600 mm		(0,5 + 12 · *D*) µm	*D*: Diameter, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.4.01
Gap Gauge	1 mm ≤ *L* ≤ 150 mm 150 mm ≤ *L* ≤ 250 mm		(0,6 + 6 · *L*) µm (1,6 + 4 · *L*) µm	*L*: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.04.07
Cylindrical Thread Ring Gauge	3 mm ≤ *D* ≤ 100 mm	Pitch: 0,5-4,5 mm	(2 + 40 · *D*) µm	*D*: Pitch Diameter, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.04.09
Cylindrical Thread Plug Gauge	1 mm ≤ *D* ≤ 200 mm	Pitch: 0,3-5,5 mm	(3 + 45 · *D*) µm	*D*: Pitch Diameter, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.04.08
Tapered Thread Plug Gauge	1 mm ≤ *D* ≤ 200 mm	Pitch: 0,3-5,5 mm	6 µm	*D*: Pitch Diameter Calibration procedure in accordance with ASME B1.20.5
Tapered Thread Ring Gauge	3 mm ≤ *D* ≤ 100 mm	Pitch: 0,5-4,5 mm	4 µm	*D*: Pitch Diameter Calibration procedure in accordance with ASME B1.20.5
Thread Pitch Gauge	*L* ≤ 7 mm		9 µm	*L*: Measured Pitch Optical Measurement Method

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Coating Thickness Gauge	$L \leq 6000$ µm		(1,1 + 50 · L) µm	L: Measured Thickness, m Comparison Method
Coating Thickness Standard (Shim, Foil)	7 µm ≤ $L \leq 8000$ µm		1,0 µm	L: Measured Thickness Comparison Method
Thickness Gauge (Dial, digital)	$L \leq 50$ mm		1,5 µm	L: Measured Thickness Comparison with block gauges
Caliper Gauge (External)	$L \leq 200$ mm		(1,5 + 10 · L) µm	L: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.12.1
Caliper Gauge (Internal)	3 mm ≤ $L \leq 200$ mm		(1,5 + 10 · L) µm	L: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.13.1
Glass Linear Scale, Stage Micrometer	$L \leq 150$ mm		(4 + 35 · L) µm	L: Length Optical Measurement Method
Internal Micrometer (2-Point Contact)	10 mm ≤ $L \leq 600$ mm		(1,2 + 11 · L) µm	L: Length, m Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.10.7
Internal Micrometer (2-Line Contact)	5 mm ≤ $L \leq 200$ mm		(1,5 + 10 · L) µm	L: Length Comparison Method

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Internal Micrometer (3-Line Contact)	3 mm ≤ *D* ≤ 100 mm		2,5 µm	*D*: Diameter Calibration procedure in accordance with Dakks-DKD-R 4.3 Bl.10.8
Level Inclinometer	*L* ≤ 200 mm *L* ≤ 800 mm *L* ≤ 200 mm		0,04 mm/m 0,3 mm/m 0,4'	*L*: Base Length Calibration procedure in accordance with DIN 877
Optical Flat, Optical Parallel	*D* ≤ 45 mm		0,2 µm (Flatness) 0,06 µm (Parallelism)	*D*: Diameter Calibration procedure in accordance with VDI/VDE/DGQ 2618 Bl.6.1
V-Block	*L* ≤ 300 mm	Squareness Parallelism Flatness	2,0 µm 0,9 µm 0,6 µm	*L*: Base Length Calibration procedure in accordance with DIN 2274
Ultrasonic Thickness Gauge	*L* ≤ 100 mm		0,174 mm	*L*: Length Measurement with steel gauge blocks
Wet Film Thickness Gauge	*d* ≤ 1800 µm		4 µm	*d*: Depth Calibration procedure in accordance with ISO 2808
Grindometer (Fineness of Grind Gauge)	*d* ≤ 1800 µm		4 µm	*d*: Depth Calibration procedure in accordance with EN ISO 1524

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Cross Cut Tester (Cross Cut Cutting Tool)	*L*: 5 - 10 mm	Distance Angle	9 µm 18'	*L* : Distance of cutting blades Calibration procedure in accordance with EN ISO 2409
Gap Wedge Gauge (Gap Feeler Gauge, Taper Gauge)	$L \leq 100$ mm		14 µm	*L*: Length Optical Measurement Method
Laser Diameter Gauge	$0,5 \text{ mm} \leq D \leq 20$ mm		2,5 µm	*D*: Diameter Comparison with pin gauges
Micrometer Head	$L \leq 100$ mm		$(0,7 + 40 \cdot L)$ µm	*L*: Length Calibration procedure in accordance with DIN 863-2
Laser Distance Meter	$L \leq 10$ m $10 \text{ m} < L \leq 50$ m		5 mm 12 mm	L: Length Comparison method with reference laser distance meter
Optical Level	± 1°	Levelling Error	9,0" (2,8 mgon)	Measurement of angular errors with optical collimator system
Theodolite, Total Station	± 1° ± 1° 0,25°	Levelling Error Horizontal/Vertical Collimation and Horizontal Tilting Errors Plummet Error	5,1" (1,6 mgon) 5,6" (1,7 mgon) 17" (5,3 mgon)	Measurement of angular errors with optical collimator system. Measurement of plummet error with reference scale.

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Measured Quantity/Calibrated Items	Range	Measurement Conditions	Calibration and Measurement Capability (k=2)	Remarks/ Calibration Method
Non-Automatic Weighing Instruments Weighing Scale (Balance)	1 mg ≤ *m* ≤ 2200 g	By class E2 weights	$1 \cdot 10^{-6}$	*m*: Weight Calibration procedure in accordance with EURAMET/cg-18/v.04
	1 g ≤ *m* ≤ 40 kg	By class F1 weights	$1 \cdot 10^{-5}$	
	5 kg ≤ *m* ≤ 3000 kg	By class M1 weights	$1 \cdot 10^{-4}$	
	10 kg ≤ *m* ≤ 15000 kg	By substitute weights	$1{,}5 \cdot 10^{-4}$	
WEIGHTS (STANDARD WEIGHTS) **Weight** Class E2 Weights Conventional Mass Value	1 mg ≤ *m* ≤ 20 mg	Air	0,003 mg	*m*: Nominal weight Calibration procedure in accordance with OIML R111-1
	50 mg		0,004 mg	
	100 mg		0,005 mg	
	200 mg		0,006 mg	
	500 mg		0,008 mg	
	1 g		0,010 mg	
	2 g		0,012 mg	
	5 g		0,016 mg	
	10 g		0,020 mg	
	20 g		0,025 mg	
	50 g		0,03 mg	
	100 g		0,05 mg	
	200 g		0,10 mg	
	500 g		0,25 mg	
	1 kg		0,5 mg	

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Measured Quantity/Calibrated Items	Range	Measurement Conditions	Calibration and Measurement Capability (k=2)	Remarks/ Calibration Method
Weight Class F1 Weights Conventional Mass Value	1 mg ≤ m ≤ 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg	Air	0,006 mg 0,008 mg 0,010 mg 0,012 mg 0,016 mg 0,020 mg 0,025 mg 0,03 mg 0,04 mg 0,05 mg 0,06 mg 0,08 mg 0,10 mg 0,16 mg 0,3 mg 0,8 mg 1,6 mg 3,0 mg 8,0 mg 16 mg	*m*: Nominal weight Calibration procedure in accordance with OIML R111-1
Weight Class F2 Weights Conventional Mass Value	1 mg ≤ m ≤ 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg	Air	0,020 mg 0,025 mg 0,03 mg 0,04 mg 0,05 mg 0,06 mg 0,08 mg 0,10 mg 0,12 mg 0,16 mg 0,20 mg 0,25 mg 0,3 mg 0,5 mg 1,0 mg 2,5 mg 5,0 mg 10 mg 25 mg 50 mg	*m*: Nominal weight Calibration procedure in accordance with OIML R111-1

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Weight Class M1 Weights Conventional Mass Value	1 mg ≤ m ≤ 5 mg 10 mg 20 mg 50 mg 100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	Air	0,06 mg 0,08 mg 0,10 mg 0,12 mg 0,16 mg 0,20 mg 0,25 mg 0,3 mg 0,4 mg 0,5 mg 0,6 mg 0,8 mg 1,0 mg 1,6 mg 3,0 mg 8,0 mg 16 mg 30 mg 80 mg 160 mg 300 mg	*m*: Nominal weight Calibration procedure in accordance with OIML R111-1
Weight Class M2 Weights Conventional Mass Value	100 mg 200 mg 500 mg 1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	Air	0,5 mg 0,6 mg 0,8 mg 1,0 mg 1,2 mg 1,6 mg 2,0 mg 2,5 mg 3,0 mg 5,0 mg 10 mg 25 mg 50 mg 100 mg 250 mg 500 mg 1000 mg	Calibration procedure in accordance with OIML R111-1

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Weight Class M3 Weights Conventional Mass Value	1 g 2 g 5 g 10 g 20 g 50 g 100 g 200 g 500 g 1 kg 2 kg 5 kg 10 kg 20 kg	Air	3,0 mg 4,0 mg 5,0 mg 6,0 mg 8,0 mg 10 mg 16 mg 30 mg 80 mg 160 mg 300 mg 800 mg 1600 mg 3000 mg	Calibration procedure in accordance with OIML R111-1
Weight Non-standard weights Conventional Mass Value	1 g 1 g < *m* ≤ 2 g 2 g < *m* ≤ 5 g 5 g < *m* ≤ 10 g 10 g < *m* ≤ 20 g 20 g < *m* ≤ 50 g 50 g < *m* ≤ 100 g 100 g < *m* ≤ 200 g 200 g < *m* ≤ 500 g 500 g < *m* ≤ 1 kg 1 kg < *m* ≤ 2 kg 2 kg < *m* ≤ 5 kg 5 kg < *m* ≤ 10 kg 10 kg < *m* ≤ 20 kg 20 kg < *m* ≤ 30 kg	Air	0,3 mg 0,4 mg 0,5 mg 0,6 mg 0,8 mg 1,0 mg 1,6 mg 3,0 mg 8,0 mg 16 mg 30 mg 80 mg 160 mg 1000 mg 2500 mg	*m*: Nominal weight Calibration procedure in accordance with OIML R111-1
FLUID FLOW **Volumetric Flow Rate of Gases** Flow meter, Rotameter (Variable Area Flowmeter), Gas Meter	0,05 l/min ≤ *Q* ≤ 0,5 l/min 0,5 l/min < *Q* < 5 l/min 5 l/min ≤ *Q* < 10 l/min 10 l/min ≤ *Q* ≤ 100 l/min	(0 - 6) barg air	%5 %3,5 %1,8 %0,5	*Q*: Measured flow Comparison with reference flow meter

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Volumetric Flow Rate of Gases Balometer (Air Flow Hood)	50 m³/h ≤ *Q* < 360 m³/h 360 m³/h ≤ *Q* < 3000 m³/h	Air	9 m3/h %2,7	*Q*: Measured flow Comparison with reference anemometer inside the wind tunnel
Velocity of Air Anemometer (Hot wire, pitot, vane type)	0,1 m/s ≤ *V* ≤ 1,5 m/s 1,5 m/s < *V* ≤ 3,0 m/s 3,0 m/s < *V* ≤ 40 m/s	(-0,02 - 0) barg dry air	0,03 m/s 0,04 m/s %1,5	*V*: Velocity of air Comparison with reference anemometer inside the wind tunnel

End of Scope

G. Banu MÜDERRİSOĞLU
Secretary General