CATALOGUE OF SERVICES

Republic of Serbia
Ministry of Economy
Directorate of Measures and Precious Metals

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2017

SERVICES OF DMDM

I CALIBRATION 2

1. MASS 2
2. PRESSURE 2
3. LENGHT & ANGLE 3
4. ACOUSTICS 4
5. TIME, FREQUENCY & VELOCITY 5
6. VOLUME 6
7. TEMPERATURE 7
8. HUMIDITY 9
9. ELECTIRICITY/DC VOLTAGE 9
10. ELECTIRICITY/DC RESISTANCE 10
11. ELECTIRICITY/DC CURRENT 10
12. ELECTIRICITY/AC VOLTAGE 10
13. ELECTIRICITY/AC CURRENT 11
14. ELECTIRICITY/AC POWER 12
15. ELECTIRICITY/ACTIVE ELECTRICAL ENERGY 13
16. ELECTIRICITY/REACTIVE ELECTRICAL ENERGY 13
17. ELECTIRICITY/PHASE ANGLE 14
18. ELECTIRICITY/CURRENT HARMONICS 14
19. ELECTIRICITY/FLICKER 14
20. ELECTIRICITY/AC HIGH VOLTAGE/RATIO ERROR 15
21. ELECTIRICITY/AC HIGH VOLTAGE/PHASE DISPLACEMENT 15
22. ELECTIRICITY/HIGH AC CURRENT/ RATION ERROR 15
23. ELECTIRICITY/HIGH AC CURRENT/PHASE DISPLACEMENT 16
24. ELECTIRICITY/CAPACITANCE 16
25. ELECTIRICITY/INDUCTANCE 16
26. PHYSICO – CHEMICAL QUANTITIES AND CHEMICAL MEASUREMENTS 17
27. PHOTOMETRY AND RADIOMETRY 18

II CERTIFIED REFERENCE MATERIALS 20

1. FORENSICS 20

III TESTING 21

1. MASS 21
2. PRESSURE 21
3. LENGHT & ANGLE 21
4. ACOUSTICS 21
5. TEMPERATURE SENSORS 22
6. HEATING ENERGY 22
7. ACTIVE ELECTRICAL ENERGY 22
8. REACTIVE ELECTRICAL ENERGY 22
9. MEASURING INSTRUMENTS FOR PHYSICO-CHEMICAL AND CHEMICAL QUANTITIES 22
10. VOLUME OF LIQUIDS 22
11. VELOCITY 23

IV VERIFICATION OF MEASURING INSTRUMENTS 24

VI PRECIOUS METALS ARTICLES CONTROL 26

SERVICES OF DMDM

I CALIBRATION

1. MASS					
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
1/1	Mass	Weights	1 mg ÷ 100 mg	1.3 μg ÷ 2 μg	YES
1/2	Mass	Weights	0.1 g ÷ 1 g	2 μg ÷ 4 μg	YES
1/3	Mass	Weights	1 g ÷ 10 g	4 μg ÷ 8 μg	YES
1/4	Mass	Weights	10 g ÷ 100 g	8 μg ÷ 22 μg	YES
1/5	Mass	Weights	100 g ÷ 1 kg	1.3 μg ÷ 220 μg	YES
1/6	Mass	Weights	1 kg ÷ 10 kg	0.22 mg ÷ 2.2 mg	YES

2. PRESSURE					
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
2/1	Pressure	Pressure gauges	-1 bar ÷ 35 bar	$1 \cdot 10^{-4} \cdot p$ (gas)	YES
			0.2 bar ÷ 40 bar	$1 \cdot 10^{-4} \cdot p$ (oil)	
			20 bar ÷ 800 bar	$3 \cdot 10^{-5} \cdot p$ (oil)	
2/2	Pressure	Pressure balances	-1 bar ÷ 35 bar	$1 \cdot 10^{-4} \cdot p$ (gas)	YES
			0.2 bar ÷ 40 bar	$1 \cdot 10^{-4} \cdot p$ (oil)	
			20 bar ÷ 800 bar	$3 \cdot 10^{-5} \cdot p$ (oil)	

3. LENGHT & ANGLE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
3/1	Laser radiation	Stabilized lasers of the mise en pratique: vacuum wavelength	633 nm	0.04 fm	YES
3/2	Laser radiation	Stabilized lasers of the mise en pratique: absolute frequency	633 nm	1E-09	YES
3/3	Laser radiation	Other stabilized lasers: vacuum wavelength	633 nm	1E-09	YES
3/4	Length	Gauge blocks: interferometry	Up to 100 mm	Q[20, 0.2*L*] nm *L* in mm	YES
3/5	Length	Gauge blocks: mechanical comparison	Up to 100 mm	Q[50, 0.5*L*] nm *L* in mm	YES
3/6	Length	Line scales	Up to 3000 mm	Q[202, 0.38*L*] nm *L* in mm	NO
3/7	Angle	Optical polygons		0.2 "	YES
3/8	Angle	Rotary tables		0.2 "	YES
3/9	Angle	Autocollimators		0.2 "	YES
3/10	Angle	Angle gauge blocks		0.2 "	YES
3/11	Surface texture: roughness	Roughness standard: Type A Parameter: *d*	(0,01 ÷ 50) µm	Q[15, 15*d*] nm *d* y µm	YES
3/12	Surface texture: roughness	Roughness standard: Type C Parameters: *Ra, Rq*	(0,01 ÷ 15) µm	Q[10, 30*Ra*] nm *Ra* y µm	YES
3/12	Surface texture: roughness	Roughness standard: Type C Parameters: *Rz, Rt, Rp, Rv*	(0,04 ÷ 30) µm	Q[20, 40*Rz*] nm *Rz* y µm	YES
3/12	Surface texture: roughness	Roughness standard: Type C Parameter: *RSm*	(10 ÷ 500) µm	0,5 µm	YES
3/13	Surface texture: roughness	Roughness standard: Type D Parameters: *Ra, Rq*	(0,01 ÷ 10) µm	Q[10, 40*Ra*] nm *Ra* y µm	YES

3/13	Surface texture: roughness	Roughness standard: Type D Parameters: *Rz, Rt, Rp, Rv*	(0,04 ÷ 30) µm	Q[20, 50*Rz*] nm *Rz* y µm	YES

4. ACOUSTICS

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty [dB] (k=2)	Notice	Calibration and measurement capabilities in BIPM data base (accreditation)
4/1	Sound in air	Laboratory standard microphone LS1P (IEC61094-1)	31.5 Hz ÷ 12.5 kHz Pressure sensitivity level dB (re 1V/Pa)	0.08 ÷ 0.13	Primary pressure reciprocity calibration method IEC 61094-2	YES
4/2	Sound in air	Laboratory standard microphone LS2aP (IEC61094-1)	31.5 Hz ÷ 25 kHz Pressure sensitivity level dB (re 1V/Pa)	0.085 ÷ 0.21	Primary pressure reciprocity calibration method IEC 61094-2	YES
4/3	Sound in air	Working standard microphone WS2P, WS2F, WS2D (IEC61094-4)	250 Hz ; 1000 Hz Pressure sensitivity level dB (re 1V/Pa)	0.1	Comparison method IEC 61094-5	NO
4/4	Sound in air	Working standard microphone WS1P, WS2P, WS1F, WS2F, WS1D, WS2D (IEC61094-4)	31.5 Hz ÷ 25 kHz Pressure sensitivity level dB (re 1V/Pa)	0.12 ÷ 0.4	Electrostatic actuator frequency response IEC 61094-6	NO
4/5	Sound in air	Acoustic calibrator	1000 Hz Sound pressure level 94/124dB (re 20µPa)	0.09 ÷ 0.2	Comparison method IEC 60942	NO
4/6	Sound in air	Sound level meter	63 Hz ÷ 16 kHz Sound pressure level (re 20µPa)	0.11 ÷ 0.4	IEC 61672 or IEC 651, IEC 804	NO

5. TIME, FREQUENCY & VELOCITY					
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
5/1	Time Scale Differences	Local clock vs. UTC (DMDM)	-1 s ÷ +1 s	9 ns	YES
5/2	Time Scale Differences	Local clock vs. predicted UTC (DMDM)	-1 s ÷ +1 s	47 ns	YES
5/3	Time Scale Differences	Local clock vs. post-processed UTC (DMDM)	-1 s ÷ +1 s	20 ns	YES
5/4	Time Scale Differences	Local (radio-synchronised) clock vs. UTC (DMDM)	0 s ÷±30 s	0,5 s	NO
5/5	Frequency	Local frequency standard	5 MHz; 10 MHz	1E÷13 Hz/Hz	YES
5/6	Frequency	General frequency source (pulsed or squared signal)	1 Hz ÷ 3 GHz	1E÷12 Hz/Hz	YES
5/7	Frequency	General frequency source (sine signal)	1Hz ÷ 3 GHz	Q[1E-12, 2.6E-07/*f*] *f* in Hz	YES
5/8	Time Interval	Period source	3.3 ns ÷10 s	0.6 ns	YES
5/9	Time Interval	Rise/fall time source	0.7 ns ÷ 1s	0.6 ns	YES
5/10	Time Interval	Pulse width source	1.6 ns ÷ 10 s	0.6 ns	YES
5/11	Time Interval	Time difference source	1 ns ÷ 10 s	0.6 ns	YES
5/12	Time Interval	Delay source	1ns ÷ 1 s	0.2 ns	YES
5/13	Frequency	Frequency counter	1mHz ÷ 6 GHz	Q[1E-12, 2.6E-07/*f*] *f* in Hz	NO
5/14	Velocity	Speedmeters	(0÷250) km/h	direct measurement: ≤ 0.05 km/h	NO
5/15	Velocity	Speedmeters	(0÷250) km/h	≤ 0.15 km/h	NO

6. VOLUME						
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Notice**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
6/1	Volume of liquid	Pycnometers	(1 ÷ 100) mL	(0.03 ÷ 0.02) %	Gravimetric method, liquid water, 20 °C	YES
6/2	Volume of liquid	Volumetric pipette	(1 ÷ 200) mL	(0.03 - 0.02) %	Gravimetric method, liquid water, 20 °C	YES
6/3	Volume of liquid	Graduated pipette	(1 ÷ 50) mL	(0.03 ÷ 0.02) %	Gravimetric method, liquid water, 20 °C	YES
6/4	Volume of liquid	Flasks	(1 ÷ 10 000) mL	(0.03 ÷ 0.01) %	Gravimetric method, liquid water, 20 °C	YES
6/5	Volume of liquid	Burettes (made of glass)	(1 ÷ 100) mL	(0.03 ÷ 0.02) %	Gravimetric method, liquid water, 20 °C	YES
6/6	Volume of liquid	Graduated measuring cylinders	(5 ÷ 2 000) mL	(0.03 ÷ 0.02) %	Gravimetric method, liquid water, 20 °C	YES
6/7	Volume of liquid	Proving tanks	(20 ÷ 500) L	0.02 %	Gravimetric method, liquid water, 20 °C or 15 ºC	YES
6/8	Volume of liquid	Proving tanks	(20 ÷ 5 000) L	0.03 %	Volumetric method, liquid water, 20 °C or 15 ºC	YES
6/9	Volume of liquid	Standard overflow pipettes	(1 ÷ 500) L	(0.02 ÷ 0.01) %	Gravimetric method, liquid water, 20 °C	YES

6/10	Volume of liquid	Standard test measures	(1 ÷ 20) L	0.03 %	Volumetric method, liquid water, 20 °C	YES
6/11	Volume of liquid	Micropipettes or piston pipettes	(10 ÷ 20 000) µL	(0.6 ÷ 0.1) %	Gravimetric method, liquid water, 20 °C	YES
6/12	Volume of liquid	Piston Burettes	(0.1 ÷ 100) mL	(0.01 ÷ 0.02) %	Gravimetric method, liquid water, 20 °C	YES
6/13	Volume of liquid	Dispensers	(0.01 ÷ 200) mL	(0.1 ÷ 0.02) %	Gravimetric method, liquid water, 20 °C	YES
6/14	Liquid flow	Rotameters	(0.003 ÷ 150) m^3/h	4 %	Dynamic method of measuring volume and passed time	YES

7. TEMPERATURE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Notice	Calibration and measurement capabilities in BIPM data base (accreditation)
7/1	Temperature – Items used for defining ITS-90	Primary fixed-point cells – Triple point of water	0.01 °C	0.55 mK	Direct comparison	YES
		Primary fixed-point cells - Triple point of mercury	-38.8344 °C	0.8 mK		YES
		Primary fixed-point cells - Melting point of gallium	29.7646 °C	0.8 mK		YES

		Standard platinum resistance thermometers and high temperature platinum resistance thermometers	-38.8344 °C	1 mK	Fixed point method	YES
			0.01 °C	0.6 mK		YES
			29.7646 °C	1 mK		YES
			156.5985°C	2.4 mK		YES
			231.928 °C	2.2 mK		YES
			419.527 °C	3 mK		YES
			660.323 °C	5 mK		NO
			981.78 °C	7 mK		NO
7/2	Temperature – Items used for disseminating ITS-90	Resistance thermometers	-80 °C ÷ -20 °C	10 mK	Comparison method/ Halocarbon bath	YES
			-40 °C ÷ 20 °C	9 mK	Comparison method/ Alcohol bath	YES
			20 °C ÷ 90 °C	8 mK	Comparison method/ Oil Bath	YES
			90 °C ÷ 250 °C	12 mK		YES
			200 °C ÷ 420 °C	16 mK ÷ 37 mK	Comparison method/ Salt bath	YES
			420 °C ÷ 660 °C	37 mK ÷ 50 mK	Comparison method/ Furnace	NO
7/3		Thermocouples/ Pure metals	419.527 °C, FP Zn	0.20 °C	Fixed point method	NO
			660.323 °C, FP Al	0.25 °C		NO
			981.78 °C, FP Ag	0.30°C		NO
7/4	Temperature – Items used for disseminating ITS-90	Thermocouples/ Noble metals	100 °C ÷ 300 °C	0.37 °C	Comparison method /Furnace	YES
			300 °C ÷ 600 °C	0.37 °C ÷ 0.51 °C		YES
			600 °C ÷ 1 000 °C	0.51°C ÷ 1 °C		YES
7/5		Thermocouples/ Base metals	100 °C ÷ 300 °C	0.51°C	Comparison method/ Furnace	YES
			300 °C ÷ 600 °C	0.51 °C ÷ 0.87 °C		YES
			600 °C ÷ 1 000 °C	0.87 °C ÷ 1 °C		YES
7/6		Liquid-in-glass thermometers	-80 °C ÷ -20 °C	20 mK	Comparison method/ Temperature bath	YES
			-40 °C ÷ 20 °C	16 mK		YES
			20 °C ÷ 90 °C	13 mK		YES
			90 °C ÷ 250 °C	18 mK		YES
7/7		Temperature sensors with display unit	-80 ÷ 420 °C	10 mK ÷ 40 mK	Comparison method/ Bath, furnace, dry well calibrators	YES
			420 °C ÷ 1000 °C	0.4 °C ÷ 1 °C		NO
7/8		Other measurement			Comparison method/	NO

		services 1.Compensation wires for cold junction 2.Temperature indicators for resistors and thermocouples sensors, 3.Dry-well block calibrators	15 °C ÷ 30 °C -200 °C ÷ 1500 °C -200 °C ÷ 660 °C	50 mK 0.01 °C 0.5 °C	Bath, furnace, dry well calibrators	

8. HUMIDITY

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
8/1	Humidity	Dew point meters	dp : -40 °C ÷ 30 °C in air	0.2 °C	NO
8/2		Relative humidity meters	RH : 10% ÷ 90% -10 °C ÷ 70 °C	-(0,5-1,1)% on 23°C	NO

9. ELECTIRICITY/DC VOLTAGE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
9/1	DC Voltage	Solid state voltage standards, standard cell	1,018 V 1 V 10 V	0,45 µV/V ÷ 1 µV/V	YES
9/2		DC Voltage source, Calibrators (Multifunction calibrators)	0,01 V ÷ 1000 V	1,2 µV/V ÷ 38 µV/V	YES
9/3		DC Voltmeters (Multimeters)	0,01 V ÷ 1000 V	1,2 µV/V ÷ 38 µV/V	YES
9/4		Solid state voltage standards	1,018 V 1V 10 V	0,12 µV/V 0,12 µV/V 0,04 µV/V	YES
9/5	DC Voltage Linearity	DC Voltmeters (Multimeters) Linearity	0 mV ÷ 100 mV 0,1 V ÷ 1 V 1 V ÷ 10 V	0,2 µV 0,3 µV 0,8 µV	NO

10. ELECTIRICITY/DC RESISTANCE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
10/1	DC Resistance	Standard resistors	100 μΩ ÷ 1 GΩ	0,2 μΩ/Ω ÷ 5000 μΩ/Ω	YES
10/2		Resistance box	100 μΩ ÷ 1 GΩ	0,2 μΩ/Ω ÷ 5000 μΩ/Ω	YES
10/3		Resistance calibrators (Multifunction calibrators)	1 Ω ÷ 1 GΩ	$3{,}76 \cdot 10^{-5}$ Ω ÷ $2{,}9 \cdot 10^{6}$ Ω	YES
10/4		Resistance Bridge	0,1 mΩ ÷ 1 GΩ	0,2 μΩ/Ω ÷ 5000 μΩ/Ω	YES
10/5		Ommeters (Multimeters)	0,1 mΩ ÷ 1 GΩ	0,2 μΩ/Ω ÷ 5000 μΩ/Ω	YES

11. ELECTIRICITY/DC CURRENT

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
11/1	DC Current	DC current generators	0,1 mA ÷ 30 A	1,3 nA ÷ 6 mA	YES
11/2		DC current calibrators (Multifunction calibrators)	0,1 mA ÷ 30 A	1,3 nA ÷ 6 mA	YES
11/3		DC Ampermeters (Multimeters)	0,1 mA ÷ 30 A	1,3 nA ÷ 6 mA	YES

12. ELECTIRICITY/AC VOLTAGE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
12/1	AC Voltage	AC/DC transfer standards, thermal converters	10 mV ÷ 500 mV 10 Hz ÷ 1 MHz	17 μV/V ÷ 240 μV/V	YES
12/2			0,5 V ÷ 5 V 10 Hz ÷ 1 MHz	10 μV/V ÷ 56 μV/V	YES
			0,5 V ÷ 1000 V 10 Hz ÷ 1 MHz	13 μV/V ÷ 73 μV/V	YES
			1 V, 10 MHz	70 μV/V	NO

			1 V, 30 MHz	500 µV/V	
			2 V, 10 MHz	50 µV/V	
			2 V, 30 MHz	400 µV/V	
			3 V, 10 MHz	300 µV/V	
			3 V, 30 MHz	1500 µV/V	
			10 V, 10 MHz	300 µV/V	
			10 V, 30 MHz	2000 µV/V	
			20 V, 10 MHz	600 µV/V	
			20 V, 30 MHz	2000 µV/V	
12/3		AC Calibrators	10 mV ÷ 1000 V 10 Hz ÷ 200 kHz (200 kHz до 60 V)	0,03 mV/V ÷ 1,4 mV/V	YES
			10 mV ÷ 20 V 200 kHz ÷ 1 MHz	0,23 mV/V ÷ 3,9 mV/V	YES
12/4		AC Voltmeters (Multimeters)	10 mV ÷ 1000 V 10 Hz ÷ 200 kHz (200 kHz до 60 V)	0,03 mV/V ÷ 1,4 mV/V	YES
			10 mV ÷ 20 V 200 kHz ÷ 1 MHz	0,23 mV/V ÷ 3,9 mV/V	YES

13. ELECTIRICITY/AC CURRENT

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
13/1	AC Current	AC current generators	1 mA ÷ 2 A 10 Hz ÷ 10 kHz	0,00042 mA/A ÷ 2,34 mA/A	YES
13/2		AC current calibrators (Multifunction calibrators)	1 mA ÷ 2 A 10 Hz ÷ 10 kHz	0,00042 mA/A ÷ 2,34 mA/A	YES
13/3		AC Ampermeters (Multimeters)	0,22 mA ÷ 2,2 A 45 Hz ÷ 5 kHz	0,21 mA/A ÷ 0,58 mA/A	YES
			0,05 A ÷ 100 A 50 Hz ÷ 60 Hz	0,08 mA/A ÷ 0,11 mA/A	YES
13/4		Current transducers	0,22 mA ÷ 2,2 A 45 Hz ÷ 5 kHz	0,21 mA/A ÷ 0,58 mA/A	YES
			0,05 A ÷ 100 A 50 Hz ÷ 60 Hz	0,08 mA/A ÷ 0,11 mA/A	YES

14. ELECTIRICITY/AC POWER					
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
14/1	Active AC Power	Active power meters, one phase	0 W ÷ 1200 W (12 V ÷ 240 V, 0,05 A ÷ 5 A, 1 ÷ 0 i/c, 45 Hz ÷ 65 Hz)	66 µW/VA ÷ 80 µW/VA	YES
			0 W ÷ 48000 W (30 V ÷ 240 V, 0,05 A ÷ 100 A, 1 ÷ 0 i/c, 50 Hz to 60 Hz)	116 µW/VA ÷ 129 µW/VA	YES
14/2		Active power converters	0 W ÷ 1200 W (12 V ÷ 240 V, 0,05 A to 5 A, 1 ÷ 0 i/c, 45 Hz ÷ 65 Hz)	66 µW/VA ÷ 80 µW/VA	YES
			0 W ÷ 48000 W (30 V ÷ 240 V, 0,05 A ÷ 100 A, 1 ÷ 0 i/c, 50 Hz ÷ 60 Hz)	116 µW/VA ÷ 129 µW/VA	YES
14/3		Watt meters	0 W ÷ 1200 W (12 V ÷ 240 V, 0,05 A to 5 A, 1 ÷ 0 i/c, 45 Hz ÷ 65 Hz)	66 µW/VA ÷ 80 µW/VA	YES
			0 W ÷ 48000 W (30 V ÷ 240 V, 0,05 A ÷ 100 A, 1 ÷ 0 i/c, 50 Hz ÷ 60 Hz)	116 µW/VA ÷ 129 µW/VA	YES
14/4	Reactive AC power	Power meters, one phase	0 ÷ 48000 var (30 V ÷ 240 V, 0,05 A ÷ 100 A, 1 ÷ 0 i/c, 50 Hz ÷to 60 Hz)	116 µvar/VA ÷ 129 µvar/VA	YES
14/5		Power converters	0 ÷ 48000 var (30 V ÷ 240 V, 0,05 A ÷ 100 A, 1 ÷ 0 i/c, 50 Hz ÷ 60 Hz)	116 µvar/VA ÷ 129 µvar/VA	YES
14/6	Apparent AC power	Power meters, one phase	6 VA ÷ 1200 VA (12 V ÷ 240 V, 0,05 A ÷ 5 A, 1 ÷ 0 i/c, 45 Hz ÷ 65 Hz)	43 µVA/VA ÷ 62 µVA/VA	YES

15. ELECTIRICITY/ACTIVE ELECTRICAL ENERGY

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
15/1	Active electrical energy	One phase Reference Standard of active energy	0,4 Ws ÷ 4800000 Ws (30 V ÷ 240 V, 0,05 A ÷ 100 A, 1 ÷ 0.25 i/c, 50 Hz ÷ 60 Hz, 1 s ÷ 100 s)	116 µWh/VAh ÷ 129 µWh/VAh	YES
15/2		Three phase Reference Standard of active energy	0,4 Ws ÷ 4800000 Ws (30 V ÷ 240 V, 0,05 A ÷100 A, 1 ÷ 0.25 i/c, 50 Hz ÷ 60 Hz, 1 s ÷ 100 s)	116 µWh/VAh ÷129 µWh/VAh	YES

16. ELECTIRICITY/REACTIVE ELECTRICAL ENERGY

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
16/1	Reactive electrical energy	One phase Reference Standard of reactive energy	0,4 vars ÷ 4800000 vars (30 V ÷ 240 V, 0.05 A ÷ 100 A, 1 ÷ 0.25 i/c, 50 Hz ÷ 60 Hz, 1 s ÷ 100 s)	116 µvarh/VAh ÷ 129 µvarh/VAh	YES
16/2		Three phase Reference Standard of reactive energy	0,4 vars ÷ 4800000 vars (30 V ÷ 240 V, 0,05 A ÷100 A, 1 ÷ 0.25 i/c, 50 Hz ÷ 60 Hz, 1 s ÷ 100 s)	116 µvarh/VAh ÷ 129 µvarh/VAh	YES

17. ELECTIRICITY/PHASE ANGLE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
17/1	Phase angle	Phase angle generators	0° ÷ 360° (10 mV ÷ 350 V, 50 Hz ÷ 100 kHz)	0,04° ÷ 1,68°	YES
17/2		Phase meters	0° ÷ 360° (1 Hz ÷ 100 kHz, 10 mV ÷ 350 V)	0,04° ÷ 1,68°	NO

18. ELECTIRICITY/CURRENT HARMONICS

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
18/1	Current and voltage waveform/ Current harmonics	Harmonics analysers	0,016 A ÷ 10 A	0,4 mA/A ÷ 2,9 mA/A (of fundamental)	YES

19. ELECTIRICITY/FLICKER

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
19/1	Current and voltage waveform/Flicker severity (Pst)	Flickermeters	0,5 ÷ 10	0,05	YES

20. ELECTIRICITY/AC HIGH VOLTAGE/RATIO ERROR					
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
20/1	AC high voltage/ Voltage transformers ratio error	Voltage transformers	0 % ÷ 2 % (Primary voltage 100/√3 V ÷ 120/√3 kV Secondary voltage 100/√3 V, 110/√3 V, 100 V, 110 V, 120 V Frequency 50 Hz)	0,01 % ÷ 0,02 %	YES

21. ELECTIRICITY/AC HIGH VOLTAGE/PHASE DISPLACEMENT					
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
21/1	AC high voltage/ Voltage transformers phase displacement	Voltage transformers	0 mrad ÷ 30 rad (Primary voltage 100/√3 V ÷ 120/√3 kV Secondary voltage 100/√3 V, 110/√3 V, 100 V, 110 V, 120 V Frequency 50 Hz)	0,10 mrad ÷ 0,15 mrad	YES

22. ELECTIRICITY/HIGH AC CURRENT/ RATION ERROR					
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
22/1	High AC current/ Current transformers ratio error	Current transformers	0 % ÷ 2 % (Primary current 1 A ÷ 3000 A Secondary current 1A, 5A Frequency 50 Hz)	0,004 % ÷ 0,015 %	YES

23. ELECTIRICITY/HIGH AC CURRENT/PHASE DISPLACEMENT

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
23/1	AC high voltage/ Current transformers phase displacement	Current transformers	0 mrad ÷ 30 mrad (Primary current 1 A ÷ 3000 A Secondary current 1A, 5A Frequency 50 Hz)	0,03 mrad ÷ 0,13 mrad	YES

24. ELECTIRICITY/CAPACITANCE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
24/1	Impedance/ Capacitance	Fixed capacitors	0,01 nF ÷ 10000 nF (frequency 20 Hz to 2 MHz)	0,59 mF/F ÷ 8,07 mF/F	YES
24/2		Capacitance meters, LCR meters, Capacitance bridge	1 Pf ÷ 1000 pF (frequency 100 Hz ÷ 1 MHz)	0,005 mF/F ÷ 0,26 mF/F	YES

25. ELECTIRICITY/INDUCTANCE

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Calibration and measurement capabilities in BIPM data base (accreditation)
25/1	Impedance/ Inductance	Inductance bridge, LCR meter	0,1 mH÷10000 mH (frequency 100 Hz, 1 kHz)	0,2 mH/H ÷ 0,5 mH/H	YES

26. PHYSICO – CHEMICAL QUANTITIES AND CHEMICAL MEASUREMENTS						
Service Number	**Field/ Subfield of measurement and calibration**	**Object of calibration**	**Measurement range**	**Measurement uncertainty (k=2)**	**Notice**	**Calibration and measurement capabilities in BIPM data base (accreditation)**
26/1	Density	Hydrometers/ glass ware of constant mass	600 kg/m^3÷ 1100 kg/m^3	± 0.06 kg/m	Provide traceability and procedure according to ISO 17025	NO
26/2			1100 kg/m^3 ÷ 1840 kg/m^3	± 0.08 kg/m^3	Provide traceability and procedure according to ISO 17025	NO
26/3		Density meters for laboratory use	600 kg/m^3÷ 1840 kg/m^3	± 0.08 kg/m^3	Provide traceability and procedure according to ISO 17025	NO
26/4		Portable density meters	600 kg/m^3÷ 1840 kg/m^3	± 0.08 kg/m^3	Provide traceability and procedure according to ISO 17025	NO
26/5		Hydrostatic balance for laboratory use	600 kg/m^3÷ 1840 kg/m^3	± 0.08 kg/m^3	Provide traceability and procedure according to ISO 17025	NO
26/6	Refractive index, Concentration	Handheld and Abbe refractometers	1.33299÷ 1.5320 for n_D 0 % ÷ 95 %	0.0001 for n_D 0.05 %	Provide traceability and procedure according to ISO 17025	NO
26/7		Automatic refractometers for laboratory use	1.33299÷ 1.5320 for n_D 0 % ÷ 95 %	0.0001 for n_D 0.05 %	Provide traceability and procedure according to ISO 17025	NO
26/8	Concentration	Hydrometers for special purposes/ Saccharimeters	0 % ÷ 60 % (% Brix)	0,4 %	Provide traceability and procedure according to ISO 17025	NO
26/9	Concentration	Glassware alcoholmeters	0 % ÷ 100 %	0.021 %	Provide traceability and procedure according to ISO 17025	NO
26/10		Hydrometers for special purposes/glass ware of constant mass	600 kg/m^3÷ 1840 kg/m^3	± 0.08 kg/m^3		NO

26/11	Ozone concentration	Ambient ozone analysers (photometers), with or without adjustment (calibration)	0 nmol/mol÷ 1000 nmol/mol	Q[1.1; 0.022x(O3)]		YES
26/12		Ozone generators				

27. PHOTOMETRY AND RADIOMETRY

Service Number	Field/ Subfield of measurement and calibration	Object of calibration	Measurement range	Measurement uncertainty (k=2)	Notice	Calibration and measurement capabilities in BIPM data base (accreditation)
27/1	Luminous intensity	Standard luminous intensity lamps	(1÷10000) cd	2 %		YES
27/2	Distribution of temperature	Lamps for distribution temperature	(2000÷3000) K	30 K		YES
27/3	Correlation temperature	Light sources	(1500÷3200) K	60 K		YES
27/4	Illuminance, illuminance responsivity	Illuminance meters, Photometers, Photodetectors	(0,05÷5000) lx	3 %		YES
27/5	Transmitance, regular, spectral	Spectrally neutral material	(0.001÷0.1)	(0.6÷2) % (401÷1000) nm		YES
27/6	Transmitance, regular, spectral	Spectrally neutral material	(0.1÷1)	0.3 % (401÷1000) nm		YES
27/7	Luminous flux	Lamps for luminous flux	(400÷10000) lm	3 %		YES
27/8	Luminance, Luminance responsivity	Luminance standards	(0,01÷5000) cd/m^2	2.5 %		YES
		Luminance meters, Photometers	A/(cd/m^2)	3 %		YES
27/9	Regular spectral transmittance	Neutral filters and solutions	(0,1÷1) (250÷359) nm	1 %		YES
			(0,1÷1) 400 nm	0,6 %		
		Spectrophotometers, biochemical analyzers (photometers, colorimeters)	(0.001÷1) (200÷1000) nm	(0,5÷2) %		

		ELISA readers				
27/10	Regular spectral reflectance	Reflectometers, reflection spectrophotometers	(280÷1000) nm	0.5 %	Provide traceability and procedure according to ISO 17025	NO
27/11	Chromaticity coordinates	Color standards, Colorymeters	x=0.1÷0.7 y= 0.05÷0.7	x=0.01÷0.02 y= 0.01÷ 0.03	Provide traceability and procedure according to ISO 17025	NO
27/12	Wavelength	Spectrally selective filters	(280÷1000) nm	± 0,3 nm	Provide traceability and procedure according to ISO 17025	NO
27/13	Spectral responsivity of detectors	Radiation detector	(280÷1000) nm	(1÷3) %	Provide traceability and procedure according to ISO 17025	NO

II CERTIFIED REFERENCE MATERIALS

1. FORENSICS

CRM CODE	Description of CRM	Certified value	Measurement uncertainty (k=2)	Notice	Calibration and measurement capabilities in BIPM data base (accreditation)
DMDM-E01	solution of ethanol in water, in 1 L volume bottles	Mass concentration of solution 0 g/L (concentration of ethanol in air at 34 °C 0 mg/L)	0,0001 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E02		Mass concentration of solution 0,2573 g/L (concentration of ethanol in air at 34 °C 0,10 mg/L)	0,0007 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E03		Mass concentration of solution 0,6432 g/L (concentration of ethanol in air at 34 °C 0,25 mg/L)	0,0014 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E04		Mass concentration of solution 1,0292 g/L (concentration of ethanol in air at 34 °C 0,40 mg/L)	0,0025 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E05		Mass concentration of solution 1,8011 g/L (concentration of ethanol in air at 34 °C 0,70 mg/L)	0,0043 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E06		Mass concentration of solution 2,4443 g/L (concentration of ethanol in air at 34 °C 0,95 mg/L)	0,0059 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E07		Mass concentration of solution 3,8594 g/L (concentration of ethanol in air at 34 °C 1,50 mg/L)	0,0092 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E08		Mass concentration of solution 5,0172 g/L (concentration of ethanol in air at 34 °C 1,95 mg/L)	0,012 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO
DMDM-E09		Mass concentration of solution 1,2252 g/L (concentration of ethanol in air at 34 °C 0,48 mg/L)	0,0030 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO

DMDM-E10		Mass concentration of solution 0,6126 g/L (concentration of ethanol in air at 34 °C 0,24 mg/L)	0,0015 g/L	Provide traceability and procedure according to ISO 17025 and ISO Guide 34	NO

III TESTING

1. MASS		
Measuring instruments	**Method of testing**	**Accreditation**
Non-automatic weighing instruments, class (I) up to 1 kg	SRPS EN 45501:2009, т.А.4.2, А.4.3,А.4.4, А.4.5, А.4.6. А.4.7, А.4.8, А.4.10, А.4.11, А.4.12, А.5.1, А.5.2, А.5.3, Б.2.2, Б.4	YES
Non-automatic weighing instruments, class (II) up to 10 kg		YES
Non-automatic weighing instruments, class (III) and (IIII) up to 100 kg		YES

2. PRESSURE		
Measuring instruments	**Method of testing**	**Accreditation**
Sphygmomanometers	OIML R16-1 OIML R16-2	No
Tire pressure gauges for motor vehicles	OIML R23	No

3. LENGHT & ANGLE		
Measuring instruments	**Method of testing**	**Accreditation**
Material measures of length for general use	OIML R 35	NO
Wire and cable length measuring machines	OIML R 66	NO
Taximeters	OIML R 21	YES
Automatic level gauges (magnetostrictive)	OIML R 85	NO

4. ACOUSTICS		
Measuring instruments	**Method of testing**	**Accreditation**
Sound level meters	OIML R 58 IEC 61672-2	NO

5. TEMPERATURE SENSORS		
Measuring instruments	**Method of testing**	**Accreditation**
Medical thermometers	SRPS EN 12470-1,3,4,5	NO
Resistance thermometers	SRPS EN 60751	NO
Thermocouples	SRPS EN 60584	NO

6. HEATING ENERGY		
Measuring instruments	**Method of testing**	**Accreditation**
Calculation unit as a part of heat meters and cooling meters	SRPS EN 1434-5 OIML R75	NO
Pair of temperature sensor as a part of heat meters and cooling meters	SRPS EN 1434-5 OIML R75 SRPS EN 60751	NO

7. ACTIVE ELECTRICAL ENERGY		
Measuring instruments	**Method of testing**	**Accreditation**
Static meters for active energy (classes 0,2S)	SRPS EN 62053-22:2008 (clause 7.3, 8.1, 8.2, 8.3.1, 8.3.2, 8.3.3, 8.4)	YES (ATS)
Electromechanical meters for active energy (class index A and B)	MID, SRPS EN 50470-2:2009 (clause 8.1, 8.7.5.3, 8.7.5.4, 8.7.7.2, 8.7.7.3, 8.7.7.4, 8.7.7.5, 8.7.7.7, 8.7.9.2, 8.7.9.3, 8.7.10)	YES (ATS)
Static meters for active energy (class index A, B and C)	MID, SRPS EN 50470-3:2009 (clause 8.1, 8.7.5.3, 8.7.5.4, 8.7.7.2, 8.7.7.3, 8.7.7.4, 8.7.7.5, 8.7.7.7, 8.7.9.2, 8.7.9.3, 8.7.10)	YES (ATS)

8. REACTIVE ELECTRICAL ENERGY		
Measuring instruments	**Method of testing**	**Accreditation**
Static meters for reactive energy (classes 2 and 3)	SRPS EN 62053-23:2008 (clause 7.3, 8.1, 8.2, 8.3.1, 8.3.2, 8.3.3, 8.4)	YES (ATS)

9. MEASURING INSTRUMENTS FOR PHYSICO-CHEMICAL AND CHEMICAL QUANTITIES		
Measuring instruments	**Method of testing**	**Accreditation**
Densitometers for laboratory use	ISO 15212-1	NO
Evidential breath analyzers	OIML R 126	NO
Refractometers	OIML R 108, OIML R 124, OIML R 142	NO
Moisture meters for cereal grains and oil seeds	OIML R 59	NO
Instruments for measuring vehicle exhaust emission	OIML R 99	NO
Opacity meters (Smoke meters)	ISO 11614:1999 EEC 72/306	NO

10. VOLUME OF LIQUIDS		
Measuring instruments	**Method of testing**	**Accreditation**
Dynamic measuring systems	OIML R 117-1	NO

for liquids other than water		

11. VELOCITY		
Measuring instruments	**Method of testing**	**Accreditation**
Laser speedmeters - Lidars	OIML R 91	NO
Radar speedmeters	OIML R 91	NO
Sensors speedmeters	OIML R 91	NO

IV VERIFICATION OF MEASURING INSTRUMENTS

Verification of measuring instruments, in accordance with the **Law on Metrology** („Official Gazette of RS" 15/16), performs authorized bodies for tasks of verification of measuring instruments, or Directorate of Measures and Precious Metals for those measuring instruments for which verification no authorized body exists.

List of measuring instruments which verification preform Dorectorate of Measures and Precious Metals

Measuring instruments	**Name of measuring instruments**
Lenght	measuring instruments for lenght of general purpose (tape measures, folding meter length, wood meters for fabric, meters for measuring liquid level and meters for measuring empty space in the tanks above 3200 mm, measuring rulers, measuring tapes with plummet)
	automatic liquid level gauges above 3200 mm
	automatic liquid level gauges (capacitive and radar)
Volume	milk measuring instruments
	milk flow measuring instruments above 36 m^3/h
	tanks (underground and above ground) geometric method
	measuring systems for compressed natural gas (CNG) for vehicles
	measuring instruments for volume liquid petroleum gas (LPG) maximum flow 1000 1/min
	measuring instruments and systems for continuous and dynamic measurement of quantities of liquids other than water above 2000 1/min
Mass	automatic balances (with addition of discontinuous measurement results, for sorting, check balances and labeling machines, balances on a conveyor belt for weighting of vehicle in motion)
Density	measuring instruments for density liquid that is used in the trade of goods and services (aerometers and densitometers);
Concentration	ethyl meter
	alcoholmeters
	refract meters
Measuring instruments of special purpose	sound-level meter
	speed measuring instruments for vehicles in traffic installed in the vehicle type Vascar
	speed measuring instruments for vehicles in traffic installed on the traffic lights

More detailed data on authorized bodies and kinds of measuring instruments for which verification are authorized, can be taken from Registry of authorized bodies for verification of measuring instruments.

EXCERPT FROM THE REGISTRY OF BODIES AUTHORIZED FOR VERIFICATION OF MEASURING INSTRUMENTS

V TYPE APPROVAL OF MESURING INSTRUMENTS

Kinds of measuring instruments for which must be issued a certificate of type approval are prescribed by the Regulation on the kinds of measuring instruments for which verification is mandatory and intervals of their periodic verification („Official Gazette of RS", No. 49/10 and 110/13).

No.	Kinds of measuring instruments
1.	Material measures of length for general use
2.	Wire and cable length measuring machines
3.	Measuring systems for compressed gas fuels for vehicles
4.	Automatic level gauges for measuring the level of liquids
5.	Measuring instruments and systems for continuous and dynamic measurement of quantities of liquids other than water
6.	Water meters
7.	Gas meters
8.	Non-automatic weighing instruments
9.	Automatic weighing instruments
10.	Load cells
11.	Electronic indicators for weighing instruments
12.	Sphygmomanometers
13.	Tire pressure gauges for motor vehicles
14.	Instruments for measurement of motor vehicles braking force
15.	Electronic density meters used in trade of products and services
16.	Evidential breath analyzers
17.	Moisture meters for cereal grains and oilseeds
18.	Exhaust gas analyzers
19.	Opacity meters (Smoke meters)
20.	Refractometers used in trade of products and services
21.	Clinical thermometers
22.	Electrical energy meters
23.	Spectrophotometers for medical laboratories
24.	Dosimeters for medical laboratories
25.	Sound level meters
26.	Taximeters
27.	Instruments for measurement of vehicles speed in traffic
28.	Heat meters

VI PRECIOUS METALS ARTICLES CONTROL

Pursuant to the Law on Control of Precious Metal Articles („Official Gazette of RS", No. 36/11 and No. 15/16), the Directorate of Measures and Precious Metals shall, and at the request of the manufacturer of precious metal articles, importers, representative, or owners of precious metal articles and other legal entities, provides the following services:

PRECIOUS METALS ARTICLES CONTROL		
No.	SERVICES	INTENDED TO
1.	Determination of meeting the requirements in order to get the mark of manufacturer of precious metals articles and issuing Decision on mark of manufacturer, importer, or representative, of precious metals articles as well as renewal of the decision.	The manufacturers of precious metals articles, i.e. business entities that are registered to conduct the business of manufacturing of precious metals articles in accordance with the law governing the registration of business entities - private craft shops and companies
2.	Determination of conditions to be met by facilities and marking equipment for precious metal articles at the business premises of the manufacturer or importer.	The manufacturers or importers of precious metals articles that want to testing and marking of precious metals is done in their business premises
3.	Performance of quantitative chemical analysis of: - precious metals (gold and silver) - alloys precious metals and - alloys precious metals articles are made of which.	The manufacturers, importers, or representatives of precious metals articles, and privately owned articles
4.	Testing the composition and fineness of test probes of precious metals	The manufacturers of precious metals articles.
5.	Testing and marking of precious metal articles testing the composition and fineness of test probes of precious metals (platinum, gold, palladium, silver).	The manufacturers, importers, or representatives of precious metals articles, and privately owned articles.