Head (Deputy head)
seal place Federal Accreditation Service
Litvak A.G.
signature initials, family name
26 July 2019

Annex
to Certificate of Accreditation
№ RA.RU.312550
of 11 July 2018
in 15 sheets, sheet 1

ACCREDITATION SCOPE

Federal Budgetary Institution "State Regional Centre for Standardization, Metrology and Testing in Sverdlovsk region"
(FBI "URALTEST")

name of the legal entity or family name, first name and patronymic of an individual entrepreneur (if any)

620990, Russian Federation, Sverdlovsk region, Ekaterinburg, Krasnoarmeyskaya str., 2a
624070, Russian Federation, Sverdlovsk region, Sredneuralsk, Gashev str., 2a;
Sverdlovsk region, Verkhnyaya Pyshma, automobile road Ekaterinburg – Nizhny Tagil – Serov from 17 to 23 km
(geodesic test site / calibration linear base line – "Sverdlovsk base line")

address of the place of activity

Calibration of measurement instruments

УР

calibration stamp cipher

Item No.	Measurements, type (group) of measurement instruments	Metrological requirements		Note
		measurement range	Uncertainty* (error, class, order)**	
1	2	3	4	5
Address of the place of activity 620990, Russian Federation, Sverdlovsk region, Ekaterinburg, Krasnoarmeyskaya str., 2a				
MEASUREMENTS OF GEOMETRIC QUANTITIES				
1	Goniometers GS-1, GS-2	(0 – 360)°	U_p = 0,6″	-
2	Plane-angle gauges	(0 – 360)°	U_p = 0,6″	-
3	Horizontal length gauges Labconcept, Precimar	(100 – 550) mm	U_p = (0,05 + + 1,4·L) µm, where L is measured length in m	-
4	Internal diameter gauges	(100 – 250) mm	U_p = 0,4 µm	-
5	Levels (incl. digital ones)	(0,5 – ∞) m	U_p = 0,1 mm Error ± (0,3 – 10) mm	-
6	Laser range finders	(1,5 – 1000) m	U_p = 0,24 mm Error ≥ ± 0,6 mm	-
		(1000 – 3000) m	U_p = 0,40 mm Error ≥ ± 0,6 mm	-

1	2	3	4	5
		(0 – 360)°	U_p = 100" Error ≥ ± 10"	-
7	Collimating testing stands	(0 – 360)°	U_p = 1,0" Error ≥ ± 1,0"	-
8	Electronic tacheometers (including theodolites)	(0 – 360) °	U_p = 1,0 " Error ≥ ± 0,5 "	-
		(1,5 – 3000) m	U_p = = Q·[0,16; 0,54L] mm, where L is distance in km- Error ≥ ± 0,6 mm	-
9	Geodesic baselines	(1,5 – 2999) m	U_p = = Q·[0,16; 0,54L] mm, where L is distance in km Error ≥ ± 0,6 mm	-
10	Defect detectors, ultrasonic devices with ultrasonic transducers	(0,2 – 20000) mm	U_p = 0,002 mm Error ≥ ± 0,003 mm	-
		(0,2 – 10000) µs	U_{po} = 1 · 10^{-9} s Relative error ≥ ± 3 · 10^{-7} (U_{po} = 1 · 10^{-6})	-
		(0,1 – 120) dB	U_p = 0,05 dB Error ≥ ± 0,1 dB	-
		(0 – 80) °	U_p = 1,2 ° Error ≥ ± 1 °	-
		in frequency range from 0,025 to 50 MHz	-	-
MEASUREMENTS OF MECHANICAL QUANTITIES				
11	Weights of classes			-
	E_1	(1 mg – 40,0 kg)	U_p = 0,5 · 10^{-3} mg Accuracy class E_1	
	E_2	(1 mg – 40,0 kg)	U_p = 2 · 10^{-3} mg Accuracy class E_2	
	F_1	(1 mg – 40,0 kg)	U_p = 0,7 · 10^{-2} mg Accuracy class F_1	
	F_2	(1 mg – 2,0 t)	U_p = 2 · 10^{-2} mg Accuracy class F_2	
	M_1	(1 mg – 2,0 t)	U_p = 0,7 · 10^{-1} mg Accuracy class M_1	
	M_{1-2}	(50 kg – 2,0 t)	U_p = 1,7 · 10^3 mg Accuracy class M_{1-2}	
	M_2	(100 mg – 2,0 t)	U_p = 0,5 mg Accuracy class M_2	
	M_{2-3}	(50 kg – 2,0 t)	U_p = 0,5 · 10^4 mg Accuracy class M_{2-3}	
	M_3	(1 g – 2,0 t)	U_p = 3,3 mg Accuracy class M_3	

1	2	3	4	5
12	Non-automatic scales of weighing device on strain gauge (weight-measuring) sensors	(0,01 mg – 200 t)	$U_p = 4 \cdot 10^{-6}$ g (accuracy class: special, high, intermediate, ordinary)	-
13	Weight batchers of discrete action	(1–20) t	$U_p = 2 \cdot 10^{-5}$ g Accuracy class 0,2; 0,5; 1; 2; 2,5; 4	-
14	Torque wrenches	(1 – 25) N·m	$U_p =$ $= 1,16 \cdot 10^{-2}$ N·m Relative error ≥ ± 2,6 % ($U_{po} = 1,16$ %)	-
		(10 – 350) N·m	$U_p =$ $= 8,2 \cdot 10^{-2}$ N·m Relative error ≥ ± 2,6 % ($U_{po} =$ 0,82 %)	-
		(200 N·m 2 kN·m)	$U_{p\ min} = 1,16$ N·m Relative error ≥ ± 2,7 % ($U_{po} =$ 0,58 %)	-
15	Presses, testing machines and hydraulic jacks	(0,01 – 0,1) kN	$U_p =$ $= 2,4 \cdot 10^{-5}$ kN Relative error ≥ ± 0,5 % ($U_{po} =$ 0,26 %)	-
		(0,04 – 2000) kN	$U_p =$ $= 4,8 \cdot 10^{-5}$ kN Relative error ≥ ± 0,5 % ($U_{po} =$ 0,12 %)	-
16	Dynamometers	(0,02) – 1) kN	$U_p = (4,2 \cdot 10^{-6})$ kN Relative error ≥ ± 0,06 % ($U_{po} =$ 0,014 %)	-
		(1-500) kN	$U_p =$ $= (2,2 \cdot 10^{-4})$ kN Relative error ≥ ± 0,06 % ($U_{po} =$ 0,022 %)	-
MEASUREMENTS OF PARAMETERS OF FLOW, CONSUMPTION, LEVEL, VOLUME OF SUBSTANCES				
17	Truck tankers for liquid petroleum products	up to 50 m^3	$U_p = 0,0009 \cdot V_{meas.} m^3$ Relative error ≥ ± 0,4 %	-
18	Steel horizontal cylindrical tanks	(3–200) m^3	$U_p = 0,1\ m^3$ Relative error ≥ ± 0,3 % ($U_{po} = 0,1 \cdot V$ %)	-

1	2	3	4	5
19	Steel horizontal vertical tanks	(100–50000) m^3	$U_p = 0{,}033\ m^3$ Relative error ≥ ± 0,1 % (U_{po} = = 0,033 · V %)	-
20	Glass, plastic and metal capacity measures	0,02 cm^3 – - 50000 dm^3	U_p = = $1{,}92 \cdot 10^{-6}\ cm^3$ Error ≥ ± 0,00015 ml Relative error ≥ ± 0,5 % (U_{po} = 0,0096 %)	-
21	Medical laboratory dispensers	(0,0001 – - 50,0) cm^3	U_p = = $1{,}7 \cdot 10^{-7}\ cm^3$ Relative error ≥ ± 0,5 % (U_{po} = 0,17 %)	-
22	Fluid meters, flow-rate meters	(0,02 – 2000) m^3/h	U_p = = $1 \cdot 10^{-5}\ m^3/h$ Relative error ≥ ± 0,1 % (U_{po} = 0,05 %)	-
23	Volume meters IO-1	(95 – 100) cm^3	$U_p = 1{,}43\ cm^3$ Relative error ≥ ± 1,5 % (U_{po} = 1,5 %)	-
24	Level gauges, level transducers	(10 mm - 100 m) [(- 40) − 65] ºC; (650 − 1500) kg/m^3	U_{ph} = = $3{,}3 \cdot 10^{-2}$ mm U_{pt} = = $1{,}7 \cdot 10^{-3}$ ˚C $U_{pp} = 0{,}5\ kg/cm^3$ Error ≥ ± 1,0 mm Error ≥ ± 0,5 ºC; Error ≥ ± 1,5 kg/m^3 (U_{pho} = 0,33 %) (U_{pto} = 0,17 %)	-
25	Technological petroleum pipelines	(0 – 500) m^3	U_p = = $1 \cdot 10^{-3}\ m^3$ Error ≥ ± 0,3 % (U_{po} = 0,1 %)	-
26	Flow transducers, flow meters, rotameters, fluid meters	(0,02 – 0,2) m^3/h (0,02 – 0,2) t/h	$U_p = 3{,}2 \cdot 10^{-5}\ m^3/h$ $U_p = 3{,}2 \cdot 10^{-5}$ t/h Relative error ≥ ± 0,3 % (U_{po} = 0,16 %)	-
		(0,2 – 50) m^3/h (0,2 – 50) t/h	$U_p = 2 \cdot 10^{-4}\ m^3/h$ $U_p = 2 \cdot 10^{-4}$ t/h Relative error ≥ ± 0,25 % (U_{po} = 0,1 %)	-
27	Calibration setups of volumetric and mass flow (volume and mass) rate	(0,02 – 900) m^3/h (0,02 – 900) t/h	$U_p = 1{,}6 \cdot 10^{-5}\ m^3/h$ $U_p = 1{,}6 \cdot 10^{-5}$ t/h Relative error ≥ ± 0,1 % (U_{po} = 0,08 %)	-

1	2	3	4	5
28	Flow transducers, flow meters, gas volume flow rate meters, rotameters, rheometers, electro-aspirators, sampling devices	(0,005 – 65) m^3/t	U_p = 1,5 · 10^{-5} m^3/t Relative error ≥ ± 0,5 % (U_{po} = 0,3 %)	-
29	Calibration setups of gas volume flow rate	(0,005 – 2500) m^3/t	U_p = = 1,25 · 10^{-5} m^3/t Relative error ≥ ± 0, 3 % (U_{po} = 0,25 %)	-
30	Air flow rate meters	(0,1 – 30) m/s	U_p = 0,12 m/s Error ± (0,045 + 0,045V) m/s	-
PRESSURE MEASUREMENTS, VACCUM MEASUREMENTS				
31	Piston overpressure manometers	[(- 0,1) – 0] MPa (0,0014 – 100) MPa	U_p = = 1,8 · 10^{-7} MPa U_p = = 8,4 · 10^{-8} MPa Relative error ≥ ± 0,008 % (U_{po} = 0,006 %)	-
32	Piston absolute pressure manometers	(0,0014 – 0,7) MPa	U_p = = 8,4 · 10^{-8} MPa Relative error ≥ ± 0,01 % (U_{po} = 0,006 %)	-
33	Calibrators, controllers, complexes, setting devices, transducers, sensors, digital and overpressure manometers	[(- 0,1) – 0] MPa (0,0014 – 100) MPa	U_p = 1,8 · 10^{-7} MPa U_p = 8,4 · 10^{-8} MPa Relative error ≥ ± 0,008 % (U_{po} = 0,006 %)	-
34	Calibrators, controllers, complexes, setting devices, transducers, sensors, digital and overpressure manometers	(5 – 250) MPa	U_p = = 1,25 · 10^{-3} MPa Relative error ≥ ± 0,05 % (U_{po} = 0,025 %)	-
35	Calibrators, controllers, complexes, setting devices, transducers, sensors, digital absolute pressure manometers	(0,0014 – 0,7) MPa	U_p = = 8,4 · 10^{-8} MPa Relative error ≥ ± 0,01% (U_{po} = 0,006 %)	-

1	2	3	4	5
36	Oxygen manometers	[(- 0,1) – 60] MPa	U_p = = 0,7 · 10^{-5} MPa Relative error ≥ ± 0,15 % (U_{po} = 0,07 %)	-
37	Micromanometers	(0 – 4) kPa	U_p = 0,12 Pa Error ≥ ± 0,01 Pa	-
38	Head gauges, draught meters, micromanom-eters	(0 – 250) kgs/m^2	U_p = = 1,25 · 10^{-3} kgs/m^2 Relative error ≥ ± 0,5 % (U_{po} = 0,025 %)	-
39	Barometric pressure measurement instru-ments	(5 – 130) kPa	U_p = 11,62 Pa Error ≥ ± 30 Pa	-
MEASUREMENTS OF PHYSICO-CHEMICAL COMPOSITION AND PROPERTIES OF SUBSTANCES				
40	pH measurement in-struments	(0 – 14)	U_p ≥ 0,012 Error ≥ ± 0,03	-
41	Instruments for meas-uring specific electri-cal conductivity of liquids	(1·10^{-4} – 100) S/m	U_p = = 1 ·10^{-7} S/ Relative error ≥ ± 0,5 % (U_{po} = 0,12 %)	-
42	Fluid densitometers	(0,6 – 2,0) g/cm^3	U_p = 5·10^{-5} g/ cm^3 error ≥ ± 1·10^{-4} g/cm^3	-
43	Gas analyzers (indus-trial emissions, work-place air, clean gases and their mixtures)	(0,000001 – 10) %	U_p = = 3,2·10^{-5} % vol. Relative error ≥ ± 0,2 %	-
		(10 – 100) %	U_p = 0,07 % vol. Relative error ≥ ± 0,2 % (U_{po} = 0,40 %)	-
		(0,02 – 1500) mg/m^3	U_p = 0,052 mg/m^3 Relative error ≥ ± 4 % (U_{po} = 5,8 %)	-
44	Ethanol Vapor Ana-lyzers in exhaled air	(0 – 2) mg/dm^3	U_p = 7,6 ·10^{-4} mg/dm^3 Relative error ≥ ± 0,02 mg/dm^3 (U_{po} = 3,6 %)	-
45	Hygrometers	(0 – 100) %	U_p = 0,08 % Error ≥ ± 1,0 %	-
THERMOPHYSICAL AND TEMPERATURE MEASUREMENTS				
46	Digital thermometers	[(- 196) – 660] °C	U_p = 0,006 °C Error ≥ ± 0,01 °C	-
47	Resistance thermometers	[(- 196) – 660] °C	U_p = 5,56 · 10^{-8} Ohm Error ≥ ± 0,01 °C	-
48	Thermoelectric trans-ducers	[(- 196) – 1800] °C	U_p = 0,4 °C Error ≥ ± 0,1 °C	-

1	2	3	4	5
49	Liquid glass, manometric, bimetallic thermometers	[(- 80) – 450] °C	U_p = 0,006 °C Error ≥ ± 0,01 °C	-
50	Digital instruments for temperature measurement	[(- 196) – 1800] °C	U_p = 0,03 °C Relative error ≥ ± 0,25 %	-
		(0,01 – 100000) Ohm	$U_p = 2{,}89 \cdot 10^{-7}$ Ohm Relative error ≥ ± 0,00005 %	-
		(1 мВ – 10 В)	$U_p = 5{,}79 \cdot 10^{-7}$ mV Error ± 0,0001%U + + 0,00001%Uп	-
51	Dew-point meters	[(- 40) – 60] °C	U_p = 0,078 °C Error ≥ ± 0,6 °C	-
52	Temperature recorders	[(- 30) – 25] °C	U_p = 0,12 °C Error ≥ ± 0,23 °C	-
TIME AND FREQUENCY MEASUREMENTS				
53	Instruments for frequency and time measurements	(1 Hz – 40 G Hz) (50 ps – 1000 s)	U_p = $= (1{,}6 \cdot 10^{-12} \cdot f)$ Hz U_p = $= (1{,}6 \cdot 10^{-12} \cdot t)$ s Relative error ≥ ± $4 \cdot 10^{-12}$ ($U_{po} = 1{,}6 \cdot 10^{-12}$)	-
MEASUREMENTS OF ELECTROTECHNICAL AND MAGNETIC QUANTITIES				
54	Instruments for measuring strength, voltage and power of alternating current	(6 – 576) V (40 – 70) Hz	$U_p = 7{,}2 \cdot 10^{-4}$ V Relative error ≥ ± 0,025 % (U_{po} = 0,012 %)	-
		(0,005 – 120) A (40 – 70) Hz	$U_p = 6 \cdot 10^{-7}$ A Relative error ≥ ± 0,025 % (U_{po} = 0,012 %)	-
		(0,03 – 207360) V·A (40 – 70) Hz	$U_p = 7{,}5 \cdot 10^{-6}$ V·A Relative error ≥ ± 0,05 % (U_{po} = 0,025 %)	-
55	Permanent voltage measurement instruments	(1 мкВ – 1 mV)	$U_p = 5 \cdot 10^{-5}$ μV Relative error ≥ ± 0,01 % (U_{po} = = (0,005 – 4,6) %)	-
		(1 – 20) mV	$U_p = 5 \cdot 10^{-5}$ mV Relative error ≥ ± 0,003 % (U_{po} = (0,001 – – 0,005) %)	-
		(20 – 200) mV	$U_p = 2 \cdot 10^{-4}$ mV Relative error ≥ ± 0,002 % (U_{po} = (0,0007 – – 0,0011) %)	-
		(200 mV – 2 V)	$U_p = 1 \cdot 10^{-3}$ mV Relative error ≥ ± 0,001 % (U_{po} = (0,0004 – – 0,0007) %)	-

1	2	3	4	5
		(2 – 20) V	$U_p = 5 \cdot\cdot 10^{-6}$ V Relative error ≥ ± 0,0005 – 5 % (U_{po} = (0,0002 – – 0,0004) %)	-
		(20 – 200) V	$U_p = 8 \cdot 10^{-5}$ V Relative error ≥ ± 0,001 % (U_{po} = (0,0004 – – 0,0006) %)	-
		(200 –1000) V	$U_p = 9 \cdot 10^{-4}$ V Relative error ≥ ± 0,0012 % (U_{po} = (0,0004 – – 0,0006) %)	-
56	Instruments for measuring alternating current voltage	(10 – 22) mV (10 Гц – 1 MHz)	$U_p = 2{,}3 \cdot 10^{-3}$ mV Relative error ≥ ± 0,035 % (U_{po} = (0,023 – - 0,23) %)	-
		(22 – 70) mV (10 Гц – 1 MHz)	U_p = $2{,}65 \cdot 10^{-3}$ mV Relative error ≥ ± 0,015 % (U_{po} = (0,007 – 0,12) %)	-
		(70 – 220) mV (10 Hz – 1 MHz)	$U_p = 4{,}8 \cdot 10^{-3}$ mV Relative error ≥ ± 0,009 % (U_{po} = (0,006 – - 0,12) %)	-
		(220 – 700) mV (10 Hz – 1 MHz)	U_p = 0,099 mV Relative error ≥ ± 0,007 % (U_{po} = (0,005 – - 0,12) %)	-
		(700 мВ – 2,2 V) (10 Hz – 1 MHz)	U_p = 0,020 mV Relative error ≥ ± 0,005 % (U_{po} = (0,004 – - 0,12) %)	-
		(2,2 –7) V (10 Hz – 1 MHz)	$U_p = 6{,}9 \cdot 10^{-5}$ V Relative error ≥ ± 0,005 % (U_{po} = (0,003 – 0,14) %)	-
		(7 – 22) V (10 Hz – 1 MHz)	$U_p = 2{,}2 \cdot 10^{-4}$ V Relative error ≥ ± 0,005 % (U_{po} = (0,003 – - 0,14) %)	-
		(22 –70) V (10 Hz – 1 MHz)	$U_p = 8{,}5 \cdot 10^{-4}$ V Relative error ≥ ± 0,006 % (U_{po} = (0,004 – – 0,14) %)	-
		(70 – 220) V (10 Hz – 500 kHz)	$U_p = 3{,}5 \cdot 10^{-3}$ V Relative error ≥ ± 0,007 % (U_{po} = (0,005 – - 0,06) %)	-

1	2	3	4	5
		(220 – 700) V (10 Hz – 100 kHz)	U_p = 0,011 V Relative error ≥ ± 0,008 % (U_{po} = (0,005 – – 0,06) %)	-
		(700 – 1000) V (10 Hz – 100 kHz)	U_p = 0,035 V Relative error ≥ ± 0,008 % (U_{po} = (0,005 – - 0,06) %)	-
57	Magnetic flux measurement instruments	$(1\cdot10^{-7} – 10)$ Wb	$U_p = 5 \cdot 10^{-10}$ Wb Relative error ≥ ± 0,1 % (U_{po} = 0,05 %)	-
		$(1\cdot10^{-4}$ – $1\cdot10^{-2})$ Wb/A	$U_p = 1,5 \cdot 10^{-7}$ Wb/A Relative error ≥ ± 0,1 % (U_{po} = 0,05 %)	-
58	Instruments for measuring magnetic induction and intensity of constant and alternating magnetic field	(1 – 200000) m^{-1} $(1\cdot10^{-6} – 0,25)$ T/A	$U_p = 5 \cdot 10^{-3}$ m^{-1} $U_p = 5 \cdot 10^{-9}$ T/A Relative error ≥ ± 0,05 % (U_{po} = 0,03 %)	-
		$(1\cdot10^{-8} – 2)$ T $(1\cdot10^{-2} – 1,6\cdot10^{6})$ A/m	$U_p = 2 \cdot 10^{-10}$ T $U_p = 2 \cdot 10^{-4}$ A/m Relative error ≥ ± 0,05 % (U_{po} = 0,03 %)	-
		$(1\cdot10^{-5} – 5)$ Wb/T	$U_p = 3 \cdot 10^{-8}$ Wb/T Relative error ≥ ± 0,5 % (U_{po} = 0,3 %)	-
		in the frequency range (0 – 400) kHz	-	-
59	Instruments for measuring the gradient of magnetic field intensity, magnetic induction	(1 – 200000) A/m^2 $(1\cdot10^{-6} – 0,25)$ T/m	U_p = 0,005 A/m^2 $U_p = 5 \cdot 10^{-9}$ T/m Relative error ≥ ± 1 % (U_{po} = 0,5 %)	-
		$(1\cdot10^{3} – 2\cdot10^{5})$ m^{-2} $(1\cdot10^{-3}$ – - 0,25) T/(A·m)	U_p = 4 m^{-2} U_p = $= 4 \cdot 10^{-6}$ T/(A·m) Relative error ≥ ± 1 % (U_{po} = 0,4 %)	-
		in the frequency range (0 – 1000) Hz	-	-
60	Measurement instruments and measures of static and dynamic magnetic characteristics of magnetic materials	$(1\cdot10^{-6} – 50)$ A	$U_p = 1 \cdot\cdot 10^{-10}$ A ≥ ± 0,05 % (U_{po} = · 0,01 %)	-
		$(1\cdot10^{-7} – 10)$ Wb	$U_p = 5 \cdot\cdot 10^{-10}$ Wb Relative error ≥ ± 0,1 % (U_{po} = · 0,05 %)	-
		$(1\cdot10^{-4} – 2,25)$ T	$U_p = 3 \cdot 10^{-7}$ T Relative error ≥ ± 0,5 % (U_{po} = 0,3 %)	-

1	2	3	4	5
		(0,001 – 25000) A/m	$U_p = 1,2 \cdot 10^{-6}$ A/ Relative error ≥ ± 0,2 % (U_{po} = 0,12 %)	-
		(1 – 1000) mH/m	U_p = 0,035 мH/m Relative error ≥ ± 3 % (U_{po} = 3,5 %)	-
		(0,1 – 100) W/kg	U_p = $= 6 \cdot 10^{-4}$ W/kg Relative error ≥ ± 0,6 % (U_{po} = 0,6 %)	-
		(0,1 – 80) % ferrite content	U_p = = 0,003 % ferrite content Relative error ≥ ± 1,5 % (U_{po} = 1,5 %)	-
		in the frequency range (0 – 30) kHz	-	-
61	Instruments for measuring parameters of electric fields	(0,1 – 25) kV	U_p = 0,0012 kV Relative error ≥ ± 5 % (U_{po} = 1,2 %)	-
		(0,0001 – - 1000) kV/m	$U_p = 3 \cdot 10^{-6}$ kV/m Relative error ≥ ± 5 % (U_{po} = 3 %)	-
		($2 \cdot 10^{-8}$ – - $1 \cdot 10^{-5}$) C/m^2	U_p = $= 6 \cdot 10^{-10}$ C/m^2 Relative error ≥ ± 5 % (U_{po} = 3 %)	-
		in the frequency range (0 – 400) kHz	-	-
RADIOELECTRONIC MEASUREMENTS				
62	Instruments for measuring attenuation of electromagnetic waves	(0 – 120) dB (0 – 17,44) GHz	U_p = 0,003 dB Error ≥ ± 0,01 dB	-
VIBROACOUSTIC MEASUREMENTS				
63	Calibration vibration shakers	($1 \cdot 10^{-1}$ – $1 \cdot 10^{4}$) m/s^2 (0,5 – 10000) Hz	U_p = $= 2,5 \cdot 10^{-3}$ m/s^2 Error ≥ ± 2 % (U_{po} = 2,5 %)	-
64	Vibrometers with piezoelectric and induction vibration converters	($1 \cdot 10^{-1}$ – $1 \cdot 10^{4}$) m/s^2 ($1 \cdot 10^{-4}$ – 1) m/s ($1 \cdot 10^{-5}$ – - $1 \cdot 10^{-2}$) m (0,5 – 10000) Hz	$U_p = 5 \cdot 10^{-3}$ m/s^2 $U_p = 5 \cdot 10^{-5}$ m/s $U_p = 5 \cdot 10^{-7}$ m Error ≥ ± 2 % (U_{po} = 5 %)	-

1	2	3	4	5
65	Noise level meters	(30 - 130) dB· (31,5 – 16000) Hz	U_p = 0,7 dB Error ≥ ± 0,5 dB	-
66	Acoustic calibrators	94 dB, 114 dB (100 – 1000) Hz	U_p = 0,35 dB Error ≥ ± 0,4 dB	-
67	Instruments for measuring time and velocity of ultrasonic wave propagation, measures for calibration of defect detectors, thickness gauges, ultrasonic testers	(0,05 – 5000) µs	U_p = 0,5 ns Relative error ≥ ± 0,003 % (U_{po} = 0,0015 %)	-
		(1000 – 10000) m/s	U_p = 2 m/s Relative error ≥ ± 0,1 % (U_{po} = 0,04 %)	-
		(0,2 – 600) mm	U_p = 0,0005 mm Error ≥ ± 0,001 mm	-
OPTICAL AND OPTICO-PHYSICAL MEASUREMENTS				
68	Instruments for measuring optical density of materials in transmitted light	(0–4,5) B	U_p = 0,012 B Error ≥ ± 0,02 B	-
69	Refractometers	(1,2–1,7) nD	$U_p = 3 \cdot 10^{-5}\ n_D$ Error ≥ $\pm 1 \cdot 10^{-4}\ n_D$	-
		(0–100) % Brix	U_p = 0,2 % Brix Error ≥ ± 0,2 % Brix	
70	Spectrophotometers	(0–100) % (190–2500) nm	U_p = 0,5 % Error ≥ ± 0,5 % Error ≥ ± 0,2 нм	-
Address of the place of activity **624070, Russian Federation, Sverdlovsk region, Sredneuralsk, Gashev str., 2a**				
MEASUREMENTS OF IONIZING RADIATION AND NUCLEAR CONSTANTS				
71	Measures of exposure dose rate of gamma-radiation (kerma rate in air)	$(3 \cdot 10^{-12}$ – – $6 \cdot 10^{-6})$ A/kg	U_p = = $4,5 \cdot 10^{-14}$ A/kg U_p = $1,5 \cdot 10^{-12}$ Gy/s Relative error ≥ ± 2,0 % (U_{po} = 1,5 %)	-
		$(1 \cdot 10^{-10}$ – – $2 \cdot 10^{-4})$ Gy/s		

1	2	3	4	5
72	Radiation instruments for measuring exposure dose, ambient, individual dose equivalents and their powers of x-ray and gamma-radiation	$(1 \cdot 10^{-12}$ – – $6 \cdot 10^{-5})$ A/kg $(1 \cdot 10^{-11}$ – 0,3) C/kg	U_p = 1,5 · 10^{-14} A/kg U_p = 1,5 · 10^{-13} C/kg Relative error ≥ ± (2,0 – 30) % (U_{po} = 1,5 %)	-
		$(3 \cdot 10^{-11}$ – – $3 \cdot 10^{-3})$ Sv/s $(1 \cdot 10^{-5}$ – 10) Sv	U_p = = 9 · 10^{-13} Sv/s U_p = = 3 · 10^{-7} Sv Relative error ≥ ± 4,0 % (U_{po} = 3,0 %)	-
73	Alpha-radiometers,	$(3 \cdot 10^{-3}$ – – $1 \cdot 10^{5})$ Bq·cm^{-2} (0,1 – – $1 \cdot 10^{6})$ min^{-1}cm^{-2}	U_p = = 0,3 · 10^{-3} Bq·cm^{-2} U_p = = 0,01 min^{-1}cm^{-2} Relative error ≥ ± 20 % (U_{po} = · 10 %)	-
	beta- radiometers	(0,1 – $1 \cdot 10^{6})$ Bq·cm^{-2} (1 – 10^{6}) min^{-1}cm^{-2}	U_p = = 0,01 Bq·cm^{-2} U_p = = 0,1 min^{-1}cm^{-2} Relative error ≥ ± 20 % (U_{po} = 10 %)	
74	Radiometric sources of alpha- radiation,	(2 – $2 \cdot 10^{7}$) Bq	U_p = 0,08 Bq Relative error ≥ ± 4 % (U_{po} = 4 %)	-
	Radiometric sources of beta- radiation	(100 – $2 \cdot 10^{8}$) Bq	U_p = 4 Bq Relative error ≥ ± 4 % (U_{po} = 4 %)	
75	Alpha-spectrometers,	$(1 \cdot 10^{-2}$ – – $1 \cdot 10^{4})$ Bq	U_p = 0,1 ·10^{-2} Bq Relative error ≥ ± 10 % (U_{po} = 10 %)	-
	beta-spectrometers,	(0,1– $1 \cdot 10^{4}$) Bq (10 – $1 \cdot 10^{4}$) Bq·kg^{-1}	U_p = 0,01 Bq U_p = 1 Bq·kg^{-1} Relative error ≥ ± 10 % (U_{po} = 4 %)	
	gamma-spectrometers	(10 – $1 \cdot 10^{4}$) Bq (10 – $1 \cdot 10^{4}$) Bq·kg^{-1}	U_p = 1 Bq U_p = 1 Bq·kg^{-1} Relative error ≥ ± 10 %	

1	2	3	4	5
76	Radiation calibration set of kerma in the air, exposure dose, ambient, individual dose equivalents and their gamma radiation power	(0,06 – 3) MeV ($1 \cdot 10^{-9}$ до $5 \cdot 10^{-2}$) Gy ($3 \cdot 10^{-11}$ – $1 \cdot 10^{-3}$) C/kg ($1 \cdot 10^{-9}$ – $6 \cdot 10^{-2}$) Sv ($1 \cdot 10^{-10}$ – $5 \cdot 10^{-5}$) Gy/s ($3 \cdot 10^{-12}$ – $1 \cdot 10^{-6}$) A/kg ($1 \cdot 10^{-10}$ – $3 \cdot 10^{-5}$) Sv/c	- $U_p = 2 \cdot 10^{-11}$ Gy $U_p = 6 \cdot 10^{-13}$ C/kg $U_p = 2 \cdot 10^{-11}$ Sv $U_p = 2 \cdot 10^{-12}$ Gy/s $U_p = 6 \cdot 10^{-14}$ A/kg $U_p = 2 \cdot 10^{-12}$ Sv/s Relative error ≥ ± 2,0 % (U_{po} = 2,0 %)	-
Sverdlovsk region, Verkhnyaya Pyshma, automobile road Ekaterinburg – Nizhny Tagil – Serov from 17 to 23 km (geodesic test site / calibration linear base line – "Sverdlovsk base line")				
MEASUREMENTS OF GEOMETRIC QUANTITIES				
77	Equipment of global navigation satellite system users	(1,5 – 3000) m	U_p = Q[0,16; 0,54L] mm, where L is a distance in km Error ≥ ± 0,6 mm	-
		(3000 – 50000) m	$U_{p\ (in\ plan)}$ = 48 mm $U_{p\ (by\ height)}$ = 72 mm ≥ ± 30 mm	-

* The minimum values of the expanded measurement uncertainty during calibration are provided, which are obtained by multiplying the standard uncertainty by the coverage factor k = 2, corresponding to a confidence level of approximately 95% on assumption of a normal distribution. Evaluation of uncertainties was carried out in accordance with "Guide to the expression of uncertainty in measurement" (GUM).

** Accuracy measures of calibrated measurement instruments are indicated with regard to the accuracy measures of the measurement standards based on the corresponding verification schedules.

Acting general director **Yu.M. Sukhanov**

seal place

stitched, numbered and sealed 13 (thirteen) sheets

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Перевод является верным

И.о. генерального директора ФБУ «УРАЛТЕСТ» **Ю.М. Суханов**

29.10.2019