AREA OF ACCREDITATION

Limited Liability Company

Research and Production Enterprise "ELEMER"

(LLC NPP "ELEMER")

name of a legal entity or surname, name and patronymic (if any) of an individual entrepreneur

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address of the place of business

Compliance

GOST ISO / IEC 17025-2019

"GENERAL REQUIREMENTS FOR THE COMPETENCE OF CALIBRATION AND TESTING LABORATORIES"

Calibration of measuring instruments

ДДЯ

conditional cipher of the calibration sign

No.	Measurements	Measured value	Calibration object	Range measurements	Extra options	Expanded measurement uncertainty <*>	Calibration method / Procedure <**>	Note
1	2	3	4	5	6	7	8	9
1	Measurement of parameters of flow, consumption, level, volume of substances	Liquid consumption	Installations for verification of volume consumption and liquid volume	from 0.01 to 600 m^3/h from 0.004 to 5 m^3		$U_{0.95}$ = 0.04 %	Direct comparison method using a liquid flow rate standard. Comparison method using a comparison standard	
			Installations for verification of mass consumption and mass of liquid	from 0.01 to 600 t/h from 0.004 to 5 t				
			Liquid pipe-piston calibration installations, compact-provers, with metal measuring gauges, dynamic measuring gauges, with towers	from 0.01 to 600 m^3/h from 0.01 to 600 t/h from 0.004 to 5 m^3 from 0.004 to 5 t		$U_{0.95}$ = 0.04 %	Direct comparison method using a liquid flow rate standard. Comparison method using a comparison standard using a liquid flow rate standard. Direct comparison method using liquid volume standard	

1	2	3	4	5	6	7	8	9
2	Measurement of parameters of flow, consumption, level, volume of substances	Liquid consumption	Flow transducers, flowmeters, counters, volumetric flowmeters-liquid meters	from 0.01 to 600 m^3/h		$U_{0.95}$ = 0.03 %	Direct comparison method using a liquid volumetric flow rate standard	
			Flow transducers, flowmeters, counters, volumetric probe flowmeters-liquid counters	from 0.1 to 45000 m^3/h		$U_{0.95}$ = 0.1 %	Method of direct comparison using the standard of liquid volume flow. Method of indirect measurements	
			Flow transducers, flow meters, counters, liquid mass flow meters	from 0.01 to 600 t/h		$U_{0.95}$ = 0.03 %	Direct comparison method using a liquid flow rate standard	
			Liquid rotameters	from 0.01 to 200 m^3/h		$U_{0.95}$ = 0.04 %		
			Flowmeters and liquid flow transducers of variable differential pressure	from 0.01 to 600 m^3/h		$U_{0.95}$ = 0.03 %		
		Gas consumption	Flow transducers, flow meters, meters, gas flow meters	from 0.5 to 12000 m^3/h		$U_{0.95}$ = 0.2 %	Direct comparison method using a gas flow standard	

1	2	3	4	5	6	7	8	9
3	Measurement of parameters of flow, consumption, level, volume of substances	Gas consumption	Flow transducers, flow meters, counters, probe gas flow meters	from 0.5 to 250000 m^3/h		$U_{0.95}$ = 0.1 %	Direct comparison method using a gas flow standard	
			Gas Rotameters	from 0.5 to 3000 m^3/h		$U_{0.95}$ = 0.2 %		
			Flow meters and gas flow transducers with variable differential pressure	from 0.5 to 12000 m^3/h		$U_{0.95}$ = 0.2 %		
		Level	Level gauges and level transducers	from 0 to 20 m		$U_{0.95}$ = 0.82 mm	Method of direct comparison using the working standard of the unit of length	

1	2	3	4	5	6	7	8	9
4	Pressure measurements, vacuum measurements	Overpressure, vacuum	Digital pressure gauges, pressure transducers, vacuum meters, manovacuummeters, pressure calibrators	± (0.04 - 0.08) kPa		$U_{0.95}$ = (0.005 ... 0.015) %	Direct comparison method using a pressure unit standard	
				± (0.08 - 0.16) kPa				
		Overpressure, vacuum	Digital pressure gauges, pressure transducers, vacuum meters, manovacuummeters, pressure calibrators	± (0.16 - 0.4) kPa		$U_{0.95}$ = (0.005 ... 0.015) %		
				from minus 100 to minus 0.4 kPa				
				from 0.0004 to 100 MPa				
			Reference pressure transducers, electronic pressure gauges, indicating pressure gauges, deformation pressure gauges	from minus 100 to 0 kPa from 0.0025 to 100 MPa		$U_{0.95}$ = (0.005 ... 0.015) %		
			Reference pressure transducers with digital output signal, measuring pressure transducers, electronic pressure gauges, calibrators, pressure controllers, pressure sensors, pressure setters	from 0.003 to 100 MPa		$U_{0.95}$ = (0.005 ... 0.015) %		

1	2	3	4	5	6	7	8	9
5	Pressure measurements, vacuum measurements	Absolute pressure	Pressure transducers, electronic pressure gauges, calibrators, pressure controllers, vacuum meters	from 0.133 to 400 kPa		$U_{0.95}$ = (0.005 ... 0.015) %	Direct comparison method using a pressure unit standard	
			Reference pressure transducers with digital output signal, measuring pressure transducers, electronic pressure gauges, calibrators, pressure controllers, pressure sensors, pressure setters	from 0 to 16.0 MPa		$U_{0.95}$ = 0.005 %		
		Overpressure	Reference pressure transducers with digital output signal, analog measuring pressure transducers, electronic pressure gauges, calibrators, pressure controllers, pressure sensors, pressure setters, deformation pressure gauges	from 0.003 to 100 MPa		$U_{0.95}$ = (0.005 ... 0.015) %	Direct comparison method using a pressure unit standard	

1	2	3	4	5	6	7	8	9
		Overpressure	Pressure calibrators, test pressure and standard signal complexes	from minus 100 to 0 kPa from 0 to 100 MPa		$U_{0.95}$ = (0.005 ... 0.015) %	Direct comparison method using a pressure unit standard	
				from minus 210 to 2500 °C		$U_{0.95}$ = (0.005 ... 0.5) °C	Method of indirect measurements using current and voltage calibrator	
				from 0 to 25 mA		$U_{0.95}$ = 0.004 mA	Direct measurement method using a DC current calibrator	
				from minus 10 to 100 mV		$U_{0.95}$ = 3 μV	Direct measurement method using a DC voltage calibrator	
				from 0 to 320 Ohm		$U_{0.95} = 2 \cdot 10^{-3}$ Ohm	Method of indirect measurements using current and voltage calibrator	
			Cargo piston pressure gauges	from 0.01 to 60.0 MPa		$U_{0.95}$ = (0.005 ... 0.015) %	Direct comparison method using a pressure unit standard	

1	2	3	4	5	6	7	8	9
6	Thermophysical and temperature measurements	Temperature	Sensitive platinum and copper elements, resistance thermal transducers made of platinum and copper, sets of platinum resistance thermometers	from minus 200 to 660 °C from 0 to 180 °C Δt_{min} = 2 °C		$U_{0.95}$ = 0.02 °C	Method of direct measurements using working temperature standards	
7	Thermophysical and temperature measurements	Temperature, direct electric current	Thermoelectric transducers	from minus 200 to 1800 °C		$U_{0.95}$ = 0.3 °C	Method of direct measurements using working temperature standards	
			Universal thermal transducers, thermal transducers with unified output signal	from minus 200 to 1800 °C		$U_{0.95}$ = 0.05 °C	Direct measurement method using a working temperature standard	
				from 0 to 20 mA		$U_{0.95}$ = 0.004 mA	Direct measurement method using a DC current calibrator	

1	2	3	4	5	6	7	8	9
8	Measurements of the physico-chemical composition and properties of substances	Humidity of gases	Temperature and humidity measuring transducers	from 0 to 100 %		$U_{0.95}$ = 0.7 %	Method of direct measurements using the standard unit of gas humidity	
				from 0 to 18 g/m^3				
				from 0 to 25000·100/P ppm^{-1}		$U_{0.95}$ = (0.5 ... 3) °C		
				from minus 40 to 80 °C dew point				
				from minus 40 to 110 °C		$U_{0.95}$ = (0.05 ... 0.1) °C		
9	Thermophysical and temperature measurements	Temperature	Resistance thermometers platinum reference, resistance thermometers platinum vibration resistant	from 0 to 660.323 °C		$U_{0.95}$ = (0.003 ... 0.004) °C	Direct measurement method using a working temperature standard	
				from minus 200 to 0 °C		$U_{0.95}$ = 0.01 °C		
		Temperature, DC current, DC voltage, DC resistance	Measuring and computing complexes based on “ELEMER-EL – 4000” modules	from minus 200 to 2500 °C		$U_{0.95}$ = (0.05 ... 2) °C	Method of direct measurements using a direct electric current calibrator. Method of direct measurements using a direct electric voltage calibrator. Indirect measurement method using a current and voltage calibrator	
				from minus 500 to 500 mV		$U_{0.95}$ = 3 μV		
				from minus 20 to 20 V				
				from minus 20 to 20 mA		$U_{0.95}$ = 0.004 mA		
				from 0 to 5 mA				

1	2	3	4	5	6	7	8	9
		Temperature, DC current, DC voltage, DC resistance	Meters-technological regulators, multi-channel technological recorders, power supplies and signal conversions, measuring converters, digital technological meters, calculators	from minus 210 to 2500 °C		$U_{0.95}$ = (0.03 ... 5) °C	Method of direct measurements using a direct electric current calibrator. Method of direct measurements using a direct electric voltage calibrator. Method of indirect measurements using a current and voltage calibrator. Method of direct measurements using a frequency meter	
				from 0 to 10 V		$U_{0.95}$ = 1.5 mV		
				from minus 10 to 600 mV		$U_{0.95}$ = 3 μV		
				from 0 to 20 mA		$U_{0.95}$ = 0.004 mA		
				from 0 to 20 kHz		$U_{0.95} = (5 \cdot 10^{-12} \cdot F + 1 \cdot 10^{-6})$ Hz		
				from 0 to 320 Ohm		$U_{0.95} = 2 \cdot 10^{-3}$ Ohm		
				from 0 to 3000 Ohm		$U_{0.95}$ = 0.001 Ohm		
				from 0.1 to 10 kOhm				
				from 0 to 24 h		$U_{0.95}$ = ± 0.01 %		
		Temperature	Equipment for the implementation of reference points, temperature measurements	from minus 38.8344 to 660.323 °C		$U_{0.95}$ = (0.0002 ... 0.01) ° C	Method of direct measurements using a working temperature standard, GOST R 8.814-13	
			Temperature calibrators	from minus 50 to 1100 °C		$U_{0.95}$ = (0.01 ... 2.0) °C	Direct measurement method using a working temperature standard	

1	2	3	4	5	6	7	8	9
10	Thermophysical and temperature measurements	Temperature, DC current, DC voltage, DC resistance	Calibrators-measuring unified signals, modules for measuring resistance, voltage and DC current as part of temperature calibrators	from minus 210 to 2500 °C		$U_{0.95}$ = (0.005 ... 0.5) ° C	Direct measurement method using a DC current calibrator. Direct measurement method using a DC voltage calibrator. Indirect measurement method using a current and voltage calibrator.	
				from 0 to 25 mA		$U_{0.95}$ = 0.004 mA		
				from minus 100 to 100 mV		$U_{0.95}$ = 3 μV		
				from 0 to 12 V		$U_{0.95}$ = 1.5 μV		
				from 0 to 120 V		$U_{0.95}$ = 1.5 μV		
				from 0 to 10 Ohm		$U_{0.95} = 1.5 \cdot 10^{-4}$ Ohm		
				from 0 to 320 Ohm		$U_{0.95} = 2 \cdot 10^{-3}$ Ohm		
				from 0 to 2000 Ohm		$U_{0.95} = 2 \cdot 10^{-3}$ Ohm		
				from 0 to 3000 Ohm		$U_{0.95}$ = 0.001 Ohm		
			Digital small-sized thermometers, digital reference thermometers, multichannel thermometers, electrocontact thermometers	from minus 200 to 2500 °C		$U_{0.95}$ = (0.005 ... 2) ° C		
				from 0 to 100 Ohm		$U_{0.95} = 2 \cdot 10^{-3}$ Ohm		
				from 0 to 375 Ohm		$U_{0.95} = 2 \cdot 10^{-3}$ Ohm		
				from 0 to 20 mA		$U_{0.95}$ = 0.004 mA		
				from minus 10 to 100 mV		$U_{0.95}$ = 3 μV		

1	2	3	4	5	6	7	8	9
			Verification systems for thermal converters, automated multichannel verification systems	from minus 270 to 2500 °C		$U_{0.95}$ = (0.002 ... 2) °C	Direct measurement method using a DC current calibrator. Direct measurement method using a DC voltage calibrator. Indirect measurement method using a current and voltage calibrator.	
				from 0 to 30 mA		$U_{0.95}$ = 0.004 mA		
				from minus 300 to 300 mV		$U_{0.95}$ = 3 µV		
				from 0 to 30 Ohm		$U_{0.95} = 1.5 \cdot 10^{-4}$ Ohm		
				from 0 to 12 V		$U_{0.95}$ = 1.5 mV		
				from 0 to 320 Ohm		$U_{0.95} = 2 \cdot 10^{-3}$ Ohm		
				from 0 to 1500 Ohm				

1	2	3	4	5	6	7	8	9
11	Time and frequency measurements	Frequency, number of pulses	Electronic counting frequency meters	from 100 μHz to 5 MHz		$U_{0.95} = (5 \cdot 10^{-12} \cdot F + + 1 \cdot 10^{-6})$ Hz	Method of direct measurements using a frequency meter	
			Channels of devices and measuring systems with frequency input (output)	generation from 1 to 10^8 Hz, from 1 to $4.29 \cdot 10^9$ pulses.		$U_{0.95} = (3 \cdot 10^{-6} \cdot f)$ Hz ±1 unit accounts	Method of direct measurements using a generator	
				measurement from 10^{-4} to $5 \cdot 10^6$ Hz, from 1 to $4.29 \cdot 10^9$ pulses.			Method of direct measurements using a frequency meter	

General Director of LLC NPP "ELEMER" _____ V. M. Okladnikov

<*> A footnote to the scope of accreditation indicates the expanded measurement uncertainty, which is part of the calibration measurement capabilities of the laboratory and represents the smallest expanded uncertainty achievable for the best available calibration object (type (group) of measuring instruments). The coverage probability corresponds to approximately 95 %, and the coverage factor k = 2, unless otherwise indicated in the note. Uncertainty values without units of quantities are relative to the measured value of the quantity, unless otherwise indicated in a note.

<**> A verbal description of the calibration method is given, including an indication of the equipment used, and (or) the details of the document establishing the calibration method (methodology) are indicated.