SCOPE OF ACCREDITATION

D.I. Mendeleyev Institute for Metrology (VNIIM)
Affiliated branch of the D.I. Mendeleyev Institute for Metrology (VNIIM-VNIIR)
Unique accreditation record number in
the Register of accredited conformity assessment bodies -
RA.RU.311764
name of a legal entity or surname, first name and patronymic (if any) of individual entrepreneur

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Calibration of measuring instruments
RVR
calibration mark code

No[1]	Measurements, type (group) of measurement instruments	Metrological requirements		Note[2]
		Measurement Range	Uncertainty[3] (error, class)	
1	2	3	4	5
MEASUREMENT OF FLOWS, LEVEL, VOLUME OF SUBSTANCES				
1	**Instruments measuring flows**			
1.1	Verification setups for volume flow and liquid volume	0,001 to 2500 m³/h 0.001 to 4500 m³/h	$U_{0,95}$ = 0.034 % ER ± (0.045 - 0.055) % $U_{0,95}$ = 0.034 % ER + (0.06 - 1.0) %	Direct comparison method using liquid flow standard. Comparison method using transfer standard along with liquid flow standard
1.2	Verification setups for tube pistons, compact-provers	0,01 to 4500 m³/h	$U_{0,95}$ = 0,029 % ER ± (0.05 - 0.1) %	Direct comparison method using liquid flow standard. Comparison method using transfer standard along with liquid flow standard
1.3	Verification setups for mass flow and liquid mass	0,001 to 2500 t/h 0,001 to 4500 t/h	$U_{0,95}$ = 0.033 % ER = (0.04 - 0.05) % $U_{0,95}$ = 0.033 % ER ± (0.06 - 1.0) %	Direct comparison method using liquid flow standard. Comparison method using transfer standard along with liquid flow standard
1.4	Verification setups for volume flow and liquid mass	1960 to 3060 dm³	$U_{0,95}$ = 0.025 % ER ± (0.04 - 0.05) %	The method of direct comparison using liquid volume standard
		1000 to 3060 kg	$U_{0,95}$ = 0.025 % ER ± (0.04 - 0.05) %	Direct comparison method using liquid mass standard
1.5	Verification setups for mass flow of liquids composing gas-liquid mixtures (GLMs) and volume flow of gas composing GLM, reduced to standard conditions	Mass flow of liquid mixture composing GLM: 0,01 to 500 t/h Volume flow of gas composing GLM, reduced to standard conditions: 0,1 to 16000 m³/h	$U_{0,95}$ = 0.3 % ER ± (0.5 - 2.0) % $U_{0,95}$ = 0.97 % ER ± (1.0 - 5.0) %	Method of direct comparison using GLM standard. Comparison method using comparator with along with GLM standard
1.6	Measuring setups for mass	Mass flow of liquid mixture composing GLM:		Method of direct comparison using

	flow of liquids composing gas-liquid mixtures (GLMs) and volume flow of gas composing GLM reduced to standard conditions	0,01 to 1000 t/h	$U_{0,95}$ = 0.3 % ER ± (1.5 - 2.5) %	GLM standard
		Volume flow of gas composing GLM, reduced to standard conditions: 0.1 to 70000 m^3/h	$U_{0,95}$ = 0.97 % ER ± (4.0 - 5.0) %	
1.7	Verification setups for gas volume flow	$3 \cdot 10^{-4}$ to 72000 m^3/h	$U_{0,95}$ = 0.2 % ER ± (0.2 - 2.0)%	Direct comparison method using gas flow standard. Comparison method with using transfer standard along with gas flow standard
1.8	Gas mass flow calibration equipment	$3,6 \cdot 10^{-1}$ to $6,3 \cdot 10^{5}$ kg/h	$U_{0,95}$ = 0.2 % ER ± (0.2 - 0.5) %	Direct comparison method using gas flow standard. Comparison method using transfer standard along with gas flow standard
1.9	Flow transducers, flow meters and volume meters for liquids	0,01 to 500 m^3/h	$U_{0,95}$ = 0.0332 % ER ± (0.07 - 5.0) %	Direct comparison method using liquid flow standard
1.10	Flow transducers, flow meters and mass meters for liquids	0,01 to 500 t/h	$U_{0,95}$ = 0.0322 % ER ± (0.05 - 5.0) %	Direct comparison method using liquid flow standard
1.11	Flow-counters for gas-liquid mixtures	Mass flow liquid mixtures composing GLM: 0,01 to 1000 t/h	$U_{0,95}$ = 0.3 % ER ± (2.0 - 2.5) %	Method of direct comparison using GLM standard
		Volume flow of gas composing GLM, reduced to standard conditions: 0.1 to 70000 m^3/h	$U_{0,95}$ = 0.97 % ER ± (4.0 - 5.0) %	
11.12	In-line analyzers of fractional composition of oil and oil products	Percentage of volume of water in the volume of liquid mixture (volume fraction): 0.01 to 99.99%	$U_{0,95}$ = 0.26 % ER ± 5.0 %	Method of direct comparison using GLM standard
		Percentage volume of oil in the volume of liquid mixture (volume fraction): 0.01 to 99.99%	$U_{0,95}$ = 0.26 % ER ± 5.0 %	
		Percentage of gas volume in the GLM volume (volume fraction) 0.01 to 99.99%	$U_{0,95}$ = 0.51 % ER ± 5.0 %	
1.13	Critical nozzles	$3 \cdot 10^{-4}$ to 2000 m^3/h	$U_{0,95}$ = 0.1 % ER ± (0.15 - 0.5) %	Direct comparison method using gas flow standard
1.14	Flow transducers, flow meters, gas volume	$3 \cdot 10^{-4}$ to $1,6 \cdot 10^{4}$ m^3/h $1,6 \cdot 10^{4}$ to $1,8 \cdot 10^{5}$ m^3/h[a]	$U_{0,95}$ = 0.1 % ER ± (0.2 - 5.0) % $U_{0,95}$ = 0.1 % ER ± (0.3 - 5.0) %	Direct comparison method using gas flow standard

	flow meters, rotameters, rheometers			
1.15	Leakage calibrators	$3 \cdot 10^{-5}$ to 1 m^3/h	$U_{0,95}$ = 1.0 % ER ± (1.0 - 5.0) %	Direct comparison method using gas flow standard
2.	**Volume measuring instruments**			
2.1	Measuring tanks of the 1st class	2 to 1000 dm^3	$U_{0,95}$ = 0,01 % ER ± 0.02%	Indirect measurement method using mass unit standard, density and temperature measuring instruments
2.2	Measuring tanks of the 2nd class	2 to 5000 dm^3	$U_{0,95}$ = 0.025 % ER ± (0.05 - 0.1) %	Direct comparison method using liquid volume standard
2.3	Technical metal measuring tanks of the 1st class	5 to 10000 dm^3	$U_{0,95}$ = 0.037 % ER ± 0.2 %	Method of direct comparison using volume liquid standard
2.4*	Horizontal cylindrical tanks	3 to 10000 m^3	$U_{0,95}$ = 0.07 % ER = (0.2 - 0.25) %	Indirect measurement method (geometric method) using length and temperature measuring instruments
				Indirect measurement method (volumetric method) using volume, length, temperature and level measuring instruments
2.5*	Vertical cylindrical metal tanks	100 to 3000 m^3 3000 to 5000 m^3 5000 to 160000 m^3	$U_{0,95}$ = 0.07 % ER ± 0.2 % $U_{0,95}$ = 0.05 % ER ± 0.15 % $U_{0,95}$ = 0.03 % ER ± 0.1 %	Indirect measurement method (volumetric method) using volume, length, temperature and level measuring instruments. Indirect measurement method (geometric method) using length and temperature measuring instruments
2.6*	Vertical cylindrical reinforced concrete tanks	100 to 3000 m^3 3000 to 5000 m^3 5000 to 100000 m^3	$U_{0,95}$ = 0.07 % ER – 0.2 % $U_{0,95}$ = 0,05 % ER ± 0.15 % $U_{0,95}$ = 0.03 % ER ± 0.1 %	Indirect measurement method (volumetric method) using volume, length, temperature and level measuring instruments. Indirect measurement method (geometric method) using length and temperature measuring instruments
2.7*	Rectangular tanks	3 to 3000 m^3	$U_{0,95}$ = 0.07 % ER = (0.2 - 0.25) %	Indirect measurement method (geometric method) using length and temperature measuring instruments
2.8*	Ball (spherical) tanks	3 to 3000 m^3	$U_{0,95}$ = 0.07 % ER ± 0.2 %	Indirect measurement method (geometric method) using length and temperature measuring instruments
2.9*	Trench buried steel tanks	500 to 10000 m^3	$U_{0,95}$ = 0.07 % ER ± (0.2 - 0.25) %	Indirect measurement method (volumetric method) using volume,

				length, temperature and level measuring instruments
2.10*	Bulk vessel tanks	3 to 100000 m^3	$U_{0,95}$ = 0.07 % ER ± (0.2 - 0.5) %	Indirect measurement method (geometric method) using length and temperature measuring instruments
2.11*	Tank trucks for liquid petroleum products	1 to 50 m^3	$U_{0,95}$ = 0.13 % ER ± 0.4%	Indirect measurement method (volumetric method) using volume, length, temperature and level measuring instruments
2.12*	Rail tank cars (tank wagons)	3 to 200 m^3	$U_{0,95}$ = 0.1 % ER ± 0.3 %	Indirect measurement method (volumetric method) using volume, length, temperature and level measuring instruments
3	**Level measuring instruments**			
3.1	Level gauging systems	0 to 80 m	$U_{0,95}$ = 0.06 mm ER ± (0.1 - 6) mm	Direct comparison method using length measuring instruments
3.2	Level transmitters and level transmitters	0 to 20 m 20 to 100 m	$U_{0,95}$ = 0.12 mm ER = (0.3 - 16) mm $U_{0,95}$ = (4 - 16) mm ER ± (6 - 20) mm	Direct comparison method using length measuring instruments, level measuring instruments and coordinate-time measuring instruments. Direct measurement method using level gauges. Indirect measurement method using mass measuring instruments, gauge pressure measuring instruments
3.3	Level signaling devices	0 to 20 m	$U_{0,95}$ = 0.12 mm ER = (0.3 - 16) mm	Direct comparison method using length measuring instruments, level measuring instruments and coordinate-time measuring instruments. Direct measurement method using level gauges. Indirect method Measurements using mass measuring instruments, gauge pressure measuring instruments
PRESSURE MEASUREMENTS, VACUUM MEASUREMENTS				
4	**Pressure measuring instruments**			
4.1	Measuring pressure transducers	0,1 to 25 MPa	$U_{0,95}$ = 0.033 % ER ± (0.1 - 2.5) %	Direct comparison method using deadweight tester or pressure calibrator
MEASUREMENTS OF PHYSICAL-CHEMICAL COMPOSITION AND PROPERTIES OF SUBSTANCES				
5	**Measuring instruments for water volume fraction (WVF)**			
5.1	Oil and petroleum product moisture	0.01 to 0.1 % wvf 0.1 to 10 % wvf 10 to 60 % wvf	$U_{0,95}$ = $4 \cdot 10^{-3}$ % wvf $U_{0,95}$ = $1.4 \cdot 10^{-2}$ % wvf	Direct comparison method using standard volumetric moisture

	meters and verification setups – 1st class working standards	60 to 99.9 % wvf	$U_{0,95} = 3.5 \cdot 10^{-2}$ % wvf $U_{0,95} = 8.4 \cdot 10^{-2}$ % wvf ER ± (0.01 - 0.1) % wvf	content (for moisture meters of oil and petroleum products). Comparison method using comparator along with volumetric moisture content standard (for verification setups)
5.2	Oil and petroleum product moisture meters and verification setups – 2nd class working standards	0.01 to 0.1% wvf 0.1 to 10 % wvf 10 to 60 % wvf 60 to 99.9 % wvf	$U_{0,95} = 9 \cdot 10^{-3}$ % wvf $U_{0,95} = 1.6 \cdot 10^{-2}$ % wvf $U_{0,95} = 6 \cdot 10^{-2}$ % wvf $U_{0,95} = 9.4 \cdot 10^{-2}$ % wvf ER ± (0.02 - 0.5) % wvf	Direct comparison method using standard volumetric moisture content (for moisture meters of oil and petroleum products). Comparison method using comparator along with volumetric moisture content standard (for verification setups)
5.3	Oil and petroleum product moisture meters (working measuring instruments)	0.01 to 0.1 % wvf 0.1 to 10 % wvf 10 to 60 % wvf 60 to 99.9 % wvf	$U_{0,95} = 1.9 \cdot 10^{-2}$ % wvf $U_{0,95} = 2.5 \cdot 10^{-2}$ % wvf $U_{0,95} = 8.5 \cdot 10^{-2}$ % wvf $U_{0,95} = 0.436$ % wvf ER ± (0.05 - 2.5) % wvf	Direct comparison method using volumetric moisture content standard
6	**Density measuring instruments**			
6.1	In-line liquid density transducers	600 to 1200 kg/m³	$U_{0,95} = 0,04$ kg/m³ ER ± (0.1 - 10) kg/m³	Direct comparison method using liquid density standard in flow
6.2	Pycnometers, pycnometer systems, automatic flow density meters - working density standards	600 to 1200 kg/m³	$U_{0,95} = 0,05$ kg/m³ ER ± (0.1 - 0.2) kg/m³	Direct comparison method using liquid density standard in flow
	THERMOPHYSICAL AND TEMPERATURE MEASUREMENTS			
7	**Temperature measuring instruments**			
7.1	Temperature transducers	minus 40 to 155 °C	$U_{0,95} = 0,069$ °C ER ± (0.1 - 5.0) °C	Direct comparison method using temperature calibrator. Direct measurement method using temperature calibrator

* The symbol "*" next to the serial number indicates that calibration can only be performed outside permanent places of business (temporary workplaces).

[2] This Note indicates the implemented calibration methods (techniques). If the document designating the calibration method (technique) is dated, only that particular method is used. If the document designating the calibration method (technique) is not dated, the latest edition of the specified technique (including any modifications) shall be used.

[3] The expanded uncertainty (U) is expressed according to ILAC-P14 and EA-4/02, is part of the CMC and represents the smallest expanded uncertainty attainable for the best calibration object available. The probability of coverage is approximately 95 % and the coverage factor $k=2$ unless otherwise specified. Uncertainty values without units are relative to the measured value of the quantity unless otherwise specified.

[4] National standards of foreign countries within the framework of the CIPM MRA agreement are used.

Acting Director of Affiliated branch of the D.I. Mendeleyev Institute for Metrology (VNIIM-VNIIR)

Authorized person's position

signature of authorized person

A.S. Taibinsky

initials, surname of the authorized person

SUPPLEMENT NO. 1 TO THE SCOPE OF ACCREDITATION

D.I. Mendeleyev Institute for Metrology (VNIIM)

Affiliated branch of the D.I. Mendeleyev Institute for Metrology (VNIIM-VNIIR)
Unique accreditation record number in the Register of accredited conformity assessment bodies:
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name of a legal entity or surname, first name and patronymic (if any) of an individual entrepreneur

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business address

Calibration of measuring instruments

RVR
calibration mark code

No.[1]	Measurements, type (group) of measuring instruments	Metrological requirements		Note[2]
		Measurement range	Uncertainty[3] (error, class)	
1	2	3	4	5
MEASUREMENT OF FLOWS, LEVEL, VOLUME OF SUBSTANCES				
1	**Flow measuring instruments**			
1.1	Flow transducers, flow meters and liquid volume meters	0,01 to 50 m³/h	$U(V)_{0,95}$ = 0.0273 % $U(Q_V)_{0,95}$ = 0.0303 % ER ± (0.07 - 5.0) %	Direct comparison method using liquid flow standards
		2,5 to 500 m³/h	$U(V)_{0,95}$ = 0.0273 % $U(Q_V)_{0,95}$ = 0.0332 % ER ± (0.07 - 5.0) %	
		5 to 50 m³/h	$U(V)_{0,95}$ = 0.0349 % $U(Q_V)_{0,95}$ = 0.0350 % ER ± (0.07 - 5.0) %	
		50 to 500 m³/h	$U(V)_{0,95}$ = 0.0354 % $U(Q_V)_{0,95}$ = 0.0357 % ER + (0.07 - 5.0) %	
		500 to 1000 m³/h	$U(V)_{0,95}$ = 0.0357 % $U(Q_V)_{0,95}$ = 0.0358 % ER + (0.07 - 5.0) %	
		1000 to 1500 m³/h	$U(V)_{0,95}$ = 0.0359 % $U(Q_V)_{0,95}$ = 0.0359 % ER ± (0.07 - 5.0) %	
		1500 to 2000 m³/h	$U(V)_{0,95}$ = 0.0359 % $U(Q_V)_{0,95}$ = 0.0360 % ER ± (0.07 - 5.0) %	
1.2	Mass flow transmitters, flow meters and liquid meters	0,01 to 50 t/h	$U(M)_{0,95}$ = 0.0273 % $U(Q_M)_{0,95}$ = 0.0303 % ER + (0.05 - 5.0) %	Direct comparison method using liquid flow standards
		2,5 to 500 t/h	$U(M)_{0,95}$ = 0.0263 % $U(Q_M)_{0,95}$ = 0.0322 % ER ± (0.05 - 5.0) %	
		5 to 50 t/h	$U(M)_{0,95}$ = 0.0347 % $U(Q_M)_{0,95}$ = 0.0348 % ER ± (0.05 - 5.0) %	

		50 to 500 t/h 500 to 1000 t/h 1000 to 1500 t/h 1500 to 2000 t/h	$U(M)_{0,95}$ = 0.0354 % $U(Q_M)_{0,95}$ = 0.0355 % ER ± (0.05 - 5.0) % $U(M)_{0,95}$ = 0.0357 % $U(Q_M)_{0,95}$ = 0.0353 % ER ± (0.05 - 5.0) % $U(M)_{0,95}$ = 0.0357 % $U(Q_M)_{0,95}$ = 0.0353 % ER ± (0.05 - 5.0) % $U(M)_{0,95}$ = 0.0358 % $U(Q_M)_{0,95}$ = 0.0357 % ER ± (0.05 - 5.0) %	
1.3	Verification setups for mass flow of liquids composing gas-liquid mixtures (GLMs) and volume flow of gas composing GLM, reduced to standard conditions	Mass flow of liquid mixture composing GLM:0,01 to 500 t/h Volume flow of gas composing GLM: 0,1 to 16000 m^3/h	$U_{0,95}$ = 0,3 % ER = (0.5 - 2.0) % $U_{0,95}$ = 0.97 % ER = (1.0 - 5.0) %	Direct comparison method using GLM standard. Comparison method using comparator along with GLM standard
1.4	Measuring setups for mass flow of liquids composing gas-liquid mixtures (GLMs) and volume flow of gas composing GLM reduced to standard conditions	Mass flow of liquid mixture composing GLM: 0,01 to 1000 t/h	$U_{0,95}$ = 0.3 % ER = (1.5 - 2.5) %	Direct comparison method using GLM standard
		Volume flow of liquid mixture composing GLM:0.1 to 70000 m^3/h	$U_{0,95}$ = 0.97 % ER = (4.0 - 5.0) %	
1.5	Gas-liquid mixture flow meters	Mass flow of liquid mixture composing GLM: 0,01 to 1000 t/h	$U_{0,95}$ = 0.3 % ER = (2.0 - 2.5) %	Direct comparison method using GLM standard
		Gas volumetric flow rate as a part of DLS: 0.1 to 70000 m^3/h	$U_{0,95}$ = 0.97 % ER = (4.0 - 5.0) %	
2	**Volume measuring instruments**			
2.1*	Horizontal tanks	0,3 to 10000 m^3	$U_{0,95}$ = 0.07 % ER = (0.2 - 0.25) %	Indirect measurement method (geometric method) using length and temperature measuring instruments.
		3 to 10000 m^3	$U_{0,95}$ = 0.07 % ER = (0.2 - 0.25) %	Indirect measurement method (volumetric method) using volume, length, temperature and level measuring instruments

2.2*	Vertical tanks	0.3 to 160,000 m^3	$U_{0,95}$ = 0.07 % ER + 0.1 %	Indirect measurement method (volumetric method) using volume, length, temperature and level measuring instruments. Indirect measurement method (geometric method) using length and temperature measuring instruments
2.3*	Rectangular tanks	0.3 to 3 m^3	$U_{0,95}$ = 0.07 % ER ± (0.2 - 0.25) %	Indirect measurement method (geometric method) using length and temperature measuring instruments
MEASUREMENTS OF PHYSICAL-CHEMICAL COMPOSITION AND PROPERTIES OF SUBSTANCES				
3	**Density measuring instruments**			
3.1	Pycnometers, pycnometer systems, automatic density meters - working density standards	600 to 1200 kg/m^3	$U_{0,95}$ = 0,05 kg/m^3 ER ± (0.1 - 0.2) kg/m^3	Direct comparison method using density standard in flow

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[3] The expanded uncertainty (U) is expressed according to ILAC-P14 and EA-4/02, is part of the CMC and represents the smallest expanded uncertainty attainable for the best calibration object available. The probability of coverage is approximately 95 % and the coverage factor $k=2$ unless otherwise specified. Uncertainty values without units are relative to the measured value of the quantity unless otherwise specified.

Acting Director of Affiliated branch of the D.I. Mendeleyev Institute for Metrology (VNIIM-VNIIR)
Authorized person's position

A.S. Taibinsky
Initials, surname of the authorized person