

## FIELDS OF ACCREDITATION

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### Calibration of measuring instruments

**RVR**

checkmark code

No.	Measurements, type (group) of measuring instruments	Metrological requirements		Note
		measurement range	uncertainty* (error, class, order)	
1	2	3	4	5
Measurements of flow, flow rate, level and volume of substances				
1	Verification setups for volume flow and liquid volume	(0.001 - 2500) m <sup>3</sup> /h (0.001 - 4500) m <sup>3</sup> /h	Ur = 0.034% ER ± (0.045 - 0.055) % ER ± (0.06 - 1.0) %	
2	Verification setups for tube pistons, compact-provers	(0.01 - 4500) m <sup>3</sup> /h	Ur = 0.027 % ER ± (0.05 - 0.1) %	
3	Verification setups for mass flow and liquid weight	(0.001 - 2500) t/h (0.001 - 4500) t/h	Ur = 0.033% ER ± (0.04 - 0.05) % ER ± (0.06 - 1.0) %	
4	Verification setups for liquid volume and weights	(1960 - 3060) dm <sup>3</sup>  (1000 - 3060) kg	Ur = 0.02% ER ± (0.04 - 0.05) % Ur = 0.006 % ER ± (0.04 - 0.05) %	
5	Verification setups for level measurement	(0 - 80) м	Ur = 0.06 mm ER ± (0.1 - 6) mm	
6	Verification setups for mass flow rate of liquid as a part of gas-liquid mixtures (GLMs) and volume flow rate of gas reduced to standard conditions as a part of GLMs	Mass consumption of liquid mixture as a part of GLMs: (0.01 - 500) t/h Volume gas flow rate, brought to standard conditions, as part of the GLMs: (0.1 - 16000) m <sup>3</sup> /h	Ur = 0.08% ER ± (0.5 - 2.0) % Ur = 0.38% ER ± (1.0 - 5.0) %	

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7	Setups measuring mass flow of a liquid as a part of GLMs and volume flow of gas reduced to standard conditions as a part of a GLMs	Mass consumption of liquid mixture as a part of GLMs: (0.01 - 1000) t/h Volume gas flow rate, at standard conditions, as a part of GLMs: (0.1 - 70000) m <sup>3</sup> /h	Ur = 0.08% ER ± (1.5 - 2.5) % Ur = 0.38% ER ± (4.0 - 5.0) %	
8	Verification units for gas volume flow rate	(3·10 <sup>-4</sup> - 72000) m <sup>3</sup> /h	Ur = 0.1% ER ± (0.2 - 2.0) %	
9	Verification setups for mass flow	(3.6·10 <sup>-4</sup> - 6.3·10 <sup>6</sup> ) kg/h	Ur = 0.1% ER ± (0.2 - 0.5) %	
10	Flow converters, flow meters and volumetric liquid meters	(0.01 - 500) m <sup>3</sup> /h (0.3 - 2100) m <sup>3</sup> /h**	Ur = 0.033% ER ± (0.07 - 5.0) % Ur = 0.0365 % ER ± (0.07 - 5.0) %	
11	Flow converters, flow meters and liquid mass meters	(0.01 - 500) t/h (0.3 - 2100) t/h**	Ur = 0.032% ER ± (0.05 - 5.0) % Ur = 0.0360 % ER ± (0.05 - 5.0) %	
12	Flowmeters - gas-liquid mixture meters	Mass consumption of liquid mixture as a part of GLMs: (0.01 - 1000) t/h Volume gas flow rate, at standard conditions, as a part of the GLMs: (0.1 - 70000) m <sup>3</sup> /h	Ur = 0.08% ER ± (2.0 - 2.5) % Ur = 0.38% ER ± (4.0 - 5.0) %	
13	Flow analyzers of fractional composition of oil and oil products	Percentage of water volume in liquid mixture volume (volume fraction): (0.01 - 99.99)% Percentage of oil volume in liquid mixture volume (volume fraction): (0.01 - 99.99)% Percentage of gas volume in the volume of GLMs (volume share) (0.01 - 99.99)%	Ur = 0.26% ER ± 5.0% Ur = 0.26% ER ± 5.0% Ur = 0.51% ER ± 5.0%	
14	Critical nozzles	(3·10 <sup>-4</sup> - 2000) m <sup>3</sup> /h	Ur = 0.1% ER ± (0.15 - 0.5) %	

1	2	3	4	5
15	Flow transmitters, flow meters, volume flow meters, rotameters, rheometers	$(3 \cdot 10^{-4} - 1.6 \cdot 10^4) \text{ m}^3/\text{h}$ $(1.6 \cdot 10^4 - 1.8 \cdot 10^5) \text{ m}^3/\text{h}^{**}$	Ur = 0.1% ER ± (0.2 - 5.0) % ER ± (0.3 - 5.0) %	
16	Flow converters, flow meters, gas mass meters	$(3.6 \cdot 10^{-4} - 1.92 \cdot 10^4) \text{ kg/h}$ $(1.92 \cdot 10^4 - 2.88 \cdot 10^4) \text{ kg/h}^{**}$	Ur = 0.1% ER ± (0.3 - 5.0) % ER ± (0.3 - 5.0) %	
17	Leakage calibrators	$(3 \cdot 10^{-4} - 1) \text{ m}^3/\text{h}$	Ur = 0.1% ER ± (1.0 - 5.0) %	
18	1st order metal reference tanks	$(2 - 1000) \text{ dm}^3$	Ur = 0.006 % ER ± 0.02 %	
19	2nd order metal reference gage tank	$(2 - 5000) \text{ dm}^3$	Ur = 0.02% ER ± (0.05 - 0.1) %	
20	Class 1 metal gage tanks	$(5 - 10000) \text{ dm}^3$	Ur = 0.02% ER ± 0.2 %	
21	Level gages and level transmitters	$(0 - 20) \text{ m}$ $(20 - 100) \text{ m}$	Ur = 0.12 mm ER ± (0.3 - 16) mm Ur = (4 - 16) mm ER ± (6 - 20) mm	
22	Horizontal cylindrical tanks	$(3 - 10000) \text{ m}^3$	Ur = 0.07% ER ± (0.2 - 0.25) %	
23	Vertical cylindrical metal tanks	$(100 - 3000) \text{ m}^3$ $(3000 - 5000) \text{ m}^3$ $(5000 - 160000) \text{ m}^3$	Ur = 0.07% ER ± 0.2 % Ur = 0.05 % ER ± 0.15% Ur = 0.03% ER ± 0.1%	
24	Vertical cylindrical reinforced concrete tanks	$(100 - 3000) \text{ m}^3$ $(3000 - 5000) \text{ m}^3$ $(5000 - 100000) \text{ m}^3$	Ur = 0.07% ER ± 0.2 % Ur = 0.05 % ER ± 0.15% Ur = 0.03% ER ± 0.1%	
25	Rectangular tanks	$(3 - 3000) \text{ m}^3$	Ur = 0.07% ER ± (0.2 - 0.25) %	
26	Ball (spherical) tanks	$(3 - 3000) \text{ m}^3$	Ur = 0.07% ER ± 0.2 %	
27	Trench deepened steel tanks	$(500 - 10000) \text{ m}^3$	Ur = 0.07% ER ± (0.2 - 0.25) %	
28	Tanks of bulk ships	$(3 - 100000) \text{ m}^3$	Ur = 0.07% ER ± (0.2 - 0.5) %	
29	Tanker trucks for liquid petroleum products	up to $50 \text{ m}^3$	Ur = 0.13% ER ± 0.4%	
30	Tanks railroad (tank wagons)	$(3 - 200) \text{ m}^3$	Ur = 0.1% ER ± 0.3 %	
31	Level indicators	$(0 - 20) \text{ m}$	Ur = 0.12 mm ER ± (0.3 - 16) mm	

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Measurements of physical and chemical composition and properties of substances				
32	Water meters of oil and petroleum products and verification units –working standards of class 1	(0.01 - 0.1) % (0.1 - 10) % (10 - 60)% (60 - 99.9) %	Ur = $3.5 \cdot 10^{-3}$ % Ur = $1.2 \cdot 10^{-2}$ % Ur = $2.8 \cdot 10^{-2}$ % Ur = $5.6 \cdot 10^{-2}$ % ER ± (0.01 - 0.1) %	
33	Crude oil and petroleum products moisture meters and verification units – class 2 working standards	(0.01 - 0.1) % (0.1 - 10) % (10 - 60)% (60 - 99.9) %	Ur = $3.5 \cdot 10^{-3}$ % Ur = $1.2 \cdot 10^{-2}$ % Ur = $2.8 \cdot 10^{-2}$ % Ur = $5.6 \cdot 10^{-2}$ % ER ± (0.02 - 0.5) %	
34	Moisture meters for petroleum and petroleum products (working measuring instruments)	(0.01 - 0.1) % (0.1 - 10) % (10 - 60)% (60 - 99.9) %	Ur = $3.5 \cdot 10^{-3}$ % Ur = $1.2 \cdot 10^{-2}$ % Ur = $2.8 \cdot 10^{-2}$ % Ur = $5.6 \cdot 10^{-2}$ % ER ± (0.05 - 2.5) %	
35	Flow liquid density transducers	(500 - 3000) kg/m <sup>3</sup>	Ur = 0.03 kg/m <sup>3</sup> ER ± (0.1 - 10) kg/m <sup>3</sup>	
36	Working density standards of class 1, (picnometers, pycnometric setups, automatic flow density meters)	(500 - 1600) kg/m <sup>3</sup>	Ur = 0.03 kg/m <sup>3</sup> ER ± (0.1 - 0.2) kg/m <sup>3</sup>	
Thermophysical and temperature measurements				
37	Temperature transducers	[(-40) - 155] °C	Ur = 0.069 °C ER ± (0.1 - 5.0) °S	
Pressure Measurements, Vacuum Measurements				
38	Measuring pressure transmitters	(0.1 - 20) MPa	Ur = 0.033% ER ± (0.1 - 2.5) %	
Elements of measuring systems				
39	Measuring converters, measuring system channels, secondary devices	DC current (0 - 100) mA	Ur = 0.001 % ER ± (0.08 - 4) %	
		Voltage ± (0 - 30) B	Ur = $0.5 \cdot 10^{-4}$ % ER ± (0.08 - 5) %	
		Electrical resistance  (0 - 4000) Ohm	DC current Ur = 0.002 % Variable current Ur = 0.05 % ER ± (0.06 - 5) %	
		Frequency (0.1 - 15000) Hz	Ur = $1.0 \cdot 10^{-12}$ Hz ER ± (0.002 - 0.5) %	
* The expanded uncertainty (Ur) is given at coverage factor k=2 and confidence probability 0.95.				
**The national standards of foreign countries under the CIPM MRA agreement are used.				

Director      B. G. Solovyov

commissioner position signed by an authorized signatory initials, surname of the commissioner

stamp