

Mass and Related Quantities, France, LNE (Laboratoire national de métrologie et d'essais)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Class	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Service provider	Comments	NMI Service Identifier
Mass	Mass standards	Comparison in air	1	100	mg			0.4 to 0.8	µg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 11 October 2005	
Mass	Mass standards	Comparison in air	0.1	1	g			0.8 to 1.6	µg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 11 October 2005	
Mass	Mass standards	Comparison in air	1	10	g			1.6 to 3	µg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 09 September 2011	
Mass	Mass standards	Comparison in air	10	100	g			3 to 7	µg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 09 September 2011	
Mass	Mass standards	Comparison in air	0.1	1	kg			7 to 30	µg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 09 September 2011	
Mass	Mass standards	Comparison in air	1	10	kg			30 to 800	µg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 11 October 2005	
Mass	Mass standards	Comparison in air	10	50	kg			0.8 to 10	mg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 11 October 2005	

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Mass	Mass standards	Comparison in air	50	100	kg			10 to 60	mg	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 11 October 2005	
Mass	Mass standards	Comparison in air	100	1000	kg			0.06 to 1.5	g	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 11 October 2005	
Mass	Mass standards	Comparison in air	1000	5000	kg			1.5 to 7	g	2	95 %	No	Service provided by the LNE	Uncertainty scales with measurand level. The volume of the mass standards is known. Approved on 11 October 2005	
Density of solid	Mass standard (Pt/Ir)	Hydrostatic weighing	21500	21600	kg/m ³	Reference temperature	20 °C	0.6	kg/m ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Density of solid	Mass standard: 0.001 kg to 0.05 kg	Hydrostatic weighing	7000	9500	kg/m ³	Reference temperature	20 °C	$(0.408 + 0.0396/m)$, m mass in kg	kg/m ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Density of solid	Mass standard: 0.05 kg to 0.5 kg	Hydrostatic weighing	7000	9500	kg/m ³	Reference temperature	20 °C	$(0.1444 + 0.0528/m)$, m mass in kg	kg/m ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Density of solid	Mass standard: 0.5 kg to 5 kg	Hydrostatic weighing	7000	9500	kg/m ³	Reference temperature	20 °C	0.25	kg/m ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Density of solid	Solid sample 100 g	Hydrostatic weighing	2000	9500	kg/m ³	Reference temperature	20 °C	0.4	kg/m ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Volume of solid	Solid density standard, mass: 0.2 kg to 1 kg	Hydrostatic weighing	50	150	cm ³	Reference temperature	20 °C	0.6	mm ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Volume of solid	Solid density standard, mass: 0.2 kg to 1 kg	Hydrostatic weighing	50	150	cm ³	Reference temperature	10 °C to 30 °C	2	mm ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	

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Volume of solid	Mass standard: 1 g to 50 g	Hydrostatic weighing	0.1	6.5	cm ³	Reference temperature	20 °C	0.6	mm ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Volume of solid	Mass standard: 50 g to 500 g	Hydrostatic weighing	6.5	65	cm ³	Reference temperature	20 °C	0.6 to 2	mm ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Volume of solid	Mass standard: 0.5 kg to 5 kg	Hydrostatic weighing	65	650	cm ³	Reference temperature	20 °C	2 to 20	mm ³	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Density of liquid	Hydrometer	Cuckow method (Hydrostatic weighing)	500	1100	kg/m ³	Liquid temperature	20 °C	0.020	kg/m ³	2	95 %	No	Service provided by the LNE	Approved on 02 July 2008	CMSI
						Pressure	101 kPa								
Density of liquid	Hydrometer	Cuckow method	1100	2000	kg/m ³	Liquid temperature	20 °C	(0.0035 + 1.5E-05d), d density in kg/m ³	kg/m ³	2	95 %	No	Service provided by the LNE	Approved on 02 July 2008	CMSI
						Pressure	101 kPa								
Absolute pressure	Vacuum gauges	Gas medium	1E-06	1E-03	Pa			(1E-07 + 5E-02p), p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 1.5E-07 Pa to 5E-05 Pa Approved on 11 October 2005	
Absolute pressure	Vacuum gauges	Gas medium	1E-03	1	Pa			(7E-06 + 5E-03p), p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 1.2E-05 Pa to 5E-03 Pa Approved on 11 October 2005	
Absolute pressure	Vacuum gauges	Gas medium	1	1E+03	Pa			(4E-03 + 1.3E-03p), p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 5.3E-03 Pa to 1.3 Pa Approved on 11 October 2005	
Absolute pressure	Vacuum gauges	Gas medium	1E+03	3.5E+03	Pa			(1 + 1.3E-03p), p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 2.3 Pa to 5.6 Pa Approved on 11 October 2005	
Gauge pressure	Pressure gauge	Gas medium	0	1E+03	Pa			(4E-03 + 1.3E-03p), p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 4.0E-03 Pa to 1.3 Pa Approved on 11 October 2005	
Gauge pressure	Pressure gauge	Gas medium	1E+03	1E+04	Pa			(1 + 1.3E-03p), p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 2.3 Pa to 14 Pa Approved on 11 October 2005	

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Absolute pressure	Pressure balance	Gas medium	3.5E+03	1E+05	Pa			$(0.2 + 1.9E-05p)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 2.7E-01 Pa to 2.1 Pa Approved on 11 October 2005	
Absolute pressure	Pressure balance	Gas medium	1E+05	1E+06	Pa			$(0.2 + 7E-06p)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 9E-01 Pa to 7.2 Pa Approved on 11 October 2005	
Gauge pressure	Pressure balance	Gas medium	1E+04	1E+06	Pa			$(0.1 + 7E-06p)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 1.7E-01 Pa to 7.1 Pa Approved on 11 October 2005	
Gauge pressure	Pressure balance	Gas medium	1E+06	1E+07	Pa			$(2.9 + 8E-06p + 9E-14p^2)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 1.1E+01 Pa to 9.2E+01 Pa Approved on 11 October 2005	
Gauge pressure	Pressure balance	Gas medium	1E+07	2E+07	Pa			$(10 + 2.1E-05p)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 2.1E+02 Pa to 4.1E+02 Pa Approved on 11 October 2005	
Gauge pressure	Pressure balance	Gas medium	2E+07	4E+07	Pa			$(60 + 3.6E-05p)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 7.8E+02 Pa to 1.5E+03 Pa Approved on 11 October 2005	
Gauge pressure	Pressure balance	Gas medium	4E+07	8E+07	Pa			$(100 + 3.1E-05p)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 1.3E+03 Pa to 2.5E+03 Pa Approved on 11 October 2005	
Gauge pressure	Pressure balance	Oil medium	2E+05	1E+07	Pa			$(5.7 + 8E-06p + 9E-14p^2)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 7.3 Pa to 9.6E+01 Pa Approved on 11 October 2005	
Gauge pressure	Pressure balance	Oil medium	1E+07	2E+08	Pa			$(50 + 1E-05p + 1E-13p^2)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 1.6E+02 Pa to 6.1E+03 Pa Approved on 11 October 2005	

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Gauge pressure	Pressure balance	Oil medium	2E+08	1E+09	Pa			$(120 + 1.5E-05p + 1E-13p^2)$, p pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Uncertainty values range from 7.3E+03 Pa to 1.2E+05 Pa Approved on 11 October 2005	
Differential pressure	Pressure gauge	Gas medium	0	4E+06	Pa	Line pressure, p_{line} and differential pressure, p	$2E+05 Pa < p_{line} + p < 4E+06 Pa$	$(6 + 1.5E-06p_{line} + 2.5E-05p)$, p_{line} and p in Pa	Pa	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Differential pressure	Pressure gauge	Gas medium	0	2E+07	Pa	Line pressure, p_{line} and differential pressure, p	$6E+05 Pa < p_{line} + p < 2E+07 Pa$	$(10 + 1.5E-06p_{line} + 2E-05p)$, p_{line} and p in Pa	Pa	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Differential pressure	Pressure gauge	Gas medium	0	5E+05	Pa	Line pressure, p_{line}	$1E+05 Pa < p_{line} < 4E+07 Pa$	$[1.1 + (1E-11p_{line} + 4E-05)p]$, p_{line} and p differential pressure in Pa	Pa	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Force: tension	Force measuring device	Build-up system	50	1500	kN			0.02	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Force: compression	Force measuring device	Build-up system	50	1000	kN			0.02	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Force: tension and compression	Force measuring device	Deadweight	5	2000	N			0.0025	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Force: tension and compression	Force measuring device	Deadweight	100	5000	N			0.001	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Force: tension and compression	Force measuring device	Deadweight	1	50	kN			0.001	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Force: tension and compression	Force measuring device	Deadweight	10	500	kN			0.002	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Force: tension and compression	Force measuring device	Build-up system	100	3000	kN			0.03	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Force: tension and compression	Force measuring device	Build-up system	300	9000	kN			0.05	%	2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	

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Torque	Torque measuring device		1	40	Nm	Mode	clockwise, anticlockwise	$(2.0E-04M + 0.005)$, M torque in Nm	Nm	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Torque	Torque measuring device		5	300	Nm	Mode	clockwise, anticlockwise	$(2.0E-04M + 0.015)$, M torque in Nm	Nm	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Torque	Torque measuring device		5	2 000	Nm	Mode	clockwise, anticlockwise	$(2.0E-04M + 0.04)$, M torque in Nm	Nm	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Torque	Torque measuring device		2	10	kNm	Mode	clockwise, anticlockwise	$(2.0E-03M + 2.0)$, M torque in kNm	Nm	2	95 %	No	Service provided by the LNE	Approved on 11 October 2005	
Torque	Torque measuring device		10	200	kNm	Mode	clockwise, anticlockwise	2.0E-03		2	95 %	Yes	Service provided by the LNE	Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Reference liquid	0.9	3	mm ² /s	Temperature	40 °C to 20 °C	0.15	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Reference liquid	0.8	2.7	mPa s	Temperature	40 °C to 20 °C	0.15	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Reference liquid	3	18	mm ² /s	Temperature	100 °C to 20 °C	0.30	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Reference liquid	2.7	16	mPa s	Temperature	100 °C to 20 °C	0.30	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	

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Kinematic viscosity	Newtonian liquids	Reference liquid	18	230	mm ² /s	Temperature	100 °C to 20 °C	0.40	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Reference liquid	16	200	mPa s	Temperature	100 °C to 20 °C	0.40	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Reference liquid	230	1260	mm ² /s	Temperature	100 °C to 20 °C	0.50	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Reference liquid	200	1140	mPa s	Temperature	100 °C to 20 °C	0.50	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Reference liquid	1260	14100	mm ² /s	Temperature	100 °C to 20 °C	0.55	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Reference liquid	1140	12500	mPa s	Temperature	100 °C to 20 °C	0.55	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Reference liquid	14100	138000	mm ² /s	Temperature	100 °C to 20 °C	0.65	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	

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Dynamic viscosity	Newtonian liquids	Reference liquid	12500	123300	mPa s	Temperature	100 °C to 20 °C	0.65	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Capillary viscometer	0.001	0.005	mm ² /s ²	Temperature	20 °C	0.15	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Capillary viscometer	0.005	0.03	mm ² /s ²	Temperature	20 °C	0.20	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Capillary viscometer	0.03	0.1	mm ² /s ²	Temperature	20 °C	0.30	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Capillary viscometer	0.1	0.3	mm ² /s ²	Temperature	20 °C	0.40	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Capillary viscometer	0.3	0.8	mm ² /s ²	Temperature	20 °C	0.50	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Capillary viscometer	0.8	3	mm ² /s ²	Temperature	20 °C	0.60	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	

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Kinematic viscosity	Newtonian liquids	Capillary viscometer	3	100	mm ² /s ²	Temperature	20 °C	0.70	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Viscosity measurement	0.9	3	mm ² /s	Temperature	100 °C to 20 °C	0.15	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Viscosity measurement	3	18	mm ² /s	Temperature	100 °C to 20 °C	0.30	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Viscosity measurement	18	230	mm ² /s	Temperature	100 °C to 20 °C	0.40	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Viscosity measurement	230	1260	mm ² /s	Temperature	100 °C to 20 °C	0.50	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Viscosity measurement	1260	14100	mm ² /s	Temperature	100 °C to 20 °C	0.55	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Kinematic viscosity	Newtonian liquids	Viscosity measurement	14100	138000	mm ² /s	Temperature	100 °C to 20 °C	0.65	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	

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Dynamic viscosity	Newtonian liquids	Viscosity measurement	0.8	2.7	mPa s	Temperature	20 °C to 70 °C	0.10	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Viscosity measurement	2.7	16	mPa s	Temperature	20 °C to 70 °C	0.30	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Viscosity measurement	16	200	mPa s	Temperature	20 °C to 70 °C	0.40	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Viscosity measurement	200	1140	mPa s	Temperature	20 °C to 70 °C	0.50	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Viscosity measurement	1140	12500	mPa s	Temperature	20 °C to 70 °C	0.55	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Dynamic viscosity	Newtonian liquids	Viscosity measurement	12500	123300	mPa s	Temperature	20 °C to 70 °C	0.65	%	2	95 %	Yes	Service provided by the LNE	The uncertainty of the viscosity of water (ISO/TR 3666 (1998), 0.17%) is not taken into account Approved on 11 October 2005	
Mass flowrate	Flowmeter (MFM, MFC, LFE), nozzle	Dynamic gravimetric method	700	2300	mg/s	Gas	nitrogen, synthetic air	0.35 to 0.40	%	2	95 %	Yes	Service provided by the LNE	Approved on 16 November 2012	LNE1
						Pressure	100 kPa to 500 kPa								
						Temperature	ambient								

Mass and Related Quantities, France, LNE (Laboratoire national de métrologie et d'essais)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Class	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Service provider	Comments	NMI Service Identifier
Mass flowrate	Molbloc-L, Molbloc-S	Dynamic gravimetric method	0.2	200	mg/s	Gas	nitrogen, synthetic air	0.06 to 0.20	%	2	95 %	Yes	Service provided by the LNE	Approved on 16 November 2012	LNE2
						Pressure	100 kPa to 500 kPa								
						Temperature	ambient								
Mass flowrate	Flowmeter (MFM, MFC, LFE), nozzle	Dynamic gravimetric method	0.03	700	mg/s	Gas	nitrogen, synthetic air, argon, helium, oxygen, carbon dioxide, nitrous oxide	0.22 to 0.4	%	2	95 %	Yes	Service provided by the LNE	Approved on 16 November 2012	LNE3
						Temperature	ambient temperature								
						Pressure	0.1 MPa to 0.5 MPa								
						Pipe size	DN 2 to DN 100								
Gas flow speed	Air speed anemometers	Any type of device (Prandtl tubes, fan type, thermal, ultrasonic, Vortex, Laser Doppler anemometers...)	0.15	40	m/s	Gas	air	(0.008+0.0051 × v)	m s ⁻¹	2	95 %	No	Service provided by the LNE-CETIAT	Approved on 23 October 2018	CETIAT1
						Temperature	10 °C to 40 °C								
						Pressure	ambient								
						Humidity	ambient								
						Flow direction	horizontal								
						Test section	test section 500 mm x 500 mm								

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Gas flow speed	Air speed anemometers	Thermal anemometers	0.05	2	m/s	Gas	air	0.007 to 0.018	m s ⁻¹	2	95 %	No	Service provided by the LNE-CETIAT	Approved on 16 November 2012	CETIAT2
						Temperature	10 °C to 50 °C								
						Pressure	ambient								
						Humidity	10% to 90%								
						Flow direction	horizontal, vertical upward or vertical downward								
						Test section	test section 250 mm x 250 mm								
Gas flow speed	Laser Doppler anemometer	Laser Doppler anemometer	1	15	µm	Particle speed on surface	fringe calibration	0.05	%	2	95 %	Yes	Service provided by the LNE-CETIAT	Approved on 16 November 2012	CETIAT3
Mass water flow rate	Any flow measurement instrument or flow device		8	36000	kg/h	Liquid	water	0.05	%	2	95 %	Yes	Service provided by the LNE-CETIAT	Approved on 23 October 2018	CETIAT4
						Temperature	15 °C to 90 °C								
						Gauge pressure	0.1 MPa to 0.3 MPa								
						Pipe size	DN 2 to DN 100								

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Class	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Service provider	Comments	NMI Service Identifier	
Mass water flow rate	Any flow measurement instrument or flow device	All except electromagnetic device	0.001	0.01	kg/h	Liquid	water	0.6	%	2	95 %	Yes	For volume water flow rate, flow range is 0.001 l/h to 0.01 l/h with the same expanded uncertainty (k=2)	Approved on 23 October 2018	CETIAT5	
						Temperature	10 °C to 50 °C									
						Gauge pressure	0.02 MPa to 1.0 MPa									
Mass water flow rate	Any flow measurement instrument or flow device	All except electromagnetic device	0.01	10	kg/h	Liquid	water	0.1	%	2	95 %	Yes	For volume water flow rate, flow range is 0.001 l/h to 0.01 l/h with the same expanded uncertainty (k=2)	Approved on 23 October 2018	CETIAT6	
						Temperature	10 °C to 50 °C									
						Gauge pressure	0.02 MPa to 1.0 MPa									
Liquid dynamic (flowing) volume	Volumetric meters	Pulses	10	600	m³/h	Refined products	Pipe prover 2500 L	0.043	%	2	95 %	Yes	Service provided by the LNE-TRAPIL	Approved on 16 November 2012	TRAPIL1	
						Temperature	5 °C to 35 °C									
						Pressure	0 MPa to 1.2MPa									
Liquid dynamic (flowing) volume	Volumetric meters	Pulses	10	600	m³/h	Fuels	pipe prover 2500 L	0.043	%	2	95 %	Yes	Service provided by the LNE-TRAPIL	Approved on 16 November 2012	TRAPIL2	
						Temperature	5 °C to 35 °C									
						Pressure	0 MPa to 1.2MPa									

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Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty							
Class	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Service provider	Comments	NMI Service Identifier
Liquid dynamic (flowing) volume	Volumetric meters	Pulses	40	2500	m³/h	Refined products	pipe prover 10000 L	0.043	%	2	95 %	Yes	Service provided by the LNE-TRAPIL	Approved on 16 November 2012	TRAPIL3
						Temperature	5 °C to 35 °C								
						Pressure	0 MPa to 1.2MPa								
Liquid dynamic (flowing) volume	Volumetric meters	Pulses	40	2500	m³/h	Fuels	pipe prover 10000 L	0.043	%	2	95 %	Yes	Service provided by the LNE-TRAPIL	Approved on 16 November 2012	TRAPIL4
						Temperature	5 °C to 35 °C								
						Pressure	0 MPa to 1.2MPa								
Volume flowrate	Flowmeter and gas meter	Pulse or electrical output	0.0028	0.44	m³/s	Gas	natural gas	0.30	%	2	95 %	Yes	Service provided by the LNE-LADG	Approved on 19 October 2016	LADG1
						Temperature	20 °C								
						Pressure	0.2 MPa to 3.5 MPa								
						Pipe size	DN50 to DN300								
Volume flowrate	Flowmeter and gas meter	Pulse or electrical output	0.0022	36	m³/s	Gas	dry air	0.26	%	2	95 %	Yes	Service provided by the LNE-LADG	Approved on 16 November 2012	LADG2
						Pressure	0.1 MPa to 4.5 MPa								
						Pipe size	DN25 to DN400								
Mass flowrate	Nozzle	Sonic	0.003	30	kg/s	Gas	dry air	0.25	%	2	95 %	Yes	Service provided by the LNE-LADG	Approved on 16 November 2012	LADG4
						Temperature	ambient temperature								
						Pressure	0.1 MPa to 4.5 MPa								
						Nozzle diameter	1.5 mm to 39 mm								

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Class	Instrument or Artifact	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	Service provider	Comments	NMI Service Identifier
Mass flowrate	Orifice plates, Venturi	Differential pressure	0.003	30	kg/s	Gas	dry air	0.31	%	2	95 %	Yes	Service provided by the LNE-LADG	Approved on 16 November 2012	LADG5
						Temperature	ambient temperature								
						Pressure	0.1 MPa to 4.5 MPa								
						Pipe size	DN25 to DN400								
Mass flowrate	Orifice plates, Venturi	Differential pressure	0.0022	10	kg/s	Gas	natural gas	0.35	%	2	95 %	Yes	Service provided by the LNE-LADG	Approved on 19 October 2016	LADG6
						Temperature	20 °C								
						Pressure	0.2 MPa to 3.5 MPa								
						Pipe size	DN50 to DN300								
Mass flowrate	Nozzle	Sonic	0.001	3.5	kg/s	Gas	dry air	$(-0.233 \cdot p + 0.26)$ with $0.2 \leq p < 0.7$ MPa 0.1% with $0.7 \leq p < 6$ MPa	%	2	95 %	Yes	Service provided by the LNE-LADG	Approved on 19 October 2016	LADG7
						Temperature	ambient temperature								
						Pressure	0.2 MPa to 6 MPa								
						Nozzle diameter	1.5 mm to 20 mm								