Mass and Related Quantities, Denmark, DFM (Danish Institute of Fundamental Metrology), DFI (Danish Force Institute), FORCE (FORCE Institute)

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**	**NMI Service Identifier**	**Comments**
Mass	Mass standards	Comparison in air	1	100	mg			0.4 to1	µg	2	95%	No	DFM		Uncertainty scales with measurand level. The volume of the mass standards is known.
Mass	Mass standards	Comparison in air	0.1	1	g			1 to 1.8	µg	2	95%	No	DFM		Uncertainty scales with measurand level. The volume of the mass standards is known.
Mass	Mass standards	Comparison in air	1	10	g			1.8 to 4	µg	2	95%	No	DFM		Uncertainty scales with measurand level. The volume of the mass standards is known.
Mass	Mass standards	Comparison in air	10	100	g			4 to 10	µg	2	95%	No	DFM		Uncertainty scales with measurand level. The volume of the mass standards is known.
Mass	Mass standards	Comparison in air	0.1	1	kg			10 to 50	µg	2	95%	No	DFM		Uncertainty scales with measurand level. The volume of the mass standards is known.
Mass	Mass standards	Comparison in air	1	10	kg			0.05 to 1.5	mg	2	95%	No	DFM		Uncertainty scales with measurand level. The volume of the mass standards is known.
Absolute pressure	Vacuum gauge		5	2.0E+01	Pa			(6E-02 + 1E-02*p*), *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 1.1E-01 Pa to 2.6E-01 Pa
Absolute pressure	Vacuum gauge		2.0E+01	1.5E+03	Pa			1E-02*p*, *p* pressure i*n Pa*	Pa	2	95%	No	DFI		Uncertainty values range from 2.0E-01 Pa to 1.5E+01 Pa
Absolute pressure	Pressure gauge	Gas medium	1.5E+03	1.5E+04	Pa			6	Pa	2	95%	No	DFI		

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**	**NMI Service Identifier**	**Comments**
Absolute pressure	Barometer	Gas medium	1.5E+04	1.5E+05	Pa			9	Pa	2	95%	No	DFI		
Negative gauge pressure	Pressure gauge	Gas medium	-1.5E+03	-1.0E+03	Pa			3E-04*p*, *p* absolute value of the gauge pressure, expressed in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 4.5E-01 Pa to 3.0E-01 Pa
Negative gauge pressure	Pressure gauge	Gas medium	-1.0E+03	0	Pa			0.3	Pa	2	95%	No	DFI		
Gauge pressure	Pressure gauge	Gas medium	0	1.0E+03	Pa			0.3	Pa	2	95%	No	DFI		
Gauge pressure	Pressure gauge	Gas medium	1.0E+03	1.5E+03	Pa			3E-04*p* , *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 3.0E-01 Pa to 4.5E-01 Pa
Gauge pressure	Pressure gauge	Gas medium	3.5E+03	1.0E+04	Pa			(2 + 5E-04*p*), *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 3.8 Pa to 7.0 Pa
Gauge pressure	Pressure balance	Gas medium	1.0E+04	2.0E+07	Pa			(3 + 1E-04*p*), *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 4.0 Pa to 2.0E+03 Pa
Gauge pressure	Pressure balance	Gas medium	2.0E+07	8.0E+07	Pa			(18 + 1E-04*p*), *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 2.0E+03 Pa to 8.0E+03 Pa
Gauge pressure	Pressure balance	Oil medium	1.0E+05	8.0E+07	Pa			(36 + 1E-04*p*), *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 4.6E+01 Pa to 8.0E+03 Pa

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**	**NMI Service Identifier**	**Comments**
Gauge pressure	Pressure balance	Oil medium	8.0E+07	5.0E+08	Pa			5E-04*p* , *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 4.0E+04 Pa to 2.5E+05 Pa
Differential pressure	Pressure gauge	Gas medium	5.0E+05	2.0E+07	Pa			1E-04*p*, *p* pressure in Pa	Pa	2	95%	No	DFI		Uncertainty values range from 5.0E+01 Pa to 2.0E+03 Pa
Force: tension and compression	Force measuring device	Deadweight	0.1	1000	N			0.01	%	2	95%	Yes	DFM		
Force: tension and compression	Force measuring device	Deadweight	> 1000	3300	N			0.02	%	2	95%	Yes	DFM		
Force: compression	Force measuring device	Reference force transducers	1	1000	kN			0.05	%	2	95%	Yes	DFM		
Force: tension	Force measuring device	Reference force transducers	1	200	kN			0.04	%	2	95%	Yes	DFM		
Flowrate, volume (gas)	Flowmeters, volumemeters	Turbine, rotary, diaphragm, swirl, V/A, vortex, ultrasonic, nozzles, vet gas meters	0.005	10	m^3/h	Gas	air	0.10	%	2	95%	Yes	FORCE	DK1	
						Temperature	20 °C ± 1 °C								
						Pipe size	various tubing								

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**	**NMI Service Identifier**	**Comments**
Flowrate, volume (gas)	Flowmeters, volumemeters	Turbine, rotary, diaphragm, swirl, V/A, vortex, ultrasonic, nozzles, vet gas meters, massflowmeters	0.025	17	m^3/h	Gas	air or nitrogen	0.17	%	2	95%	Yes	FORCE	DK2	
						Temperature	20 °C ± 1 °C								
						Pressure	0 bar g to 50 bar g								
						Pipe size	various tubing								
Flowrate, massflow (gas)	Flowmeters, volumemeters	Turbine, rotary, diaphragm, swirl, V/A, vortex, ultrasonic, nozzles, vet gas meters, massflowmeters	0.03	22	kg/h	Gas	air or nitrogen	0.25	%	2	95%	Yes	FORCE	DK2	
						Temperature	20 °C ± 1 °C								
						Pressure	0 bar g to 50 bar g								
						Pipe size	various tubing								
Flowrate, volume (gas)	Flowmeters, volumemeters	Turbine, rotary, diaphragm, swirl, V/A, vortex, ultrasonic, nozzles, vet gas meters, massflowmeters	1	4000	m^3/h	Gas	air	0.15 to 0.18	%	2	95%	Yes	FORCE	DK3	
						Temperature	20 °C ± 2 °C								
						Pipe size	1" to 12"								
Flowrate, massflow (gas)	Flowmeters, volumemeters	Turbine, rotary, diaphragm, swirl, V/A, vortex, ultrasonic, nozzles, vet gas meters, massflowmeters	1.3	5200	kg/h	Gas	air	0.24	%	2	95%	Yes	FORCE	DK3	
						Temperature	20 °C ± 2 °C								
						Pipe size	1" to 12"								

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**	**NMI Service Identifier**	**Comments**
Flowrate, volume (gas)	Flowmeters, volumemeters	Turbine, rotary, V/A, vortex, ultrasonic, nozzles, massflowmeters	5	5000	$m^3(n)/h$	Gas	air	0.25	%	2	95%	Yes	FORCE	DK4	
						Temperature	20 °C ± 3 °C								
						Pressure	0 bar g to 8 bar g								
						Pipe size	2" to 8"								
Flowrate, massflow (gas)	Flowmeters, volumemeters	Turbine, rotary, V/A, vortex, ultrasonic, nozzles, massflowmeters	6.5	6500	kg/h	Gas	air	0.29	%	2	95%	Yes	FORCE	DK4	
						Temperature	20 °C ± 3 °C								
						Pressure	0 bar g to 8 bar g								
						Pipe size	2" to 8"								
Flowrate, volume (gas)	Flowmeters, volumemeters	Flowmeters, V/A-meters, massflowmeters, massflowcontrollers and other flowmeters	1	50000	ml/min	Gas	air or other medium	0.12 to 0.19	%	2	95%	Yes	FORCE	DK5	
						Temperature	20 °C ± 1 °C								
						Pressure	0 bar g to 10 bar g								
						Pipe size	various tubing								
Flowrate, massflow (gas)	Flowmeters, volumemeters	Flowmeters, V/A-meters, Massflowmeters, massflowcontrollers and other flowmeters	7.8E-05	3.879	kg/h	Gas	air or other medium	0.16	%	2	95%	Yes	FORCE	DK5	
						Temperature	20 °C ± 1 °C								
						Pressure	0 bar g to 10 bar g								
						Pipe size	various tubing								

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**	**NMI Service Identifier**	**Comments**
Flow or volume (liquid other than water)	Flowmeters, volumemeters	Puls, analog or mA	0.4	400	m^3/h	Liquid	hydrocarbons	0.03	%	2	95%	Yes	FORCE	DK6	
						Volume	60 litres								
Flow or volume (liquid other than water)	Flowmeters, volumemeters , weighingtanks	Puls, analog or mA	0.4	200	m^3/h	Liquid	hydrocarbons	0.03	%	2	95%	Yes	FORCE	DK7	
						Volume	no limits in litre								
Volume (liquid)	Flowmeter	Mechanical, on-site, mobile volume standards	5	5	l	Liquid	petrol / diesel	0.24 / 0.21	%	2	95%	Yes	FORCE	DK8	
						Air temperature	0 °C to 24 °C								
						Liquid temperature	6 °C to 18 °C								
Volume (liquid)	Flowmeter	Mechanical, on-site, mobile volume standards	20	20	l	Liquid	petrol / diesel	0.16 / 0.14	%	2	95%	Yes	FORCE	DK9	
						Air temperature	0 °C to 24 °C								
						Liquid temperature	6 °C to 18 °C								
Volume (liquid)	Flowmeter	Mechanical, on-site, handheld and mobile volume standards	5	5	l	Liquid	petrol / diesel	0.28 / 0.38	%	2	95%	Yes	FORCE	DK10	
						Air temperature	0 °C to 24 °C								
						Liquid temperature	6 °C to 18 °C								

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**	**NMI Service Identifier**	**Comments**
Volume (liquid)	Flowmeter	Mechanical, on-site, handheld and mobile volume standards	20	20	l	Liquid	petrol / diesel	0.25 / 0.28	%	2	95%	Yes	FORCE	DK11	
						Air temperature	0 °C to 24 °C								
						Liquid temperature	6 °C to 18 °C								
Volume (liquid)	Flowmeter	Mechanical, on-site	100	2500	l	Liquid	petrol / diesel	0.25 / 0.28	%	2	95%	Yes	FORCE	DK12	
						Air temperature	0 °C to 24 °C								
						Liquid temperature	6 °C to 18 °C								
Volume (liquid)	Flowmeter	Mechanical, on-site	5	100	l	Liquid	petrol or similar	0.09	%	2	95%	Yes	FORCE	DK13	
						Air temperature	15 °C to 28 °C								
						Liquid temperature	10 °C to 33 °C								
Volume (liquid)	Flowmeter	Mechanical, on-site	5	5	l	Liquid	diesel or similar	0.25	%	2	95%	Yes	FORCE	DK14	
						Air temperature	15 °C to 28 °C								
						Liquid temperature	10 °C to 33 °C								
Volume (liquid)	Flowmeter	Mechanical, on-site	20	100	l	Liquid	diesel or similar	0.14	%	2	95%	Yes	FORCE	DK15	
						Air temperature	15 °C to 28 °C								
						Liquid temperature	10 °C to 33 °C								

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**	**NMI Service Identifier**	**Comments**
Volume (liquid)	Flowmeter	Mechanical, on-site	5	300	l	Liquid	diesel	0.1	%	2	95%	Yes	FORCE	DK16	
Volume (liquid)	Laboratory equipment	e.g. pipettes	0.8	8	µl	Temperature	20 °C	2.2	%	2	95%	Yes	FORCE	DK17	Delivered or contained liquid
Volume (liquid)	Laboratory equipment	e.g. pipettes, injectors	8	80	µl	Temperature	20 °C	0.3	%	2	95%	Yes	FORCE	DK18	Delivered or contained liquid
Volume (liquid)	Laboratory equipment	e.g. pipettes, burettes, pycnometers	80	800	µl	Temperature	20 °C	0.08	%	2	95%	Yes	FORCE	DK19	Delivered or contained liquid
Volume (liquid)	Laboratory equipment	Any type of volume standards	0.8	8	ml	Temperature	20 °C	0.08	%	2	95%	Yes	FORCE	DK20	Delivered or contained liquid
Volume (liquid)	Laboratory equipment	Any type of volume standards	8	80	ml	Temperature	20 °C	0.03	%	2	95%	Yes	FORCE	DK21	Delivered or contained liquid
Volume (liquid)	Laboratory / proving equipment	Any type of volume standards	80	800	ml	Temperature	20 °C	0.008	%	2	95%	Yes	FORCE	DK22	Delivered or contained liquid
Volume (liquid)	Laboratory / proving equipment	Any type of volume standards	0.8	6	l	Temperature	20 °C	0.006	%	2	95%	Yes	FORCE	DK23	Delivered or contained liquid
Volume (liquid)	Laboratory / proving equipment	Any type of volume standards	6	26	l	Temperature	20 °C	0.007	%	2	95%	Yes	FORCE	DK24	Delivered or contained liquid
Volume (liquid)	Proving tanks	Any type of volume standards	26	60	l	Temperature	20 °C	0.012 to 0.005	%	2	95%	Yes	FORCE	DK25	Delivered or contained liquid
Volume (liquid)	Proving tanks	Any type of volume standards	60	550	l	Temperature	20 °C	0.005	%	2	95%	Yes	FORCE	DK26	Delivered or contained liquid
Volume (liquid)	Storage / proving tanks	Any type of volume standards	1	1.5	l	Temperature	20 °C	0.15 to 0.01	%	2	95%	Yes	FORCE	DK27	Delivered or contained liquid
Volume (liquid)	Storage / proving tanks	Any type of volume standards	1.5	10000	l	Temperature	20 °C	0.01	%	2	95%	Yes	FORCE	DK28	Delivered or contained liquid
Volume (liquid)	Storage / proving tanks	Any type of volume standards	10	40	m^3	Temperature	20 °C	0.024	%	2	95%	Yes	FORCE	DK29	Delivered or contained liquid

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**	**NMI Service Identifier**	**Comments**
Mass flowrate (liquid)	Flowmeter	Pulse or electrical output	0.0014	0.833	kg/s	Liquid	water	0.05	%	2	95%	Yes	FORCE	DK30	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								
Mass flowrate (liquid)	Flowmeter	Pulse or electrical output	0.833	111	kg/s	Liquid	water	0.05 to 0.2	%	2	95%	Yes	FORCE	DK31	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								
Mass flowrate (liquid)	Flowmeter	Visual reading	0.0014	0.833	kg/s	Liquid	water	0.05	%	2	95%	Yes	FORCE	DK32	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								
Mass flowrate (liquid)	Flowmeter	Visual reading	0.833	111	kg/s	Liquid	water	0.05 to 0.2	%	2	95%	Yes	FORCE	DK33	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								
Volume flowrate (liquid)	Flowmeter	Pulse or electrical output	0.0014	0.833	l/s	Liquid	water	0.05	%	2	95%	Yes	FORCE	DK34	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								

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**	**NMI Service Identifier**	**Comments**
Volume flowrate (liquid)	Flowmeter	Pulse or electrical output	0.833	111	l/s	Liquid	water	0.05 to 0.2	%	2	95%	Yes	FORCE	DK35	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								
Volume flowrate (liquid)	Flowmeter	Visual reading	0.0014	0.833	l/s	Liquid	water	0.05	%	2	95%	Yes	FORCE	DK36	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								
Volume flowrate (liquid)	Flowmeter	Visual reading	0.833	111	l/s	Liquid	water	0.05 to 0.2	%	2	95%	Yes	FORCE	DK37	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								
Mass (liquid)	Mass meter	Coriolis	1	60	kg	Liquid	water	0.05 to 0.1	%	2	95%	Yes	FORCE	DK38	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								
Mass (liquid)	Mass meter	Coriolis	200	5000	kg	Liquid	water	0.05 to 0.1	%	2	95%	Yes	FORCE	DK39	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								
Mass (liquid)	Mass meter	Coriolis	1	25000	kg	Liquid	water	0.4	%	2	95%	Yes	FORCE	DK40	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								

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**	**NMI Service Identifier**	**Comments**
Mass (liquid)	Mass meter	Coriolis	2500	250000	kg	Liquid	water	0.4	%	2	95%	Yes	FORCE	DK41	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								
Volume (liquid)	Water meter	Axial turbine, electromagnetic, ultrasonic, Coriolis, etc.	1	60	l	Liquid	water	0.05 to 0.1	%	2	95%	Yes	FORCE	DK42	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								
Volume (liquid)	Water meter	Axial turbine, electromagnetic, ultrasonic, Coriolis, etc.	200	250000	l	Liquid	water	0.05 to 0.2	%	2	95%	Yes	FORCE	DK43	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								
Volume (liquid)	Water meter	Axial turbine, electromagnetic, ultrasonic, Coriolis, etc.	1	25000	l	Liquid	water	0.4 to 0.5	%	2	95%	Yes	FORCE	DK44	
						Temperature	12 °C to 80 °C								
						Pipe size	0.004 m to 0.025 m								
Volume (liquid)	Water meter	Axial turbine, electromagnetic, ultrasonic, Coriolis, etc.	2500	250000	l	Liquid	water	0.4 to 0.5	%	2	95%	Yes	FORCE	DK45	
						Temperature	12 °C to 80 °C								
						Pipe size	0.025 m to 0.250 m								