

Appendix A – NTEP Technical Policy C. Product Families for Meters – Proposed Revisions for October 2010 Meeting

C. Product Families for Meters

When submitting a meter for evaluation, the manufacturer must specify the product family and critical parameters for which the meter is being submitted.

The product family and the specific product subgroup covered by the Certificate are to be identified on Page 1 of the Certificate of Conformance. More detailed information, including the typical product types found in the subgroup, is to be included in the application section of the Certificate.

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements			Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
Test B: To cover a range of the following products, test with one product having a low specific gravity and test with a second product having a high specific gravity. The Certificate of Conformance will cover <u>all products in all product categories listed in the table</u> within the specific gravity range tested.			Test F – To cover a range of the following products, test with one product having a specified conductivity. The Certificate of Conformance will cover all products in both of the families with conductivity equal to or above the conductivity of the tested liquid.			Test C - To cover a range of products <u>within each product category</u> , test with one product having a low viscosity and test with a second product having a high viscosity <u>within each category</u> . The Certificate of Conformance will cover <u>all products in the product category</u> within the viscosity range tested.		Test E – To cover a range of products <u>within each product category</u> , test with one product having a low kinematic viscosity and test with a second product having a high kinematic viscosity <u>within each category</u> . The Certificate of Conformance will cover <u>all products in the product category</u> within the kinematic viscosity range tested.	
Typical Products	Specific Gravity* (60 F)	Product Category	Typical Products	Conductivity (micro-Siemens/centimeter)	Product Category	Product Category: Fuels, Lubricants, Industrial and Food Grade Liquid Oils (FL&O)		Product Category: Fuels, Lubricants, Industrial and Food Grade Liquid Oils (FL&O)	
Asphalt		FL&O	Gasoline		FL&O	Typical Products	Reference Viscosity* (60 F)	Typical Products	Reference Viscosity* (60 F)
Asphalt		Heated	JP4		FL&O		Centipoise (cP)		Centipoise (cP)
Avgas		FL&O	Jet A-1		FL&O	Gasoline	0.28	Gasoline	0.28
Jet A		FL&O	JP7 & JP8		FL&O	JP4	1.02	JP4	1.02
Jet B		FL&O	Kerosene		FL&O	Jet A-1	1.36	Jet A-1	1.36
Spindle Oil		FL&O	JP5		FL&O	JP7 & JP8	1.82	JP7 & JP8	1.82
Adjuvants	0.7 - 1.2	CC	Corn Oil		FL&O	Kerosene	1.94	Kerosene	1.94
Banvel	0.7 - 1.2	CC	Cooking Oils		FL&O	JP5	1.94	JP5	1.94
Fumigants	0.7 - 1.2	CC	Diesel Fuel		FL&O	Corn Oil	4	Corn Oil	4
Fungicides	0.7 - 1.2	CC	Biodiesel above B20		FL&O	Cooking Oils	9.93	Cooking Oils	9.93
Herbicides	0.7 - 1.2	CC	Light Oil		FL&O	Diesel Fuel	10	Diesel Fuel	10

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements			Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
Insecticides	0.7 - 1.2	CC	Sunflower Oil		FL&O	Biodiesel above B20	10.12	Biodiesel above B20	10.12
Paraquat	0.7 - 1.2	CC	Soy Oil	0	FL&O	Light Oil	13.47	Light Oil	13.47
Prowl	0.7 - 1.2	CC	Olive Oil		FL&O	Sunflower Oil	90.1	Sunflower Oil	90.1
Round-up	0.7 - 1.2	CC	Vegetable Oil	0	FL&O	Soy Oil	90.6	Soy Oil	90.6
Touchdown	0.7 - 1.2	CC	Bunker Oil		FL&O	Olive Oil	116.8	Olive Oil	116.8
Treflan	0.7 - 1.2	CC	Avgas		FL&O	Vegetable Oil	133	Vegetable Oil	133
Ammonia Nitrate	1.16-1.37	Fert	Jet A		FL&O	Bunker Oil	11,200	Bunker Oil	11,200
Crude Oil	0.79-0.97	FL&O	Jet B		FL&O	Avgas	1.5 to 6	Avgas	1.5 to 6
Lubricating Oils	0.80-0.90	FL&O	Asphalt		FL&O	Jet A	1.5 to 6	Jet A	1.5 to 6
Peanut Oil	0.9-1.0	FL&O	Peanut Oil		FL&O	Jet B	1.5 to 6	Jet B	1.5 to 6
Hexane	0.66	Sol Gen	SAE Grades		FL&O	Asphalt	100 – 5000	Asphalt	100 – 5000
Diesel Fuel	0.72	FL&O	Lubricating Oils		FL&O	Peanut Oil	11 to 110	Peanut Oil	11 to 110
Gasoline	0.72	FL&O	Crude Oil		FL&O	SAE Grades	192-3626	SAE Grades	192-3626
Kerosene	0.75	FL&O	6 Oil (#5, #6)		FL&O	Lubricating Oils	20 to 1000	Lubricating Oils	20 to 1000
Jet A-1	0.76	FL&O	Fuel Oil (#1, #2, #3, #4)	0	FL&O	Crude Oil	3-1783	Crude Oil	3-1783
JP4	0.76	FL&O	Spindle Oil		FL&O	6 Oil (#5, #6)	66-13,000	6 Oil (#5, #6)	66-13,000
JP5	0.76	FL&O	Acetone	.02	Sol Gen	Fuel Oil (#1, #2, #3, #4)	8 to 88	Fuel Oil (#1, #2, #3, #4)	8 to 88
JP7 JP8	0.76	FL&O	Hexane	0	Sol Gen	Spindle Oil		Spindle Oil	
Ethanol	0.79	Alc Gly	Acetates		Sol Gen	Product Category: Solvents General (Sol Gen)		Product Category: Solvents General (Sol Gen)	
Isopropyl	0.79	Alc Gly	MEK	0.1	Sol Gen	Typical Products	Reference Viscosity* (60 F)	Typical Products	Reference Viscosity* (60 F)
Acetone	0.8	Sol Gen	Toluene	0	Sol Gen		Centipoise (cP)		Centipoise (cP)
Methanol	0.80	Alc Gly	Xylene	0	Sol Gen	Acetone	0.34	Acetone	0.34
Butanol	0.81	Alc Gly	Ethylacetate	0.00001	Sol Gen	Hexane	0.34	Hexane	0.34
Isobutyl	0.81	Alc Gly	Methylene-Chloride		Sol Chl	Acetates	0.44	Acetates	0.44
MEK	0.81	Sol Gen	Trichloro-Ethylene		Sol Chl	MEK	0.45	MEK	0.45
Biodiesel above B20	0.86	FL&O	Carbon Tetra-Chloride		Sol Chl	Toluene	0.62	Toluene	0.62

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements			Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements				
Light Oil	0.86	FL&O	Perchloro-Ethylene		Sol Chl	Xylene	0.86	Xylene	0.86			
Toluene	0.87	Sol Gen	Methanol	0.44	Alc Gly	Ethylacetate	1.36	Ethylacetate	1.36			
20% Aqua-Ammonia	0.89	Fert	Ethanol	0.0013	Alc Gly	Product Category: Solvents Chlorinated (Sol Chl)		Product Category: Alcohols, Glycols & Water Mixes Thereof (Alc Gly)				
Xylene	0.89	Sol Gen	Isopropyl	3.5	Alc Gly	Typical Products	Reference Viscosity* (60 F)	Typical Products	Reference Viscosity* (60 F)			
6 Oil (#5, #6)	0.9	FL&O	Butanol		Alc Gly		Centipoise (cP)		Centipoise (cP)			
Fuel Oil (#1, #2, #3, #4)	0.9	FL&O	Isobutyl	0.02	Alc Gly	Methylene-Chloride	0.46	Methanol	0.64			
SAE Grades	0.9	FL&O	Ethylene glycol		Alc Gly	Trichloro-Ethylene	0.6	Ethanol	1.29			
Corn Oil	0.91	FL&O	Propylene glycol		Alc Gly	Carbon Tetra-Chloride	0.99	Isopropyl	2.78			
Cooking Oils	0.92	FL&O	Demineralized		Water	Perchloro-Ethylene	1	Butanol	3.34			
Olive Oil	0.92	FL&O	Deionized		Water	Product Category: Alcohols, Glycols & Water Mixes Thereof (Alc Gly)		Isobutyl	4.54			
Vegetable Oil	0.92	FL&O	Asphalt		Heated	Typical Products	Reference Viscosity* (60 F)	Ethylene glycol	25.5			
Acetates	0.93	Sol Gen	Bunker C		Heated		Centipoise (cP)	Propylene glycol	54			
Soy Oil	0.93	FL&O	Test D – To obtain coverage for a product category: Test with one product in the product category. The Certificate of Conformance will cover all products in the category.			Methanol	0.64	Compressed liquids: Fuels and Refrigerants, NH ₃				
										Typical Products	Reference Viscosity* (60 F)	Centipoise (cP)
Sunflower Oil	0.93	FL&O						Ethanol	1.29	Propane	0.098	
										Anhydrous Ammonia	0.188	
Ethylacetate	0.96	Sol Gen				Isopropyl	2.78	Butane	0.19			
Bunker Oil	0.99	FL&O				Butanol	3.34	Freon 11	0.313			

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements			Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
Beverages	1.0	Water	Tap water	72**	Water	Isobutyl	4.54	Freon 12	0.359
Deionized	1.0	Water	Potable	72**	Water	Ethylene glycol	25.5	Freon 22	1.99
Demineralized	1.0	Water	Nonpotable	72**	Water	Propylene glycol	54	Ethane	
Juices	1.0	Water	Juices		Water	Product Category: Clear Liquid Fertilizers (Liq Fert)		Test A – The following products must be individually tested and noted on the Certificate of Conformance.	
Milk	1.0	Water	Beverages		Water	Typical Products	Reference Viscosity* (60 F)		
Nonpotable	1.0	Water	Water mixes of alcohols & glycols		Alc Gly		Centipoise (cP)	Typical Products	Product Category
Potable	1.0	Water	Urea	5000	Fert	Urea	1	Methylene-Chloride	Sol Chl
Tap Water	1.0	Water	Ammonia Nitrate		Fert	Ammonia Nitrate	11.22	Trichloro-Ethylene	Sol Chl
Propylene glycol	1.04	Alc Gly	10-34-0		Fert	10-34-0	48	Carbon Tetra-Chloride	Sol Chl
Hydrochloric Acid	1.1	Chem	20% Aqua-Ammonia		Fert	20% Aqua-Ammonia	1.1 – 1.3	Perchloro-Ethylene	Sol Chl
Ethylene glycol	1.19	Alc Gly	Clear Liquid Fert		Fert	Chlear Liquid Fert	31 - 110	Urea	Liq Fert
Liquid Molasses	1.25	Liq Feed	Nitrogen Solution		Fert	Nitrogen Solution	31 - 110	Ammonia Nitrate	Liq Fert
9-18-9	1.32	Fert	28%, 30% or 32%		Fert	28%, 30% or 32%	31 - 110	10-34-0	Liq Fert
Methylene-Chloride	1.34	Sol Chl	N-P-K solutions		Fert	N-P-K solutions		20% Aqua-Ammonia	Liq Fert
10-34-0	1.39	Fert	9-18-0		Fert	9-18-0		Chlear Liquid Fert	Liq Fert
Trichloro-Ethylene	1.47	Sol Chl	4-4-27		Sus Fert	Product Category: Suspension Fertilizers (Sus Fert)		Nitrogen Solution	Liq Fert
Carbon Tetra-Chloride	1.6	Sol Chl	3-10-30		Sus Fert	Typical Products	Reference Viscosity* (60 F)	28%, 30% or 32%	Liq Fert
Perchloro-Ethylene	1.6	Sol Chl	Molasses plus Phos Acid and/or Urea (TreaChle)		Liq Feed		Centipoise (cP)	N-P-K solutions	Liq Fert

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements			Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
Sulfuric Acid	1.83	Chem	Liquid Molasses	300	Liq Feed	4-4-27	20 – 215	9-18-0	Liq Fert
Phosphoric Acid	1.87	Chem	Sulfuric Acid	209000	Chem	3-10-30	100 – 1000	4-4-27	Sus Fert
Urea	1.89	Fert	Phosphoric Acid	56600	Chem	Product Category: Liquid Feeds (Liq Feed)		3-10-30	Sus Fert
Bunker C	1.99	Heated	Hydrochloric Acid	395000	Chem	Typical Products	Reference Viscosity* (60 F)	Molasses plus Phos Acid and/or Urea (TreaChle)	Liq Feed
Fungicides	1 – 1.2	CC	Herbicides		CC-A		Centipoise (cP)	Liquid Molasses	Liq Feed
Micronutrients	1 – 1.2	CC	Round-up		CC-A	Molasses plus Phos Acid and/or Urea (TreaChle)	2882	Asphalt	Heated
Molasses plus Phos Acid and/or Urea (TreaChle)	1.1 to 1.3	Liq Feed	Touchdown		CC-A	Liquid Molasses	8640	Bunker C	Heated
3-10-30	0.9 – 1.65	Liq Fert	Banvel		CC-A	Product Category: Heated Products (Heated)		Sulfuric Acid	Chem
4-4-27	0.9 – 1.65	Liq Fert	Treflan		CC-A	Typical Products	Reference Viscosity* (60 F)	Phosphoric Acid	Chem
Micronutrients	0.9 – 1.65	Liq Fert	Paraquat		CC-A		Centipoise (cP)	Hydrochloric Acid	Chem
28%, 30% or 32%	1.28 – 1.32	Fert	Prowl		CC-A	Asphalt	100 – 5000	Herbicides	CC-A
N-P-K solutions	1.2 – 1.4	Fert	Herbicides		CC-A	Bunker C	11,200	Round-up	CC-A
Chlear Liquid Fert	1.17 – 1.44	Fert	Fungicides		CC-B	Product Category: Chemicals (Chem)		Touchdown	CC-A
Nitrogen Solution	1.17 – 1.44	Fert	Insecticides		CC-B	Typical Products	Reference Viscosity* (60 F)	Treflan	CC-A
Test D – To obtain coverage for each of the			Adjuvants		CC-B			Banvel	CC-A
			Fumigants		CC-B	Sulfuric Acid	1.49	Paraquat	CC-A

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements			Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
following product categories, test with one product in each product category. The Certificate of Conformance will cover all of the products in the product category in which a product was tested.			Fungicides		CC-C	Phosphoric Acid	161	Prowl	CC-A
			Micronutrients		CC-D	Hydrochloric Acid	0.80 – 1.0	Herbicides	CC-A
Comp gas	Compressed Natural Gas (CNG)	0.6 to 0.8 (1=Air)				Product Category: Crop Chemicals (Type A) (CC-A)		Fungicides	CC-B
						Typical Products	Reference Viscosity* (60 F)	Insecticides	CC-B
Comp liq	Anhydrous Ammonia	0.61					Centipoise (cP)	Adjuvants	CC-B
Comp liq	Butane	0.595				Herbicides	4 – 400	Fumigants	CC-B
Comp liq	Ethane					Round-up	4 – 400	Fungicides	CC-C
Comp liq	Freon 11	1.49				Touchdown	4 – 400	Micronutrients	CC-D
Comp liq	Freon 12	1.33				Banvel	4 – 400	Dual	Flow
Comp liq	Freon 22	1.37				Treflan	4 – 400	Bicep	Flow
						Paraquat	4 – 400	Marksman	Flow
Comp liq	Propane	0.504				Prowl	4 – 400	Broadstrike	Flow
						Product Category: Crop Chemicals (Type B) (CC-B)		Doubleplay	Flow
Cryo LNG	Liquefied Natural Gas					Typical Products	Reference Viscosity* (60 F)	Topnotch	Flow
Cryo LNG	Liquefied Oxygen	0.66					Centipoise (cP)	Guardzman	Flow
Cryo LNG	Nitrogen	0.31				Fungicides	0.7 – 100	Harness	Flow
						Insecticides	0.7 – 100	NH ₃	
						Adjuvants	0.7 – 100	Test D – To obtain coverage for a product category: Test with	
						Fumigants	0.7 – 100		

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements		Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
					Product Category: Crop Chemicals (Type C) (CC-C)		one product in the product category. The Certificate of Conformance will cover all products in the category.	
					Typical Products	Reference Viscosity* (60 F)	Tap Water	Water
						Centipoise (cP)	Deionized	Water
					Fungicides	20 – 900	Demineralized	Water
					Product Category: Crop Chemicals (Type D) (CC-D)		Potable	Water
					Typical Products	Reference Viscosity* (60 F)	Nonpotable	Water
						Centipoise (cP)	Juices	Water
					Micronutrients	20 – 1000	Beverages	Water
					Product Category: Flowables (Flow)		Milk	Water
					Typical Products	Reference Viscosity* (60 F)	Liquefied Oxygen	Cryo LNG
						Centipoise (cP)	Nitrogen	Cryo LNG
					Dual	20 – 900	Liquefied Natural Gas	Cryo LNG
					Bicep	20 – 900		
					Marksman	20 – 900		
					Broadstrike	20 – 900		
					Doubleplay	20 – 900		
					Topnotch	20 – 900		
					Guardsman	20 – 900		
					Harness	20 – 900		
					Product Category: Compressed Liquids: Fuels and Refrigerants (Comp liq)			

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements		Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
					Typical Products	Reference Viscosity* (60 F)		
						Centipoise (cP)		
					Propane	0.098		
					Anhydrous Ammonia	0.188		
					Butane	0.19		
					Freon 11	0.313		
					Freon 12	0.359		
					Freon 22	1.99		
					Ethane			
					Test D – To obtain coverage for a product category: Test with one product in the product category. The Certificate of Conformance will cover all products in the category.			
					Product Category: All Water (Water)			
					Typical Products	Reference Viscosity* (60 F)		
						Centipoise (cP)		
					Tap Water	1.0		
					Deionized	1.0		
					Demineralized	1.0		
					Potable	1.0		
					Nonpotable	1.0		
					Juices	1.0		
					Beverages	1.0		
					Milk	1.0		
					Test A – The following products must be individually tested and noted on the Certificate of Conformance.			

Mass Meter Product Category & Test Requirements			Magnetic Flow Meter Product Category & Test Requirements		Positive Displacement Flow Meter Product Category & Test Requirements		Turbine Flow Meter Product Category & Test Requirements	
					Product Category: Cryogenic Liquids and Liquefied Natural Gas (Cryo LNG)			
					Typical Products	Reference Viscosity* (60 F)		
						Centipoise (cP)		
					Liquefied Oxygen	0.038		
					Nitrogen	1.07		
					Liquefied Natural Gas			

Product Family Table – Category Abbreviations	
Abbreviation	Product Categories
FL&O	Fuels, Lubricants, Industrial and Food Grade Liquid Oils
Solv Gen	Solvents General
Solv Cl	Solvents Chlorinated
Alc Gly	Alcohols, Glycols & Water Mixes thereof
Water	Water
Fert	Fertilizers
CC-A	Crop Chemicals <i>(Type A)</i>
CC-B	Crop Chemicals <i>(Type B)</i>
CC-C	Crop Chemicals <i>(Type C)</i>
CC-D	Crop Chemicals <i>(Type D)</i>
Flow	Flowables
Sus Fert	Suspension Fertilizers
Liq Feed	Liquid Feeds
Chem	Chemicals
Heated	<u>Heated Products</u>
Comp liq	<u>Compressed Liquids: Fuels and Refrigerants NH₃</u>
Comp gas	<u>Compressed Gases</u>
Cryo LNG	<u>Cryogenic Liquids and Liquefied Natural Gas</u>

¹Note: The Typical Products listed in this table are not limiting or all-inclusive; there may be other products and product trade names, which fall into a product family. Water and a product such as stoddard solvent or mineral spirits may be used as test products in the fuels, lubricants, industrial, and food- grade liquid oils product family.

²The specific gravity of a liquid is the ratio of its density to that of water at standard conditions, usually 4 °C (or 40 °F) and 1 atm. The density of water at standard conditions is approximately 1000 kg/m³ (or 998 kg/m³)

³ Diesel fuel blends (biodiesel) with up to 20 % vegetable or animal fat/oil.

⁴ Gasoline includes oxygenated fuel blends with up to 15 % oxygenate.

$$\text{Centistokes} = \frac{\text{Centipoise}}{\text{Specific Gravity}}$$

⁵ Kinematic viscosity is measured in centistokes.

Source for some of the viscosity value information is in the Industry Canada - Measurement Canada "Liquid Products Group, Bulletin V-16-E (rev. 1), August 3, 1999."

**** Editor Note: This data point is suspected to be lower than that of normal tap water supplied for residential consumption.**