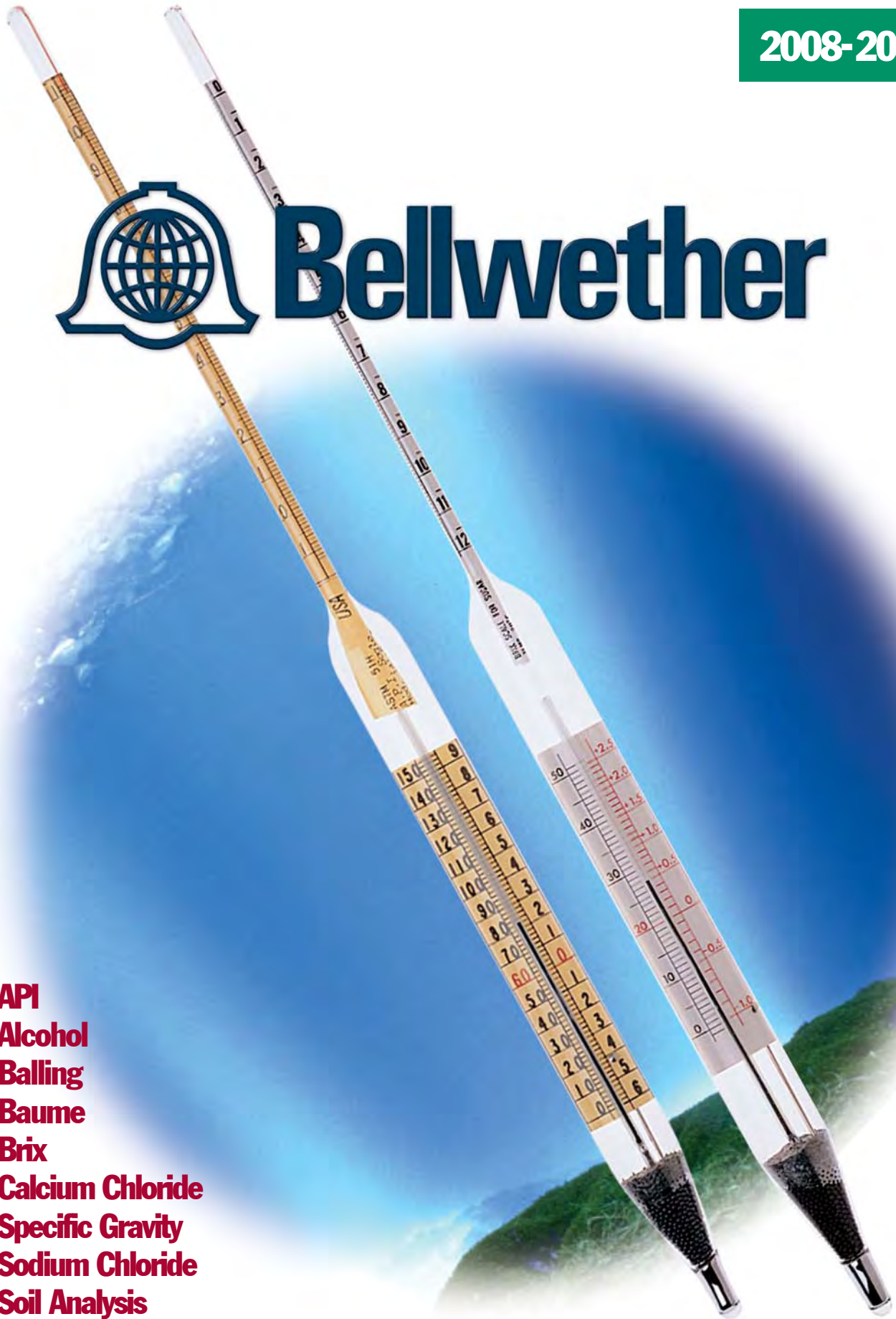


2008-2009



# Bellwether

**API**  
**Alcohol**  
**Balling**  
**Baume**  
**Brix**  
**Calcium Chloride**  
**Specific Gravity**  
**Sodium Chloride**  
**Soil Analysis**



**Hydrometers**



Bellwether Hydrometers are manufactured to exacting standards. Each instrument is individually tested and inspected to insure the highest level of dependability, accuracy, and uniformity. If a scale or range is required which is not listed, please contact our office for a custom quotation. Thank you!

## Hydrometers Explained . . .



The hydrometer is an instrument which is constructed on the Archimedes principle that a solid body displaces its own weight of the liquid in which it floats. Hydrometers can be divided into

two general classes; namely for liquids heavier than water and for liquids lighter than water. The base hydrometer scale is Specific Gravity, in which distilled water equals 1.000 as the initial point. Liquids lighter than water are scaled below 1.000 specific gravity and liquids heavier than water are scaled above 1.000 specific gravity.

Many other scales are commonly used, such as API, Brix, Baume, Plato, etc. All of which are convertible into specific gravity by formula.

Hydrometers are usually calibrated at 60°F/60°F. To determine the density of a liquid, the liquid should be at 60°F. If the temperature varies, the liquid will either contract or expand, depending upon the temperature. Therefore, the density fluctuates with the temperature. Where there is a variation from the standard 60°F, corrections must be applied to the hydrometer reading. To assure proper corrections, a separate accurate thermometer should be used, or a hydrometer in combination with a thermometer, which is sometimes referred to as a "thermo-hydrometer."

The correct method of reading a hydrometer follows:

**A.** Observe a point below the plane of the liquid surface. The surface should appear as an ellipse (Fig. 1).

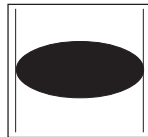


Fig. 1

**B.** The line of vision is raised until the surface, seen first as an ellipse, becomes a straight line (Fig. 2).

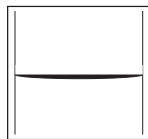


Fig. 2

**C.** The point at which this line cuts the hydrometer scale is the reading of the instrument (Fig. 3).

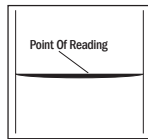


Fig. 3

If the liquid is not sufficiently clear for readings to be made in this manner, read from above the surface and estimate as accurately as possible the point to which the liquid rises on the hydrometer stem. Since hydrometers are calibrated to give correct indications when read at the principal surface of the liquid, correct the reading just taken at the upper edge of the meniscus by an amount equal to this height above the principal surface of the liquid. The amount of correction can be determined with the sufficient accuracy for most purposes by taking a few readings on the upper and lower meniscus in a clear liquid of the same character as that being tested and noting the differences.



## API Scale

The API Scale was selected in 1921 by the American Petroleum Institute (API), the U.S. Bureau of Mines, and the National Institute of Standards and Technology (NIST) as the standard hydrometer scale for petroleum products. The API Scale is based on the following formula:

$$^{\circ}\text{API} @ 60^{\circ}\text{F} = \left( \frac{141.5}{\text{Specific Gravity @ } \frac{60^{\circ}\text{F}}{60^{\circ}\text{F}}} \right) - 131.5$$

The thermometer scale for Bellwether Hydrometers (w/ Thermometers) is located in the body. A correction scale for conversion of readings to 60°F is printed opposite the temperature scale.

General Specifications for Bellwether ASTM Hydrometers: Manufactured in strict accordance to specifications of ASTM (American Society for Testing and Materials) for accuracy and design. All instruments are suitable for certification for use as a primary reference standard with NIST traceability.

### API, ASTM



Cat. No.	ASTM No.	API Range	Subdivision	Length (mm)
6721H	21H	0 to 6°	0.1°	165
6722H	22H	5 to 11°	0.1°	165
6723H	23H	10 to 16°	0.1°	165
6724H	24H	15 to 21°	0.1°	165
6725H	25H	20 to 26°	0.1°	165
6726H	26H	25 to 31°	0.1°	165
6727H	27H	30 to 36°	0.1°	165
6728H	28H	35 to 41°	0.1°	170
6729H	29H	40 to 46°	0.1°	165
6730H	30H	45 to 51°	0.1°	165
6731H	31H	50 to 56°	0.1°	165
6732H	32H	55 to 61°	0.1°	170
6733H	33H	60 to 66°	0.1°	170
6734H	34H	65 to 71°	0.1°	170
6735H	35H	70 to 76°	0.1°	165
6736H	36H	75 to 81°	0.1°	165
6737H	37H	80 to 86°	0.1°	165
6738H	38H	85 to 91°	0.1°	165
6739H	39H	90 to 96°	0.1°	165

### API, w/ Spirit-Filled Thermometer



Cat. No.	API Range	Subdivision	Thermometer Scale (Subdivision: 2°F)	Length (mm)
6751HTS	-1 to 11°	0.1°	0 to 150°F	300
6753HTS	19 to 31°	0.1°	0 to 150°F	385
6754HTS	29 to 41°	0.1°	0 to 150°F	380
6755HTS	39 to 51°	0.1°	0 to 150°F	385
6608-12TS	45 to 90°	1.0°	10 to 130°F	210

### Liquid Petroleum Gas (LPG), Specific Gravity, w/ Spirit-Filled Thermometer

Thermometer Scale: 30 to 90°F (Subdivision: 1°F)



Cat. No.	Specific Gravity Range	Subdivision	Length (mm)
67101HTS	0.500 to 0.650	0.001	380

## Brix Scale

Bellwether Brix Hydrometers are calibrated to show the percentage of sucrose by weight at 20°C. The Brix Scale is based on the following: 1° Brix = 1% sucrose by weight at specified temperature (20°C). The data of the National Bureau of Standards are used.

The thermometer scale for Bellwether Hydrometers (w/ Thermometers) is located in the body. Available in both Celsius and Fahrenheit, the thermometers contain safety blue liquid. The Celsius thermometers have a range of 0-50°C with 1° subdivisions. The Fahrenheit thermometers have a range of 30-130°F with 1° subdivisions. A correction scale for conversion of readings to 20°C is printed opposite the Celsius temperature scale.

### Brix



Cat. No.	Brix Range	Subdivision	Length (mm)
6601-1	0 to 12°	0.1°	315
6601-2	9 to 21°	0.1°	320
6601-3	19 to 31°	0.1°	320
6601-4	29 to 41°	0.1°	325
6601-5	39 to 51°	0.1°	330
6601-6	49 to 61°	0.1°	325
6601-7	59 to 71°	0.1°	325
6601-8	69 to 81°	0.1°	330
6601-9	79 to 91°	0.1°	330
6601-10	0 to 35°	0.5°	290
6601-11	35 to 70°	0.5°	290
6601-12	0 to 70°	1.0°	295
6601-13	-5 to 5°	0.1°	295
6601-14	5 to 15°	0.1°	330
6601-15	15 to 25°	0.1°	295

### Brix, w/ Spirit-Filled Thermometer (Celsius)

Thermometer Scale: 0 to 50°C (Subdivision: 1°C)



Cat. No.	Brix Range	Subdivision	Length (mm)
6601TS-1	0 to 12°	0.1°	375
6601TS-2	9 to 21°	0.1°	380
6601TS-3	19 to 31°	0.1°	385
6601TS-4	29 to 41°	0.1°	370
6601TS-5	39 to 51°	0.1°	385
6601TS-6	49 to 61°	0.1°	375
6601TS-7	59 to 71°	0.1°	365
6601TS-8	69 to 81°	0.1°	370
6601TS-9	79 to 91°	0.1°	370
6601TS-10	0 to 35°	0.5°	380
6601TS-11	35 to 70°	0.5°	370
6601TS-12	0 to 70°	0.5°	370
6601TS-13	-5 to 5°	0.1°	350
6601TS-14	5 to 15°	0.1°	370
6601TS-15	15 to 25°	0.1°	370

### Brix, w/ Spirit-Filled Thermometer (Fahrenheit)

Thermometer Scale: 30 to 130°F (Subdivision: 1°F)



Cat. No.	Brix Range	Subdivision	Length (mm)
6601TS-1F	0 to 12°	0.1°	375
6601TS-2F	9 to 21°	0.1°	380
6601TS-3F	19 to 31°	0.1°	385
6601TS-10F	0 to 35°	0.5°	380
6601TS-13F	-5 to 5°	0.1°	365

### NIST Certification, 3-Point

Cat. No. 6600

- Certificate states correction points traceable to NIST.
- Certificate does not include the cost of the hydrometer.
- Please specify hydrometer model at point of order.

### Hydrometer Cases

PVC Material

Cat. No. 66CS-8  
Length: 216mm/8.5"

Cat. No. 66CS-13  
Length: 343mm/13.5"

Cat. No. 66CS-16  
Length: 420mm/16.5"

## Specific Gravity Scale

Specific Gravity, also known as relative density, is the ratio of the mass of a solid or liquid to the mass of an equal volume of distilled water. The standard temperature of calibration in the U.S. is 60°F/60°F. All Bellwether Specific Gravity Hydrometers listed are calibrated at 60°F/60°F.

$$\text{Specific Gravity} = \frac{\text{Mass of X@60°F}}{\text{Mass of Distilled Water@60°F}}$$

General Specifications for Bellwether ASTM Hydrometers: Manufactured in strict accordance to specifications of ASTM (American Society for Testing and Materials) for accuracy and design. All instruments are suitable for certification for use as a primary reference standard with NIST traceability.

### Specific Gravity



Cat. No.	Specific Gravity Range	Subdivision	Length (mm)
6602-0	0.600 to 0.670	0.0005	330
6602-1	0.640 to 0.710	0.0005	330
6602-2	0.700 to 0.770	0.0005	310
6602-3	0.760 to 0.830	0.0005	325
6602-4	0.820 to 0.890	0.0005	330
6602-5	0.880 to 0.950	0.0005	320
6602-6	0.940 to 1.010	0.0005	325
6602-7	1.000 to 1.070	0.0005	320
6602-8	1.060 to 1.130	0.0005	315
6602-9	1.120 to 1.190	0.0005	315
6602-10	1.180 to 1.250	0.0005	305
6602-11	1.240 to 1.310	0.0005	330
6602-12	1.300 to 1.370	0.0005	330
6602-13	1.360 to 1.430	0.0005	330
6602-14	1.420 to 1.490	0.0005	330
6602-15	1.480 to 1.550	0.0005	325
6602-16	1.540 to 1.610	0.0005	325
6602-17	1.600 to 1.670	0.0005	330
6602-18	1.660 to 1.730	0.0005	330
6602-19	1.720 to 1.790	0.0005	330
6602-20	1.780 to 1.850	0.0005	330
6602-21	1.840 to 1.920	0.0005	330

### Specific Gravity



Cat. No.	Specific Gravity Range	Subdivision	Length (mm)
6603-1	1.000 to 1.220	0.002	295
6603-2	1.200 to 1.420	0.002	300
6603-3	1.400 to 1.620	0.002	330
6603-4	1.600 to 1.820	0.002	290
6603-5	1.800 to 2.020	0.002	335
6603-6	1.000 to 1.600	0.005	310
6603-7	1.000 to 2.000	0.01	310
6603-8	2.000 to 3.000	0.01	310
6603-9	3.000 to 4.000	0.01	305
6603-10	0.700 to 0.810	0.001	315
6603-11	0.800 to 0.910	0.001	330
6603-12	0.900 to 1.000	0.001	305
6603-13	0.650 to 1.000	0.005	320

### Specific Gravity & Baume, Dual Scale



Cat. No.	Specific Gravity Range	Baume Range	Subdivision	Length (mm)
6603DS-1	1.000 to 1.220	0 to 26° Heavy	0.002 / 0.2°	285
6603DS-2	1.200 to 1.420	25 to 42° Heavy	0.002 / 0.2°	330
6603DS-3	1.400 to 1.620	42 to 55° Heavy	0.002 / 0.2°	330
6603DS-4	1.600 to 1.820	54 to 65° Heavy	0.002 / 0.2°	330
6603DS-5	1.800 to 2.020	64 to 72° Heavy	0.002 / 0.2°	330
6603DS-6	1.000 to 1.450	0 to 45° Heavy	0.005 / 0.5°	295
6603DS-7	1.000 to 2.000	0 to 72° Heavy	0.010 / 1.0°	305
6603DS-13	0.600 to 1.000	10 to 100° Light	0.005 / 1.0°	305

**Specific Gravity** 60°F

Cat. No.	Specific Gravity Range	Subdivision	Length (mm)
6604-1	1.000 to 1.250	0.005	165
6604-2	1.200 to 1.450	0.005	175
6604-3	1.400 to 1.650	0.005	160
6604-4	1.600 to 1.850	0.005	160
6604-5	1.800 to 2.050	0.005	165

**Specific Gravity, ASTM** 60°F

Cat. No.	ASTM No.	Specific Gravity Range	Subdivision	Length (mm)
6782H	82H	0.650 to 0.700	0.0005	330
6783H	83H	0.700 to 0.750	0.0005	335
6784H	84H	0.750 to 0.800	0.0005	335
6785H	85H	0.800 to 0.850	0.0005	330
6786H	86H	0.850 to 0.900	0.0005	335
6787H	87H	0.900 to 0.950	0.0005	335
6788H	88H	0.950 to 1.000	0.0005	335
6789H	89H	1.000 to 1.050	0.0005	335
6790H	90H	1.050 to 1.100	0.0005	330

**Specific Gravity, ASTM** 60°F

Cat. No.	ASTM No.	Specific Gravity Range	Subdivision	Length (mm)
67111H	111H	1.000 to 1.050	0.0005	330
67112H	112H	1.050 to 1.100	0.0005	330
67113H	113H	1.100 to 1.150	0.0005	330
67114H	114H	1.150 to 1.200	0.0005	330
67115H	115H	1.200 to 1.250	0.0005	330
67116H	116H	1.250 to 1.300	0.0005	330
67117H	117H	1.300 to 1.350	0.0005	330
67118H	118H	1.350 to 1.400	0.0005	330
67119H	119H	1.400 to 1.450	0.0005	330
67120H	120H	1.450 to 1.500	0.0005	330

**Specific Gravity, ASTM** 60°F

Cat. No.	ASTM No.	Specific Gravity Range	Subdivision	Length (mm)
67125H	125H	1.000 to 1.050	0.001	270
67126H	126H	1.050 to 1.100	0.001	265
67127H	127H	1.100 to 1.150	0.001	270
67128H	128H	1.150 to 1.200	0.001	270
67129H	129H	1.200 to 1.250	0.001	270
67130H	130H	1.250 to 1.300	0.001	270
67131H	131H	1.300 to 1.350	0.001	270
67132H	132H	1.350 to 1.400	0.001	270
67133H	133H	1.400 to 1.450	0.001	270
67134H	134H	1.450 to 1.500	0.001	270
67135H	135H	1.500 to 1.550	0.001	270
67136H	136H	1.550 to 1.600	0.001	270
67137H	137H	1.600 to 1.650	0.001	270
67138H	138H	1.650 to 1.700	0.001	270
67139H	139H	1.700 to 1.750	0.001	270
67140H	140H	1.750 to 1.800	0.001	270
67141H	141H	1.800 to 1.850	0.001	270

**Specific Gravity, Universal** 60°F

Cat. No.	Specific Gravity Range	Subdivision (0.700 to 1.000)	Subdivision (1.000 to 2.000)	Length (mm)
6605-1	0.700 to 2.000	0.005	0.01	365

**Specific Gravity, Soil Analysis, ASTM** 68°F

Cat. No.	ASTM No.	Specific Gravity Range	Subdivision	Length (mm)
67151H	151H	0.995 to 1.038	0.001	280

**Soil Colloids (g), Soil Analysis, ASTM** 68°F

Cat. No.	ASTM No.	Soil Colloid Range	Subdivision	Length (mm)
67152H	152H	-5 to 60g	1.0	280



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**Additional Scales**

**Alcohol, Tralle & Proof Scales** 60°F

Cat. No.	Tralle Range	Proof Range	Subdivision	Tolerance	Length (mm)
6612-1	0 to 100%	0 to 200%	1.0% / 2.0%	±1.0% / ±2.0%	290

**Alcohol, Tralle & Proof Scales, w/ Spirit-Filled Thermometer** 60°F

Thermometer Scale: -10 to 100°F (Subdivision: 1°F)

Cat. No.	Tralle Range	Proof Range	Subdivision	Tolerance	Length (mm)
6612-2TS	0 to 100%	0 to 200%	1.0% / 2.0%	±1.0% / ±2.0%	380

**Alcohol, Proof Scale, Internal Revenue Specifications** 60°F

Cat. No.	Proof Range	I.R. Size	Subdivision	Tolerance	Length (mm)
6613-B	80 to 120%	B	0.5%	±0.5%	260
6613-F	0 to 20%	F	0.2%	±0.3%	310
6613-G	20 to 40%	G	0.2%	±0.4%	320
6613-H	40 to 60%	H	0.2%	±0.4%	310
6613-I	60 to 80%	I	0.2%	±0.3%	310
6613-K	75 to 90%	K	0.2%	±0.2%	310
6613-L	90 to 110%	L	0.2%	±0.2%	310
6613-M	105 to 125%	M	0.2%	±0.2%	310
6613-N	125 to 145%	N	0.2%	±0.3%	310
6613-P	145 to 165%	P	0.2%	±0.2%	310
6613-Q	165 to 185%	Q	0.2%	±0.2%	310
6613-R	185 to 206%	R	0.2%	±0.2%	320

**Balling (Plato), w/ Spirit-Filled Thermometer** 20°C

Thermometer Scale (6614TS-5, -6, -7): 0 to 50°C (Subdivision: 1°C)

Thermometer Scale (6614TS-8): 30 to 120°F (Subdivision: 1°F)

Cat. No.	Balling Range	Subdivision	Length (mm)
6614TS-5	0 to 8.5°	0.1°	345
6614TS-6	7.5 to 16°	0.1°	340
6614TS-7	15.5 to 24°	0.1°	350
6614TS-8	0 to 32°	0.5°	385

**Baume (Heavy)** 60°F

Cat. No.	Baume Range	Subdivision	Length (mm)
6609-1	0 to 12°	0.1°	310
6609-2	9 to 21°	0.1°	310
6609-3	19 to 31°	0.1°	310
6609-4	29 to 41°	0.1°	310
6609-5	39 to 51°	0.1°	295
6609-6	49 to 61°	0.1°	300
6609-7	59 to 71°	0.1°	310
6609-8	0 to 15°	0.1°	295
6609-9	0 to 25°	0.2°	310
6609-10	0 to 35°	0.5°	315
6609-11	0 to 50°	0.5°	305
6609-12	35 to 70°	0.5°	310
6609-13	0 to 50°	1.0°	300
6609-14	0 to 70°	1.0°	310
6609-15	0 to 90°	1.0°	265

**Calcium Chloride (CaCl<sub>2</sub>), Specific Gravity, Freezing Points** 60°F

Cat. No.	CaCl <sub>2</sub> Range	Subdivision	Length (mm)
6611-3	1.000 to 1.280 (S.G.)	0.002	295
	+30 to -40°F (F.P.)	5°	

**Sodium Chloride (NaCl), % Saturation** 60°F

Cat. No.	NaCl Range	Subdivision	Length (mm)
6611-1	0 to 100%	1.0%	265

**Sodium Chloride (NaCl), % By Weight** 60°F

Cat. No.	NaCl Range	Subdivision	Length (mm)
6611-2	0 to 26.5%	0.5%	280