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Designation: E1 – 07

Method 9501—Federal Test Method Standard No. 791b

Standard Specification for ASTM Liquid-in-Glass Thermometers[1]

This standard is issued under the fixed designation E1; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers liquid-in-glass thermometers graduated in degrees Celsius or degrees Fahrenheit that are frequently identified and used in methods under the jurisdiction of the various technical committees within ASTM. The various thermometers specified are listed in Table 1. The inclusion of an IP number in Table 1 indicates, where appearing, that the thermometer specification has been jointly agreed upon by the British Institute of Petroleum (IP) and ASTM.

1.2 This specification also covers adjustable-range enclosed-scale thermometers, graduated in degrees Celsius, which are used in ASTM methods.

1.3 The enclosed-scale thermometers are commonly called Beckmann thermometers. They are suitable for measuring small temperature differences not exceeding 6 °C within a larger range of temperature. The thermometers are unsuitable for measuring Celsius- or kelvin-scale temperatures unless they have been compared with standard instruments immediately before use.

1.4 An alphabetic list of the ASTM Thermometers included in this standard is given in Table 2.

1.5 A list of ASTM Thermometers is given in Table 3 to facilitate selection according to temperature range, immersion, and scale-error requirements.

NOTE 1—For a listing of thermometers recommended for general laboratory use, the Scientific Apparatus Makers Association Specifications for General Purpose Glass Laboratory Thermometers may be consulted.[2]

NOTE 2—It has been found by experience that these ASTM Thermometers, although developed in general for specific tests, may also be found suitable for other applications, thus precluding the need for new thermometer specifications differing in only minor features. However, it is suggested that technical committees contact Subcommittee E20.05 before choosing a currently specified thermometer for a new method to be sure the thermometer will be suitable for the intended application.

1.6 For non-mercury alternatives to E1 thermometers see Specification E2251.

1.7 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

1.8 **WARNING—**Mercury has been designated by EPA and many state agencies as a hazardous material that can cause central nervous system, kidney and liver damage. Mercury, or its vapor, may be hazardous to health and corrosive to materials. Caution should be taken when handling mercury and mercury containing products. See the applicable product Material Safety Data Sheet (MSDS) for details and EPA's website-http://www.epa.gov/mercury/faq.htm - for additional information. Users should be aware that selling mercury and/or mercury containing products into your state may be prohibited by state law.

2. Referenced Documents

2.1 *ASTM Standards:*[3]

E77 Test Method for Inspection and Verification of Thermometers

E344 Terminology Relating to Thermometry and Hydrometry

E563 Practice for Preparation and Use of an Ice-Point Bath as a Reference Temperature

E2251 Specification for Liquid-in-Glass ASTM Thermometers with Low-Hazard Precision Liquids

3. Terminology

3.1 *Definitions*—The definitions given in Terminology E344 apply.

3.2 *Definitions of Terms Specific to This Standard:*

[1] This specification is under the jurisdiction of ASTM Committee E20 on Temperature Measurement and is the direct responsibility of Subcommittee E20.05 on Liquid-in-Glass Thermometers and Hydrometers.

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[2] Available from SAMA Group of Assocs., 225 Reinekers, Ste. 625, Alexandria, VA 23314.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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3.2.1 *adjusting device, n*—a section of the instrument used to adjust the amount of mercury in the bulb and main capillary to that needed for the intended temperature interval.

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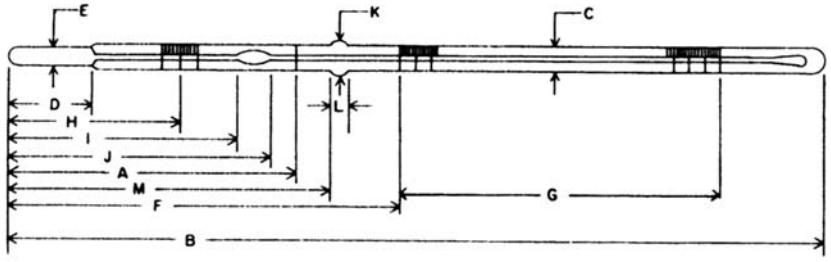
TABLE 1 Specification for ASTM Thermometers

All dimensions are in millimeters.
See Table 4 for Verification and Calibration Temperatures.



Explanatory Notes:

[A] An expansion chamber is provided for relief of gas pressure to avoid distortion of the bulb at higher temperatures. It is not for the purpose of joining mercury separations and under no circumstances should the thermometer be heated above the highest temperature reading.

[B] Toluene or other suitable liquid colored red with a permanent dye shall be used as the actuating liquid.

[C] Under certain test conditions, the bulb of the thermometer may be 28 °C (50 °F) above the temperature indicated by the thermometer, and at an indicated temperature of 371 °C (700 °F) the temperature of the bulb is approaching a critical range in the glass. It is therefore not desirable to use this thermometer under such conditions at indicated temperatures above 371 °C (700 °F) without checking the ice point.

[D] Longest graduation lines at 155 °C, 160 °C, 162 °C, 164 °C, 165 °C, and 170 °C, with arrows at 162 °C and 164 °C.

[E] The length of the enlargement, and the distance from the bottom of the enlargement to the bottom of the bulb shall be measured with the test gage shown in Fig. 1.

[F] Long, narrow shape.

[G] The test temperature shall be indicated by an arrow whether the graduation corresponding to that point is numbered or not.

[H] Long, narrow shape; mercury shall be in the chamber at 0 °C (32 °F).

[I] The thermometer shall be made to be mounted in a brass ferrule consisting of a tubular bushing 8.0 mm in outside diameter with a flanged head approximately 12 mm in diameter so that the upper extremity of the 8.0 mm diameter is located 90 mm from the bottom of the bulb.

[J] To be marked on the glass stem at least 90 mm from the bottom of the bulb.

[K] Glass button finish, see 6.2.1.

[L] Long, narrow shape; mercury shall be near bottom of the chamber at 0 °C.

[M] For kinematic viscosity thermometers, the ice-point reading shall be taken within 1 h after being at the test temperature for not less than 3 minutes. The ice-point reading shall be expressed to the nearest 0.01 °C or 0.02 °F and applied as explained in Test Method E77, Section 13.

[N] Thermometers made to these specifications conform also with the requirements for the titer test thermometer of the American Oil Chemists Society and the Association of Official Agricultural Chemists, except for the special inscription.

[O] Capillary clearances must conform to Section 8.

[P] Mercury shall be near middle of chamber at 0 °C.

[Q] The stem may be either the plain front or lens front type. If the thermometer is of the lens front type, the cross section of the stem shall be such that it will pass through an 8-mm ring gage but will not enter a 5-mm slot gage.

[R] A suitable mercury-thallium alloy shall be used as the actuating liquid.

[S] The expansion chamber shall be of the long narrow type 10 to 20 mm in length. The length of unchanged capillary between the nearest graduation mark and the expansion chamber shall be not less than 10 mm.

[T] Mercury shall be near the bottom of the chamber at 0 °C.

[U] The length of unchanged capillary between the nearest graduation mark and contraction chamber shall be not less than 10 mm.

[V] Change in correction over any 5 °F interval shall not exceed 0.10 °F.

[W] Expansion chamber shall be of the long narrow type and there shall be not less than 10 mm of unchanged capillary between the base of the chamber and the top graduation.

[X] Mercury shall be in the chamber at 32 °F.

[Y] Over any interval of 2 °C the change in correction shall not exceed 0.02 °C.

[Z] Over any interval of 4 °F the change in correction shall not exceed 0.05 °F.

[AA] Special finish, see 6.2.2.

[BB] The bulb diameter shall not be more than 0.5 mm greater than the stem.

[CC] The stem shall be of the lens front type. The cross section of the stem shall be such that it will pass through a 8.0-mm ring gage but will not enter a 5.0-mm slot gage. A minor diameter of 4 mm is permissible provided that the major diameter is not less than 7 mm.

[DD] Bulb bottom shall be essentially hemispherical.

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[EE] Immersion line shall be omitted.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

[GG] The immersion line shall be visible in the case opening after assembly. The immersion shall be measured from the bottom of the bulb rather than from the bottom of the armor. See 6.2.2.

[HH] The stem shall be either the round or lens-front type.

[II] Contraction chamber to be long narrow type.

[JJ] Over any interval of 1 °C the change in correction shall not exceed 0.01 °C. The correction at the lowest temperature of the nominal range shall not change by more than 0.02 °C immediately after the thermometer has been heated for 15 min at a temperature 30 °C higher, and allowed to cool naturally in air.

[KK] The capillary bore shall be large enough in relation to the bulb to ensure that (without tapping) jumping of the meniscus does not exceed one half of the smallest scale division, when the temperature is rising at a uniform rate not exceeding 0.05 °C/min.

[LL] The thermometer is to be calibrated for 100-mm immersion for the main scale, the ice point is to be calibrated for total immersion.

[MM] Bulb shape ellipsoidal (see Fig. 2).

[NN] This thermometer may be furnished with an optional ring top. See 6.2.3. Addition of a ring top will increase the total length by an amount equal to the outside diameter of the ring.

[OO] The stem shall be of the lens front type. The cross section of the stem shall be such that it will pass through a 7.0 mm ring gage.

ASTM No.	1C-99	1F-99[FF]	2C-99	2F-99[FF]	3C-99	3F-99[FF]
IP No.	62C				73C	
Name	Partial Immersion		Partial Immersion		Partial Immersion	
Reference Fig. No.	3		3		3	
Range	−20 to + 150°C	0 to 302°F	−5 to + 300°C	20 to 580°F	−5 to + 400°C[C]	20 to 760°F[C]
For test at						
A Immersion, mm	76		76		76	
Graduations:						
Subdivisions	1°C	2°F	1°C	2°F	1°C	2°F
Long lines at each	5°C	10°F	5°C	10°F	5°C	10°F
Numbers at each	10°C	20°F	10°C	20°F	10°C	20°F
Scale error, max	0.5°C	1°F	1°C	2°F	1°C to 301°C 1.5°C above 301°C	2°F to 574°F 3°F above 574°F
Special inscription	ASTM 1C-99 or 1F-99 76 MM IMM		ASTM 2C-99 or 2F-99 76 MM IMM		ASTM 3C-99 or 3F–99 76 MM IMM	
Expansion chamber:						
Permit heating to	200°C	392°F	[A]		[A]	
B Total length, mm	317 to 327		385 to 395		410 to 420	
C Stem OD, mm	6.0 to 7.0		6.0 to 7.0		6.0 to 7.5	
D Bulb length, mm	19 to 25		10 to 15		10 to 15	
E Bulb OD, mm	5.0 to 6.0		5.0 to 6.0		5.0 to 6.0	
Scale location:						
Bottom of bulb to line at	0°C	32°F	0°C	32°F	0°C	32°F
F Distance, mm	111 to 118		100 to 110		100 to 110	
G Length of graduated portion, mm	170 to 200[O]		225 to 265 [O]		250 to 290[O]	
Ice-point scale:						
Range						
H Bottom of bulb to ice-point, mm						
Contraction chamber:						
I Distance to bottom, min, mm						
J Distance to top, max, mm						
Stem enlargement:						
OD, mm						
Length, mm						
Distance to bottom, mm						

[A] An expansion chamber is provided for relief of gas pressure to avoid distortion of the bulb at higher temperatures. It is not for the purpose of joining mercury separations and under no circumstances should the thermometer be heated above the highest temperature reading.

[B] Under certain test conditions, the bulb of the thermometer may be 28°C (50°F) above the temperature indicated by the thermometer, and at an indicated temperature of 371°C (700°F) the temperature of the bulb is approaching a critical range in the glass. It is therefore not desirable to use this thermometer under such conditions at indicated temperatures above 371°C (700°F) without checking the ice point.

[O] Capillary clearances shall conform to Section 8.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

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TABLE 1 *Continued*

ASTM No.	5C-86	5F-86[FF]	6C-86	6F-86[FF]	7C-86	7F-86[FF]
IP No.	1C		2C		5C	
Name	Cloud and Pour		Low Cloud and Pour[B]		Low Distillation	
Reference Fig. No.	3		3		4	
Range	–38 to + 50°C	–36 to + 120°F	–80 to + 20°C	–112 to + 70°F	–2 to + 300°C	30 to 580°F
For test at						
A Immersion, mm	108		76		total	
Graduations:						
Subdivisions	1°C	2°F	1°C	2°F	1°C	2°F
Long lines at each	5°C	10°F	5°C	10°F	5°C	10°F
Numbers at each	10°C	20°F	10°C	20°F	10°C	20°F
Scale error, max	0.5°C	1°F	1°C to – 33°C 2°C below – 33°C	2°F to – 28°F 4°F below – 28°F	0.5°C to 150°C 1°C above 150°C	1°F to 300°F 2°F above 300°F
Special inscription	ASTM 5C-86 or 5F–86 108 MM IMM		ASTM 6C-86 or 6F-86 76 MM IMM		ASTM 7C-86 or 7F–86	
Expansion chamber:						
Permit heating to	100°C	212°F	60°C	140°F	[A]	
B Total length, mm	225 to 235		225 to 235		380 to 390	
C Stem OD, mm	6.0 to 8.0		6.0 to 8.0		6.0 to 8.0	
D Bulb length, mm	7 to 10		7 to 10		10 to 15	
E Bulb OD, mm	≮5.5 and ≯stem		≮5.0 and ≯stem		≮5.0 and ≯stem	
Scale location:						
Bottom of bulb to line at	–38°C	–36°F	–70°C	–94°F	0°C	32°F
F Distance, mm	120 to 130		100 to 120		100 to 110	
G Length of graduated portion, mm	65 to 85[O]		70 to 100 [O]		225 to 255[O]	
Ice-point scale:						
Range						
H Bottom of bulb to ice-point, mm						
Contraction chamber:						
I Distance to bottom, min, mm						
J Distance to top, max, mm						
Stem enlargement:						
K OD, mm						
L Length, mm						
M Distance to bottom, mm						

[A] An expansion chamber is provided for relief of gas pressure to avoid distortion of the bulb at higher temperatures. It is not for the purpose of joining mercury separations and under no circumstances should the thermometer be heated above the highest temperature reading.

[B] Toluene or other suitable liquid colored red with a permanent dye shall be used as the actuating liquid.

[O] Capillary clearances shall conform to Section 8.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

ASTM No.	8C-86	8F-86[FF]	9C-86	9F-86[FF]	10C-86	10F-86[FF]
IP No.	6C		15C		16C	
Name	High Distillation		Low-Pensky-Martens		High-Pensky-Martens	
Reference Fig. No.	4		5		5	
Range	–2 to + 400°C[C]	30 to 760°F[C]	–5 to + 110°C	20 to 230°F	90 to 370°C	200 to 700°F
For test at						
A Immersion, mm	total		57		57	
Graduations:						
Subdivisions	1°C	2°F	0.5°C	1°F	2°C	5°F
Long lines at each	5°C	10°F	1°C and 5°C	5°F	10°C	25°F
Numbers at each	10°C	20°F	5°C	10°F	20°C	50°F
Scale error, max	1°C to 300°C 1.5°C above 300°C	2°F to 570°F 3°F above 570°F	0.5°C	1°F	1°C to 260°C 2°C above 260°C	2.5°F to 500°F 3.5°F above 500°F

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TABLE 1 *Continued*

Special inscription		ASTM 8C-86 or 8F-86		ASTM 9C-86 or 9F–86 57 MM IMM		ASTM 10C-86 or 10F–86 57 MM IMM
Expansion chamber:						
Permit heating to		[A]	160°C	320°F		[A]
B Total length, mm		380 to 390		285 to 295		285 to 295
C Stem OD, mm		6.0 to 8.0		6.0 to 7.0		6.0 to 7.0
D Bulb length, mm		10 to 15		9 to 13		7 to 10
E Bulb OD, mm		≤5.0 and ≥stem		≤5.5 and ≥stem		≤4.5 and ≥stem
Scale location:						
Bottom of bulb to line at	0°C	32°F	0°C	32°F	90°C	200°F
F Distance, mm		30 to 40		85 to 95		80 to 90
G Length of graduated portion, mm		290 to 330[O]		140 to 175 [O]		145 to 180[O]
Ice-point scale:						
Range						
H Bottom of bulb to ice-point, mm						
Contraction chamber:						
I Distance to bottom, min, mm						
J Distance to top, max, mm						
Stem enlargement						
K OD, mm				7.5 to 8.5		7.5 to 8.5
L Length, mm				2.5 to 5.0 [E]		2.5 to 5.0[E]
M Distance to bottom, mm				64 to 66		64 to 66

[A] An expansion chamber is provided for relief of gas pressure to avoid distortion of the bulb at higher temperatures. It is not for the purpose of joining mercury separations and under no circumstances should the thermometer be heated above the highest temperature reading.

[C] Under certain test conditions, the bulb of the thermometer may be 28°C (50°F) above the temperature indicated by the thermometer, and at an indicated temperature of 371°C (700°F) the temperature of the bulb is approaching a critical range in the glass. It is therefore not desirable to use this thermometer under such conditions at indicated temperatures above 371°C (700°F) without checking the ice point.

[E] The length of the enlargement, and the distance from the bottom of the enlargement to the bottom of the bulb shall be measured with the test gage shown in Fig. 1.

[O] Capillary clearances shall conform to Section 8.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

ASTM No.	11C-86	11F-86[FF]	12C-86	12F-86[FF]	13C-86
IP No.	28C		64C	64F	47C
Name	Cleveland Open Flash		Density-Wide Range		Loss on Heat
Reference Fig. No.	3		4		9
Range	−6 to + 400°C[C]	20 to 760°F[C]	−20 to + 102°C	−5 to + 215°F	155 to 170°C
For test at					
A Immersion, mm	25		total		total
Graduations:					
Subdivisions	2°C	5°F	0.2°C	0.5°F	0.5°C
Long lines at each	10°C	10°F	1°C	1°F	1°C[D]
Numbers at each	20°C	20°F	2°C	5°F	155°C, 160°C, 165°C, 170°C
Scale error, max	2°C to 260°C 4°C above 260°C	5°F to 500°F 7°F above 500°F	0.15°C	0.25°F	0.5°C
Special inscription	ASTM 11C-86 or 11F–86 25 MM IMM		ASTM 12C-86 or 12F–86		ASTM 13C-86
Expansion chamber:					
Permit heating to	[A]		150°C	300°F	200°C
B Total length, mm	305 to 315[NN]		415 to 425		150 to 160
C Stem OD, mm	6.0 to 8.0		6.0 to 8.0		5.5 to 7.0
D Bulb length, mm	7 to 10		15 to 20		10 to 15
E Bulb OD, mm	≤4.5 and ≥stem		bulb size ≥stem size		≤5.0 and ≥stem
Scale location:					
Bottom of bulb to line at	0°C	32°F	−20°C	−4°F	155°C
F Distance, mm	45 to 55		35 to 50		50 to 60
G Length of graduated portion, mm	210 to 240[O]		305 to 350 [O]		40 to 60[O]

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TABLE 1 *Continued*

	Ice-point scale:	
	Range	
H	Bottom of bulb to ice-point, mm	
	Contraction chamber:	
I	Distance to bottom, min, mm	
J	Distance to top, max, mm	30[F]
	Stem enlargement:	
K	OD, mm	
L	Length, mm	
M	Distance to bottom, mm	

[A] An expansion chamber is provided for relief of gas pressure to avoid distortion of the bulb at higher temperatures. It is not for the purpose of joining mercury separations, and under no circumstances should the thermometer be heated above the highest temperature reading.

[C] Under certain test conditions, the bulb of the thermometer may be 28°C (50°F) above the temperature indicated by the thermometer, and at an indicated temperature of 371°C (700°F) the temperature of the bulb is approaching a critical range in the glass. It is therefore not desirable to use this thermometer under such conditions at indicated temperatures above 371°C (700°F) without checking the ice point.

[D] Longest graduation lines at 155°C, 160°C, 162°C, 164°C, 165°C, and 170°C, with arrows at 162°C and 164°C.

[F] Long, narrow shape.

[O] Capillary clearances shall conform to Section 8.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

[NN] This thermometer may be furnished with an optional ring top. See 6.2.3. Addition of a ring top will increase the total length by an amount equal to the outside diameter of the ring.

	ASTM No.	14C-86	14F-86[FF]	15C-86	15F-86[FF]	16C-86	16F-86[FF]
	IP No.	17C		60C		61C	
	Name	Wax Melting Point		Low Softening Point		High Softening Point	
	Reference Fig. No.	7		4		4	
	Range	38 to 82°C	100 to 180°F	–2 to + 80°C	30 to 180°F	30 to 200°C	85 to 392°F
	For test at						
A	Immersion, mm	79		total		total	
	Graduations:						
	Subdivisions	0.1°C	0.2°F	0.2°C	0.5°F	0.5°C	1°F
	Long lines at each	0.5°C	1°F	1°C	1°F	1°C	5°F
	Numbers at each	1°C	2°F	2°C	5°F	5°C	10°F
	Scale error, max	0.1°C	0.2°F	0.2°C	0.4°F	0.3°C	0.5°F
	Special inscription	ASTM 14C-86 or 14F–86 79 MM IMM		ASTM 15C-86 or 15F–86		ASTM 16C-86 or 16F–86	
	Expansion chamber:						
	Permit heating to	100°C	212°F	130°C	270°F	250°C	482°F
B	Total length, mm	370 to 380		390 to 400		390 to 400	
C	Stem OD, mm	6.0 to 8.0		6.0 to 8.0		6.0 to 8.0	
D	Bulb length, mm	18 to 28		9 to 14		9 to 14	
E	Bulb OD, mm	5.0 to 6.0		4.5 to 5.5		4.5 to 5.5	
	Scale location:						
	Bottom of bulb to line at	40°C	104°F	0°C	32°F	30°C	86°F
F	Distance, mm	115 to 125		75 to 90		75 to 90	
G	Length of graduated portion, mm	210 to 240[O]		245 to 285 [O]		245 to 280[O]	
	Ice-point scale:						
	Range						
	Bottom of bulb to ice-point, mm						
	Contraction chamber:						
	Distance to bottom, min, mm						
	Distance to top, max, mm	41					
	Stem enlargement:						
	OD, mm						
	Length, mm						
	Distance to bottom, mm						

[O] Capillary clearances shall conform to Section 8.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

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TABLE 1 *Continued*

ASTM No.	17C-86	17F-86[FF]	18C-86	18F-86[FF]	19C-86	19F-86[FF]
IP No.			23C			
Name	Saybolt Viscosity		Reid Vapor Pressure		Saybolt Viscosity	
Reference Fig. No.	8		8		8	
Range	19 to 27°C	66 to 80°F	34 to 42°C	94 to 108°F	49 to 57°C	120 to 134°F
For test at	21.1 and 25°C[G]	70 and 77°F [G]	37.8°C[G]	100°F[G]	50 and 54.4°C[G]	122 and 130°F [G]
A Immersion, mm	total		total		total	
Graduations:						
Subdivisions	0.1°C	0.2°F	0.1°C	0.2°F	0.1°C	0.2°F
Long lines at each	0.5°C	1°F	0.5°C	1°F	0.5°C	1°F
Numbers at each	1°C, except 21	2°F	1°C	2°F	1°C, except 54	2°F
Scale error, max	0.1°C	0.2°F	0.1°C	0.2°F	0.1°C	0.2°F
Special inscription	ASTM 17C-86 or 17F-86		ASTM 18C-86 or 18F-86		ASTM 19C-86 or 19F-86	
Expansion chamber:						
Permit heating to	100°C	212°F	100°C	212°F	115°C	240°F
B Total length, mm	270 to 280		270 to 280		270 to 280	
C Stem OD, mm	6.0 to 7.0		6.0 to 7.0		6.0 to 7.0	
D Bulb length, mm	25 to 35		25 to 35		25 to 35	
E Bulb OD, mm	∢5.0 and ∣stem		∣stem		∢5.0 and ∣stem	
Scale location:						
Bottom of bulb to line at	19°C	66°F	34°C	94°F	49°C	120°F
F Distance, mm	135 to 150		130 to 150		135 to 150	
G Length of graduated portion, mm	67 to 101[O]		60 to 90 [O]		67 to 101[O]	
Ice-point scale:						
Range						
H Bottom of bulb to ice-point, mm						
Contraction chamber:						
I Distance to bottom, min, mm						
J Distance to top, max, mm	60[H]		60[H]		60 [H]	
Stem enlargement:						
K OD, mm	8.0 to 10.0		8.0 to 10.0		8.0 to 10.0	
L Length, mm	4.0 to 7.0		4.0 to 7.0		4.0 to 7.0	
M Distance to bottom, mm	112 to 116		112 to 116		112 to 116	

[G] The test temperatures shall be indicated by an arrow whether the graduation corresponding to that point is numbered or not.
[H] Long, narrow shape; mercury shall be in the chamber at 0°C (32°F).
[O] Capillary clearances shall conform to Section 8.
[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

ASTM No.	20C-86	20F-86[FF]	21C-86	21F-86[FF]	22C-86	22F-86[FF]
IP No.					24C	
Name	Saybolt Viscosity		Saybolt Viscosity		Oxidation Stability	
Reference Fig. No.	8		8		8	
Range	57 to 65°C	134 to 148°F	79 to 87°C	174 to 188°F	95 to 103°C	204 to 218°F
For test at	60°C [G]	140°F[G]	82.2°C[G]	180°F[G]	98.9 and 100°C[G]	210°F[G]
A Immersion, mm	total		total		total	
Graduations:						
Subdivisions	0.1°C	0.2°F	0.1°C	0.2°F	0.1°C	0.2°F
Long lines at each	0.5°C	1°F	0.5°C	1°F	0.5°C	1°F
Numbers at each	1°C	2°F	1°C, except 82	2°F	1°C	2°F
Scale error, max	0.1°C	0.2°F	0.1°C	0.2°F	0.1°C	0.2°F
Special inscription	ASTM 20C-86 or 20F-86		ASTM 21C-86 or 21F–86		ASTM 22C-86 or 22F–86	
Expansion chamber:						
Permit heating to	115°C	240°F	140°C	285°F	155°C	310°F
Total length, mm	270 to 280		270 to 280		270 to 280	
Stem OD, mm	6.0 to 7.0		6.0 to 7.0		6.0 to 8.0	

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TABLE 1 *Continued*

D	Bulb length, mm	25 to 35		25 to 35		25 to 35
E	Bulb OD, mm	≮5.0 and ≯stem		≮5.0 and ≯stem		≮5.0 and ≯stem
	Scale location:					
	Bottom of bulb to line at	57°C	134°F	79°C	174°F	95°C 204°F
F	Distance, mm	135 to 150		135 to 150		135 to 150
G	Length of graduated portion, mm	67 to 101[O]		67 to 101[O]		70 to 100[O]
	Ice-point scale:					
	Range					
H	Bottom of bulb to ice-point, mm					
	Contraction chamber:					
I	Distance to bottom, min, mm					
J	Distance to top, max, mm	60[H]		60[H]		60 [H]
	Stem enlargement:					
K	OD, mm	8.0 to 10.0		8.0 to 10.0		8.0 to 10.0
L	Length, mm	4.0 to 7.0		4.0 to 7.0		4.0 to 7.0
M	Distance to bottom, mm	112 to 116		112 to 116		112 to 116

[G] The test temperatures shall be indicated by an arrow whether the graduation corresponding to that point is numbered or not.
[H] Long, narrow shape; mercury shall be in the chamber at 0°C (32°F).
[O] Capillary clearances shall conform to Section 8.
[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

	ASTM No.	23C-86	24C-86	25C-86
	IP No.			
	Name	Engler Viscosity[I]	Engler Viscosity[I]	Engler Viscosity[I]
	Reference Fig. No.	7[K]	7[K]	7[K]
	Range	18 to 28°C	39 to 54°C	95 to 105°C
	For test at	25°C	40 and 50°C	100°C
A	Immersion, mm	90	90	90
	Graduations:			
	Subdivisions	0.2°C	0.2°C	0.2°C
	Long lines at each	1°C	1°C	1°C
	Numbers at each	2°C full figures at 25	2°C full figures at 40 and 50	2°C full figures at 100
	Scale error, max	0.1°C at 25°C	0.1°C at 40 and 50°C	0.1°C at 100°C
	Special inscription	ASTM 23C-86 90 MM IMM[J]	ASTM 24C-86 90 MM IMM[J]	ASTM 25C-86 90 MM IMM [J]
	Expansion chamber:			
	Permit heating to	100°C	105°C	155°C
B	Total length, mm	207 to 217	232 to 242	207 to 217
C	Stem OD, mm	5.5 to 6.5	5.5 to 6.5	5.5 to 6.5
D	Bulb length, mm	13 to 19	13 to 19	13 to 19
E	Bulb OD, mm	5.5 to 6.5	5.5 to 6.5	5.5 to 6.5
	Scale location:			
	Bottom of bulb to line at	18°C	39°C	95°C
F	Distance, mm	108 to 118	108 to 118	108 to 118
G	Length of graduated portion, mm	42 to 69[O]	67 to 94[O]	42 to 69[O]
	Ice-point scale:			
	Range			
	Bottom of bulb to ice-point, mm			
	Contraction chamber:			
	Distance to bottom, min, mm			
	Distance to top, max, mm	60[I]	60[I]	60[I]
	Stem enlargement:			
	OD, mm			
	Length, mm			
	Distance to bottom, mm			

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TABLE 1 *Continued*

[I] The thermometer shall be made to be mounted in a brass ferrule consisting of a tubular bushing 8.0 mm in outside diameter with a flanged head approximately 12 mm in diameter so that the upper extremity of the 8.0 mm diameter is located 90 mm from the bottom of the bulb.
[J] To be marked on the glass stem at least 90 mm from the bottom of the bulb.
[K] Glass button finish, see 6.2.1.
[L] Long, narrow shape; mercury shall be near bottom of the chamber at 0°C.
[O] Capillary clearances shall conform to Section 8.

	ASTM No.	26C-86	27C-86	28C-86	28F-86 [FF]
	IP No.			31C	
	Name	Stability Test of Soluble Nitrocellulose	Turpentine Distillation	Kinematic Viscosity[M]	
	Reference Fig. No.	9	7	6	
	Range	130 to 140°C	147 to 182°C	36.6 to 39.4°C	97.5 to 102.5°F
	For test at	134.5°C		37.8°C	100°F
A	Immersion, mm	total	76	total	
	Graduations:				
	Subdivisions	0.1°C	0.5°C	0.05°C	0.1°F
	Long lines at each	0.5°C	1°C	0.1 and 0.5°C	0.5 and 1°F
	Numbers at each	1°C and in full at 130, 135, 140	2°C from 148	1°C	1°F
	Scale error, max	0.2°C	0.5°C	0.1°C	0.2°F
	Special inscription	ASTM 26C-86	ASTM 27C-86 76 MM IMM	ASTM 28C-86 or 28F-86	
	Expansion chamber:				
	Permit heating to	175°C	230°C	105°C	220°F
B	Total length, mm	458 to 468	296 to 306	300 to 310	
C	Stem OD, mm	6.5 to 8.0	6.0 to 7.0	6.0 to 8.0	
D	Bulb length, mm	54 to 67	10 to 15	45 to 55	
E	Bulb OD, mm	6.0 to 7.0	4.0 to 5.5	≯stem	
	Scale location:				
	Bottom of bulb to line at	134.5°C	147°C	36.6°C	97.5°F
F	Distance, mm	320 to 340	100 to 115	145 to 165	
G	Length of graduated portion, mm	112 to 145[O]	131 to 166[O]	40 to 90 [O]	
	Ice-point scale:				
	Range			−0.3 to + 0.3°C[O]	31.5 to 32.5°F[O]
H	Bottom of bulb to ice-point, mm				
	Contraction chamber:				
I	Distance to bottom, min, mm			100	
J	Distance to top, max, mm	100[I]	40[I]	125	
	Stem enlargement:				
K	OD, mm				
L	Length, mm				
M	Distance to bottom, mm				

[I] Long, narrow shape; mercury shall be near bottom of the chamber at 0°C.
[M] For kinematic viscosity thermometers, the ice-point reading shall be taken within 1 h after being at the test temperature for not less than 3 minutes. The ice-point reading shall be expressed to the nearest 0.01°C or 0.02°F and applied as explained in Test Method E77, Section 13.
[O] Capillary clearances shall conform to Section 8.
[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

	ASTM No.	29C-86	29F-86[FF]	30F-86[FF]	33C-86	33F-86[FF]
	IP No.	34C			20C	
	Name	Kinematic Viscosity[M]		Kinematic Viscosity[M]	Low Aniline Point	
	Reference Fig. No.	6		6	3	
	Range	52.6 to 55.4°C	127.5 to 132.5°F	207.5 to 212.5°F	−38 to + 42°C	−36.5 to + 107.5°F
	For test at	54.4°C	130°F	210°F		
	Immersion, mm	total		total	50	
	Graduations:					
	Subdivisions	0.05°C	0.1°F	0.1°F	0.2°C	0.5°F
	Long lines at each	0.1 and 0.5°C	0.5 and 1°F	0.5 and 1°F	1°C	1°F

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TABLE 1 *Continued*

Numbers at each	1°C	1°F	1°F	2°C	5°F
Scale error, max	0.1°C	0.2°F	0.2°F	0.2°C	0.5°F
Special inscription	ASTM 29C-86 or 29F–86		ASTM 30F-86	ASTM 33C-86 or 33F-86 50 MM IMM	
Expansion chamber:					
Permit heating to	105°C	220°F	266°F	100°C	212°F
B Total length, mm	300 to 310		300 to 310	415 to 425	
C Stem OD, mm	6.0 to 8.0		6.0 to 8.0	6.0 to 7.5	
D Bulb length, mm	45 to 55		45 to 55	10 to 20	
E Bulb OD, mm	≯stem		≯stem	≮5.0 and ≯stem	
Scale location:					
Bottom of bulb to line at	52.6°C	127.5°F	207.5°F	–35°C	–31°F
F Distance, mm	145 to 165		145 to 165	100 to 125	
G Length of graduated portion, mm	40 to 90[O]		40 to 90[O]	240 to 280 [O]	
Ice-point scale:					
Range	–0.3 to + 0.3°C[O]	31.5 to 32.5°F[O]	31.5 to 32.5°F [O]		
H Bottom of bulb to ice-point, mm					
Contraction chamber:					
I Distance to bottom, min, mm	100		100		
J Distance to top, max, mm	125		125		
Stem enlargement:					
K OD, mm					
L Length, mm					
M Distance to bottom, mm					

[M] For kinematic viscosity thermometers, the ice-point reading shall be taken within 1 h after being at the test temperature for not less than 3 minutes. The ice-point reading shall be expressed to the nearest 0.01°C or 0.02°F and applied as explained in Test Method E77, Section 13.

[O] Capillary clearances shall conform to Section 8.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

ASTM No.	34C-86	34F-86[FF]	35C-86	35F-86[FF]	36C-86
IP No.	21C		59C		
Name	Medium Aniline Point		High Aniline Point		Titer Test[N]
Reference Fig. No.	3		7		3
Range	25 to 105°C	77 to 221°F	90 to 170°C	194 to 338°F	–2 to + 68°C
For test at					
A Immersion, mm	50		50		45
Graduations:					
Subdivisions	0.2°C	0.5°F	0.2°C	0.5°F	0.2°C
Long lines at each	1°C	1°F	1°C	1°F	1°C
Numbers at each	2°C	5°F	2°C	5°F	2°C
Scale error, max	0.2°C	0.5°F	0.4°C	1.0°F	0.2°C
Special inscription	ASTM 34C-86 or 34F-86 50 MM IMM		ASTM 35C-86 or 35F–86 50 MM IMM		ASTM 36C-86 45 MM IMM
Expansion chamber:					
Permit heating to	150°C	302°F	220°C	428°F	85°C[O]
B Total length, mm	415 to 425		415 to 425		400 to 410
C Stem OD, mm	6.0 to 7.5		6.0 to 7.5		6.0 to 7.0[Q]
D Bulb length, mm	10 to 20		10 to 20		15 to 25
E Bulb OD, mm	≮5.0 and ≯stem		5.0 to ≯stem		≮5.5 and ≯stem
Scale location:					
Bottom of bulb to line at	25°C	77°F	90°C	194°F	–2°C
F Distance, mm	100 to 115		100 to 115		50 to 60
G Length of graduated portion, mm	240 to 280[O]		240 to 280 [O]		290 to 320[O]
Ice-point scale:					
Range					
H Bottom of bulb to ice-point, mm					

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TABLE 1 *Continued*

	Contraction chamber:	
I	Distance to bottom, min, mm	
J	Distance to top, max, mm	35[P]
	Stem enlargement:	
K	OD, mm	
L	Length, mm	
M	Distance to bottom, mm	

[N] Thermometers made to these specifications conform also with the requirements for the titer test thermometer of the American Oil Chemists Society and the Association of Official Agricultural Chemists, except for the special inscription.

[O] Capillary clearances shall conform to Section 8.

[P] Mercury shall be near middle of chamber at 0°C.

[Q] The stem may be either the plain front or lens front type. If the thermometer is of the lens front type, the cross section of the stem shall be such that it will pass through an 8-mm ring gage but will not enter a 5-mm slot gage.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

ASTM No.	37C-86	38C-86	39C-86
IP No.	77C	78C	79C
Name	Solvents Distillation	Solvents Distillation	Solvents Distillation
Reference Fig. No.	3	3	7
Range	−2 to + 52°C	24 to 78°C	48 to 102°C
For test at			
A Immersion, mm	100	100	100
Graduations:			
Subdivisions	0.2°C	0.2°C	0.2°C
Long lines at each	1°C	1°C	1°C
Numbers at each	2°C	2°C	2°C
Scale error, max	0.2°C	0.2°C	0.2°C
Special inscription	ASTM 37C-86 100 MM IMM	ASTM 38C-86 100 MM IMM	ASTM 39C-86 100 MM IMM
Expansion chamber:			
Permit heating to	80°C	105°C	130°C
B Total length, mm	390 to 400	390 to 400	390 to 400
C Stem OD, mm	6.0 to 8.0	6.0 to 8.0	6.0 to 8.0
D Bulb length, mm	15 to 20	15 to 20	15 to 20
E Bulb OD, mm	≯stem	≯stem	≯stem
Scale location:			
Bottom of bulb to line at	−2°C	24°C	48°C
F Distance, mm	125 to 145	125 to 145	125 to 145
G Length of graduated portion, mm	190 to 235[O]	190 to 235[O]	190 to 235[O]
Ice-point scale:			
Range			
H Bottom of bulb to ice-point, mm			
Contraction chamber:			
I Distance to bottom, min, mm			
J Distance to top, max, mm			35[T]
Stem enlargement:			
K OD, mm			
L Length, mm			
M Distance to bottom, mm			

[O] Capillary clearances shall conform to Section 8.

[T] Mercury shall be near the bottom of the chamber at 0°C.

ASTM No.	40C-86	41C-86	42C-86
IP No.	80C	81C	82C
Name	Solvents Distillation	Solvents Distillation	Solvents Distillation
Reference Fig. No.	7	7	7
Range	72 to 126°C	98 to 152°C	95 to 255°C

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TABLE 1 *Continued*

For test at			
A Immersion, mm	100	100	100
Graduations:			
Subdivisions	0.2°C	0.2°C	0.5°C
Long lines at each	1°C	1°C	1°C
Numbers at each	2°C	2°C	5°C
Scale error, max	0.2°C	0.3°C	1°C
Special inscription	ASTM 40C-86 100 MM IMM	ASTM 41C-86 100 MM IMM	ASTM 42C-86 100 MM IMM
Expansion chamber:			
Permit heating to	150°C	180°C	280°C
B Total length, mm	390 to 400	390 to 400	390 to 400
C Stem OD, mm	6.0 to 8.0	6.0 to 8.0	6.0 to 8.0
D Bulb length, mm	15 to 20	15 to 20	15 to 20
E Bulb OD, mm	≯stem	≯stem	≯stem
Scale location:			
Bottom of bulb to line at			
F Distance, mm	72°C	98°C	95°C
G Length of graduated portion, mm	125 to 145 190 to 235[O]	125 to 145 190 to 235[O]	125 to 145 190 to 235[O]
Ice-point scale:			
Range			
H Bottom of bulb to ice-point, mm			
Contraction chamber:			
I Distance to bottom, min, mm			
J Distance to top, max, mm	35[T]	35[T]	35[T]
Stem enlargement:			
K OD, mm			
L Length, mm			
M Distance to bottom, mm			

[O] Capillary clearances shall conform to Section 8.
[T] Mercury shall be near the bottom of the chamber at 0°C.

ASTM No.	43C-86	43F-86[FF]	44C-86	44F-86[FF]	45C-86	45F-86 [FF]
IP No.	65C		29C		30C	
Name	Kinematic Viscosity[M,R]		Kinematic Viscosity[M]		Kinematic Viscosity[M]	
Reference Fig. No.	10		6		6	
Range	–51.6 to – 34°C	–61 to – 29°F	18.6 to 21.4°C	66.5 to 71.5°F	23.6 to 26.4°C	74.5 to 79.5°F
For test at			20°C	68 and 70°F	25°C	77°F
A Immersion, mm	total		total		total	
Graduations:						
Subdivisions	0.1°C	0.2°F	0.05°C	0.1°F	0.05°C	0.1°F
Long lines at each	0.5 and 1°C	1°F	0.1 and 0.5°C	0.5 and 1°F	0.1 and 0.5°C	0.5 and 1°F
Numbers at each	1°C starting at –51°C	2°F starting at – 60°F	1°C	1°F	1°C	1°F
Scale error, max	0.1°C	0.2°F	0.1°C	0.2°F	0.1°C	0.2°F
Special inscription	ASTM 43C-86 or 43F-86 MERC-THAL		ASTM 44C-86 or 44F-86		ASTM 45C-86 or 45F–86	
Expansion chamber:						
Permit heating to	105°C[S]	220°F [S]	105°C	220°F	105°C	220°F
Total length, mm	410 to 425		300 to 310		300 to 310	
Stem OD, mm	7.0 to 8.0		6.0 to 8.0		6.0 to 8.0	
Bulb length, mm	30 to 40		45 to 55		45 to 55	
Bulb OD, mm	6.0 to 7.0		≯stem		≯stem	
Scale location:						
Bottom of bulb to line at	–51.6°C	–61°F	18.6°C	66.5°F	23.6°C	74.5°F
Distance, mm	60 to 90		145 to 165		145 to 165	

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TABLE 1 *Continued*

G Length of graduated portion, mm	140 to 225[O]		40 to 90 [O]		40 to 90[O]	
Ice-Point scale:						
Range	–0.6 to + 0.6°C[O]	31 to 33°F[O]	–0.3 to + 0.3°C[O]	31.5 to 32.5°F [O]	–0.3 to + 0.3°C[O]	31.5 to 32.5°F[O]
H Bottom of bulb to ice-point, mm						
Contraction chamber:						
I Distance to bottom, min, mm	290[U]		100		100	
J Distance to top, max, mm	310[U]		125		125	
Stem enlargement:						
K OD, mm						
L Length, mm						
M Distance to bottom, mm						

[M] For kinematic viscosity thermometers, the ice-point reading shall be taken within 1 h after being at the test temperature for not less than 3 minutes. The ice-point reading shall be expressed to the nearest 0.01°C or 0.02°F and applied as explained in Test Method E77, Section 13.

[O] Capillary clearances shall conform to Section 8.

[R] A suitable mercury-thallium alloy shall be used as the actuating liquid.

[S] The expansion chamber shall be of the long narrow type 10 to 20 mm in length. The length of unchanged capillary between the nearest graduation mark and the expansion chamber shall be not less than 10 mm.

[U] The length of unchanged capillary between the nearest graduation mark and contraction chamber shall be not less than 10 mm.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

ASTM No.	46C-86	46F-86[FF]	47C-86	47F-86[FF]	48C-86	48F-86[FF]
IP No.	66C		35C		90C	
Name	Kinematic Viscosity[M]		Kinematic Viscosity[M]		Kinematic Viscosity[M]	
Reference Fig. No.	6		6		6	
Range	48.6 to 51.4°C	119.5 to 124.5°F	58.6 to 61.4°C	137.5 to 142.5°F	80.6 to 83.4°C	177.5 to 182.5°F
For test at	50°C	122°F	60°C	140°F	82.2°C	180°F
A Immersion, mm	total		total		total	
Graduations:						
Subdivisions	0.05°C	0.1°F	0.05°C	0.1°F	0.05°C	0.1°F
Long lines at each	0.1 and 0.5°C	0.5 and 1°F	0.1 and 0.5°C	0.5 and 1°F	0.1 and 0.5°C	0.5 and 1°F
Numbers at each	1°C	1°F	1°C	1°F	1°C	1°F
Scale error, max	0.1°C	0.2°F	0.1°C	0.2°F	0.1°C	0.2°F
Special inscription	ASTM 46C-86 or 46F–86		ASTM 47C-86 or 47F–86		ASTM 48C-86 or 48F–86	
Expansion chamber:						
Permit heating to	105°C	220°F	105°C	220°F	105°C	220°F
B Total length, mm	300 to 310		300 to 310		300 to 310	
C Stem OD, mm	6.0 to 8.0		6.0 to 8.0		6.0 to 8.0	
D Bulb length, mm	45 to 55		45 to 55		45 to 55	
E Bulb OD, mm	≯stem		≯stem		≯stem	
Scale location:						
Bottom of bulb to line at	48.6°C	119.5°F	58.6°C	137.5°F	80.6°C	177.5°F
F Distance, mm	145 to 165		145 to 165		145 to 165	
G Length of graduated portion, mm	40 to 90[O]		40 to 90 [O]		40 to 90[O]	
Ice-point scale:						
Range	–0.3 to + 0.3°C[O]	31.5 to 32.5°F[O]	–0.3 to + 0.3°C [O]	31.5 to 32.5°F[O]	–0.3 to + 0.3°C[O]	31.5 to 32.5°F [O]
H Bottom of bulb to ice-point, mm						
Contraction chamber:						
Distance to bottom, min, mm	100		100		100	
Distance to top, max, mm	125		125		125	
Stem enlargement:						
OD, mm						
Length, mm						
Distance to bottom, mm						

[M] For kinematic viscosity thermometers, the ice-point reading shall be taken within 1 h after being at the test temperature for not less than 3 minutes. The ice-point reading shall be expressed to the nearest 0.01°C or 0.02°F and applied as explained in Test Method E77, Section 13.

[O] Capillary clearances shall conform to Section 8.

[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

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TABLE 1 *Continued*

ASTM No.	49C-86	50F-86[FF]	51F-86[FF]
IP No.			
Name	Stormer Viscosity	Gas Calorimeter Inlet	Gas Calorimeter Outlet
Reference Fig. No.	7	9	9
Range	20 to 70°C	54 to 101°F	69 to 116°F
For test at			
A Immersion, mm	65	total	total
Graduations:			
Subdivisions	0.2°C	0.1°F	0.1°F
Long lines at each	1°C	0.5°F	0.5°F
Numbers at each	2°C	1°F	1°F
Scale error, max	0.2°C	0.2°F[V]	0.2°F[V]
Special inscription	ASTM 49C-86 65 MM IMM	ASTM 50F-86	ASTM 51F-86
Expansion chamber:			
Permit heating to	100°C	150°F	212°F
B Total length, mm	300 to 310	463 to 473	463 to 473
C Stem OD, mm	5.5 to 6.0	6.0 to 7.0	6.0 to 7.0
D Bulb length, mm	15 to 30	25 to 30	25 to 30
E Bulb OD, mm	≤5.0 and ≥stem	6.5 to 7.0	6.5 to 7.0
Scale location:			
Bottom of bulb to line at	20°C	54°F	69°F
F Distance, mm	70 to 80	100 to 120	100 to 120
G Length of graduated portion, mm	165 to 200[O]	292 to 338 [O]	292 to 338[O]
Ice-point scale:			
Range			
H Bottom of bulb to ice-point, mm			
Contraction chamber:			
I Distance to bottom, min, mm			
J Distance to top, max, mm	50[P]	43[X]	43[X]
Stem enlargement:			
K OD, mm			
L Length, mm			
M Distance to bottom, mm			

[O] Capillary clearances shall conform to Section 8.
[P] Mercury shall be near middle of chamber at 0°C.
[V] Change in correction over any 5°F interval shall not exceed 0.10°F.
[X] Mercury shall be in the chamber at 32°F.
[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.

ASTM No.	52C-86	54C-86	54F-86[FF]	56C-86	56F-86[FF]
IP No.		18C			
Name	Butadiene Boiling Point Range	Congealing Point		Bomb Calorimeter	
Reference Fig. No.	4	4		9	
Range	−10 to + 5°C	20 to 100.6°C	68 to 213°F	19 to 35°C	66 to 95°F
For test at					
A Immersion, mm	total	total		total	
Graduations:					
Subdivisions	0.1°C	0.2°C	0.5°F	0.02°C	0.05°F
Long lines at each	0.5°C	1°C	1°F	0.1°C	0.1 and 0.5°F
Numbers at each	1°C	2°C	5°F	0.2°C	1°F
Scale error, max	0.1°C	0.2°C	0.5°F	0.10°C[Y]	0.20°F [Z]
Special inscription	ASTM 52C-86	ASTM 54C–86 or 54F-86		ASTM 56C–86 or 56F-86	
Expansion chamber:					

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TABLE 1 *Continued*

Permit heating to	100°C[W]		110°C	230°F	66°C	150°F
B Total length, mm	157 to 167		305 to 315		570 to 600	
C Stem OD, mm	6.0 to 6.5		6.0 to 8.0		7.0 to 8.0	
D Bulb length, mm	9 to 13		10 to 12		35 to 55	
E Bulb OD, mm	5.5 to ≯stem		4.5 to 6.0 [MM]		7.0 to 8.0[BB]	
Scale location:						
Bottom of bulb to line at	−10°C		20°C	68°F	19°C	66°F
F Distance, mm	28 to 36		60 to 70		165 to 187	
G Length of graduated portion, mm	70 to 100[O]		170 to 215[O]		323 to 385 [O]	
Ice-point scale:						
Range						
H Bottom of bulb to ice-point, mm						
Contraction chamber:						
I Distance to bottom, min, mm						
J Distance to top, max, mm					76	
Stem enlargement:						
K OD, mm						
L Length, mm						
M Distance to bottom, mm						

[O] Capillary clearances shall conform to Section 8.
[W] Expansion chamber shall be of the long narrow type and there shall be not less than 10 mm of unchanged capillary between the base of the chamber and the top graduation.
[Y] Over any interval of 2°C the change in correction shall not exceed 0.02°C.
[Z] Over any interval of 4°F the change in correction shall not exceed 0.05°F.
[BB] The bulb diameter shall not be more than 0.5 mm greater than the stem.
[FF] For Fahrenheit thermometers, dimension G (length of graduated portion) shall be measured as the length of graduated portion corresponding to the nominal Celsius range.
[MM] Bulb shape ellipsoidal (see Fig. 2).

ASTM No.	57C-86	57F-86[FF]	58C-86	58F-86[FF]	59C-86	59F-86[FF]
IP No.						
Name	Tag Closed Tester Low Range		Tank		Tank	
Reference Fig. No.	5		4[AA]		4 [AA]	
Range	−20 to + 50°C	−4 to + 122°F	−34 to + 49°C	−30 to + 120°F	−18 to + 82°C	0 to 180°F
For test at						
A Immersion, mm	57		total		total	
Graduations:						
Subdivisions	0.5°C	1°F	0.5°C	1°F	0.5°C	1°F
Long lines at each	1°C	5°F	1°C	5°F	1°C	5°F
Numbers at each	5°C	10°F	5°C	10°F	5°C	10°F
Scale error, max	0.5°C	1°F	0.3°C	0.5°F	0.3°C	0.5°F
Special inscription	ASTM 57C-86 or 57F-86 57 MM IMM		ASTM 58C-86 or 58F–86		ASTM 59C-86 or 59F-86	
Expansion chamber:						
Permit heating to	100°C	212°F	100°C	212°F	100°C	212°F
B Total length, mm	282 to 292		300 to 305		300 to 305	
C Stem OD, mm	6.0 to 7.0		[CC]		[CC]	
D Bulb length, mm	9 to 13		15 to 25		15 to 25	
E Bulb OD, mm	≯stem		≯stem		≯stem	
Scale location:						
Bottom of bulb to line at	−20°C	−4°F	−34°C	−30°F	−18°C	0°F
Distance, mm	75 to 90		75 to 90		65 to 80	
Length of graduated portion, mm	143 to 177[O]		165 to 205 [O]		175 to 210[O]	
Ice-point scale						
Range						
Bottom of bulb to ice-point, mm						
Contraction chamber:						
Distance to bottom, min, mm						
Distance to top, max, mm						
Stem enlargement:						

Full document details: ASTM E1-07
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