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**Liquid-in-glass thermometers for
testing of petroleum product**

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of International Trade and Industry through deliberations at Japanese Industrial Standards Committee in accordance with the Industrial Standardization Law. Consequently **JIS B 7410 : 1982** is replaced with **JIS B 7410 : 1997**.

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Liquid-in-glass thermometers for testing of petroleum product

1 Scope This Japanese Industrial Standard specifies the stick-type liquid-in-glass thermometers for testing of petroleum products (hereafter referred to as "thermometer").

Remarks: Since this Standard can not cover wholly the safe method to use these thermometers, the user of these thermometers shall establish adequately in advance the prohibited items for keeping of safety and health.

2 Normative references The following standard contains provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent edition of the standard indicated below shall be applied.

JIS Z 8103 *Glossary of terms used in instrumentation*

3 Definitions For the purposes of this Standard, the following definitions apply, in addition to the definitions given in JIS Z 8103.

- a) **immersion** The immersion means such a state of a thermometer that it is kept at the temperature to be measured, and includes the complete immersion and the partial immersion.

Remarks: The complete immersion means such a state of the thermometer that it is kept at the temperature to be measured up to the top part of its liquid column, the partial immersion means such a state of the temperature that it is kept at the temperature to be measured up to the designated position from the lowest end of bulb part.

- b) **expansion chamber** The expansion chamber is a chamber made by expanding the top part of capillary tube of thermometer so that the thermometer is not damaged when it has been heated up to the temperature of maximum graduation or more.
- c) **contraction chamber** The contraction chamber is a chamber made by expanding the part of capillary tube adjacent to the bulb part to avoid shortness of liquid caused by such a phenomenon that the enclosed liquid is wholly drawn into the bulb part when the thermometer has been kept at a low temperature.
- d) **stem enlargement** The thickened part of stem for convenience of fitting to the test apparatus.

4 Classification The thermometers shall be classified into 92 types as shown in Attached Table 1.

5 Temperature graduation The graduation of thermometers shall be as follows:

- a) The thermometers shall be graduated based on Celsius graduation and SI units which have been adopted by the general meeting of weights and measures and established by the existing definitions on the international temperature graduation.

b) The thermometers shall be graduated as stated in either of the following sub-clauses based on the immersion condition shown in Attached Table 1.

- 1) In the case of complete immersion, the thermometer shall be so graduated that the indication of thermometer coincides with the temperature of the heat-medium, when the thermometer is used under such condition that the top part of liquid column of thermometer is not exposed from the surface of the heat-medium by two graduations or more.
- 2) In the case of partial immersion, the indication of thermometer shall be so graduated the indication of thermometer coincides with the temperature of the heat-medium, when the thermometer is immersed up to the position of immersion line specified in Attached Table 1 from the lowest part of bulb of thermometer and the average temperature of liquid column at the part exposed from heat-medium reaches the average temperature of exposed part specified in Attached Table 2.

6 Glass The stem part shall be made of adequate glass for thermometer use (¹), the section shall be approximately circular, the colour of front shall be transparent and the colour of back shall be milky white unless otherwise specified. The inner wall of capillary tube shall be smooth and uniform in inner diameter. The bulb part shall be at least equivalent to the glass of stem part in quality and stabilized by adequate heat treatment.

- a) As for the strain in glass of bulb part and stem part, the possibility of breakage by thermal and mechanical impacts shall be minimized.
- b) The meniscuses or the distortion of image caused by the impurities, blow holes, flaw, breaks of joint line shall be minimized as possible.

Note (¹) Jena 16 III glass or the material having the same expansion coefficient, or Jena 59 III glass or the material having the same expansion coefficient.

7 Enclosed liquid The enclosed liquid shall be mercury except the material specified in Attached Table 1.

8 Enclosed gas If the enclosed liquid is mercury, the enclosed gas shall be nitrogen, argon or adequate inert gas.

9 Structure and dimensions The structure and dimensions of thermometer shall be as shown in Fig. 1, Fig. 2 and Attached Table 1.

The length of bulb *D*, as shown in Fig. 2, is defined as the length from the point where the inside diameter of bulb begins to taper (the joint of bulb and stem) to the lower end of bulb.

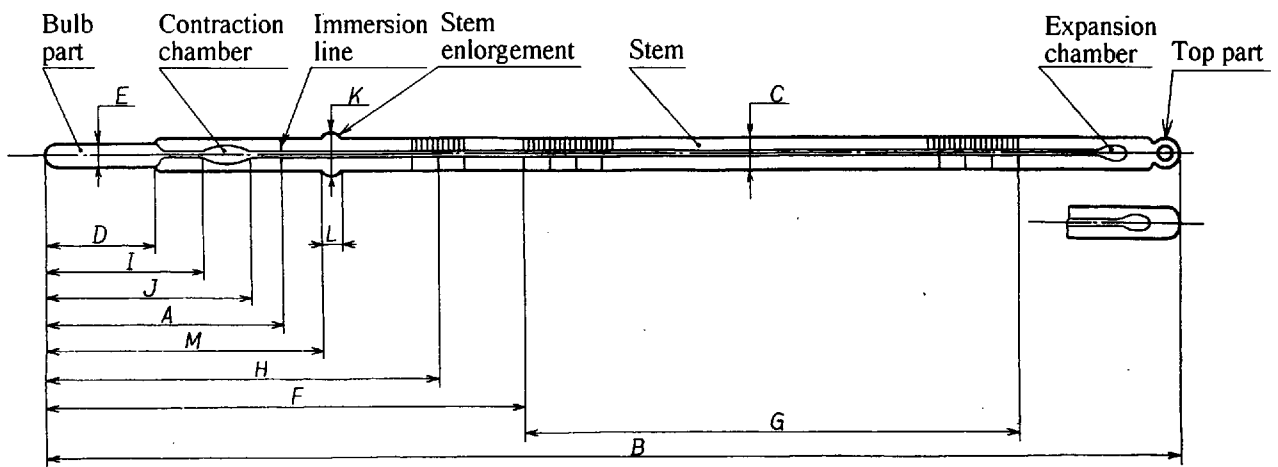


Fig. 1 Dimensions of thermometer

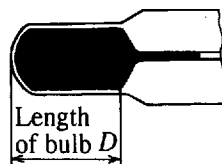


Fig. 2 Bulb part of thermometer

10 Graduation and marks

10.1 General The graduation and marks shall be clearly indicated and the pigment shall be durable by being adequately treated and be clearly indicated so as to be easily read.

10.2 Graduation line The graduation line shall be uniformly notched in a thickness not exceeding of one-fifth of scale spacing so as not to disturb reading of the indication, according to Attached Table 1.

10.3 Immersion line For the thermometer of partial immersion type, a permanently indelible line shall be notched on the front of stem at the position specified from the lower end of bulb (with tolerance of ± 0.5 mm) as shown in Attached Table 1.

10.4 Graduation digits The graduation digits shall be indicated with full digits or abbreviated digits (for instance, only minimum place of digits) according to Attached Table 1. The graduation digits at both upper and lower ends shall be full digits. If the graduation digits neighboring these are written in full or in case of the following thermometers, the abbreviated digits may be used.

- a) VAP-2, VAP-89
- b) GOS-6
- c) VIS-14 to VIS-24, VIS-88, VIS-92 to VIS-96, VIS-98, VIS-99
- d) SFV-1, SFV-81 to SFV-87

Remarks: When the graduation ranges over and under 0 °C, the graduation digits shall be written so that the positive or negative temperature can be identified by any of the following methods. However, this doesn't apply to DIST-7, DIST-8, COC-32, DP-38, GUM-49, SP-74, VIS-14 to VIS-24, IOS-26, AEL-27, TTS-63, SG-64, VIS-88, VIS-92 to VIS-96 and VIS-98.

- a) Change the colours of graduation line.
- b) Change the forms of character of graduation digits.
- c) Put negative sign (–) in the front of digits for negative temperature.

10.5 Marks, etc. The indicated items shall be marked at the easily visible position and the letter of “immersion” shall be marked on the immersion line.

11 Appearance The appearance shall be straight and the direction of reflection of mercury shall not deflect remarkably.

12 Maximum tolerance The error of graduation shall be less than the maximum allowable error shown in Attached Table 1 when the correction test has been performed.

Remarks: The correction test shall be performed by the method shown in Annex.

Further, in case where the test temperature is specified in Attached Table 1, the test shall be performed at that specified temperature.

13 Designation of thermometer The thermometer shall be designated by the thermometer symbol and thermometer number shown in Attached Table 1.

Example: DIST-7

14 Marking The following items shall be marked durably and conspicuously on each thermometer.

- a) Symbol of temperature unit, “°C”
- b) Thermometer symbol and thermometer number
- c) Manufacturer's name or abbreviation
- d) Number of Japanese Industrial Standard
- e) Material of the stem When the material is Jena 16 III glass or the equivalent expansion coefficient to this, mark “Jena 16 III”. When the material is Jena 59 III glass or has the equivalent expansion coefficient to this, mark “Jena 59 III”.
- f) Year of manufacture or identification number or manufacturing number

Related standard ASTM E 1-95 *Standard Specification for ASTM Thermometers*

IP APPENDIX A *Specification—IP Standard Thermometers (1996)*

Attached Table 1 Classification of thermometer

Classi- fication	Name		For saybolt viscosity	For vapour pressure	For gasoline oxidation stability
	Thermometer symbol		SFV	VAP	GOS
	Thermometer number		1	2	6
Graduation range °C			19 to 27	34 to 42	95 to 103
Test temperature °C			21.1 and 25	37.8	100
Immersion A mm			Complete immersion	Complete immersion	Complete immersion
Gradu- ation	Graduation interval °C		0.1	0.1	0.1
	Long graduation mark °C		Every 0.5	Every 0.5	Every 0.5
	Graduation digit °C		Every 1 except 21	Every 1	Every 1
	Max. tolerance of gradu- ation °C		0.1	0.1	0.1
Expansion chamber	Allowable heating temper- ature of thermometer °C		100	100	155
Top shape			Round stop or annular	Round stop or annular	Round stop or annular
Overall length B mm			270 to 280	270 to 280	270 to 280
Diameter C mm			6.0 to 7.0	6.0 to 7.0	6.0 to 8.0
Bulb	Length D mm		25 to 35	25 to 35	25 to 35
	Diameter E mm		5.0 and over, not thicker than the stem	5.0 and over, not thicker than the stem	5.0 and over, not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		135 to 150 up to 19 °C	130 to 150 up to 34 °C	135 to 150 up to 95 °C
	Length of graduation G mm		67 to 101	60 to 90	70 to 100
Ice point	Graduation range °C		—	—	—
	Distance from the lower end of bulb to the ice point H mm		—	—	—
Contraction chamber	Distance from the lower end of bulb to the lowest end of chamber I mm		—	—	—
	Distance from the lower end of bulb to the upper end of chamber J mm		60 max.	60 max.	60 max.
	Shape		—	Slender shape	Slender shape
	Place of mercury at 0 °C		—	Indoors	Indoors
Stem en- largement	Diameter K mm		8.0 to 10.0	8.0 to 10.0	8.0 to 10.0
	Length L mm		4.0 to 7.0	4.0 to 7.0	4.0 to 7.0
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		112 to 116	112 to 116	112 to 116

Attached Table 1 Classification of thermometer (continued)

Classification	Name		For low fractional distillation	For high fractional distillation	For high pour point
	Thermometer symbol		DIST	DIST	PP
	Thermometer number		7	8	9
Graduation range °C			− 2 to +300	− 2 to +400	− 38 to +50
Test temperature °C			—	—	—
Immersion <i>A</i> mm			Complete immersion	Complete immersion	108
Graduation	Graduation interval °C		1	1	1
	Long graduation mark °C		Every 5	Every 5	Every 5
	Graduation digit °C		Every 10	Every 10	Every 10
	Max. tolerance of graduation °C		0.5 up to 150 °C 1 for 150 °C and over	1 up to 300 °C 1.5 for 300 °C and over	0.5
Expansion chamber	Allowable heating temperature of thermometer °C		—	—	100
Top shape			Round stop or annular	Round stop or annular	Annular
Overall length <i>B</i> mm			380 to 390	380 to 390	225 to 235
Diameter <i>C</i> mm			6.0 to 8.0	6.0 to 8.0	6.0 to 8.0
Bulb	Length <i>D</i> mm		10 to 15	10 to 15	7 to 10
	Diameter <i>E</i> mm		5.0 and over, not thicker than the stem	5.0 and over, not thicker than the stem	5.5 and over, not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark <i>F</i> mm		100 to 110 up to 0 °C	30 to 40 up to 0 °C	120 to 130 up to − 38 °C
	Length of graduation <i>G</i> mm		225 to 255	290 to 330	65 to 85
Ice point	Graduation range °C		—	—	—
	Distance from the lower end of bulb to the ice point <i>H</i> mm		—	—	—
Contraction chamber	Distance from the lower end of bulb to the lowest end of chamber <i>I</i> mm		—	—	—
	Distance from the lower end of bulb to the upper end of chamber <i>J</i> mm		—	—	—
	Shape		—	—	—
	Place of mercury at 0 °C		—	—	—
Stem enlargement	Diameter <i>K</i> mm		—	—	—
	Length <i>L</i> mm		—	—	—
	Distance from the lower end of bulb to the lower end of stem enlargement <i>M</i> mm		—	—	—

Attached Table 1 Classification of thermometer (continued)

Classi- fication	Name		For low pour point (°)	For kinetic coefficient of viscosity (°)	For kinetic coefficient of viscosity
	Thermometer symbol		PP	VIS	VIS
	Thermometer number		10	14	15
Graduation range °C			−80 to +20	−51.6 to −34	−19.4 to −16.6
Test temperature °C			—	—	−17.8
Immersion A mm			76	Complete immersion	Complete immersion
Gradu- ation	Graduation interval °C		1	0.1	0.05
	Long graduation mark °C		Every 5	Every 0.5	Every 0.1 and 0.5
	Graduation digit °C		Every 10	Every 1	Every 1
	Max. tolerance of gradu- ation °C		1 up to −33 °C 2 when exceeding −33 °C	0.1	0.1 at −17.8 °C
Expansion chamber	Allowable heating temper- ature of thermometer °C		60	105 (°)	105
Top shape			Round stop	Annular	Annular
Overall length B mm			225 to 235	410 to 425	300 to 310
Diameter C mm			6.0 to 8.0	7.0 to 8.0	6.0 to 8.0
Bulb	Length D mm		7 to 10	30 to 40	45 to 55
	Diameter E mm		5.0 and over, not thicker than the stem	6.0 to 7.0	Not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		100 to 120 up to −70 °C	60 to 90 up to −51.6 °C	80 to 110 up to −19.4 °C
	Length of graduation G mm		70 to 100	140 to 225	40 to 90
Ice point	Graduation range °C		—	−0.6 to +0.6	−0.3 to +0.3
	Distance from the lower end of bulb to the ice point H mm		—	—	—
Contraction cham- ber	Distance from the lower end of bulb to the lowest end of chamber I mm		—	290 min. (°)	180 min.
	Distance from the lower end of bulb to the upper end of chamber J mm		—	310 max.	205 max.
	Shape		—	—	—
	Place of mercury at 0 °C		—	—	—
Stem en- largement	Diameter K mm		—	—	—
	Length L mm		—	—	—
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		—	—	—

Notes (°) Use toluene to which red dye is added for enclosed liquid.

(°) A suitable mercury-thallium alloy shall be used as the enclosed liquid of thermometer.

(°) The expansion chamber shall be slender in shape and be 10 mm to 20 mm in full length. The length of capillary tube from the lower end of chamber to the adjacent graduation line shall be not less than 10 mm.

(°) The length of capillary tube from the lower end of contraction chamber to the adjacent graduation line shall be not less than 10 mm.

Attached Table 1 Classification of thermometer (continued)

Classi- fication	Name		For kinetic coefficient of viscosity	For kinetic coefficient of viscosity	For kinetic coefficient of viscosity
	Thermometer symbol		VIS	VIS	VIS
	Thermometer number		16	17	18
Graduation range °C			18.6 to 21.4	23.6 to 26.4	28.6 to 31.4
Test temperature °C			20.0	25.0	30.0
Immersion A mm			Complete immersion	Complete immersion	Complete immersion
Gradu- ation	Graduation interval °C		0.05	0.05	0.05
	Long graduation mark °C		Every 0.1 and 0.5	Every 0.1 and 0.5	Every 0.1 and 0.5
	Graduation digit °C		Every 1	Every 1	Every 1
	Max. tolerance of gradu- ation °C		0.1 at 20.0 °C	0.1 at 25.0 °C	0.1 at 30.0 °C
Expansion chamber	Allowable heating temper- ature of thermometer °C		105	105	105
Top shape			Annular	Annular	Annular
Overall length B mm			300 to 310	300 to 310	300 to 310
Diameter C mm			6.0 to 8.0	6.0 to 8.0	6.0 to 8.0
Bulb	Length D mm		45 to 55	45 to 55	45 to 55
	Diameter E mm		Not thicker than the stem	Not thicker than the stem	Not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		145 to 165 up to 18.6 °C	145 to 165 up to 23.6 °C	145 to 165 up to 28.6 °C
	Length of graduation G mm		40 to 90	40 to 90	40 to 90
Ice point	Graduation range °C		−0.3 to +0.3	−0.3 to +0.3	−0.3 to +0.3
	Distance from the lower end of bulb to the ice point H mm		—	—	—
Contraction chamber	Distance from the lower end of bulb to the lowest end of chamber I mm		100 min.	100 min.	100 min.
	Distance from the lower end of bulb to the upper end of chamber J mm		125 max.	125 max.	125 max.
	Shape		—	—	—
	Place of mercury at 0 °C		—	—	—
Stem en- largement	Diameter K mm		—	—	—
	Length L mm		—	—	—
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		—	—	—

Attached Table 1 Classification of thermometer (continued)

Classi- fication	Name		For kinetic coefficient of viscosity	For kinetic coefficient of viscosity	For kinetic coefficient of viscosity
	Thermometer symbol		VIS	VIS	VIS
	Thermometer number		19	20	21
Graduation range °C			36.6 to 39.4	48.6 to 51.4	52.6 to 55.4
Test temperature °C			37.8	50.0	54.4
Immersion A mm			Complete immersion	Complete immersion	Complete immersion
Gradu- ation	Graduation interval °C		0.05	0.05	0.05
	Long graduation mark °C		Every 0.1 and 0.5	Every 0.1 and 0.5	Every 0.1 and 0.5
	Graduation digit °C		Every 1	Every 1	Every 1
	Max. tolerance of gradu- ation °C		0.1 at 37.8 °C	0.1 at 50 °C	0.1 at 54.4 °C
Expansion chamber	Allowable heating temper- ature of thermometer °C		105	105	105
Top shape			Annular	Annular	Annular
Overall length B mm			300 to 310	300 to 310	300 to 310
Diameter C mm			6.0 to 8.0	6.0 to 8.0	6.0 to 8.0
Bulb	Length D mm		45 to 55	45 to 55	45 to 55
	Diameter E mm		Not thicker than the stem	Not thicker than the stem	Not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		145 to 165 up to 36.6 °C	145 to 165 up to 48.6 °C	145 to 165 up to 52.6 °C
	Length of graduation G mm		40 to 90	40 to 90	40 to 90
Ice point	Graduation range °C		−0.3 to +0.3	−0.3 to +0.3	−0.3 to +0.3
	Distance from the lower end of bulb to the ice point H mm		—	—	—
Contraction cham- ber	Distance from the lower end of bulb to the lowest end of chamber I mm		100 min.	100 min.	100 min.
	Distance from the lower end of bulb to the upper end of chamber J mm		125 max.	125 max.	125 max.
	Shape		—	—	—
	Place of mercury at 0 °C		—	—	—
Stem en- largement	Diameter K mm		—	—	—
	Length L mm		—	—	—
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		—	—	—

Attached Table 1 Classification of thermometer (continued)

Classi- fication	Name		For kinetic coefficient of viscosity	For kinetic coefficient of viscosity	For kinetic coefficient of viscosity
	Thermometer symbol		VIS	VIS	VIS
	Thermometer number		22	23	24
Graduation range °C			73.5 to 76.5	78.6 to 81.4	98.6 to 101.4
Test temperature °C			75.0	80.0	98.9 and 100.0
Immersion A mm			Complete immersion	Complete immersion	Complete immersion
Gradu- ation	Graduation interval °C		0.05	0.05	0.05
	Long graduation mark °C		Every 0.1 and 0.5	Every 0.1 and 0.5	Every 0.1 and 0.5
	Graduation digit °C		Every 1	Every 1	Every 1
	Max. tolerance of gradu- ation °C		0.1 at 75.0 °C	0.1 at 80.0 °C	0.1 at 98.9 °C and 100.0 °C
Expansion chamber	Allowable heating temper- ature of thermometer °C		105	105	130
Top shape			Annular	Annular	Annular
Overall length B mm			300 to 310	300 to 310	300 to 310
Diameter C mm			6.5 to 8.0	6.0 to 8.0	6.0 to 8.0
Bulb	Length D mm		45 to 55	20 to 35	45 to 55
	Diameter E mm		6.0 to 7.0	Not thicker than the stem	Not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		135 to 157 up to 73.5 °C	170 to 210 up to 80 °C	145 to 165 up to 98.6 °C
	Length of graduation G mm		36 to 81	40 to 90	40 to 90
Ice point	Graduation range °C		−0.3 to +0.3	−0.3 to +0.3	−0.3 to +0.3
	Distance from the lower end of bulb to the ice point H mm		—	—	—
Contraction chamber	Distance from the lower end of bulb to the lowest end of chamber I mm		100 min.	100 min.	100 min.
	Distance from the lower end of bulb to the upper end of chamber J mm		125 max.	125 max.	125 max.
	Shape		—	—	—
	Place of mercury at 0 °C		—	—	—
Stem en- largement	Diameter K mm		—	—	—
	Length L mm		—	—	—
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		—	—	—

Attached Table 1 Classification of thermometer (continued)

Classi- fication	Name		For quantity of insulating oil evaporation	For oxidation stability of insulating oil	For quantity of asphalt evaporation
	Thermometer symbol		IOEL	IOS	AEL
	Thermometer number		25	26	27
Graduation range °C			80 to 150	95 to 155	155 to 170
Test temperature °C			98.0 and 140.0	120.0	—
Immersion A mm			90	Complete immersion	Complete immersion
Gradu- ation	Graduation interval °C		0.5	0.2	0.5
	Long graduation mark °C		Every 1 and 5	Every 1	Every 1 and 5 (‘)
	Graduation digit °C		Every 10 and 98 °C	Every 2	155 °C, 160 °C, 165 °C and 170 °C
	Max. tolerance of gradu- ation °C		0.5 at 98.9 °C and 140.0 °C	0.2 at 120.0 °C	0.5
Expansion chamber	Allowable heating temper- ature of thermometer °C		180	180	200
Top shape			Round stop or annular	Round stop or annular	Round stop or annular
Overall length B mm			290 to 300	374 to 384	150 to 160
Diameter C mm			6.0 to 7.0	7.0 to 8.0	5.5 to 7.0
Bulb	Length D mm		15 to 20	10 to 20	10 to 15
	Diameter E mm		5.0 to 6.0	6.0 to 7.0	5.0 and over, not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		120 to 130 up to 80 °C	115 to 135 up to 95 °C	50 to 60 up to 155 °C
	Length of graduation G mm		55 to 115	189 to 229	40 to 60
Ice point	Graduation range °C		—	— 1 to +1	—
	Distance from the lower end of bulb to the ice point H mm		—	45 to 55	—
Contraction chamber	Distance from the lower end of bulb to the lowest end of chamber I mm		—	65 min.	—
	Distance from the lower end of bulb to the upper end of chamber J mm		35 max.	85 max.	30 max.
	Shape		Slender shape	—	Slender shape
	Place of mercury at 0 °C		—	—	—
Stem en- largement	Diameter K mm		—	—	—
	Length L mm		—	—	—
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		—	—	—

Note (°) Each graduation line for 0 °C, 155 °C, 160 °C, 163 °C, 165 °C and 170 °C of long graduation mark of the thermometer for quantity of asphalt evaporation shall be longer than the graduation mark of every 1 °C.

Attached Table 1 Classification of thermometer (continued)

Classification	Name		For P-M low flash point, for high flash point of tag sealing type	For P-M high flash point	For C-O flash point
	Thermometer symbol		PMF	PMF	COC
	Thermometer number		30	31	32
Graduation range °C			-5 to +110	90 to 370	-6 to +400
Test temperature °C			-	-	-
Immersion A mm			57	57	25
Graduation	Graduation interval °C		0.5	2	2
	Long graduation mark °C		Every 1 and 5	Every 10	Every 10
	Graduation digit °C		Every 5	Every 20	Every 20
	Max. tolerance of graduation °C		0.5	1 up to 260 °C 2 when exceeding 260 °C	2 up to 260 °C 4 when exceeding 260 °C
Expansion chamber	Allowable heating temperature of thermometer °C		160	370	400
Top shape			Round stop or annular	Round stop or annular	Round stop or annular
Overall length B mm			285 to 295	285 to 295	305 to 315
Diameter C mm			6.0 to 7.0	6.0 to 7.0	6.0 to 8.0
Bulb	Length D mm		9 to 13	7 to 10	7 to 10
	Diameter E mm		5.5 and over, not thicker than the stem	4.5 and over, not thicker than the stem	4.5 and over, not thicker than the stem
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		85 to 95 up to 0 °C	80 to 90 up to 90 °C	45 to 55 up to 0 °C
	Length of graduation G mm		140 to 175	145 to 180	210 to 240
Ice point	Graduation range °C		-	-	-
	Distance from the lower end of bulb to the ice point H mm		-	-	-
Contraction chamber	Distance from the lower end of bulb to the lowest end of chamber I mm		-	-	-
	Distance from the lower end of bulb to the upper end of chamber J mm		-	-	-
	Shape		-	-	-
	Place of mercury at 0 °C		-	-	-
Stem enlargement	Diameter K mm		7.5 to 8.5	7.5 to 8.5	-
	Length L mm		2.5 to 5.0	2.5 to 5.0	-
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		64 to 66	64 to 66	-

Attached Table 1 Classification of thermometer (continued)

Classi- fication	Name		For low softening point	For high softening point	For melting point of paraffin
	Thermometer symbol		SP	SP	MP
	Thermometer number		33	34	35
Graduation range °C			− 2 to +80	30 to 200	38 to 82
Test temperature °C			—	—	—
Immersion A mm			Complete immersion	Complete immersion	79
Gradu- ation	Graduation interval °C		0.2	0.5	0.1
	Long graduation mark °C		Every 1	Every 1 and 5	Every 0.5
	Graduation digit °C		Every 2	Every 5	Every 1
	Max. tolerance of gradu- ation °C		0.2	0.3	0.1
Expansion chamber	Allowable heating temper- ature of thermometer °C		130	250	100
Top shape			Round stop or annular	Round stop or annular	Round stop
Overall length B mm			390 to 400	390 to 400	370 to 380
Diameter C mm			6.0 to 8.0	6.0 to 8.0	6.0 to 8.0
Bulb	Length D mm		9 to 14	9 to 14	18 to 28
	Diameter E mm		4.5 to 5.5	4.5 to 5.5	5.0 to 6.0
Position of graduation	Distance from the lower end of bulb to the specified graduation mark F mm		75 to 90 up to 0 °C	75 to 90 up to 30 °C	115 to 125 up to 40 °C
	Length of graduation G mm		245 to 285	245 to 280	210 to 240
Ice point	Graduation range °C		—	—	—
	Distance from the lower end of bulb to the ice point H mm		—	—	—
Contraction chamber	Distance from the lower end of bulb to the lowest end of chamber I mm		—	—	—
	Distance from the lower end of bulb to the upper end of chamber J mm		—	—	41 max.
	Shape		—	—	—
	Place of mercury at 0 °C		—	—	—
Stem en- largement	Diameter K mm		—	—	—
	Length L mm		—	—	—
	Distance from the lower end of bulb to the lower end of stem enlargement M mm		—	—	—