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**HYDROMETERS,
 THERMOMETERS,
 & ACCESSORIES**

**BULLETIN 61
 (08-19)**

HYDROMETERS & THERMOMETERS TO ASTM E-100 STANDARDS

API GRAVITY RANGE	W/THERMOMETER	LENGTH (MM)	ASTM NO.	GTP NO.
29-41	0-150° F	380	54HL	GTP-1680
♦ 37-49	0-102° F	405	255HL	GTP-9155GB
39-51	NO	335	5H	GTP-1676
39-51	0-150° F	380	55HL	GTP-915GB
49-61	0-150° F	380	56HL	GTP-1681
59-71	0-150° F	380	57HL	GTP-1682GB
♦ 64-76	0-102° F	405	258H	GTP-9185GB
69-81	0-150° F	380	58HL	GTP-1683G

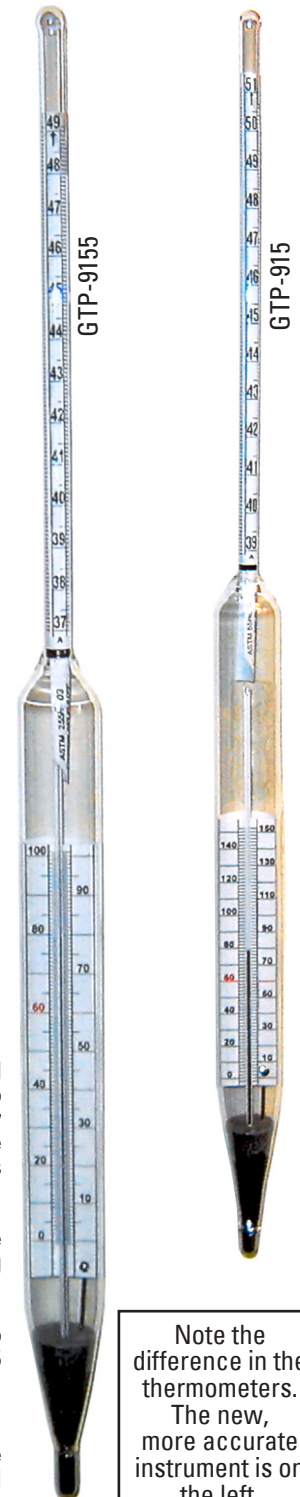
METRIC DENSITY RANGE

650/700 kg/m ³	NO	330	312H	GTP-1855
650/700 kg/m ³	-20 to +65° C	380	301HL	GTP-1875
650/700 kg/m ³	-35 to +50° C	380	—	GTP-1875-1
★ 700/750 kg/m ³	NO	335	313H	GTP-1856
700/750 kg/m ³	-20 to +65° C	380	302HL	GTP-1876
700/750 kg/m ³	-35 to +50° C	380	—	GTP-1876-1
★ 750/800 kg/m ³	NO	335	314H	GTP-1857
750/800 kg/m ³	0-150° F	385	—	GTP-1690
750/800 kg/m ³	-20 to +65° C	380	303HL	GTP-1877
750/800 kg/m ³	-35 to +50° C	380	—	GTP-1877-1
● 760/825 kg/m ³	NO	335	314H/315H	GTP-5904-1
● 760/825 kg/m ³	-20 to +65° C	380	303HL/304HL	GTP-5909-1
◆★ 775/825 kg/m ³	NO	335	321H	GTP-5904
● 775/825 kg/m ³	-20 to +65° C	380	303HL/304HL	GTP-5909
◆■ 775/825 kg/m ³	-10 to +40° C	395	345H	GTP-5909-2
★ 800/850 kg/m ³	NO	330	315H	GTP-1858
800/850 kg/m ³	0-150° F	380	—	GTP-1691
800/850 kg/m ³	-20 to +65° C	380	304HL	GTP-1878GB
800/850 kg/m ³	-35 to +50° C	380	—	GTP-1878-1
850/900 kg/m ³	-20 to +65° C	380	305HL	GTP-1879

★ These hydrometers comply with BS 718-1991 L50 specifications.

These marks (♦, ■, ●) may help you to select the hydrometers you should order. Hydrometers and thermohydrometers marked with these symbols have special ranges that avoid the need to purchase two instruments to cover the range for aviation fuels. ASTM has assigned special numbers and has officially approved them. For example, most jet fuels have an API gravity range that requires ASTM 5H but there are some fuels that need ASTM 4H to reach 37° API. So the new ASTM 11H, with a range of 37-49°, covers all jet fuels. ASTM 12H covers Avgas. Each symbol also indicates additional qualities as described below:

- ♦ ASTM has also approved thermohydrometers having these special ranges but instead of the thermometers being graduated in 2°F increments, they are graduated in 0.5°F increments, giving them the same resolution as ASTM thermometer ASTM 12F.
- For metric density, ASTM 321H covers the range from 775 to 825 kg/m³, avoiding the need to purchase two hydrometers, ASTM 314H & 315H. Likewise, for a thermohydrometer, ASTM 345 handles the range from 775 to 825 kg/m³ but its thermometer is graduated in 0.2°C increments. Unfortunately, the temperature range had to be limited to -10 to +40°C.
- For extremely hot climates, we offer instruments with a density range down to 760 kg/m³ but these do not carry official ASTM designations. Instead, they are marked as a combination of 314H/315H and 303HL/304HL.



Note the difference in the thermometers. The new, more accurate instrument is on the left.

SPECIAL HYDROMETERS AND THERMOMETERS FOR USE IN CLOSED CIRCUIT SAMPLERS, SUCH AS ALJAC BRAND

These hydrometers and thermometers have been shortened so they will fit in Aljac samplers when the lid is closed. Graduated spacings remain the same as ASTM instruments but the ranges have been shortened in some cases.

GTP-5904-2	Hydrometer, metric. 760-825 kg/m ³ , graduated in 0.5 kg/m ³ increments
GTP-3312-1	Thermometer, -20 to +60° C, graduated in 0.2° C increments

POUNDS PER U.S. GALLON HYDROMETERS

	<u>RANGE, LBS./GAL.</u>	<u>MODEL NO.</u>
Graduated to 0.01, 320mm length	5.70-6.95	GTP-1695-1
	6.5-7.1	GTP-1697-2

NOTE: Model GTP-1695-1 covers jet fuel and Avgas. GTP-1697-2 covers only jet fuel. No thermometers are included.

NON-MERCURY THERMOMETERS AND THERMOHYDROMETERS

For customers who prefer **non-mercury thermohydrometers**, add a suffix "B" to the part number for any instrument listed on the front page of this bulletin.

SELECTING HYDROMETERS FOR YOUR FUEL

	<u>API GRAVITY</u>	<u>RELATIVE DENSITY</u>	<u>METRIC DENSITY</u>	<u>LBS PER U.S. GALLON</u>
Diesel/No. 2 Fuel Oil	25-40	0.82-0.90	825-904	6.87-7.53
Jet A - Jet A1	37-50	0.78-0.84	779-839	6.49-6.99
JP-4 - Jet B	43-64	0.72-0.81	724-810	6.03-6.75
Avgas - Motor Gasoline	64-76	0.68-0.72	682-724	5.68-6.03

CERTIFIED HYDROMETERS AND THERMOMETERS

Any of the hydrometers in this brochure may be furnished with a NIST Traceable Certificate of Calibration at extra cost, upon request. This certificate shows actual data at three test points as required by ASTM E-100 (for hydrometers) or the test points required by ASTM E-1 (for thermometers). Actual readings are resolved to 1/10 of the smallest scale division. The test methods and NIST standards that are used, as well as uncertainties of measurement and all other necessary data to maintain full traceability are provided.

This calibration is performed by an independent calibration laboratory which is accredited to the international standard ISO/IEC Guide 25. Copies of the laboratory's ISO Guide 25 Accreditation are available upon request for your qualified vendor files. To order this certificate, add the suffix "C" to our GTP number. There is an additional charge for this service.

CALCULATORS

API Gravity and Metric Density

These circular calculators eliminate the need for books of tables for making gravity or density corrections to standard temperature. Easy to use and very fast - about half a minute. See Bulletin 100.

CORRECTION TABLES

(Formerly called reduction tables)

Tables for correcting measured gravity and density readings to a standard temperature were changed in 1980 to provide greater accuracy. The project took about 7 years and was based on US National Bureau of Standards data now known as NIST. The preparation was jointly done by ASTM, API, and the IP. Unfortunately, these new tables are available only in rather expensive books that include volume correction tables. These books are available from ASTM headquarters but we maintain a small stock and can supply them at a nominally higher price to cover our handling costs. There are 2 tables that we can provide, as follows:

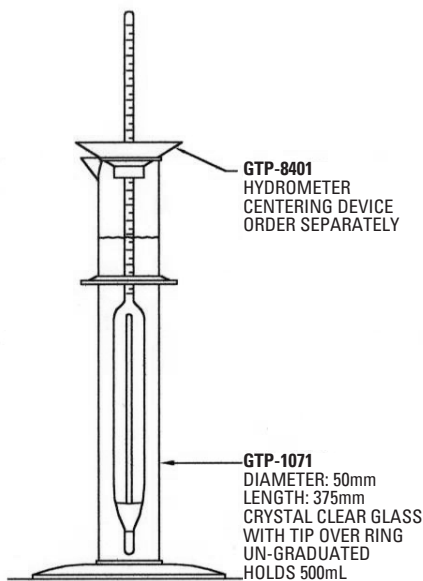
1. **Table 5B (Order Part No. TL-2457)** corrects measured API gravity to the standard temperature of 60°F. (Table 5B replaces Table 5.) Table 5B is a book 7/8" thick and includes Table 6B which is used to correct volume to 60°F against API gravity at 60°F.
2. **Table 53B (Order Part No. TL-2459)** corrects measured Metric Density to the standard temperature of 15°C. The new units of "Density" are kg/m³. (Table 53B replaces Table 53.) Table 53B is in a book 1 3/16" thick and includes Table 54B, which is used to correct volume to 15°C against Density at 15°C.

HYDROMETER CYLINDERS & ACCESSORIES

GLASS HYDROMETER CYLINDERS

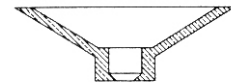
(also known as jars)

Model GTP-1073A Non-breakable plastic. Take reading at top of jar - no need to see through the plastic. Overflow collector at top prevents spilling as hydrometer settles.



Shown with plastic tip-over ring to protect the glass (included). Centering device and hydrometer not included.

COLRUD HYDROMETER CENTERING DEVICE GTP-8401



SECTION

Eliminates errors caused by the hydrometer adhering to the side of the hydrometer jar. Loosely self-centering, this device dramatically reduces the time needed to obtain accurate readings, especially in outdoor conditions and for inexperienced personnel. Developed with Dave Colrud, an Alaskan fuel Q.C. expert for use in all conditions. Tested by a top laboratory to confirm that it causes no error. Precision machined, fuel resistant, high-density plastic.

ASTM THERMOMETERS

Certified to ASTM E-1 Specifications

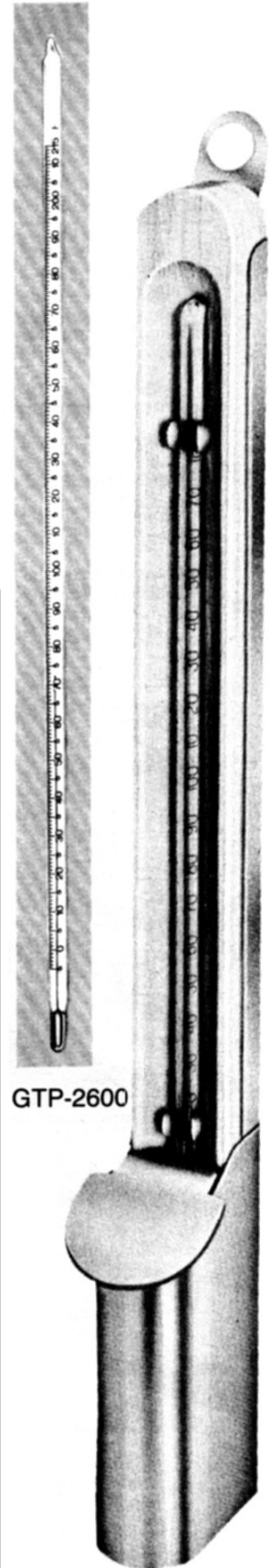
(non-mercury thermometers have suffix "SB" and are in stock)

For tank level gauging:	GTP-1670	ASTM 58F	-30 to +120°F	mercury
	GTP-1670B	ASTM S58F	-30 to +120°F	non-mercury
	GTP-1671	ASTM 58C	-34 to +49°C	mercury
	GTP-1671B		-34 to +49°C	non-mercury

For density or gravity:	GTP-2600	ASTM 12F	-5 to +215°F	mercury
	GTP-2600B	ASTM S12F	-5 to +215°F	non-mercury
	GTP-3312G	ASTM 12C	-20 to +102°C	mercury
	GTP-3312B	ASTM S12C	-20 to +102°C	non-mercury

Thermometer holder with cup and lid, equipped with metal backing to dissipate static charges through wire cable. Cable not supplied; order separately, specifying length. Lid of cup is hinged to open as it is lowered into fuel.

GTP-2126 Assembly: holder with ASTM thermometer 58F
GTP-2127 Assembly: holder with ASTM thermometer 58C



GTP-2600

GTP-2126

Rejoining Mercury and Oil Separations in Thermometers



PLEASE UNDERSTAND - A separation of mercury in your thermometer is not a defect! It is a condition, normally caused by shock in transit, which of course must be rectified before using the thermometer, or you will experience significant errors in your readings.

There are two methods that you can use. The best way is by cooling. The more difficult way is by using heat. The object of both methods is to get the broken pieces of mercury into a chamber where they can rejoin. The bulb at the bottom is large enough to hold all of the mercury in the capillary when it is cooled in dry ice. If there are pieces of mercury left in the capillary after cooling, carefully tap it vertically on a padded surface. Allow the thermometer to warm naturally (do not heat it) in a vertical position, and observe the mercury column as it ascends into the capillary to be certain it is intact.

If dry ice is not available, you must use heat. Thermometers and thermohydrometers that are offered by Gammon Technical are made with an "expansion chamber" at the top of the capillary tube. The purpose of this chamber is to provide over-range protection in case the thermometer is heated beyond its scale range. This chamber may be used to rejoin separations provided that the amount of separated mercury is very small (not more than a few scale divisions in length). The thermometer should be heated in water that is warmed only slightly higher than its maximum reading. The objective is to apply **only enough heat** to urge the broken pieces of mercury into the expansion chamber, followed by a small portion of the main (intact) column. **DO NOT USE FLAME!** Great care must be taken to not fill the expansion chamber more than halfway, because the developed pressure can break the glass. Remove the thermometer from the heat, maintain it in a vertical position, and observe the mercury column as it retreats into the capillary to be sure it is intact.