

ICS 75.080
CCS E 30



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 2013-2010

**Standard test method for density of liquid petrochemical
products**

(English Translation)

Issued on: January 10, 2011

Implemented on: May 1, 2011

**Issued by: General Administration of Quality Supervision, Inspection and
Quarantine of the PRC**

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1 Scope

1.1

This Standard specifies three test methods for the determination of density of liquid petrochemical products using hydrometer, U-shaped vibrating tube, and pycnometer.

1.2

Test method A - Hydrometer method

This method is suitable for determining the density of a flowable transparent liquid. For a viscous liquid which does not flow easily, a constant-temperature bath can be used to measure the density above room temperature. The method can also be used for density measurement of opaque liquids; but the reading method is different from that of transparent liquids.

1.3

Test method B - U-shaped vibrating tube method

This method is applicable to petrochemical products which may be treated as single-phase liquids at test temperature and test pressure. This method is applicable to any vapor-pressure liquid; but appropriate measures shall be taken, to ensure that the sample is always single-phase during treatment and measurement, with no loss of light components and changes in composition and density.

1.4

Test method C - Pycnometer method

This method is applicable to the density measurement of petrochemical products which may be treated as liquids at the test temperature and test pressure. The capillary plug pycnometer is not suitable for liquids with an initial boiling point below 40 °C. The graduated double-capillary pycnometer is suitable for the accurate measurement of the density of all liquid petrochemical products except for more viscous products, especially for liquids with only a small amount of sample; but limited to liquids with a kinematic viscosity not exceeding 50 mm²/s at the test temperature.

Note: The unit is kilograms per cubic meter (kg/m³) or grams per cubic centimeter (g/cm³).

3.4 Density temperature factor; gamma

The change in liquid density for each change (rise or decrease) of temperature of 1 °C.

Note: The unit is kg/(m³ · °C).

4 Sampling

SAMPLE according to the method specified in the product standard. When there is no requirement in the product standard, samples are taken according to the provisions of GB/T 4756 and GB/T 6680.

5.1 Method summary

PLACE the sample at a specified temperature and pour it into a density metering cylinder with approximately the same temperature. PLACE the appropriate hydrometer into the temperature-adjusted sample and let it stand still. When the temperature reaches equilibrium, read the hydrometer reading and sample temperature and convert the density or standard density as needed.

If necessary, the density metering cylinder containing the sample can be placed in a constant-temperature bath, to avoid excessive temperature fluctuations during the measurement.

5.2.1 Sample preparation

MIX the sample so that the loss of light components of the sample is minimized and the sample integrity is maintained.

5.2.1.1 Volatile petrochemical products

To reduce light component losses, the sample shall be mixed in the original container and the closed system.

Note: Mixing volatile samples in open containers will result in loss of light components and will affect the measured density values.

5.4 Apparatus verification

5.4.1

The hydrometer shall be periodically verified using a standard hydrometer traceable to national standards or the density of traceable reference materials and re-verified at least once every five years.

5.4.2

The thermometer shall be periodically verified using a standard thermometer traceable to national standards.

5.5.1 CHECK the hydrometer's reference point to determine if the hydrometer

scale is in the correct position in the main. If the scale has moved, it shall discard the hydrometer.

5.5.2 The temperature of the density metering cylinder and hydrometer is brought close to the sample temperature.

5.6.1 At the test temperature, transfer the sample to a temperature-stable and

clean density metering cylinder, to prevent the sample from splashing and generating bubbles and to reduce the volatilization of light components.

5.6.2 USE a clean piece of filter paper to remove all bubbles formed on the sample surface.

5.6.3 PLACE the cylinder containing the sample vertically in a place where there

is no air flow. Throughout the test, the ambient temperature change shall not exceed 2 °C. When the ambient temperature changes by more than ± 2 °C, a constant-temperature bath shall be used, to avoid too much temperature change.

5.6.4 USE a suitable thermometer or stir bar for vertical rotation to stir the sample, to achieve uniform sample density and temperature throughout the cylinder. RECORD the temperature to the nearest 0.1 °C. REMOVE the thermometer or stir bar from the density metering cylinder.

5.6.5 PUT an appropriate hydrometer into the liquid; when reaching the

equilibrium position, let it go; LET the hydrometer float freely; TAKE care to avoid wetting the main above the liquid level. PRESS the hydrometer 1 mm or

2 mm below the equilibrium point and return it to the equilibrium position, to observe the

meniscus shape. If the meniscus shape changes, it shall clean the hydrometer main and repeat this operation, until the meniscus shape remains the same.

Note 3: When the temperature of the sample tube of vibrating tube hydrometer is lower than the dew point temperature of ambient air, moisture will condense on the sample tube sensor and electronic components; the surrounding air shall be kept dry.

6.2.2 Circulating constant-temperature bath: If a constant-temperature bath is required, it shall be able to maintain the temperature of the circulating liquid within ± 0.05 °C of the required temperature.

6.2.3 Temperature sensor: After calibration, it shall be able to measure the temperature of the sample tube, accurate to at least ± 0.10 °C. The rate of energy transfer through the sample tube is very low. Therefore, in order to minimize heat transfer along the wire into and out of the sample tube, care shall be taken to use a sensor with a very thin wire.

6.2.4 Homogenizer: Suitable for sample and sample containers. It can make samples uniform; available in high-speed shears, static mixers, and other suitable forms.

6.3 Reagents

6.3.1

Unless otherwise specified, analytically pure reagents are allowed only.

6.3.2 Cleaning solvent

Any solvent can be used as long as a clean and dry sample tube can be obtained.

6.3.3 Ammonium persulfate

Prepare into 8 g/L sulfuric acid solution.

Warning: Ammonium persulfate is a strong oxidant.

6.3.4 Calibration liquid

At least two calibration solutions are required to calibrate the sample tube. The density of the selected calibration solution shall be within the density range of the test sample. The density of the calibration solution shall be traceable to national standards or adopt internationally-recognized values.

When using water and air, it shall meet the requirements of 6.3.4.1 and 6.3.4.2.

6.3.4.1 Water

It shall meet the requirements of Grade 2 or higher grade of GB/T 6682.

required test temperature. Otherwise, connect a constant-temperature bath, to keep the