

# **Manual of Petroleum Measurement Standards Chapter 7—Temperature Determination**

## **Section 2—Portable Electronic Thermometers**

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This standard, API *MPMS* Chapter 7.2, Third Edition, supersedes the following sections of API *MPMS* Chapter 7, *Temperature Determination*, First Edition (2001), which has been withdrawn:

5.2—Portable Electronic Thermometers (PETs)

5.4—Electronic Temperature Devices

5.5—Thermowells

5.6—Data Collection, Data Transmission, and Receiving Equipment

6.1—Ambient Temperature

6.4—Portable Electronic Thermometers

8.2—Portable Electronic Thermometers (PETs)

API *MPMS* Chapter 7.1, *Temperature Determination—Liquid-in-Glass Thermometers*, Second Edition (2017) superseded the following sections of API *MPMS* Chapter 7, First Edition (2001), which has been withdrawn:

5.3—Glass Thermometers

5.5—Thermowells

5.6—Data Collection, Data Transmission, and Receiving Equipment

6.1—Ambient Temperature

6.5—Mercury-in-Glass Thermometers

8.3—Glass and Mercury-in-Glass Thermometer Verification

API MPMS Chapter 7.3, *Temperature Determination—Fixed Automatic Tank Temperature Systems*, Second Edition (2011) superseded the following sections of API MPMS Chapter 7, First Edition (2001), which has been withdrawn:

5.1—Fixed Automatic Tank Thermometers (ATTs)

5.5—Thermowells

5.6—Data Collection, Data Transmission, and Receiving Equipment

6.1—Ambient Temperature

6.3—Fixed Automatic Tank Thermometers

8.1—Fixed Automatic Tank Thermometers (ATTs)

9.1—Fixed Automatic Tank Thermometers

API MPMS Chapter 7.4, *Temperature Determination—Dynamic Temperature Measurement*, Second Edition (2018) superseded the following sections of API MPMS Chapter 7, First Edition (2001), which has been withdrawn:

5.5—Thermowells

5.6—Data Collection, Data Transmission, and Receiving Equipment

7—Dynamic Temperature Measurement

8.4—Dynamic Verification and Calibration

9.2—Dynamic Temperature Equipment

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, NW, Washington, DC 20001, [standards@api.org](mailto:standards@api.org).

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## Introduction

The purpose of this standard is to describe methods and practices that may be used to obtain accurate temperature measurements of petroleum and petroleum products in storage tanks, ships, and barges under static conditions by the use of a portable electronic thermometer (PET). The use of PETs for dynamic measurement applications is primarily covered in API *MPMS* Ch. 7.4; however, guidance is provided in this standard on the device itself, including practices to ensure accuracy.

Previous versions of this standard described various temperature methods and apparatuses. They did not give much guidance on specific applications or methods of verification and certification, and were oriented toward crude oil. This version will include guidance on calibration, verification, and certification of equipment used in liquid petroleum products, refinery feedstocks, and renewable fuel products. Annex A is reference material for the user that synthesizes the methods described in this standard.

Temperature has a significant impact on the volumetric determination of liquid quantities when correcting observed volume to volume at standard conditions. As a result, the most accurate means for temperature determination should be used. For custody transfer, the means of temperature determination should be agreed among the parties involved.

# Temperature Determination—Portable Electronic Thermometers

## 1 Scope

This chapter describes the methods, equipment, and procedures for manually determining the temperature of liquid petroleum and petroleum products by use of a portable electronic thermometer (PET).

This chapter discusses temperature measurement requirements in general for custody transfer, inventory control, and marine measurements. The actual method and equipment selected for temperature determination are left to the agreement of the parties involved.

The manual method covers:

- nonpressurized tanks and nonpressurized marine vessel;
- gas-blanketed tanks and gas-blanketed marine vessels.

It does not cover hydrocarbons under pressures in excess of 21 kPa (3 psi gauge) or cryogenic temperature measurement unless the tank is equipped with a thermowell.

The requirements of this chapter are based on practices for crude oils and petroleum products covered by API *MPMS* Ch. 11.1 (ASTM D1250). Requirements in this chapter may be used for other fluids and other applications. However, other applications may require different performance and installation specifications.

## 2 Normative References

### API

*Manual of Petroleum Measurement Standards*

Chapter 1, *Terms and Definitions*

Chapter 3, *Tank Gauging* (all sections)

Recommended Practice 500, *Recommended Practice for Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1, and Division 2*

Recommended Practice 2003, *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*

Recommended Practice 3000, *Classifying and Loading of Crude Oil into Rail Tank Cars*

### ASTM

E2877, *Standard Guide for Digital Contact Thermometers*

E77, *Standard Test Method for Inspection and Verification of Thermometers*

E344, *Terminology Relating to Thermometry and Hydrometry*