Manual of Petroleum Measurement Standards Chapter 7.3

Temperature Determination—Fixed Automatic Tank Temperature Systems

SECOND EDITION, OCTOBER 2011

REAFFIRMED, DECEMBER 2016

energy API

AMERICAN PETROLEUM INSTITUTE

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Measurement Coordination

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Foreword

This foreword is for information and is not part of this standard. This standard discusses equipment, methods and procedures for determining the temperature of hydrocarbon liquids using fixed automatic tank temperature systems.

The below listed sections are removed from API *MPMS* Chapter 7, “Temperature Determination”, 1st edition 2001 and are covered by this publication of API *MPMS* Chapter 7.3 “Temperature Determination-Fixed Automatic Tank Temperature Systems”, 2nd edition, 2011.

— 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

Revision of API *MPMS* Chapter 7-2001 is ongoing. The revision of API *MPMS* Chapter 7 will divide the current standard into four separate standards. It is anticipated that these four standards, including API *MPMS* Chapter 7.3-2011 referenced above, will supersede the sections of API *MPMS* Chapter 7-2001 as follows.

API *MPMS* Chapter 7, “Temperature Determination”, 1st edition 2001, sections:

— 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

to be covered by API *MPMS* Chapter 7.1, 2nd Edition, 'Liquid-in-Glass Thermometers”.

API *MPMS* Chapter 7, “Temperature Determination”, 1st edition 2001, sections:

— 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)

to be covered by API *MPMS* Chapter 7.2, 3rd Edition, “Portable Electronic Thermometers (PETs)”.

API *MPMS* Chapter 7, “Temperature Determination”, 1st edition 2001, sections:

— 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

to be covered by API *MPMS* Chapter 7.4, 2nd Edition, “Dynamic Temperature Measurement”.

For the purposes of business transactions, limits on error or measurement tolerance are usually set by law, regulation, or mutual agreement between contracting parties. This publication provides guidance on tolerances that are recommended for custody transfer applications, and also describes methods by which acceptable approaches to any desired accuracy can be achieved.

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Shall: As used in a standard, “shall” denotes a minimum requirement in order to conform to the specification.

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Suggested revisions are invited and should be submitted to the Standards Department, API, 1220 L Street, NW, Washington, DC 20005, standards@api.org.

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Introduction

The purpose of this standard is to describe methods and practices that can 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 an automatic method.

Temperature has a significant effect on the accurate determination of liquid quantities when correcting to standard conditions for custody transfer and inventory control purposes. A temperature of the liquid in the tank is used in these applications, so it is imperative that temperatures be determined accurately and are representative of the tank content.

This standard presents both Metric (SI) and US Customary units, and can be implemented in either system of units. The presentations of both units are for convenience of the user, and are not necessarily exact conversions. The units of implementation are typically determined by contract, regulatory requirement, the manufacturer, or the user's calibration program.

In cases where marine applications have different requirements, they are handled in separate subsections.

Temperature Determination—Fixed Automatic Tank Temperature Systems

1 Scope

This standard describes the methods, equipment, and procedures for determining the temperature of petroleum and petroleum products under static conditions by the use of an automatic method. Automatic temperature measurement is discussed for custody transfer and inventory control for both onshore and marine measurement applications.

Temperatures of hydrocarbon liquids under static conditions can be determined by measuring the temperature of the liquid at specific locations. Examples of where static temperature determination is required include storage tanks, ships and barges.

The application of this standard is restricted to automatic methods for the determination of temperature using fixed automatic tank thermometer (ATT) systems for hydrocarbons having a Reid Vapor Pressure at or below 101.325 kPa (14.696 psia).

Although not included in the scope, requirements in this standard or other Chapter 7 Sections (see the Foreword) can be used for other fluids and other applications including petroleum liquids having Reid vapor pressures in excess of 101.325 kPa (14.696 psia) tanks with inert gas systems and cryogenic liquids. However, such applications can require different performance and installation specifications.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API *MPMS* Chapter 12.1.1, *Calculation of Static Petroleum Quantities,* Part 1—*Upright Cylindrical Tanks and Marine Vessels*

3 Terms, Definitions, and Acronyms

For the purposes of this document, the following definitions apply.

3.1 Terms and Definitions

Terms used in this chapter are defined as follows:

3.1.1
automatic tank thermometer
ATT
An instrument used to continuously generate and transmit a representative measure of the temperature of the contents of any tank, bullet, vessel, or compartment by any means other than by the manual use of a thermometer or Portable Electronic Thermometer (PET). ATTs may include a local temperature display.

3.1.1.1
spot ATT
single-point ATT
A temperature instrument that measures the temperature at a particular point in the tank where the spot temperature sensor is located.