Chapter 2.2B  
Calibration of Upright Cylindrical Tanks Using the Optical Reference Line Method  
(includes Addendum 1 dated October 2019)  
Describes measurement and calculation procedures for determining the diameters of upright, welded (lap/butt) cylindrical tanks, or vertical cylindrical tanks, with a smooth outside surface and either floating or fixed roofs. The optical reference line method is an alternative to the manual tank strapping method for determining tank diameter. Ch. 2.2B should be used in conjunction with Ch. 2.2A. Pages: 8  
1st Edition | March 1989 | Reaffirmed: March 2019  
Product Number: H30023 | Price: $90.00

Chapter 2.2C/ISO 7507-3:1993  
Calibration of Upright Cylindrical Tanks Using the Optical-Triangulation Method  
(ANSI/API MPMS Ch. 2.2C-2002)  
Describes the calibration of vertical cylindrical tanks by means of optical triangulation using theodolites. The method is an alternative to other methods such as strapping (Ch. 2.2A) and the optical-reference-line method (Ch. 2.2B).  
This edition of Ch. 2.2C is the modified national adoption of ISO 7507-3:1993. Pages: 19  
1st Edition | January 2002 | Reaffirmed: September 2018  
Product Number: H022C1 | Price: $90.00

Chapter 2.2D/ISO 7507-4:1995  
Calibration of Upright Cylindrical Tanks Using the Internal Electro-Optical Distance Ranging Method  
(ANSI/API MPMS Ch. 2.2D-2003)  
Specifies a method for the calibration of upright cylindrical tanks having diameters greater than 5 m by means of internal measurements using an electro-optical distance-ranging instrument, and for the subsequent compilation of tank capacity tables.  
This edition of Ch. 2.2D is the modified national adoption of ISO 7507-4:1995. Pages: 13  
Product Number: H022D1 | Price: $90.00

Chapter 2.2E/ISO 12917-1:2002  
(includes Errata 1 dated November 2009)  
(ANSI/API MPMS Ch. 2.2E)  
Specifies manual methods for the calibration of nominally horizontal cylindrical tanks, installed at a fixed location. It is applicable to horizontal tanks up to 4 m (13 ft) in diameter and 30 m (100 ft) in length. The methods are applicable to insulated and non-insulated tanks, either when they are above-ground or underground. The methods are applicable to pressurized tanks, and to both knuckle-dish-end and flat-end cylindrical tanks as well as elliptical and spherical head tanks. This chapter is applicable to tanks inclined by up to 10 % from the horizontal provided a correction is applied for the measured tilt. For tanks over and above these dimensions and angle of tilt, appropriate corrections for tilt and appropriate volume computations should be based on the “Corrs” equation.  
This edition of Ch. 2.2E is the national adoption of ISO 12917-1:2002. Pages: 18  
Product Number: H202E01 | Price: $96.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersede the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Chapter 2.2F/ISO 12917-2:2002
Petroleum and Liquid Petroleum Products—Calibration of Horizontal Cylindrical Tanks—Part 2: Internal Electro-Optical Distance-Ranging Method
(ANSI/API MPMS Ch. 2.2F)

This edition of Ch. 2.2F is the national adoption of ISO 12917-2:2002. Pages: 14
1st Edition | April 2004 | Reaffirmed: September 2014
Product Number: H202F01 | Price: $83.00

Chapter 2.2G
Calibration of Upright Cylindrical Tanks Using the Total Station Reference Line Method

Describes measurement and calculation procedures for determining the diameters of upright cylindrical tanks by taking vertical offset measurements externally using electro-optical distance ranging equipment rather than conventional ORLM plummet/trolley equipment. This standard is an alternate standard to Ch. 2.2B. This standard is used in conjunction with Ch. 2.2A. Calibration of insulated tanks is covered by Ch. 2.2D. Abnormally deformed tanks that are dent ed or have other visible signs of damage are not covered by this standard. Pages: 14

Std 2552
Measurement and Calibration of Spheres and Spheroids

Describes the procedures for calibrating spheres and spheroids, which are used as liquid containers. It outlines the procedures for the measurement and calibration of spherical tanks. Pages: 17
1st Edition | October 1966 | Reaffirmed: August 2018
Product Number: H25520 | Price: $105.00

Std 2554
Measurement and Calibration of Tank Cars

Describes the procedures for calibrating tank cars. It outlines procedures for nonpressure-type tank cars and pressure-type tank cars. Pages: 41
2-Year Extension: December 2017
Product Number: H25540 | Price: $124.00

Std 2555
Liquid Calibration of Tanks

Describes the procedure for calibrating tanks, or portions of tanks, larger than a barrel or drum by introducing or withdrawing measured quantities of liquid. Pages: 14
1st Edition | September 1966 | Reaffirmed: May 2014
Product Number: H25550 | Price: $105.00

RP 2556
Correcting Gauge Tables for Incrustation

Incrustation is defined in this document as any material that adheres to the internal vertical sidewall surfaces of a tank when the tank is otherwise empty. The tables given in this recommended practice show the percent of error of measurement caused by varying thicknesses of uniform incrustation in tanks of various sizes. Pages: 3
2nd Edition | August 1993 | Reaffirmed: November 2013
Product Number: H25560 | Price: $82.00

Chapter 2.7
Calibration of Barge Tanks

Describes three methods for determining the total incremental volumes of liquids in barge tanks for coastal and inland waterway service that have integral hull tanks. The three methods are as follows.
· Liquids calibration.
· Calibration by linear measurement.
· Calibration from vessel drawings.
This document and Ch. 2.8A supersede the previous Std 2553. A joint API/Energy Institute (EI) standard, it also carries the EI designation Hydrocarbon Management, HM2 Section 5A. Pages: 25
Product Number: H30044 | Price: $65.00

Chapter 2.8A
Calibration of Tanks on Ships and Oceangoing Barges

Three methods for determining the total and incremental volumes of liquids in tanks, oceangoing barges, and integrated tug barge units that have integral hull tanks. The three methods include liquid calibration, calibration by linear measurement, and calibration from vessel drawings. This document and Ch. 2.7 supersede the previous Std 2553. A joint API/Energy Institute (EI) standard, it also carries the EI designation Hydrocarbon Management, HM2 Section 5B. Pages: 22
1st Edition | March 1991 | Reaffirmed: March 2018
Product Number: H30049 | Price: $97.00

Chapter 2.8B
Recommended Practice for the Establishment of the Location of the Reference Gauge Point and the Gauge Height of Tanks on Marine Tank Vessels

Recommended practice, for use in conjunction with Ch. 2.7 and Ch. 2.8A. Establishes reference gauge heights during calibration of marine tank vessels. A reference gauge point is necessary for converting ullage to inventory, and when determining the volume of the quantities remaining on board. A reference gauge point is also used for wedge formulas and establishing wedge tables. Pages: 26
Product Number: H028B1 | Price: $105.00

Chapter 3
Tank Gauging

Standardized procedures for gauging liquid hydrocarbons in various types of tanks, containers, and carriers.

Chapter 3.1A
Standard Practice for the Manual Gauging of Petroleum and Petroleum Products

Describes the following:
· the procedures for manually gauging the liquid level of petroleum and petroleum products in non-pressure fixed-roof, floating-roof tanks and marine tank vessels,
· procedures for manually gauging the level of free water that may be found with the petroleum or petroleum products,
· methods used to verify the length of gauge taps under field conditions and the influence of bob weights and temperature on the gauge tape length, and
· the influences that may affect the position of gauging reference point (either the datum plate or the reference gauge point).
Throughout this standard the term petroleum is used to denote petroleum, petroleum products, or the liquids normally associated with the petroleum industry. The methods used to determine the volume of tank contents determined from gauge readings is not covered in this standard. The determination of temperature, API gravity, and suspended sediment and water of the tank contents are not within the scope of this standard. Pages: 31
3rd Edition | August 2013 | Reaffirmed: December 2018
Product Number: H301A03 | Price: $109.00
Chapter 3.1A *
Spanish translation of Ch. 3.1A.
3rd Edition | August 2013 | Product Number: H301A03S | Price: $109.00

Chapter 3.1B
Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Tanks by Automatic Tank Gauging
Covers level measurement of liquid hydrocarbons in stationary, aboveground, atmospheric storage tanks using automatic tank gauges (ATGs). The standard discusses automatic tank gauging in general, accuracy, installation, commissioning, calibration, and verification of ATGs that measure either innate or ullage. It covers both intrusive and nonintrusive ATGs used for either custody transfer or inventory control. The standard also covers the requirements for data collection, transmission, and receiving. Pages: 28
3rd Edition | April 2018 | Product Number: H301B3 | Price: $112.00

Chapter 3.2
Standard Practice for Gauging Petroleum and Petroleum Products in Tank Cars
Provides method for measuring liquids and liquefied gases in tank cars by liquid level measurement. Measurement of both vapor space and liquid level are covered. Gauging and temperature measurement equipment used in both open and closed measurement systems are described in this standard. These procedures reduce variability in the results of measurement and sampling operations when comparing loading terminal data to unloading terminal data. Pages: 20
1st Edition | August 1995 | Reaffirmed: May 2013
Product Number: H03021 | Price: $105.00

Chapter 3.2 *
Standard Practice for Gauging Petroleum and Petroleum Products in Tank Cars—Spanish
Spanish translation of Ch. 3.2.
1st Edition | August 1995 | Product Number: H03021S | Price: $105.00

Chapter 3.3
Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Pressurized Storage Tanks by Automatic Tank Gauging
Provides guidance on the installation, calibration, and verification of automatic tank gauges used in custody transfer for measuring the level of liquid hydrocarbons having a Reid vapor pressure of 15 psia (103 kPa) or greater, stored in pressurized storage tanks. This standard also provides guidance on the requirements for data collection, transmission, and receiving. Pages: 10
1st Edition | June 1996 | Reaffirmed: March 2017
Product Number: H03031 | Price: $90.00

Chapter 3.3 *
Standard Practice for Level Measurement of Liquid Hydrocarbons in Stationary Pressurized Storage Tanks by Automatic Tank Gauging—Spanish
Spanish translation of Ch. 3.3.
1st Edition | June 1996 | Product Number: H030316 | Price: $90.00

Chapter 3.4
Standard Practice for Level Measurement of Liquid Hydrocarbons on Marine Vessels by Automatic Tank Gauging
Provides guidance on the selection, installation, calibration, and verification of automatic tank gauges for measuring the level of liquid hydrocarbons having a Reid vapor pressure less than 15 psia (103 kPa), transported aboard marine vessels (tankers and barges). This standard also provides guidance on the requirements for data collection, transmission, and receiving. This standard supersedes all applicable sections of Std 2545. Pages: 10
Product Number: H03041 | Price: $90.00

Chapter 3.4 *
Standard Practice for Level Measurement of Liquid Hydrocarbons on Marine Vessels by Automatic Tank Gauging—Spanish
Spanish translation of Ch. 3.4.
1st Edition | April 1995 | Product Number: H03041SP | Price: $90.00

Chapter 3.5
Standard Practice for Level Measurement of Light Hydrocarbon Liquids Onboard Marine Vessels by Automatic Tank Gauging
Covers the standard practice for level measurement of light hydrocarbon liquids onboard marine vessels by automatic tank gauges. This publication covers pressurized and refrigerated light hydrocarbon liquids. The light hydrocarbon liquids covered include: liquefied petroleum gas (LPG), natural gas liquid (NGL), and other petrochemical liquids where the storage and transportation requirements and the methods of measurement are similar to that for LPG and NGL gauging. This standard also covers the requirements for data collection, transmission, and receiving. Pages: 8
Product Number: H03051 | Price: $90.00

Chapter 3.5 *
Standard Practice for Level Measurement of Light Hydrocarbon Liquids Onboard Marine Vessels by Automatic Tank Gauging—Spanish
Spanish translation of Ch. 3.5.
1st Edition | March 1997 | Product Number: H03051S | Price: $90.00

Chapter 3.6
Measurement of Liquid Hydrocarbons by Hybrid Tank Measurement Systems
(includes Errata 1 dated September 2005)
Covers selection, installation, commissioning, calibration, and verification of hybrid tank measurement systems for the measurement of level, static mass, observed and standard volume, and observed and reference density in tanks storing petroleum and petroleum products for custody transfer and/or inventory control purposes. Pages: 26
1st Edition | February 2001 | Reaffirmed: January 2017
Product Number: H03061 | Price: $104.00

Chapter 4
Proving Systems
Serves as a guide for the design, installation, calibration, and operation of meter proving systems.

Chapter 4.1
Introduction
General introduction to the subject of proving. The requirements in Ch. 4 are based on customary practices that evolved for crude oils and products covered by Ch. 11.1. The prover and meter uncertainties should be appropriate for the measured fluids and should be agreeable to the parties involved. Pages: 4
3rd Edition | February 2005 | Reaffirmed: June 2014
Product Number: H04013 | Price: $89.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersede the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.

This publication is a new entry in this catalog. This publication is related to an API licensing, certification, or accreditation program.
Chapter 4.1 *
Introduction—Spanish
Spanish translation of Ch. 4.1.
3rd Edition | February 2005 | Product Number: H40101S | Price: $89.00

Chapter 4.2
Displacement Provers
(includes Addendum 1 dated February 2015)
Outlines the essential elements of provers that accumulate meter pulses as a displacing element within the prover travels between detector switches. It provides design and installation details for the types of displacement provers that are currently in use. The provers discussed are designed for proving measurement devices under dynamic operating conditions with single-phase liquid hydrocarbons. Pages: 45
Product Number: H04023 | Price: $134.00

Chapter 4.2 *
Displacement Provers—Russian
Russian translation of Chapter 4.2.
3rd Edition | September 2003
Product Number: H04023R | Price: $107.00

Chapter 4.4
Tank Provers
Specifies the characteristics of tank provers that are in general use and the procedures for their calibration. This standard does not apply to weir-type, vapor-condensing, dual-tank water-displacement, or gas-displacement provers. Pages: 11
Product Number: H04042 | Price: $90.00

Chapter 4.5
Master Meter Provers
Covers the use of displacement, turbine, Coriolis, and ultrasonic meters as master meters. The requirements in this standard are intended for single-phase liquid hydrocarbons. Meter proving requirements for other fluids should be appropriate for the overall custody transfer accuracy and should be agreeable to the parties involved. This document does not cover master meters to be used for the calibration of provers. For information concerning master meter calibration of provers, see Ch. 4.9.3. Pages: 24

Chapter 4.6
Pulse Interpolation
(includes Errata 1 dated April 2007)
Describes how the double-chronometry method of pulse interpolation, including system operating requirements and equipment testing, is applied to meter proving. Pages: 8
Product Number: H04082 | Price: $71.00

Chapter 4.7
Field Standard Test Measures
Details the essential elements of field standard test measures by providing descriptions, construction requirements, as well as inspection, handling, and calibration methods. Bottom-neck scale test measures and prover tanks are not addressed in this document. The scope of this standard is limited to the certification of “delivered volumes” of test measures. Pages: 19
3rd Edition | April 2009 | Reaffirmed: June 2014
Product Number: H40703 | Price: $94.00

Chapter 4.8
Operation of Proving Systems
Provides information for operating meter provers on single-phase liquid hydrocarbons. It is intended for use as a reference manual for operating proving systems. The requirements of this chapter are based on customary practices for single-phase liquids. This standard is primarily written for hydrocarbons, but much of the information in this chapter may be applicable to other liquids. Specific requirements for other liquids should be agreeable to the parties involved. Pages: 40
2nd Edition | September 2013 | 2-Year Extension: October 2018
Product Number: H40802 | Price: $136.00

Chapter 4.9.1
Methods of Calibration for Displacement and Volumetric Tank Provers, Part 1—Introduction to the Determination of the Volume of Displacement and Tank Provers
Provers are precision devices, defined as volumetric standards, which are used to verify the accuracy of liquid volumetric meters used for custody transfer measurement. Both displacement and tank provers are used to prove a meter in order to obtain its meter factor, which is then used to correct for meter error caused by differences between the metered volume and the true volume. The base volume of a displacement or tank prover, determined by calibration, is an essential requirement in the determination of these meter factors. The accuracy of a meter factor is limited by several considerations:

- equipment performance,
- observation errors,
- prover volume calibration errors,
- calculation errors. Pages: 28
Product Number: H409011 | Price: $82.00

Chapter 4.9.2
Methods of Calibration for Displacement and Volumetric Tank Provers, Part 2—Determination of the Volume of Displacement and Tank Provers by the Waterdraw Method of Calibration
All prove meters used to calibrate meters shall be determined by calibration and not by theoretical calculation. Volumetric provers have an exact reference volume, which has been determined by a recognized method of calibration. Techniques for the determination of this reference volume include the waterdraw, master meter, and gravimetric methods of calibration. This standard describes only the waterdraw method of calibration, which is used to accurately determine the calibrated volume of both displacement and tank provers. Pages: 92
Product Number: H409021 | Price: $197.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersedes the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Chapter 5.2
Measurement of Liquid Hydrocarbons by Displacement Meters

Ch. 5.2, together with the general considerations for measurement by meters found in Ch. 5.1, describes methods for obtaining accurate quantity measurement with displacement meters in liquid hydrocarbon service. It covers the unique performance characteristics of displacement meters in liquid hydrocarbon service. It does not apply to the measurement of two-phase fluids. Pages: 3

Product Number: H05023 | Price: $95.00

Chapter 5.3
Measurement of Liquid Hydrocarbons by Turbine Meters

(includes Addendum 1 dated July 2009)

Defines the application criteria for turbine meters and discusses appropriate considerations regarding the liquids to be measured. Discusses the installation of a turbine metering system and the performance, operation, and maintenance of turbine meters in liquid hydrocarbon service. Includes "Selecting a Meter and Accessory Equipment" and information on the recommended location for prover connections. Pages: 11

Product Number: H05035 | Price: $115.00

Chapter 5.4
Accessory Equipment for Liquid Meters

(includes Errata 1 dated May 2015)

Describes the characteristics of accessory equipment used with displacement and turbine meters in liquid hydrocarbon service. Includes guidance on the use of electronic flow computers. Pages: 8

Product Number: H05044 | Price: $102.00

Chapter 5.4 *
Accessory Equipment for Liquid Meters—Spanish

Spanish translation of Ch. 5.4.

4th Edition | September 2005
Product Number: H05044SP | Price: $102.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersede the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Chapter 5.5
Fidelity and Security of Flow Measurement Pulsed-Data Transmission Systems
Serves as a guide for the selection, operation, and maintenance of various types of pulsed-data, cabled transmission systems for fluid metering systems to provide the desired level of fidelity and security of transmitted flow pulse data. This publication does not endorse or advocate the preferential use of any specific type of equipment or systems, nor is it intended to restrict future development of such equipment. Pages: 8
Product Number: H50502 | Price: $76.00

Chapter 5.5 *
Fidelity and Security of Flow Measurement Pulsed-Data Transmission Systems—Spanish
Spanish translation of Ch. 5.5.
2nd Edition | July 2005 | Product Number: H50502SP | Price: $76.00

Chapter 5.6
Measurement of Liquid Hydrocarbons by Coriolis Meters (ANSI/API MPMS Ch. 5.6-2002)
Describes methods for achieving custody transfer levels of accuracy when a Coriolis meter is used to measure liquid hydrocarbons. Topics covered include: applicable API standards used in the operation of Coriolis meters; proving and verification using both mass- and volume-based methods; and installation, operation, and maintenance. Both mass and volume-based calculation procedures for proving and quantity determination are included in Appendix E. Pages: 48
Product Number: H05061 | Price: $151.00

Chapter 5.6 *
Measurement of Liquid Hydrocarbons by Coriolis Meters—Spanish
Spanish translation of Ch. 5.6.
1st Edition | October 2002 | Product Number: H05061S | Price: $151.00

Chapter 5.8
Measurement of Liquid Hydrocarbons by Ultrasonic Flow Meters (includes Errata 1 dated February 2014) (ANSI/API MPMS Ch. 5.8-2011)
 Defines the application criteria for ultrasonic flowmeters (UFMs) and addresses the appropriate considerations regarding the liquids to be measured. This document addresses the installation, operation, and maintenance of UFMs in liquid hydrocarbon service. The field of application of this standard is the dynamic measurement of liquid hydrocarbons. While this document is specifically written for custody transfer measurement, other acceptable applications may include allocation measurement, check meter measurement, and leak detection measurement. This document only pertains to spool type, multi-path ultrasonic flow meters with permanently affixed acoustic transducer assemblies. Pages: 23
2nd Edition | November 2011 | Reaffirmed: May 2017
Product Number: H050802 | Price: $94.00

Chapter 5.8 *
Measurement of Liquid Hydrocarbons by Ultrasonic Flow Meters—Spanish
Spanish translation of Ch. 5.8.
2nd Edition | November 2011 | Product Number: H050802SP | Price: $94.00
Chapter 7.1
Liquid-in-Glass Thermometers

Describes how to correctly use various types of liquid-in-glass thermometers to accurately determine the temperatures of hydrocarbon liquids. Other methods, equipment, and procedures for temperature determination are described in the other sub-sections of Ch. 7. This chapter describes the methods, equipment, and procedures for manually determining the temperature of liquid petroleum and petroleum products with liquid-in-glass thermometers. 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. Pages: 37
2nd Edition | August 2017 | Product Number: H70102 | Price: $119.00

Chapter 7.2
Portable Electronic Thermometers

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 vessels;
- 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. Pages: 30
3rd Edition | May 2018 | Product Number: H70203 | Price: $116.00

Chapter 7.3
Fixed Automatic Tank Temperature Systems

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 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. Pages: 27
Product Number: H70302 | Price: $90.00

Chapter 7.3 *
Fixed Automatic Tank Temperature Systems—Spanish

Spanish translation of Ch. 7.3.
2nd Edition | October 2011 | Product Number: H70302SP | Price: $90.00

Chapter 7.4
Dynamic Temperature Measurement

Describes methods, equipment, installation, and operating procedures for the proper determination of the temperature of hydrocarbon liquids under dynamic conditions in custody transfer applications. This standard describes the accuracy requirement and the calibration of the temperature measurement equipment. This standard does not cover dynamic temperature measurement of refrigerated, light hydrocarbon fluids or cryogenic liquids. Pages: 34

Chapter 7.5/ISO 8310:2012
Automatic Tank Temperature Measurement Onboard Marine Vessels Carrying Refrigerated Hydrocarbon and Chemical Gas Fluids

(ANSI/API MPMS Ch. 7.5)

Specifies the essential requirements and verification procedures for automatic tank thermometers (ATTs) consisting of platinum resistance thermometers (PRT) and an indicating device used for custody transfer measurement of liquefied natural gas, liquefied petroleum, and chemical gases on board ships. Temperature detectors other than PRT are considered acceptable for use in the custody transfer service of liquefied gases if they meet the performance requirements of this document and are approved by national regulations. Pages: 12
1st Edition | September 2014
Product Number: HH70501 | Price: $103.00

Chapter 8
Sampling

Covers standardized procedures for sampling petroleum and petroleum products.

Chapter 8.1
Standard Practice for Manual Sampling of Petroleum and Petroleum Products

Covers procedures and equipment for manually obtaining samples of liquid petroleum and petroleum products, crude oils, and intermediate products from the sample point into the primary container. Procedures are also included for the sampling of free water and other heavy components associated with petroleum and petroleum products. This practice also addresses the sampling of semi-liquid or solid-state petroleum products. This practice provides additional specific information about sample container selection, preparation, and sample handling. This practice does not cover sampling of electrical insulating oils and hydraulic fluids. The procedures described in this practice may also be applicable in sampling most non-corrosive liquid industrial chemicals provided that all safety precautions specific to these chemicals are followed (also, refer to ASTM Practice E300). The procedures described in this practice are also applicable to sampling liquefied petroleum gases and chemicals. Pages: 58
5th Edition | September 2019
Product Number: H80105 | Price: $79.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersede the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Chapter 8.3 (ASTM Practice D5854). This practice does not cover sampling of in conjunction with this practice. For sample mixing and handling, refer to as described in ASTM D3700.

Chapter 8.5
Spanish translation of Ch. 8.5.

Chapter 9
Density Determination
Describes the standard methods and apparatus used to determine the specific gravity of crude oil and petroleum products normally handled as liquids.

Chapter 9.1
Standard Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method (ASTM D1298)
Covers the laboratory determination, using a glass hydrometer in conjunction with a series of calculations, of the density, relative density, or API gravity of crude petroleum, petroleum products, or mixtures of petroleum and nonpetroleum products normally handled as liquids and having a Reid vapor pressure of 101.325 kPa (14.696 psi) or less. Values are determined at existing temperatures and corrected to 15 °C or 60 °F by means of a series of calculations and international standard tables.

Chapter 9.2
Standard Test Method for Density or Relative Density of Light Hydrocarbons by Pressure Hydrometer (ASTM D1657)
Covers the determination of the density or relative density of light hydrocarbons including liquefied petroleum gases (LPG) having Reid vapor pressures exceeding 101.325 kPa (14.696 psi). The prescribed apparatus should not be used for materials having vapor pressures higher than 1.4 MPa (200 psi) at the test temperature. This pressure limit is dictated by the type of equipment. Higher pressures can apply to other equipment designs.

Chapter 9.3
Standard Test Method for Density or Relative Density of Light Hydrocarbons by Displacement Method (ASTM D4052)
Covers the determination of the density or relative density of light hydrocarbons having a Reid vapor pressure of 29 kPa (4.23 psi) or less.

Values determined as density, relative density, or API gravity can be converted to equivalent values in the other units or alternative reference temperatures by means of Interconversion Procedures (Ch. 11.5) or volume correction factors (Ch. 11.1), or both, or tables, as applicable.

These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersed the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Chapter 9.3
Covers the determination, using a glass thermohydrometer in conjunction with a series of calculations, of the density, relative density, or API gravity of crude petroleum, petroleum products, or mixtures of petroleum and nonpetroleum products normally handled as liquids and having a Reid vapor pressures of 101.325 kPa (14.696 psi) or less. Values are determined at existing temperatures and corrected to 15 °C or 60 °F by means of a series of calculations and international standard tables. The initial thermohydrometer readings obtained are uncorrected hydrometer readings and not density measurements. Readings are measured on a thermohydrometer at either the reference temperature or at another convenient temperature, and readings are corrected for the meniscus effect, the thermal glass expansion effect, alternate calibration temperature effects, and to the reference temperature by means of calculations and volume correction factors (Ch. 11.1). Readings determined as density, relative density, or API gravity can be converted to equivalent values in the other units or alternate reference temperatures by means of Interconversion Procedures (Ch. 11.5) or volume correction factors (Ch. 11.1), or both, or tables, as applicable. Pages: 10
3rd Edition | December 2012 | Reaffirmed: May 2017
Product Number: H09033 | Price: $45.00

Chapter 10
Sediment and Water
Describes methods for determining the amount of sediment and water, either together or separately in petroleum products. Laboratory and field methods are covered.

Chapter 10.1
Covers the determination of sediment in crude oils and fuel oils by extraction with toluene. The precision applies to a range of sediment levels from 0.01 to 0.40 % mass, although higher levels may be determined. Pages: 6
3rd Edition | November 2007 | Reaffirmed: May 2017
Product Number: H10013 | Price: $42.00

Chapter 10.2
Standard Test Method of Water in Crude Oil by Distillation (ASTM D4006)
Covers the determination of water in crude oil by distillation. Pages: 11

Chapter 10.3
Standard Test Method for Water and Sediment in Crude Oil by the Centrifuge Method (Laboratory Procedure) (ASTM D4007)
Describes the laboratory determination of water and sediment in crude oils by means of the centrifuge procedure. This centrifuge method for determining water and sediment in crude oils is not entirely satisfactory. The amount of water detected is almost always lower than the actual water content. When a highly accurate value is required, the revised procedures for water by distillation, Ch. 10.2, and sediment by extraction, Ch. 10.1, shall be used. Pages: 13
Product Number: H100304 | Price: $55.00

Chapter 10.4
Determination of Water and/or Sediment in Crude Oil by the Centrifuge Method (Field Procedure) (includes Errata 1 dated March 2015)
Describes the field centrifuge method for determining both water and sediment or sediment only in crude oil. This method may not always produce the most accurate results, but it is considered the most practical method for field determination of water and sediment. This method may also be used for field determination of sediment. Pages: 23
4th Edition | October 2013 | Reaffirmed: September 2018
Product Number: H100404 | Price: $93.00

Chapter 10.5
Standard Test Method for Water in Petroleum Products and Bituminous Materials by Distillation (ASTM D95)
Covers the determination of water in the range from 0 to 25 % volume in petroleum products, tars, and other bituminous materials by the distillation method. Volatile water-soluble material, if present, may be measured as water. The specific products considered during the development of this test method were asphalt, bitumen, tar, fuel oil, lubricating oil, lubricating oil additives, and greases. For bituminous emulsions refer to ASTM Test Method D244. For crude oils, refer to Ch. 10.2. Pages: 6
5th Edition | September 2013 | Reaffirmed: September 2018
Product Number: H100505 | Price: $45.00

Chapter 10.6
Standard Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method (Laboratory Procedure) (ASTM D1796)
Describes the laboratory determination of water and sediment in fuel oils in the range from 0 to 30 % volume by means of the centrifuge procedure. Note that with some types of fuel oils such as residual fuel oils or distillate fuel oils containing residual components, it is difficult to obtain water or sediment contents with this test method. When this situation is encountered, Ch. 10.5 or Ch. 10.1 may be used. Pages: 7
Product Number: H100605 | Price: $45.00

Chapter 10.7
Describes the procedure for the determination of water in crude oils by Karl Fischer titration (potentiometric). This test method covers the determination of water in the range from 0.02 to 2 mass percent in crude oils. Mercaptan and sulfide (S- or H2S) sulfur are known to interfere with the method. Pages: 6
2-Year Extension: October 2017
Product Number: H10072 | Price: $42.00
Chapter 10.8
Standard Test Method for Sediment in Crude Oil by Membrane Filtration

Covers the determination of sediment in crude oils by membrane filtration. This test method has been validated for crude oils with sediments up to approximately 0.15 mass%. The accepted unit of measure for this test method is mass %, but an equation to convert to volume % is provided. Pages: 5

Product Number: H100802 | Price: $42.00

Chapter 10.9
Standard Test Method for Water in Crude Oils by Coulometric Karl Fischer Titration

Covers the determination of water in the range from 0.02 to 5.00 mass or volume % in crude oils. Mercaptan (RSH) and sulfide (S^- or H2S) as sulfur are known to interfere with this test method, but at levels of less than 500 μg/g [ppm(m)], the interference from these compounds is insignificant. This test method can be used to determine water in the 0.005 to 0.02 mass % range, but the effects of the mercaptan and sulfide interference at these levels has not been determined. For the range 0.005 to 0.02 mass %, there is no precision or bias statement. This test method is intended for use with standard commercially available coulometric Karl Fischer reagent. Pages: 6

3rd Edition | May 2013 | Reaffirmed: June 2018
Product Number: H10093 | Price: $45.00

Chapter 10.9 *
Standard Test Method for Water in Crude Oils by Coulometric Karl Fischer Titration—Spanish

Spanish translation of Ch. 10.9.

3rd Edition | May 2013 | Product Number: H10093SP | Price: $45.00

TR 2570
Continuous On-Line Measurement of Water Content in Petroleum (Crude Oil and Condensate)

Provides guidance for the application, installation, operation, verification, and proving of on-line water devices (OWDs) for use in the non-custody transfer measurement of water in crude oil and condensate. A joint API/Enery Institute (EI) standard, it also carries the EI designation Hydrocarbon Management, HM56. Pages: 17

1st Edition | October 2010 | Reaffirmed: January 2016
Product Number: H25701 | Price: $79.00

TR 2573
Standard Guide for Sediment and Water Determination in Crude Oil

Covers a summary of the water and sediment determination methods from Ch. 10 for crude oils. The purpose of this guide is to provide a quick reference to these methodologies such that the reader can make the appropriate decision regarding which method to use based on the associated benefits, uses, drawbacks, and limitations. Pages: 7

1st Edition | September 2013 | Reaffirmed: September 2018
Product Number: H257301 | Price: $45.00

Chapter 11
Physical Properties Data (Volume Correction Factors)

Ch. 11 is the physical data that has direct application to volumetric measurement of liquid hydrocarbons. It is presented in equations relating volume to temperature and pressure, and computer subroutines. The subroutines for Ch. 11.1 are available in electronic form. These standards are not included in the complete set of measurement standards. Each element of Ch. 11 must be ordered separately.

Chapter 11.1
Standard Document and API 11.1 VCF Application


This publication is a new entry in this catalog.

Phone Orders: +1 800 854 7179 (Toll-free: U.S. and Canada)

Phone Orders: +1 303 397 7956 (Local and International)

Ordering Information

Chapter 11.1 VCF Application | $568.00 per single user license

11.1 Standard Document + 11.1 VCF Application | $704.00

2-Year Extension: March 2017

11.1 Standard Document | $260.00 per document

11.1 VCF Application | $568.00 per single user license

11.1 Standard Document + 11.1 VCF Application | $704.00

(15% discount when purchased together)

See the listing for “Chapter 11.1–1980” on page 179 of this Catalog for more information on the previous edition of the standard(s).

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersede the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Chapter 11.1 Dynamic Link Library (DLL)

The DLL is compiled from source code written in the C programming language. The DLL provides subroutines that can be called from applications written in C or other programming languages. These subroutines are subdivided into three groups (density, volume correction factors, and scaled compressibility factor) for generalized crude oils, refined products, and lubricating oils.

- The density subroutines have two sets of density functions allowing calculations at base conditions or at alternate conditions.
- The volume correction factor subroutines calculate a correction for the effect of temperature and pressure on a liquid (CTPL), correction for the effect of temperature on liquid (CTL), and correction for the effect of pressure on liquid (CPL), which are used to transform volume and density data to base or desired conditions.
- The scaled compressibility factor subroutines will convert from alternate to base conditions or from observed to base conditions.

The DLL supports the following process units, densities in API gravity, relative density, and kg/m³, temperatures in °F and °C, and pressures (psig, bar, and kPa). This version is compatible with and can coexist with the 1980 version DLL.

To order, contact Quorum Software at +1 (713) 430-8600 or send an e-mail to APIstandards@qbsol.com.

Chapter 11.1 Source Code

ANSI C-Code used to compile the dynamic link libraries (DLLs). The source code may be compiled into user programs to calculate temperature and pressure volume correction factors for generalized crude oils, refined products, and lubricating oils.

NOTE: An experienced C programmer will be needed to implement the C-Code subroutines. API does not directly provide technical support for the C-Code; however, a support program is available from Flow-Cal, Inc.

To order, contact Quorum Software at +1 (713) 430-8600 or send an e-mail to APIstandards@qbsol.com.

C-Code—compiled to run on a network with unlimited nodes
Price: $32,445.00

C-Code—compiled as part of an application for distribution (software distributor)
Price: $48,668.00

Chapter 11.2 Data File of Chapters 11.2.2 and 11.2.2M

This package includes a data file of tables found in Ch. 11.2.2 and Ch. 11.2.2M. The tables, presented in both U.S. customary (USC) and metric (SI) units, cover compressibility factors for light hydrocarbons.

1st Edition | August 1984 | Product Number: H27320 | Price: $321.00

Chapter 11.2.2 Compressibility Factors for Hydrocarbons: 0.350–0.637 Relative Density (60 °F/60 °F) and -50 °F to 140 °F Metering Temperature

Provides tables to correct hydrocarbon volumes metered under pressure for the metered temperature. Contains compressibility factors related to the meter temperature and relative density (60 °F/60 °F) of the metered material. Pages: 246

2nd Edition | October 1986 | Reaffirmed: September 2017
Product Number: H27307 | Price: $185.00

Chapter 11.2.2M Compressibility Factors for Hydrocarbons: 350–637 Kilograms per Cubic Meter Density (15 °C) and -46 °C to 60 °C Metering Temperature

Provides tables to correct hydrocarbon volumes metered under pressure to corresponding volumes at equilibrium pressure for the metered temperature. The standard contains compressibility factors related to the meter temperature and density (15 °C) of the metered material. Pages: 264

1st Edition | October 1986 | Reaffirmed: September 2017
Product Number: H27309 | Price: $185.00

This publication is a new entry in this catalog. This publication is related to an API licensing, certification, or accreditation program.
Chapter 11.2.2™
Compressibility Factors for Hydrocarbons: 350–637 Kilograms per Cubic Meter Density (15 °C) and -46 °C to 60 °C Metering Temperature—Russian

Russian translation of Chapter 11.2.2M.

Chapter 11.2.4™
Temperature Correction for the Volume of NGL and LPG Tables 23E, 24E, 53E, 54E, 59E, 60E (GPA 8217)

Consists of the implementation procedures for the correction of temperature effects on density and volume of natural gas liquids and liquefied petroleum gas. Sample tables, flow charts, and specific examples created from a computerized version of these implementation procedures are included. The examples provide guidance and checkpoints for those who wish to implement a computerized procedure to represent the standard, however these are not part of the actual standard.

This standard covers a 60 °F relative density range of 0.3500 to 0.6880, which nominally equates to a density at 15 °C of 351.7 kg/m³ to 683.6 kg/m³. The temperature range of this standard is -50.8 °F to 199.4 °F (-46 °C to 93 °C). At all conditions, the pressure is assumed to be at saturation conditions (also known as bubble point or saturation vapor pressure). Pages: 155

Chapter 11.2.5™
A Simplified Vapor Pressure Correlation for Commercial NGLs (supersedes the Addendum to Ch. 11.2.2–1994)
Methods used for calculation of the correction factor for pressure effects such as Ch. 11.2.1-1984 (now superseded by Ch. 11.1-2004) and Ch. 11.2.2-1986 require knowledge of the equilibrium bubble point pressure (vapor pressure) at the measured conditions. However, the vapor pressure of the process liquid is generally not measured. The vapor pressure can also be calculated from compositional information using correlations for natural gas liquids (NGLs). Therefore, a correlation for the vapor pressure of NGLs is based upon normally measured properties and is documented in this publication. Pages: 27

Chapter 11.3.2.1™
Ethylene Density
Identifies an equation of state (EOS) suitable for use in custody transfer measurement of pure ethylene (>99 %) in the gaseous, liquid, and supercritical phases. Given flowing temperature and pressure, an EOS is capable of calculating density and other thermodynamic properties used to calculate mass and volumetric flow of ethylene to custody transfer accuracy. All accuracy and uncertainty statements in this standard are limited to the EOS results and do not include the uncertainty added by the primary and secondary measuring equipment. Pages: 4

Chapter 11.3.3™
Miscellaneous Hydrocarbon Product Properties—Denatured Ethanol Density and Volume Correction Factors
Covers density and volume correction factors for denatured fuel ethanol. Annex E of the Third Edition presents a method to determine the compressibility factor for ethanol. The actual standard consists of the explicit implementation procedures set forth in this document. Sample tables and other examples created from a computerized version of this implementation procedure are presented as examples only, and do not represent the standard.

This standard is applicable at any operating temperature to bulk (e.g., tank trucks, tank cargos, barges) denatured 95 % to 99 % fuel ethanol containing D4806 allowed denaturants (natural gasoline, gasoline blend stocks, and unleaded gasoline) and denatured 99+ % fuel ethanol containing less than 1 % denaturant. This standard does not apply to denatured ethanol of any purity. Annex E extends the range of application to -40 to 60 °C (-40 to 140 °F) over the pressure range of 0 to 15 MPa (0 to 2200 psi). Pages: 29

Chapter 11.3.3.2™
Propylene Compressibility
An electronic FORTRAN Source Code text file on CD-ROM that will produce a table of values applicable to liquid propylene in the following ranges: temperature, 30 °F to 185 °F; and saturation pressure to 1800 psia. It computes the following two values: density (pounds per cubic foot) at flowing temperature and pressure, and ratio of density at flowing conditions to density at 60 °F and saturation pressure. A documentation file is also included.

Chapter 11.3.4™
Miscellaneous Hydrocarbon Product Properties—Denatured Ethanol and Gasoline Component Blend Densities and Volume Correction Factors
Covers density and volume correction factors for blends of denatured ethanol and gasoline blend components ranging from 0 % to 95 % denatured ethanol based upon calculation methods defined in API MPMS Chapter 11.1 and Chapter 11.3.3. Calculation of blends and denatured ethanol containing more than 95 % ethanol should use the calculation procedures within API MPMS Chapter 11.3.3.

The standard consists of correlations and algorithms for estimating the blend volume change at base conditions and for calculating volume correction factors of denatured ethanol and gasoline component blends. This standard also provides the algorithms to estimate certain blend properties in blending situations where some of the required parameters are not measured.

This standard is applicable to blends containing denatured ethanol and gasoline blend components with 15.5 °C (60 °F) densities ranging from 680 to 800 kg/m³ (45.2 to 76.4 °API) containing between 0 % and 95 % by volume denatured ethanol over the temperature range of -40 °C to 50 °C (-40 °F to 122 °F) and pressure range of 0 to 10.34 MPa gage (0 to 1508 psig). Pages: 60

Chapter 11.3.3.3™
Documentation Report and Data Files for: API MPMS Chapter 11.3.3 and API MPMS Chapter 11.3.4
Assembles and makes available the various foundational data and materials used in the development of API MPMS Chapter 11.3.3 and API MPMS Chapter 11.3.4. It includes the historical reports and spreadsheets used as is, without update or reconciliation for any later changes. This document does not extend, modify, or otherwise change anything in the standards as published by API.

Users should not attempt to develop their own implementations of the standard calculations from this document.

This is a new entry in this catalog.
may not appear the same as in published documents because the authors may have changed settings or data filters in the spreadsheets subsequent to copying the graphs for publication.

Annex A through Annex G materials are available in files for download from API Publications for purchasers of this document. Annex H is included in this document. Pages: 33

1st Edition | May 2019 | Product Number: H258001 | Price: $220.00

Chapter 11.4.1

Specifies the density of water to be used in all applicable API MPMS standards. It also specifies the volume correction factor equation for water and demonstrates its use for water calibration of volumetric provers. Pages: 25

2nd Edition | July 2018 | Product Number: H11412 | Price: $81.00

Chapter 11.5
Density/Weight/Volume Intraconversion
[includes Errata 1 dated September 2011 (updated September 2013)]
[replaces Ch. 11.1–1980 Volumes X/XII (ASTM D1250-80, IP 200/80)]

These intraconversion tables are applicable to all crude oils, petroleum products, and petrochemicals. These standards are intended for application to bulk liquid quantities. Ch. 11.5, Parts 1 to 3 are available collectively on one CD-ROM.

1st Edition | March 2009 | Reaffirmed: March 2015
Product Number: H1105CD | Price: $268.00

Chapter 11.5.1
Part 1—Conversions of API Gravity at 60 °F

Provides implementation procedures for conversion of API gravity at 60 °F to equivalent densities in both in vacuo and in air values. This standard gives the following equivalents for any value of API gravity at 60 °F:
- relative density at 60 °F (old Table 3);
- absolute density at 60 °F;
- absolute density at 15 °C (old Table 3);
- pounds per U.S. gallon at 60 °F in vacuo and in air (old Table 8);
- U.S. gallons per pound at 60 °F in vacuo and in air (old Table 8);
- short tons per 1000 U.S. gallons at 60 °F in vacuo and in air (old Table 9);
- U.S. gallons per short ton at 60 °F in vacuo and in air (old Table 10);
- short tons per barrel at 60 °F in vacuo and in air (old Table 9);
- barrels per short ton at 60 °F in vacuo and in air (old Table 10);
- long tons per 1000 U.S. gallons at 60 °F in vacuo and in air (old Table 11);
- U.S. gallons per long ton at 60 °F in vacuo and in air (old Table 12);
- long tons per barrel at 60 °F in vacuo and in air (old Table 11);
- barrels per long ton at 60 °F in vacuo and in air (old Table 12);
- metric tons per 1000 U.S. gallons at 60 °F in vacuo and in air (old Table 13);
- metric tons per barrel at 60 °F in vacuo and in air (old Table 13);
- barrels per metric ton at 60 °F in vacuo and in air;
- cubic metres per short ton at 15 °C in vacuo and in air (old Table 14);
- cubic metres per long ton at 15 °C in vacuo and in air (old Table 14).

While not related to API gravity, the following are included for user convenience:
- U.S. gallons at 60 °F to litres at 15 °C (old Table 4);
- barrels at 60 °F to litres at 15 °C (old Table 4).

Chapter 11.5.2
Part 2—Conversions for Relative Density (60/60 °F)

Provides implementation procedures for conversion of relative density (60/60 °F) to equivalent densities in both in vacuo and in air values. This standard gives the following equivalents for any value of relative density (60/60 °F):
- API gravity at 60 °F (old Table 21);
- absolute density at 60 °F;
- absolute density at 15 °F (old Table 21);
- pounds per U.S. gallon at 60 °F in and in air (old Table 26);
- U.S. gallons per pound at 60 °F in vacuo and in air (old Table 26);
- short tons per 1000 U.S. gallons at 60 °F in vacuo and in air (old Table 27);
- U.S. gallons per short ton at 60 °F in vacuo and in air (old Table 28);
- short tons per barrel at 60 °F in vacuo and in air (old Table 27);
- barrels per short ton at 60 °F in vacuo and in air (old Table 28);
- long tons per 1000 U.S. gallons at 60 °F in vacuo and in air (old Table 29);
- U.S. gallons per long ton at 60 °F in vacuo and in air (old Table 30);
- long tons per barrel at 60 °F in vacuo and in air (old Table 29);
- barrels per long ton at 60 °F in vacuo and in air (old Table 30);
- metric tons per 1000 U.S. gallons at 60 °F in vacuo and in air;
- metric tons per barrel at 60 °F in vacuo and in air;
- barrels per metric ton at 60 °F in vacuo and in air;
- cubic metres per short ton at 15 °C in vacuo and in air (old Table 31);
- cubic metres per long ton at 15 °C in vacuo and in air (old Table 31).

While not related to relative density, the following are included for user convenience:
- U.S. gallons at 60 °F to litres at 15 °C (old Table 22);
- barrels at 60 °F to litres at 15 °C (old Table 22, Table 52).

Chapter 11.5.3
Part 3—Conversions for Absolute Density at 15 °C

Provides implementation procedures for conversion of absolute density at 15 °C to equivalent densities in both in vacuo and in air values. This standard gives the following equivalents for any value of absolute density at 15 °C:
- relative density at 15 °C;
- absolute density at 15 °C;
- relative density at 60 °F (old Table 51);
- API gravity at 60 °F (old Table 51);
- density at 15 °C (similar to old Table 56);
- conversion of apparent density at 15 °C to absolute density at 15 °C;
- cubic metres per metric ton at 15 °C in vacuo and in air (similar to old Table 56);
- cubic metres per short ton at 15 °C in vacuo and in air;
- cubic metres per long ton at 15 °C in vacuo and in air;
- pounds per U.S. gallon at 60 °F in vacuo and in air;
- U.S. gallons per pound at 60 °F in vacuo and in air;
- short tons per 1000 litres (cubic metres) at 15 °C in vacuo and in air (old Table 57);
- short tons per 1000 U.S. gallons at 60 °F in vacuo and in air;
- U.S. gallons per short ton at 60 °F in vacuo and in air;
- short tons per barrel at 60 °F in vacuo and in air;
- barrels per short ton at 60 °F in vacuo and in air;
- long tons per 1000 litres (cubic metres) at 15 °C in vacuo and in air (old Table 57);
- U.S. gallons per metric ton at 60 °F in vacuo and in air (old Table 58);
- cubic metres per short ton at 60 °F in vacuo and in air;
- cubic metres per long ton at 60 °F in vacuo and in air (old Table 58);
- long tons per 1000 U.S. gallons at 60 °F in vacuo and in air;
- U.S. gallons per long ton at 60 °F in vacuo and in air;
- long tons per barrel at 60 °F in vacuo and in air;
- barrels per long ton at 60 °F in vacuo and in air.

While not related to relative density, the following are included for user convenience:
- litres at 15 °C to U.S. gallons at 60 °F;
- cubic metres at 15 °C to barrels at 60 °F (old Table 52).
Chapter 12
Calculation of Petroleum Quantities

Describes the standard procedures for calculating net standard volumes, including the application of correction factors and the importance of significant figures. The purpose of standardizing the calculation procedure is to achieve the same result regardless of which person or computer does the calculating.

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

Guides the user through the steps necessary to calculate static liquid quantities, at atmospheric conditions, in upright cylindrical tanks and marine tank vessels. It defines terms employed in the calculation of static petroleum quantities.

This document also specifies equations that allow the values of some correction factors to be computed. Fundamental to this process is the understanding that, in order for different parties to be able to reconcile volumes, they must start with the same basic information (tank capacity table, levels, temperatures, and so forth) regardless of whether the information is gathered automatically or manually. Pages: 52


Chapter 12.1.2
Calculation of Static Petroleum Quantities, Part 2—Calculation Procedures for Tank Cars

Describes the standardized method for calculating target loading quantities and actual loading quantities of liquids in tank cars. Also explained are the factors required for the calculations. This information is applicable to all crude oils, petroleum products, and petrochemicals (including LPGs and other liquefied gases) transported by rail tank car. It does not cover any products loaded or measured as solids. It defines the terms required to understand the calculations and provides instructions for their use; includes 13 calculation examples in Appendix E. Pages: 62

2nd Edition | February 2018 | Product Number: H12122 | Price: $128.00

Chapter 12.2.1
Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors, Part 1—Introduction

(includes Ch. 12 Addendum 1 dated August 2007 and Errata 1 dated July 2009)

Provides the general introduction of this standard, which is divided into five parts, each published separately. The basic (reference or standard) volumes, at atmospheric conditions, in upright cylindrical tanks and marine tank vessels. It defines terms employed in the calculation of static petroleum quantities.

This document also specifies equations that allow the values of some correction factors to be computed. Fundamental to this process is the understanding that, in order for different parties to be able to reconcile volumes, they must start with the same basic information (tank capacity table, levels, temperatures, and so forth) regardless of whether the information is gathered automatically or manually. Pages: 52


Chapter 12.2.2
Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors, Part 2—Measurement Tickets

(includes Ch. 12 Addendum 1 dated August 2007)

Provides standardized calculation methods for the quantification of liquids and the determination of base prover volumes under defined conditions, regardless of the point of origin or destination or the units of measure required by governmental customs or statute. The publication rigorously specifies the equations for computing correction factors, rules for rounding, calculational sequence, and discrimination levels to be employed in the calculations. Pages: 18

Product Number: H12223 | Price: $110.00

Chapter 12.2.3
Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors, Part 3—Proving Reports

(includes Ch. 12 Addendum 1 dated August 2007)

Consolidates and standardizes calculations for metering petroleum liquids using turbine or displacement meters and clarifies terms and expressions by eliminating local variations among terms. This standard provides calculation methods for the determination of meter factors under defined conditions, regardless of the point of origin or destination or units of measure required by governmental customs or statute. This document specifies the equations for computing correction factors, including the calculation sequence, discrimination levels, and rules for rounding. Pages: 59

Product Number: H12023 | Price: $130.00

Chapter 12.2.4
Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors, Part 4—Calculation of Base Prover Volumes by Waterdraw Method

(includes Ch. 12 Addendum 1 dated August 2007 and Errata 1 dated July 2009)

Provides a standardized calculation method to determine a base prover volume under defined conditions. Specifically, this standard discusses the calculation procedures for the waterdraw calibration method, which is one of several different procedures used to determine base prover volume (BPV) of a displacement prover. Pages: 58

1st Edition | December 1997 | Reaffirmed: September 2014
Product Number: H12024 | Price: $133.00

Chapter 12.2.5
Calculation of Petroleum Quantities Using Dynamic Measurement Methods and Volumetric Correction Factors, Part 5—Base Prover Volume Using Master Meter Method

(includes Ch. 12 Addendum 1 dated August 2007 and Errata 1 dated July 2009)

Provides standardized calculation methods for the quantification of liquids and the determination of base prover volumes under defined conditions, regardless of the point of origin or destination or units of measure required by governmental customs or statute. The criteria contained in this document allow different entities using various computer languages on different computer hardware (or manual calculations) to arrive at identical results using the same standardized input data. Pages: 108

Product Number: H12025 | Price: $184.00

Chapter 12.3
Calculation of Volumetric Shrinkage from Blending Light Hydrocarbons with Crude Oils

(includes Ch. 12 Addendum 1 dated August 2007)

Provides background, theory, calculation examples, and tables to correct for volumetric shrinkage resulting when blending volatile hydrocarbons with crude oil. The tables are entered with density differentials at standard conditions and percentage light hydrocarbon in total mix. This standard supersedes and replaces Bull 2509C, 2nd Edition, 1967. Pages: 110

Product Number: H12031 | Price: $97.00
Chapter 13
Statistical Aspects of Measuring and Sampling
The more accurate petroleum measurement becomes, the more its practitioners stand in need of statistical methods to express residual uncertainties. This chapter covers the application of statistical methods to petroleum measurement and sampling.

Chapter 13.2
Methods of Evaluating Meter Proving Data
Establishes the basic concepts and procedures to estimate and report meter performance uncertainty in consistent and comparable ways. Pages: 40
2nd Edition | April 2018 | Product Number: H13022 | Price: $105.00

Ch. 13.3
Measurement Uncertainty
Establishes a methodology to develop uncertainty analyses for use in writing API Manual of Petroleum Measurement Standards (MPMS) documents that are consistent with the ISO GUM and NIST Technical Note 1297. This standard also supersedes Ch. 13.1, 1st Edition, 1985, which is withdrawn. Pages: 75
2nd Edition | December 2017 | Product Number: H130302 | Price: $122.00

Chapter 13.3 * *
Measurement Uncertainty—Spanish
Spanish translation of Ch. 13.3.
2nd Edition | December 2017 | Product Number: H130302S | Price: $122.00

Chapter 14
Natural Gas Fluids Measurement
Standardizes practices for measuring, sampling, and testing natural gas fluids.

Chapter 14.1
Collecting and Handling of Natural Gas Samples for Custody Transfer
(includes Addendum 1 and Errata 1 dated August 2017)
Concentrates on proper sampling systems and procedures. It recognizes the critical impact of hydrocarbon dew point consideration to the overall accuracy and success of these practices and procedures. Analyses of gas samples are used for many purposes and are applied to various calculations, some of which have an impact on the accuracy of custody transfer calculations (quantity and quality). Pages: 76
7th Edition | May 2016 | Product Number: H140107 | Price: $226.00

Chapter 14.3.1
Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids—Concentric Square-Edged Orifice Meters, Part 1: General Equations and Uncertainty Guidelines
Provides a single reference for engineering equations, uncertainty estimations, construction and installation requirements, and standardized implementation recommendations for the calculation of flow rate through concentric square-edged, flange-tapped orifice meters. Both U.S. customary (USC) and international system of units (SI) units are included. The mass flow rate and base (or standard) volumetric flow rate equations are discussed, along with the terms required for solution of the flow equation. The empirical equations for the coefficient of discharge and expansion factor are also presented. This revision includes a change to the empirical expansion factor calculation for flange-tapped orifice meters. Pages: 58

Chapter 14.3.2
Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids—Concentric, Square-Edged Orifice Meters, Part 2: Specification and Installation Requirements
(ANSI/API MPMS Ch. 14.3.2-2016) (AGA Report No. 3, Part 2)
Includes Errata 1 dated March 2017 and Errata 2 dated January 2019
Outlines the specification and installation requirements for the measurement of single-phase, homogeneous Newtonian fluids using concentric, square-edged, flange-tapped orifice meters. It provides specifications for the construction and installation of orifice plates, meter tubes, and associated fittings when designing metering facilities using orifice meters. Pages: 74
5th Edition | March 2016 | Product Number: H1403025 | Price: $204.00

Chapter 14.3.3
Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids—Concentric, Square-Edged Orifice Meters, Part 3: Natural Gas Applications
(ANSI/API MPMS Ch. 14.3.3-2013) (AGA Report No. 3, Part 3)
Developed as an application guide for the calculation of natural gas flow through a flange-tapped, concentric orifice meter, using the U.S. customary (USC) inch-pound system of units. It also provides practical guidelines for applying Ch. 14.3, Parts 1 and 2, to the measurement of natural gas. Pages: 54

Chapter 14.3.4
Orifice Metering of Natural Gas and Other Related Hydrocarbon Fluids—Concentric, Square-Edged Orifice Meters Part 4—Background, Development, Implementation Procedure, and Example Calculations
(AGA Report No. 3, Part 4)
Describes the background and development of the equation for the coefficient of discharge of flange-tapped square-edged concentric orifice meters and recommends a flow rate calculation procedure. The recommended procedures provide consistent computational results for the quantification of fluid flow under defined conditions, regardless of the point of origin or destination, or the units of measure required by governmental customs or statute.
The procedures allow different users with different computer languages on different computing hardware to arrive at almost identical results using the same standardized input data. Pages: 112
4th Edition | October 2019 | Product Number: H1403044 | Price: $186.00

Chapter 14.4
Converting Mass of Natural Gas Liquids and Vapors to Equivalent Liquid Volumes
(GPA 8173-17)
Prescribes a method for calculating liquid volumes at equilibrium pressures and at temperatures of 80 °F, 15 °C, and 20 °C from the mass of a natural gas fluid (liquid or vapor) measured at operating conditions, in conjunction with a representative compositional analysis and published values for each component’s molar mass and absolute density. Pages: 24
2nd Edition | June 2017 | Product Number: H140402 | Price: $71.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersed the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.

This publication is a new entry in this catalog. This publication is related to an API licensing, certification, or accreditation program.
Chapter 14.5
Calculation of Gross Heating Value, Relative Density, Compressibility and Theoretical Hydrocarbon Liquid Content for Natural Gas Mixtures for Custody Transfer (GPA 2172-09)

Presents procedures for calculating, at base conditions from composition, the following properties of natural gas mixtures: gross heating value, relative density (real and ideal), compressibility factor, and theoretical hydrocarbon liquid content, which in the U.S. is typically expressed as GPM, the abbreviation for gallons of liquid per thousand cubic feet of gas. Rigorous calculation of the effect of water upon these calculations is complicated. Because this document relates primarily to custody transfer, the water effect included is an acceptable contractual calculation. Annex A of this standard contains a detailed investigation of the effect of water and detailed derivations of the equations presented in the standard. Pages: 41

Product Number: H140503 | Price: $79.00

Chapter 14.7
Mass Measurement of Natural Gas Liquids and Other Hydrocarbons (GPA 8182-18)

Serves as a reference for the selection, design, installation, operation, and maintenance of single-phase dynamic liquid mass measurement systems that operate in the 350 to 688 kg/m³ (0.350 to 0.689 relative density at 60 °F) density range. The mass measurement systems within the scope of this document include inferred mass measurement, where volume at flowing conditions is combined with density at similar conditions to result in measured mass, as well as Coriolis mass measurement. Liquids with density below 350 and above 688 kg/m³ (below 0.350 and above 0.689 relative density at 60 °F) and cryogenic fluids (colder than approximately -50 °F) are excluded from the scope of this document, but the principles described herein may apply to such streams. Sampling equipment and techniques are covered including standards for analytical methods used to determine the composition of the sampled product. Equations of state and correlations used to calculate the density of the product are discussed. The standard used to convert mass to equivalent liquid volumes of components is also discussed. Pages: 16

5th Edition | February 2018 | Product Number: H140705 | Price: $77.00

Chapter 14.9
Measurement of Natural Gas by Coriolis Meter (AGA Report No. 11)

Developed to assist designers and users in operating, calibrating, installing, maintaining, and verifying Coriolis flow meters used for natural gas flow measurement.

2nd Edition | February 2013
Order from the American Gas Association, 500 N. Capitol Street NW, Washington, DC 20001 | 202-824-7000

Chapter 14.10
Measurement of Flow to Flares

Addresses measurement of flow to flares and includes:
- application considerations,
- selection criteria and other considerations for flare meters and related instrumentation,
- installation considerations,
- limitations of flare measurement technologies,
- calibration,
- operation,
- uncertainty and propagation of error,
- calculations.

Chapter 14.12
Measurement of Gas by Vortex Meters

Addresses the following: (a) provides generic information on full-bore vortex shedding flowmeters, including glossary, and sets of engineering equations useful in specifying performance; (b) describes vortex shedding flowmeters in which alternating vortices are shed from one or more bluff bodies installed in a closed conduit; (c) describes how the vortex shedding frequency is used to determine the velocity to infer the volume, mass, and/or energy flow rate and the total gas flow through the meter over a specific time interval; (d) applies only to single phase gas flows in closed conduit that are steady or vary slowly in time. For fiscal measurement, the output of the flow rate shall be within the acceptable limits of steady state flow rate; (e) describes the physical components of vortex shedding flowmeters and identifies need for inspection, certification, and material traceability; (f) addresses the effect of gas properties, installation, and process conditions that may affect the measurement uncertainty and describes guidelines for reducing or eliminating their influences; (g) defines the method for calculating uncertainty of the flow rate measurement; (h) defines the meter output requirements and necessary information pertaining to the meter output for the purpose of fiscal measurement of gas; and (i) provides calibration and/or performance verification guidance for the field application. Pages: 35

1st Edition | March 2017 | Product Number: H140121 | Price: $94.00

Chapter 15
Guidelines for the Use of Petroleum Industry-Specific International System (SI) Units

Specifies the API-preferred units for quantities involved in petroleum industry measurements and indicates factors for conversion of quantities expressed in customary units to the API-preferred SI units not covered in ASTM/IEEE SI-10. The quantities that comprise the tables are grouped into convenient categories related to their use. They were chosen to meet the needs of the many and varied aspects of the petroleum industry, but also should be useful in other, similar process industries. Pages: 44


Chapter 16
Measurement of Hydrocarbon Fluids by Weight or Mass

Covers the static and dynamic measurement of hydrocarbon fluids by weight or mass.

Chapter 16.2
Mass Measurement of Liquid Hydrocarbons in Vertical Cylindrical Storage Tanks by Hydrostatic Tank Gauging

Provides guidance on the installation, commissioning, maintenance, validation, and calibration of hydrostatic tank gauging systems for the direct measurement of static mass of liquid hydrocarbons in storage tanks. This edition is applicable to hydrostatic tank gauging systems that use pressure sensors with one port open to the atmosphere. It is also applicable for use on vertical cylindrical atmosphere storage tanks with either fixed or floating roofs. Pages: 20

1st Edition | November 1994 | Reaffirmed: September 2017
Product Number: H16021 | Price: $105.00
Chapter 17
Marine Measurement
 Provides guidelines for the measurement and reporting of hydrocarbons including but not limited to crude oil or petroleum product for transfers by shore terminal operators, vessel personnel, and other parties involved in cargo transfer measurement and accountability operations.

Chapter 17.1
Guidelines for Marine Inspection
 Specifies the policy and minimum recommended practices for the manual and automatic measurement, sampling, and accounting for bulk quantities of crude oil (including spiked, blended, and reconstituted crude oil), petroleum products and chemicals that are transported on marine vessels. The activities described in these guidelines include actions by producers, buyers, sellers, terminal operators, vessel owners, and their crews, customs authorities, independent inspectors, and other parties with an interest in measurements.

Certain vessel or terminal configurations and cargo characteristics, particularly chemicals, may require extensive procedures and calculation methods not covered in this chapter.

These procedures are equally valid and applicable for either metric or customary units of measurement, provided that the same types of units are used consistently.

The purchase of this document includes Excel® spreadsheets of the Sample Forms in Annex A (excluding “Voyage Analysis Report,” which is available in Ch. 17.5). The sample forms are designed to provide a guideline for recording and reporting essential data obtained during the marine cargo inspection procedure. Pages: 45


Chapter 17.1 *
Guidelines for Marine Inspection—Spanish
 Spanish translation of Ch. 17.1.

Chapter 17.2
Measurement of Cargoes On Board Tank Vessels
 (includes Errata 1 dated April 2000)
 Covers manual portable measurement units through deck-fitted vapor control valves and fixed automatic tank gauge systems for use when a marine vessel’s cargo tanks may not be open to the atmosphere. It establishes the procedures for obtaining the level measurements of cargo, free water, and onboard quantity/removing onboard (OBQ/ROB), as well as taking the temperatures and samples required for the marine custody transfer of bulk liquid petroleum cargoes under closed or restricted system measurement conditions. This standard is not intended for use with pressurized or refrigerated cargoes such as LPG and LNG. Pages: 19

2nd Edition | May 1999 | Reaffirmed: September 2011
 2-Year Extension: May 2016 | Product Number: H17022 | Price: $143.00

Chapter 17.2 *
Measurement of Cargoes On Board Tank Vessels—Spanish
 Spanish translation of Ch. 17.2.
 2nd Edition | May 1999 | Product Number: H1702SP | Price: $143.00

Chapter 17.3
Guidelines for Identification of the Source of Free Waters Associated with Marine Petroleum Cargo Movements
 Provides guidelines for identifying the source of free waters associated with marine petroleum cargo movements. The presence of free water is a factor in marine custody transfers of bulk petroleum, especially in the case of crude oil cargoes. This standard recommends the water samples and volumes to be taken, the containers to be used, the care and distribution of the samples, and the analytical procedures of use in identifying sources of free water associated with marine petroleum cargoes. Pages: 29

2nd Edition | December 2016
 Product Number: H170302 | Price: $131.00

Chapter 17.3 *
Guidelines for Identification of the Source of Free Waters Associated with Marine Petroleum Cargo Movements—Spanish
 Spanish translation of Ch. 17.3.
 2nd Edition | December 2016
 Product Number: H170302S | Price: $131.00

Chapter 17.4
Method for Quantification of Small Volumes on Marine Vessels (OBQ/ROB)
 Provides a method for determining the small volumes of on board quantity prior to loading a vessel or material remaining on board a vessel upon completion of discharge. This standard applies only to quantification by manual gauging of small volumes on marine vessels prior to loading or upon completion of discharge. It does not address clinging, hydrocarbon vapors, cargoes in transit, or cargo pumpability. Refer to Ch. 3. Pages: 25

2nd Edition | September 2016
 Product Number: H170402 | Price: $119.00

Chapter 17.4 *
Method for Quantification of Small Volumes on Marine Vessels (OBQ/ROB)—Spanish
 Spanish translation of Ch. 17.4.
 2nd Edition | September 2016
 Product Number: H170402S | Price: $119.00

Chapter 17.5
Guidelines for Voyage Analysis and Reconciliation of Cargo Quantities
 Covers guidelines for the reconciliation of marine cargo quantities. These guidelines are intended to provide a basis for analyzing and reconciling the quantity differences (gains/losses) resulting from marine custody transfer movement(s) of petroleum and petroleum product cargoes. As such, the guidelines are complementary to, but do not replace, normal inspection procedures. The purchase of this document includes a spreadsheet for determining voyage analysis and reconciliation of cargo quantities. Pages: 48

4th Edition | July 2019
 Product Number: H170504 | Price: $180.00

Chapter 17.6
Guidelines for Determining Fullness of Pipelines Between Vessels and Shore Tanks
 Describes procedures for determining or confirming the fill condition of pipeline systems used for the transfer of liquid cargoes before and/or after the liquid is loaded onto or discharged from marine vessels. It includes descriptions of methods and procedures that apply to crude oil and petroleum products. While this document includes descriptions of common line fill verification methods, it does not recommend any particular method. The responsibility for selecting a method appropriate for a given terminal, and documenting its effectiveness, rests with those responsible for operating the terminal where it is applied. Pages: 10

2nd Edition | June 2014
 Product Number: H170602 | Price: $119.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersed the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Chapter 17.8
Guidelines for Pre-Loading Inspection of Marine Vessel Cargo Tanks and Their Cargo-Handling Systems

Specifies procedures for determining that the cargo tanks and associated cargo-handling system of marine vessels are in a suitably clean condition to receive the intended cargo. This applies to the loading of crude oil, petroleum products, and petrochemical cargoes. The extent of pre-loading inspection will vary depending on the nature of the cargo to be loaded. These guidelines recommend the extent of inspection that should be instituted for certain general types of cargoes and an example of a format that may be used for reporting the findings of tank inspections. Because of the wide variety of conditions that may exist when performing pre-loading tank inspections, this guideline is not intended to restrict the judgment of the person performing the inspection. Pages: 18
2nd Edition | August 2016 | Product Number: H170802 | Price: $117.00

Chapter 17.8 *
Guidelines for Pre-Loading Inspection of Marine Vessel Cargo Tanks and Their Cargo-Handling Systems—Spanish

Spanish translation of Ch. 17.8.
2nd Edition | August 2016 | Product Number: H170802S | Price: $117.00

Chapter 17.9
Vessel Experience Factor (VEF)

Provides a recommended practice for the calculation and application of a vessel experience factor (VEF). This standard provides guidelines for data compilation, data maintenance, data validation, and recommendations on the appropriate use of a VEF involving marine vessels.

It also provides instruction for parcel tankers, compartmental VEFs, and vessel-to-vessel transfers. The methods are applicable to liquid bulk cargoes including crude oil, petroleum products, chemicals, and liquid petroleum gases. Pages: 30
3rd Edition | July 2019 | Product Number: H170903 | Price: $185.00

Chapter 17.10.1/ISO 10976:2012
Measurement of Cargoes On Board Marine Gas Carriers, Part 1—Liquefied Natural Gas (ANSI/API MPMS Ch. 17.10.1)

Establishes all of the steps needed to properly measure and account for the quantities of cargoes on liquefied natural gas (LNG) carriers. This includes, but is not limited to, the measurement of liquid volume, vapour volume, temperature and pressure, and accounting for the total quantity of the cargo on board. This document describes the use of common measurement systems used on board LNG carriers, the aim of which is to improve the general knowledge and processes in the measurement of LNG for all parties concerned; This document provides general requirements for those involved in the LNG trade on ships and onshore. Pages: 65
1st Edition | April 2014 | Product Number: HH171011 | Price: $163.00

Chapter 17.10.2
Measurement of Cargoes On Board Marine Gas Carriers, Part 2—Liquefied Petroleum and Chemical Gases

Provides guidance to vessel and shore personnel regarding accepted methods for determining quantities of liquefied petroleum and chemical gas cargoes (excluding LNG) on board refrigerated and/or pressurized carriers. This standard covers all measurement systems commonly used on refrigerated and/or pressurized gas carriers designed to carry those types of cargoes and includes recommended methods for measuring, sampling, documenting, and reporting quantities on board these vessels. Pages: 80
2nd Edition | March 2016 | Product Number: H171022 | Price: $183.00

Chapter 17.11
Measurement and Sampling of Cargoes On Board Tank Vessels Using Closed and Restricted Equipment (includes Errata 1 dated March 2017)

Provides guidance on the use, maintenance, and calibration of restricted and closed measurement and sampling equipment. It also provides guidance on preferred size and positioning for gauging and sampling fittings on vessels. A joint API/Energy Institute (EI) standard, it also carries the EI designation Hydrocarbon Management, HM52. Pages:19
2nd Edition | August 2016 | Product Number: H170112 | Price: $117.00

Chapter 17.11 *
Measurement and Sampling of Cargoes On Board Tank Vessels Using Closed and Restricted Equipment—Spanish

Spanish translation of Ch. 17.11.
2nd Edition | August 2016 | Product Number: H170112S | Price: $117.00

Chapter 17.12
Procedures for Bulk Liquid Chemical Cargo Inspections

Provides systematic cargo measurement procedures for use primarily by cargo inspectors and to specify procedures directed at minimizing cargo contamination and losses, in the absence of, or in conjunction with, specific client guidelines. This document should be considered a summary of best practices used within the industry. A joint API/Energy Institute (EI) standard, it also carries the EI designation Hydrocarbon Management, HM51. Pages: 66
2nd Edition | August 2015 | Product Number: H170122 | Price: $177.00

Chapter 17.12 *
Procedures for Bulk Liquid Chemical Cargo Inspections—Spanish

Spanish translation of Ch. 17.12.
2nd Edition | August 2015 | Product Number: H170122S | Price: $177.00

Chapter 17.14.1
Measurement of Bulk Cargoes by Draft Survey, Part 1: Ocean-Going Vessels

Describes the procedure for determining the transferred quantity of non-liquid petroleum products loaded onto or discharged from ocean-going vessels by draft survey.
This procedure is not an alternative where effective static or dynamic liquid measurement methods can be used. Pages: 38
1st Edition | October 2019 | Product Number: H1714101 | Price: $160.00

Chapter 17.14.2
Measurement of Bulk Cargoes by Draft Survey, Part 2: Inland Barges

Describes the procedure for determining the transferred quantity of non-liquid petroleum products loaded onto or discharged from inland barges by draft survey.
This procedure is not an alternative where effective static or dynamic liquid measurement methods can be used. Pages: 29
1st Edition | October 2019 | Product Number: H1714201 | Price: $150.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersed the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.
Some sites may require measurements from multiple zones in order to determine the quantities of crude oil being gathered from lease tanks by truck. These measurements and tests are performed by crude oil truck drivers (COTDs) and other parties who are responsible for the custody transfer and for recording the results of the measurements and tests on the run tickets. These procedures apply to the custody transfer from lease storage tanks to the transporting truck. Pages: 24

Chapter 18
Custody Transfer
Covers application of other measurement standards to unique custody transfer situations.

Chapter 18.1
Measurement Procedures for Crude Oil Gathered from Lease Tanks by Truck
Contains procedures that are organized into a recommended sequence of steps for manually gauging and determining the quantity and quality of crude oil being gathered from lease tanks by truck. These measurements and tests are performed by crude oil truck drivers (COTDs) and other parties who are responsible for the custody transfer and for recording the results of the measurements and tests on the run tickets. These procedures apply to the custody transfer from lease storage tanks to the transporting truck. Pages: 24

Chapter 18.2
Custody Transfer of Crude Oil from Lease Tanks Using Alternative Measurement Methods
Defines the minimum equipment and methods used to determine the quantity and quality of crude oil being loaded from a lease tank to a truck trailer without requiring direct access to a lease tank. Many of the individual standards have guidelines defining the frequency and tolerances for installation, verification, and calibration of the specified equipment under controlled or ideal conditions allowing for uncertainty within custody transfer requirements. However, with the conditions encountered in many of today's applications, the installation, verification, and calibration of measurement devices may have higher uncertainties due to the operational characteristics and limited access available at the lease site. In the interest of safety and environmental concerns, these higher uncertainties may still provide acceptable measurement for custody transfer of crude oil from lease tanks using the defined alternate methods. The alternate measurement methods discussed in this standard are intended to minimize uncertainty and bias while encouraging consistent measurement and testing practices using existing technologies within API standards. Pages: 24

Chapter 19
Evaporation Loss Measurement
Defines methods for estimating hydrocarbon evaporation losses from various types of tanks.

Chapter 19.1
Evaporative Loss from Fixed-Roof Tanks
(Previously Publ 2518)
Contains methodologies for estimating the total evaporative losses of hydrocarbons from fixed-roof tanks. The methodologies provide loss estimates for general equipment types based on laboratory, test-tank, and field-tank data.

Types of fixed-roof tanks and roof fittings described are for information only. The equations estimate average annual losses from uninsulated fixed-roof tanks for various liquid stocks, stock vapor pressures, tank sizes, meteorological conditions, and operating conditions. The following special cases are addressed.

• Horizontal tanks.
• Higher volatility stocks (true vapor pressure greater than 0.1 psia).
• Vent settings higher than 0.03 pounds (0.5 oz) per square inch.

The estimation may be improved by using detailed field information, including climatic data and operational data for the appropriate time period.

The equations are not intended to be used in the following applications.

• To estimate losses from unstable or boiling stocks or from petroleum liquids or petrochemicals for which the vapor pressure is not known or cannot readily be predicted [to calculate emissions from tanks that contain material at or above their boiling point or the point at which material starts to flash, the API model E&P Tank (Publ 4697) can be used].
• To estimate losses from fixed-roof tanks which have an internal floating roof. Ch. 19.2 and TR 2569 address these.
• To estimate losses from fixed-roof tanks which have either roof or shell insulation.
• To estimate losses from cleaning fixed-roof tanks. TR 2568 addresses this. Pages: 38

Chapter 19.2
Evaporative Loss from Floating-Roof Tanks
(Previously Publ 2517 and Publ 2519)
Contains methodologies for estimating the total evaporative losses of hydrocarbons from external floating-roof tanks (EFRTs), freely vented internal floating-roof tanks (IFRFTs), and domed external floating-roof tanks (domed EFRFTs). The methodologies provide loss estimates for general equipment types based on laboratory, test-tank, and field-tank data. Types of floating roofs, rim-seal systems, and deck fittings are described for information only.

The equations estimate average annual losses from floating-roof tanks for various types of tank construction, floating-roof construction, rim-seal systems, and deck fittings, as well as for various liquid stocks, stock vapor pressures, tank sizes, and wind speeds (EFRFTs).

The equations were developed for:

• stocks with a true vapor pressure greater than approximately 0.1 psia,
• average wind speeds ranging from 0 miles per hour (mph) to 15 mph (EFRFTs), and
• tank diameters greater than 20 ft.

The estimation techniques become more approximate when these conditions are not met.

When this standard is used to estimate losses from non-freely vented (closed vent) internal or domed external floating-roof tanks (tanks vented only through a pressure-vacuum relief vent, blanketed with an inert gas, vented to a vapor processing unit, or otherwise restricted from being freely vented), refer to the methodology in TR 2569.
The equations are not intended to be used in the following applications.

- To estimate losses from unstable or boiling stocks (i.e., stocks with a true vapor pressure greater than the atmospheric pressure at the tank location) or from petroleum liquids or petrochemicals for which the vapor pressure is not known or cannot readily be predicted.
- To estimate losses from tanks in which the materials used in the rim seal, deck fittings, or deck seams have either deteriorated or been significantly permeated by the stored stock.
- To estimate losses from storage tanks that do not have a floating roof.
- To estimate losses from landing floating roofs (TR 2567 addresses this).
- To estimate losses from cleaning storage tanks (TR 2568 addresses this).

The 3rd Edition of Ch. 19.4 was published following a revision that was carried out concurrently with revisions to Ch. 19.1, published as the 4th Edition, and Ch. 19.2, published as the 3rd Edition. Primary changes are as follows.

- Consolidation of common material in Ch. 19.4. Material that had previously been included in both Ch. 19.1 and Ch. 19.2 has been moved to Ch. 19.4, Ch. 19.4, which was previously Recommended Practice for Specification of Evaporative Losses, now has the title Evaporative Loss Reference Information and Speciation Methodology. This chapter had already contained reference information on the properties of chemicals and typical petroleum liquids, and this information has now been removed from Ch. 19.1 and Ch. 19.2. In addition, meteorological data have been moved from Ch. 19.1 and Ch. 19.2 to Ch. 19.4. In the revised documents:
  - meteorological data are found in Ch. 19.4;
  - calculation of storage tank temperatures is found in Ch. 19.1 and Ch. 19.2 (in that fixed-roof tanks involve calculation of the vapor space temperature in order to determine vapor density, whereas this step is not involved in estimating emissions from floating-roof tanks); and
  - calculation of true vapor pressure is found in Ch. 19.4 (in that this is now calculated in the same manner for both fixed- and floating-roof tanks). Pages: 85

3rd Edition | October 2012  
Product Number: H190203  | Price: $191.00

Chapter 19.3, Part A
Wind Tunnel Test Method for the Measurement of Deck-Fitting Loss Factors for External Floating-Roof Tanks

Describes the procedures to establish evaporative loss factors for deck fittings on external floating-roof tanks. The test method involves measuring the weight loss of a test assembly over time. The standard specifies the test apparatus, instruments, test procedures, and calculation procedures to be used. It also addresses the variables to be measured, format for reporting the test values, and their associated uncertainty. Pages: 27

1st Edition | June 1997 | Reaffirmed: September 2017
Product Number: H1903A | Price: $133.00

Chapter 19.3, Part B
Air Concentration Test Method—Rim-Seal Loss Factors for Floating-Roof Tanks

Describes the procedures to establish evaporative rim-seal loss factors for rim seals used on external floating-roof tanks. The test method involves passing a controlled flow rate of air through a test chamber that contains a test liquid and a test rim seal, and measuring the concentration of the test liquid vapor in the air streams entering and leaving the test chamber. The standard specifies the test apparatus, instruments, test procedures, and calculation procedures to be used. It also addresses the variables to be measured, format for reporting the test values, and their associated uncertainty. Pages: 30

1st Edition | August 1997 | Reaffirmed: September 2017
Product Number: H1903B | Price: $133.00
Chapter 19.5

Atmospheric Hydrocarbon Emissions from Marine Vessel Transfer Operations (formerly Publ 2514A)

Provides methods for estimating evaporative loss from marine vessel transfer operations. Specifically, this standard addresses:

- liquids for which the vapor pressure is known or for which sufficient data are available to determine the vapor pressure; and
- liquid mixtures where Raoult’s Law cannot be used to describe the vapor phase equilibria.

This methodology does not apply to:

- emissions that result from leaks from piping components (e.g. valves, flanges, pumps, connectors etc.);
- liquid mixtures where Raoult’s Law cannot be used to describe the vapor phase equilibria (e.g. mixtures in which hydrocarbons are dissolved in water, or mixtures of hydrocarbons with alcohols).

This 3rd Edition of Ch. 19.4 was published following a revision that was carried out concurrently with revisions to Ch. 19.1, published as the 4th Edition, and Ch. 19.2, published as the 3rd Edition. Primary changes are as follows.

- Consolidation of common material in Ch. 19.4. Material that had previously been included in both Ch. 19.1 and Ch. 19.2 has been moved to Ch. 19.4. Ch. 19.4, which was previously Recommended Practice for Specification of Evaporative Losses, now has the title Emission Loss Reference Information and Specification Methodology. This chapter had already contained reference information on the properties of chemicals and typical petroleum liquids, and this information has now been removed from Ch. 19.1 and Ch. 19.2. In addition, meteorological data have been moved from Ch. 19.1 and Ch. 19.2 to Ch. 19.4. In the revised documents:
  - meteorological data are found in Ch. 19.4;
  - calculation of storage tank temperatures is found in Ch. 19.1 and Ch. 19.2 (in that fixed-roof tanks involve calculation of the vapor space temperature in order to determine vapor density, whereas this step is not involved in estimating emissions from floating-roof tanks); and
  - calculation of true vapor pressure is found in Ch. 19.4 (in that this is now calculated in the same manner for both fixed- and floating-roof tanks).

Chapter 19.6.1

Evaporative Loss from Storage Tank Floating-Roof Landings (formerly TR 2567)

Investigates storage tank emissions that may result from landing and subsequently refloating a floating roof. The existing emission factors for floating-roof tanks are based on the assumption that the floating roof is continuously floating on the stored stock liquid. Additional emissions may occur, however, if the tank is emptied such that the floating roof is no longer floating. This study sought to quantify these floating-roof landing loss emissions. Pages: 38
In other words, this report addresses the estimation of the mass of volatile organic compounds that leave the tank as vapor during the tank cleaning process. It does not address emissions that may result from the handling of liquids or sludge after such materials have been removed from the tank. This report is intended to reduce the effort required to generate a good faith estimate of tank cleaning emissions, and to result in more uniformity in the resulting emissions estimates. Pages: 47


TR 2569
Evaporative Loss from Closed-Vent Internal Floating-Roof Storage Tanks
Addresses evaporative loss from internal floating-roof tanks (IFRTs) with closed vents. When the vents in the fixed roof of an IFRT are closed, rather than open, estimation of emissions is shown to be highly complex. This subject is not covered in other API standards such as Ch. 19.1, which specifically excludes fixed-roof tanks that have an internal floating roof, and Ch. 19.2, which specifically excludes closed internal floating-roof tanks (that is, tanks vented only through a pressure-vacuum relief vent, blanketed with an inert gas, vented to a vapor processing unit, or otherwise restricted from being freely vented). Pages: 26

1st Edition | August 2008 | Product Number: H25690 | Price: $116.00

TR 2574
Field Testing Protocol for Characterization of Total Gaseous Nonmethane Organics (TGNMO), Methane, and Ethane in Air-Vapor Mixture During Filling of a Cargo Vessel with Crude Oil
Provides a standardized testing methodology for quantifying total gaseous nonmethane organics (TGNMO), methane, and ethane, in the air-vapor mixture that is expelled from cargo compartments during filing with crude oil. It utilizes a modified version of Federal Reference Method 25 (FRM 25) to characterize the concentration of TGNMO, methane, and ethane. While the field testing in support of this protocol was performed only for loading of crude oil into barges, the method could be suitable for loading of any volatile organic liquid into any type of vessel or compartment from which vapors are exhausted through a single vent opening where the field sampling can take place. Pages: 56

1st Edition | August 2016 | Product Number: H257401 | Price: $114.00

TR 2576
Short-Term Evaporative Loss Estimation from Atmospheric Storage Tanks
Provides methodology on how to estimate short-term individual tank and facility-wide emissions. The methodology in this technical report can be used for purposes such as preparing permit applications and air dispersion modeling. The technical report does not provide guidance on how to run the actual air dispersion model. Pages: 18

1st Edition | July 2016 | Product Number: H257601 | Price: $119.00

Chapter 20
Production Measurement and Allocation of Oil and Natural Gas

Chapter 20.1
Allocation Measurement
(includes Addendum 1 dated January 2013, Addendum 2 dated November 2016, and Addendum 3 dated December 2017)
Provides design and operating guidelines for liquid and gas allocation measurement systems. Included are recommendations for metering, static measurement, sampling, proving, calibrating, and calculating procedures. Pages: 67

Product Number: H30701 | Price: $118.00

Chapter 20.2
Production Allocation Measurement Using Single-Phase Devices
Covers the application of production allocation (determination of flow quantities and rates of oil, gas, water, and other constituents) using single-phase measurement devices in combination with a two- or three-phase production separator.
This standard is applicable to single-phase measurement techniques upstream of the custody transfer points where custody transfer conditions are not possible. The standard presents single-phase flow measurement used in the allocation process and located downstream of the first stage of separation on a production facility.
This standard addresses common allocation single-phase flow measurement devices for liquid hydrocarbons, water, and gas including ancillary flow measurement systems such as fuel, flare, and recirculation.
This standard discusses configuration and operation of flow measurement equipment, fluid properties, production processing, associated flow conditions, and their effects on the quality of the flow measurement results. This standard discusses the possible impacts on these devices during inefficient and/or ineffective separation.
This document provides guidance with respect to the major factors that could contribute to measurement uncertainty for single-phase devices used in production allocation. It is not intended to prescribe a particular meter type or allocation method. Allocation methodologies are addressed in Ch. 20.1. Pages: 33

1st Edition | November 2016 | Product Number H200201 | Price: $135.00

Chapter 20.3
Measurement of Multiphase Flow
(supersedes RP 86)
Addresses multiphase flow measurement in the production environment, upstream of the custody transfer (single-phase) measurement point, where allocation measurement for onshore, offshore, or subsea is applied. For other multiphase flow measurement applications such as reservoir management, well tests, and flow assurance, the standard can be used as a reference or guide. However, the focus of this standard is on those applications where the accuracy of multiphase flow measurement for allocation systems is required.
This document refers to existing standards and recommended practices to supplement the guidance it provides in this subject area. The document addresses principles used in multiphase flow measurement, multiphase metering types and classifications, assessment of expected performance, and selecting and operating multiphase measurement systems. Operational requirements or constraints are addressed, including expectations for flow meter acceptance, calibration criteria, flow loop and in situ verifications, and other guidance specific to different multiphase flow metering applications. The document does not address specific meter configurations. Pages: 72

1st Edition | January 2013 | Reaffirmed: October 2018
Product Number: H200301 | Price: $195.00

Chapter 20.3 *
Measurement of Multiphase Flow—Russian
(supersedes RP 86)
Russian translation of Chapter 20.3.

1st Edition | January 2013
Product Number: H200301R | Price: $148.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersede the English-language versions which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.

Phone Orders: +1 800 854 7179 (Toll-free: U.S. and Canada) Phone Orders: +1 303 397 7956 (Local and International)
Chapter 20.5
Recommended Practice for Application of Production Well Testing in Measurement and Allocation

Establishes a framework to conduct and apply production well testing for well rate determination in measurement and allocation. Production well testing addressed in this document refers to measurement of gas, oil, and water quantities from a single well during a specified length of time under controlled operational conditions. The intent of this document is to provide operators with a consistent and transparent approach for conducting, applying, and managing production well testing within an upstream measurement and allocation system. It is not intended to prescribe a particular production well testing method, or particular application of production well test data in allocation.

This document provides recommendations and guidelines for the application of production well testing in production measurement and allocation. The recommendations and guidelines apply to conducting a production well test, calculating production well test volumes and rates, and the application of production well test data for use in measurement and allocation. This includes production well testing preparation, initiation, measurement, validation, and volume and rate calculations for separator, multiphase flow meter, and tank production well test systems. Additionally, this document addresses the proration of production well test results for use in allocation, the application of production well test results for validation and update of well flow models and virtual flow metering, and the adjustment of gas well continuous measurement results with production well test data.

This document also provides recommendations and guidelines for the application of well flow modeling and virtual flow metering in production measurement and allocation.

Allocation methodologies are addressed in Ch. 20.1. Pages: 123
1st Edition | December 2017 | Product Number: H200501 | Price: $202.00

Draft Standard
Application of Hydrocarbon Phase Behavior Modeling in Upstream Measurement and Allocation Systems

Provides requirements and guidelines for the application of hydrocarbon phase behavior modeling in upstream measurement and allocation systems. The requirements and guidelines apply to the development, implementation, and performance management of a process simulation model (PSM) incorporating an equation of state (EOS) description of phase behavior. This includes functional specifications, validation, and maintenance of the PSM, EOS specification and implementation, and fluid compositional specification and validation.

This document establishes a framework to develop, implement, and manage the application of hydrocarbon phase behavior modeling. The applied phase behavior modeling addressed in this document refers to PSM incorporating EOS description of the phase behavior, or pressure, volume, temperature (PVT) properties, of the fluids within the modeled process. The intent of this document is to provide operators with a consistent and transparent approach for applying and managing an EOS-based PSM within an upstream measurement and allocation system. It is not intended to prescribe a particular mathematical phase estimation (i.e., EOS), process simulation (i.e., PSM), or allocation method. Allocation methodologies are addressed in Ch. 20.1. Pages: 47
1st Edition | August 2016 | Product Number: H200401D | Price: $98.00

RP 85
Use of Subsea Wet-Gas Flowmeters in Allocation Measurement Systems
(includes Addendum 1 dated January 2013)

Presents a recommended allocation methodology that best fits the application and that equitably accommodates variances in the uncertainty level between meters in the system. It is intended to advise the user on various aspects of the use of subsea wet-gas flowmeters in allocation measurement systems. Marination, operation, abnormal operation, and meter testing are important topics included here, but foremost, this document proposes techniques to be used in the allocation of total production to individual contributing streams. Pages: 64
2-Year Extension: October 2018 | Product Number: G08501 | Price: $134.00

RP 85 * ■
Use of Subsea Wet-Gas Flowmeters in Allocation Measurement Systems—Russian

Russian translation of RP 85.
1st Edition | March 2003 | Product Number: G08501R | Price: $107.00

RP 87
Recommended Practice for Field Analysis of Crude Oil Samples Containing from Two to Fifty Percent Water by Volume

Provides the user with recommended “field” methods of sampling, sample handling, and analysis for high water content streams up to 50 % water on a volumetric basis. In particular, this RP was developed giving consideration to offshore installations (both floating and fixed platforms). These installations are generally subject to motion and vibrations, have minimal laboratory equipment, and perform S&W analysis with multi-skilled operations personnel as opposed to laboratory chemists. The techniques described, however, are applicable to onshore locations.

Provides design and operating guidelines for sampling, sample handling, and analysis for high water content streams, up to 50 % water on a volumetric basis. As a guide, this RP targets a relative accuracy of 5 % of reading up to a maximum of 50 % water content as a qualifier for various methods described herein. For example, the corresponding absolute accuracy for a 10 % water content stream is ±0.5 % and for 20 % water content is ±1.0 %. Pages: 19
1st Edition | August 2007 | Reaffirmed: October 2017
Product Number: G08701 | Price: $98.00

Chapter 21
Flow Measurement Using Electronic Metering Systems

Describes standard practices and minimum specifications for electronic measurement systems used in the measurement and recording of flow parameters. This chapter covers natural gas fluid and petroleum and petroleum product custody transfer applications using industry-recognized primary measurement devices.

Chapter 21.1
(ANSI/API MPMS Ch. 21.1-2011) (AGA Report No. 13)

Describes the minimum specifications for electronic gas measurement systems used in the measurement and recording of flow parameters of gaseous phase hydrocarbon and other related fluids for custody transfer applications utilizing industry recognized primary measurement devices. This standard provides the minimum reporting and change management requirements of the various intelligent components required for accurate and auditable measurement. The requirements can be met by a combination of electronically and/or manually recorded configuration, test reports, change record reporting of the electronic gas measurement system components, and flow parameters. It is recognized that diagnostic capabilities of the newer meter and transmitter technologies are important but due to the device specific complexity, intelligent device diagnostics are out of scope for this standard. Pages: 94
2nd Edition | February 2013 | 2-Year Extension: December 2018
Product Number: H210102 | Price: $175.00

*These translated versions are provided for the convenience of our customers and are not officially endorsed by API. The translated versions shall neither replace nor supersedes the English-language versions, which remain the official standards. API shall not be responsible for any discrepancies or interpretations of these translations. Translations may not include any addenda or errata to the document. Please check the English-language versions for any updates to the documents.

This publication is a new entry in this catalog.
This publication is related to an API licensing, certification, or accreditation program.
Chapter 21.2
Electronic Liquid Volume Measurement Using Positive Displacement and Turbine Meters
Provides guidance for the effective use of electronic liquid measurement systems for custody transfer measurement of liquid hydrocarbons under the following conditions. Use of the measurement systems must fall within the scope and field of application of Ch. 12.2. Guidance applies to systems using turbine or positive displacement meters. Guidance applies to systems using on-line correction for the effect of temperature on liquid (TUL) and correction for the effect of pressure on liquid (CPL) compensation. The procedures and techniques in Ch. 21.2 are recommended for new measurement applications. This standard provides custody transfer measurement procedures for pipeline and other electronic liquid metering systems including design, selection, use, auditing, reporting, calibration, verification, and security. Pages: 60
Product Number: H21021 | Price: $207.00

Chapter 21.2-A1
Addendum 1 to Flow Measurement Using Electronic Metering Systems, Inferred Mass
This addendum specifically covers inferred mass measurement systems utilizing flow computers as the primary flow calculation device and either turbine or displacement type meters, working with on-line density meters, as the primary measurement devices. The scope does not include systems using calculated flowing densities, i.e. Equations of State. The hardware is essentially identical to that referenced in Ch. 21.2 and the methods and procedures are as described in Ch. 14.4, 14.6, 14.7, and 14.8. Audit, record-keeping, collection and calculation interval, security, and most other requirements for systems covered in Ch. 21.2 will apply to this addendum. As in Ch. 21.2, the hydrocarbon liquid streams covered in the scope must be single phase liquids at measurement conditions.
Product Number: H2102A | Price: $66.00

Chapter 22
Testing Protocols
Testing protocols for devices used in the measurement of hydrocarbon fluids. Testing protocols define appropriate methods for measuring and reporting the performance characteristics of similar equipment in a comparable manner, thus providing a means to highlight the relative performance advantages and disadvantages of similar devices.

Chapter 22.1
(introduces Addendum 1 dated November 2018)
Intended for the development of testing protocols and to serve as a guideline to document performance characteristics of hydrocarbon fluid measurement related devices. Pages: 7
2nd Edition | August 2015 | Product Number: H220102 | Price: $95.00

Chapter 22.2
Defines the testing and reporting protocols for flow measurement devices based on the detection of a pressure differential that is created by the device in a flowing stream. This protocol is designed to supply industry with a comparable description of the capabilities of these devices for the measurement of single-phase fluid flow when they are used under similar operating conditions. The objectives of this Testing Protocol are to:
· ensure that the user of any differential pressure flow meter knows the performance characteristics of the meter over a range of Reynolds numbers as applicable or defined by tests,
· facilitate both the understanding and the introduction of new technologies,
· provide a standardized vehicle for validating manufacturer’s performance specifications,
· provide information about relative performance characteristics of the primary elements of the differential pressure metering devices under standardized testing protocol,
· quantify the uncertainty of these devices and define the operating and installation conditions for which the stated uncertainties apply. Pages: 52
2nd Edition | April 2017 | Product Number: H220202 | Price: $113.00

Chapter 22.3
Testing Protocol for Flare Gas Metering (ANSI/API MPMS Ch. 22.3-2015)
Describes a testing protocol for flare gas meters. This includes a discussion of the testing to be performed, how the test data should be analyzed, and how an uncertainty is determined from the testing of the meter. The scope does not include the general guidelines to flare gas metering that are covered under Ch. 14.10. Pages: 21
1st Edition | August 2015 | Product Number: H220301 | Price: $107.00

Chapter 22.4
Testing Protocol for Pressure, Differential Pressure, and Temperature Measuring Devices
Documents the method for testing the performance characteristics specific to pressure, differential pressure, and temperature sensors and transmitters used in petroleum measurement. The testing protocol includes a listing of parameters affecting the performance of the devices, a description of the tests required, requirements for the test facility, a data reporting format, and an uncertainty determination methodology. Pages: 44
1st Edition | July 2018 | Product Number: H220401 | Price: $81.00

Chapter 22.6
Testing Protocol for Gas Chromatographs
A general gas chromatograph (GC) performance test protocol that specifies the scope and reporting requirements of GC tests for repeatability, reproducibility, and response linearity. The protocol specifies requirements for tests over a range of gas compositions, tests over a range of environmental conditions, and long-term performance tests. Pages: 50
1st Edition | August 2015 | Product Number: H220601 | Price: $107.00

Chapter 23
Reconciliation of Hydrocarbon Quantities
Provides practical methodologies for monitoring hydrocarbon transportation loss and gain for non-marine systems i.e. pipeline, tank cars (rail tank cars, tank trucks, etc.). For Marine Reconciliation, refer to Ch. 17.

Chapter 23.1
Reconciliation of Liquid Pipeline Quantities (supersedes Std 2560)
Provides methodologies for monitoring liquid pipeline loss/gain and for determining the normal loss/gain level for any given pipeline system. Troubleshooting suggestions are also presented. This document does not establish industry standards for loss/gain level because each system is individual and exhibits its own loss/gain level and/or patterns under normal operating conditions. The document provides operational and statistically based tools for identifying when a system has deviated from normal, the magnitude of the deviation, and guidelines for identifying the causes of deviation from normal.
The primary application of this publication is in custody transfer liquid pipeline systems in which there is provision for measuring all liquids that enter the system and exit the system, as well as liquid inventory within the system. The application is not intended for nonliquid or mixed-phase systems. The applications and examples in this document are intended primarily for custody transfer pipeline systems, but the principles may be applied to any system that involves the measurement of liquids into and out of the system and, possibly, inventory of liquids within the system. Such systems may include pipelines, marine terminals, marine voyages, bulk loading or storage terminals, tank farms, and rail and trucking systems. Pages: 35
1st Edition | June 2016 | Product Number: H230101 | Price: $103.00
2002. It should be noted that the indicated performances data stated in documentation was prepared from information obtained through mid-2002. It should be noted that the indicated performances data stated in these published documents have not necessarily been verified by an independent body. The listing of these references in the Appendix 2 is intended to provide a comprehensive source of data and information on multiphase metering; the reader needs to carefully review the source of the data in the documents when utilizing the information. Pages: 80

TR 2571
Fuel Gas Measurement

Provides a performance-based methodology for the measurement and reporting of fuel gas consumption. The document provides guidance in the following areas to allow the user to achieve a targeted uncertainty of measurement:

- selection of flow meter type; differential pressure (DP), displacement, ultrasonic, Coriolis, vortex, turbine, thermal, and others;
- associated instrumentation for measuring fluid properties and flow conditions, such as pressure and temperature transmitters, densitometers, gas chromatographs;
- obtaining and use of gas composition or other analytical data;
- design and installation requirements of the measurement system;
- inspection, verification, and calibration practices of flow meters and their associated accessory instrumentation; and
- simplified uncertainty calculations with examples to illustrate the methodology.

Techniques are described to assess the uncertainty contribution of individual components of fuel gas measurement systems and overall facility fuel gas measurement uncertainty. Pages: 67

TR 2572
Carbon Content, Sampling, and Calculation

Carbon emission quantities can be calculated from either the volume/mass of fuel or feedstock fed to a process (as applicable) and carbon content of the process or fuel supply, or by directly measuring volume/mass emissions. This technical report (TR) provides guidance on the sampling and calculation of carbon content of process or fuel supplies. The API companion technical report, TR 2571, can be referenced for guidance on measuring the volume/mass of process fuel gas or feedstock, and the API Compendium of Greenhouse Gas Emissions Estimation Methodologies for the Oil and Natural Gas Industry can be reference for guidance on the calculation of emissions.

TR 2572 provides guidance and a methodology for the determination of carbon content from hydrocarbon-based petroleum and petrochemical products, and the uncertainty of the average carbon content as calculated from multiple samples taken during a reporting period. This method is intended to make use of industry-accepted mixture property data and test methods with no new or modified test methods introduced in this document. The method is applicable to carbon-content-based reporting or trading for all gaseous and liquid hydrocarbons.

This TR provides references and supplemental information on applicable industry practices based on the published resources, existing industry standards, industry-accepted physical constants, or properties of hydrocarbons for measurement, sampling, sampling frequency, and analysis of hydrocarbon samples. Pages: 24

TR 2575
Measurement of Thermally Cracked Gas

Presents a method to compute the density, compressibility factor, and supercompressibility factor for thermally cracked gas (TCG) for custody transfer using orifice meters. It provides equations, parameters, computation flow diagrams, and example spreadsheet calculations. This technical report applies to TCG mixtures after treatment. It applies for temperature from 90 °F to 120 °F (305 K to 322 K) at pressures up to 300 psig (2 MPa). It is limited to a specific operating region. The method is for the single gas phase only. Pages: 17

TR 2577
Performance of Full-Bore Vortex Meters for Measurement of Liquid Flows

Provides documentation of performance characteristics of full-bore liquid vortex meters for measuring liquid hydrocarbon flows of different API gravity under the field operating conditions and under a controlled environment in a laboratory test facility with water as the proving fluid, limited laboratory proving facility test results using water as the calibration fluid of several and 2-in. (50 mm) and 4-in. (100 mm) commercially available full-bore vortex meters that are typically installed for non-custody transfer liquid installations, and typical performance of full-bore 4-in. (100-mm) liquid vortex meters for liquid hydrocarbon measurement and to provide guidance in selecting liquid vortex meters for custody transfer measurement. Pages: 30

TR 2578
Flow Conditioner Installation and Effects on Turbine Meters

Provides a summary of flow conditioning testing performed on turbine meters in liquid hydrocarbons. Initial testing was conducted in water and those findings were included as an addendum to Ch. 5.3 in 2009, subsequent testing in hydrocarbon liquids was carried out through July 2016. Phase II testing focused on operational effects, specifically the relationship of strainer design, strainer basket disturbances, flow conditioning, and their effects on the flow meter deviations in hydrocarbon applications (viscosities, densities, and Reynolds number). Pages: 16

This publication is a new entry in this catalog.

This publication is related to an API licensing, certification, or accreditation program.