
**Petroleum and liquid petroleum products —
Measurement of level and temperature in
storage tanks by automatic methods —**

Part 6:

**Measurement of temperature in pressurized
storage tanks (non-refrigerated)**

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*Pétrole et produits pétroliers liquides — Mesurage du niveau et de la
température dans les réservoirs de stockage par méthodes automatiques —*

ISO 4266-6:2002

*Partie 6: Mesurage de la température dans les réservoirs de stockage sous
pression (non réfrigérés) — 2002*



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Contents

	Page
1 Scope	1
2 Normative reference	1
3 Terms and definitions	1
4 Precautions	2
4.1 Safety precautions	2
4.2 Equipment precautions	2
4.3 General precautions	2
5 Accuracy	3
5.1 General	3
5.2 Intrinsic error of ATTs	3
5.3 Calibration prior to installation	3
5.3.1 General	3
5.3.2 ATT calibrated as a system	3
5.3.3 ATT calibrated by components	4
5.3.4 Multiple-point ATTs	4
5.3.5 Uncertainty of the reference	4
5.4 Error caused by installation and operating conditions	4
5.5 Overall accuracy	4
5.5.1 General	4
5.5.2 Use of ATT for fiscal/custody transfer purposes	4
6 Selection of ATTs	5
6.1 General	5
6.2 ATTs for fiscal/custody transfer purpose	5
7 Description of ATT equipment	5
7.1 Introduction	5
7.2 Electrical temperature elements	6
7.2.1 Resistance temperature detectors	6
7.2.2 Other temperature elements	6
8 Installation of ATTs	6
8.1 General	6
8.2 Single-point (spot) temperature elements	6
8.3 Multiple-point temperature elements	6
8.4 Moveable spot temperature element	7
8.5 Other methods	7
8.6 Thermowells for electronic temperature elements	7
8.7 Thermowells for verification purposes	7
9 Calibration and field verification of ATTs	7
9.1 Introduction	7
9.2 Calibration of single-point temperature element ATTs used for fiscal/custody transfer purpose	8

9.2.1	Calibration prior to installation	8
9.2.2	Initial field verification	8
9.3	Calibration of upper, middle and lower or multiple-point ATTs	9
9.3.1	Calibration prior to installation	9
9.3.2	Initial field verification	9
9.4	Subsequent verification of ATTs	10
9.4.1	General	10
9.4.2	Frequency of subsequent verification	10
9.4.3	Record keeping	10
10	Data communication and receiving	10
	Bibliography.....	11

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this part of ISO 4266 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 4266-6 was prepared by Technical Committee ISO/TC 28, *Petroleum products and lubricants*, Subcommittee SC 3, *Static petroleum measurement*.

ISO 4266-6, together with ISO 4266-1 to ISO 4266-5, cancels and replaces ISO 4266:1994, which has been technically revised.

ISO 4266 consists of the following parts, under the general title *Petroleum and liquid petroleum products — Measurement of level and temperature in storage tanks by automatic methods*:

- Part 1: Measurement of level in atmospheric tanks
- Part 2: Measurement of level in marine vessels
- Part 3: Measurement of level in pressurized storage tanks (non-refrigerated)
- Part 4: Measurement of temperature in atmospheric tanks
- Part 5: Measurement of temperature in marine vessels
- Part 6: Measurement of temperature in pressurized storage tanks (non-refrigerated)

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Petroleum and liquid petroleum products — Measurement of level and temperature in storage tanks by automatic methods —

Part 6:

Measurement of temperature in pressurized storage tanks (non-refrigerated)

1 Scope

This part of ISO 4266 gives guidance on the selection, accuracy, installation, commissioning, calibration and verification of automatic tank thermometers (ATTs) in fiscal/custody transfer applications in which the ATT is used for measuring the temperature of petroleum and liquid petroleum products, stored in pressurized storage tanks.

This part of ISO 4266 is not applicable to the measurement of temperature in caverns or in refrigerated storage tanks.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 4266. For dated references, subsequent amendments to, or revisions of, this publication do not apply. However, parties to agreements based on this part of ISO 4266 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1998 (all parts), *Petroleum industry — Terminology*

3 Terms and definitions

For the purposes of this part of ISO 4266, the following terms and definitions given in ISO 1998, and the following, apply.

3.1

automatic tank thermometer

ATT

instrument that continuously measures temperature in storage tanks

NOTE An ATT, which may also be known as an automatic tank temperature system, typically includes precision temperature sensors, field-mounted transmitters for electronic signal transmission, and receiving/readout device(s).

3.2

resistance temperature detector

RTD

electrical temperature-sensing element in common use to measure the temperature of the contents of a storage tank

3.3

single-point ATT

spot ATT

ATT that measures the temperature at a particular point in a tank by the spot temperature element

3.4

multiple-point ATT

ATT consisting of multiple (usually three or more) spot temperature elements to measure the temperature(s) at selected liquid level(s)

NOTE The readout equipment should average the readings from the submerged temperature elements to compute the average temperature of the liquid in the tank, and may also display the temperature profile in the tank.

3.5 Averaging ATT

3.5.1

multiple-point averaging ATT

averaging ATT where the readout equipment selects the individual, spot temperature element(s) that are submerged in the liquid to determine the average temperature of the liquid in the tank

3.5.2

variable-length averaging ATT

averaging ATT consisting of several temperature elements of varying length, with all the elements extending upwards from a position close to the bottom of the tank, and where the readout equipment selects the longest, completely submerged temperature element to determine the average temperature of the liquid in the tank

3.6

temperature transmitter

instrument that typically provides electrical power to the temperature element(s), converts the temperature measured by the element(s) to an electrical or electronic signal, and transmits the signal to a remote readout

NOTE A local readout may be provided. Often, the function of the temperature transmitter is provided by the level transmitter of the automatic level gauge (ALG).

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4 Precautions

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4.1 Safety precautions

International Standards and government regulations on safety and material-compatibility precautions should be followed when using ATT equipment. In addition, the manufacturer's recommendations on the use and installation of the equipment should be followed. All regulations covering entry into hazardous areas should be observed.

4.2 Equipment precautions

4.2.1 All ATT equipment should be capable of withstanding the pressure, temperature, operating and environmental conditions likely to be encountered in service.

4.2.2 ATTs should be certified for use in the hazardous-area classification appropriate to their installation.

4.2.3 Measures should be taken to ensure that all exposed metal parts of the ATT have the same electrical potential as the tank.

4.2.4 All parts of the ATT in contact with the product or its vapour should be chemically compatible with the product, to avoid both product contamination and corrosion of the ATT.

4.2.5 All ATT equipment should be maintained in safe operating condition and the manufacturer's maintenance instructions should be complied with.

4.3 General precautions

4.3.1 The general precautions given in 4.3.2 to 4.3.6 apply to all types of ATTs and should be observed where they are applicable.

4.3.2 Tank levels should be measured at the same time as the tank temperature is measured.

4.3.3 Temperatures measured for bulk transfer should be recorded when they are taken, unless the remote readout equipment of the ATT automatically records the temperatures periodically.

4.3.4 The same general procedures should be used to measure a tank temperature before product transfer (opening gauge) and after product transfer (closing gauge).

4.3.5 ATTs should provide security to prevent unauthorized adjustment or tampering. ATTs used in fiscal/custody transfer applications should provide facilities to allow sealing for calibration adjustment.

4.3.6 The design and installation of ATTs may be subject to the approval of the national measurement organization, who will normally have issued a type or pattern approval ("Type Approval") for the design of the ATT for the particular service for which it is to be employed. Type approval is normally issued after an ATT has been subjected to a specific series of tests and is subject to the ATT being installed in an approved manner. Type approval tests may include the following: visual inspection, performance, vibration, humidity, dry heat, inclination, fluctuations in power supplies, insulation, resistance, electromagnetic compatibility and high voltage.

5 Accuracy

5.1 General

The accuracy of petroleum temperatures taken by the ATTs should be consistent with the accuracy of the levels taken by the automatic tank-level gauging system so that the overall accuracy of the standard volume measurement is not seriously degraded.

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5.2 Intrinsic error of ATTs

The intrinsic error of the ATT, i.e. the accuracy of the ATTs when tested under controlled conditions as specified by the manufacturer, can be a major component of the uncertainty of the temperature measurement of the ATT as installed. The calibration reference device used to calibrate the ATT should be traceable to appropriate national standards.

NOTE The temperature elements and field transmitters used for fixed, automatic tank temperature measurement are calibrated prior to installation. The transmitters normally do not provide field calibration adjustments.

5.3 Calibration prior to installation

5.3.1 General

ATTs to be used in fiscal/custody transfer applications can be calibrated/verified either as a system (see 3.1) or by components.

5.3.2 ATT calibrated as a system

If verified as a system, the temperature reading of the ATT readout should agree with that of the thermostatically controlled reference bath or oven temperature within 0,25 °C at a minimum of three test temperatures spanning the anticipated working range of the ATT.