

# **Manual of Petroleum Measurement Standards, Chapter 22.4**

## **Testing Protocol for Pressure, Differential Pressure, and Temperature Measuring Devices**

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## Introduction

This document defines the testing protocol and reporting protocols for families of devices used to measure differential pressure, pressure, and temperature for the purpose of determining flow rates for hydrocarbon fluids. This testing protocol is designed to supply industry with capabilities of these devices that can be compared when they are used under similar operating conditions. The objectives of this testing protocol are to:

- a) Ensure that the user of any differential pressure, pressure, and temperature device knows its performance characteristics under the prescribed Chapter 22.4 testing conditions (units should only be compared when tested at the same time),
- b) Facilitate both the understanding and the introduction of new technologies,
- c) Provide information about relative performance characteristics of the differential pressure, pressure, and temperature devices under standardized API 22.4 testing protocol, and
- d) Provide a standardized process for reporting transmitter API 22.4 tested performance.

To accomplish these objectives, this testing protocol defines the test limits for operating conditions of the devices, the requirements of the facility or facilities to perform the tests and encompasses any device capable of measuring differential pressure, pressure, and temperature.

# Testing Protocol for Pressure, Differential Pressure, and Temperature Measuring Devices

## 1 Scope

This testing protocol 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.

## 2 Normative References

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

ISO/IEC 17025:2005, *General requirements for the competence of testing and calibration laboratories*

IEC 60770-2: 2010, *Transmitters for use in industrial-process control systems—Part 2: Methods for inspection and routine testing*

ISO/IEC Guide 98-3 (GUM:1995): 2008, *Uncertainty of measurement—Part 3: Guide to the expression of uncertainty in measurement*

## 3 Terms and Definitions

### 3.1

#### **Hysteresis**

The difference between the indications of a measuring instrument when the same value of the quantity measured is reached by increasing or decreasing the quantity.

### 3.2

#### **API 22.4 baseline accuracy**

A measure of the accuracy at a near ambient temperature determined by the testing procedure defined in this document. The API 22.4 baseline accuracy is calculated from the combination of the linearity, hysteresis and repeatability data calculations. API 22.4 baseline accuracy is used to compare the result to other transmitters tested at the same time and is also used in the calculation of influence factor effects.

### 3.3

#### **Analog signal**

A signal that varies continuously in amplitude rather than in discrete steps.

### 3.4

#### **Digital signal**

A signal that varies in discrete steps rather than continuously.

### 3.5

#### **Dp pressure limit**

The maximum working pressure that can be applied to one side of a differential pressure device as defined by the manufacturer.