

ASTM D1250-04 for Pocket PC

Temperature and pressure volume correction factors for generalized crude oils, refined products, and lubricating oils.

Version 1.0



ROFA Laboratory & Process Analyzers
Mag. Matthias Fiedler
Hauptstrasse 145
A-3420 Kritzensdorf
AUSTRIA
Email: office@rofa.at

Introduction

The density and therefore the volume of hydrocarbons is sensitive to temperature and pressure. Volume Correction Factors (VCFs) are used to correct observed volumes to equivalent volumes at a standard temperature and pressure. These standard, or base, conditions serve as a way to use volumetric measures equitably in general commerce. The calculations performed in this application conform to the calculations outlined in the API publication:

Manual of Petroleum Measurement Standards Chapter 11

Physical Properties Data SECTION 1 TEMPERATURE AND PRESSURE VOLUME CORRECTION FACTORS FOR GENERALIZED CRUDE OILS, REFINED PRODUCTS, AND LUBRICATING OILS

Measurement Coordination May 2004

That Standard establishes a procedure for crude oils, liquid refined products, and lubricating oils by which density measurements taken at any temperature and pressure can be corrected to an equivalent density at the base conditions. The Standard also provides a method for making a conversion to alternate base temperatures.

The procedure recognizes three distinct commodity groups: crude oil, refined products, and lubricating oils. A special application category is also provided which provides volume correction based on the input of an experimentally derived coefficient of thermal expansion.

Installation

IMPORTANT: For PocketPC 2002 devices you must first install the ".NET Compact Framework 1.0"! (Not needed for PocketPC 2003 devices). Download it from:

<http://www.microsoft.com/downloads/details.aspx?FamilyID=a5a02311-194b-4c00-b445-f92bec03032f&DisplayLang=en>

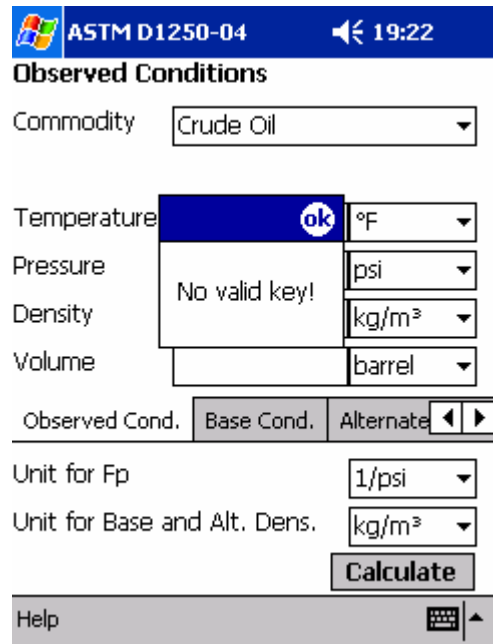
Connect your Pocket PC to your computer (ActiveSync will start automatically) start the program "setup.exe" and follow the instructions on the screen. After successful installation you will have a new icon in your "Programs" folder on your Pocket PC:



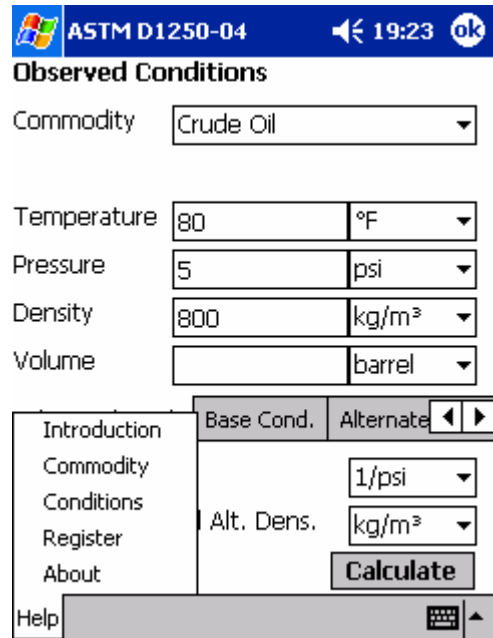
After you start the software for the first time, you have to register the software for your device. Send your Device ID, that is shown on your screen, to office@rofa.at or nell@rofa.at, and you will receive a registration key. Enter this key (e.g. 47F5-93AC-F742-7847-0DE7-8AA3-648C-8462) in the input field and press "ok".



If you don't enter a valid registration key, you will get message and the software will run in demo mode. In demo mode you can't change temperature or pressure values.



You can register any time later, selecting Register from the Help menu.



How to perform the calculation

Select the commodity group first. It describes the classification of the liquid.

Crude Oil: A crude oil is considered to conform to the commodity group Generalized Crude Oils if its density falls in the range between approximately -10 to 100 °API.

Refined Products: A refined product is considered to conform to the commodity group of Generalized Refined Products if the fluid falls within one of the refined product groups: Gasoline, Jet Fuels, Fuel Oils

Lubricating Oils: A lubricating oil is considered to conform to the commodity group Generalized Lubricating Oils if it is a base stock derived from crude oil fractions by distillation or asphalt precipitation. For the purpose of this Standard, lubricating oils have initial boiling points greater than 700°F (370°C) and densities in the range between approximately -10 to 45 oAPI.

Special Applications (alpha-60 supplied): Liquids that are assigned the special applications category are generally relatively pure products or homogeneous mixtures with stable (unchanging) chemical composition that are derived from petroleum (or are petroleum-based with minor proportions of other constituents) and have been tested to establish a specific thermal expansion factor for the particular fluid.

Enter the observed temperature and pressure conditions and the measured density. The volume may be entered optionally. The “observed” condition is the temperature and pressure at which the density of a liquid is actually or assumed to have been measured. Calculations can then be performed to correct this observed density to any other temperature and pressure conditions. If the density has already been corrected to base conditions, you would enter the base temperature and pressure in the Observed Conditions fields. If the density has not already been corrected to base conditions, you enter the temperature and pressure at which the density was measured.

Select the Base Cond. Tab and enter the base temperature and pressure conditions.

The “standard” or “base” condition is a defined combination of temperature and pressure at which liquid volumes are expressed for purposes of custody transfer, stock accounting, etc. The terms standard and base are used interchangeably.

Accepted standard temperatures are 60°F, 15°C and 20°C. Accepted standard pressures are zero gauge pressure (for non-volatile liquids at the standard temperature) or the liquid’s vapour pressure at the standard temperature (for volatile liquids).

You can use the buttons on the bottom of the tab control for predefined values.

ASTM D1250-04 19:44 ok

Observed Conditions

Commodity: Crude Oil

Temperature: 75 °F

Pressure: 0 psi

Density: 823,7 kg/m³

Volume: 1000 barrel

Observed Cond. Base Cond. Alternate

Unit for Fp: 1/psi

Unit for Base and Alt. Dens.: kg/m³

Calculate

Help

ASTM D1250-04 19:44 ok

Base Conditions

Temperature: 60 °F

Pressure: 0 psi

Set to:

60°F/0 psi 15°C/0 kPa 20°C/0 kPa

Observed Cond. Base Cond. Alternate

Unit for Fp: 1/psi

Unit for Base and Alt. Dens.: kg/m³

Calculate

Help

Select the Alternate Cond. Tab and enter the alternate temperature and pressure conditions. The “alternate” conditions are any other temperature and pressure conditions to which the observed or standard density can be corrected. The input of a volume is optional, but if you have already entered a observed volume, you must not enter an alternate volume.

Finally select the units for the compressibility coefficient (Fp), base and alternate densities and press the Calculate button.

The result screen shows the calculated CTL (Correction factor for the effect of Temperature on the Liquid), CPL (Correction factor for the effect of Pressure on the Liquid), CTPL (Correction factor for the effects of Temperature and Pressure on the Liquid, Volume Correction Factor VCF), Fp (Compressibility coefficient), base and alternate density and, if you have entered a observed or alternate volume, the base and alternate volumes.

If the Round Values checkbox is checked, all values are rounded in compliance with ASTM D1250-04. Otherwise more decimal places are shown.

The Input Data tab gives an overview of all input data.

ASTM D1250-04 19:45 ok

Alternate Conditions

Temperature 80 °F

Pressure 0 psi

Volume barrel

Base Cond. Alternate Cond.

Unit for Fp 1/psi

Unit for Base and Alt. Dens. kg/m³

Calculate

Help

ASTM D1250-04 19:45 X

Observed to Base

CTL	0,99255	
CPL	1,00000	
CTPL	0,99255	
Fp	0,561	1/psi
Base Density	829,9	kg/m³
Base Volume	992,553	barrel

Base to Alternate

CTL	0,99006	
CPL	1,00000	
CTPL	0,99006	
Fp	0,571	1/psi
Alt. Density	821,6	kg/m³
Alt. Volume	1002,515	barrel

Input Data Results

Round Values

Help

ASTM D1250-04 19:45 X

Commodity Crude Oil

Observed Conditions

Temperature	75,0	°F
Pressure	0	psi
Density	823,7	kg/m³
Volume	1000,000	barrel

Base Conditions

Temperature	60,0	°F
Pressure	0	psi

Alternate Conditions

Temperature	80,0	°F
Pressure	0	psi
Volume	1002,515	barrel

Input Data Results

Round Values

Help