Designation: D2766 – 95 (Reapproved 2009)

# Standard Test Method for Specific Heat of Liquids and Solids[1]

This standard is issued under the fixed designation D2766; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope

1.1 This test method covers the determination of the heat capacity of liquids and solids. It is applicable to liquids and solids that are chemically compatible with stainless steel, that have a vapor pressure less than 13.3 kPa (100 torr), and that do not undergo phase transformation throughout the range of test temperatures. The specific heat of materials with higher vapor pressures can be determined if their vapor pressures are known throughout the range of test temperatures.

1.2 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

## 2. Referenced Documents

2.1 *ASTM Standards:*[2]

D1217 Test Method for Density and Relative Density (Specific Gravity) of Liquids by Bingham Pycnometer

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *specific heat*—the ratio of the amount of heat needed to raise the temperature of a mass of the substance by a specified amount to that required to raise the temperature of an equal mass of water by the same amount, assuming no phase change in either case.

3.2 *Symbols:*

$T_f$ = temperature of hot zone, °C,
$T_c$ = initial temperature of calorimeter, °C,
$T'$ = $T_f - T_c$ = temperature differential, °C,
$R_1$ = resistance of nominal 1-Ω standard resistor,
$R_{100}$ = resistance of nominal 100-Ω standard resistor,
$R_{10\ 000}$ = resistance of nominal 10 000-Ω standard resistor,
$E_1$ = emf across nominal 1-Ω standard resistor,
$E_{100}$ = emf across nominal 100-Ω standard resistor,
$E_{10\ 000}$ = emf across nominal 10 000-Ω standard resistor,
$t_c$ = time of application of calibration heater current, s,
$q$ = total heat developed by calibration heater, cal,
$\Delta E_c$ = total heat effect for container, mV,
$\Delta E_s$ = total heat effect for sample + container, mV,
$\Delta e_c$ = total heat effect for calibration of calorimeter system during container run, mV,
$\Delta e_s$ = total heat effect for calibration of calorimeter system during sample run, mV,
$\Delta H_c$ = total enthalpy change for container changing from $T_f$ to $T_c$,
$\Delta H_T$ = total enthalpy change for sample plus container changing from $T_f$ to $T_c$,
$\Delta H_s$ = total enthalpy change for sample changing from $T_f$ to $T_c$,
$F$ = calorimeter factor,
$W$ = weight of sample corrected for air buoyancy
$d_f$ = density of sample at $T_f$,
$d_c$ = density of sample at $T_c$,
$V_T$ = total volume of sample container,
$V_f$ = volume of sample vapor at $T_f$,
$V_c$ = volume of sample vapor at $T_c$,
$P_f$ = vapor pressure of sample at $T_f$,
$P_c$ = vapor pressure of sample at $T_c$,
$N_f$ = moles sample vapor at $T_f$,
$N_c$ = moles sample vapor at $T_c$,
$N$ = moles sample vapor condensed,
$\Delta H_v$ = heat of vaporization of sample,
$R$ = gas constant, and
$K$ = heat of vaporization correction.

3.3 *Units:*

[1] This test method is under jurisdiction of ASTM Committee D02 on Petroleum Products and Lubricants and is the direct responsibility of Subcommittee D02.L0.07 on Engineering Sciences of High Performance Fluids and Solids.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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