

Orthobaric densities and molar volumes of liquids: Halogenated ethanes

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THE PREPARATION OF THIS DATA ITEM

The work on this particular Data Item was monitored and guided by the Physical Data and Reaction Kinetics Committee, which first met in 1966 and now has the following membership:

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The technical work involved in the assessment of the available information and the construction and subsequent development of the Data Item was undertaken (under contract to ESDU) by

Mr J. Walton — Independent

in consultation with Dr D. Ambrose.

The person with overall responsibility for the work in this subject area is Mr S.J. Pugh, Head of Thermofluids Group.

ORTHOBARIC DENSITIES AND MOLAR VOLUMES OF LIQUIDS: HALOGENATED ETHANES

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Compound tables are given on data sheets in the following order:-

Sheet No.	Formula	Name	Alternative Name and Refrigerant No.
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MONOHALOETHANES

	C_2H_5F	Fluoroethane (not issued)		
1.2	C_2H_5Cl	Chloroethane	Ethyl chloride	R-160
1.3	C_2H_5Br	Bromoethane	Ethyl bromide	R-160B1
1.4	C_2H_5I	Iodoethane	Ethyl iodide	

DIHALOETHANES

2.1a	$C_2H_4F_2$	1,1-Difluoroethane	Ethylidene fluoride	R-152a
2.1b	$C_2H_4F_2$	1,2-Difluoroethane	Ethylene difluoride	R-152
	C_2H_4ClF	1-Chloro-1-fluoroethane (not issued)		
	C_2H_4ClF	1-Chloro-2-fluoroethane (not issued)		
2.3a	$C_2H_4Cl_2$	1,1-Dichloroethane	Ethylidene chloride	R-150a
2.3b	$C_2H_4Cl_2$	1,2-Dichloroethane	Ethylene dichloride	R-150
2.4a	C_2H_4BrCl	1-Bromo-1-chloroethane	Ethylidene bromochloride	R-150B1a
	C_2H_4BrCl	1-Bromo-2-chloroethane (not issued)		
2.5a	$C_2H_4Br_2$	1,1-Dibromoethane	Ethylidene bromide	R-150B2a
2.5b	$C_2H_4Br_2$	1,2-Dibromoethane	Ethylene dibromide	R-150B2

Sheet No.	Formula	Name	Alternative Name and Refrigerant No.	
TRIALOETHANES				
3.1a	C ₂ H ₃ F ₃	1,1,1-Trifluoroethane	Methyl fluoroform	R-143a
	C ₂ H ₃ F ₃	1,1,2-Trifluoroethane (not issued)		
3.2a	C ₂ H ₃ ClF ₂	1-Chloro-1,1-difluoroethane		R-142b
3.2c	C ₂ H ₃ ClF ₂	2-Chloro-1,1-difluoroethane		R-142
	C ₂ H ₃ Cl ₂ F	1,1-Dichloro-1-fluoroethane (not issued)		
	C ₂ H ₃ Cl ₂ F	1,2-Dichloro-1-fluoroethane (not issued)		
3.4a	C ₂ H ₃ Cl ₃	1,1,1-Trichloroethane	Methyl chloroform	R-140a
3.4b	C ₂ H ₃ Cl ₃	1,1,2-Trichloroethane		R-140
3.7b	C ₂ H ₃ Br ₃	1,1,2-Tribromoethane		R-140B3
TETRAHALOETHANES				
4.1a	C ₂ H ₂ F ₄	1,1,1,2-Tetrafluoroethane		R-134a
4.1b	C ₂ H ₂ F ₄	1,1,2,2-Tetrafluoroethane	Acetylene tetrafluoride	R-134
4.2b	C ₂ H ₂ ClF ₃	2-Chloro-1,1,1-trifluoroethane		R-133a
4.3b	C ₂ H ₂ Cl ₂ F ₂	1,2-Dichloro-1,1-difluoroethane		R-132b
	C ₂ H ₂ Cl ₃ F	1,1,2-Trichloro-1-fluoroethane (not issued)		
4.5a	C ₂ H ₂ Cl ₄	1,1,1,2-Tetrachloroethane		R-130a
4.5b	C ₂ H ₂ Cl ₄	1,1,2,2-Tetrachloroethane	Acetylene tetrachloride	R-130
4.7c	C ₂ H ₂ Br ₂ Cl ₂	1,2-Dibromo-1,1-dichloroethane		R-130B2a
4.9a	C ₂ H ₂ Br ₄	1,1,1,2-Tetrabromoethane (not issued)		
4.9b	C ₂ H ₂ Br ₄	1,1,2,2-Tetrabromoethane (not issued)		
PENTAHALOETHANES				
5.1	C ₂ HF ₅	Pentafluoroethane		R-125
5.2a	C ₂ HClF ₄	Chloro-1,1,2,2-tetrafluoroethane		R-124a
5.2b	C ₂ HClF ₄	Chloro-1,1,1,2-tetrafluoroethane		R-124
5.3b	C ₂ HCl ₂ F ₃	1,2-Dichloro-1,1,2-trifluoroethane		R-123a
5.3c	C ₂ HCl ₂ F ₃	2,2-Dichloro-1,1,1-trifluoroethane		R-123
5.3f	C ₂ HBrClF ₃	Bromochloro-1,1,1-trifluoroethane	Halothane	R-123B1a
	C ₂ HC1 ₃ F ₂	1,1,1-Trichloro-2,2-difluoroethane (not issued)		
	C ₂ HCl ₃ F ₂	1,1,2-Trichloro-1,2-difluoroethane (not issued)		
	C ₂ HC1 ₃ F ₂	1,2,2-Trichloro-1,1-difluoroethane (not issued)		

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Sheet No.	Formula	Name	Alternative Name and Refrigerant No.	
	C ₂ HCl ₄ F	1,1,1,2-Tetrachloro-2-fluoroethane (not issued)		
	C ₂ HCl ₄ F	1,1,2,2-Tetrachloro-1-fluoroethane (not issued)		
5.6	C ₂ HCl ₅	Pentachloroethane		R-120
HEXAHALOETHANES				
6.1	C ₂ F ₆	Hexafluoroethane	Perfluoroethane	R-116
6.2	C ₂ ClF ₅	Chloropentafluoroethane		R-115
6.3a	C ₂ Cl ₂ F ₄	1,1-Dichlorotetrafluoroethane		R-114a
6.3b	C ₂ Cl ₂ F ₄	1,2-Dichlorotetrafluoroethane		R-114
6.3f	C ₂ Br ₂ F ₄	1,2-Dibromotetrafluoroethane		R-114B2
6.4a	C ₂ Cl ₃ F ₃	1,1,1-Trichlorotrifluoroethane		R-113a
6.4b	C ₂ Cl ₃ F ₃	1,1,2-Trichlorotrifluoroethane		R-113
6.4f	C ₂ Br ₂ ClF ₃	1,2-Dibromochlorotrifluoroethane		R-113B2
6.5b	C ₂ Cl ₄ F ₂	Tetrachloro-1,1-difluoroethane (not issued)		R-112
	C ₂ Cl ₄ F ₂	Tetrachloro-1,2-difluoroethane		
	C ₂ Cl ₅ F	Pentachlorofluoroethane (not issued)		
	C ₂ Cl ₆	Hexachloroethane (not issued)		
AZEOTROPIC MIXTURES				
7.1a		Refrigerant 500 ((0.606 mol R-12 + 0.394 mol R-152a) Azeotrope)		
7.1c		Refrigerant 502 ((0.630 mol R-22 + 0.370 mol R-115) Azeotrope)		
		Refrigerant 503 (not issued)		
7.1e		Refrigerant 504 ((0.734 mol R-32 + 0.266 mol R-115) Azeotrope)		
7.2		(0.754 mol R-31 + 0.246 mol R-114) Azeotrope		
		(0.382 mol R-115 + 0.618 mol R-290) Azeotrope (not issued)		
		(0.770 mol R-124a + 0.230 mol R-C318) Azeotrope (not issued)		

NB. To allow for the future issue of omitted compounds sheet numbers are not always consecutive.

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ORTHOBARIC DENSITIES AND MOLAR VOLUMES OF LIQUIDS: HALOGENATED ETHANES

1. INTRODUCTION

This Data Item presents orthobaric densities and molar volumes of the halogenated ethanes arranged in the order shown on the Contents page. The Compound Name Index lists alternative names of the compounds with, in bold, the first name used for each compound on the Contents page and at the head of each Table.

The values of density and molar volume for each compound have been obtained by calculation from the equation given, with its numerical coefficients, at the top of each Table. This equation was fitted to the data that had been selected after critical assessment of all the data. The value of the critical temperature for each compound was, unless otherwise stated, taken from the relevant Data Item giving the vapour pressure. For completeness all the critical parameters of each compound are given in the Tables which also show the density at 25 deg. C, where applicable, and for convenience, the approximate normal boiling and melting temperatures.

The Table of Data at Specified Temperatures for each compound gives the density, the molar volume and their derivatives with respect to temperature. In addition this Table also gives an assessment of the data quality indicated, in decreasing order, by one of the letters 'A', 'B' or 'C', at each temperature. Brackets enclose the data at those temperatures which are outside the range of supporting experimental data. The estimated uncertainties in density and molar volume are shown below each letter in the units of density and molar volume rounded to 1, 2 or 5 times a power of 10.

In the main Tables the uncertainties in the tabulated values of density and molar volume are shown for each value. The number of decimal places in each value is adjusted to be consistent with the uncertainty. Data quality and uncertainties are discussed at greater length in Section 5 and in Section 4 of the Introductory Data Item, Reference 4.

The sources of information which give liquid density or liquid molar volume data for the compound considered are listed on the reverse side of each sheet. Those sources that were used to derive the critical density and the coefficients of the liquid density/molar volume equation are shown together with the temperature ranges (ambient, low, medium, high or critical) of their data. These arbitrary temperature ranges are defined more precisely in Section 2 of the Introductory Data Item, Reference 4.

2. NOTATION AND UNITS

All temperatures are based on the International Temperature Scale (ITS-90).

b_1, b_2, b_3, b_4	non-dimensional coefficients of the density/molar volume equation
d	liquid density
q	$(1 - T/T_c)^{1/3}$
T	kelvin temperature
t	Celsius temperature ($T - 273.15$)
V	liquid molar volume

Note: The UNITS of temperature, density and molar volume are shown in each Table.

Subscripts

b	denotes value at the normal boiling point
c	denotes value at the critical point
m	denotes value at the normal melting point.

3. THE CRITICAL DENSITY

The Rackett equation, one of many equations developed to estimate or correlate saturated liquid densities, is described, with its subsequent modifications, in References 1, 2 and 3. This equation does not represent the experimental data over the full range of temperature as well as does the equation used in this Item. However, in its latest form, when fitted to experimental data, it yields reliable values of critical density for a wide variety of compounds, provided the critical temperature and the critical pressure for each compound are reliably known.

For this Item, the critical density was initially taken as the value given by the modified Rackett equation and, where necessary, slightly adjusted to give a smooth variation between compounds. This value was, in general, found to be in good agreement with the reported critical densities.

4. EVALUATION AND CORRELATION

Reliable data over the greater part of the liquid range up to the critical point are available for six of the compounds considered here. Reliable data for the remainder of the compounds are mainly confined to low and medium reduced temperatures.

The data of the six compounds with extensive reliable data were fitted by the liquid density equation used here with the critical density adjusted to the value obtained as described in Section 3. It should be noted that in this Item three independent coefficients in the equation were sufficient to represent adequately the experimental data of each compound.

The equations for these compounds were then used to derive a correlation similar to that derived for alkanes which is described in Item 87010. This correlation was then used to derive the density/molar volume equations of the remainder of the compounds.

5. UNCERTAINTIES

At any temperature, the estimated uncertainties in the tabulated values of density and molar volume are dependent upon the rates of change of these properties with temperature and the quality of the experimental or estimated data upon which they are based. The table of Data at Specified Temperatures shows these gradients, the assessed data quality (indicated by one of the letters 'A', 'B' or 'C') and the corresponding uncertainties at various points of the liquid range.

At low and medium reduced temperatures average quality data, denoted by the letter 'B', have uncertainties varying from 0.1 to 1 per cent, increasing to between 1 and 10 per cent at the critical point. Data with lower or higher uncertainties than these bands are graded 'A' and 'C' respectively. When the data quality is 'C' it will be appreciated that the uncertainties are necessarily rather speculative and that for some compounds they may be underestimated.

Comparison of the tabulated values given here with those given in Reference 5 shows good agreement for most compounds, the differences generally being comparable with the estimated uncertainties.

6. REFERENCES

1. RACKETT, H.G. Equation of state for saturated liquids. J. Chem. Eng. Data, Vol.15, No.4, pp.514-517, 1970.
2. SPENCER, C.F.,
DANNER, R.P. Improved equation for prediction of saturated liquid density. J. Chem. Eng. Data, Vol.17, No.2, pp.236-241, 1972.
3. CAMPBELL, S.W.
THODOS, G. Prediction of saturated-liquid densities and critical volumes for polar and non-polar substances. J. Chem. Eng. Data, Vol.30, No.1, pp.102-111, 1985.
4. ESDU Orthobaric densities and molar volumes of liquids. Introduction to Data Items issued after July 1989. Item No. 89018, ESDU ESDU International, 1989.
5. TRC TRC Thermodynamic Tables - Non-Hydrocarbons. Thermodynamics Research Center, Texas A & M University System, College Station, Texas, USA. Loose leaf data sheets extant 1991.

COMPOUND NAME INDEX

The first name given for each compound on the Contents page and at the head of each Table is in bold type

Name		Sheet No.
Acetylene tetrachloride	see 1,1,2,2-Tetrachloroethane	4.5b
Acetylene tetrafluoride	see 1,1,2,2-Tetrafluoroethane	4.1b
1-Bromo-1-chloroethane		2.4a
Bromochloro-1,1,1-trifluoroethane		5.3f
Bromoethane		1.3
1-Chloro-1,1-difluoroethane		3.2a
2-Chloro-1,1-difluoroethane		3.2c
Chloroethane		1.2
Chloropentafluoroethane		6.2
Chloro-1,1,1,2-tetrafluoroethane		5.2b
Chloro-1,1,2,2-tetrafluoroethane		5.2a
2-Chloro-1,1,1-trifluoroethane		4.2b
1,2-Dibromochlorotrifluoroethane		6.4f
1,2-Dibromo-1,1-dichloroethane		4.7c
1,1-Dibromoethane		2.5a
1,2-Dibromoethane		2.5b
1,2-Dibromotetrafluoroethane		6.3f
1,2-Dichloro-1,1-difluoroethane		4.3b
1,1-Dichloroethane		2.3a
1,2-Dichloroethane		2.3b
1,1-Dichlorotetrafluoroethane		6.3a
1,2-Dichlorotetrafluoroethane		6.3b
1,2-Dichloro-1,1,2-trifluoroethane		5.3b
2,2-Dichloro-1,1,1-trifluoroethane		5.3c
1,1-Difluoroethane		2.1a
1,2-Difluoroethane		2.1b
Ethyl bromide	see Bromoethane	1.3
Ethyl chloride	see Chloroethane	1.2
Ethyl iodide	see Iodoethane	1.4
Ethylene dibromide	see 1,2-Dibromoethane	2.5b
Ethylene dichloride	see 1,2-Dichloroethane	2.3b
Ethylene difluoride	see 1,2-Difluoroethane	2.1b
Ethylidene bromide	see 1,1-Dibromoethane	2.5a
Ethylidene chloride	see 1,1-Dichloroethane	2.3a
Ethylidene fluoride	see 1,1-Difluoroethane	2.1a
Halothane	see Bromochloro-1,1,1-trifluoroethane	5.3f
Hexafluoroethane		6.1
Iodoethane		1.4
Methyl chloroform	see 1,1,1-Trichloroethane	3.4a
Methyl fluoroform	see 1,1,1-Trifluoroethane	3.1a
Pentachloroethane		5.6
Pentafluoroethane		5.1
Perfluoroethane	see Hexafluoroethane	6.1
Tetrachloro-1,2-difluoroethane		6.5b
1,1,1,2-Tetrachloroethane		4.5a
1,1,2,2-Tetrachloroethane		4.5b
1,1,1,2-Tetrafluoroethane		4.1a
1,1,2,2-Tetrafluoroethane		4.1b
1,1,2-Tribromoethane		3.7b
1,1,1-Trichloroethane		3.4a
1,1,2-Trichloroethane		3.4b
1,1,1-Trichlorotrifluoroethane		6.4a
1,1,2-Trichlorotrifluoroethane		6.4b
1,1,1-Trifluoroethane		3.1a

Continued on next page

COMPOUND NAME INDEX continued

Refrigerant Number Index

Refrigerant	Name	Sheet No.
Refrigerant 112	see Tetrachloro-1,2-difluoroethane	6.5b
Refrigerant 113	see 1,1,2-Trichlorotrifluoroethane	6.4b
Refrigerant 113a	see 1,1,1-Trichlorotrifluoroethane	6.4a
Refrigerant 113B2	see 1,2-Dibromochlorotrifluoroethane	6.4f
Refrigerant 114	see 1,2-Dichlorotetrafluoroethane	6.3b
Refrigerant 114a	see 1,1-Dichlorotetrafluoroethane	6.3a
Refrigerant 114B2	see 1,2-Dibromotetrafluoroethane	6.3f
Refrigerant 115	see Chloropentafluoroethane	6.2
Refrigerant 116	see Hexafluoroethane	6.1
Refrigerant 123	see 2,2-Dichloro-1,1,1-trifluoroethane	5.3c
Refrigerant 123a	see 1,2-Dichloro-1,1,2-trifluoroethane	5.3b
Refrigerant 123B1a	see Bromochloro-1,1,1-trifluoroethane	5.3f
Refrigerant 124	see Chloro-1,1,1,2-tetrafluoroethane	5.2b
Refrigerant 124a	see Chloro-1,1,2,2-tetrafluoroethane	5.2a
Refrigerant 125	see Pentafluoroethane	5.1
Refrigerant 130	see 1,1,2,2-Tetrachloroethane	4.5b
Refrigerant 130a	see 1,1,1,2-Tetrachloroethane	4.5a
Refrigerant 130B2a	see 1,2-Dibromo-1,1-dichloroethane	4.7c
Refrigerant 132b	see 1,2-Dichloro-1,1-difluoroethane	4.3b
Refrigerant 133a	see 2-Chloro-1,1,1-trifluoroethane	4.2b
Refrigerant 134	see 1,1,2,2-Tetrafluoroethane	4.1b
Refrigerant 134a	see 1,1,1,2-Tetrafluoroethane	4.1a
Refrigerant 140	see 1,1,2-Trichloroethane	3.4b
Refrigerant 140a	see 1,1,1-Trichloroethane	3.4a
Refrigerant 140B3	see 1,1,2-Tribromomethane	3.7b
Refrigerant 142	see 2-Chloro-1,1-difluoroethane	3.2c
Refrigerant 142b	see 1-Chloro-1,1-difluoroethane	3.2a
Refrigerant 143a	see 1,1,1-Trifluoroethane	3.1a
Refrigerant 150	see 1,2-Dichloroethane	2.3b
Refrigerant 150a	see 1,1-Dichloroethane	2.3a
Refrigerant 150B1a	see 1-Bromo-1-chloroethane	2.4a
Refrigerant 150B2	see 1,2-Dibromoethane	2.5b
Refrigerant 150B2a	see 1,1-Dibromoethane	2.5a
Refrigerant 152	see 1,2-Difluoroethane	2.1b
Refrigerant 152a	see 1,1-Difluoroethane	2.1a
Refrigerant 160	see Chloroethane	1.2
Refrigerant 160B1	see Bromoethane	1.3
Refrigerant 500		7.1a
Refrigerant 502		7.1c
Refrigerant 504		7.1e
(0.606 mol R-12 + 0.394 mol R-152a) Azeotrope	see Refrigerant 500	7.1a
(0.630 mol R-22 + 0.370 mol R-115) Azeotrope	see Refrigerant 502	7.1c
(0.754 mol R-31 + 0.246 mol R-114) Azeotrope		7.2
(0.734 mol R-32 + 0.266 mol R-115) Azeotrope	see Refrigerant 504	7.1e

C₂H₅Cl Chloroethane (Ethyl chloride, Refrigerant 160)**Orthobaric Liquid Density and Molar Volume**

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

Molecular Weight	MW =	64.51	
Critical Temperature	$T_c =$	460 K	($t_c = 186.85\text{ }^\circ\text{C}$)
Critical Pressure	$p_c =$	5227 kPa	($= 51.59\text{ atm}$)
Critical Density	$d_c =$	330 kg/m ³	($V_c = 196\text{ cm}^3/\text{mol}$)
Critical Compression Factor	$Z_c =$	0.268	
$b_1 = 1.77223$	$b_2 = -0.64985$	$b_3 = 0.00000$	$b_4 = 0.23689$
Density at 298.15 K (25 °C)	$d_{25} =$	884.65 kg/m ³	($V_{25} = 72.93\text{ cm}^3/\text{mol}$)
Normal Boiling Point	$T_b =$	285.42 K	($t_b = 12.27\text{ }^\circ\text{C}$)
Normal Melting Point	$T_m =$	135 K	($t_m = -138\text{ }^\circ\text{C}$)

Data at Specified Temperatures

$t/^\circ\text{C}$	-138	-50	0	12.27	25	100	186.85
T/K	135.15	223.15	273.15	285.42	298.15	373.15	460.00
$d/(\text{kg}/\text{m}^3)$	1108.68	992.11	921.89	903.84	884.65	755.65	(330.00)
$(d(d)/dT)/(\text{kg}/\text{m}^3\text{ K})$	-1.30	-1.36	-1.45	-1.49	-1.53	-2.01	$-\infty$
$V/(\text{cm}^3/\text{mol})$	58.19	65.03	69.98	71.38	72.93	85.38	(195.50)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	0.07	0.09	0.11	0.12	0.13	0.23	∞
Data Quality	B	B	B	B	B	B	(B)
Uncertainty in d (kg/m ³)	2	2	2	2	2	2	(10)
Uncertainty in V (cm ³ /mol)	0.1	0.1	0.2	0.2	0.2	0.2	(5)

Orthobaric Liquid Density of ChloroethaneUnits: kg/m³ v. °C

t	d	Uncert.	t	d	Uncert.	t	d	Uncert.	t	d	Uncert.
$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³
			50	845.	2	150	(633.)	5	180	(491.)	10
			55	837.	2	152	(627.)	5	181	(482.)	10
-130	1098.	2	60	829.	2	154	(620.)	5	182	(472.)	10
-120	1085.	2	65	820.	2	156	(613.)	5	183	(461.)	10
-110	1072.	2	70	812.	2	158	(606.)	5	184	(447.)	10
-100	1059.	2	75	803.	2	160	(598.)	5	185	(430.)	10
-90	1046.	2	80	794.	2	162	(591.)	5	186	(406.)	10
-80	1033.	2	85	785.	2	164	(582.)	5			
-70	1019.	2	90	775.	2	166	(574.)	5			
-60	1006.	2	95	766.	2	168	(565.)	5			
-50	992.	2	100	756.	2	170	(555.)	5			
-40	978.	2	105	745.	2	172	(545.)	10			
-30	965.	2	110	735.	2	174	(533.)	10			
-20	951.	2	115	724.	2	176	(521.)	10			
-10	936.	2	120	713.	2	178	(507.)	10			
0	922.	2	125	701.	2						
10	907.	2	130	689.	2						
20	892.	2	135	676.	5						
30	877.	2	140	663.	5						
40	861.	2	145	648.	5						

Orthobaric Liquid Molar Volume of Chloroethane

Units: cm³/mol v. K

T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V
K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol
			300	73.2	0.2	400	93.	0.5	440	(113.)	1
			305	73.8	0.2	402	93.	0.5	441	(114.)	1
			310	74.5	0.2	404	94.	0.5	442	(115.)	1
			315	75.2	0.2	406	95.	0.5	443	(116.)	2
140	58.5	0.1	320	75.9	0.2	408	95.	0.5	444	(117.)	2
150	59.2	0.1	325	76.6	0.2	410	96.	0.5	445	(118.)	2
160	59.9	0.1	330	77.4	0.2	412	97.	0.5	446	(120.)	2
170	60.7	0.1	335	78.1	0.2	414	98.	0.5	447	(121.)	2
180	61.4	0.1	340	79.0	0.2	416	99.	0.5	448	(122.)	2
190	62.2	0.1	345	79.8	0.2	418	99.	0.5	449	(124.)	2
200	63.0	0.1	350	80.7	0.2	420	100.	0.5	450	(125.)	2
210	63.9	0.1	355	81.6	0.2	422	101.	1	451	(127.)	2
220	64.7	0.1	360	82.6	0.2	424	(102.)	1	452	(129.)	2
230	65.6	0.1	365	83.6	0.2	426	(103.)	1	453	(131.)	2
240	66.6	0.1	370	84.7	0.2	428	(105.)	1	454	(133.)	2
250	67.6	0.1	375	85.8	0.2	430	(106.)	1	455	(136.)	2
260	68.6	0.1	380	87.0	0.2	432	(107.)	1	456	(140.)	2
270	69.6	0.2	385	88.3	0.2	434	(108.)	1	457	(144.)	2
280	70.7	0.2	390	89.6	0.2	436	(110.)	1	458	(149.)	2
290	71.9	0.2	395	91.	0.5	438	(111.)	1	459	(157.)	5

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

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C₂H₅Br Bromoethane (Ethyl bromide, Refrigerant 160B1)

Orthobaric Liquid Density and Molar Volume

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

Molecular Weight	MW =	108.97	
Critical Temperature	T_c =	504 K	(t_c = 230.85 °C)
Critical Pressure	p_c =	5315 kPa	(= 52.45 atm)
Critical Density	d_c =	518 kg/m ³	(V_c = 210 cm ³ /mol)
Critical Compression Factor	Z_c =	0.266	
b_1	=	1.77656	
b_2	=	-0.65472	
b_3	=	0.00000	
b_4	=	0.23795	
Density at 298.15 K (25 °C)	d_{25} =	1450.67 kg/m ³	(V_{25} = 75.11 cm ³ /mol)
Normal Boiling Point	T_b =	303.53 K	(t_b = 30.38 °C)
Normal Melting Point	T_m =	154 K	(t_m = -119 °C)

Data at Specified Temperatures

$t/^\circ\text{C}$	-119	-50	0	25	30.38	150	230.85
T/K	154.15	223.15	273.15	298.15	303.53	423.15	504.00
$d/(\text{kg/m}^3)$	(1730.12)	1599.85	1501.78	1450.67	1439.44	1144.50	518.00
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-1.87)	-1.92	-2.01	-2.08	-2.10	-3.12	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(62.98)	68.11	72.56	75.11	75.70	95.21	210.36
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.07)	0.08	0.10	0.11	0.11	0.26	∞
Data Quality	(B)	B	B	B	B	B	B
Uncertainty in d (kg/m ³)	(2)	2	2	2	2	2	10
Uncertainty in V (cm ³ /mol)	(0.05)	0.1	0.1	0.1	0.1	0.2	5

Orthobaric Liquid Density of Bromoethane

Units: kg/m³ v. °C

t	d	Uncert.	t	d	Uncert.	t	d	Uncert.	t	d	Uncert.
$^\circ\text{C}$	kg/m ³	in d	$^\circ\text{C}$	kg/m ³	in d	$^\circ\text{C}$	kg/m ³	in d	$^\circ\text{C}$	kg/m ³	in d
-100	1695.	2	100	1282.	2	200	948.	5	220	808.	10
-90	1676.	2	105	1270.	2	202	937.	5	221	798.	10
-80	1657.	2	110	1257.	2	204	926.	5	222	787.	10
-70	1638.	2	115	1244.	2	206	914.	5	223	776.	10
-60	1619.	2	120	1231.	2	208	901.	5	224	763.	10
-50	1600.	2	125	1217.	2	210	888.	5	225	749.	10
-40	1581.	2	130	1203.	2	212	875.	5	226	734.	10
-30	1561.	2	135	1189.	2	214	860.	5	227	717.	10
-20	1542.	2	140	1175.	2	216	844.	5	228	696.	10
-10	1522.	2	145	1160.	2	218	827.	10	229	671.	10
0	1502.	2	150	1144.	2						
10	1482.	2	155	1129.	2						
20	1461.	2	160	1112.	2						
30	1440.	2	165	1095.	2						
40	1419.	2	170	1077.	2						
50	1398.	2	175	1059.	2						
60	1376.	2	180	1039.	5						
70	1353.	2	185	1019.	5						
80	1330.	2	190	997.	5						
90	1306.	2	195	973.	5						

Orthobaric Liquid Molar Volume of Bromoethane

Units: cm³/mol v. K

T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V
K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol
160	(63.4)	0.05	350	81.5	0.1	450	103.6	0.2	490	130.	1
170	64.1	0.1	355	82.2	0.1	452	104.	0.5	491	132.	1
180	64.8	0.1	360	82.9	0.1	454	105.	0.5	492	133.	1
190	65.5	0.1	365	83.7	0.1	456	106.	0.5	493	135.	1
			370	84.5	0.1	458	107.	0.5	494	136.	1
200	66.3	0.1	375	85.3	0.1	460	108.	0.5	495	138.	1
210	67.1	0.1	380	86.1	0.1	462	109.	0.5	496	140.	2
220	67.9	0.1	385	87.0	0.1	464	110.	0.5	497	142.	2
230	68.7	0.1	390	87.9	0.1	466	111.	0.5	498	145.	2
240	69.5	0.1	395	88.9	0.1	468	112.	0.5	499	148.	2
250	70.4	0.1	400	89.9	0.1	470	113.	0.5	500	151.	2
260	71.3	0.1	405	90.9	0.2	472	114.	0.5	501	156.	2
270	72.3	0.1	410	92.0	0.2	474	116.	0.5	502	161.	2
280	73.2	0.1	415	93.2	0.2	476	117.	0.5	503	170.	2
290	74.3	0.1	420	94.4	0.2	478	118.	1	504	210.	5
300	75.3	0.1	425	95.7	0.2	480	120.	1			
310	76.4	0.1	430	97.1	0.2	482	122.	1			
320	77.6	0.1	435	98.5	0.2	484	123.	1			
330	78.8	0.1	440	100.1	0.2	486	125.	1			
340	80.1	0.1	445	101.8	0.2	488	128.	1			

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

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20	TRC Thermodynamic Tables,	Texas A & M Univ.,	Loose leaf data sheets extant		1992.*	

C₂H₅I Iodoethane (Ethyl iodide)**Orthobaric Liquid Density and Molar Volume**

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

NB. The values of the critical properties given below are to be regarded as only as correlating parameters.

Molecular Weight	MW =	155.97		
Critical Temperature	T _c =	563 K	(t _c =	289.85 °C)
Critical Pressure	p _c =	5200 kPa	(=	51.32 atm)
Critical Density	d _c =	655 kg/m ³	(V _c =	238 cm ³ /mol)
Critical Compression Factor	Z _c =	0.264		
b ₁ = 1.78272	b ₂ = -0.65187	b ₃ = 0.00000	b ₄ = 0.23429	
Density at 298.15 K (25 °C)	d ₂₅ =	1924.73 kg/m ³	(V ₂₅ =	81.03 cm ³ /mol)
Normal Boiling Point	T _b =	345.59 K	(t _b =	72.44 °C)
Normal Melting Point	T _m =	162 K	(t _m =	-111 °C)

Data at Specified Temperatures

$t/^\circ\text{C}$	-111	-50	0	25	72.44	200	289.85
T/K	162.15	223.15	273.15	298.15	345.59	473.15	563.00
$d/(\text{kg/m}^3)$	(2220.95)	2090.59	1981.04	1924.73	(1813.54)	(1451.14)	(655.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-2.12)	-2.16	-2.23	-2.28	(-2.42)	(-3.58)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(70.22)	74.60	78.73	81.03	(86.00)	(107.48)	(238.12)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.07)	0.08	0.09	0.10	(0.11)	(0.26)	∞
Data Quality	(B)	B	B	B	(B)	(C)	(C)
Uncertainty in d (kg/m ³)	(2)	2	2	2	(2)	(10)	(50)
Uncertainty in V (cm ³ /mol)	(0.05)	0.05	0.1	0.1	(0.1)	(1)	(20)

Orthobaric Liquid Density of IodoethaneUnits: kg/m³ v. °C

t	d	Uncert.	t	d	Uncert.	t	d	Uncert.	t	d	Uncert.
$^\circ\text{C}$	kg/m ³	in d	$^\circ\text{C}$	kg/m ³	in d	$^\circ\text{C}$	kg/m ³	in d	$^\circ\text{C}$	kg/m ³	in d
-100	(2198.)	2	100	(1745.)	2	200	(1451.)	10	240	(1286.)	20
-90	2176.	2	105	(1732.)	2	202	(1444.)	10	241	(1281.)	20
-80	2155.	2	110	(1720.)	5	204	(1437.)	10	242	(1276.)	20
-70	2134.	2	115	(1707.)	5	206	(1429.)	10	243	(1271.)	20
-60	2112.	2	120	(1693.)	5	208	(1422.)	20	244	(1265.)	20
-50	2091.	2	125	(1680.)	5	210	(1414.)	20	245	(1260.)	20
-40	2069.	2	130	(1666.)	5	212	(1407.)	20	246	(1255.)	20
-30	2047.	2	135	(1653.)	5	214	(1399.)	20	247	(1250.)	20
-20	2025.	2	140	(1639.)	5	216	(1391.)	20	248	(1244.)	20
-10	2003.	2	145	(1625.)	5	218	(1383.)	20	249	(1239.)	20
0	1981.	2	150	(1610.)	5	220	(1375.)	20	250	(1233.)	20
10	1959.	2	155	(1596.)	5	222	(1367.)	20	251	(1228.)	20
20	1936.	2	160	(1581.)	5	224	(1358.)	20	252	(1222.)	20
30	1913.	2	165	(1566.)	10	226	(1350.)	20	253	(1216.)	20
40	1890.	2	170	(1551.)	10	228	(1341.)	20	254	(1210.)	20
50	1867.	2	175	(1535.)	10	230	(1332.)	20	255	(1204.)	20
60	1843.	2	180	(1519.)	10	232	(1323.)	20	256	(1198.)	20
70	(1819.)	2	185	(1503.)	10	234	(1314.)	20	257	(1192.)	20
80	(1795.)	2	190	(1486.)	10	236	(1305.)	20	258	(1186.)	20
90	(1770.)	2	195	(1469.)	10	238	(1295.)	20	259	(1179.)	20

Orthobaric Liquid Molar Volume of Iodoethane

Units: cm³/mol v. K

T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V
K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol
			400	(93.1)	0.2	520	(125.)	2	550	(151.)	5
			405	(93.9)	0.2	522	(126.)	2	551	(153.)	5
170	(70.8)	0.05	410	(94.7)	0.2	524	(127.)	2	552	(154.)	5
180	(71.4)	0.05	415	(95.5)	0.2	526	(128.)	2	553	(156.)	5
190	72.1	0.05	420	(96.)	0.5	528	(129.)	2	554	(158.)	5
200	72.9	0.05	425	(97.)	0.5	530	(131.)	2	555	(161.)	5
210	73.6	0.05	430	(98.)	0.5	532	(132.)	5	556	(163.)	10
220	74.4	0.05	435	(99.)	0.5	534	(134.)	5	557	(166.)	10
230	75.1	0.05	440	(100.)	0.5	536	(135.)	5	558	(169.)	10
240	75.9	0.05	445	(101.)	0.5	538	(137.)	5	559	(173.)	10
250	76.7	0.1	450	(102.)	0.5	540	(139.)	5	560	(178.)	10
260	77.6	0.1	455	(103.)	0.5	542	(141.)	5	561	(184.)	10
270	78.5	0.1	460	(104.)	1	544	(143.)	5	562	(194.)	10
280	79.3	0.1	465	(105.)	1	546	(145.)	5	563	(238.)	20
290	80.3	0.1	470	(107.)	1	548	(148.)	5			
300	81.2	0.1	475	(108.)	1						
310	82.2	0.1	480	(109.)	1						
320	83.2	0.1	485	(111.)	1						
330	84.3	0.1	490	(112.)	1						
340	85.4	0.1	495	(114.)	2						
350	(86.5)	0.1	500	(116.)	2						
360	(87.7)	0.1	505	(118.)	2						
370	(89.0)	0.2	510	(120.)	2						
380	(90.3)	0.2	515	(122.)	2						
390	(91.7)	0.2									

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

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C₂H₄F₂ 1,1-Difluoroethane (Ethylidene fluoride, Refrigerant 152a)**Orthobaric Liquid Density and Molar Volume**

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

Molecular Weight	MW =	66.05		
Critical Temperature	$T_c =$	386.55 K	($t_c =$	113.40 °C)
Critical Pressure	$p_c =$	4519 kPa	($=$	44.60 atm)
Critical Density	$d_c =$	365 kg/m ³	($V_c =$	181 cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.255		
$b_1 =$	1.82016	$b_2 =$	-0.64985	$b_3 =$ 0.00000 $b_4 =$ 0.21900
Density at 298.15 K (25 °C)	$d_{25} =$	898.37 kg/m ³	($V_{25} =$	73.52 cm ³ /mol)
Normal Boiling Point	$T_b =$	249.45 K	($t_b =$	-23.70 °C)
Normal Melting Point	$T_m =$	156 K	($t_m =$	-117 °C)

Data at Specified Temperatures

$t/^\circ\text{C}$	-117	-23.70	0	25	50	75	113.40
T/K	156.15	249.45	273.15	298.15	323.15	348.15	386.55
$d/(\text{kg/m}^3)$	(1189.51)	1009.96	958.24	898.37	829.79	745.13	365.00
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-1.81)	-2.10	-2.27	-2.54	-2.99	-3.91	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(55.53)	65.40	68.93	73.52	79.60	88.64	180.96
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.08)	0.14	0.16	0.21	0.29	0.47	∞
Data Quality	(B)	B	B	B	B	B	B
Uncertainty in d (kg/m ³)	(2)	2	2	2	2	5	5
Uncertainty in V (cm ³ /mol)	(0.1)	0.1	0.2	0.2	0.2	0.5	2

Orthobaric Liquid Density of 1,1-DifluoroethaneUnits: kg/m³ v. °C

t	d	Uncert. in d	t	d	Uncert. in d	t	d	Uncert. in d	t	d	Uncert. in d
°C	kg/m ³	kg/m ³	°C	kg/m ³	kg/m ³	°C	kg/m ³	kg/m ³	°C	kg/m ³	kg/m ³
			0	958.	2	72	757.	5	101	611.	5
			5	947.	2	74	749.	5	102	603.	5
			10	935.	2	76	741.	5	103	595.	5
			15	923.	2	78	733.	5	104	587.	5
-110	(1177.)	2	20	911.	2	80	725.	5	105	577.	5
-100	(1159.)	2	25	898.	2	82	716.	5	106	568.	5
-90	(1140.)	2	30	885.	2	84	707.	5	107	557.	5
-80	(1121.)	2	35	872.	2	86	698.	5	108	545.	5
-70	(1102.)	2	40	859.	2	88	688.	5	109	532.	5
-60	(1083.)	2	45	844.	2	90	678.	5	110	517.	5
-50	(1064.)	2	50	830.	2	92	668.	5	111	499.	5
-40	1044.	2	55	815.	5	94	657.	5	112	475.	5
-30	1023.	2	60	799.	5	96	645.	5	113	436.	5
-20	1002.	2	65	782.	5	98	632.	5			
-10	981.	2	70	764.	5	100	618.	5			

Orthobaric Liquid Molar Volume of 1,1-Difluoroethane

Units: cm³/mol v. K

T	V	Uncert.	T	V	Uncert.	T	V	Uncert.	T	V	Uncert.
K	cm ³ /mol	in V cm ³ /mol	K	cm ³ /mol	in V cm ³ /mol	K	cm ³ /mol	in V cm ³ /mol	K	cm ³ /mol	in V cm ³ /mol
160	(55.9)	0.1	300	73.9	0.2	360	95.	0.5	380	118.	1
170	(56.7)	0.1	305	75.0	0.2	362	97.	0.5	381	121.	1
180	(57.6)	0.1	310	76.2	0.2	364	98.	0.5	382	124.	1
190	(58.6)	0.1	315	77.4	0.2	366	100.	0.5	383	127.	1
			320	78.7	0.2	368	101.	0.5	384	132.	1
200	(59.6)	0.1	325	80.1	0.2	370	103.	0.5	385	138.	1
210	(60.6)	0.1	330	82.	0.5	372	105.	1	386	149.	2
220	(61.7)	0.1	335	83.	0.5	374	108.	1			
230	(62.9)	0.1	340	85.	0.5	376	111.	1			
240	64.2	0.1	345	87.	0.5	378	114.	1			
250	65.5	0.1	350	90.	0.5						
260	66.9	0.2	355	92.	0.5						
270	68.4	0.2									
280	70.1	0.2									
290	71.9	0.2									

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

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C₂H₄F₂ 1,2-Difluoroethane (Ethylene difluoride, Refrigerant 152)

Orthobaric Liquid Density and Molar Volume

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

NB. The values of the critical properties given below are to be regarded as only as correlating parameters.

Molecular Weight	MW =	66.05	
Critical Temperature	$T_c =$	452 K	($t_c = 178.85$ °C)
Critical Pressure	$p_c =$	5150 kPa	(= 50.83 atm)
Critical Density	$d_c =$	355 kg/m ³	($V_c = 186$ cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.255	
$b_1 = 1.82298$	$b_2 = -0.65963$	$b_3 = 0.00000$	$b_4 = 0.22429$
Density at 298.15 K (25 °C)	$d_{25} =$	969.40 kg/m ³	($V_{25} = 68.13$ cm ³ /mol)
Normal Boiling Point	$T_b =$	283.65 K	($t_b = 10.50$ °C)
Normal Melting Point	$T_m =$	256 K	($t_m = -17$ °C)

Data at Specified Temperatures

$t/^\circ\text{C}$	-17	0	10.50	25	50	100	178.85
T/K	256.15	273.15	283.65	298.15	323.15	373.15	452.00
$d/(\text{kg/m}^3)$	(1040.45)	(1012.41)	994.63	(969.40)	(923.57)	(817.82)	(355.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-1.63)	(-1.68)	-1.71	(-1.77)	(-1.90)	(-2.40)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(63.48)	(65.24)	66.41	(68.13)	(71.52)	(80.76)	(186.06)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.10)	(0.11)	0.11	(0.12)	(0.15)	(0.24)	∞
Data Quality	(C)	(C)	C	(C)	(C)	(C)	(C)
Uncertainty in d (kg/m ³)	(10)	(10)	10	(10)	(10)	(20)	(50)
Uncertainty in V (cm ³ /mol)	(0.5)	(0.5)	0.5	(0.5)	(1)	(2)	(20)

Orthobaric Liquid Density of 1,2-Difluoroethane

Units: kg/m³ v. °C

Uncert.			Uncert.			Uncert.			Uncert.		
t	d	in	t	d	in	t	d	in	t	d	in
°C	kg/m ³	kg/m ³	°C	kg/m ³	kg/m ³	°C	kg/m ³	kg/m ³	°C	kg/m ³	kg/m ³
-10	(1029.)	10	100	(818.)	20	150	(666.)	50	170	(554.)	50
			105	(806.)	20	152	(657.)	50	171	(545.)	50
			110	(793.)	20	154	(648.)	50	172	(536.)	50
			115	(780.)	20	156	(639.)	50	173	(526.)	50
			120	(766.)	20	158	(629.)	50	174	(514.)	50
0	(1012.)	10	125	(752.)	20	160	(619.)	50	175	(501.)	50
			130	(737.)	20	162	(608.)	50	176	(486.)	50
			135	(721.)	20	164	(596.)	50	177	(467.)	50
			140	(704.)	20	166	(583.)	50	178	(440.)	50
			145	(686.)	50	168	(569.)	50			
50	(924.)	10									
60	(904.)	10									
70	(884.)	20									
80	(863.)	20									
90	(841.)	20									

NOTE. HENNE & RENOLL found this compound to be unstable, see J.Am.Chem.Soc., Vol.58, p.889, 1936.

Orthobaric Liquid Molar Volume of 1,2-Difluoroethane

Units: cm³/mol v. K

$\frac{T}{K}$	$\frac{V}{cm^3/mol}$	Uncert. in $\frac{V}{cm^3/mol}$	$\frac{T}{K}$	$\frac{V}{cm^3/mol}$	Uncert. in $\frac{V}{cm^3/mol}$	$\frac{T}{K}$	$\frac{V}{cm^3/mol}$	Uncert. in $\frac{V}{cm^3/mol}$	$\frac{T}{K}$	$\frac{V}{cm^3/mol}$	Uncert. in $\frac{V}{cm^3/mol}$
260	(64.)	0.5	375	(81.)	2	422	(99.)	5	441	(116.)	10
270	(65.)	0.5	380	(82.)	2	424	(100.)	5	442	(117.)	10
280	(66.)	0.5	385	(84.)	2	426	(101.)	5	443	(119.)	10
290	(67.)	0.5	390	(85.)	2	428	(102.)	5	444	(121.)	10
			395	(87.)	2	430	(104.)	5	445	(123.)	10
300	(68.)	0.5	400	(88.)	2	432	(106.)	5	446	(125.)	10
310	(70.)	1	405	(90.)	5	434	(107.)	5	447	(128.)	10
320	(71.)	1	410	(92.)	5	436	(110.)	10	448	(131.)	10
330	(73.)	1	415	(95.)	5	438	(112.)	10	449	(135.)	10
340	(74.)	1	420	(97.)	5	440	(114.)	10	450	(140.)	10
350	(76.)	2									
360	(78.)	2									
370	(80.)	2									

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

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- 2 TRC Thermodynamic Tables, Texas A & M Univ., Loose leaf data sheets extant 1992.* M

C₂H₄Cl₂ 1,1-Dichloroethane (Ethylidene chloride, Refrigerant 150a)**Orthobaric Liquid Density and Molar Volume**

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

Molecular Weight	MW =	98.96		
Critical Temperature	$T_c =$	522 K	($t_c =$	248.85 °C)
Critical Pressure	$p_c =$	4800 kPa	(=	47.37 atm)
Critical Density	$d_c =$	411 kg/m ³	($V_c =$	241 cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.267		
$b_1 =$	1.77379	$b_2 =$	-0.65015	$b_3 =$ 0.00000 $b_4 =$ 0.23651
Density at 298.15 K (25 °C)	$d_{25} =$	1167.91 kg/m ³	($V_{25} =$	84.73 cm ³ /mol)
Normal Boiling Point	$T_b =$	330.45 K	($t_b =$	57.30 °C)
Normal Melting Point	$T_m =$	176 K	($t_m =$	-97 °C)

Data at Specified Temperatures

$t/^\circ\text{C}$	-97	-50	0	25	57.30	150	248.85
T/K	176.15	223.15	273.15	298.15	330.45	423.15	522.00
$d/(\text{kg/m}^3)$	(1349.43)	(1281.29)	1206.62	1167.91	(1115.88)	(942.48)	(411.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-1.44)	(-1.47)	-1.53	-1.57	(-1.65)	(-2.20)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(73.33)	(77.23)	82.01	84.73	(88.68)	(105.00)	(240.78)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.08)	(0.09)	0.10	0.11	(0.13)	(0.25)	∞
Data Quality	(A)	(A)	A	A	(A)	(B)	(B)
Uncertainty in d (kg/m ³)	(1)	(0.5)	0.5	0.5	(0.5)	(2)	(20)
Uncertainty in V (cm ³ /mol)	(0.05)	(0.05)	0.02	0.05	(0.05)	(0.5)	(10)

Orthobaric Liquid Density of 1,1-DichloroethaneUnits: kg/m³ v. °C

t	d	Uncert.	t	d	Uncert.	t	d	Uncert.	t	d	Uncert.
$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³
-90	(1339.)	1	100	(1042.)	1	200	(812.)	10	240	(622.)	20
-80	(1325.)	1	105	(1033.)	2	202	(806.)	10	241	(613.)	20
-70	(1310.)	1	110	(1023.)	2	204	(799.)	10	242	(603.)	20
-60	(1296.)	1	115	(1014.)	2	206	(792.)	10	243	(592.)	20
			120	(1004.)	2	208	(785.)	10	244	(580.)	20
-50	(1281.)	0.5	125	(995.)	2	210	(778.)	10	245	(567.)	20
-40	(1267.)	0.5	130	(985.)	2	212	(771.)	10	246	(551.)	20
-30	(1252.)	0.5	135	(974.)	2	214	(763.)	10	247	(531.)	20
-20	(1237.)	0.5	140	(964.)	2	216	(755.)	10	248	(502.)	20
-10	(1222.)	0.5	145	(953.)	2	218	(747.)	10			
0	1207.	0.5	150	(942.)	2	220	(739.)	10			
10	1191.	0.5	155	(931.)	5	222	(730.)	10			
20	1176.	0.5	160	(920.)	5	224	(721.)	10			
30	1160.	0.5	165	(908.)	5	226	(711.)	10			
40	1144.	0.5	170	(896.)	5	228	(701.)	10			
50	(1128.)	0.5	175	(883.)	5	230	(690.)	10			
60	(1111.)	0.5	180	(870.)	5	232	(679.)	10			
70	(1095.)	1	185	(857.)	5	234	(666.)	20			
80	(1077.)	1	190	(843.)	5	236	(653.)	20			
90	(1060.)	1	195	(828.)	10	238	(638.)	20			

Orthobaric Liquid Molar Volume of 1,1-Dichloroethane

Units: cm³/mol v. K

T	V	Uncert.	T	V	Uncert.	T	V	Uncert.	T	V	Uncert.
K	cm ³ /mol	in V cm ³ /mol	K	cm ³ /mol	in V cm ³ /mol	K	cm ³ /mol	in V cm ³ /mol	K	cm ³ /mol	in V cm ³ /mol
			375	(95.3)	0.1	490	(132.)	2	520	(185.)	5
			380	(96.1)	0.2	492	(133.)	2	521	(195.)	10
			385	(97.0)	0.2	494	(135.)	2			
180	(73.6)	0.05	390	(97.9)	0.2	496	(136.)	2			
190	(74.4)	0.05	395	(98.9)	0.2	498	(138.)	2			
200	(75.3)	0.05	400	(99.9)	0.2	500	(140.)	2			
210	(76.1)	0.05	405	(100.9)	0.2	502	(142.)	2			
220	(77.0)	0.05	410	(102.0)	0.2	504	(144.)	2			
230	(77.8)	0.05	415	(103.1)	0.2	506	(147.)	2			
240	(78.8)	0.05	420	(104.)	0.5	508	(150.)	5			
250	(79.7)	0.05	425	(105.)	0.5	510	(153.)	5			
260	(80.7)	0.05	430	(107.)	0.5	512	(157.)	5			
270	(81.69)	0.02	435	(108.)	0.5	514	(161.)	5			
280	82.73	0.02	440	(110.)	0.5	516	(167.)	5			
290	83.82	0.05	445	(111.)	0.5	518	(174.)	5			
300	84.94	0.05	450	(113.)	0.5						
310	86.1	0.05	455	(114.)	1						
320	(87.3)	0.05	460	(116.)	1						
330	(88.6)	0.05	465	(118.)	1						
340	(90.0)	0.05	470	(120.)	1						
350	(91.4)	0.1	475	(123.)	1						
360	(92.9)	0.1	480	(125.)	2						
370	(94.5)	0.1	485	(128.)	2						

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

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C₂H₄Cl₂ 1,2-Dichloroethane (Ethylene dichloride, Refrigerant 150)

Orthobaric Liquid Density and Molar Volume

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

Molecular Weight	MW =	98.96		
Critical Temperature	$T_c =$	563 K	($t_c =$	289.85 °C)
Critical Pressure	$p_c =$	5510 kPa	(=	54.38 atm)
Critical Density	$d_c =$	419 kg/m ³	($V_c =$	236 cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.278		
$b_1 =$	1.80299	$b_2 =$	-0.65578	$b_3 =$ 0.00000
$b_4 =$	0.22926			
Density at 298.15 K (25 °C)	$d_{25} =$	1245.55 kg/m ³	($V_{25} =$	79.45 cm ³ /mol)
Normal Boiling Point	$T_b =$	356.63 K	($t_b =$	83.48 °C)
Normal Melting Point	$T_m =$	237 K	($t_m =$	-36 °C)

Data at Specified Temperatures

$t/°C$	-36	-25	0	25	83.48	200	289.85
T/K	237.15	248.15	273.15	298.15	356.63	473.15	563.00
$d/(kg/m^3)$	(1333.50)	(1317.93)	1282.12	1245.55	(1155.73)	(937.07)	(419.00)
$(d(d)/dT)/(kg/m^3 K)$	(-1.41)	(-1.42)	-1.45	-1.48	(-1.60)	(-2.33)	-∞
$V/(cm^3/mol)$	(74.21)	(75.09)	77.18	79.45	(85.63)	(105.61)	(236.18)
$(dV/dT)/(cm^3/mol K)$	(0.08)	(0.08)	0.09	0.09	(0.12)	(0.26)	∞
Data Quality	(A)	(A)	A	A	(A)	(B)	(B)
Uncertainty in d (kg/m ³)	(1)	(1)	0.5	0.5	(0.5)	(5)	(20)
Uncertainty in V (cm ³ /mol)	(0.05)	(0.05)	0.02	0.02	(0.05)	(0.5)	(10)

Orthobaric Liquid Density of 1,2-Dichloroethane

Units: kg/m³ v. °C

t	d	Uncert.	t	d	Uncert.	t	d	Uncert.	t	d	Uncert.
°C	kg/m ³	in d	°C	kg/m ³	in d	°C	kg/m ³	in d	°C	kg/m ³	in d
			150	(1041.)	2	250	(795.)	10	280	(641.)	20
			155	(1031.)	2	252	(787.)	10	281	(632.)	20
-30	(1325.)	1	160	(1022.)	2	254	(780.)	10	282	(623.)	20
-20	(1311.)	0.5	165	(1012.)	2	256	(772.)	10	283	(613.)	20
-10	(1297.)	0.5	170	(1002.)	2	258	(764.)	10	284	(602.)	20
0	1282.	0.5	175	(992.)	2	260	(755.)	10	285	(590.)	20
10	1268.	0.5	180	(981.)	2	262	(747.)	10	286	(576.)	20
20	1253.	0.5	185	(971.)	5	264	(737.)	10	287	(560.)	20
30	1238.	0.5	190	(960.)	5	266	(728.)	10	288	(540.)	20
40	1223.	0.5	195	(949.)	5	268	(718.)	10	289	(511.)	20
50	1208.	0.5	200	(937.)	5	270	(707.)	10			
60	1193.	0.5	205	(925.)	5	272	(696.)	10			
70	(1177.)	0.5	210	(913.)	5	274	(684.)	20			
80	(1161.)	0.5	215	(900.)	5	276	(671.)	20			
90	(1145.)	1	220	(887.)	5	278	(657.)	20			
100	(1129.)	1	225	(874.)	5						
110	(1112.)	1	230	(860.)	10						
120	(1095.)	1	235	(845.)	10						
130	(1077.)	2	240	(829.)	10						
140	(1060.)	2	245	(812.)	10						

Orthobaric Liquid Molar Volume of 1,2-Dichloroethane

Units: cm³/mol v. K

T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V	T	V	Uncert. in V
K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol	K	cm ³ /mol	cm ³ /mol
			425 (95.4)		0.2	520 (123.)		2	550 (149.)		5
			430 (96.3)		0.2	522 (124.)		2	551 (150.)		5
			435 (97.2)		0.2	524 (125.)		2	552 (152.)		5
			440 (98.1)		0.2	526 (126.)		2	553 (154.)		5
240 (74.4)		0.05	445 (99.1)		0.2	528 (127.)		2	554 (156.)		5
250 (75.2)		0.05	450 (100.2)		0.2	530 (129.)		2	555 (158.)		5
260 (76.1)		0.05	455 (101.)		0.5	532 (130.)		2	556 (161.)		5
270 (76.91)		0.02	460 (102.)		0.5	534 (132.)		2	557 (164.)		5
280 (77.79)		0.02	465 (104.)		0.5	536 (133.)		2	558 (167.)		5
290 (78.69)		0.02	470 (105.)		0.5	538 (135.)		2	559 (171.)		5
300 (79.63)		0.02	475 (106.)		0.5	540 (137.)		2	560 (176.)		5
310 (80.6)		0.05	480 (107.)		0.5	542 (139.)		2	561 (182.)		5
320 (81.6)		0.05	485 (109.)		0.5	544 (141.)		2	562 (192.)		5
330 (82.6)		0.05	490 (110.)		1	546 (143.)		2			
340 (83.7)		0.05	495 (112.)		1	548 (146.)		2			
350 (84.9)		0.05	500 (114.)		1						
360 (86.0)		0.05	505 (116.)		1						
370 (87.3)		0.05	510 (118.)		1						
380 (88.6)		0.1	515 (120.)		1						
390 (89.9)		0.1									
400 (91.4)		0.1									
410 (92.9)		0.1									
420 (94.5)		0.2									

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

1	TIMMERMANS, J.,	Bul. Soc. Chim. Belg., Vol. 24,	p. 244, 1910.	M
2	MATHEWS, J. H.,	J. Am. Chem. Soc., Vol. 48,	p. 562, 1926.	A
3	TIMMERMANS, J., MARTIN, F.,	J. Chim. Phys., Vol. 25,	p. 411, 1928.	M
4	TREW, V. C. G., SPENCER, J. F.,	Proc. Roy. Soc., London, Vol. A131,	p. 209, 1931.	A
5	HENNE, A. L., HUBBARD, D. M.,	J. Am. Chem. Soc., Vol. 58,	p. 404, 1936.	A
6	SCHAAFFS, W.,	Z. Phys. Chem. Leipzig, Vol. 194,	p. 28, 1944.	A
7	HOJENDAHL, K.,	K. Dan. Vidensk. Selsk. Mat. Fys. Medd., Vol. 24,	p. 1, 1946.	C
8	COULSON, HALES, HERINGTON,	Trans. Faraday Soc., Vol. 44,	p. 6396, 1948.	A
9	VOGEL, A. I.,	J. Chem. Soc.,	p. 1833, 1948.	M
10	BARTON, H. D. R., HOWLETT, K. E.,	J. Chem. Soc.,	p. 165, 1949.	
11	DREISBACH, R. R., MARTIN, R. A.,	Ind. Eng. Chem., Vol. 41,	p. 2875, 1949.	A
12	LAGEMANN, R. T., McMILLAN, D. R., WOOLF, W. E.,	J. Chem. Phys., Vol. 17,	p. 369, 1949.	M
13	SEARS, G. W., HOPKE, E. R.,	J. Am. Chem. Soc., Vol. 71,	p. 1632, 1949.	A
14	MUMFORD, S. A., PHILLIPS, J. W. C.,	J. Chem. Soc.,	p. 75, 1950.	A
15	STERN, MARTELL,	J. Am. Chem. Soc., Vol. 77,	p. 1983, 1955.	
16	RAO, Y. J., VISWANATH, D. S.,	J. Chem. Eng. Data, Vol. 18,	p. 49, 1973.	
17	SUNDARAM, S., VISWANATH, D. S.,	J. Chem. Eng. Data, Vol. 21,	p. 448, 1976.	A
18	AMBROSE, D., NPL Report Chem 107, Nat. Phys. Lab., Teddington, Middlesex, UK,		1980.*	
19	KRISHNAIAH, A., NAIDU, P. R.,	J. Chem. Eng. Data, Vol. 25,	p. 135, 1980.	A
20	NIGAM, R. K., SINGH, P. P., et al.,	Fluid Phase Equilib., Vol. 16,	p. 25, 1984.	A
21	SINGH, P. P., NIGAM, R. K., et al.,	Fluid Phase Equilib., Vol. 18,	p. 333, 1984.	A
22	HRADETZKY, G., GIKAS, A., et al.,	Z. Phys. Chem., Leipzig, Vol. 266,	p. 165, 1985.	
23	REDDY, K. D., RAO, M. V. P.,	J. Chem. Eng. Data, Vol. 30,	p. 36, 1985.	A
24	VENKATESWARLU, P., RAMAN, G. K.,	J. Chem. Eng. Data, Vol. 30,	p. 180, 1985.	A
25	PAUL, H. -I., KRUG, J., et al.,	J. Chem. Eng. Data, Vol. 31,	p. 488, 1986.	A
26	MATO, F., GONZALEZ, G., ARROYO, F. J.,	J. Chem. Eng. Data, Vol. 34,	p. 179, 1989.	A
27	EMBED, J. M., BERRO, C., et al.,	J. Chem. Eng. Data, Vol. 35,	p. 266, 1990.	
28	JOSHI, S. S., AMINABHAVI, T. M., et al.,	J. Chem. Eng. Data, Vol. 35,	p. 247, 1990.	M
29	SIVARAMPRASAD, G., VENKATESHWARA RAO, M.,	J. Chem. Eng. Data, Vol. 35,	p. 122, 1990.	
30	TRC Thermodynamic Tables, Texas A & M Univ., Loose leaf data sheets extant		1992.*	

Several Sources giving only one data point, usually at ambient temperatures, are omitted from the above list. A number of these are given in Source 30.

C₂H₄BrCl 1-Bromo-2-chloroethane (Ethylene bromochloride, Refrigerant 150B1)**Orthobaric Liquid Density and Molar Volume**

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

NB. The values of the critical properties given below are to be regarded as only as correlating parameters.

Molecular Weight	MW = 143.41		
Critical Temperature	$T_c = 605 \text{ K}$	($t_c = 331.85 \text{ }^\circ\text{C}$)	
Critical Pressure	$p_c = 5400 \text{ kPa}$	($= 53.29 \text{ atm}$)	
Critical Density	$d_c = 578 \text{ kg/m}^3$	($V_c = 248 \text{ cm}^3/\text{mol}$)	
Critical Compression Factor	$Z_c = 0.266$		
$b_1 = 1.77289$	$b_2 = -0.64998$	$b_3 = 0.00000$	$b_4 = 0.23673$
Density at 298.15 K (25 °C)	$d_{25} = 1729.88 \text{ kg/m}^3$	($V_{25} = 82.90 \text{ cm}^3/\text{mol}$)	
Normal Boiling Point	$T_b = 380.15 \text{ K}$	($t_b = 107.00 \text{ }^\circ\text{C}$)	
Normal Melting Point	$T_m = 256 \text{ K}$	($t_m = -17 \text{ }^\circ\text{C}$)	

Data at Specified Temperatures

$t/^\circ\text{C}$	-17	0	25	107	150	250	331.85
T/K	256.15	273.15	298.15	380.15	423.15	523.15	605.00
$d/(\text{kg/m}^3)$	(1805.38)	(1775.05)	(1729.88)	(1574.20)	(1485.01)	(1230.10)	(578.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-1.78)	(-1.79)	(-1.82)	(-2.00)	(-2.16)	(-3.17)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(79.44)	(80.79)	(82.90)	(91.10)	(96.57)	(116.58)	(248.12)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.08)	(0.08)	(0.09)	(0.12)	(0.14)	(0.30)	∞
Data Quality	(B)	(B)	(B)	(B)	(B)	(C)	(C)
Uncertainty in d (kg/m^3)	(2)	(2)	(2)	(5)	(10)	(20)	(50)
Uncertainty in V (cm^3/mol)	(0.1)	(0.1)	(0.1)	(0.2)	(0.5)	(2)	(20)

Orthobaric Liquid Density of 1-Bromo-2-chloroethaneUnits: kg/m^3 v. $^\circ\text{C}$

t	d	Uncert. in d	t	d	Uncert. in d	t	d	Uncert. in d	t	d	Uncert. in d
$^\circ\text{C}$	kg/m^3	kg/m^3	$^\circ\text{C}$	kg/m^3	kg/m^3	$^\circ\text{C}$	kg/m^3	kg/m^3	$^\circ\text{C}$	kg/m^3	kg/m^3
0	(1775.)	2	200	(1369.)	10	300	(1030.)	50	330	(738.)	50
10	(1757.)	2	205	(1357.)	10	302	(1019.)	50	331	(699.)	50
20	(1739.)	2	210	(1344.)	10	304	(1008.)	50			
30	(1721.)	2	215	(1331.)	10	306	(996.)	50			
40	(1702.)	2	220	(1318.)	20	308	(983.)	50			
50	(1684.)	2	225	(1304.)	20	310	(970.)	50			
60	(1665.)	2	230	(1290.)	20	312	(956.)	50			
70	(1646.)	2	235	(1276.)	20	314	(942.)	50			
80	(1627.)	5	240	(1261.)	20	316	(926.)	50			
90	(1608.)	5	245	(1246.)	20	318	(909.)	50			
100	(1588.)	5	250	(1230.)	20	320	(890.)	50			
110	(1568.)	5	255	(1214.)	20	322	(870.)	50			
120	(1548.)	5	260	(1197.)	20	324	(846.)	50			
130	(1527.)	5	265	(1180.)	20	326	(819.)	50			
140	(1506.)	5	270	(1162.)	20	328	(785.)	50			
150	(1485.)	10	275	(1143.)	20						
160	(1463.)	10	280	(1123.)	20						
170	(1441.)	10	285	(1102.)	20						
180	(1418.)	10	290	(1080.)	20						
190	(1394.)	10	295	(1056.)	20						

Orthobaric Liquid Molar Volume of 1-Bromo-2-chloroethane

Units: cm^3/mol v. K

$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$	$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$	$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$	$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$
260	(79.7)	0.1	450	(101.)	0.5	550	(126.)	2	590	(156.)	5
270	(80.5)	0.1	455	(101.)	1	552	(127.)	2	591	(158.)	5
280	(81.4)	0.1	460	(102.)	1	554	(128.)	2	592	(159.)	10
290	(82.2)	0.1	465	(103.)	1	556	(129.)	2	593	(161.)	10
			470	(104.)	1	558	(130.)	5	594	(163.)	10
300	(83.1)	0.1	475	(105.)	1	560	(131.)	5	595	(165.)	10
310	(84.0)	0.1	480	(106.)	1	562	(132.)	5	596	(167.)	10
320	(84.9)	0.1	485	(107.)	1	564	(133.)	5	597	(169.)	10
330	(85.8)	0.1	490	(108.)	1	566	(134.)	5	598	(172.)	10
340	(86.8)	0.2	495	(109.)	1	568	(136.)	5	599	(175.)	10
350	(87.8)	0.2	500	(110.)	1	570	(137.)	5	600	(178.)	10
360	(88.9)	0.2	505	(112.)	2	572	(138.)	5	601	(182.)	10
370	(90.0)	0.2	510	(113.)	2	574	(140.)	5	602	(187.)	10
380	(91.1)	0.2	515	(114.)	2	576	(141.)	5	603	(193.)	10
390	(92.3)	0.2	520	(116.)	2	578	(143.)	5	604	(203.)	10
400	(93.)	0.5	525	(117.)	2	580	(145.)	5			
410	(95.)	0.5	530	(119.)	2	582	(147.)	5			
420	(96.)	0.5	535	(120.)	2	584	(149.)	5			
430	(98.)	0.5	540	(122.)	2	586	(151.)	5			
440	(99.)	0.5	545	(124.)	2	588	(153.)	5			

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

1 MORGAN, S.O., YAGER, W.A.,

Ind.Eng.Chem., Vol.32, p.1519, 1940.* A

C₂H₄Br₂ 1,1-Dibromoethane (Ethylidene bromide, Refrigerant 150B2a)**Orthobaric Liquid Density and Molar Volume**

$$\ln(d/d_c) = -\ln(V/V_c) = b_1q + b_2q^2 + b_3q^3 + b_4q^4$$

where d is the density, d_c the critical density, V the molar volume, V_c the critical molar volume and $q = (1-T/T_c)^{1/3}$, T being the temperature and T_c the critical temperature in kelvins.

NB. The values of the critical properties given below are to be regarded as only as correlating parameters.

Molecular Weight	MW =	187.86	
Critical Temperature	$T_c =$	615 K	($t_c = 341.85\text{ }^\circ\text{C}$)
Critical Pressure	$P_c =$	5300 kPa	($= 52.31\text{ atm}$)
Critical Density	$d_c =$	709 kg/m ³	($V_c = 265\text{ cm}^3/\text{mol}$)
Critical Compression Factor	$Z_c =$	0.275	
$b_1 = 1.73798$	$b_2 = -0.64325$	$b_3 = 0.00000$	$b_4 = 0.24540$
Density at 298.15 K (25 °C)	$d_{25} =$	2090.36 kg/m ³	($V_{25} = 89.87\text{ cm}^3/\text{mol}$)
Normal Boiling Point	$T_b =$	385.88 K	($t_b = 112.73\text{ }^\circ\text{C}$)
Normal Melting Point	$T_m =$	210 K	($t_m = -63\text{ }^\circ\text{C}$)

Data at Specified Temperatures

$t/^\circ\text{C}$	-63.15	-25	0	25	112.73	200	341.85
T/K	210.00	248.15	273.15	298.15	385.88	473.15	615.00
$d/(\text{kg}/\text{m}^3)$	(2274.76)	(2195.75)	(2143.39)	2090.36	(1895.36)	(1673.20)	(709.00)
$(d(d)/dT)/(\text{kg}/\text{m}^3\text{ K})$	(-2.06)	(-2.08)	(-2.11)	-2.14	(-2.34)	(-2.83)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(82.59)	(85.56)	(87.65)	89.87	(99.12)	(112.28)	(264.97)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.07)	(0.08)	(0.09)	0.09	(0.12)	(0.19)	∞
Data Quality	(B)	(B)	(B)	B	(B)	(B)	(B)
Uncertainty in d (kg/m ³)	(2)	(2)	(2)	2	(5)	(10)	(50)
Uncertainty in V (cm ³ /mol)	(0.05)	(0.1)	(0.1)	0.1	(0.2)	(0.5)	(20)

Orthobaric Liquid Density of 1,1-DibromoethaneUnits: kg/m³ v. °C

t	d	Uncert. in d	t	d	Uncert. in d	t	d	Uncert. in d	t	d	Uncert. in d
$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³	$^\circ\text{C}$	kg/m ³	kg/m ³
			150	(1806.)	5	272	(1434.)	20	321	(1166.)	50
			155	(1793.)	5	274	(1426.)	20	322	(1158.)	50
			160	(1780.)	5	276	(1417.)	20	323	(1150.)	50
			165	(1768.)	5	278	(1409.)	20	324	(1141.)	50
-60	(2268.)	2	170	(1755.)	5	280	(1400.)	20	325	(1132.)	50
-50	(2248.)	2	175	(1741.)	5	282	(1392.)	20	326	(1122.)	50
-40	(2227.)	2	180	(1728.)	10	284	(1383.)	20	327	(1112.)	50
-30	(2206.)	2	185	(1715.)	10	286	(1373.)	20	328	(1102.)	50
-20	(2185.)	2	190	(1701.)	10	288	(1364.)	20	329	(1091.)	50
-10	(2164.)	2	195	(1687.)	10	290	(1355.)	20	330	(1080.)	50
0	(2143.)	2	200	(1673.)	10	292	(1345.)	20	331	(1068.)	50
10	(2122.)	2	205	(1659.)	10	294	(1335.)	20	332	(1056.)	50
20	2101.	2	210	(1644.)	10	296	(1325.)	20	333	(1043.)	50
30	2080.	2	215	(1630.)	10	298	(1314.)	20	334	(1028.)	50
40	2058.	2	220	(1615.)	10	300	(1304.)	20	335	(1013.)	50
50	2036.	2	225	(1599.)	10	302	(1293.)	20	336	(996.)	50
60	(2015.)	2	230	(1583.)	10	304	(1281.)	20	337	(977.)	50
70	(1993.)	2	235	(1567.)	10	306	(1270.)	20	338	(956.)	50
80	(1970.)	2	240	(1551.)	20	308	(1258.)	20	339	(931.)	50
90	(1948.)	2	245	(1534.)	20	310	(1245.)	20	340	(899.)	50
100	(1925.)	2	250	(1517.)	20	312	(1232.)	50	341	(854.)	50
110	(1902.)	5	255	(1499.)	20	314	(1219.)	50			
120	(1878.)	5	260	(1481.)	20	316	(1205.)	50			
130	(1854.)	5	265	(1462.)	20	318	(1190.)	50			
140	(1830.)	5	270	(1442.)	20	320	(1174.)	50			

Orthobaric Liquid Molar Volume of 1,1-Dibromoethane

Units: cm^3/mol v. K

$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$	$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$	$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$	$\frac{T}{K}$	$\frac{V}{\text{cm}^3/\text{mol}}$	Uncert. in $\frac{V}{\text{cm}^3/\text{mol}}$
210	(82.6)	0.05	450	(108.)	0.5	572	(143.)	2	611	(196.)	10
220	(83.3)	0.05	455	(109.)	0.5	574	(145.)	2	612	(201.)	10
230	(84.1)	0.1	460	(110.)	0.5	576	(146.)	5	613	(208.)	10
240	(84.9)	0.1	465	(111.)	0.5	578	(147.)	5	614	(218.)	10
			470	(112.)	0.5	580	(149.)	5			
250	(85.7)	0.1	475	(113.)	0.5	582	(150.)	5			
260	(86.5)	0.1	480	(114.)	0.5	584	(152.)	5			
270	(87.4)	0.1	485	(115.)	1	586	(153.)	5			
280	(88.2)	0.1	490	(116.)	1	588	(155.)	5			
290	(89.1)	0.1	495	(117.)	1	590	(157.)	5			
300	90.0	0.1	500	(118.)	1	592	(159.)	5			
310	91.0	0.1	505	(119.)	1	594	(161.)	5			
320	91.9	0.1	510	(120.)	1	596	(163.)	5			
330	92.9	0.1	515	(122.)	1	598	(166.)	5			
340	(94.0)	0.1	520	(123.)	1	600	(169.)	5			
350	(95.0)	0.1	525	(124.)	1	602	(172.)	5			
360	(96.1)	0.2	530	(126.)	2	604	(176.)	5			
370	(97.2)	0.2	535	(127.)	2	606	(180.)	10			
380	(98.4)	0.2	540	(129.)	2	608	(185.)	10			
390	(99.6)	0.2	545	(131.)	2	610	(192.)	10			
400	(100.9)	0.2	550	(133.)	2						
410	(102.2)	0.2	555	(135.)	2						
420	(103.6)	0.2	560	(137.)	2						
430	(105.)	0.5	565	(140.)	2						
440	(107.)	0.5	570	(142.)	2						

The following Sources give liquid density or liquid molar volume data for this compound. Those Sources used to derive the coefficients of the liquid density/molar volume equation are indicated by the temperature range (ambient 'A', low 'L', medium 'M', high 'H' or critical 'C') of their data. An asterisk (*) indicates that the Source is not a primary source of experimental data.

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