

95005

Issued January 1995

Orthobaric densities and molar volumes of liquids

Glycol ethers (alkyl Cellosolves and Carbitols etc.)

ESDU Copyright material. For current status contact ESDU.

Endorsed by
The Institution of Chemical Engineers



ESDU DATA ITEM No. 95005

ESDU DATA ITEMS

Data Items provide validated information for use in engineering design and analysis by, or under the supervision of, professionally qualified engineers. The data are founded on an evaluation of all the relevant information, both published and unpublished, and invariably supported by original work of ESDU staff engineers or consultants. The whole process is subject to independent review for which crucial support is provided by industrial companies, government research laboratories, universities and others from around the world through the participation of some of their leading experts on ESDU Technical Committees. This process ensures that the results of much valuable work (theoretical, experimental and operational), which may not be widely available or in a readily usable form, can be communicated concisely and accurately to the engineering community.

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:

Chairman	
Dr D.T.Jamieson	— Independent
Vice-Chairman	
Mr C.F.Beaton	— Independent
Members	
Dr D.Ambrose [†]	— Independent
Dr E.Brunner*	— BASF AG, Ludwigshafen, West Germany
Dr M.W.Chase*	— National Institute of Standards and Technology, Gaithersburgh, USA
Dr J.R.Downey*	— Dow Chemical, Midland, USA
Dr B.Edmonds	— Infochem Computer Services Ltd
Dr G.Hobson	— Imperial Chemical Industries plc, Petrochemicals and Plastics Division
Dr A.E.Humphreys	— Independent
Mr S.R.Knight	— Stone & Webster Engineering Ltd
Dr A.P.Laughton	— British Gas plc
Dr K.N.Marsh*	— Thermodynamics Research Center, USA
Mrs K.M.deReuck	— Imperial College of Science, Technology and Medicine
Mr J.T.R.Watson	— National Engineering Laboratory.

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.

KEEPING UP TO DATE

We are constantly striving to develop new work and review data already issued. Any comments arising out of your use of our data, or any suggestions for new topics or information that might lead to improvements, will help us to provide a better service.

(Continued on inside back cover)

*Corresponding Member

[†]Emeritus Member

ORTHOBARIC DENSITIES AND MOLAR VOLUMES OF LIQUIDS
GLYCOL ETHERS (ALKYL CELLOSOLVES AND CARBITOLS etc.)

CONTENTS

1.	INTRODUCTION	page 1
2.	NOTATION AND UNITS	page 2
3.	THE CRITICAL DENSITY	page 2
4.	EVALUATION AND CORRELATION	page 2
5.	UNCERTAINTIES	page 3
6.	REFERENCES	page 3
	TABLE 1	page 5

COMPOUND TABLES in the following order

Sheet	Name		Alternative Names	
MONOALKYL ETHERS				
1.11	C ₃ H ₈ O ₂	Ethylene glycol monomethyl ether	Methyl glycol	Methyl cellosolve
1.12	C ₄ H ₁₀ O ₂	Ethylene glycol monoethyl ether	Ethyl glycol	Ethyl cellosolve
1.13a	C ₅ H ₁₂ O ₂	Ethylene glycol monopropyl ether	Propyl glycol	Propyl cellosolve
1.13b	,,	Ethylene glycol monoisopropyl ether	Isopropyl glycol	Isopropyl cellosolve
1.14a	C ₆ H ₁₄ O ₂	Ethylene glycol monobutyl ether	Butyl glycol	Butyl cellosolve
1.14c	,,	Ethylene glycol monoisobutyl ether	Isobutyl glycol	Isobutyl cellosolve
1.21	C ₅ H ₁₂ O ₃	Diethylene glycol monomethyl ether	Methyl diglycol	Methyl carbitol
1.22	C ₆ H ₁₄ O ₃	Diethylene glycol monoethyl ether	Ethyl diglycol	Ethyl carbitol
1.23a	C ₇ H ₁₆ O ₃	Diethylene glycol monopropyl ether	Propyl diglycol	Propyl carbitol
1.24a	C ₈ H ₁₈ O ₃	Diethylene glycol monobutyl ether	Butyl diglycol	Butyl carbitol
DIALKYL ETHERS				
2.11	C ₄ H ₁₀ O ₂	Ethylene glycol dimethyl ether	Dimethyl glycol	Dimethyl cellosolve
2.12	C ₆ H ₁₄ O ₂	Ethylene glycol diethyl ether	Diethyl glycol	Diethyl cellosolve
2.21	C ₆ H ₁₄ O ₃	Diethylene glycol dimethyl ether	Dimethyl diglycol	Dimethyl carbitol
2.22	C ₈ H ₁₈ O ₃	Diethylene glycol diethyl ether	Diethyl diglycol	Diethyl carbitol
2.31	C ₈ H ₁₈ O ₄	Triethylene glycol dimethyl ether	Dimethyl triglycol	Triglyme
2.41	C ₁₀ H ₂₂ O ₅	Tetraethylene glycol dimethyl ether	Dimethyl tetraglycol	Tetraglyme

NB. Other alternative names for most compounds are given on the relevant Sheets.

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

.....

ORTHOBARIC DENSITIES AND MOLAR VOLUMES OF LIQUIDS
GLYCOL ETHERS (ALKYL CELLOSOLVES AND CARBITOLS etc.)

1. INTRODUCTION

This Data Item presents orthobaric liquid densities and molar volumes of the glycol ethers (alkyl cellosolves and carbitols etc.) shown in the order of arrangement on the Contents page.

Table 1, page 5, gives the constants in the liquid density equation for all the compounds. On the following Sheets, the values of liquid density and liquid molar volume for each compound have been obtained by calculation from the equation given at the top of each Sheet. Using the critical temperature and the critical density given, the numerical values of the coefficients were derived by fitting the equation to the data that had been selected and weighted in accordance with a critical assessment of all the data. The value of the critical temperature for each compound was taken from Item 95004 which gives the vapour pressures. The adjustment of the critical properties was arranged to give optimum values for the correlation of both the vapour pressure and the liquid density.

For completeness all the critical properties of each compound are given in the Tables which also show the density at 298.15 K, where applicable, and for convenience, the normal boiling point and the approximate melting point. Brackets enclose the data at those temperatures which are outside the range of supporting experimental data.

The table of Data at Specified Temperatures for each compound gives the density, the molar volume and their derivatives with respect to temperature. 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. 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.

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.

2. NOTATION AND UNITS

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

d	liquid density
N_1, N_2, N_3, N_4	non-dimensional coefficients in the liquid density/molar volume equation
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 normal boiling point
c	denotes value at critical point
m	denotes value at normal melting point

3. THE CRITICAL DENSITY

For the compounds considered here only one value of the critical density has been reported for only one of the compounds, namely ethylene glycol dimethyl ether and this value is thought to be of only moderate accuracy. For consistency the critical density of this compound was derived, in common with the remainder of the compounds, by adjusting the fitted critical density to be in good agreement with the value given by the latest form of Rackett equation, see References 1, 2 and 3.

The Rackett equation, even in its latest form, does not represent experimental data over a long range of temperature as satisfactorily as does the equation used in this Item. However, it can yield reliable values of the critical density when used with reliable values of critical temperature and critical pressure.

4. EVALUATION AND CORRELATION

Reliable liquid density data for the compounds considered here are confined to medium reduced temperatures and the compounds fall into two distinctly different groups.

The monoalkyl ethers behave like alcohols for which the second term in the liquid density equation is zero. In contrast, the dialkyl ethers behave like alkanes for which the third term in the liquid density equation is zero. Using the equations for the compounds with the most extensive and reliable data separate correlations were derived for each group and used to derive equations for those compounds for which the data was less extensive.

As indicated on page 1 the critical pressure, and if necessary, the critical temperature also, were adjusted until the fitted critical density and the value given by the Rackett equation were in good agreement.

5. UNCERTAINTIES

At any temperature, the estimated uncertainties in the tabulated values of density and molar volume are dependent upon the derivatives with respect to temperature of these properties and the quality of the experimental or estimated data upon which they are based. The table of Data at Specified Temperatures shows these derivatives, 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 temperatures below the normal boiling point 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.

For those compounds for which the data quality at the critical point is denoted by 'C' the values of critical temperature and critical density given in the Tables should, in general, be regarded only as correlating parameters.

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.

TABLE 1

Summary of Constants in the Liquid Density equation

$$\ln d = \ln d_c + N_1q + N_2q^2 + N_3q^3 + N_4q^4 \quad \text{where } q = (1-T/T_c)^{1/3}$$

Sheet	Name	T_c K	d_c kg/m ³	N_1	N_2	N_3	N_4
MONOALKYL ETHERS							
1.11	Ethylene glycol monomethyl ether	573	313	1.79212	0	-1.00359	0.53320
1.12	Ethylene glycol monoethyl ether	584	306	1.74159	0	-0.97529	0.54939
1.13a	Ethylene glycol monopropyl ether	600	299	1.72241	0	-0.96455	0.56186
1.13b	Ethylene glycol monoisopropyl ether	587	300	1.70454	0	-0.95454	0.57447
1.14a	Ethylene glycol monobutyl ether	626	294	1.67896	0	-0.94022	0.60082
1.14c	Ethylene glycol monoisobutyl ether	606	294	1.69642	0	-0.94999	0.58114
1.21	Diethylene glycol monomethyl ether	662	308	1.78860	0	-1.00161	0.62022
1.22	Diethylene glycol monoethyl ether	668	306	1.80226	0	-1.00927	0.54649
1.23a	Diethylene glycol monopropyl ether	675	304	1.78208	0	-0.99797	0.53148
1.24a	Diethylene glycol monobutyl ether	689	302	1.75216	0	-0.98121	0.53795
DIALKYL ETHERS							
2.11	Ethylene glycol dimethyl ether	535	297	1.79315	-0.63785	0	0.20413
2.12	Ethylene glycol diethyl ether	563	281	1.80356	-0.64025	0	0.20421
2.21	Diethylene glycol dimethyl ether	610	294	1.83191	-0.59768	0	0.19273
2.22	Diethylene glycol diethyl ether	635	279	1.83192	-0.59788	0	0.19277
2.31	Triethylene glycol dimethyl ether	666	291	1.81815	-0.52984	0	0.17717
2.41	Tetraethylene glycol dimethyl ether	713	287	1.79508	-0.46143	0	0.16191

.....

$C_3H_8O_2$ Ethylene glycol monomethyl ether; Methyl glycol; Methyl cellosolve;
3-Oxabutan-1-ol; 2-Methoxyethanol

CAS Reg. No. 109-86-4

Mol. Wt. 76.10

Orthobaric Liquid Density and Molar Volume

$$\ln(d/d_c) = -\ln(V/V_c) = N_1q + N_2q^2 + N_3q^3 + N_4q^4$$

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.

Critical Temperature	$T_c =$	573 K	$(t_c =$	299.85 °C)
Critical Pressure	$p_c =$	4450 kPa	$(p_c =$	43.92 atm)
Critical Density	$d_c =$	313 kg/m ³	$(V_c =$	243.13 cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.227		
$N_1 = 1.79212$	$N_2 = 0.00000$	$N_3 = -1.00359$	$N_4 = 0.53320$	
Density at 298.15 K (25 °C)	$d_{25} =$	960.91 kg/m ³	$(V_{25} =$	79.20 cm ³ /mol)
Normal Boiling Point	$T_b =$	397.28 K	$(t_b =$	124.13 °C)
Normal Melting Point	$T_m =$	188 K	$(t_m =$	-85 °C)

Data at Specified Temperatures

$t/^\circ\text{C}$	-85	0	25	100	124.13	200	299.85
T/K	188.15	273.15	298.15	373.15	397.28	473.15	573.00
$d/(\text{kg/m}^3)$	(1048.61)	(982.44)	960.91	(887.64)	(860.25)	(753.11)	(313.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-0.73)	(-0.84)	-0.89	(-1.09)	(-1.19)	(-1.72)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(72.57)	(77.46)	79.20	(85.73)	(88.46)	(101.05)	(243.13)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.05)	(0.07)	0.07	(0.11)	(0.12)	(0.23)	∞
Data Quality	(B)	(B)	B	(B)	(B)	(B)	(B)
Uncertainty in d (kg/m^3)	(2)	(2)	1	(1)	(2)	(5)	(5)
Uncertainty in V (cm^3/mol)	(0.2)	(0.2)	0.1	(0.1)	(0.2)	(0.5)	(5)

Orthobaric Liquid Density of Ethylene glycol monomethyl ether

Units: kg/m^3 v. $^\circ\text{C}$

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
			0	(982.)	2	100	(888.)	1	200	(753.)	5
			5	(978.)	2	105	(882.)	1	205	(744.)	5
			10	(974.)	2	110	(877.)	1	210	(735.)	5
-85	(1049.)	2	15	970.	1	115	(871.)	2	215	(726.)	5
-80	(1045.)	2	20	965.	1	120	(865.)	2	220	(716.)	5
-75	(1041.)	2	25	961.	1	125	(859.)	2	225	(706.)	5
-70	(1038.)	2	30	956.	1	130	(853.)	2	230	(696.)	5
-65	(1034.)	2	35	952.	1	135	(847.)	2	235	(684.)	5
-60	(1030.)	2	40	947.	1	140	(841.)	2	240	(673.)	5
-55	(1026.)	2	45	943.	1	145	(834.)	2	245	(661.)	5
-50	(1022.)	2	50	938.	1	150	(828.)	2	250	(648.)	5
-45	(1019.)	2	55	933.	1	155	(821.)	2	255	(634.)	5
-40	(1015.)	2	60	929.	1	160	(814.)	2	260	(619.)	5
-35	(1011.)	2	65	924.	1	165	(808.)	2	265	(603.)	5
-30	(1007.)	2	70	919.	1	170	(800.)	2	270	(586.)	5
-25	(1003.)	2	75	914.	1	175	(793.)	2	275	(567.)	5
-20	(999.)	2	80	909.	1	180	(785.)	2	280	(545.)	5
-15	(995.)	2	85	904.	1	185	(778.)	2	285	(520.)	5
-10	(991.)	2	90	(898.)	1	190	(770.)	5	290	(490.)	5
-5	(987.)	2	95	(893.)	1	195	(762.)	5	295	(448.)	5

Orthobaric Liquid Molar Volume of Ethylene glycol monomethyl ether

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
			275	(77.6)	0.2	375	(85.9)	0.1	475	(101.)	0.5
			280	(77.9)	0.1	380	(86.5)	0.1	480	(103.)	0.5
			285	(78.3)	0.1	385	(87.0)	0.1	485	(104.)	0.5
190	(72.7)	0.2	290	78.6	0.1	390	(87.6)	0.2	490	(105.)	0.5
195	(72.9)	0.2	295	79.0	0.1	395	(88.2)	0.2	495	(107.)	0.5
200	(73.2)	0.2	300	79.3	0.1	400	(88.8)	0.2	500	(108.)	0.5
205	(73.4)	0.2	305	79.7	0.1	405	(89.4)	0.2	505	(110.)	0.5
210	(73.7)	0.2	310	80.1	0.1	410	(90.1)	0.2	510	(112.)	0.5
215	(74.0)	0.2	315	80.5	0.1	415	(90.8)	0.2	515	(114.)	0.5
220	(74.3)	0.2	320	80.9	0.1	420	(91.5)	0.2	520	(116.)	1
225	(74.5)	0.2	325	81.3	0.1	425	(92.2)	0.2	525	(118.)	1
230	(74.8)	0.2	330	81.7	0.1	430	(92.9)	0.2	530	(121.)	1
235	(75.1)	0.2	335	82.1	0.1	435	(93.7)	0.2	535	(124.)	1
240	(75.4)	0.2	340	82.5	0.1	440	(94.5)	0.2	540	(127.)	1
245	(75.7)	0.2	345	83.0	0.1	445	(95.)	0.5	545	(131.)	1
250	(76.0)	0.2	350	83.4	0.1	450	(96.)	0.5	550	(136.)	1
255	(76.3)	0.2	355	83.9	0.1	455	(97.)	0.5	555	(142.)	1
260	(76.6)	0.2	360	(84.4)	0.1	460	(98.)	0.5	560	(149.)	1
265	(76.9)	0.2	365	(84.9)	0.1	465	(99.)	0.5	565	(160.)	2
270	(77.3)	0.2	370	(85.4)	0.1	470	(100.)	0.5	570	(179.)	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	PALOMAA, M.H.,	Chem. Ber.,	Vol. 35,	p. 3300,	1902.	
2	DAVIDSON, J.G.,	Ind. Eng. Chem.,	Vol. 18,	p. 669,	1926.	
3	GALLAUGHER, A.F., HIBBERT, H.,	J. Am. Chem. Soc.,	Vol. 59,	p. 2521,	1937.	
4	PETROV, A.A.,	Zh. Obshch. Khim.,	Vol. 10,	p. 983,	1940.	A
5	PHADKE, S.R., PHALNIKAR, N.L., BHIDE, B.V., J. Indian Chem. Soc.,	J. Chem. Soc.,	Vol. 22,	p. 239,	1945.	M
6	VOGEL, A.I.,	J. Chem. Soc.,	p. 1814,	1948.		M
7	CARBIDE & CARBON CHEM. CO.,	Cellosolve and Carbitol Solvents,	New York,	1954.*		
8	DYKYJ, J., et al.,	Chem. Zvesti,	Vol. 12,	p. 543,	1958.	A
9	GAEUMANN, T.,	Helv. Chem. Acta,	Vol. 41,	p. 1956,	1958.	
10	HOIGNE, J., GAEUMANN, T.,	Helv. Chem. Acta,	Vol. 41,	p. 1933,	1958.	A
11	GLADEL, -, et al.,	Rev. Inst. Franc. Petr.,	Vol. 14,	p. 1147,	1959.	A
12	CHU, K.-Y., THOMPSON, A.R.,	J. Chem. Eng. Data,	Vol. 5,	p. 147,	1960.	A
13	MIKHANT'EV, B.I., et al.,	Sb. Nau. Rab. Asp. Vor. Gos. Univ.,	Vol. 2,	p. 94,	1965.	
14	PORMALE, M. Ya., et al.,	J. Org. Chem. USSR,	Vol. 1,	p. 1788,	1965.	A
15	UNION CARBIDE CORP.,	Chemicals and Plastics Physical Properties,	1968.*			
16	QUITZSCH, H.K., et al.,	Z. Phys. Chem. (Leipzig),	Vol. 243,	p. 321,	1970.	A
17	KOMAROVA, L.F., GARBER, Y.N.,	J. Org. Chem. USSR,	Vol. 7,	p. 2605,	1971.	A
18	MIKHANT'EV, B.I., et al.,	J. Org. Chem. USSR,	Vol. 8,	p. 450,	1972.	A
19	WOLLMANN, -, et al.,	Pharmazie,	Vol. 29,	p. 708,	1974.	
20	ROUX, G., PERRON, G., DESNOYERS, J.E.,	J. Solution Chem.,	Vol. 7,	p. 639,	1978.	A
21	CHANDAK, B.S., et al.,	J. Chem. Eng. Data,	Vol. 24,	p. 267,	1979.	M
22	SHINDO, Y., KUSANO, K.,	J. Chem. Eng. Data,	Vol. 24,	p. 106,	1979.	A
23	SOKOLOVSKI, A., BURCZYK, B.,	Pol. J. Chem.,	Vol. 53,	p. 905,	1979.	
24	DOUHERET, G., PAL, A.,	J. Chem. Eng. Data,	Vol. 33,	p. 40,	1988.	A
25	DOUHERET, G., et al.,	J. Chem. Thermodynamics,	Vol. 22,	p. 99,	1990.	
26	CHIAVONE-FILHO, O., PROUST, P., RASMUSSEN, P., J. Chem. Eng. Data,	Vol. 38,	p. 128,	1993.		A

$C_4H_{10}O_2$ Ethylene glycol monoethyl ether; Ethyl glycol; Ethyl cellosolve;
3-Oxapentan-1-ol; 2-Ethoxyethanol

CAS Reg. No. 110-80-5

Mol. Wt. 90.12

Orthobaric Liquid Density and Molar Volume

$$\ln(d/d_c) = -\ln(V/V_c) = N_1q + N_2q^2 + N_3q^3 + N_4q^4$$

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.

Critical Temperature	$T_c = 584 \text{ K}$	$(t_c = 310.85 \text{ }^\circ\text{C})$
Critical Pressure	$p_c = 3950 \text{ kPa}$	$(p_c = 38.98 \text{ atm})$
Critical Density	$d_c = 306 \text{ kg/m}^3$	$(V_c = 294.51 \text{ cm}^3/\text{mol})$
Critical Compression Factor	$Z_c = 0.240$	
$N_1 = 1.74159$	$N_2 = 0.00000$	$N_3 = -0.97529$
$N_4 = 0.54939$		
Density at 298.15 K (25 °C)	$d_{25} = 925.80 \text{ kg/m}^3$	$(V_{25} = 97.34 \text{ cm}^3/\text{mol})$
Normal Boiling Point	$T_b = 408.22 \text{ K}$	$(t_b = 135.07 \text{ }^\circ\text{C})$
Normal Melting Point	$T_m = -$	$(t_m = -)$

Data at Specified Temperatures

$t/^\circ\text{C}$	-75	0	25	100	135.07	200	310.85
T/K	198.15	273.15	298.15	373.15	408.22	473.15	584.00
$d/(\text{kg/m}^3)$	(1004.48)	(946.60)	925.80	(856.48)	(818.94)	(734.57)	(306.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-0.74)	(-0.81)	-0.85	(-1.01)	(-1.13)	(-1.51)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(89.72)	(95.20)	97.34	(105.22)	(110.04)	(122.68)	(294.51)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.07)	(0.08)	0.09	(0.12)	(0.15)	(0.25)	∞
Data Quality	(B)	(B)	B	(B)	(B)	(B)	(B)
Uncertainty in d (kg/m^3)	(2)	(2)	1	(1)	(2)	(5)	(5)
Uncertainty in V (cm^3/mol)	(0.2)	(0.2)	0.1	(0.1)	(0.2)	(0.5)	(5)

Orthobaric Liquid Density of Ethylene glycol monoethyl ether

Units: kg/m^3 v. $^\circ\text{C}$

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
-75	(1004.)	2	25	926.	1	125	(830.)	2	225	(694.)	5
-70	(1001.)	2	30	922.	1	130	(825.)	2	230	(685.)	5
-65	(997.)	2	35	917.	1	135	(819.)	2	235	(675.)	5
-60	(993.)	2	40	913.	1	140	(813.)	2	240	(665.)	5
-55	(990.)	2	45	908.	1	145	(807.)	2	245	(655.)	5
-50	(986.)	2	50	904.	1	150	(802.)	2	250	(644.)	5
-45	(982.)	2	55	899.	1	155	(796.)	2	255	(633.)	5
-40	(978.)	2	60	895.	1	160	(789.)	2	260	(621.)	5
-35	(974.)	2	65	890.	1	165	(783.)	2	265	(609.)	5
-30	(970.)	2	70	886.	1	170	(777.)	2	270	(595.)	5
-25	(967.)	2	75	881.	1	175	(770.)	2	275	(581.)	5
-20	(963.)	2	80	876.	1	180	(763.)	2	280	(565.)	5
-15	(959.)	2	85	871.	1	185	(756.)	2	285	(547.)	5
-10	(955.)	2	90	(866.)	1	190	(749.)	5	290	(528.)	5
-5	(951.)	2	95	(862.)	1	195	(742.)	5	295	(505.)	5
0	(947.)	2	100	(856.)	1	200	(735.)	5	300	(478.)	5
5	(943.)	2	105	(851.)	1	205	(727.)	5	305	(442.)	5
10	(938.)	2	110	(846.)	1	210	(719.)	5	310	(372.)	5
15	934.	1	115	(841.)	1	215	(711.)	5			
20	930.	1	120	(836.)	1	220	(702.)	5			

Orthobaric Liquid Molar Volume of Ethylene glycol monoethyl ether

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
200	(89.8)	0.2	300	97.5	0.1	400	(108.8)	0.2	500	(131.)	1
205	(90.2)	0.2	305	98.0	0.1	405	(109.6)	0.2	505	(132.)	1
210	(90.5)	0.2	310	98.4	0.1	410	(110.3)	0.2	510	(134.)	1
215	(90.9)	0.2	315	98.9	0.1	415	(111.1)	0.2	515	(136.)	1
220	(91.2)	0.2	320	99.4	0.1	420	(111.9)	0.2	520	(138.)	1
225	(91.5)	0.2	325	99.9	0.1	425	(112.7)	0.2	525	(141.)	1
230	(91.9)	0.2	330	100.4	0.1	430	(114.)	0.5	530	(143.)	1
235	(92.3)	0.2	335	100.9	0.1	435	(115.)	0.5	535	(146.)	1
240	(92.6)	0.2	340	101.4	0.1	440	(115.)	0.5	540	(149.)	1
245	(93.0)	0.2	345	102.0	0.1	445	(116.)	0.5	545	(153.)	1
250	(93.4)	0.2	350	102.5	0.1	450	(117.)	0.5	550	(157.)	1
255	(93.8)	0.2	355	103.1	0.1	455	(118.)	0.5	555	(161.)	1
260	(94.2)	0.2	360	(103.6)	0.1	460	(120.)	0.5	560	(167.)	1
265	(94.5)	0.2	365	(104.2)	0.1	465	(121.)	0.5	565	(173.)	2
270	(94.9)	0.2	370	(104.8)	0.1	470	(122.)	0.5	570	(182.)	2
275	(95.4)	0.2	375	(105.5)	0.1	475	(123.)	0.5	575	(193.)	2
280	(95.8)	0.2	380	(106.1)	0.1	480	(124.)	0.5	580	(213.)	2
285	(96.2)	0.1	385	(106.7)	0.2	485	(126.)	0.5			
290	96.6	0.1	390	(107.4)	0.2	490	(127.)	0.5			
295	97.1	0.1	395	(108.1)	0.2	495	(129.)	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.

1	DEMOLE, E.,	Chem. Ber.,	Vol. 9,	p. 743,	1876.	
2	PALOMAA, M. H.,	Chem. Ber.,	Vol. 35,	p. 3300,	1902.	A
3	DAVIDSON, J. G.,	Ind. Eng. Chem.,	Vol. 18,	p. 669,	1926.	A
4	DOOLITTLE, A. K.,	Ind. Eng. Chem.,	Vol. 27,	p. 1169,	1935.	
5	PETROV, A. A.,	Zh. Obshch. Khim.,	Vol. 10,	p. 983,	1940.	A
6	VOGEL, A. I.,	J. Chem. Soc.,	p. 1814,	1948.		M
7	MELLAN, I.,	Industrial Solvents, 2nd. Ed.,	New York,	1950.		A
8	CARBIDE & CARBON CHEM. CO.,	Cellosolve and Carbitol Solvents,	New York,	1954.*		
9	BOUBLIK, T., KUCHYNKA, -,	Coll. Czech. Chem. Comm.,	Vol. 21,	p. 1634,	1956.	A
10	PICK, J., et al.,	Coll. Czech. Chem. Comm.,	Vol. 21,	p. 260,	1956.	A
11	MURTI, P. S., VAN WINKLE, M.,	A. I. Ch. E. J.,	Vol. 3,	p. 517,	1957.	A
12	DYKYJ, J., et al.,	Chem. Zvesti,	Vol. 12,	p. 543,	1958.	A
13	MILLER, K. J.,	J. Phys. Chem.,	Vol. 62,	p. 512,	1958.	A
14	CHU, K.-Y., THOMPSON, A. R.,	J. Chem. Eng. Data,	Vol. 5,	p. 147,	1960.	A
15	MIKHANT'EV, B. I., et al.,	Sb. Nau. Rab. Asp. Vor. Gos. Univ.,	Vol. 2,	p. 94,	1965.	
16	PORMALE, M. Ya., et al.,	J. Org. Chem. USSR,	Vol. 1,	p. 1788,	1965.	
17	UNION CARBIDE CORP.,	Chemicals and Plastics Physical Properties,	1968.*			
18	KOMAROVA, L. F., et al.,	J. Appl. Chem. USSR,	Vol. 43,	p. 2046,	1970.	
19	MIKHANT'EV, B. I., et al.,	J. Org. Chem. USSR,	Vol. 8,	p. 450,	1972.	A
20	KALASY, A. K., et al.,	J. Chem. Thermodynamics,	Vol. 7,	p. 101,	1975.	
21	ROUX, G., PERRON, G., DESNOYERS, J. E.,	J. Solution Chem.,	Vol. 7,	p. 639,	1978.	A
22	SHINDO, Y., KUSANO, K.,	J. Chem. Eng. Data,	Vol. 24,	p. 106,	1979.	
23	SOKOLOVSKI, A., BURCZYK, B.,	Pol. J. Chem.,	Vol. 53,	p. 905,	1979.	
24	THORAT, R. T., et al.,	J. Chem. Eng. Data,	Vol. 24,	p. 270,	1979.	M
25	BENSON, G. C., HALPIN, C. J., et al.,	J. Chem. Thermodynamics,	Vol. 13,	p. 1175,	1981.	A
26	NAUMANN, D., WAGNER, H. G.,	J. Chem. Thermodynamics,	Vol. 18,	p. 81,	1986.	A
27	DOUHERET, G., PAL, A.,	J. Chem. Eng. Data,	Vol. 33,	p. 40,	1988.	A
28	FERMEGLIA, M., LAPASIN, R.,	J. Chem. Eng. Data,	Vol. 33,	p. 415,	1988.	
29	AL-AZZAWI, S. F., AWWAD, A. M.,	J. Chem. Eng. Data,	Vol. 35,	p. 411,	1990.	M
30	DOUHERET, G., et al.,	J. Chem. Thermodynamics,	Vol. 22,	p. 99,	1990.	
31	FERMEGLIA, M., LAPASIN, R., TORRIANO, G.,	J. Chem. Eng. Data,	Vol. 35,	p. 260,	1990.	
32	CHIAVONE-FILHO, O., PROUST, P., RASMUSSEN, P.,	J. Chem. Eng. Data,	Vol. 38,	p. 128,	1993.	A