

93029

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Orthobaric densities and molar volumes of liquids

Fused ring compounds

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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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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
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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)

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ORTHOBARIC DENSITIES AND MOLAR VOLUMES OF LIQUIDS
FUSED RING COMPOUNDS

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COMPOUND TABLES in the following order

Sheet	Formula	Name	Alternative Names
1.00	C ₉ H ₈	Indene	
1.01	C ₉ H ₁₀	Indane	2,3-Dihydroindene
1.02a	C ₉ H ₁₆	cis-Hexahydroindane	*cis-Octahydroindene
1.02b	C ₉ H ₁₆	trans-Hexahydroindane	*trans-Octahydroindene
1.20	C ₁₁ H ₁₄	1,1-Dimethylindane	1,1-Dimethyl-2,3-Dihydroindene
2.00	C ₁₀ H ₈	Naphthalene	
2.01	C ₁₀ H ₁₂	1,2,3,4-Tetrahydronaphthalene	Tetralin
2.02	C ₁₀ H ₁₈	Decalin (cis + trans mixture)	*Decahydronaphthalene
2.02a	C ₁₀ H ₁₈	cis-Decahydronaphthalene	*cis-Decalin
2.02b	C ₁₀ H ₁₈	trans-Decahydronaphthalene	*trans-Decalin
2.10a	C ₁₁ H ₁₀	1-Methylnaphthalene	
2.10b	C ₁₁ H ₁₀	2-Methylnaphthalene	
2.11a	C ₁₁ H ₁₄	5-Methyl-1,2,3,4-tetrahydronaphthalene	5-Methyltetralin
2.11b	C ₁₁ H ₁₄	6-Methyl-1,2,3,4-tetrahydronaphthalene	6-Methyltetralin
2.20a	C ₁₂ H ₁₂	1-Ethylnaphthalene	
2.20b	C ₁₂ H ₁₂	2-Ethylnaphthalene	
2.20c	C ₁₂ H ₁₂	1,2-Dimethylnaphthalene	
2.20d	C ₁₂ H ₁₂	1,3-Dimethylnaphthalene	
2.20e	C ₁₂ H ₁₂	1,4-Dimethylnaphthalene	
	C ₁₂ H ₁₂	1,5-Dimethylnaphthalene (not issued)	
2.20g	C ₁₂ H ₁₂	1,6-Dimethylnaphthalene	
2.20h	C ₁₂ H ₁₂	1,7-Dimethylnaphthalene	
	C ₁₂ H ₁₂	1,8-Dimethylnaphthalene (not issued)	
	C ₁₂ H ₁₂	2,3-Dimethylnaphthalene (not issued)	
	C ₁₂ H ₁₂	2,6-Dimethylnaphthalene (not issued)	
	C ₁₂ H ₁₂	2,7-Dimethylnaphthalene (not issued)	
2.30a	C ₁₃ H ₁₄	1-Propylnaphthalene	
2.30b	C ₁₃ H ₁₄	2-Propylnaphthalene	
2.30c	C ₁₃ H ₁₄	1-Isopropylnaphthalene	1-(1-Methylethyl)-naphthalene
2.30d	C ₁₃ H ₁₄	2-Isopropylnaphthalene	2-(1-Methylethyl)-naphthalene
3.00	C ₁₂ H ₁₀	Acenaphthene	
	C ₁₃ H ₁₀	Fluorene (not issued)	
5.00a	C ₁₄ H ₁₀	Anthracene	
5.00b	C ₁₄ H ₁₀	Phenanthrene	
	C ₁₆ H ₁₀	Fluoranthene (not issued)	
6.01	C ₁₆ H ₁₀	Pyrene	
8.00	C ₁₂ H ₉ N	Carbazole	

* For these compounds other alternative names are shown at the head of the relevant Sheets.
NB. To allow for the future issue of omitted compounds sheet numbers are not always consecutive.

ORTHOBARIC DENSITIES AND MOLAR VOLUMES OF LIQUIDS
FUSED RING COMPOUNDS

1. INTRODUCTION

This Data Item presents orthobaric liquid densities and molar volumes of the fused ring compounds arranged in the order shown on the Contents page. Space allows the listing of only one alternative name for each compound but for some compounds other alternative names are shown at the head of the relevant Sheets.

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 93028 which gives the vapour pressures.

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. 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. 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

Of the compounds considered here naphthalene and tetralin are the only ones for which critical densities based on experimental measurements have been reported.

Estimates of the critical density of each compound were made using both the Riedel equation, see Reference 1, and the latest form of Rackett equation, see References 2, 3 and 4. Both of these equations require reliable values of critical temperature and critical pressure but neither represents experimental data over a long range of temperature as satisfactorily as does the equation used in this Item. However, provided the use of the Riedel equation is limited to non-associated liquids, both equations can yield reliable values of the critical density for a wide variety of compounds.

4. EVALUATION AND CORRELATION

Reliable liquid density data for the compounds considered here are confined to medium reduced temperatures and the data for each compound was fitted by the correlation for the alkanes. The critical pressure, and if necessary, the critical temperature also, were adjusted until the critical density given by the Riedel and Rackett equations were in good agreement. As indicated in Item 93028, the corresponding Item on 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.

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 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 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.

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

6. REFERENCES

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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
1.00	Indene	695	317	1.78736	-0.63451	0	0.19926
1.01	Indane	684.9	309	1.79205	-0.66664	0	0.22998
1.02a	cis-Hexahydroindane	663	286	1.79272	-0.67048	0	0.23388
1.02b	trans-Hexahydroindane	650	280	1.79910	-0.68006	0	0.24010
1.20	1,1-Dimethylindane	679	289	1.85114	-0.71401	0	0.24216
2.00	Naphthalene	749	321	1.79358	-0.65286	0	0.21451
2.01	1,2,3,4-Tetrahydronaphthalene	720	305	1.80808	-0.67150	0	0.22511
2.02	Decalin (cis + trans mixture)	695	284	1.77696	-0.64328	0	0.21517
2.02a	cis-Decahydronaphthalene	702	286	1.79373	-0.67624	0	0.23916
2.02b	trans-Decahydronaphthalene	687	280	1.76878	-0.62792	0	0.20395
2.10a	1-Methylnaphthalene	772	313	1.82218	-0.65781	0	0.20110
2.10b	2-Methylnaphthalene	765	309	1.83294	-0.69285	0	0.23155
2.11a	5-Methyl-1,2,3,4-tetrahydronaphthalene	740	302	1.87927	-0.74362	0	0.25506
2.11b	6-Methyl-1,2,3,4-tetrahydronaphthalene	732	293	1.86508	-0.72852	0	0.24840
2.20a	1-Ethylnaphthalene	773	305	1.87010	-0.72186	0	0.23746
2.20b	2-Ethylnaphthalene	772	301	1.85794	-0.70230	0	0.22542
2.20c	1,2-Dimethylnaphthalene	784	307	1.87330	-0.72497	0	0.23917
2.20d	1,3-Dimethylnaphthalene	782	302	1.89428	-0.75994	0	0.26244
2.20e	1,4-Dimethylnaphthalene	789	306	1.87547	-0.73954	0	0.25324
	1,5-Dimethylnaphthalene (not issued)						
2.20g	1,6-Dimethylnaphthalene	788	304	1.85507	-0.71791	0	0.24363
2.20h	1,7-Dimethylnaphthalene	786	303	1.86348	-0.72676	0	0.24792
	1,8-Dimethylnaphthalene (not issued)						
	2,3-Dimethylnaphthalene (not issued)						
	2,6-Dimethylnaphthalene (not issued)						
	2,7-Dimethylnaphthalene (not issued)						
2.30a	1-Propylnaphthalene	780	296	1.90875	-0.77686	0	0.27071
2.30b	2-Propylnaphthalene	783	293	1.89368	-0.75929	0	0.26214
2.30c	1-Isopropylnaphthalene	769	297	1.91948	-0.78123	0	0.26808
2.30d	2-Isopropylnaphthalene	774	293	1.89317	-0.74591	0	0.24753
3.00	Acenaphthene	831	335	1.82000	-0.68289	0	0.22947
	Fluorene (not issued)						
5.00a	Anthracene	923	328	1.82670	-0.68943	0	0.23205
5.00b	Phenanthrene	912	331	1.84447	-0.71012	0	0.24234
	Fluoranthene (not issued)						
6.01	Pyrene	989	343	1.85867	-0.72180	0	0.24549
8.00	Carbazole	928	337	1.89204	-0.75748	0	0.26132

C₉H₈ Indene

CAS Reg. No. 95-13-6

Mol. Wt. 116.16

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	$T_c =$	695 K	$(t_c =$	421.85 °C)
Critical Pressure	$p_c =$	4100 kPa	$(p_c =$	40.46 atm)
Critical Density	$d_c =$	317 kg/m ³	$(V_c =$	366.44 cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.260		
$N_1 = 1.78736$	$N_2 = -0.63451$	$N_3 = 0.00000$	$N_4 = 0.19926$	
Density at 298.15 K (25 °C)	$d_{25} =$	991.69 kg/m ³	$(V_{25} =$	117.13 cm ³ /mol)
Normal Boiling Point	$T_b =$	455.72 K	$(t_b =$	182.57 °C)
Normal Melting Point	$T_m =$	272 K	$(t_m =$	-1 °C)

Data at Specified Temperatures

$t/^\circ\text{C}$	-1	25	100	182.57	200	300	421.85
T/K	272.15	298.15	373.15	455.72	473.15	573.15	695.00
$d/(\text{kg/m}^3)$	(1012.90)	991.69	(928.27)	(852.37)	(835.09)	(720.58)	(317.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-0.81)	-0.82	(-0.87)	(-0.98)	(-1.01)	(-1.34)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(114.68)	117.13	(125.14)	(136.28)	(139.10)	(161.20)	(366.44)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.09)	0.10	(0.12)	(0.16)	(0.17)	(0.30)	∞
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)	(0.2)	0.2	(0.2)	(0.2)	(0.5)	(1)	(5)

Orthobaric Liquid Density of IndeneUnits: 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	(1012.)	2	250	(782.)	2	370	(605.)	5	410	(482.)	5
10	1004.	2	255	(776.)	5	372	(601.)	5	411	(477.)	5
20	996.	2	260	(770.)	5	374	(596.)	5	412	(471.)	5
30	988.	2	265	(765.)	5	376	(592.)	5	413	(465.)	5
40	979.	2	270	(759.)	5	378	(587.)	5	414	(459.)	5
50	971.	2	275	(753.)	5	380	(582.)	5	415	(452.)	5
60	(963.)	2	280	(746.)	5	382	(577.)	5	416	(444.)	5
70	(954.)	2	285	(740.)	5	384	(572.)	5	417	(436.)	5
80	(946.)	2	290	(734.)	5	386	(567.)	5	418	(426.)	5
90	(937.)	2	295	(727.)	5	388	(561.)	5	419	(415.)	5
100	(928.)	2	300	(721.)	5	390	(556.)	5	420	(401.)	5
110	(919.)	2	305	(714.)	5	392	(550.)	5	421	(381.)	5
120	(911.)	2	310	(707.)	5	394	(544.)	5			
130	(902.)	2	315	(700.)	5	396	(538.)	5			
140	(893.)	2	320	(692.)	5	398	(531.)	5			
150	(883.)	2	325	(685.)	5	400	(524.)	5			
160	(874.)	2	330	(677.)	5	402	(517.)	5			
170	(864.)	2	335	(669.)	5	404	(509.)	5			
180	(855.)	2	340	(661.)	5	406	(501.)	5			
190	(845.)	2	345	(653.)	5	408	(492.)	5			
200	(835.)	2	350	(644.)	5						
210	(825.)	2	355	(635.)	5						
220	(815.)	2	360	(625.)	5						
230	(804.)	2	365	(615.)	5						
240	(793.)	2									

Orthobaric Liquid Molar Volume of Indene

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
280	115.4	0.2	500	(144.)	0.5	620	(179.)	1	670	(217.)	2
290	116.3	0.2	505	(145.)	0.5	622	(180.)	1	671	(219.)	2
			510	(146.)	0.5	624	(181.)	1	672	(220.)	2
300	117.3	0.2	515	(147.)	0.5	626	(182.)	1	673	(221.)	2
310	118.3	0.2	520	(148.)	0.5	628	(183.)	1	674	(223.)	2
320	119.3	0.2									
330	120.3	0.2	525	(149.)	0.5	630	(184.)	1	675	(225.)	2
340	(121.4)	0.2	530	(150.)	0.5	632	(185.)	1	676	(226.)	2
			535	(151.)	0.5	634	(186.)	1	677	(228.)	2
350	(122.5)	0.2	540	(152.)	0.5	636	(187.)	1	678	(230.)	2
360	(123.6)	0.2	545	(154.)	0.5	638	(189.)	1	679	(232.)	2
370	(124.8)	0.2									
380	(126.0)	0.2	550	(155.)	1	640	(190.)	1	680	(234.)	2
390	(127.2)	0.2	555	(156.)	1	642	(191.)	1	681	(236.)	2
			560	(157.)	1	644	(193.)	1	682	(238.)	2
400	(128.4)	0.2	565	(159.)	1	646	(194.)	1	683	(241.)	2
410	(129.7)	0.2	570	(160.)	1	648	(195.)	2	684	(243.)	2
420	(131.1)	0.2									
430	(132.5)	0.2	575	(162.)	1	650	(197.)	2	685	(246.)	2
440	(133.9)	0.2	580	(163.)	1	652	(199.)	2	686	(249.)	2
			585	(165.)	1	654	(200.)	2	687	(253.)	2
450	(135.4)	0.2	590	(167.)	1	656	(202.)	2	688	(256.)	2
460	(137.)	0.5	595	(168.)	1	658	(204.)	2	689	(261.)	2
470	(139.)	0.5									
480	(140.)	0.5	600	(170.)	1	660	(206.)	2	690	(266.)	2
490	(142.)	0.5	605	(172.)	1	662	(208.)	2	691	(271.)	2
			610	(174.)	1	664	(210.)	2	692	(279.)	2
			615	(177.)	1	666	(212.)	2	693	(288.)	5
						668	(215.)	2	694	(302.)	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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C₉H₁₀ Indane (2,3-Dihydroindene)

CAS Reg. No. 496-11-7

Mol. Wt. 118.18

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	$T_c = 684.9 \text{ K}$	$(t_c = 411.75 \text{ }^\circ\text{C})$
Critical Pressure	$p_c = 3950 \text{ kPa}$	$(p_c = 38.98 \text{ atm})$
Critical Density	$d_c = 309 \text{ kg/m}^3$	$(V_c = 382.46 \text{ cm}^3/\text{mol})$
Critical Compression Factor	$Z_c = 0.265$	
$N_1 = 1.79205$	$N_2 = -0.66664$	$N_3 = 0.00000$
$N_4 = 0.22998$		
Density at 298.15 K (25 °C)	$d_{25} = 959.55 \text{ kg/m}^3$	$(V_{25} = 123.16 \text{ cm}^3/\text{mol})$
Normal Boiling Point	$T_b = 451.01 \text{ K}$	$(t_b = 177.86 \text{ }^\circ\text{C})$
Normal Melting Point	$T_m = 222 \text{ K}$	$(t_m = -51 \text{ }^\circ\text{C})$

Data at Specified Temperatures

$t/^\circ\text{C}$	-51	25	100	177.86	200	300	411.75
T/K	222.15	298.15	373.15	451.01	473.15	573.15	684.90
$d/(\text{kg/m}^3)$	(1021.36)	959.55	(895.97)	(824.80)	(803.01)	(688.17)	(309.00)
$d(d)/dT/(\text{kg/m}^3 \text{ K})$	(-0.80)	-0.83	(-0.87)	(-0.96)	(-1.00)	(-1.36)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(115.71)	123.16	(131.90)	(143.28)	(147.17)	(171.73)	(382.46)
$dV/dT/(\text{cm}^3/\text{mol K})$	(0.09)	0.11	(0.13)	(0.17)	(0.18)	(0.34)	∞
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)	(0.2)	0.2	(0.2)	(0.2)	(0.5)	(1)	(5)

Orthobaric Liquid Density of IndaneUnits: 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
-50	(1021.)	2	200	(803.)	2	320	(660.)	5	370	(567.)	5
-40	(1013.)	2	205	(798.)	2	322	(656.)	5	371	(565.)	5
-30	(1004.)	2	210	(793.)	2	324	(653.)	5	372	(563.)	5
-20	996.	2	215	(788.)	2	326	(650.)	5	373	(560.)	5
-10	988.	2	220	(783.)	2	328	(647.)	5	374	(558.)	5
0	980.	2	225	(777.)	2	330	(644.)	5	375	(555.)	5
10	972.	2	230	(772.)	2	332	(641.)	5	376	(552.)	5
20	964.	2	235	(767.)	2	334	(637.)	5	377	(550.)	5
30	955.	2	240	(761.)	2	336	(634.)	5	378	(547.)	5
40	947.	2	245	(755.)	2	338	(631.)	5	379	(545.)	5
50	(939.)	2	250	(750.)	2	340	(627.)	5	380	(542.)	5
60	(930.)	2	255	(744.)	5	342	(624.)	5	381	(539.)	5
70	(922.)	2	260	(738.)	5	344	(620.)	5	382	(536.)	5
80	(913.)	2	265	(733.)	5	346	(617.)	5	383	(533.)	5
90	(905.)	2	270	(727.)	5	348	(613.)	5	384	(530.)	5
100	(896.)	2	275	(720.)	5	350	(609.)	5	385	(527.)	5
110	(887.)	2	280	(714.)	5	352	(605.)	5	386	(524.)	5
120	(878.)	2	285	(708.)	5	354	(602.)	5	387	(521.)	5
130	(869.)	2	290	(701.)	5	356	(598.)	5	388	(518.)	5
140	(860.)	2	295	(695.)	5	358	(594.)	5	389	(514.)	5
150	(851.)	2	300	(688.)	5	360	(589.)	5	390	(511.)	5
160	(842.)	2	305	(681.)	5	362	(585.)	5	391	(507.)	5
170	(832.)	2	310	(674.)	5	364	(581.)	5	392	(504.)	5
180	(823.)	2	315	(667.)	5	366	(576.)	5	393	(500.)	5
190	(813.)	2				368	(572.)	5	394	(496.)	5

Orthobaric Liquid Molar Volume of Indane

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
			450 (143.1)		0.2	570 (171.)		1	620 (192.)		1
			455 (144.)		0.5	572 (171.)		1	621 (193.)		1
			460 (145.)		0.5	574 (172.)		1	622 (193.)		1
230 (116.4)		0.2	465 (146.)		0.5	576 (173.)		1	623 (194.)		1
240 (117.4)		0.2	470 (147.)		0.5	578 (173.)		1	624 (195.)		1
250 (118.3)		0.2	475 (148.)		0.5	580 (174.)		1	625 (195.)		1
260 (119.3)		0.2	480 (148.)		0.5	582 (175.)		1	626 (196.)		1
270 (120.3)		0.2	485 (149.)		0.5	584 (176.)		1	627 (196.)		1
280 (121.3)		0.2	490 (150.)		0.5	586 (176.)		1	628 (197.)		1
290 (122.3)		0.2	495 (151.)		0.5	588 (177.)		1	629 (198.)		1
300 (123.4)		0.2	500 (152.)		0.5	590 (178.)		1	630 (198.)		1
310 (124.4)		0.2	505 (153.)		0.5	592 (179.)		1	631 (199.)		2
320 (125.5)		0.2	510 (155.)		0.5	594 (180.)		1	632 (200.)		2
330 (126.7)		0.2	515 (156.)		0.5	596 (180.)		1	633 (200.)		2
340 (127.8)		0.2	520 (157.)		0.5	598 (181.)		1	634 (201.)		2
350 (129.0)		0.2	525 (158.)		0.5	600 (182.)		1	635 (202.)		2
360 (130.2)		0.2	530 (159.)		1	602 (183.)		1	636 (203.)		2
370 (131.5)		0.2	535 (161.)		1	604 (184.)		1	637 (203.)		2
380 (132.8)		0.2	540 (162.)		1	606 (185.)		1	638 (204.)		2
390 (134.1)		0.2	545 (163.)		1	608 (186.)		1	639 (205.)		2
400 (135.5)		0.2	550 (165.)		1	610 (187.)		1	640 (206.)		2
410 (136.9)		0.2	555 (166.)		1	612 (188.)		1	641 (207.)		2
420 (138.4)		0.2	560 (167.)		1	614 (189.)		1	642 (207.)		2
430 (139.9)		0.2	565 (169.)		1	616 (190.)		1	643 (208.)		2
440 (141.5)		0.2				618 (191.)		1	644 (209.)		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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C₉H₁₆ cis-Hexahydroindane (cis-Octahydroindene, cis-Hydrindan)

CAS Reg. No. 4551-51-3

Mol. Wt. 124.23

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	$T_c = 663 \text{ K}$	$(t_c = 389.85 \text{ }^\circ\text{C})$
Critical Pressure	$p_c = 3350 \text{ kPa}$	$(p_c = 33.06 \text{ atm})$
Critical Density	$d_c = 286 \text{ kg/m}^3$	$(V_c = 434.37 \text{ cm}^3/\text{mol})$
Critical Compression Factor	$Z_c = 0.264$	
$N_1 = 1.79272$	$N_2 = -0.67048$	$N_3 = 0.00000$
$N_4 = 0.23388$		
Density at 298.15 K (25 °C)	$d_{25} = 880.33 \text{ kg/m}^3$	$(V_{25} = 141.12 \text{ cm}^3/\text{mol})$
Normal Boiling Point	$T_b = 441.00 \text{ K}$	$(t_b = 167.85 \text{ }^\circ\text{C})$
Normal Melting Point	$T_m = -$	$(t_m = -)$

Data at Specified Temperatures

$t/^\circ\text{C}$	-50	25	100	167.85	200	300	389.85
T/K	223.15	298.15	373.15	441.00	473.15	573.15	663.00
$d/(\text{kg/m}^3)$	(939.03)	880.33	(818.92)	(758.96)	(728.12)	(611.68)	(286.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-0.77)	-0.80	(-0.85)	(-0.93)	(-0.99)	(-1.43)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(132.30)	141.12	(151.70)	(163.68)	(170.62)	(203.10)	(434.37)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.11)	0.13	(0.16)	(0.20)	(0.23)	(0.48)	∞
Data Quality	(B)	A	(B)	(B)	(B)	(B)	(B)
Uncertainty in d (kg/m^3)	(1)	0.5	(1)	(2)	(2)	(5)	(5)
Uncertainty in V (cm^3/mol)	(0.1)	0.05	(0.2)	(0.5)	(0.5)	(1)	(10)

Orthobaric Liquid Density of cis-HexahydroindaneUnits: 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
-50	(939.)	1	200	(728.)	2	320	(581.)	5	370	(469.)	5
-40	(931.)	1	205	(723.)	2	322	(578.)	5	371	(465.)	5
-30	(924.)	1	210	(718.)	2	324	(574.)	5	372	(462.)	5
-20	(916.)	0.5	215	(713.)	2	326	(571.)	5	373	(458.)	5
-10	(908.)	0.5	220	(708.)	2	328	(567.)	5	374	(454.)	5
0	(900.)	0.5	225	(703.)	2	330	(564.)	5	375	(450.)	5
10	(892.)	0.5	230	(697.)	2	332	(560.)	5	376	(446.)	5
20	(884.)	0.5	235	(692.)	2	334	(556.)	5	377	(442.)	5
30	(876.)	0.5	240	(686.)	2	336	(553.)	5	378	(437.)	5
40	(868.)	0.5	245	(681.)	2	338	(549.)	5	379	(432.)	5
50	(860.)	0.5	250	(675.)	2	340	(545.)	5	380	(427.)	5
60	(852.)	0.5	255	(669.)	5	342	(541.)	5	381	(422.)	5
70	(844.)	0.5	260	(664.)	5	344	(537.)	5	382	(416.)	5
80	(836.)	1	265	(658.)	5	346	(532.)	5	383	(410.)	5
90	(827.)	1	270	(651.)	5	348	(528.)	5	384	(403.)	5
100	(819.)	1	275	(645.)	5	350	(524.)	5	385	(395.)	5
110	(810.)	1	280	(639.)	5	352	(519.)	5	386	(386.)	5
120	(802.)	1	285	(632.)	5	354	(514.)	5	387	(376.)	5
130	(793.)	1	290	(626.)	5	356	(509.)	5	388	(363.)	5
140	(784.)	2	295	(619.)	5	358	(504.)	5	389	(345.)	5
150	(775.)	2	300	(612.)	5	360	(499.)	5			
160	(766.)	2	305	(604.)	5	362	(494.)	5			
170	(757.)	2	310	(597.)	5	364	(488.)	5			
180	(748.)	2	315	(589.)	5	366	(482.)	5			
190	(738.)	2				368	(475.)	5			

Orthobaric Liquid Molar Volume of cis-Hexahydroindane

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
			450 (166.)		0.5	570 (202.)		1	620 (234.)		2
			455 (167.)		0.5	572 (203.)		1	621 (235.)		2
			460 (168.)		0.5	574 (204.)		1	622 (236.)		2
230 (133.0)		0.1	465 (169.)		0.5	576 (204.)		1	623 (237.)		2
240 (134.2)		0.1	470 (170.)		0.5	578 (205.)		1	624 (238.)		2
250 (135.3)		0.1	475 (171.)		0.5	580 (206.)		1	625 (239.)		2
260 (136.5)		0.1	480 (172.)		0.5	582 (208.)		1	626 (240.)		2
270 (137.6)		0.1	485 (173.)		1	584 (209.)		1	627 (241.)		2
280 (138.8)		0.1	490 (175.)		1	586 (210.)		1	628 (243.)		2
290 (140.09)		0.05	495 (176.)		1	588 (211.)		1	629 (244.)		2
300 (141.35)		0.05	500 (177.)		1	590 (212.)		2	630 (245.)		2
310 (142.7)		0.1	505 (179.)		1	592 (213.)		2	631 (246.)		2
320 (144.0)		0.1	510 (180.)		1	594 (214.)		2	632 (247.)		2
330 (145.4)		0.1	515 (182.)		1	596 (216.)		2	633 (249.)		2
340 (146.8)		0.1	520 (183.)		1	598 (217.)		2	634 (250.)		2
350 (148.2)		0.1	525 (185.)		1	600 (218.)		2	635 (252.)		2
360 (149.7)		0.2	530 (186.)		1	602 (220.)		2	636 (253.)		2
370 (151.2)		0.2	535 (188.)		1	604 (221.)		2	637 (254.)		2
380 (152.8)		0.2	540 (190.)		1	606 (222.)		2	638 (256.)		2
390 (154.4)		0.2	545 (191.)		1	608 (224.)		2	639 (258.)		2
400 (156.1)		0.2	550 (193.)		1	610 (225.)		2	640 (259.)		2
410 (157.8)		0.2	555 (195.)		1	612 (227.)		2	641 (261.)		2
420 (159.7)		0.2	560 (197.)		1	614 (229.)		2	642 (263.)		2
430 (162.)		0.5	565 (199.)		1	616 (230.)		2	643 (265.)		2
440 (163.)		0.5				618 (232.)		2	644 (267.)		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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C₉H₁₆ trans-Hexahydroindane (trans-Octahydroindene, trans-Hydrindan)

CAS Reg. No. 3296-50-2

Mol. Wt. 124.23

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	$T_c =$	650 K	$(t_c =$	376.85 °C)
Critical Pressure	$p_c =$	3200 kPa	$(p_c =$	31.58 atm)
Critical Density	$d_c =$	280 kg/m ³	$(V_c =$	443.68 cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.263		
$N_1 = 1.79910$	$N_2 = -0.68006$	$N_3 = 0.00000$	$N_4 = 0.24010$	
Density at 298.15 K (25 °C)	$d_{25} =$	858.56 kg/m ³	$(V_{25} =$	144.70 cm ³ /mol)
Normal Boiling Point	$T_b =$	434.23 K	$(t_b =$	161.08 °C)
Normal Melting Point	$T_m =$	-	$(t_m =$	-)

Data at Specified Temperatures

$t/^\circ\text{C}$	-50	25	100	161.08	200	300	376.85
T/K	223.15	298.15	373.15	434.23	473.15	573.15	650.00
$d/(\text{kg/m}^3)$	(917.66)	858.56	(796.62)	(742.21)	(704.41)	(582.84)	(280.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-0.78)	-0.80	(-0.86)	(-0.93)	(-1.01)	(-1.54)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(135.38)	144.70	(155.95)	(167.38)	(176.36)	(213.15)	(443.68)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.11)	0.14	(0.17)	(0.21)	(0.25)	(0.56)	∞
Data Quality	(B)	A	(B)	(B)	(B)	(B)	(B)
Uncertainty in d (kg/m^3)	(1)	0.5	(1)	(2)	(2)	(5)	(5)
Uncertainty in V (cm^3/mol)	(0.1)	0.05	(0.2)	(0.5)	(1)	(1)	(10)

Orthobaric Liquid Density of trans-HexahydroindaneUnits: 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
-50	(918.)	1	200	(704.)	2	320	(549.)	5	370	(402.)	5
-40	(910.)	1	205	(699.)	2	322	(546.)	5	371	(395.)	5
-30	(902.)	1	210	(694.)	2	324	(542.)	5	372	(388.)	5
-20	(894.)	0.5	215	(689.)	2	326	(538.)	5	373	(379.)	5
-10	(886.)	0.5	220	(684.)	2	328	(534.)	5	374	(369.)	5
0	(878.)	0.5	225	(678.)	2	330	(530.)	5	375	(356.)	5
10	(871.)	0.5	230	(673.)	2	332	(526.)	5	376	(338.)	5
20	(863.)	0.5	235	(667.)	2	334	(522.)	5			
30	(855.)	0.5	240	(661.)	2	336	(517.)	5			
40	(846.)	0.5	245	(656.)	2	338	(513.)	5			
50	(838.)	0.5	250	(650.)	2	340	(508.)	5			
60	(830.)	0.5	255	(644.)	5	342	(503.)	5			
70	(822.)	0.5	260	(638.)	5	344	(498.)	5			
80	(814.)	1	265	(631.)	5	346	(493.)	5			
90	(805.)	1	270	(625.)	5	348	(488.)	5			
100	(797.)	1	275	(619.)	5	350	(482.)	5			
110	(788.)	1	280	(612.)	5	352	(477.)	5			
120	(779.)	1	285	(605.)	5	354	(471.)	5			
130	(770.)	1	290	(598.)	5	356	(464.)	5			
140	(762.)	2	295	(590.)	5	358	(457.)	5			
150	(752.)	2	300	(583.)	5	360	(450.)	5			
160	(743.)	2	305	(575.)	5	362	(442.)	5			
170	(734.)	2	310	(567.)	5	364	(434.)	5			
180	(724.)	2	315	(558.)	5	366	(425.)	5			
190	(714.)	2				368	(414.)	5			

Orthobaric Liquid Molar Volume of trans-Hexahydroindane

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
			450 (171.)		0.5	570 (211.)		1	620 (253.)		2
			455 (172.)		0.5	572 (213.)		1	621 (254.)		2
			460 (173.)		0.5	574 (214.)		1	622 (256.)		2
230 (136.2)		0.1	465 (174.)		0.5	576 (215.)		1	623 (257.)		2
240 (137.3)		0.1	470 (176.)		0.5	578 (216.)		2	624 (259.)		2
250 (138.5)		0.1	475 (177.)		1	580 (217.)		2	625 (260.)		2
260 (139.8)		0.1	480 (178.)		1	582 (218.)		2	626 (262.)		2
270 (141.0)		0.1	485 (179.)		1	584 (220.)		2	627 (264.)		2
280 (142.3)		0.1	490 (181.)		1	586 (221.)		2	628 (266.)		2
290 (143.61)		0.05	495 (182.)		1	588 (222.)		2	629 (267.)		2
300 (144.95)		0.05	500 (184.)		1	590 (224.)		2	630 (269.)		2
310 (146.3)		0.1	505 (185.)		1	592 (225.)		2	631 (271.)		2
320 (147.7)		0.1	510 (187.)		1	594 (227.)		2	632 (273.)		2
330 (149.2)		0.1	515 (188.)		1	596 (228.)		2	633 (276.)		2
340 (150.7)		0.1	520 (190.)		1	598 (230.)		2	634 (278.)		2
350 (152.2)		0.1	525 (192.)		1	600 (232.)		2	635 (280.)		2
360 (153.8)		0.2	530 (194.)		1	602 (233.)		2	636 (283.)		2
370 (155.4)		0.2	535 (196.)		1	604 (235.)		2	637 (286.)		2
380 (157.1)		0.2	540 (197.)		1	606 (237.)		2	638 (289.)		2
390 (158.8)		0.2	545 (200.)		1	608 (239.)		2	639 (292.)		2
400 (160.7)		0.2	550 (202.)		1	610 (241.)		2	640 (296.)		2
410 (162.5)		0.2	555 (204.)		1	612 (243.)		2	641 (299.)		5
420 (164.)		0.5	560 (206.)		1	614 (245.)		2	642 (303.)		5
430 (166.)		0.5	565 (209.)		1	616 (248.)		2	643 (308.)		5
440 (169.)		0.5				618 (250.)		2	644 (313.)		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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C₁₁H₁₄ 1,1-Dimethylindane (1,1-Dimethyl-2,3-dihydroindene)

CAS Reg. No. 4912-92-9

Mol. Wt. 146.230

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	$T_c =$	679 K	($t_c =$	405.85 °C)
Critical Pressure	$p_c =$	2850 kPa	($p_c =$	28.13 atm)
Critical Density	$d_c =$	289 kg/m ³	($V_c =$	506.00 cm ³ /mol)
Critical Compression Factor	$Z_c =$	0.255		
$N_1 = 1.85114$	$N_2 = -0.71401$	$N_3 = 0.00000$	$N_4 = 0.24216$	
Density at 298.15 K (25 °C)	$d_{25} =$	915.49 kg/m ³	($V_{25} =$	159.73 cm ³ /mol)
Normal Boiling Point	$T_b =$	467.18 K	($t_b =$	194.03 °C)
Normal Melting Point	$T_m =$	-	($t_m =$	-)

Data at Specified Temperatures

$t/^\circ\text{C}$	-50	25	100	194.03	200	300	405.85
T/K	223.15	298.15	373.15	467.18	473.15	573.15	679.00
$d/(\text{kg/m}^3)$	(974.81)	915.49	(853.62)	(768.70)	(762.86)	(649.50)	(289.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	(-0.78)	-0.80	(-0.85)	(-0.97)	(-0.98)	(-1.36)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	(150.01)	159.73	(171.31)	(190.23)	(191.69)	(225.14)	(505.99)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	(0.12)	0.14	(0.17)	(0.24)	(0.25)	(0.47)	∞
Data Quality	(C)	B	(C)	(C)	(C)	(C)	(C)
Uncertainty in d (kg/m^3)	(5)	5	(5)	(5)	(5)	(10)	(10)
Uncertainty in V (cm^3/mol)	(1)	0.5	(1)	(1)	(2)	(2)	(20)

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

Uncert. in d			Uncert. in d			Uncert. in d			Uncert. in d		
t	d		t	d		t	d		t	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
-50	(975.)	5	200	(763.)	5	320	(621.)	10	370	(526.)	10
-40	(967.)	5	205	(758.)	5	322	(618.)	10	371	(523.)	10
-30	(959.)	5	210	(753.)	5	324	(615.)	10	372	(521.)	10
-20	(951.)	5	215	(748.)	5	326	(612.)	10	373	(518.)	10
-10	(943.)	5	220	(743.)	5	328	(608.)	10	374	(516.)	10
0	(935.)	5	225	(738.)	5	330	(605.)	10	375	(513.)	10
10	(928.)	5	230	(732.)	10	332	(602.)	10	376	(510.)	10
20	(920.)	5	235	(727.)	10	334	(598.)	10	377	(507.)	10
30	(911.)	5	240	(722.)	10	336	(595.)	10	378	(504.)	10
40	(903.)	5	245	(716.)	10	338	(592.)	10	379	(501.)	10
50	(895.)	5	250	(711.)	10	340	(588.)	10	380	(498.)	10
60	(887.)	5	255	(705.)	10	342	(585.)	10	381	(495.)	10
70	(879.)	5	260	(699.)	10	344	(581.)	10	382	(492.)	10
80	(870.)	5	265	(694.)	10	346	(577.)	10	383	(489.)	10
90	(862.)	5	270	(688.)	10	348	(574.)	10	384	(486.)	10
100	(854.)	5	275	(682.)	10	350	(570.)	10	385	(482.)	10
110	(845.)	5	280	(675.)	10	352	(566.)	10	386	(479.)	10
120	(836.)	5	285	(669.)	10	354	(562.)	10	387	(475.)	10
130	(828.)	5	290	(663.)	10	356	(558.)	10	388	(471.)	10
140	(819.)	5	295	(656.)	10	358	(554.)	10	389	(467.)	10
150	(810.)	5	300	(650.)	10	360	(549.)	10	390	(463.)	10
160	(801.)	5	305	(643.)	10	362	(545.)	10	391	(459.)	10
170	(792.)	5	310	(636.)	10	364	(540.)	10	392	(455.)	10
180	(782.)	5	315	(628.)	10	366	(536.)	10	393	(450.)	10
190	(773.)	5				368	(531.)	10	394	(446.)	10

Orthobaric Liquid Molar Volume of 1,1-Dimethylindane

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
			450 (186.)		1	570 (224.)		2	620 (254.)		5
			455 (187.)		1	572 (225.)		2	621 (255.)		5
			460 (189.)		1	574 (226.)		2	622 (256.)		5
230 (151.)		1	465 (190.)		1	576 (227.)		2	623 (257.)		5
240 (152.)		1	470 (191.)		2	578 (227.)		2	624 (257.)		5
250 (153.)		0.5	475 (192.)		2	580 (228.)		2	625 (258.)		5
260 (155.)		0.5	480 (193.)		2	582 (229.)		2	626 (259.)		5
270 (156.)		0.5	485 (195.)		2	584 (231.)		2	627 (260.)		5
280 (157.)		0.5	490 (196.)		2	586 (232.)		2	628 (261.)		5
290 (159.)		0.5	495 (197.)		2	588 (233.)		2	629 (262.)		5
300 (160.)		0.5	500 (199.)		2	590 (234.)		2	630 (263.)		5
310 (161.)		0.5	505 (200.)		2	592 (235.)		5	631 (264.)		5
320 (163.)		1	510 (202.)		2	594 (236.)		5	632 (265.)		5
330 (164.)		1	515 (203.)		2	596 (237.)		5	633 (266.)		5
340 (166.)		1	520 (205.)		2	598 (238.)		5	634 (267.)		5
350 (167.)		1	525 (206.)		2	600 (240.)		5	635 (268.)		5
360 (169.)		1	530 (208.)		2	602 (241.)		5	636 (269.)		5
370 (171.)		1	535 (210.)		2	604 (242.)		5	637 (270.)		5
380 (172.)		1	540 (212.)		2	606 (244.)		5	638 (272.)		5
390 (174.)		1	545 (213.)		2	608 (245.)		5	639 (273.)		5
400 (176.)		1	550 (215.)		2	610 (246.)		5	640 (274.)		5
410 (178.)		1	555 (217.)		2	612 (248.)		5	641 (275.)		5
420 (180.)		1	560 (219.)		2	614 (249.)		5	642 (277.)		5
430 (182.)		1	565 (221.)		2	616 (251.)		5	643 (278.)		5
440 (184.)		1				618 (252.)		5	644 (279.)		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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C₁₀H₈ Naphthalene

CAS Reg. No. 91-20-3

Mol. Wt. 128.17

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	$T_c = 749 \text{ K}$	$(t_c = 475.85 \text{ }^\circ\text{C})$	
Critical Pressure	$p_c = 4075 \text{ kPa}$	$(p_c = 40.22 \text{ atm})$	
Critical Density	$d_c = 321 \text{ kg/m}^3$	$(V_c = 399.28 \text{ cm}^3/\text{mol})$	
Critical Compression Factor	$Z_c = 0.261$		
$N_1 = 1.79358$	$N_2 = -0.65286$	$N_3 = 0.00000$	$N_4 = 0.21451$
Normal Boiling Point	$T_b = 491.10 \text{ K}$	$(t_b = 217.95 \text{ }^\circ\text{C})$	
Normal Melting Point	$T_m = 353 \text{ K}$	$(t_m = 80 \text{ }^\circ\text{C})$	

Data at Specified Temperatures

$t/^\circ\text{C}$	80	100	200	217.95	300	400	475.85
T/K	353.15	373.15	473.15	491.10	573.15	673.15	749.00
$d/(\text{kg/m}^3)$	978.93	962.94	878.54	(862.30)	(780.96)	(649.20)	(321.00)
$(d(d)/dT)/(\text{kg/m}^3 \text{ K})$	-0.79	-0.81	-0.89	(-0.92)	(-1.09)	(-1.69)	$-\infty$
$V/(\text{cm}^3/\text{mol})$	130.93	133.10	145.89	(148.64)	(164.12)	(197.43)	(399.28)
$(dV/dT)/(\text{cm}^3/\text{mol K})$	0.11	0.11	0.15	(0.16)	(0.23)	(0.51)	∞
Data Quality	B	B	B	(B)	(C)	(C)	(C)
Uncertainty in d (kg/m^3)	1	1	2	(5)	(5)	(10)	(10)
Uncertainty in V (cm^3/mol)	0.1	0.1	0.2	(0.5)	(1)	(2)	(10)

Orthobaric Liquid Density of NaphthaleneUnits: kg/m^3 v. $^\circ\text{C}$

$\frac{t}{^\circ\text{C}}$	$\frac{d}{\text{kg/m}^3}$	Uncert. in $\frac{d}{\text{kg/m}^3}$	$\frac{t}{^\circ\text{C}}$	$\frac{d}{\text{kg/m}^3}$	Uncert. in $\frac{d}{\text{kg/m}^3}$	$\frac{t}{^\circ\text{C}}$	$\frac{d}{\text{kg/m}^3}$	Uncert. in $\frac{d}{\text{kg/m}^3}$	$\frac{t}{^\circ\text{C}}$	$\frac{d}{\text{kg/m}^3}$	Uncert. in $\frac{d}{\text{kg/m}^3}$
			300	(781.)	5	420	(612.)	10	460	(502.)	10
			305	(775.)	5	422	(608.)	10	461	(498.)	10
			310	(770.)	5	424	(604.)	10	462	(493.)	10
80	979.	1	315	(764.)	5	426	(600.)	10	463	(489.)	10
90	971.	1	320	(759.)	5	428	(596.)	10	464	(484.)	10
100	963.	1	325	(753.)	5	430	(591.)	10	465	(478.)	10
110	955.	1	330	(747.)	5	432	(587.)	10	466	(473.)	10
120	947.	1	335	(741.)	5	434	(582.)	10	467	(467.)	10
130	938.	1	340	(735.)	5	436	(577.)	10	468	(461.)	10
140	930.	1	345	(729.)	5	438	(572.)	10	469	(454.)	10
150	922.	1	350	(722.)	5	440	(567.)	10	470	(447.)	10
160	913.	2	355	(716.)	5	442	(562.)	10	471	(438.)	10
170	905.	2	360	(709.)	5	444	(556.)	10	472	(429.)	10
180	896.	2	365	(702.)	5	446	(551.)	10	473	(418.)	10
190	887.	2	370	(695.)	5	448	(545.)	10	474	(404.)	10
200	879.	2	375	(688.)	5	450	(538.)	10	475	(384.)	10
210	(870.)	2	380	(681.)	10	452	(532.)	10			
220	(860.)	5	385	(673.)	10	454	(525.)	10			
230	(851.)	5	390	(666.)	10	456	(518.)	10			
240	(842.)	5	395	(658.)	10	458	(510.)	10			
250	(832.)	5	400	(649.)	10						
260	(822.)	5	405	(641.)	10						
270	(812.)	5	410	(632.)	10						
280	(802.)	5	415	(622.)	10						
290	(792.)	5									

Orthobaric Liquid Molar Volume of Naphthalene

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
360	131.7	0.1	600	(171.)	1	700	(214.)	2	740	(274.)	5
370	132.8	0.1	605	(172.)	2	702	(216.)	2	741	(278.)	5
380	133.9	0.1	610	(174.)	2	704	(218.)	2	742	(282.)	5
390	135.0	0.2	615	(175.)	2	706	(219.)	2	743	(286.)	5
			620	(176.)	2	708	(221.)	5	744	(291.)	5
400	136.2	0.2	625	(178.)	2	710	(223.)	5	745	(298.)	5
410	137.4	0.2	630	(180.)	2	712	(225.)	5	746	(305.)	10
420	138.6	0.2	635	(181.)	2	714	(227.)	5	747	(315.)	10
430	139.9	0.2	640	(183.)	2	716	(229.)	5	748	(330.)	10
440	141.2	0.2	645	(185.)	2	718	(231.)	5	749	(399.)	10
450	142.6	0.2	650	(187.)	2	720	(234.)	5			
460	144.0	0.2	655	(189.)	2	722	(236.)	5			
470	145.4	0.2	660	(191.)	2	724	(239.)	5			
480	(147.)	0.5	665	(193.)	2	726	(242.)	5			
490	(148.)	0.5	670	(196.)	2	728	(245.)	5			
500	(150.)	0.5	675	(198.)	2	730	(249.)	5			
510	(152.)	1	680	(201.)	2	732	(253.)	5			
520	(153.)	1	685	(204.)	2	734	(257.)	5			
530	(155.)	1	690	(207.)	2	736	(262.)	5			
540	(157.)	1	695	(211.)	2	738	(267.)	5			
550	(159.)	1									
560	(161.)	1									
570	(163.)	1									
580	(166.)	1									
590	(168.)	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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