

## 2.3.2 Fluoroalkanes, C<sub>3</sub> - C<sub>16</sub>

**Octafluoropropane**

[76-19-7]

C<sub>3</sub>F<sub>8</sub>

MW = 188.02

383

$T_c = 345.05$  K [1963-bro]

$\rho_c = 628.00$  kg·m<sup>-3</sup> [1963-bro]

**Table 1.** Coefficients for the polynomial expansion equations. Standard deviations (see introduction):

$\sigma_1 = 2.4087$  (low temperature range),  $\sigma_{c,w} = 1.8427$  (combined temperature ranges, weighted),

$\sigma_{c,uw} = 4.2862 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	$T = 213.15$ to $280.00$ K $\rho = A + BT + CT^2 + DT^3 + \dots$	$T = 280.00$ to $345.05$ K $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)]$ $[\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3$ $+ D(T_c - T)^4]$
$A$	$2.09897 \cdot 10^3$	3.12221
$B$	$-3.88973 \cdot 10^{-1}$	$-1.20473 \cdot 10^{-1}$
$C$	$-7.21858 \cdot 10^{-3}$	$2.06023 \cdot 10^{-3}$
$D$		$-1.25344 \cdot 10^{-5}$

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
213.15	$1691.00 \pm 2.00$	2.90	1963-bro(□)	313.15	$1225.00 \pm 2.00$	-0.98	1963-bro(□)
223.45	$1650.00 \pm 2.00$	-1.63	1963-bro(□)	323.15	$1145.00 \pm 3.00$	-2.51	1963-bro(□)
232.45	$1618.00 \pm 1.50$	-0.51	1963-bro(□)	253.18	$1540.74 \pm 1.00$	2.96	1997-bou/ric(○)
240.85	$1585.00 \pm 1.50$	-1.55	1963-bro(□)	273.19	$1454.95 \pm 1.50$	0.98	1997-bou/ric(○)
253.15	$1538.00 \pm 1.50$	0.10	1963-bro(□)	293.17	$1353.78 \pm 1.50$	-0.13	1997-bou/ric(○)
263.35	$1493.00 \pm 1.50$	-2.90	1963-bro(□)	313.16	$1228.25 \pm 2.00$	2.34	1997-bou/ric(○)
268.45	$1474.00 \pm 2.00$	-0.34	1963-bro(□)	333.16	$1039.36 \pm 2.00$	0.33	1997-bou/ric(○)
303.05	$1293.00 \pm 2.00$	-0.15	1963-bro(□)				

<sup>1)</sup> Not included in Fig. 1.

**Further references:** [1967-gil/zwi, 1997-def/mol].

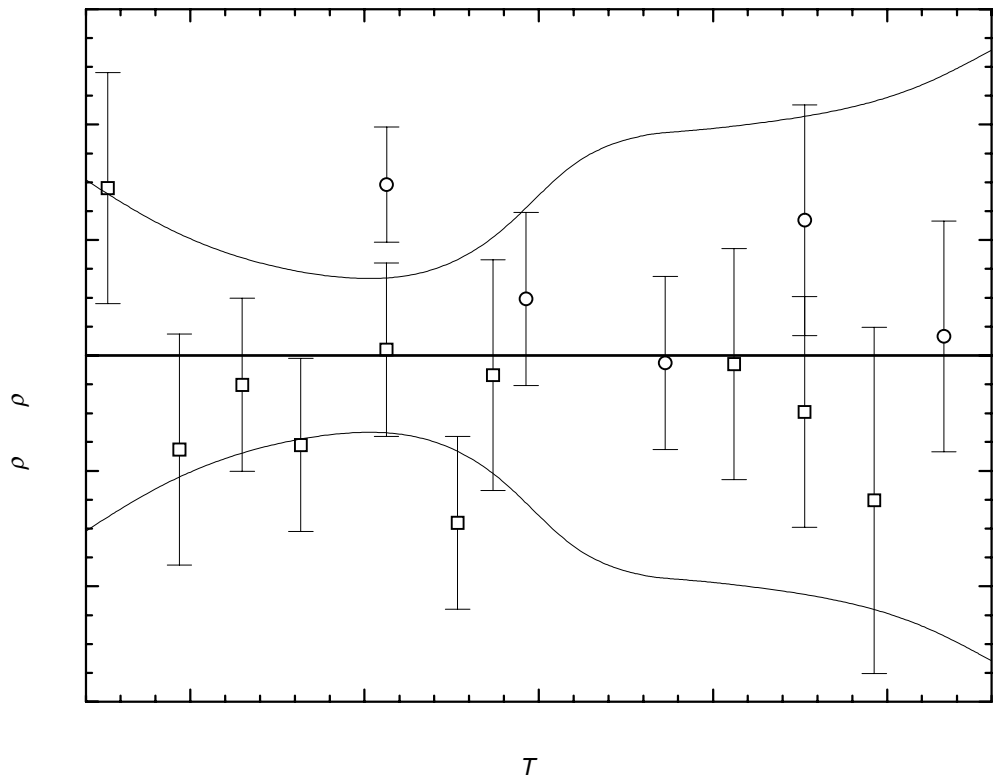
**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4].$$

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
210.00	$1698.95 \pm 3.04$	270.00	$1467.71 \pm 2.08$	310.00	$1247.73 \pm 4.07$
220.00	$1664.02 \pm 2.27$	280.00	$1424.12 \pm 3.48$	320.00	$1174.31 \pm 4.28$
230.00	$1627.65 \pm 1.75$	290.00	$1372.38 \pm 3.83$	330.00	$1078.40 \pm 4.64$
240.00	$1589.83 \pm 1.44$	293.15	$1354.03 \pm 3.86$	340.00	$922.36 \pm 5.29$
250.00	$1550.57 \pm 1.29$	298.15	$1323.79 \pm 3.91$		
260.00	$1509.86 \pm 1.40$	300.00	$1312.34 \pm 3.93$		

cont.

**Octafluoropropane (cont.)**



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**1,1,1,2,3,3,3-Heptafluoropropane** [431-89-0] **C<sub>3</sub>HF<sub>7</sub>** **MW = 170.00** **384**

$T_c = 375.95$  K [1996-amb/tso]  
 $\rho_c = 599.00$  kg·m<sup>-3</sup> [1996-amb/tso]

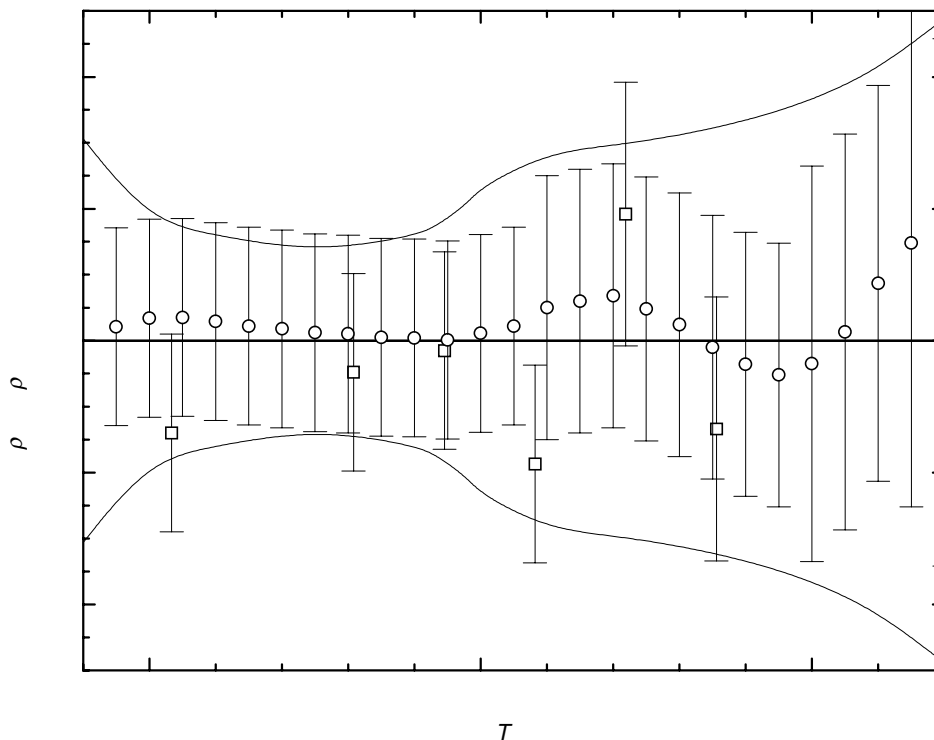
**Table 1.** Coefficients for the polynomial expansion equations. Standard deviations (see introduction):  
 $\sigma_1 = 4.2552 \cdot 10^{-1}$  (low temperature range),  $\sigma_{c,w} = 6.7958 \cdot 10^{-1}$  (combined temperature ranges, weighted),  
 $\sigma_{c,uw} = 9.4732 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	$T = 245.00$ to $300.00$ K $\rho = A + BT + CT^2 + DT^3 + \dots$	$T = 300.00$ to $375.95$ K $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)]$ $[\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$
<i>A</i>	$3.23229 \cdot 10^3$	1.82998
<i>B</i>	$-1.40432 \cdot 10^1$	$-4.33399 \cdot 10^{-2}$
<i>C</i>	$4.61508 \cdot 10^{-2}$	$4.88924 \cdot 10^{-4}$
<i>D</i>	$-6.64230 \cdot 10^{-5}$	$-2.07122 \cdot 10^{-6}$

cont.

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
245.00	1585.30 $\pm$ 1.50	0.21	1997-def/mol(O)	325.00	1261.70 $\pm$ 2.00	0.48	1997-def/mol(O)
250.00	1568.40 $\pm$ 1.50	0.34	1997-def/mol(O)	330.00	1234.70 $\pm$ 2.00	0.24	1997-def/mol(O)
255.00	1551.20 $\pm$ 1.50	0.35	1997-def/mol(O)	335.00	1206.00 $\pm$ 2.00	-0.10	1997-def/mol(O)
260.00	1533.70 $\pm$ 1.50	0.29	1997-def/mol(O)	340.00	1175.30 $\pm$ 2.00	-0.36	1997-def/mol(O)
265.00	1515.90 $\pm$ 1.50	0.22	1997-def/mol(O)	345.00	1142.00 $\pm$ 2.00	-0.52	1997-def/mol(O)
270.00	1497.80 $\pm$ 1.50	0.18	1997-def/mol(O)	350.00	1105.50 $\pm$ 3.00	-0.35	1997-def/mol(O)
275.00	1479.30 $\pm$ 1.50	0.12	1997-def/mol(O)	355.00	1064.60 $\pm$ 3.00	0.13	1997-def/mol(O)
280.00	1460.40 $\pm$ 1.50	0.10	1997-def/mol(O)	360.00	1017.40 $\pm$ 3.00	0.87	1997-def/mol(O)
285.00	1441.00 $\pm$ 1.50	0.05	1997-def/mol(O)	365.00	960.20 $\pm$ 4.00	1.48	1997-def/mol(O)
290.00	1421.10 $\pm$ 1.50	0.04	1997-def/mol(O)	370.00	883.60 $\pm$ 4.00	0.58	1997-def/mol(O)
295.00	1400.60 $\pm$ 1.50	0.01	1997-def/mol(O)	253.37	1555.08 $\pm$ 1.50	-1.40	2002-sca/bob( $\square$ )
300.00	1379.60 $\pm$ 1.50	0.11	1997-def/mol(O)	280.81	1456.72 $\pm$ 1.50	-0.48	2002-sca/bob( $\square$ )
305.00	1357.80 $\pm$ 1.50	0.22	1997-def/mol(O)	294.55	1402.31 $\pm$ 1.50	-0.15	2002-sca/bob( $\square$ )
310.00	1335.30 $\pm$ 2.00	0.50	1997-def/mol(O)	308.20	1341.23 $\pm$ 1.50	-1.87	2002-sca/bob( $\square$ )
315.00	1311.80 $\pm$ 2.00	0.60	1997-def/mol(O)	321.90	1279.08 $\pm$ 2.00	1.92	2002-sca/bob( $\square$ )
320.00	1287.40 $\pm$ 2.00	0.68	1997-def/mol(O)	335.59	1201.28 $\pm$ 2.00	-1.34	2002-sca/bob( $\square$ )

**Further references:** [1992-sal/wan, 1993-bey/des].**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

cont.

**1,1,1,2,3,3,3-Heptafluoropropane** (cont.)**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
240.00	1601.98 ± 3.06	293.15	1408.23 ± 1.72	340.00	1175.66 ± 3.33
250.00	1568.06 ± 1.81	298.15	1387.37 ± 2.09	350.00	1105.85 ± 3.64
260.00	1533.41 ± 1.60	300.00	1379.49 ± 2.33	360.00	1016.53 ± 4.11
270.00	1497.62 ± 1.42	310.00	1334.80 ± 2.85	370.00	883.02 ± 4.89
280.00	1460.30 ± 1.41	320.00	1286.72 ± 2.96		
290.00	1421.06 ± 1.60	330.00	1234.46 ± 3.11		

**1,1,1,2,3,3,3-Hexafluoropropane**

[431-63-0]

C<sub>3</sub>H<sub>2</sub>F<sub>6</sub>

MW = 152.04

385

**Table 1.** Experimental values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
408.87	791.00 ± 0.90	1996-aoy/kis	411.64	696.50 ± 1.00	1996-aoy/kis
410.03	763.30 ± 0.90	1996-aoy/kis	412.33	624.70 ± 1.00	1996-aoy/kis
411.16	720.00 ± 1.00	1996-aoy/kis	412.37	583.30 ± 2.00	1996-aoy/kis

**1,1,1,2,2-Pentafluoropropane**

[1814-88-6]

C<sub>3</sub>H<sub>3</sub>F<sub>5</sub>

MW = 134.05

386

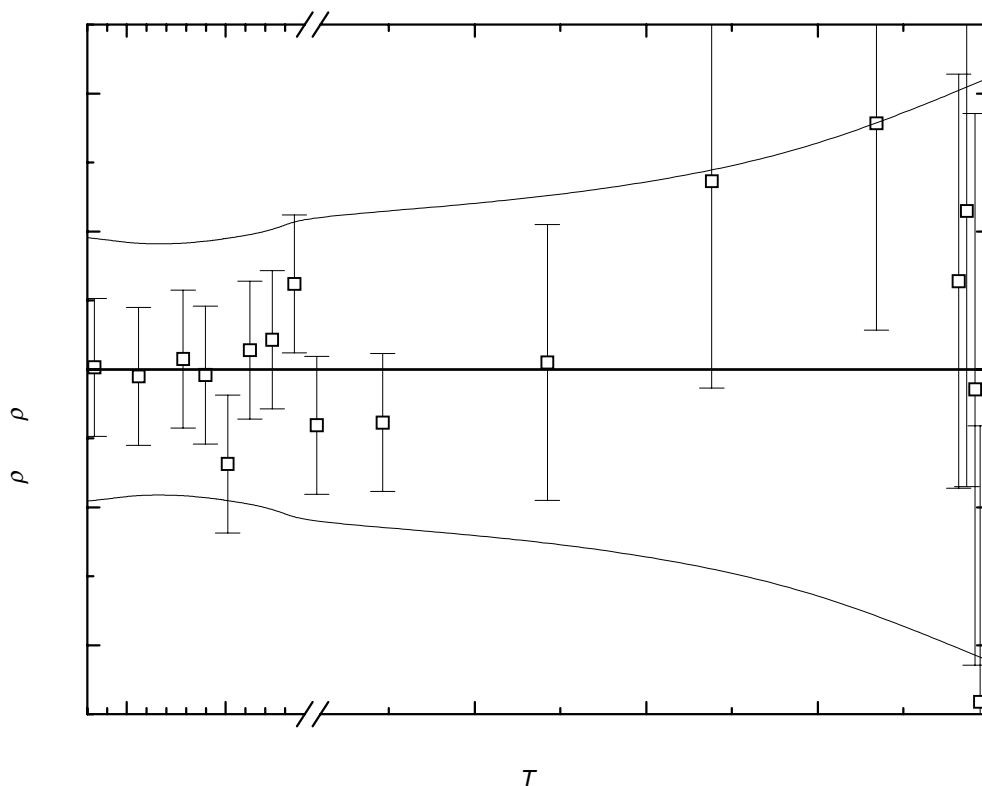
 $T_c = 380.11 \text{ K}$  [1967-sha] $\rho_c = 491.00 \text{ kg} \cdot \text{m}^{-3}$  [1967-sha]**Table 1.** Coefficients for the polynomial expansion equations. Standard deviations (see introduction): $\sigma_1 = 1.0175 \cdot 10^{-1}$  (low temperature range),  $\sigma_{c,w} = 1.1819$  (combined temperature ranges, weighted), $\sigma_{c,uw} = 6.4720 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	$T = 233.15 \text{ to } 285.00 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$	$T = 285.00 \text{ to } 380.11 \text{ K}$ $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)]$ $[\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$
<i>A</i>	$1.81277 \cdot 10^3$	1.57733
<i>B</i>	-1.10081	$-3.51362 \cdot 10^{-2}$
<i>C</i>	$-3.40955 \cdot 10^{-3}$	$3.65946 \cdot 10^{-4}$
<i>D</i>		$-1.41091 \cdot 10^{-6}$

cont.

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
233.15	1370.81 $\pm$ 1.00	0.03	1967-sha(□)	353.15	934.07 $\pm$ 2.00	0.10	1967-sha(□)
253.15	1315.50 $\pm$ 1.00	-0.10	1967-sha(□)	363.15	863.41 $\pm$ 3.00	2.73	1967-sha(□)
273.15	1257.85 $\pm$ 1.00	0.15	1967-sha(□)	373.15	757.87 $\pm$ 3.00	3.57	1967-sha(□)
283.15	1227.64 $\pm$ 1.00	-0.08	1967-sha(□)	378.15	660.86 $\pm$ 3.00	1.28	1967-sha(□)
293.15	1194.51 $\pm$ 1.00	-1.37	1967-sha(□)	378.65	646.17 $\pm$ 4.00	2.30	1967-sha(□)
303.15	1161.05 $\pm$ 1.00	0.28	1967-sha(□)	379.15	624.14 $\pm$ 4.00	-0.29	1967-sha(□)
313.15	1123.73 $\pm$ 1.00	0.43	1967-sha(□)	379.45	604.67 $\pm$ 4.00	-4.82	1967-sha(□)
323.15	1084.72 $\pm$ 1.00	1.24	1967-sha(□)	379.75	579.52 $\pm$ 4.00	-9.77	1967-sha <sup>1)</sup>
333.15	1039.50 $\pm$ 1.00	-0.81	1967-sha(□)	379.95	553.47 $\pm$ 4.00	-14.81	1967-sha <sup>1)</sup>
343.15	990.90 $\pm$ 1.00	-0.77	1967-sha(□)	380.05	538.41 $\pm$ 5.00	-11.23	1967-sha <sup>1)</sup>

<sup>1)</sup> Not included in Fig. 1.**Further references:** [1993-bey/des, 1997-def/mol].**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

cont.

**1,1,1,2,2-Pentafluoropropane** (cont.)**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
230.00	1379.22 ± 1.91	290.00	1206.32 ± 1.86	330.00	1054.38 ± 2.09
240.00	1352.19 ± 1.88	293.15	1195.88 ± 1.87	340.00	1007.76 ± 2.21
250.00	1324.47 ± 1.84	298.15	1178.66 ± 1.89	350.00	953.43 ± 2.39
260.00	1296.08 ± 1.82	300.00	1172.11 ± 1.90	360.00	886.08 ± 2.68
270.00	1267.00 ± 1.82	310.00	1135.34 ± 1.94	370.00	793.86 ± 3.20
280.00	1237.24 ± 1.83	320.00	1096.32 ± 2.00	380.00	560.41 ± 4.23

**1,1,1,3-Tetrafluoropropane**

[460-36-6]



MW = 116.06

387

**Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	1258.50 ± 1.00	1955-tar/lov

**1,3-Difluoropropane**

[462-39-5]



MW = 80.08

388

**Table 1.** Fit with estimated B coefficient for 2 accepted points. Deviation  $\sigma_w = 1.000$ .

Coefficient	$\rho = A + BT$
A	1389.31
B	-1.290

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	1005.70 ± 2.00	1.00	1949-hof
308.15	990.80 ± 2.00	-1.00	1949-hof

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	1015.2 ± 2.2
293.15	1011.1 ± 2.2
298.15	1004.7 ± 2.1
310.00	989.4 ± 2.1

**2,2-Difluoropropane****[420-45-1]****MW = 80.08****389****Table 1.** Experimental values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
273.15	920.00 ± 6.00	1937-hen/ren
273.15	920.00 ± 6.00	1939-hen/ren
293.15	920.50 ± 2.00	1942-gro/lin

**1-Fluoropropane****[460-13-9]****MW = 62.09****390****Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):

$\sigma_{\text{c,w}} = 2.6765 \cdot 10^{-2}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 1.0036 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	$T = 173.15 \text{ to } 293.15 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.05759 \cdot 10^3$
B	$-6.15339 \cdot 10^{-1}$
C	$-1.49162 \cdot 10^{-3}$

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
173.15	906.30 ± 1.00	-0.02	1940-gro/wac(□)	270.65	781.80 ± 1.00	0.02	1940-gro/wac(□)
193.15	883.10 ± 1.00	0.01	1940-gro/wac(□)	273.15	778.20 ± 1.00	-0.02	1940-gro/wac(□)
213.15	858.70 ± 1.00	0.04	1940-gro/wac(□)	283.15	763.80 ± 1.00	0.04	1940-gro/wac(□)
233.15	833.00 ± 1.00	-0.04	1940-gro/wac(□)	293.15	749.00 ± 1.00	-0.01	1940-gro/wac(□)
253.15	806.20 ± 1.00	-0.02	1940-gro/wac(□)				

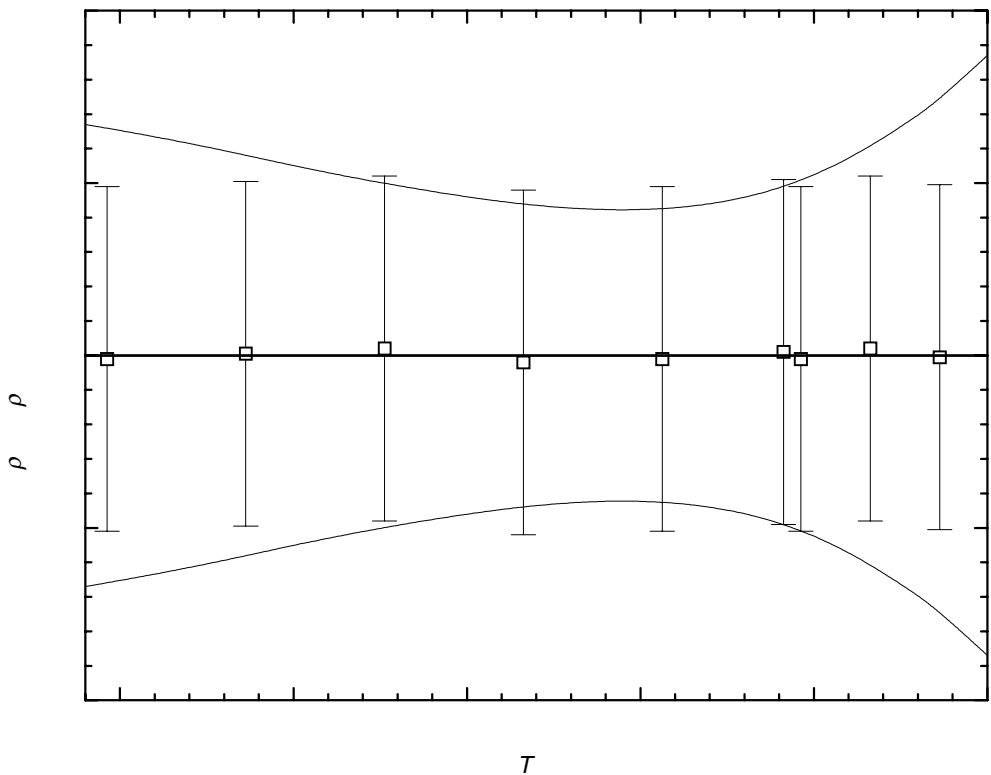
**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4].$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
170.00	909.87 ± 1.34	230.00	837.15 ± 0.89	290.00	753.69 ± 1.39
180.00	898.50 ± 1.27	240.00	823.99 ± 0.85	293.15	749.01 ± 1.49
190.00	886.82 ± 1.19	250.00	810.53 ± 0.84	298.15	741.53 ± 1.67
200.00	874.85 ± 1.10	260.00	796.76 ± 0.87	300.00	738.74 ± 1.74
210.00	862.58 ± 1.02	270.00	782.71 ± 0.96		
220.00	850.02 ± 0.95	280.00	768.35 ± 1.13		

cont.

1-Fluoropropane (cont.)



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**2-Fluoropropane** [420-26-8] C<sub>3</sub>H<sub>7</sub>F MW = 62.09 391

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 3.9917 \cdot 10^{-2}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 1.5387 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

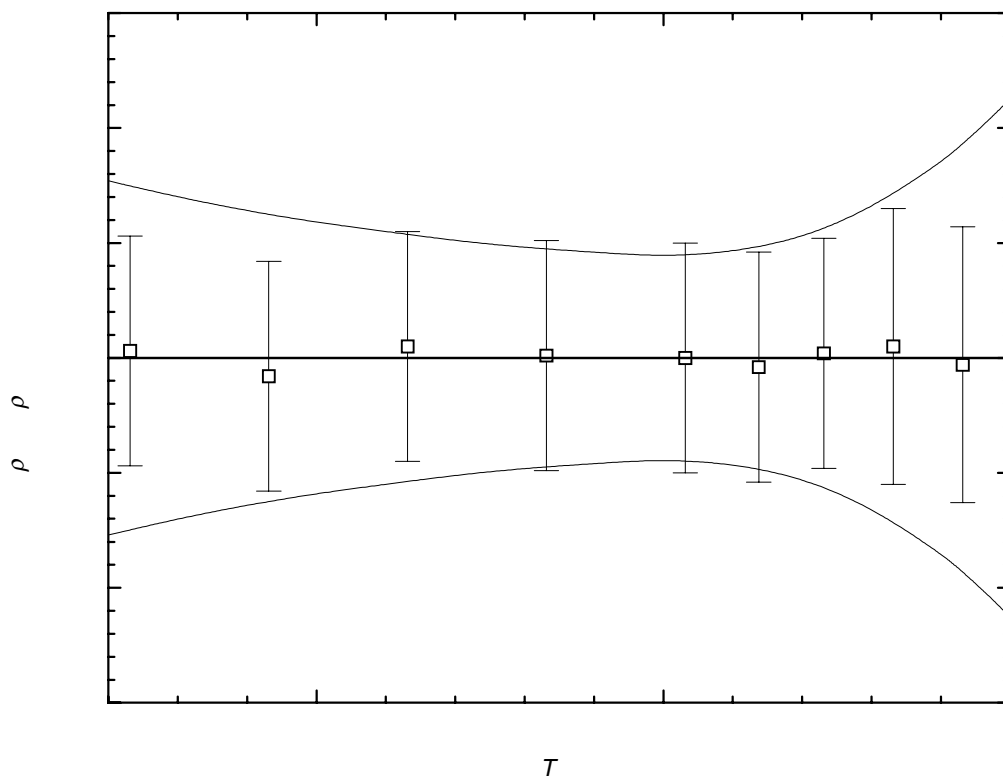
Coefficient	$T = 173.15 \text{ to } 293.15 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
<i>A</i>	$1.02865 \cdot 10^3$
<i>B</i>	$-4.78797 \cdot 10^{-1}$
<i>C</i>	$-1.91369 \cdot 10^{-3}$

cont.

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ $\text{kg} \cdot \text{m}^{-3}$	$\rho_{\text{exp}} - \rho_{\text{calc}}$ $\text{kg} \cdot \text{m}^{-3}$	Ref. (Symbol in Fig. 1)	$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ $\text{kg} \cdot \text{m}^{-3}$	$\rho_{\text{exp}} - \rho_{\text{calc}}$ $\text{kg} \cdot \text{m}^{-3}$	Ref. (Symbol in Fig. 1)
173.15	$888.40 \pm 0.50$	0.03	1940-gro/wac(□)	263.75	$769.20 \pm 0.50$	-0.04	1940-gro/wac(□)
193.15	$864.70 \pm 0.50$	-0.08	1940-gro/wac(□)	273.15	$755.10 \pm 0.50$	0.02	1940-gro/wac(□)
213.15	$839.70 \pm 0.50$	0.05	1940-gro/wac(□)	283.15	$739.70 \pm 0.60$	0.05	1940-gro/wac(□)
233.15	$813.00 \pm 0.50$	0.01	1940-gro/wac(□)	293.15	$723.80 \pm 0.60$	-0.03	1940-gro/wac(□)
253.15	$784.80 \pm 0.50$	-0.00	1940-gro/wac(□)				

**Further references:** [1938-gro/lin].



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

cont.

**2-Fluoropropane (cont.)****Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
170.00	891.95 ± 0.77	230.00	817.29 ± 0.48	290.00	728.86 ± 0.85
180.00	880.46 ± 0.70	240.00	803.51 ± 0.46	293.15	723.83 ± 0.93
190.00	868.59 ± 0.64	250.00	789.34 ± 0.44	298.15	715.78 ± 1.07
200.00	856.34 ± 0.59	260.00	774.80 ± 0.46	300.00	712.78 ± 1.13
210.00	843.71 ± 0.55	270.00	759.87 ± 0.52		
220.00	830.69 ± 0.51	280.00	744.55 ± 0.65		

**Decafluorobutane****[355-25-9]****C<sub>4</sub>F<sub>10</sub>****MW = 238.03****392****Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):

$\sigma_{c,w} = 1.2091$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 7.1107 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	$T = 271.00 \text{ to } 347.45 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
<i>A</i>	$1.31919 \cdot 10^3$
<i>B</i>	5.26986
<i>C</i>	$-1.56476 \cdot 10^{-2}$

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

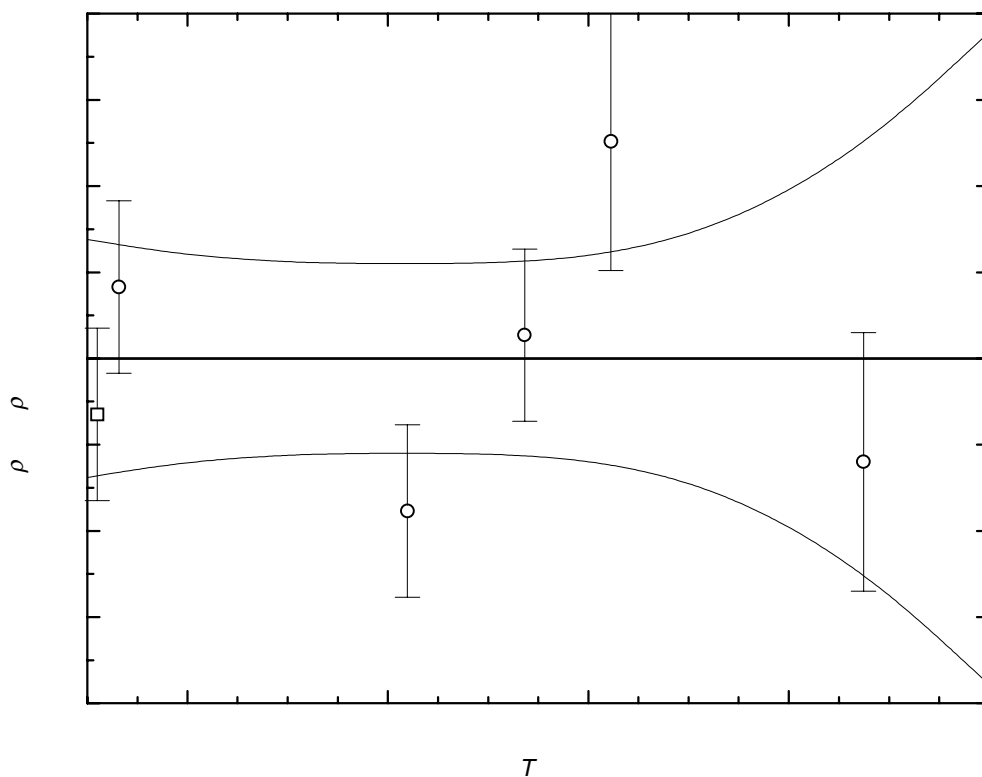
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
273.15	1592.00 ± 1.00	0.83	1958-bro/mea(○)	322.25	1395.00 ± 1.50	2.52	1958-bro/mea(○)
301.95	1482.00 ± 1.00	-1.77	1958-bro/mea(○)	347.45	1260.00 ± 1.50	-1.20	1958-bro/mea(○)
313.65	1433.00 ± 1.00	0.27	1958-bro/mea(○)	271.00	1597.50 ± 1.00	-0.65	1967-gil/zwi(□)

**Further references:** [1947-fow/ham, 1952-sim/mau].**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	1601.34 ± 1.38	298.15	1499.43 ± 1.10	330.00	1354.22 ± 1.41
280.00	1567.98 ± 1.19	300.00	1491.86 ± 1.10	340.00	1302.08 ± 1.91
290.00	1531.49 ± 1.12	310.00	1449.11 ± 1.10	350.00	1246.81 ± 2.70
293.15	1519.34 ± 1.11	320.00	1403.23 ± 1.17	360.00	1188.41 ± 3.79

cont.



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**1,1,1-Trifluoro-2-trifluoromethylpropane**

[500060-31-1]

C<sub>4</sub>H<sub>4</sub>F<sub>6</sub>

MW = 166.07

393

**Table 1.** Experimental value with uncertainty.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m <sup>-3</sup>	Ref.
273.15	1372.50 ± 2.00	1950-hen/she

**1,1,1-Trifluorobutane**

[460-34-4]

C<sub>4</sub>H<sub>7</sub>F<sub>3</sub>

MW = 112.09

394

**Table 1.** Experimental value with uncertainty.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m <sup>-3</sup>	Ref.
293.15	1014.40 ± 1.00	1945-hen/hin

**1,4-Difluorobutane**

[372-90-7]

**MW = 94.10****395****Table 1.** Fit with estimated B coefficient for 2 accepted points. Deviation  $\sigma_w = 0.450$ .

Coefficient	$\rho = A + BT$
A	1304.21
B	-1.100

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	$976.7 \pm 2.00$	0.45	1949-hof
308.15	$964.8 \pm 2.00$	-0.45	1949-hof

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	$985.2 \pm 2.1$
293.15	$981.7 \pm 2.0$
298.15	$976.2 \pm 1.9$
310.00	$963.2 \pm 1.9$

**2,2-Difluorobutane**

[353-81-1]

**MW = 94.10****396****Table 1.** Experimental values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
283.15	$916.40 \pm 2.00$	1939-hen/ren	283.15	$915.90 \pm 2.00$	1943-hen/plu
293.15	$901.60 \pm 1.00$	1942-gro/lin	293.15	$915.90 \pm 5.00$	1945-hen/hin
283.15	$917.00 \pm 2.00$	1942-ren	283.15	$911.00 \pm 2.00$	1951-bar-3

**1-Fluorobutane**

[2366-52-1]

**MW = 76.11****397****Table 1.** Fit with estimated B coefficient for 8 accepted points. Deviation  $\sigma_w = 0.651$ .

Coefficient	$\rho = A + BT$
A	1113.69
B	-1.150

cont.

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	$776.3 \pm 1.00$	-0.27	1934-des	273.15	$800.5 \pm 1.00$	0.93	1935-des-1
288.15	$782.4 \pm 1.00$	0.08	1934-des	288.15	$782.4 \pm 1.00$	0.08	1935-des-1
273.15	$800.5 \pm 1.00$	0.93	1934-des	293.15	$776.3 \pm 1.00$	-0.27	1940-gro/wac
293.15	$776.3 \pm 1.00$	-0.27	1935-des-1	305.65	$761.0 \pm 1.00$	-1.20	1940-gro/wac

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	$803.2 \pm 1.4$
280.00	$791.7 \pm 1.2$
290.00	$780.2 \pm 1.1$
293.15	$776.6 \pm 1.1$
298.15	$770.8 \pm 1.2$
310.00	$757.2 \pm 1.5$

**2-Fluorobutane**

[359-01-3]

C<sub>4</sub>H<sub>9</sub>F

MW = 76.11

398

**Table 1.** Fit with estimated B coefficient for 10 accepted points. Deviation  $\sigma_w = 0.742$ .

Coefficient	$\rho = A + BT$
A	1114.34
B	-1.200

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
273.15	$788.4 \pm 1.00$	1.84	1934-des	273.15	$786.5 \pm 0.50$	-0.06	1940-gro/wac
288.15	$770.0 \pm 1.00$	1.44	1934-des	283.15	$774.3 \pm 0.50$	-0.26	1940-gro/wac
273.15	$788.4 \pm 1.00$	1.84	1935-des-1	293.15	$762.1 \pm 0.50$	-0.46	1940-gro/wac
288.15	$770.0 \pm 1.00$	1.44	1935-des-1	303.15	$749.9 \pm 0.50$	-0.66	1940-gro/wac
298.25	$755.9 \pm 0.50$	-0.54	1940-gro/wac	285.15	$782.0 \pm 3.00$	9.84	1951-bar-3 <sup>1)</sup>
253.15	$810.9 \pm 0.50$	0.34	1940-gro/wac				

<sup>1)</sup> Not included in calculation of linear coefficients.

cont.

**2-Fluorobutane** (cont.)**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
250.00	814.3 ± 1.4
260.00	802.3 ± 1.2
270.00	790.3 ± 1.0
280.00	778.3 ± 0.9
290.00	766.3 ± 1.0
293.15	762.6 ± 1.0
298.15	756.6 ± 1.0
310.00	742.3 ± 1.2

**2-Fluoro-2-methylpropane**

[353-61-7]

C<sub>4</sub>H<sub>9</sub>F

MW = 76.11

399

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):

$\sigma_{\text{c,w}} = 1.0102 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 6.3247 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	$T = 213.15 \text{ to } 285.25 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.04302 \cdot 10^3$
B	$-7.04445 \cdot 10^{-1}$
C	$-1.09563 \cdot 10^{-3}$

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

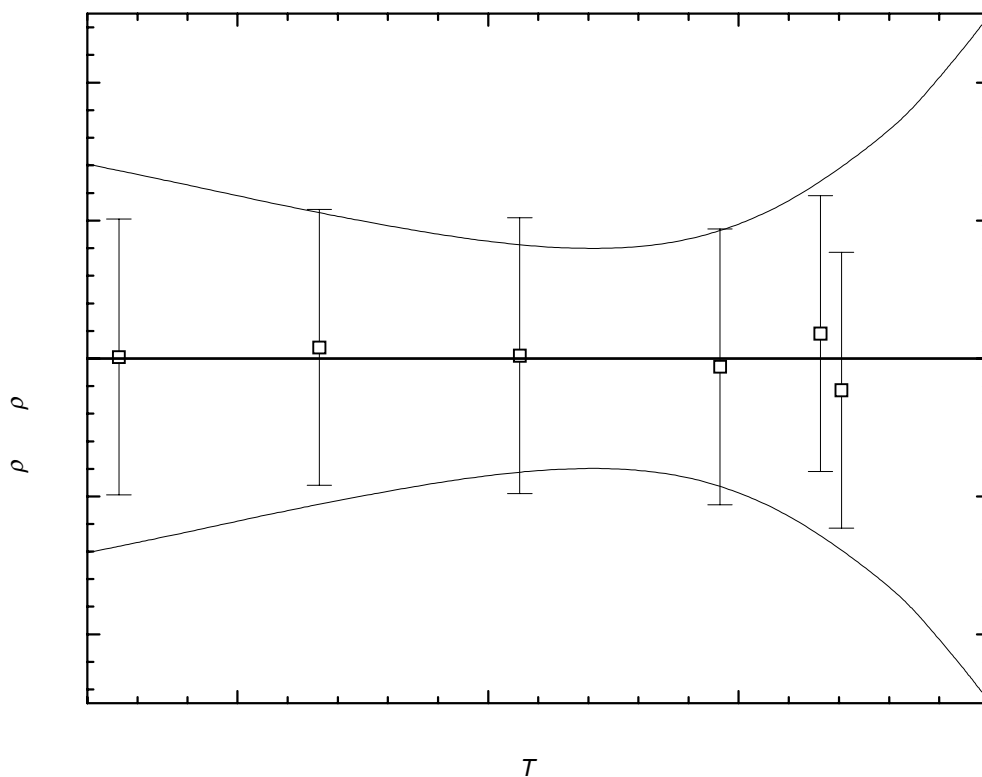
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
213.15	843.10 ± 1.00	0.01	1940-gro/wac(□)	273.15	768.80 ± 1.00	-0.06	1940-gro/wac(□)
233.15	819.30 ± 1.00	0.08	1940-gro/wac(□)	283.15	755.90 ± 1.00	0.18	1940-gro/wac(□)
253.15	794.50 ± 1.00	0.02	1940-gro/wac(□)	285.25	752.70 ± 1.00	-0.23	1940-gro/wac(□)

**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
210.00	846.77 ± 1.41	250.00	798.43 ± 0.84	290.00	746.59 ± 1.64
220.00	835.02 ± 1.26	260.00	785.80 ± 0.78	293.15	742.36 ± 1.87
230.00	823.04 ± 1.10	270.00	772.95 ± 0.83	298.15	735.60 ± 2.31
240.00	810.85 ± 0.96	280.00	759.88 ± 1.10	300.00	733.08 ± 2.49

cont.



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

### Dodecafluoropentane

[678-26-2]

C<sub>5</sub>F<sub>12</sub>

MW = 288.04

400

**Table 1.** Fit with estimated B coefficient for 6 accepted points. Deviation  $\sigma_w = 1.624$ .

Coefficient	$\rho = A + BT$
A	2680.89
B	-3.600

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
253.00	$1768.7 \pm 1.00$	-1.39	1974-coc/nor	238.00	$1827.3 \pm 1.00$	3.21	1974-coc/nor
248.00	$1787.1 \pm 1.00$	-0.99	1974-coc/nor	233.00	$1842.0 \pm 1.00$	-0.09	1974-coc/nor
243.00	$1805.1 \pm 1.00$	-0.99	1974-coc/nor	298.16	$1608.1 \pm 1.50$	0.58	1989-nar/swa

cont.

**Dodecafluoropentane (cont.)****Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
230.00	1852.9 $\pm$ 2.1
240.00	1816.9 $\pm$ 1.9
250.00	1780.9 $\pm$ 1.9
260.00	1744.9 $\pm$ 2.0
270.00	1708.9 $\pm$ 2.2
280.00	1672.9 $\pm$ 2.5
290.00	1636.9 $\pm$ 2.8
293.15	1625.6 $\pm$ 3.0
298.15	1607.6 $\pm$ 3.2

**1,1,1-Trifluoro-2,2-dimethylpropane** [55757-33-0] C<sub>5</sub>H<sub>9</sub>F<sub>3</sub> MW = 126.12 401

**Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	990.50 $\pm$ 1.00	1974-dmo/kol

**1,1,1-Trifluoro-3-methylbutane** [406-49-5] C<sub>5</sub>H<sub>9</sub>F<sub>3</sub> MW = 126.12 402

**Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	978.80 $\pm$ 1.00	1954-tar/att

**1,1,1-Trifluoropentane** [406-82-6] C<sub>5</sub>H<sub>9</sub>F<sub>3</sub> MW = 126.12 403

**Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	970.10 $\pm$ 1.00	1974-dmo/kol

**1,5-Difluoropentane** [373-17-1] C<sub>5</sub>H<sub>10</sub>F<sub>2</sub> MW = 108.13 404

**Table 1.** Fit with estimated B coefficient for 2 accepted points. Deviation  $\sigma_w = 0.000$ .

Coefficient	$\rho = A + BT$
A	1282.18
B	-1.090

cont.

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	$957.20 \pm 2.00$	-0.00	1949-hof
308.15	$946.30 \pm 2.00$	-0.00	1949-hof

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	$966.1 \pm 2.0$
293.15	$962.7 \pm 1.9$
298.15	$957.2 \pm 1.8$
310.00	$944.3 \pm 1.9$

**2,2-Difluoropentane**

[371-65-3]

C<sub>5</sub>H<sub>10</sub>F<sub>2</sub>

MW = 108.13

405

**Table .** Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	$895.80 \pm 2.00$	1939-hen/ren
293.15	$890.40 \pm 2.00$	1942-gro/lin
293.15	$898.70 \pm 3.00$	1942-ren <sup>1)</sup>
293.15	$893.20 \pm 1.00$	1943-hen/plu
293.15	$893.20 \pm 1.00$	Recommended

<sup>1)</sup> Not included in calculation of recommended value.**3,3-Difluoropentane**

[358-03-2]

C<sub>5</sub>H<sub>10</sub>F<sub>2</sub>

MW = 108.13

406

**Table 1.** Experimental values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	$910.60 \pm 2.00$	1942-ren
293.15	$910.60 \pm 2.00$	1942-ren-1
293.15	$902.30 \pm 1.00$	1943-hen/plu

**1-Fluoro-2-methylbutane**

[10086-64-3]

C<sub>5</sub>H<sub>11</sub>F

MW = 90.14

407

**Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	790.60 $\pm$ 2.00	1937-bra

**1-Fluoro-3-methylbutane**

[407-06-7]

C<sub>5</sub>H<sub>11</sub>F

MW = 90.14

408

**Table 1.** Fit with estimated B coefficient for 2 accepted points. Deviation  $\sigma_w = 0.533$ .

Coefficient	$\rho = A + BT$
A	937.65
B	-0.830

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
287.65	699.40 $\pm$ 2.00	0.53	1926-tro/kre
292.75	694.10 $\pm$ 2.00	-0.53	1926-tro/kre

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	705.2 $\pm$ 2.0
290.00	696.9 $\pm$ 1.9
293.15	694.3 $\pm$ 1.9
298.15	690.2 $\pm$ 1.9

**2-Fluoro-2-methylbutane**

[661-53-0]

C<sub>5</sub>H<sub>11</sub>F

MW = 90.14

409

**Table 1.** Fit with estimated B coefficient for 7 accepted points. Deviation  $\sigma_w = 0.728$ .

Coefficient	$\rho = A + BT$
A	1062.94
B	-0.970

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
317.95	753.50 $\pm$ 0.50	-1.03	1940-gro/wac	293.15	778.40 $\pm$ 0.50	-0.18	1940-gro/wac
253.15	818.60 $\pm$ 0.50	1.22	1940-gro/wac	303.15	768.30 $\pm$ 0.50	-0.58	1940-gro/wac
273.15	798.50 $\pm$ 0.50	0.52	1940-gro/wac	293.15	778.00 $\pm$ 1.00	-0.58	1942-aud/gos-1
283.15	788.50 $\pm$ 0.50	0.22	1940-gro/wac				

cont.

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
250.00	820.4 ± 1.4
260.00	810.7 ± 1.2
270.00	801.0 ± 1.0
280.00	791.3 ± 0.9
290.00	781.6 ± 0.9
293.15	778.6 ± 0.9
298.15	773.7 ± 0.9
310.00	762.2 ± 1.1
320.00	752.5 ± 1.3

**1-Fluoropentane**

[592-50-7]

C<sub>5</sub>H<sub>11</sub>F

MW = 90.14

410

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):

$\sigma_{\text{c,w}} = 1.0351$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 2.5033 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

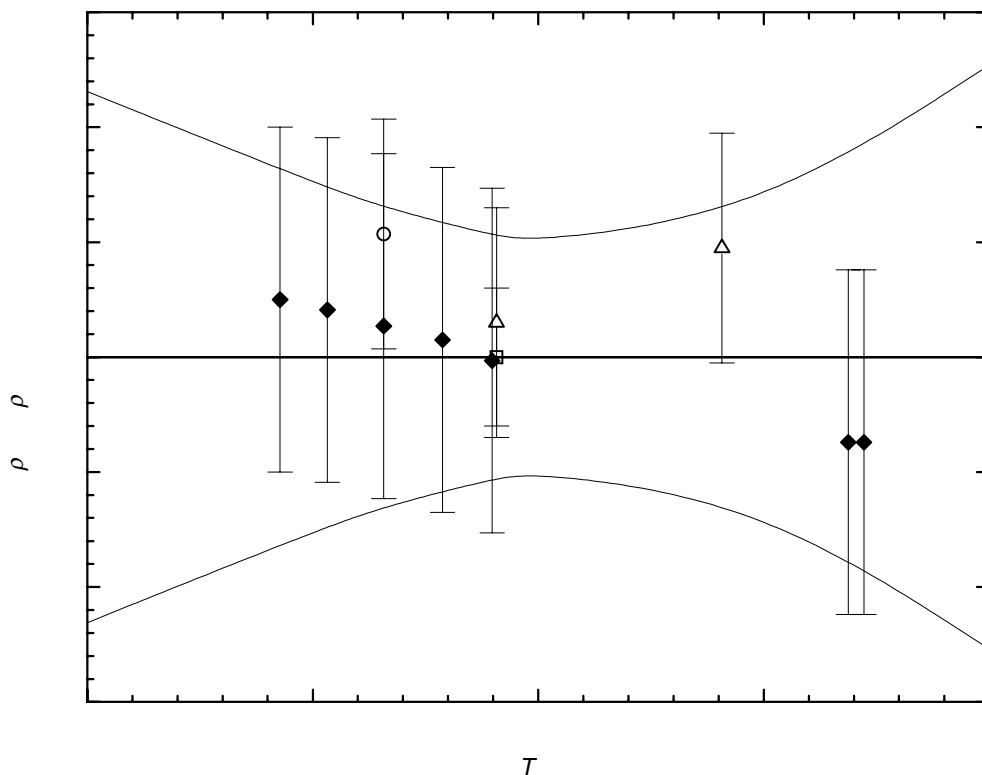
Coefficient	$T = 288.55 \text{ to } 314.45 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
<i>A</i>	$1.12634 \cdot 10^3$
<i>B</i>	-1.14518

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
293.15	788.50 ± 1.00	-2.13	1942-aud/gos-1(∇)	297.95	785.10 ± 1.50	-0.03	1948-vog(◆)
298.15	784.90 ± 0.60	-0.00	1947-rog-1(□)	313.75	766.30 ± 1.50	-0.74	1948-vog(◆)
288.55	796.40 ± 1.50	0.50	1948-vog(◆)	314.45	765.50 ± 1.50	-0.74	1948-vog(◆)
290.65	793.90 ± 1.50	0.41	1948-vog(◆)	298.15	785.20 ± 1.00	0.30	1950-hof(Δ)
293.15	790.90 ± 1.50	0.27	1948-vog(◆)	308.15	774.40 ± 1.00	0.95	1950-hof(Δ)
295.75	787.80 ± 1.50	0.15	1948-vog(◆)	293.15	791.70 ± 1.00	1.07	1960-mac(○)

**Further references:** [1921-swa, 1921-swa-1, 1923-swa, 1935-des-1, 1940-gro/wac].

cont.

**1-Fluoropentane** (cont.)

**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	805.69 ± 2.31	298.15	784.90 ± 1.05	320.00	759.88 ± 2.54
290.00	794.24 ± 1.52	300.00	782.79 ± 1.00		
293.15	790.63 ± 1.30	310.00	771.33 ± 1.27		

**(S)-2-Fluoropentane****[500002-54-0]****C<sub>5</sub>H<sub>11</sub>F****MW = 90.14****411**

**Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	778.80 ± 0.50	1943-bra

**Tetradecafluorohexane****[355-42-0]****C<sub>6</sub>F<sub>14</sub>****MW = 338.04****412****Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):

$\sigma_{c,w} = 2.1322$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 5.0285 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	$T = 278.15 \text{ to } 318.15 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
<i>A</i>	$2.58657 \cdot 10^3$
<i>B</i>	-3.07112

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
288.15	$1701.60 \pm 0.60$	-0.02	1958-dun/mur(□)	318.15	$1607.52 \pm 0.60$	-1.97	1958-dun/mur(□)
288.15	$1699.43 \pm 0.60$	-2.19	1958-dun/mur(□)	278.15	$1730.00 \pm 1.50$	-2.33	1988-ken/pol(○)
298.15	$1671.70 \pm 0.60$	0.79	1958-dun/mur(□)	283.15	$1717.00 \pm 1.50$	0.02	1988-ken/pol(○)
298.15	$1669.70 \pm 0.60$	-1.21	1958-dun/mur(□)	288.15	$1702.00 \pm 1.50$	0.38	1988-ken/pol(○)
308.15	$1641.40 \pm 0.60$	1.20	1958-dun/mur(□)	293.15	$1688.00 \pm 1.50$	1.73	1988-ken/pol(○)
308.15	$1639.01 \pm 0.60$	-1.19	1958-dun/mur(□)	298.15	$1675.00 \pm 1.50$	4.09	1988-ken/pol(○)
318.15	$1610.20 \pm 0.60$	0.71	1958-dun/mur(□)				

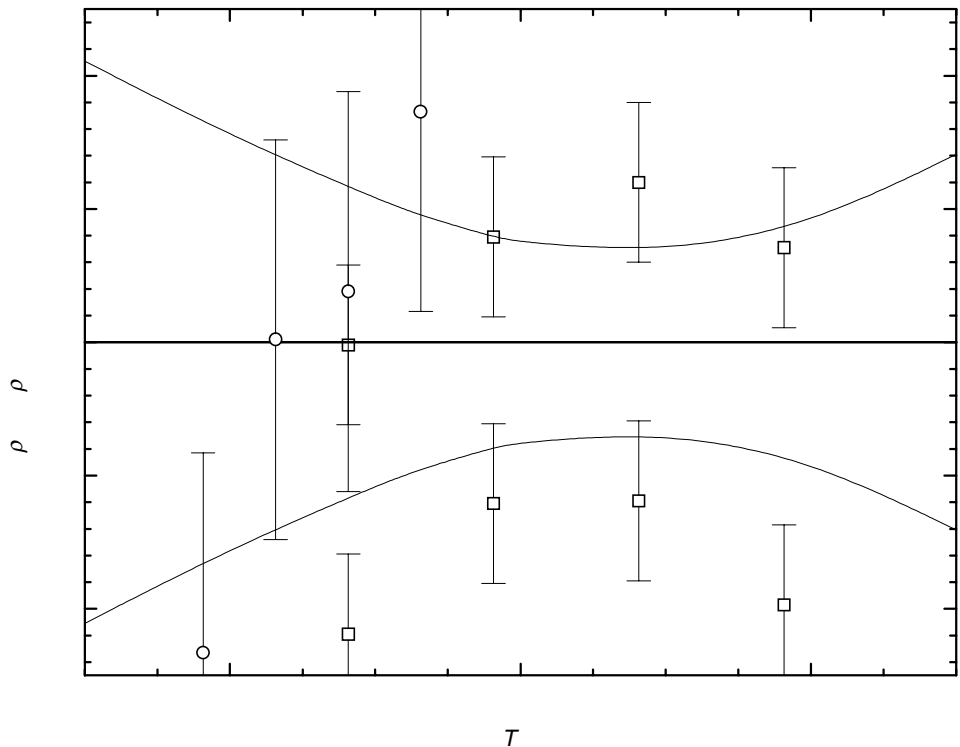
**Further references:** [1952-sti/cad, 1989-nar/swa].**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4].$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	$1757.36 \pm 2.11$	293.15	$1686.27 \pm 0.95$	310.00	$1634.52 \pm 0.67$
280.00	$1726.65 \pm 1.55$	298.15	$1670.91 \pm 0.79$	320.00	$1603.81 \pm 0.88$
290.00	$1695.94 \pm 1.08$	300.00	$1665.23 \pm 0.75$	330.00	$1573.10 \pm 1.41$

cont.

Tetradecafluorohexane (cont.)



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**Tetradecafluoro-2-methylpentane** [355-04-4] C<sub>6</sub>F<sub>14</sub> MW = 338.04 413

**Table 1.** Fit with estimated B coefficient for 5 accepted points. Deviation  $\sigma_w = 1.194$ .

Coefficient	$\rho = A + BT$
A	2611.31
B	-3.000

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m <sup>-3</sup>	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m <sup>-3</sup>	Ref.
286.31	1750.50 ± 0.70	-1.88	1952-sti/cad
293.36	1731.90 ± 0.70	0.67	1952-sti/cad
303.31	1702.60 ± 0.70	1.22	1952-sti/cad
313.54	1671.60 ± 0.70	0.91	1952-sti/cad
323.40	1640.20 ± 0.70	-0.91	1952-sti/cad

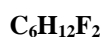
cont.

**Table 3.** Recommended values.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m <sup>-3</sup>
280.00	1771.3 ± 1.5
290.00	1741.3 ± 1.4
293.15	1731.9 ± 1.4
298.15	1716.9 ± 1.4
310.00	1681.3 ± 1.4
320.00	1651.3 ± 1.4
330.00	1621.3 ± 1.6

**1,6-Difluorohexane**

[373-29-5]



MW = 122.16

414

**Table 1.** Fit with estimated B coefficient for 2 accepted points. Deviation  $\sigma_w = 0.000$ .

Coefficient	$\rho = A + BT$
A	1229.91
B	-0.970

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m <sup>-3</sup>	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m <sup>-3</sup>	Ref.
298.15	940.70 ± 1.00	0.00	1949-hof
308.15	931.00 ± 1.00	0.00	1949-hof

**Table 3.** Recommended values.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m <sup>-3</sup>
290.00	948.6 ± 1.1
293.15	945.5 ± 1.0
298.15	940.7 ± 0.9
310.00	929.2 ± 1.0

**2,2-Difluoro-4-methylpentane**

[371-70-0]



MW = 122.16

415

**Table 1.** Experimental values with uncertainties.

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m <sup>-3</sup>	Ref.
293.15	888.20 ± 1.00	1942-ren
293.15	886.70 ± 1.00	1942-ren

**1,1,1-Trifluorohexane** [17337-12-1] C<sub>6</sub>H<sub>11</sub>F<sub>3</sub> MW = 140.15 416

**Table 1.** Experimental values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	960.80 ± 1.00	1974-dmo/kol

**4-Fluoro-2,2-dimethylbutane** [371-64-2] C<sub>6</sub>H<sub>13</sub>F MW = 104.17 417

**Table 1.** Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	780.00 ± 2.00	1948-lin/sch
293.15	781.80 ± 2.00	1950-sch-6
293.15	780.90 ± 2.10	Recommended

**1-Fluorohexane** [373-14-8] C<sub>6</sub>H<sub>13</sub>F MW = 104.17 418

**Table 1.** Fit with estimated B coefficient for 8 accepted points. Deviation  $\sigma_w = 0.257$ .

Coefficient	$\rho = A + BT$
A	1082.01
B	-0.960

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	800.40 ± 1.00	-0.19	1934-des	290.05	799.20 ± 2.00	-4.36	1948-vog-10 <sup>1)</sup>
288.15	805.20 ± 1.00	-0.19	1934-des	293.15	796.00 ± 2.00	-4.59	1948-vog-10 <sup>1)</sup>
273.15	820.00 ± 1.00	0.21	1934-des	314.15	774.50 ± 2.00	-5.93	1948-vog-10 <sup>1)</sup>
293.15	800.40 ± 1.00	-0.19	1935-des-1	314.65	774.00 ± 2.00	-5.95	1948-vog-10 <sup>1)</sup>
288.15	805.20 ± 1.00	-0.19	1935-des-1	333.35	754.80 ± 2.00	-7.20	1948-vog-10 <sup>1)</sup>
273.15	820.00 ± 1.00	0.21	1935-des-1	334.65	753.50 ± 2.00	-7.25	1948-vog-10 <sup>1)</sup>
293.15	800.40 ± 1.00	-0.19	1940-gro/wac	293.15	801.10 ± 1.00	0.51	1960-mac

<sup>1)</sup> Not included in calculation of linear coefficients.

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	822.8 ± 1.3
280.00	813.2 ± 0.7
290.00	803.6 ± 0.6
293.15	800.6 ± 0.7
298.15	795.8 ± 1.0

**2-Fluorohexane**

[372-54-3]

**MW = 104.17****419****Table 1.** Fit with estimated B coefficient for 2 accepted points. Deviation  $\sigma_w = 0.050$ .

Coefficient	$\rho = A + BT$
A	1084.60
B	-1.000

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	791.40 $\pm$ 1.00	-0.05	1934-des
273.15	811.50 $\pm$ 1.00	0.05	1934-des

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	814.6 $\pm$ 1.1
280.00	804.6 $\pm$ 0.9
290.00	794.6 $\pm$ 1.0
293.15	791.4 $\pm$ 1.0
298.15	786.4 $\pm$ 1.2

**Hexadecafluoroheptane**

[335-57-9]

**MW = 388.05****420****Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):

$\sigma_{c,w} = 1.0577$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 3.0361 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	$T = 293.15 \text{ to } 373.12 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$2.15376 \cdot 10^3$
B	$-1.86708 \cdot 10^{-1}$
C	$-4.26980 \cdot 10^{-3}$

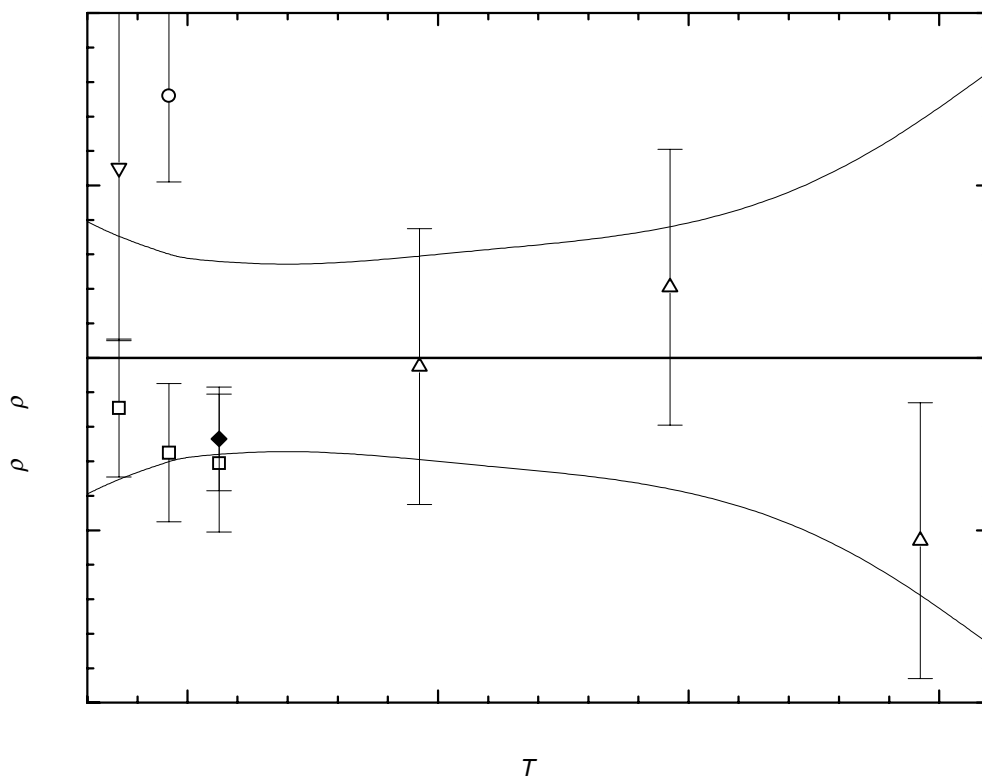
**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
293.15	1733.20 $\pm$ 1.00	1.10	1947-fow/ham(∇)	303.15	1704.30 $\pm$ 0.30	-0.47	1957-mue/lew(◆)
293.15	1731.81 $\pm$ 0.40	-0.29	1951-oli/blu(□)	323.15	1647.50 $\pm$ 0.80	-0.05	1997-ste/chi-1(Δ)
298.15	1717.99 $\pm$ 0.40	-0.55	1951-oli/blu(□)	348.13	1571.70 $\pm$ 0.80	0.41	1997-ste/chi-1(Δ)
303.15	1704.16 $\pm$ 0.40	-0.61	1951-oli/blu(□)	373.12	1488.60 $\pm$ 0.80	-1.06	1997-ste/chi-1(Δ)
298.15	1720.06 $\pm$ 0.50	1.52	1956-gle/ree(○)				

cont.

**Hexadecafluoroheptane (cont.)**

**Further references:** [1948-lag/woo, 1950-hil/fis, 1959-yen/ree, 1967-erm/skr, 1988-ken/pol].



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

$$\rho = A + BT + CT^2 + DT^3 + \dots \text{ or } \rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4].$$

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	1740.53 ± 0.79	310.00	1685.56 ± 0.53	350.00	1565.37 ± 0.77
293.15	1732.10 ± 0.70	320.00	1656.79 ± 0.57	360.00	1533.18 ± 0.94
298.15	1718.54 ± 0.60	330.00	1627.17 ± 0.63	370.00	1500.15 ± 1.24
300.00	1713.47 ± 0.57	340.00	1596.69 ± 0.68	380.00	1466.26 ± 1.66

**1H-Perfluoroheptane**

[375-83-7]

**MW = 370.06****421****Table 1.** Fit with estimated B coefficient for 4 accepted points. Deviation  $\sigma_w = 0.124$ .

Coefficient	$\rho = A + BT$
A	2467.14
B	-2.520

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.12	1728.50 $\pm$ 0.30	0.02	1966-car/ste
298.15	1715.75 $\pm$ 0.30	-0.05	1966-car/ste
303.15	1703.39 $\pm$ 0.30	0.19	1966-car/ste
308.15	1690.45 $\pm$ 0.30	-0.15	1966-car/ste

**Table 3.** Recommended values.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	1736.3 $\pm$ 0.5
293.15	1728.4 $\pm$ 0.4
298.15	1715.8 $\pm$ 0.3
310.00	1685.9 $\pm$ 0.5

**1,1-Difluoroheptane**

[407-96-5]

**MW = 136.18****422****Table 1.** Experimental values with uncertainties.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	895.90 $\pm$ 0.80	1939-hen/ren
293.15	895.90 $\pm$ 1.00	1943-hen/plu

**1-Fluoroheptane**

[661-11-0]

**MW = 118.19****423****Table 1.** Fit with estimated B coefficient for 12 accepted points. Deviation  $\sigma_w = 1.032$ .

Coefficient	$\rho = A + BT$
A	1099.03
B	-1.000

cont.

**1-Fluoroheptane** (cont.)**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
294.15	802.90 ± 2.00	-1.98	1919-swa <sup>1)</sup>	290.05	809.40 ± 1.00	0.42	1948-vog-10
293.15	807.10 ± 1.00	1.22	1921-swa	293.15	806.30 ± 1.00	0.42	1948-vog-10
294.15	802.90 ± 1.00	-1.98	1921-swa	296.35	803.10 ± 1.00	0.42	1948-vog-10
294.15	803.90 ± 1.00	-0.98	1923-swa	315.35	784.10 ± 1.00	0.42	1948-vog-10
293.15	807.10 ± 1.00	1.22	1935-des-1	331.65	767.80 ± 1.00	0.42	1948-vog-10
294.15	802.90 ± 1.00	-1.98	1935-des-1	334.15	765.20 ± 1.00	0.32	1948-vog-10
293.15	803.90 ± 2.00	-1.98	1940-gro/wac <sup>1)</sup>	293.15	806.00 ± 1.00	0.12	1960-mac

<sup>1)</sup> Not included in calculation of linear coefficients.**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	809.0 ± 1.4
293.15	805.9 ± 1.3
298.15	800.9 ± 1.3
310.00	789.0 ± 1.3
320.00	779.0 ± 1.5
330.00	769.0 ± 1.7
340.00	759.0 ± 2.0

**Octadecafluorooctane**

[307-34-6]

C<sub>8</sub>F<sub>18</sub>

MW = 438.06

424

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 7.4187 \cdot 10^{-2}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 3.3178 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

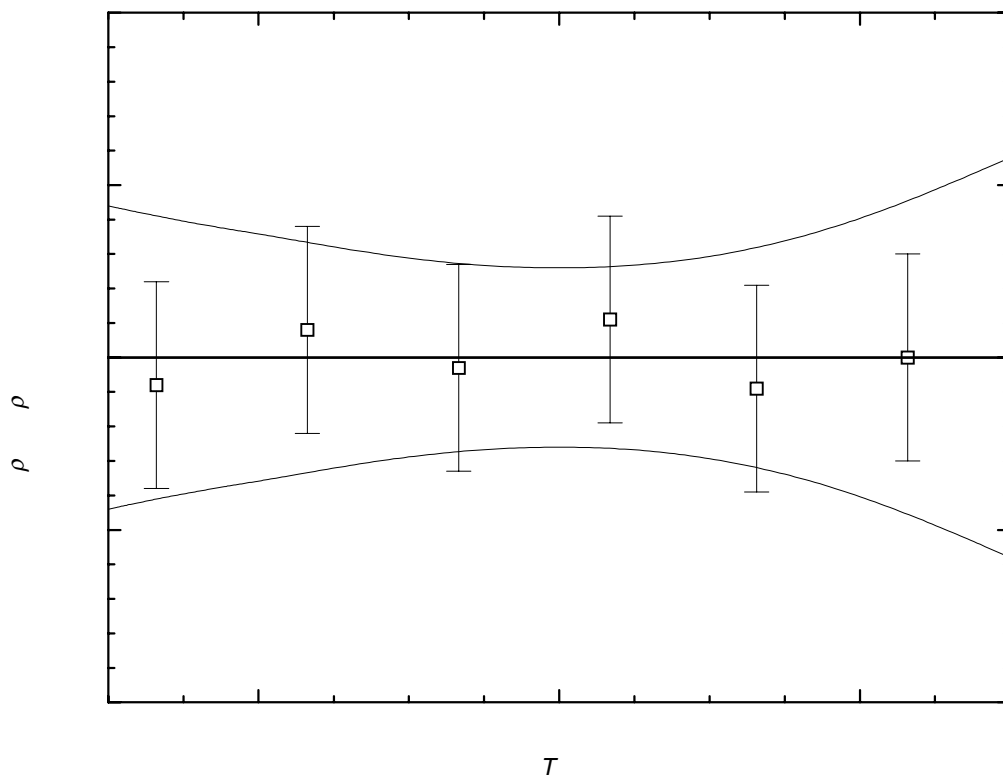
Coefficient	$T = 293.21 \text{ to } 343.17 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$2.56264 \cdot 10^3$
B	-2.69761

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
293.21	1771.60 ± 0.30	-0.08	1981-var/bul(□)	323.38	1690.40 ± 0.30	0.11	1981-var/bul(□)
303.24	1744.70 ± 0.30	0.08	1981-var/bul(□)	333.13	1663.90 ± 0.30	-0.09	1981-var/bul(□)
313.32	1717.40 ± 0.30	-0.03	1981-var/bul(□)	343.17	1636.90 ± 0.30	-0.00	1981-var/bul(□)

**Further references:** [1967-erm/skr, 1988-ken/pol].

cont.



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**Table 3.** Recommended values (fit to the reliable experimental values according to the equations  $\rho = A + BT + CT^2 + DT^3 + \dots$  or  $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$ ).

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	$1780.33 \pm 0.44$	300.00	$1753.36 \pm 0.36$	330.00	$1672.43 \pm 0.28$
293.15	$1771.84 \pm 0.41$	310.00	$1726.38 \pm 0.28$	340.00	$1645.45 \pm 0.39$
298.15	$1758.35 \pm 0.37$	320.00	$1699.41 \pm 0.25$	350.00	$1618.48 \pm 0.58$

## 1-Fluorooctane

[463-11-6]

C<sub>8</sub>H<sub>17</sub>F

MW = 132.22

425

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 9.1824 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 2.9037 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	$T = 290.85 \text{ to } 361.05 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
$A$	$1.07070 \cdot 10^3$
$B$	$-8.85478 \cdot 10^{-1}$

**Table 2.** Experimental values with uncertainties and deviation from calculated values.

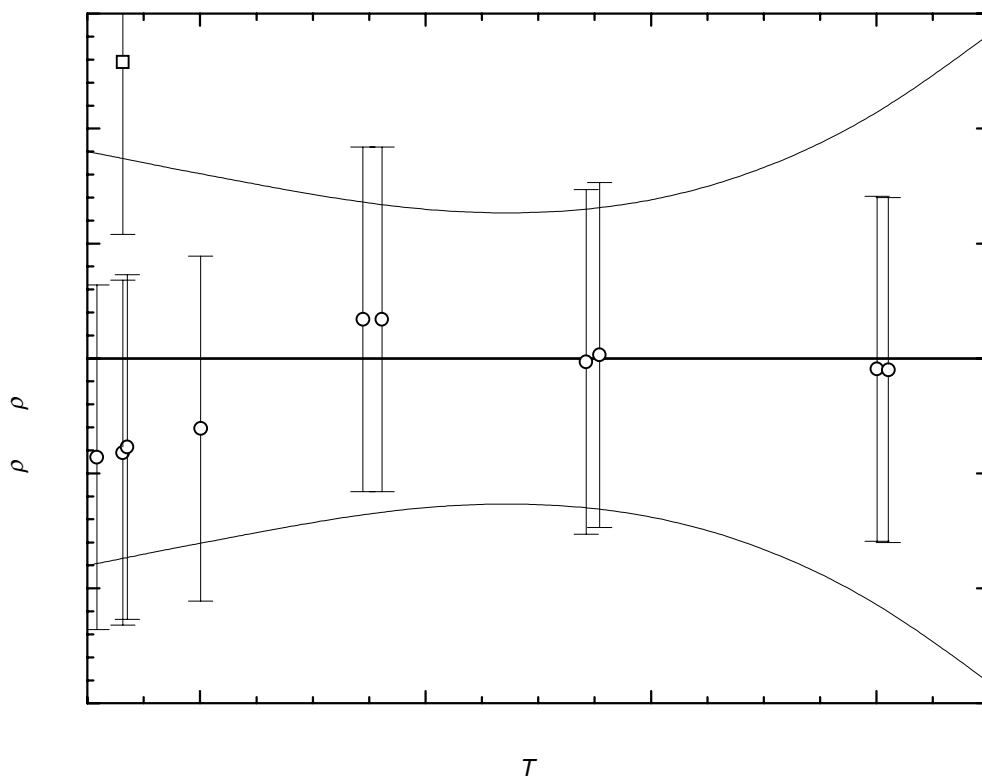
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
290.85	$812.30 \pm 1.50$	-0.86	1948-vog(○)	334.25	$774.70 \pm 1.50$	-0.03	1948-vog(○)
293.15	$810.30 \pm 1.50$	-0.82	1948-vog(○)	335.45	$773.70 \pm 1.50$	0.03	1948-vog(○)
293.55	$810.00 \pm 1.50$	-0.77	1948-vog(○)	360.05	$751.80 \pm 1.50$	-0.09	1948-vog(○)
300.05	$804.40 \pm 1.50$	-0.61	1948-vog(○)	361.05	$750.90 \pm 1.50$	-0.10	1948-vog(○)
314.45	$792.60 \pm 1.50$	0.34	1948-vog(○)	293.15	$813.70 \pm 1.50$	2.58	1960-mac(□)
316.15	$791.10 \pm 1.50$	0.34	1948-vog(○)				

**Further references:** [1919-swa, 1921-swa-1, 1923-swa, 1940-gro/wac].

**Table 3.** Recommended values (fit to the reliable experimental values according to the equations  $\rho = A + BT + CT^2 + DT^3 + \dots$  or  $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$ ).

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	$813.91 \pm 1.80$	310.00	$796.20 \pm 1.42$	350.00	$760.78 \pm 1.63$
293.15	$811.12 \pm 1.74$	320.00	$787.35 \pm 1.28$	360.00	$751.93 \pm 2.10$
298.15	$806.70 \pm 1.64$	330.00	$778.49 \pm 1.25$	370.00	$743.08 \pm 2.82$
300.00	$805.06 \pm 1.61$	340.00	$769.64 \pm 1.35$		

cont.



**Fig. 1.** The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the symbols are omitted for clarity of the figure.)

**Eicosafluorononane**

[375-96-2]

**C<sub>9</sub>F<sub>20</sub>****MW = 488.07****426****Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	$1831.00 \pm 5.00$	1967-erm/skr

**1,1,1-Trifluorononane**

[55757-34-1]

**C<sub>9</sub>H<sub>17</sub>F<sub>3</sub>****MW = 182.23****427****Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	$935.70 \pm 1.00$	1974-dmo/kol

**1-Fluorononane** [463-18-3] C<sub>9</sub>H<sub>19</sub>F MW = 146.25 428

**Table 1.** Experimental value with uncertainty.

$T$	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$	Ref.
K	kg · m <sup>-3</sup>	
293.15	815.90 ± 1.00	1960-mac

**Docosafluorodecane** [307-45-9] C<sub>10</sub>F<sub>22</sub> MW = 538.07 429

**Table 1.** Experimental value with uncertainty.

$T$	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$	Ref.
K	kg · m <sup>-3</sup>	
298.15	1852.00 ± 5.00	1967-erm/skr

**1-Fluorodecane** [334-56-5] C<sub>10</sub>H<sub>21</sub>F MW = 160.28 430

**Table 1.** Experimental values with uncertainties.

$T$	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$	Ref.
K	kg · m <sup>-3</sup>	
283.35	792.00 ± 3.00	1921-swa-1
293.15	819.70 ± 1.00	1960-mac

**1-Fluoroundecane** [506-05-8] C<sub>11</sub>H<sub>23</sub>F MW = 174.30 431

**Table 1.** Experimental value with uncertainty.

$T$	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$	Ref.
K	kg · m <sup>-3</sup>	
293.15	823.90 ± 1.00	1960-mac

**1-Fluorododecane** [334-68-9] C<sub>12</sub>H<sub>25</sub>F MW = 188.33 432

**Table 1.** Experimental value with uncertainty.

$T$	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$	Ref.
K	kg · m <sup>-3</sup>	
293.15	825.70 ± 1.00	1960-mac

**1-Fluorotetradecane** [593-33-9] C<sub>14</sub>H<sub>29</sub>F MW = 216.38 433

**Table 1.** Experimental value with uncertainty.

$T$	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$	Ref.
K	kg · m <sup>-3</sup>	
293.15	827.70 ± 1.00	1960-mac

**1-Fluorohexadecane****[408-38-8]****C<sub>16</sub>H<sub>33</sub>F****MW = 244.44****434****Table 1.** Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	831.30 ± 1.00	1960-mac