

2.1.5 Saturated Monoesters, C<sub>9</sub>

Butyl 3-methylbutanoate [109-19-3] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 96

Table 1. Fit with estimated *B* coefficient for 8 accepted points. Deviation  $\sigma_w = 0.432$ .

Coefficient	$\rho = A + BT$
<i>A</i>	1125.03
<i>B</i>	-0.900

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.
298.15	858.4 ± 2.0	1.70	1926-mun <sup>1)</sup>	316.75	840.1 ± 0.6	0.14	1948-vog-9
289.65	863.9 ± 0.6	-0.45	1948-vog-9	335.05	824.2 ± 0.8	0.71	1948-vog-9
292.45	861.4 ± 0.6	-0.43	1948-vog-9	360.05	801.6 ± 0.8	0.61	1948-vog-9
293.15	860.8 ± 0.6	-0.40	1948-vog-9	360.45	801.2 ± 0.8	0.57	1948-vog-9
315.55	841.1 ± 0.6	0.06	1948-vog-9				

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

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	873.0 ± 1.0	310.00	846.0 ± 0.7	350.00	810.0 ± 1.0
290.00	864.0 ± 0.8	320.00	837.0 ± 0.7	360.00	801.0 ± 1.1
293.15	861.2 ± 0.8	330.00	828.0 ± 0.8	370.00	792.0 ± 1.3
298.15	856.7 ± 0.8	340.00	819.0 ± 0.9		

Butyl pentanoate [591-68-4] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 97

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 3.5338 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 5.6024 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	$T = 273.15 \text{ to } 403.55 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
<i>A</i>	$1.09190 \cdot 10^3$
<i>B</i>	$-6.70022 \cdot 10^{-1}$
<i>C</i>	$-3.23545 \cdot 10^{-4}$

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	884.60 ± 1.50	-0.14	1886-gar(O)	302.55	859.20 ± 0.60	-0.37	1886-gar(O)
280.15	878.60 ± 0.60	-0.20	1886-gar(O)	312.35	850.80 ± 0.60	-0.25	1886-gar(O)

cont.

Butyl pentanoate (cont.)

Table 2. (cont.)

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
322.85	841.80 ± 0.80	-0.06	1886-gar(○)	293.15	868.00 ± 0.60	0.32	1948-vog-9(□)
351.15	816.50 ± 0.80	-0.23	1886-gar(○)	299.45	862.40 ± 0.60	0.15	1948-vog-9(□)
369.65	799.90 ± 0.80	-0.12	1886-gar(○)	313.45	850.00 ± 0.60	-0.09	1948-vog-9(□)
383.15	787.90 ± 1.00	0.22	1886-gar(○)	314.05	849.50 ± 0.60	-0.07	1948-vog-9(□)
403.55	768.50 ± 1.00	-0.32	1886-gar(○)	334.85	831.30 ± 0.80	0.03	1948-vog-9(□)
427.75	743.90 ± 1.00	-2.20	1886-gar <sup>1)</sup>	334.95	831.20 ± 0.80	0.02	1948-vog-9(□)
273.15	885.20 ± 2.00	0.46	1924-lie(Δ)	358.45	810.40 ± 0.80	0.24	1948-vog-9(□)
288.15	870.00 ± 2.00	-1.97	1924-lie <sup>1)</sup>	359.15	809.80 ± 0.80	0.27	1948-vog-9(□)
293.15	867.80 ± 0.50	0.12	1935-sch-2(∇)				

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

Further references: [1934-gil/dex, 1937-boi, 1964-tur/den].

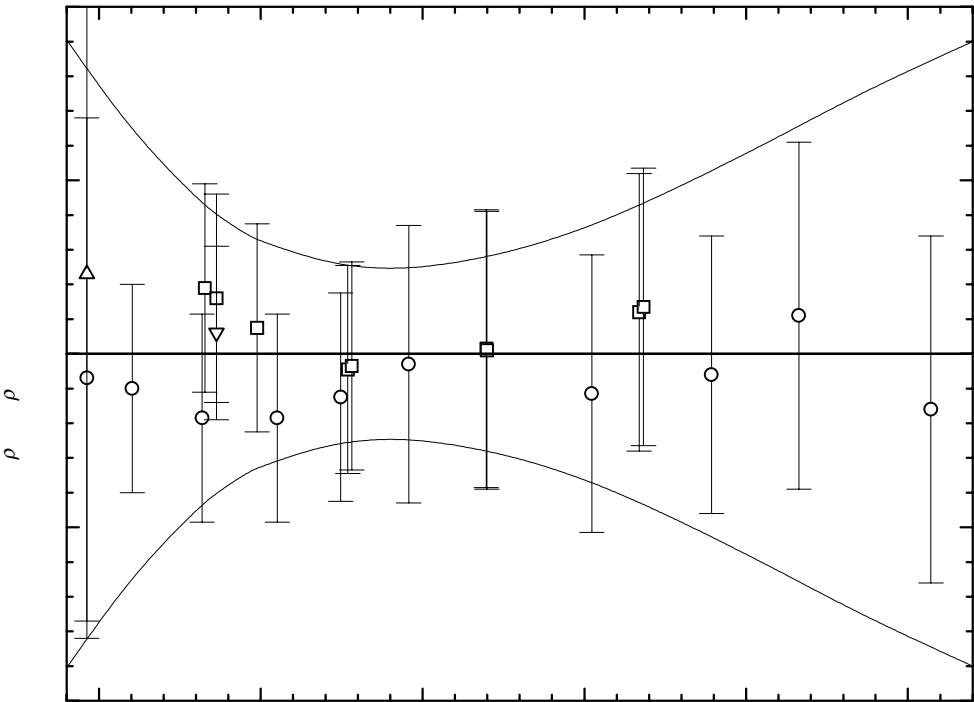


Fig. 1. The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the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

cont.

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

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	887.41 ± 1.81	310.00	853.10 ± 0.52	370.00	799.70 ± 1.06
280.00	878.93 ± 1.28	320.00	844.36 ± 0.48	380.00	790.57 ± 1.25
290.00	870.38 ± 0.90	330.00	835.56 ± 0.52	390.00	781.38 ± 1.45
293.15	867.68 ± 0.80	340.00	826.69 ± 0.60	400.00	772.12 ± 1.63
298.15	863.37 ± 0.68	350.00	817.76 ± 0.72	410.00	762.80 ± 1.80
300.00	861.77 ± 0.65	360.00	808.76 ± 0.88		

**1,4-Dimethylpentyl ethanoate** [500029-30-1] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 98

**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.
296.15	858.4 ± 2.0	1878-roh

**Ethyl 2,4-dimethylpentanoate** [172103-12-7] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 99

**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.
301.15	855.0 ± 2.0	1935-lev/mar

**Ethyl 3,4-dimethylpentanoate** [6570-83-8] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 100

**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	869.0 ± 2.0	1935-lev/mar

**Ethyl 2-ethylpentanoate** [43164-26-7] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 101

**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	857.2 ± 2.0	1890-gar
298.15	858.5 ± 2.0	1936-lev/rot-1

Ethyl heptanoate

[106-30-9]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

102

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 6.7383 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 1.4163 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 429.45 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.07696 \cdot 10^3$
B	$-5.69949 \cdot 10^{-1}$
C	$-4.76023 \cdot 10^{-4}$

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

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{cal}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
273.15	$886.00 \pm 0.60$	0.24	1886-gar(×)	293.15	$868.50 \pm 0.60$	-0.47	1932-kao/ma -1(◆)
293.75	$868.20 \pm 0.60$	-0.26	1886-gar(×)	298.15	$864.00 \pm 0.60$	-0.71	1932-kao/ma -1(◆)
307.35	$856.50 \pm 0.60$	-0.32	1886-gar(×)	273.15	$886.19 \pm 0.50$	0.43	1935-bil/gis(□)
322.45	$843.20 \pm 0.60$	-0.48	1886-gar(×)	288.15	$872.94 \pm 0.50$	-0.26	1935-bil/gis(□)
338.65	$828.70 \pm 0.80$	-0.65	1886-gar(×)	303.15	$859.70 \pm 0.50$	-0.73	1935-bil/gis(□)
351.95	$816.90 \pm 0.80$	-0.50	1886-gar(×)	293.15	$870.20 \pm 0.60$	1.23	1948-vog-9(×)
371.15	$799.20 \pm 0.80$	-0.65	1886-gar(×)	293.95	$869.50 \pm 0.60$	1.21	1948-vog-9(×)
384.55	$787.00 \pm 1.00$	-0.39	1886-gar(×)	298.45	$865.50 \pm 0.60$	1.05	1948-vog-9(×)
403.95	$768.60 \pm 1.00$	-0.45	1886-gar(×)	314.05	$851.40 \pm 0.60$	0.38	1948-vog-9(×)
429.45	$744.40 \pm 1.00$	-0.00	1886-gar(×)	315.05	$850.50 \pm 0.60$	0.35	1948-vog-9(×)
288.15	$871.17 \pm 0.60$	-2.03	1896-per(∇)	335.05	$833.00 \pm 0.80$	0.44	1948-vog-9(×)
365.25	$801.32 \pm 1.00$	-3.96	1896-per <sup>1)</sup>	335.25	$832.80 \pm 0.80$	0.42	1948-vog-9(×)
273.15	$886.16 \pm 1.00$	0.40	1931-def(×)	359.65	$811.70 \pm 0.80$	1.30	1948-vog-9(×)
288.15	$872.94 \pm 1.00$	-0.26	1931-def <sup>1)</sup>	360.15	$811.10 \pm 0.80$	1.15	1948-vog-9(×)
303.15	$859.65 \pm 1.00$	-0.78	1931-def(×)	293.15	$869.70 \pm 0.50$	0.73	1962-bel/shu-1(○)
288.15	$873.00 \pm 0.60$	-0.20	1932-kao/ma -1(◆)	293.15	$868.50 \pm 0.50$	-0.47	1970-ere(Δ)

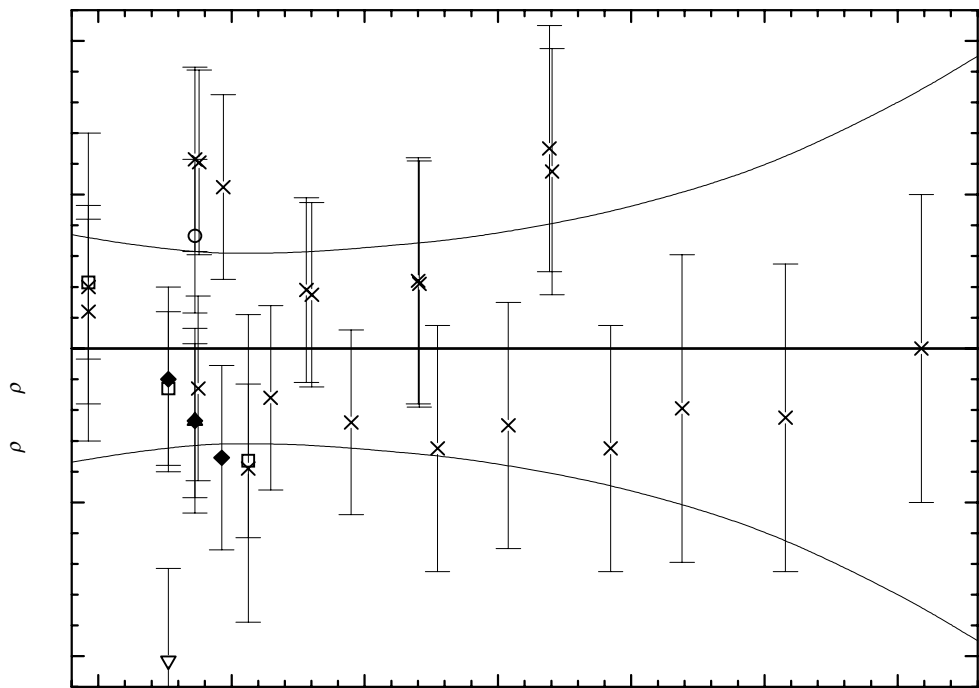
<sup>1)</sup> Not included in Fig. 1.

**Further references:** [1873-gri/sho, 1877-lie/jan, 1884-per, 1896-per-1, 1905-lum, 1922-tro, 1954-fic].

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

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	$888.37 \pm 0.74$	320.00	$845.83 \pm 0.64$	390.00	$782.27 \pm 1.07$
280.00	$880.05 \pm 0.68$	330.00	$837.03 \pm 0.67$	400.00	$772.81 \pm 1.19$
290.00	$871.64 \pm 0.64$	340.00	$828.15 \pm 0.70$	410.00	$763.26 \pm 1.34$
293.15	$868.97 \pm 0.63$	350.00	$819.16 \pm 0.75$	420.00	$753.61 \pm 1.51$
298.15	$864.71 \pm 0.62$	360.00	$810.08 \pm 0.81$	430.00	$743.86 \pm 1.69$
300.00	$863.13 \pm 0.62$	370.00	$800.91 \pm 0.88$	440.00	$734.02 \pm 1.90$
310.00	$854.53 \pm 0.62$	380.00	$791.64 \pm 0.97$		

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.)

**Ethyl 2-methylhexanoate** [32400-29-6] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 103

**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	860.0 ± 2.0	1929-lev/mik

**Ethyl 3-methylhexanoate** [41692-47-1] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 104

**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	867.9 ± 2.0	1924-dew/wec

**(R)-(+)-Ethyl 3-methylhexanoate** [22328-89-8] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 105

**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.
295.15	888.0 ± 2.0	1931-lev/mar-2

Ethyl 4-methylhexanoate

[1561-10-0]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

106

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	870.8 ± 2.0	1924-dew/wec

(R)-Ethyl 4-methylhexanoate

[16176-99-1]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

107

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.
295.15	888.0 ± 2.0	1931-lev/mar-2

2-Ethyl-3-methylbutyl ethanoate

[500001-51-4]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

108

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	877.4 ± 1.0	1956-sar/new

Heptyl ethanoate

[112-06-1]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

109

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 2.2657 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 4.5313 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 408.15 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.10160 \cdot 10^3$
B	$-6.97953 \cdot 10^{-1}$
C	$-3.04550 \cdot 10^{-4}$

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

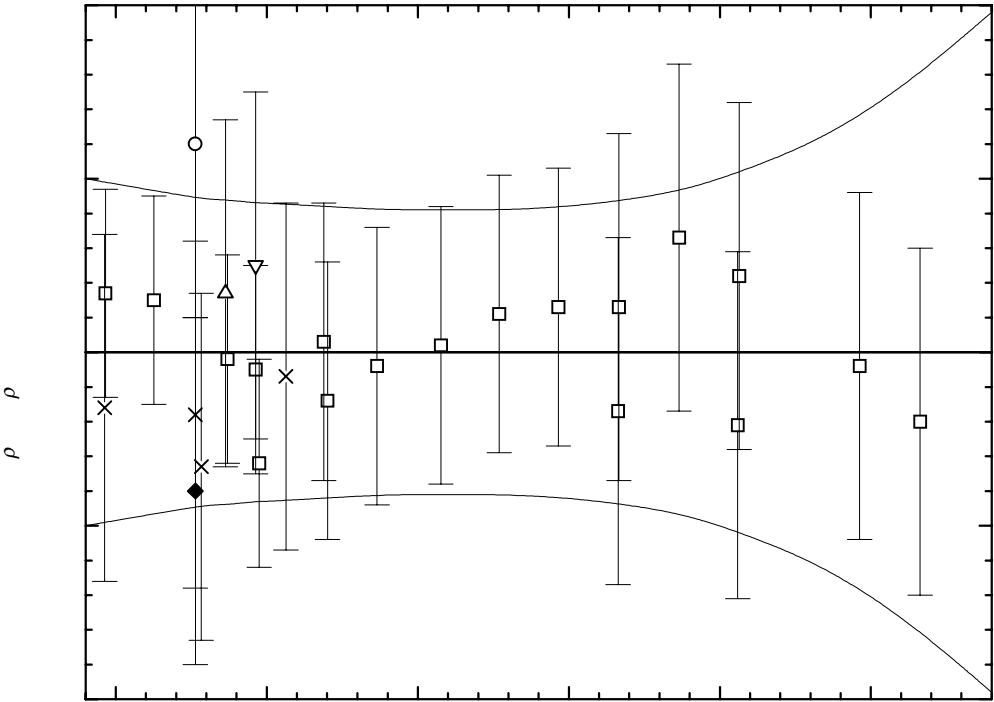
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{cal}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
273.15	888.08 ± 0.50	-0.16	1935-bil/gis(×)	288.15	874.80 ± 0.50	-0.40	1977-toj/arc(◆)
288.15	875.02 ± 0.50	-0.18	1935-bil/gis(×)	273.27	888.30 ± 0.30	0.17	1980-mey/awe(□)
303.15	861.96 ± 0.50	-0.07	1935-bil/gis(×)	281.32	881.30 ± 0.30	0.15	1980-mey/awe(□)
288.15	875.80 ± 0.50	0.60	1937-rog/dvo(O)	293.50	870.50 ± 0.30	-0.02	1980-mey/awe(□)
289.15	874.00 ± 0.50	-0.33	1963-fok/skl(×)	298.14	866.40 ± 0.30	-0.05	1980-mey/awe(□)
293.15	871.00 ± 0.50	0.17	1965-sad/mam(Δ)	298.74	865.60 ± 0.30	-0.32	1980-mey/awe(□)

cont.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{cal}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
309.44	$856.50 \pm 0.40$	0.03	1980-mey/awe(□)	368.27	$803.60 \pm 0.50$	0.33	1980-mey/awe(□)
310.04	$855.80 \pm 0.40$	-0.14	1980-mey/awe(□)	377.95	$794.10 \pm 0.50$	-0.21	1980-mey/awe(□)
318.24	$848.60 \pm 0.40$	-0.04	1980-mey/awe(□)	378.20	$794.30 \pm 0.50$	0.22	1980-mey/awe(□)
328.82	$839.20 \pm 0.40$	0.02	1980-mey/awe(□)	398.15	$775.40 \pm 0.50$	-0.04	1980-mey/awe(□)
338.46	$830.60 \pm 0.40$	0.11	1980-mey/awe(□)	408.15	$765.80 \pm 0.50$	-0.20	1980-mey/awe(□)
348.29	$821.70 \pm 0.40$	0.13	1980-mey/awe(□)	428.15	$745.80 \pm 0.50$	-1.15	1980-mey/awe <sup>1)</sup>
358.15	$812.40 \pm 0.50$	-0.17	1980-mey/awe(□)				

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

**Further references:** [1877-cro, 1877-cro-1, 1886-gar, 1919-eyk, 1949-eng/sch, 1960-sol/bar, 1964-bre/ulo, 1964-mam/niz, 1964-tur/den, 1967-bar/fro, 1976-nay/zor].



**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.

Heptyl ethanoate (cont.)

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

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	890.96 ± 0.50	310.00	855.97 ± 0.42	370.00	801.67 ± 0.47
280.00	882.30 ± 0.47	320.00	847.07 ± 0.41	380.00	792.41 ± 0.53
290.00	873.59 ± 0.44	330.00	838.11 ± 0.41	390.00	783.08 ± 0.60
293.15	870.83 ± 0.44	340.00	829.09 ± 0.41	400.00	773.70 ± 0.70
298.15	866.44 ± 0.43	350.00	820.01 ± 0.42	410.00	764.25 ± 0.83
300.00	864.81 ± 0.43	360.00	810.87 ± 0.44	420.00	754.74 ± 0.98

Hexyl propanoate

[2445-76-3]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

110

**Table 1.** Fit with estimated *B* coefficient for 5 accepted points. Deviation σ<sub>w</sub> = 0.502.

Coefficient	$\rho = A + BT$
<i>A</i>	1133.76
<i>B</i>	-0.900

**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	887.6 ± 0.5	-0.34	1935-bil/gis	313.15	848.0 ± 2.0	-3.92	1955-usa/bil <sup>1)</sup>
288.15	874.2 ± 0.5	-0.22	1935-bil/gis	333.15	831.7 ± 2.0	-2.22	1955-usa/bil <sup>1)</sup>
303.15	860.9 ± 0.5	-0.02	1935-bil/gis	273.15	882.3 ± 2.0	-5.62	1959-hof <sup>1)</sup>
293.15	870.9 ± 1.0	0.98	1949-eng/sch	293.15	871.3 ± 1.0	1.38	1963-pan/mat
298.15	859.9 ± 2.0	-5.52	1955-usa/bil <sup>1)</sup>	293.15	865.9 ± 3.0	-4.02	1963-voi <sup>1)</sup>

<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	890.8 ± 1.0
280.00	881.8 ± 0.7
290.00	872.8 ± 0.6
293.15	869.9 ± 0.6
298.15	865.4 ± 0.7
310.00	854.8 ± 1.0



**Methyl 5-methylheptanoate** [500001-59-2] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 111

**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	882.0 ± 1.0	1954-wic/vog

**Methyl octanoate** [111-11-5] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 112

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 9.8202 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 1.8679 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 448.75 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.07904 \cdot 10^3$
B	$-5.57588 \cdot 10^{-1}$
C	$-4.46306 \cdot 10^{-4}$

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

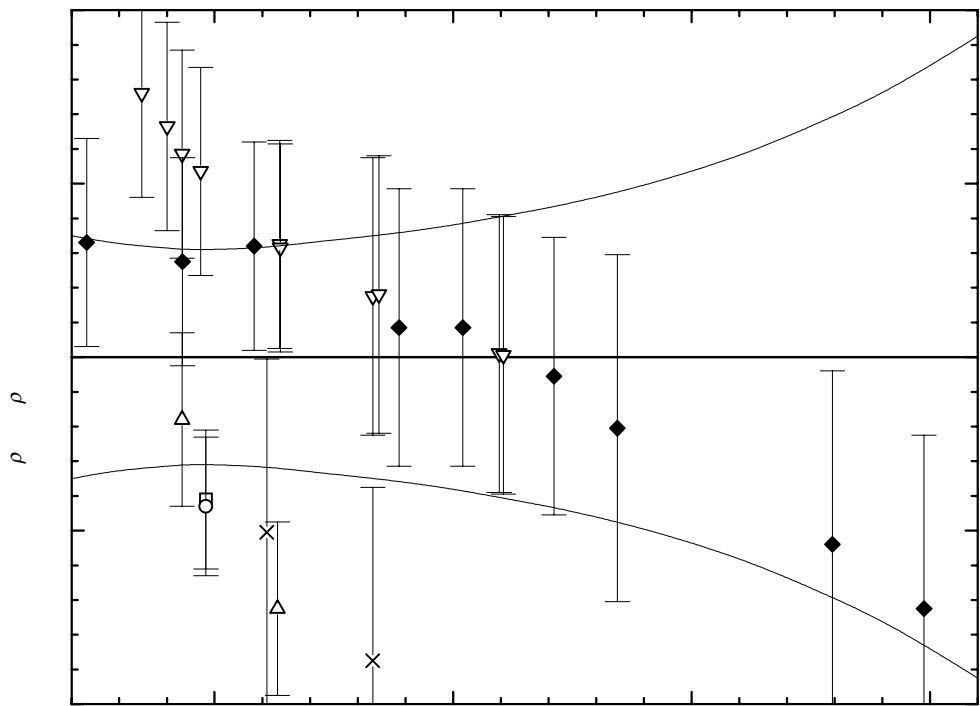
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
273.15	894.10 ± 0.60	0.66	1886-gar(◆)	290.05	881.10 ± 0.60	1.33	1948-vog-9(∇)
293.25	877.70 ± 0.60	0.55	1886-gar(◆)	293.15	878.40 ± 0.60	1.17	1948-vog-9(∇)
308.25	865.40 ± 0.60	0.64	1886-gar(◆)	297.05	875.10 ± 0.60	1.07	1948-vog-9(∇)
338.65	839.20 ± 0.80	0.17	1886-gar(◆)	313.65	860.90 ± 0.60	0.65	1948-vog-9(∇)
352.05	827.60 ± 0.80	0.17	1886-gar(◆)	313.75	860.80 ± 0.60	0.63	1948-vog-9(∇)
371.15	810.50 ± 0.80	-0.11	1886-gar(◆)	333.15	844.10 ± 0.80	0.35	1948-vog-9(∇)
384.45	798.30 ± 1.00	-0.41	1886-gar(◆)	334.45	843.00 ± 0.80	0.36	1948-vog-9(∇)
429.55	756.10 ± 1.00	-1.08	1886-gar(◆)	359.65	820.80 ± 0.80	0.02	1948-vog-9(∇)
448.75	737.50 ± 1.00	-1.45	1886-gar(◆)	360.55	820.00 ± 0.80	0.01	1948-vog-9(∇)
293.15	877.50 ± 1.00	0.27	1948-bon/alt <sup>1)</sup>	293.15	876.87 ± 0.50	-0.36	1964-gou/vlu(Δ)
310.95	861.50 ± 1.00	-1.01	1948-bon/alt(×)	313.15	859.22 ± 0.50	-1.45	1964-gou/vlu(Δ)
333.15	842.00 ± 1.00	-1.75	1948-bon/alt(×)	298.15	872.30 ± 0.40	-0.82	1990-ort(□)
372.05	806.80 ± 1.00	-3.01	1948-bon/alt <sup>1)</sup>	298.15	872.26 ± 0.40	-0.86	1995-pos/gar(○)
284.75	885.60 ± 0.60	1.52	1948-vog-9(∇)				

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

**Further references:** [1845-feh, 1935-dra/spi, 1952-gro/feu, 1954-mce/deg, 1964-adr/dek].

cont.

Methyl 5-methylheptanoate (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  $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$ ).

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	895.96 ± 0.70	330.00	846.44 ± 0.69	400.00	784.60 ± 1.07
280.00	887.93 ± 0.65	340.00	837.87 ± 0.72	410.00	775.41 ± 1.16
290.00	879.81 ± 0.63	350.00	829.21 ± 0.76	420.00	766.13 ± 1.27
293.15	877.23 ± 0.62	360.00	820.47 ± 0.81	430.00	756.76 ± 1.39
298.15	873.12 ± 0.62	370.00	811.64 ± 0.86	440.00	747.30 ± 1.52
300.00	871.60 ± 0.62	380.00	802.71 ± 0.92	450.00	737.75 ± 1.68
310.00	863.30 ± 0.63	390.00	793.70 ± 0.99	460.00	728.11 ± 1.85
320.00	854.91 ± 0.66				

**Methyl 2-propylpentanoate** [22632-59-3] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 113

**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	871.0 ± 1.0	1890-gar

**1-Methylbutyl butanoate** [60415-61-4] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 114

**Table 1.** Fit with estimated *B* coefficient for 4 accepted points. Deviation σ<sub>w</sub> = 1.478.

Coefficient	$\rho = A + BT$
<i>A</i>	1150.94
<i>B</i>	-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.
291.15	870.2 ± 1.0	-1.24	1914-pic/ken-1
322.65	843.0 ± 1.0	1.80	1914-pic/ken-1
340.15	825.5 ± 1.0	1.10	1914-pic/ken-1
369.15	794.9 ± 1.0	-1.66	1914-pic/ken-1

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	872.5 ± 1.9	320.00	843.7 ± 1.7	350.00	814.9 ± 1.8
293.15	869.5 ± 1.9	330.00	834.1 ± 1.7	360.00	805.3 ± 1.8
298.15	864.7 ± 1.8	340.00	824.5 ± 1.7	370.00	795.7 ± 1.9
310.00	853.3 ± 1.8				

**3-Methylbutyl butanoate** [106-27-4] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 115

**Table 1.** Fit with estimated *B* coefficient for 6 accepted points. Deviation σ<sub>w</sub> = 0.529.

Coefficient	$\rho = A + BT$
<i>A</i>	1125.65
<i>B</i>	-0.890

**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	862.7 ± 2.0	-2.05	1920-har/cia <sup>1)</sup>	359.65	805.8 ± 0.8	0.23	1948-vog-9
293.15	864.2 ± 0.6	-0.55	1948-vog-9	273.15	882.3 ± 1.0	-0.25	1959-hof
315.15	845.6 ± 0.6	0.43	1948-vog-9	293.15	864.2 ± 0.7	-0.55	1963-voi
333.95	829.3 ± 0.8	0.86	1948-vog-9				

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

cont.

3-Methylbutyl butanoate (cont.)

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	885.4 ± 1.1	298.15	860.3 ± 0.8	340.00	823.1 ± 1.0
280.00	876.5 ± 1.0	310.00	849.8 ± 0.8	350.00	814.2 ± 1.1
290.00	867.6 ± 0.9	320.00	840.9 ± 0.8	360.00	805.3 ± 1.3
293.15	864.8 ± 0.9	330.00	832.0 ± 0.9		

1-Methylethyl 3,3-dimethylbutanoate [500001-56-9] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 116

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	838.0 ± 2.0	1957-tra/bat

1-Methylethyl hexanoate [2311-46-8] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 117

Table 1. Fit with estimated *B* coefficient for 4 accepted points. Deviation σ<sub>w</sub> = 0.236.

Coefficient	$\rho = A + BT$
<i>A</i>	1132.76
<i>B</i>	-0.940

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	857.0 ± 1.0	-0.20	1948-bon/alt
310.95	840.4 ± 1.0	-0.07	1948-bon/alt
333.15	820.0 ± 1.0	0.40	1948-bon/alt
372.05	782.9 ± 1.0	-0.13	1948-bon/alt

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	860.2 ± 1.2	320.00	832.0 ± 0.9	360.00	794.4 ± 1.1
293.15	857.2 ± 1.2	330.00	822.6 ± 0.9	370.00	785.0 ± 1.3
298.15	852.5 ± 1.1	340.00	813.2 ± 1.0	380.00	775.6 ± 1.4
310.00	841.4 ± 1.0	350.00	803.8 ± 1.0		

1-(1-Methylethyl)butyl ethanoate [500001-29-6] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 118

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	877.0 ± 2.0	1906-mus

**1-Methylheptyl methanoate** [500001-24-1] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 119

**Table 1.** Fit with estimated *B* coefficient for 4 accepted points. Deviation σ<sub>w</sub> = 0.859.

Coefficient	$\rho = A + BT$
<i>A</i>	1123.91
<i>B</i>	-0.880

**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.
285.65	871.8 ± 1.0	-0.73	1923-pic/ken
324.15	839.7 ± 1.0	1.05	1923-pic/ken
346.15	819.6 ± 1.5	0.31	1923-pic/ken
372.15	795.4 ± 1.5	-1.01	1923-pic/ken
407.15	759.1 ± 3.0	-6.51	1923-pic/ken <sup>1)</sup>

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

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	877.5 ± 1.5	310.00	851.1 ± 1.3	350.00	815.9 ± 1.4
290.00	868.7 ± 1.4	320.00	842.3 ± 1.2	360.00	807.1 ± 1.5
293.15	865.9 ± 1.4	330.00	833.5 ± 1.3	370.00	798.3 ± 1.6
298.15	861.5 ± 1.3	340.00	824.7 ± 1.3	380.00	789.5 ± 1.7

**1-Methylhexyl ethanoate** [5921-82-4] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 120

**Table 1.** Fit with estimated *B* coefficient for 4 accepted points. Deviation σ<sub>w</sub> = 1.553.

Coefficient	$\rho = A + BT$
<i>A</i>	1140.27
<i>B</i>	-0.950

**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.
288.15	865.0 ± 1.0	-1.52	1914-pic/ken-1
316.15	841.6 ± 1.0	1.68	1914-pic/ken-1
351.15	808.1 ± 1.0	1.43	1914-pic/ken-1
407.15	751.9 ± 1.0	-1.57	1914-pic/ken-1

cont.

1-Methylhexyl ethanoate (cont.)

Table 3. Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	874.3 ± 2.2	320.00	836.3 ± 1.8	370.00	788.8 ± 1.9
290.00	864.8 ± 2.1	330.00	826.8 ± 1.8	380.00	779.3 ± 2.0
293.15	861.8 ± 2.0	340.00	817.3 ± 1.8	390.00	769.8 ± 2.0
298.15	857.0 ± 2.0	350.00	807.8 ± 1.8	400.00	760.3 ± 2.1
310.00	845.8 ± 1.9	360.00	798.3 ± 1.8	410.00	750.8 ± 2.3

3-Methylhexyl ethanoate

[500001-26-3]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

121

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	874.3 ± 1.0	1924-dew/wec

4-Methylhexyl ethanoate

[500001-27-4]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

122

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	874.0 ± 1.0	1924-dew/wec

1-Methylpentyl propanoate

[500003-26-9]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

123

Table 1. Fit with estimated *B* coefficient for 4 accepted points. Deviation σ<sub>w</sub> = 0.905.

Coefficient	$\rho = A + BT$
<i>A</i>	1142.22
<i>B</i>	-0.950

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.
289.15	867.7 ± 1.0	0.18	1914-pic/ken-1
332.15	828.0 ± 1.0	1.32	1914-pic/ken-1
367.15	793.1 ± 1.0	-0.32	1914-pic/ken-1
396.15	764.7 ± 1.0	-1.17	1914-pic/ken-1

cont.

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	876.2 ± 1.8	320.00	838.2 ± 1.4	370.00	790.7 ± 1.4
290.00	866.7 ± 1.7	330.00	828.7 ± 1.3	380.00	781.2 ± 1.4
293.15	863.7 ± 1.7	340.00	819.2 ± 1.3	390.00	771.7 ± 1.5
298.15	859.0 ± 1.6	350.00	809.7 ± 1.3	400.00	762.2 ± 1.7
310.00	847.7 ± 1.5	360.00	800.2 ± 1.3		

**1-Methylpropyl 3-methylbutanoate** [2051-38-9] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 124

**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	848.2 ± 1.0	1901-nor/gre

**2-Methylpropyl 3-methylbutanoate** [589-59-3] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 125

**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.
290.15	857.0 ± 2.0	1891-sch/kos
298.15	861.7 ± 2.0	1926-mun

**1-Methylpropyl pentanoate** [23361-74-2] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 126

**Table 1.** Fit with estimated *B* coefficient for 4 accepted points. Deviation σ<sub>w</sub> = 1.267.

Coefficient	$\rho = A + BT$
<i>A</i>	1136.32
<i>B</i>	-0.944

**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.
286.15	865.0 ± 1.0	-1.19	1914-pic/ken-1
323.15	833.0 ± 1.0	1.74	1914-pic/ken-1
356.15	800.8 ± 1.0	0.69	1914-pic/ken-1
401.15	756.4 ± 1.0	-1.23	1914-pic/ken-1

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	872.0 ± 2.0	320.00	834.2 ± 1.6	370.00	787.0 ± 1.7
290.00	862.6 ± 1.9	330.00	824.8 ± 1.6	380.00	777.6 ± 1.7
293.15	859.6 ± 1.8	340.00	815.4 ± 1.6	390.00	768.2 ± 1.8
298.15	854.9 ± 1.8	350.00	805.9 ± 1.6	400.00	758.7 ± 1.9
310.00	843.7 ± 1.7	360.00	796.5 ± 1.6	410.00	749.3 ± 2.1

2-Methylpropyl pentanoate

[10588-10-0]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

127

**Table 1.** Fit with estimated *B* coefficient for 4 accepted points. Deviation  $\sigma_w = 0.391$ .

Coefficient	$\rho = A + BT$
<i>A</i>	1136.81
<i>B</i>	-0.950

**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.
286.15	864.3 ± 1.0	-0.67	1903-hom/guy
293.15	858.6 ± 1.0	0.28	1903-hom/guy
327.65	825.8 ± 1.0	0.25	1903-hom/guy
379.95	776.0 ± 1.0	0.14	1903-hom/guy
293.15	854.4 ± 2.0	-3.92	1918-mat/fav <sup>1)</sup>

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

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	870.8 ± 1.2	310.00	842.3 ± 0.8	350.00	804.3 ± 1.0
290.00	861.3 ± 1.0	320.00	832.8 ± 0.8	360.00	794.8 ± 1.1
293.15	858.3 ± 1.0	330.00	823.3 ± 0.8	370.00	785.3 ± 1.3
298.15	853.6 ± 0.9	340.00	813.8 ± 0.9	380.00	775.8 ± 1.4

Octyl methanoate

[112-32-3]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

128

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 1.0635$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 3.0410 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 419.75 K $\rho = A + BT + CT^2 + DT^3 + \dots$
<i>A</i>	$1.09837 \cdot 10^3$
<i>B</i>	$-7.06869 \cdot 10^{-1}$
<i>C</i>	$-1.86924 \cdot 10^{-4}$

**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	892.80 ± 0.60	1.46	1886-gar(□)	351.75	826.90 ± 0.80	0.30	1886-gar(□)
288.05	880.70 ± 0.60	1.45	1886-gar(□)	370.55	810.50 ± 0.80	-0.27	1886-gar(□)
301.45	869.10 ± 0.60	0.80	1886-gar(□)	383.85	799.10 ± 1.00	-0.40	1886-gar(□)
317.15	856.40 ± 0.60	1.02	1886-gar(□)	405.75	779.40 ± 1.00	-1.38	1886-gar(□)

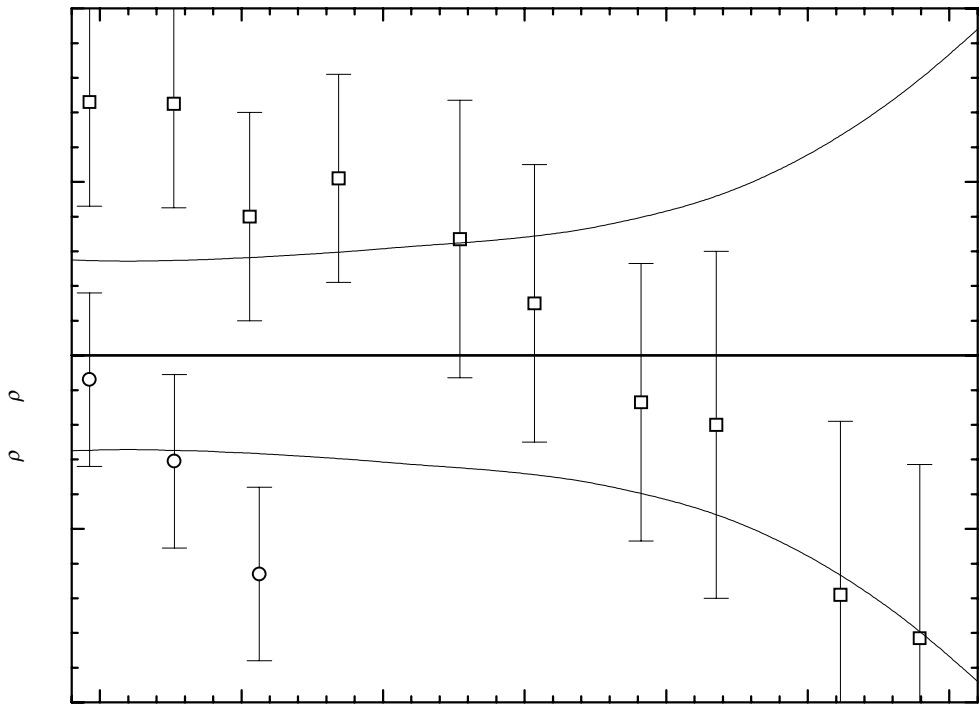
cont.



$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
419.75	767.10 ± 1.00	-1.63	1886-gar(□)	303.15	865.64 ± 0.50	-1.26	1935-bil/gis(O)
273.15	891.20 ± 0.50	-0.14	1935-bil/gis(O)				

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

**Further references:** [1931-hor, 1936-kur/sht, 1945-pha/gok, 1956-air/red, 1960-sol/bar, 1967-bar/fro, 1971-gaz/mar, 1972-arb/mar, 1975-nay/zor, 1976-dus/pie, 1993-ami/rai-3].



**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.

Octyl methanoate (cont.)

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

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	893.89 ± 0.55	320.00	853.03 ± 0.60	380.00	802.77 ± 0.87
280.00	885.79 ± 0.54	330.00	844.75 ± 0.63	390.00	794.26 ± 0.99
290.00	877.66 ± 0.55	340.00	836.43 ± 0.65	400.00	785.71 ± 1.15
293.15	875.09 ± 0.55	350.00	828.07 ± 0.68	410.00	777.13 ± 1.35
298.15	871.00 ± 0.56	360.00	819.67 ± 0.72	420.00	768.51 ± 1.59
300.00	869.49 ± 0.56	370.00	811.24 ± 0.79	430.00	759.85 ± 1.88
310.00	861.28 ± 0.58				

Pentyl butanoate

[540-18-1]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

129

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 6.1083 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 1.7829 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 381.75 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	1.05150 · 10 <sup>3</sup>
B	-4.12180 · 10 <sup>-1</sup>
C	-7.50576 · 10 <sup>-4</sup>

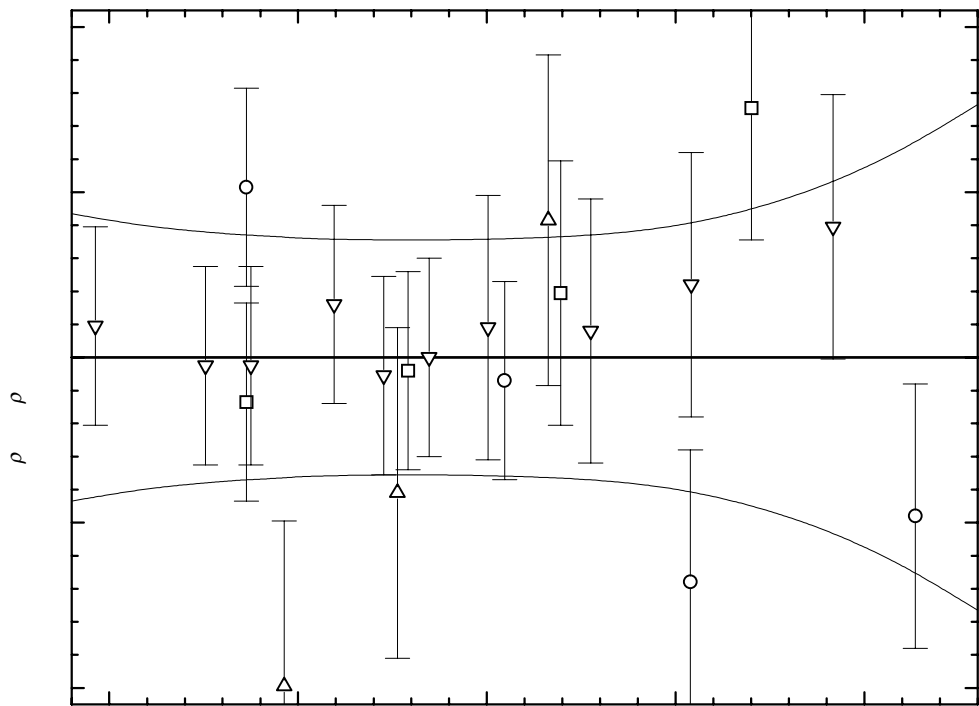
**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{cal}}}{\text{kg} \cdot \text{m}^{-3}}$	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	883.10 ± 0.60	0.19	1886-gar(V)	327.35	836.00 ± 0.60	-0.14	1903-hom/guy(○)
287.75	870.70 ± 0.60	-0.05	1886-gar(V)	351.95	812.10 ± 0.80	-1.36	1903-hom/guy(○)
293.75	865.60 ± 0.60	-0.05	1886-gar(V)	381.75	783.80 ± 0.80	-0.96	1903-hom/guy(○)
304.75	856.50 ± 0.60	0.32	1886-gar(V)	293.15	865.90 ± 0.60	-0.27	1948-vog-9(□)
311.35	850.30 ± 0.60	-0.11	1886-gar(V)	314.55	847.50 ± 0.60	-0.08	1948-vog-9(□)
317.35	845.10 ± 0.60	-0.00	1886-gar(V)	334.75	829.80 ± 0.80	0.39	1948-vog-9(□)
325.15	838.30 ± 0.80	0.18	1886-gar(V)	360.05	807.30 ± 0.80	1.51	1948-vog-9(□)
338.75	825.90 ± 0.80	0.16	1886-gar(V)	298.15	859.90 ± 1.00	-1.99	1955-usa/bil(Δ)
352.05	813.80 ± 0.80	0.44	1886-gar(V)	313.15	848.00 ± 1.00	-0.82	1955-usa/bil(Δ)
370.85	796.20 ± 0.80	0.79	1886-gar(V)	333.15	831.70 ± 1.00	0.83	1955-usa/bil(Δ)
293.15	867.20 ± 0.60	1.03	1903-hom/guy(○)				

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

**Further references:** [1924-lie, 1934-gil/dex, 1964-tur/den].

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

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	885.49 ± 0.87	300.00	860.29 ± 0.72	350.00	815.29 ± 0.79
280.00	877.24 ± 0.79	310.00	851.59 ± 0.71	360.00	805.84 ± 0.89
290.00	868.84 ± 0.75	320.00	842.74 ± 0.71	370.00	796.24 ± 1.04
293.15	866.17 ± 0.74	330.00	833.74 ± 0.72	380.00	786.49 ± 1.25
298.15	861.89 ± 0.73	340.00	824.59 ± 0.74	390.00	776.59 ± 1.53

Pentyl 2-methylpropanoate

[2445-72-9]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

130

**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	872.1 ± 1.0	1976-nay/zor

Propyl 2-ethylbutanoate

[5129-46-4]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

131

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	868.8 ± 2.0	1890-gar

Propyl hexanoate

[626-77-7]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

132

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 2.0196 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 4.9234 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 429.55 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	1.09204 · 10 <sup>3</sup>
B	-6.64688 · 10 <sup>-1</sup>
C	-3.46996 · 10 <sup>-4</sup>

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

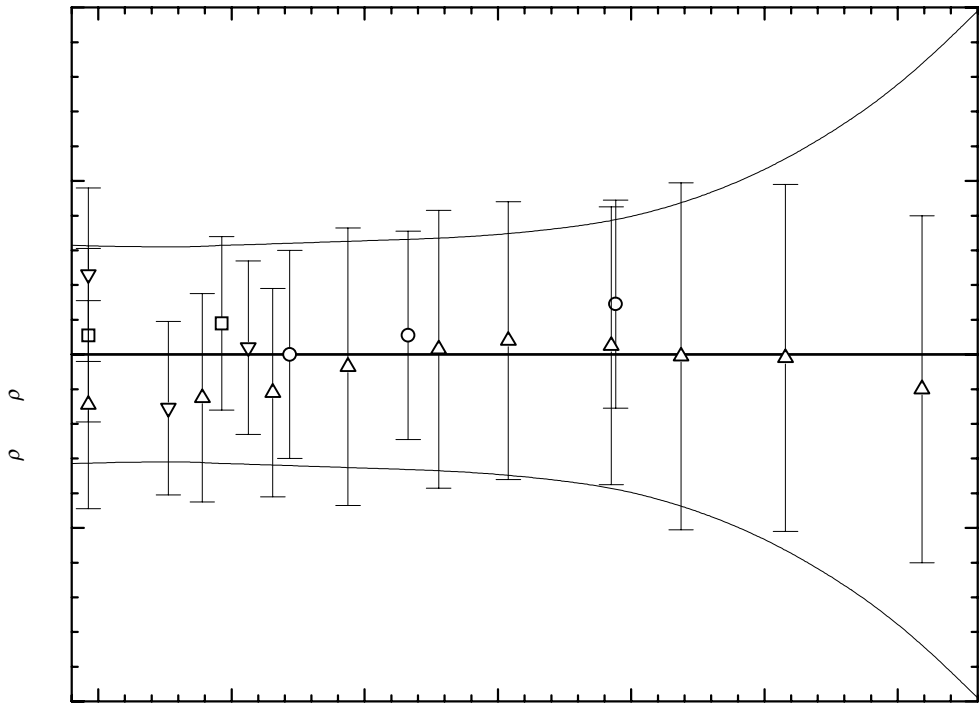
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
273.15	884.30 ± 0.60	-0.29	1886-gar(Δ)	273.15	885.05 ± 0.50	0.46	1935-bil/gis(∇)
294.55	865.90 ± 0.60	-0.25	1886-gar(Δ)	288.15	871.39 ± 0.50	-0.31	1935-bil/gis(∇)
307.75	854.40 ± 0.60	-0.22	1886-gar(Δ)	303.15	858.69 ± 0.50	0.04	1935-bil/gis(∇)
321.85	842.10 ± 0.80	-0.07	1886-gar(Δ)	273.15	884.70 ± 0.50	0.11	1943-hob/par(□)
338.85	827.00 ± 0.80	0.03	1886-gar(Δ)	298.15	863.20 ± 0.50	0.18	1943-hob/par(□)
351.95	815.20 ± 0.80	0.08	1886-gar(Δ)	293.15	868.00 ± 0.60	0.63	1948-bon/alt <sup>1)</sup>
371.25	797.50 ± 0.80	0.05	1886-gar(Δ)	310.95	851.80 ± 0.60	-0.00	1948-bon/alt(○)
384.35	785.30 ± 1.00	-0.01	1886-gar(Δ)	333.15	832.20 ± 0.60	0.11	1948-bon/alt(○)
403.95	766.90 ± 1.00	-0.02	1886-gar(Δ)	372.05	797.00 ± 0.60	0.29	1948-bon/alt(○)
429.55	742.30 ± 1.00	-0.20	1886-gar(Δ)				

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

Further references: [1934-gil/dex].

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

$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	887.28 ± 0.63	320.00	843.81 ± 0.65	390.00	780.03 ± 0.93
280.00	878.72 ± 0.62	330.00	834.90 ± 0.66	400.00	770.64 ± 1.06
290.00	870.10 ± 0.62	340.00	825.93 ± 0.67	410.00	761.19 ± 1.23
293.15	867.37 ± 0.62	350.00	816.89 ± 0.69	420.00	751.66 ± 1.43
298.15	863.02 ± 0.63	360.00	807.78 ± 0.72	430.00	742.06 ± 1.68
300.00	861.40 ± 0.63	370.00	798.60 ± 0.76	440.00	732.40 ± 1.98
310.00	852.64 ± 0.64	380.00	789.35 ± 0.83		



**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.)

**Propyl 2-methylpentanoate** [6639-14-1] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 133

**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	866.9 ± 1.0	1890-gar

**1,3,3-Trimethylbutyl ethanoate** [500001-53-6] C<sub>9</sub>H<sub>18</sub>O<sub>2</sub> MW = 158.24 134

**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	858.0 ± 1.0	1933-whi/hom-1

2,3,3-Trimethylbutyl ethanoate

[500001-54-7]

C<sub>9</sub>H<sub>18</sub>O<sub>2</sub>

MW = 158.24

135

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

$T$ K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg·m <sup>-3</sup>	Ref.
298.15	868.7 ± 1.0	1956-sar/new