

2.1.6 Saturated Monoesters, C<sub>10</sub>

Butyl 3,3-dimethylbutanoate

[85204-26-8]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

136

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	856.8 ± 1.0	1933-hom/whi

Butyl hexanoate

[626-82-4]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

137

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 2.3902 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 7.7463 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 428.05 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	1.08369 · 10 <sup>3</sup>
B	-6.57026 · 10 <sup>-1</sup>
C	-2.96481 · 10 <sup>-4</sup>

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

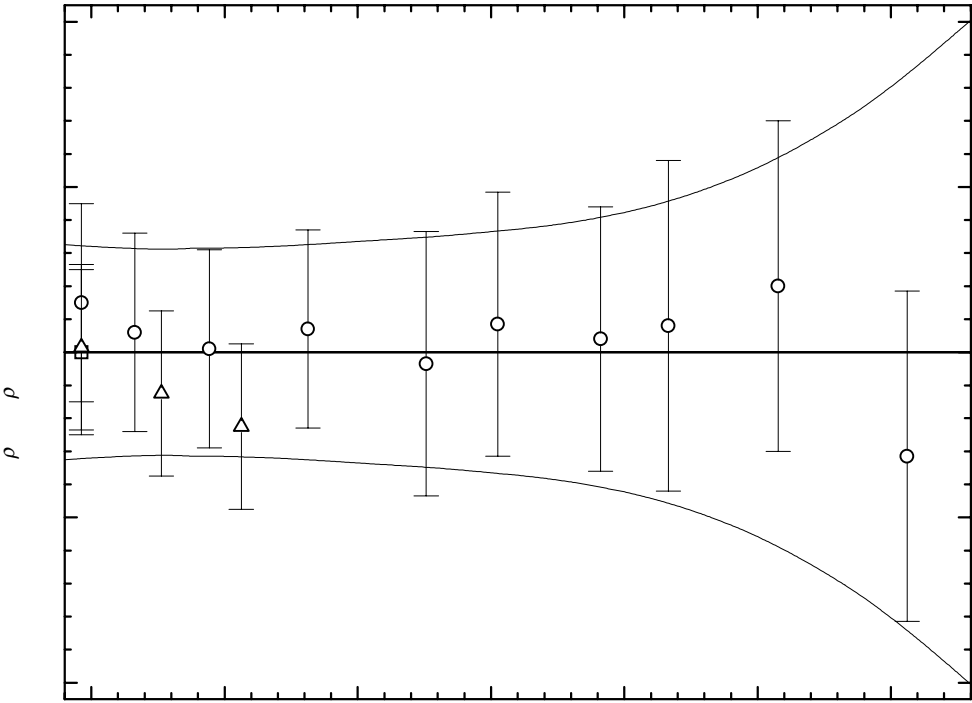
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
273.15	882.40 ± 0.60	0.30	1886-gar(○)	403.85	770.40 ± 1.00	0.40	1886-gar(○)
283.15	874.00 ± 0.60	0.12	1886-gar(○)	428.05	747.50 ± 1.00	-0.63	1886-gar(○)
297.15	862.30 ± 0.60	0.02	1886-gar(○)	273.15	882.13 ± 0.50	0.03	1935-bil/gis(Δ)
315.65	846.90 ± 0.60	0.14	1886-gar(○)	288.15	869.50 ± 0.50	-0.25	1935-bil/gis(Δ)
337.85	827.80 ± 0.80	-0.07	1886-gar(○)	303.15	856.82 ± 0.50	-0.45	1935-bil/gis(Δ)
351.25	816.50 ± 0.80	0.17	1886-gar(○)	273.15	882.10 ± 0.50	-0.00	1943-hob/par(□)
370.55	799.60 ± 0.80	0.08	1886-gar(○)	298.15	862.30 ± 0.50	0.86	1943-hob/par <sup>1)</sup>
383.25	788.50 ± 1.00	0.16	1886-gar(○)				

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

Further references: [1934-gil/dex].

cont.

Butyl hexanoate (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	884.68 ± 0.65	320.00	843.08 ± 0.66	390.00	782.36 ± 0.98
280.00	876.48 ± 0.63	330.00	834.59 ± 0.68	400.00	773.44 ± 1.11
290.00	868.22 ± 0.62	340.00	826.03 ± 0.70	410.00	764.47 ± 1.28
293.15	865.61 ± 0.63	350.00	817.41 ± 0.73	420.00	755.44 ± 1.48
298.15	861.44 ± 0.63	360.00	808.74 ± 0.76	430.00	746.35 ± 1.73
300.00	859.90 ± 0.63	370.00	800.00 ± 0.81	440.00	737.20 ± 2.01
310.00	851.52 ± 0.64	380.00	791.21 ± 0.88		

1-Butylpentyl methanoate

[500001-61-6]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

138

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	870.0 ± 2.0	1906-mal-1

2,2-Diethylbutyl ethanoate

[500001-90-1]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

139

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	890.0 ± 1.0	1956-sar/new

3,3-Dimethyl-2-ethylbutyl ethanoate

[500001-99-0]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

140

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	877.0 ± 1.0	1956-sar/new

1,2-Dimethylhexyl ethanoate

[500001-63-8]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

141

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.
294.15	854.5 ± 1.0	1924-pow

1,5-Dimethylhexyl ethanoate

[500001-65-0]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

142

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	849.4 ± 2.0	1908-bue-1

2,2-Dimethylpropyl 2,2-dimethylpropanoate

[5340-26-1]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

143

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	843.1 ± 1.0	1960-ser/tsi

Ethyl 2,2-diethylbutanoate

[34666-17-6]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

144

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.
289.15	883.7 ± 1.0	1958-gru/hsu

(*R*)-Ethyl 3,5-dimethylhexanoate

[82398-51-4]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

145

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.
303.15	856.0 ± 2.0	1932-lev/mar

Ethyl 2-ethylhexanoate

[2983-37-1]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

146

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.
298.15	858.6 ± 1.0	1936-lev/rot-1
290.15	864.1 ± 1.0	1939-ken/pla

(*S*)-Ethyl 3-methylheptanoate

[102276-59-5]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

147

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.
297.15	862.0 ± 2.0	1931-lev/mar-5

*D*-Ethyl 4-methylheptanoate

[500002-00-6]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW =172.27

148

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.
297.15	859.0 ± 2.0	1932-lev/mar

(*R*)-Ethyl 5-methylheptanoate

[130129-91-8]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

149

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	865.0 ± 2.0	1933-lev/mar-1

Ethyl octanoate

[106-32-1]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

150

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 5.5533 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 1.2622 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 428.45 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.11303 \cdot 10^3$
B	$-8.18424 \cdot 10^{-1}$
C	$-6.85545 \cdot 10^{-5}$

**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)
273.15	$884.10 \pm 0.60$	-0.26	1886-gar(×)	288.15	$871.10 \pm 0.60$	-0.41	1932-kao/ma -1(V)
289.15	$870.40 \pm 0.60$	-0.25	1886-gar(×)	293.15	$866.70 \pm 0.60$	-0.52	1932-kao/ma -1(V)
294.45	$866.20 \pm 0.60$	0.10	1886-gar(×)	298.15	$862.40 \pm 0.60$	-0.52	1932-kao/ma -1(V)
307.75	$855.20 \pm 0.60$	0.53	1886-gar(×)	288.15	$872.00 \pm 0.50$	0.49	1946-ben/igo(Δ)
321.65	$843.40 \pm 0.80$	0.71	1886-gar(×)	293.15	$867.60 \pm 0.50$	0.38	1950-mum/phi(○)
338.45	$829.10 \pm 0.80$	0.92	1886-gar(×)	298.15	$863.50 \pm 0.50$	0.58	1950-mum/phi(○)
351.55	$817.80 \pm 0.80$	0.96	1886-gar(×)	348.15	$819.10 \pm 1.00$	-0.68	1952-gro/feu(×)
370.35	$801.50 \pm 0.80$	0.98	1886-gar(×)	308.10	$854.10 \pm 0.60$	-0.26	1955-shi/bon(◆)
383.85	$789.50 \pm 1.00$	0.72	1886-gar(×)	323.10	$841.00 \pm 0.60$	-0.44	1955-shi/bon(◆)
404.15	$771.70 \pm 1.00$	0.64	1886-gar(×)	338.10	$827.90 \pm 0.60$	-0.58	1955-shi/bon(◆)
428.45	$749.10 \pm 1.00$	-0.69	1886-gar(×)	353.10	$814.80 \pm 0.60$	-0.70	1955-shi/bon(◆)
273.15	$885.31 \pm 1.00$	0.95	1931-def(×)	368.10	$801.70 \pm 0.60$	-0.78	1955-shi/bon(◆)
288.15	$870.75 \pm 1.00$	-0.76	1931-def(×)	293.15	$866.70 \pm 0.50$	-0.52	1970-ere(□)
303.15	$858.02 \pm 1.00$	-0.60	1931-def(×)				

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

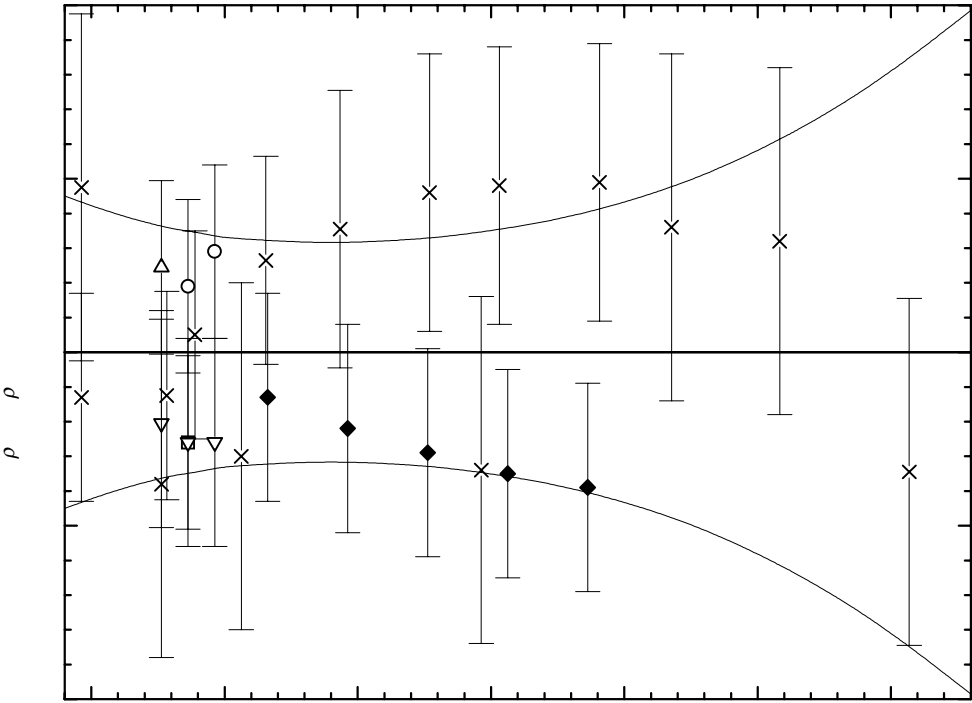
**Further references:** [1845-feh, 1869-zin, 1874-van, 1948-vog-9, 1964-kul/zil].

**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	$887.06 \pm 0.90$	320.00	$844.11 \pm 0.63$	390.00	$783.42 \pm 1.02$
280.00	$878.50 \pm 0.79$	330.00	$835.48 \pm 0.64$	400.00	$774.69 \pm 1.16$
290.00	$869.92 \pm 0.71$	340.00	$826.84 \pm 0.66$	410.00	$765.95 \pm 1.32$
293.15	$867.22 \pm 0.70$	350.00	$818.18 \pm 0.70$	420.00	$757.20 \pm 1.51$
298.15	$862.92 \pm 0.67$	360.00	$809.51 \pm 0.75$	430.00	$748.43 \pm 1.73$
300.00	$861.33 \pm 0.66$	370.00	$800.83 \pm 0.82$	440.00	$739.65 \pm 1.97$
310.00	$852.73 \pm 0.64$	380.00	$792.13 \pm 0.91$		

cont.

Ethyl octanoate (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-propylpentanoate** [17022-31-0] C<sub>10</sub>H<sub>20</sub>O<sub>2</sub> MW = 172.271 151

**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	865.9 ± 2.0	1890-gar

**2-Ethylbutyl butanoate** [74398-53-1] C<sub>10</sub>H<sub>20</sub>O<sub>2</sub> MW = 172.27 152

**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.
292.95	872.6 ± 1.0	1959-hof

2-Ethylhexyl ethanoate

[103-09-3]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

153

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 7.0498 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 1.5097 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 293.15 to 498.15 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.04866 \cdot 10^3$
B	$-3.95387 \cdot 10^{-1}$
C	$-7.03827 \cdot 10^{-4}$

**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)
293.15	$871.90 \pm 1.00$	-0.36	1953-ano-5(◆)	348.15	$825.80 \pm 0.50$	0.11	1994-ste/chi-2(×)
293.15	$871.90 \pm 1.00$	-0.36	1955-ano-2(∇)	373.15	$802.50 \pm 0.50$	-0.62	1994-ste/chi-2(×)
298.15	$868.80 \pm 0.60$	0.59	1956-sar/new(□)	398.15	$779.20 \pm 0.50$	-0.46	1994-ste/chi-2(×)
293.15	$871.90 \pm 1.00$	-0.36	1958-ano-3(○)	423.15	$755.60 \pm 0.50$	0.28	1994-ste/chi-2(×)
293.15	$871.80 \pm 1.00$	-0.46	1968-ano(Δ)	448.15	$730.60 \pm 0.50$	0.49	1994-ste/chi-2(×)
298.15	$870.60 \pm 0.50$	2.39	1994-ste/chi-2 <sup>1)</sup>	473.15	$704.50 \pm 0.50$	0.49	1994-ste/chi-2(×)
323.15	$848.40 \pm 0.50$	1.01	1994-ste/chi-2(×)	498.15	$676.70 \pm 0.50$	-0.34	1994-ste/chi-2(×)

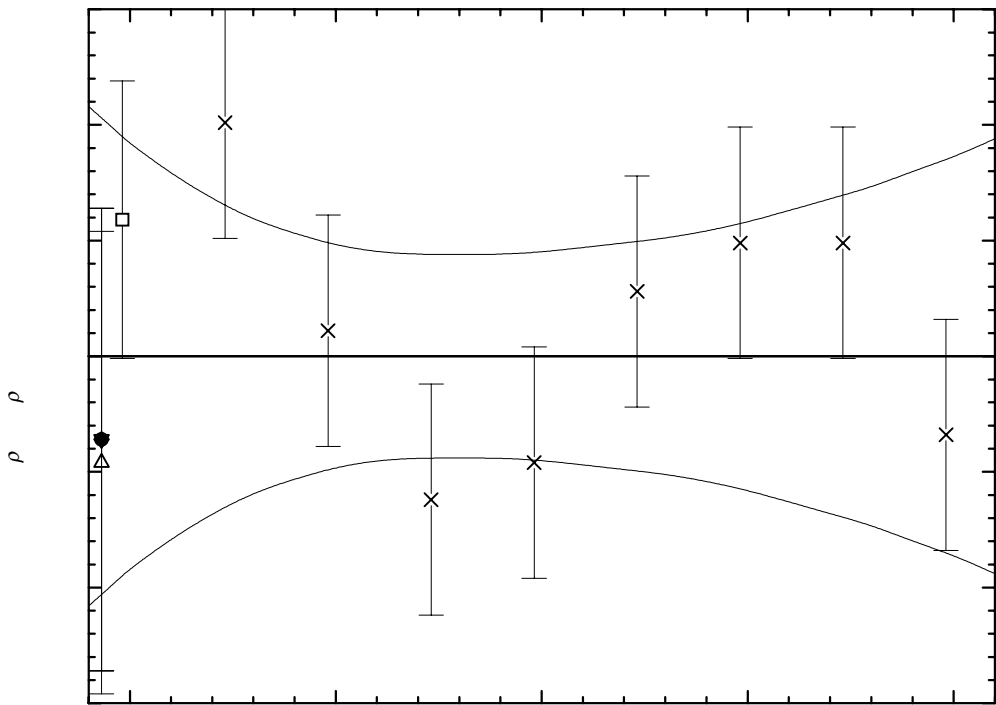
<sup>1)</sup> Not included in Fig. 1.

**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	$874.80 \pm 1.08$	360.00	$815.10 \pm 0.45$	440.00	$738.42 \pm 0.54$
293.15	$872.26 \pm 1.03$	370.00	$806.01 \pm 0.44$	450.00	$728.21 \pm 0.58$
298.15	$868.21 \pm 0.95$	380.00	$796.78 \pm 0.44$	460.00	$717.85 \pm 0.63$
300.00	$866.70 \pm 0.92$	390.00	$787.40 \pm 0.44$	470.00	$707.35 \pm 0.68$
310.00	$858.45 \pm 0.79$	400.00	$777.89 \pm 0.45$	480.00	$696.71 \pm 0.73$
320.00	$850.06 \pm 0.68$	410.00	$768.23 \pm 0.47$	490.00	$685.93 \pm 0.80$
330.00	$841.53 \pm 0.59$	420.00	$758.44 \pm 0.49$	500.00	$675.01 \pm 0.86$
340.00	$832.86 \pm 0.53$	430.00	$748.50 \pm 0.51$	510.00	$663.94 \pm 0.94$
350.00	$824.05 \pm 0.48$				

cont.

2-Ethylhexyl ethanoate (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-Ethyl-4-methylpentyl ethanoate** [500001-71-8] C<sub>10</sub>H<sub>20</sub>O<sub>2</sub> MW = 172.27 154

**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	$855.4 \pm 2.0$	1908-buc-1

**Heptyl propanoate** [2216-81-1] C<sub>10</sub>H<sub>20</sub>O<sub>2</sub> MW = 172.27 155

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 3.9066 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 1.3483 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

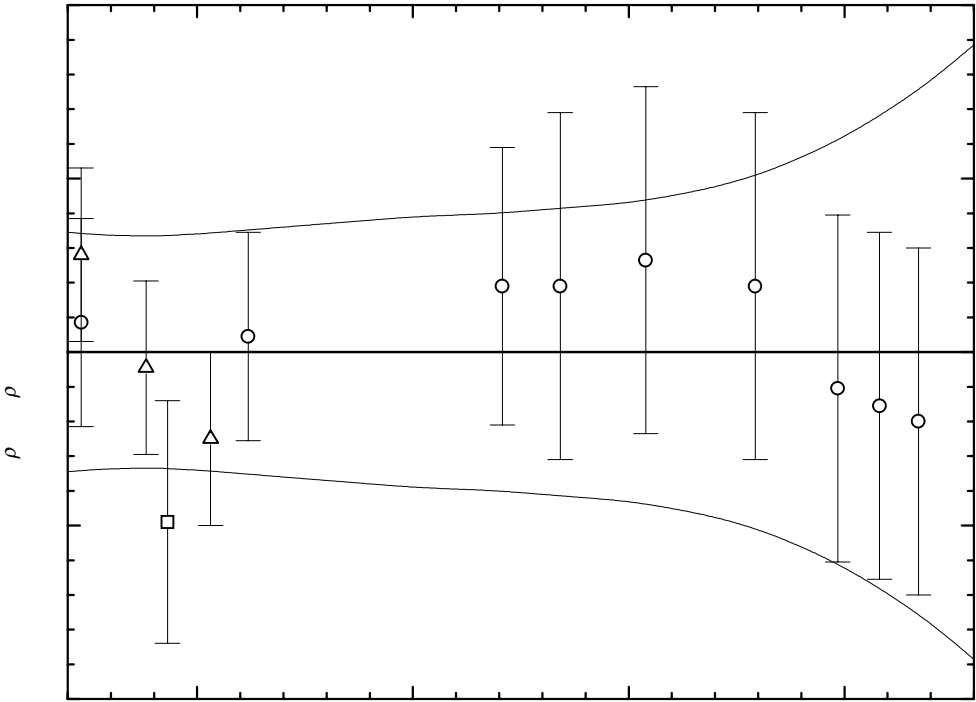
Coefficient	T = 273.15 to 467.15 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.07393 \cdot 10^3$
B	$-5.84240 \cdot 10^{-1}$
C	$-4.02352 \cdot 10^{-4}$



**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	884.50 ± 0.60	0.17	1886-gar(O)	448.45	730.80 ± 1.00	-0.21	1886-gar(O)
311.85	852.70 ± 0.60	0.09	1886-gar(O)	458.15	721.50 ± 1.00	-0.31	1886-gar(O)
338.35	838.50 ± 0.80	8.31	1886-gar <sup>1)</sup>	467.15	712.80 ± 1.00	-0.40	1886-gar(O)
370.75	802.40 ± 0.80	0.38	1886-gar(O)	273.15	884.89 ± 0.50	0.56	1935-bil/gis(Δ)
384.15	790.50 ± 1.00	0.38	1886-gar(O)	288.15	872.08 ± 0.50	-0.09	1935-bil/gis(Δ)
403.95	772.80 ± 1.00	0.53	1886-gar(O)	303.15	859.34 ± 0.50	-0.50	1935-bil/gis(Δ)
429.35	749.30 ± 1.00	0.38	1886-gar(O)	293.15	867.10 ± 0.70	-0.98	1949-eng/sch(□)

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



**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 propanoate (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	886.85 ± 0.69	340.00	828.78 ± 0.76	410.00	766.76 ± 0.90
280.00	878.80 ± 0.67	350.00	820.16 ± 0.78	420.00	757.58 ± 0.95
290.00	870.66 ± 0.67	360.00	811.46 ± 0.79	430.00	748.31 ± 1.02
293.15	868.08 ± 0.67	370.00	802.68 ± 0.80	440.00	738.97 ± 1.12
298.15	863.97 ± 0.68	380.00	793.82 ± 0.82	450.00	729.55 ± 1.24
300.00	862.45 ± 0.68	390.00	784.88 ± 0.84	460.00	720.04 ± 1.39
310.00	854.15 ± 0.70	400.00	775.86 ± 0.86	470.00	710.46 ± 1.56
320.00	845.77 ± 0.72	330.00	837.32 ± 0.74	480.00	700.79 ± 1.77

Hexyl butanoate

[2639-63-6]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

156

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 2.5380 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 8.6014 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 429.35 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	1.07504 · 10 <sup>3</sup>
B	-6.04350 · 10 <sup>-1</sup>
C	-3.73356 · 10 <sup>-4</sup>

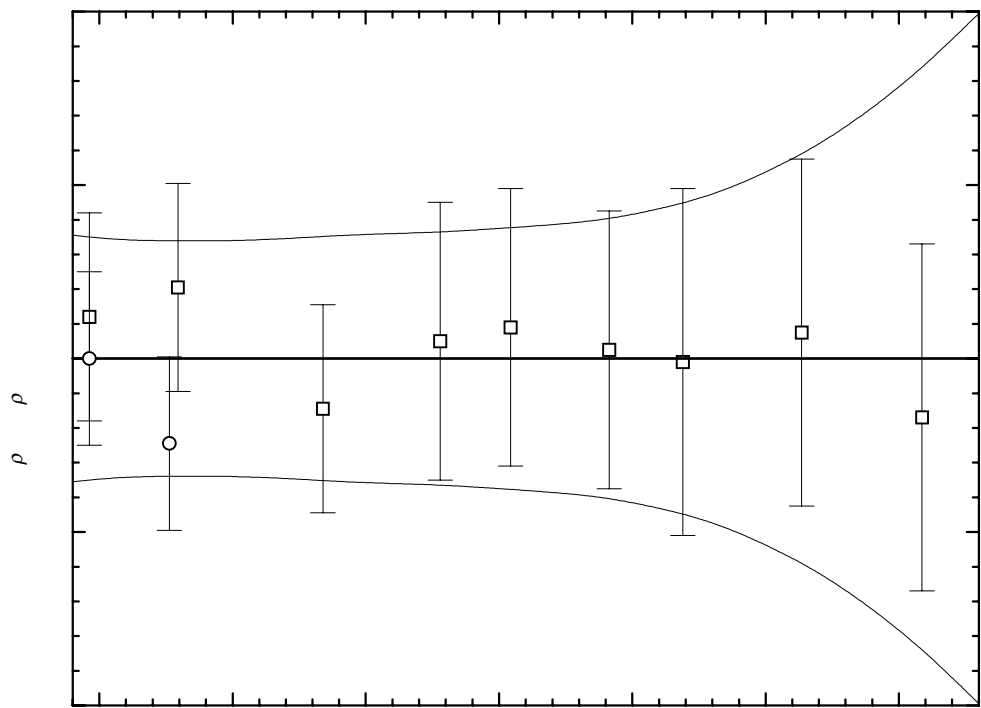
**Table 2.** Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	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	882.35 ± 0.60	0.24	1886-gar(□)	384.45	787.50 ± 1.00	-0.02	1886-gar(□)
289.75	869.00 ± 0.60	0.41	1886-gar(□)	406.75	767.60 ± 1.00	0.15	1886-gar(□)
316.95	845.70 ± 0.60	-0.29	1886-gar(□)	429.35	746.40 ± 1.00	-0.34	1886-gar(□)
338.95	827.40 ± 0.80	0.10	1886-gar(□)	273.15	882.11 ± 0.50	0.00	1935-bil/gis(○)
352.15	816.10 ± 0.80	0.18	1886-gar(□)	288.15	869.41 ± 0.50	-0.49	1935-bil/gis(○)
370.65	799.80 ± 0.80	0.05	1886-gar(□)	303.15	855.21 ± 0.60	-2.31	1935-bil/gis <sup>1)</sup>

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

**Further references:** [1959-hof, 1967-mus/mek].

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	884.65 ± 0.71	320.00	843.42 ± 0.71	390.00	782.56 ± 0.94
280.00	876.55 ± 0.68	330.00	834.95 ± 0.72	400.00	773.57 ± 1.07
290.00	868.38 ± 0.68	340.00	826.40 ± 0.73	410.00	764.50 ± 1.23
293.15	865.79 ± 0.68	350.00	817.78 ± 0.75	420.00	755.36 ± 1.44
298.15	861.67 ± 0.68	360.00	809.09 ± 0.77	430.00	746.14 ± 1.69
300.00	860.14 ± 0.68	370.00	800.32 ± 0.80	440.00	736.85 ± 1.99
310.00	851.81 ± 0.69	380.00	791.48 ± 0.86		

Hexyl 2-methylpropanoate

[2349-07-7]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

157

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	870.0 ± 1.0	1976-nay/zor

Methyl 2-ethylheptanoate

[816-63-7]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

158

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	864.4 ± 0.5	1960-tre/mil

Methyl 2-methyloctanoate

[2177-86-8]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

159

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.
277.15	875.9 ± 1.0	1904-bou/bla-2

Methyl nonanoate

[1731-84-6]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

160

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 7.6741 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 1.9294 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 453.15 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	1.07599 · 10 <sup>3</sup>
B	-5.81522 · 10 <sup>-1</sup>
C	-3.57038 · 10 <sup>-4</sup>

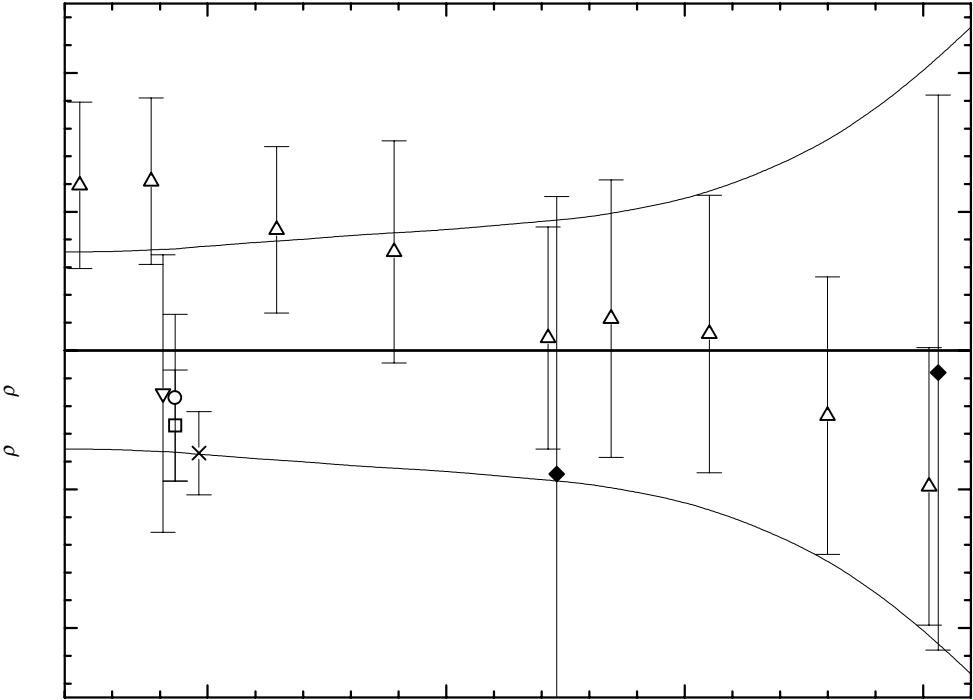
Table 2. Experimental values with uncertainties and deviation from calculated values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
290.65	876.50 ± 1.00	-0.31	1872-zin/fra(V)	451.25	739.90 ± 1.00	-0.98	1886-gar(Δ)
273.15	891.70 ± 0.60	1.19	1886-gar(Δ)	293.15	876.91 ± 2.00	2.07	1938-alb <sup>1)</sup>
288.15	880.00 ± 0.60	1.22	1886-gar(Δ)	298.15	873.23 ± 2.00	2.35	1938-alb <sup>1)</sup>
314.45	858.70 ± 0.60	0.87	1886-gar(Δ)	373.15	808.40 ± 2.00	-0.89	1938-alb(◆)
339.05	838.50 ± 0.80	0.71	1886-gar(Δ)	453.15	739.00 ± 2.00	-0.16	1938-alb(◆)
371.35	810.90 ± 0.80	0.09	1886-gar(Δ)	293.15	874.50 ± 0.60	-0.34	1964-adr/dek(○)
384.55	799.80 ± 1.00	0.23	1886-gar(Δ)	293.15	874.30 ± 0.40	-0.54	1964-gou/vlu(□)
405.15	781.90 ± 1.00	0.12	1886-gar(Δ)	298.15	870.14 ± 0.30	-0.74	1990-ort(×)
429.95	759.50 ± 1.00	-0.47	1886-gar(Δ)				

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

Further references: [1960-tre/mil].

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	892.96 ± 0.71	330.00	845.21 ± 0.83	410.00	777.55 ± 1.20
280.00	885.18 ± 0.71	340.00	837.00 ± 0.85	420.00	768.77 ± 1.34
290.00	877.33 ± 0.73	350.00	828.72 ± 0.87	430.00	759.92 ± 1.51
293.15	874.84 ± 0.73	360.00	820.37 ± 0.90	440.00	751.00 ± 1.74
298.15	870.88 ± 0.75	370.00	811.95 ± 0.93	450.00	742.01 ± 2.01
300.00	869.40 ± 0.75	380.00	803.46 ± 0.96	460.00	732.94 ± 2.33
310.00	861.41 ± 0.78	390.00	794.90 ± 1.02		
320.00	853.35 ± 0.80	400.00	786.26 ± 1.09		

3-Methylbutyl 3-methylbutanoate

[659-70-1]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

161

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	870.0 ± 2.0	1876-bal
288.85	860.6 ± 2.0	1891-sch/kos
298.15	854.1 ± 2.0	1926-mun

1-Methylbutyl pentanoate

[89155-38-4]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

162

Table 1. Fit with estimated *B* coefficient for 4 accepted points. Deviation σ<sub>w</sub> = 1.145.

Coefficient	$\rho = A + BT$
<i>A</i>	1123.92
<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.
290.15	863.1 ± 1.0	0.31	1914-pic/ken-1
318.15	838.9 ± 1.0	1.31	1914-pic/ken-1
346.15	812.6 ± 1.0	0.21	1914-pic/ken-1
368.65	790.3 ± 1.0	-1.84	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	862.9 ± 2.2	320.00	835.9 ± 1.5	350.00	808.9 ± 1.6
293.15	860.1 ± 2.1	330.00	826.9 ± 1.5	360.00	799.9 ± 1.9
298.15	855.6 ± 2.0	340.00	817.9 ± 1.5	370.00	790.9 ± 2.1
310.00	844.9 ± 1.7				

3-Methylbutyl pentanoate

[2050-09-1]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

163

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 ± 2.0	1974-raj/mur-1

1-(1-Methylethyl)pentyl ethanoate

[500001-70-7]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

164

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	875.0 ± 2.0	1906-mus

1-Methylheptyl ethanoate

[2051-50-5]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

165

**Table 1.** Fit with estimated *B* coefficient for 9 accepted points. Deviation  $\sigma = 1.727$ .

Coefficient	$\rho = A + BT$
<i>A</i>	1126.42
<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.
290.15	856.9 ± 2.0	-8.38	1911-pic/ken <sup>1)</sup>	293.55	862.2 ± 1.0	-0.01	1936-pat/hol
292.15	860.6 ± 1.0	-2.88	1914-pic/ken-1	307.95	850.0 ± 1.0	0.74	1936-pat/hol
328.15	830.9 ± 1.0	-0.18	1914-pic/ken-1	321.75	838.3 ± 1.0	1.46	1936-pat/hol
361.15	798.8 ± 1.0	-2.58	1914-pic/ken-1	337.25	824.4 ± 1.0	1.51	1936-pat/hol
392.15	770.0 ± 3.0	-3.48	1914-pic/ken-1 <sup>1)</sup>	352.75	811.5 ± 1.0	2.56	1936-pat/hol
273.15	880.0 ± 1.0	-0.58	1936-pat/hol				

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

**Table 3.** Recommended values.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	883.4 ± 2.7	298.15	858.1 ± 2.0	340.00	820.4 ± 2.1
280.00	874.4 ± 2.4	310.00	847.4 ± 1.9	350.00	811.4 ± 2.3
290.00	865.4 ± 2.2	320.00	838.4 ± 1.9	360.00	802.4 ± 2.5
293.15	862.6 ± 2.1	330.00	829.4 ± 1.9	370.00	793.4 ± 2.8

1-Methylhexyl propanoate

[500003-29-2]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

166

**Table 1.** Fit with estimated *B* coefficient for 3 accepted points. Deviation  $\sigma_{\text{w}} = 0.963$

Coefficient	$\rho = A + BT$
<i>A</i>	1117.36
<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.
285.15	866.0 ± 1.0	-0.43	1914-pic/ken-1
322.15	835.2 ± 1.0	1.33	1914-pic/ken-1
354.15	804.8 ± 1.0	-0.91	1914-pic/ken-1
402.15	759.0 ± 2.0	-4.47	1914-pic/ken-1 <sup>1)</sup>

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

cont.

1-Methylhexyl propanoate (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	871.0 ± 2.0	310.00	844.6 ± 1.2	340.00	818.2 ± 1.4
290.00	862.2 ± 1.7	320.00	835.8 ± 1.2	350.00	809.4 ± 1.7
293.15	859.4 ± 1.6	330.00	827.0 ± 1.2	360.00	800.6 ± 2.0
298.15	855.0 ± 1.5				

3-Methyl-2-(1-methylethyl)butyl  
ethanoate

[99850-69-8]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

167

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	880.3 ± 1.0	1956-sar/new

1-Methylpentyl butanoate

[6963-52-6]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

168

Table 1. Fit with estimated *B* coefficient for 4 accepted points. Deviation  $\sigma_{\text{w}} = 0.865$ .

Coefficient	$\rho = A + BT$
<i>A</i>	1154.43
<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.
294.15	874.4 ± 1 0	-0.59	1914-pic/ken-1
329.15	843.2 ± 1.0	1.46	1914-pic/ken-1
362.15	810.2 ± 1.0	-0.19	1914-pic/ken-1
392.15	781.2 ± 1.0	-0.69	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	878.9 ± 2.5	330.00	840.9 ± 1.4	370.00	802.9 ± 1.6
293.15	875.9 ± 2.4	340.00	831.4 ± 1.3	380.00	793.4 ± 1.9
298.15	871.2 ± 2.2	350.00	821.9 ± 1.3	390.00	783.9 ± 2.2
310.00	859.9 ± 1.9	360.00	812.4 ± 1.4	400.00	774.4 ± 2.5
320.00	850.4 ± 1.6				



D-3-Methylpentyl butanoate

[500002-07-3]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

169

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	877.0 ± 2.0	1961-bai/yat

1-Methylpropyl hexanoate

[820-00-8]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

170

Table 1. Fit with estimated *B* coefficient for 3 accepted points. Deviation  $\sigma_{\text{w}} = 0.200$ .

Coefficient	$\rho = A + BT$
<i>A</i>	1119.86
<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.
287.15	866.9 ± 1.0	-0.27	1914-pic/ken-1
323.15	835.7 ± 1.0	0.21	1914-pic/ken-1
356.15	806.5 ± 1.0	0.05	1914-pic/ken-1
405.15	760.0 ± 2.0	-3.33	1914-pic/ken-1 <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	873.5 ± 1.8	310.00	847.1 ± 0.9	340.00	820.7 ± 1.0
290.00	864.7 ± 1.5	320.00	838.3 ± 0.7	350.00	811.9 ± 1.3
293.15	861.9 ± 1.4	330.00	829.5 ± 0.8	360.00	803.1 ± 1.7
298.15	857.5 ± 1.2				

1-(2-Methylpropyl)butyl ethanoate

[500001-83-2]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

171

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.
291.15	880.0 ± 2.0	1906-mus

Nonyl methanoate

[5451-92-3]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

172

Table 2. 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	867.0 ± 2.0	1967-bar/fro

Octyl ethanoate

[112-14-1]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

173

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 5.9429 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 1.5967 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 457.05 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.08889 \cdot 10^3$
B	$-6.76570 \cdot 10^{-1}$
C	$-2.57228 \cdot 10^{-4}$

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

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
289.15	$870.93 \pm 1.50$	-0.82	1869-zin(×)	457.05	$724.90 \pm 1.00$	-1.03	1886-gar(Δ)
288.15	$873.64 \pm 1.00$	1.06	1884-per(×)	293.15	$868.10 \pm 0.60$	-0.35	1950-mum/phi(○)
298.15	$865.20 \pm 1.00$	0.89	1884-per(×)	298.15	$863.80 \pm 0.60$	-0.51	1950-mum/phi(○)
273.15	$884.56 \pm 0.60$	-0.33	1886-gar(Δ)	308.10	$855.80 \pm 0.60$	-0.22	1955-shi/bon(□)
284.75	$875.30 \pm 0.60$	-0.08	1886-gar(Δ)	323.10	$843.10 \pm 0.60$	-0.34	1955-shi/bon(□)
298.25	$864.30 \pm 0.60$	0.08	1886-gar(Δ)	338.10	$830.20 \pm 0.60$	-0.54	1955-shi/bon(□)
310.25	$854.40 \pm 0.60$	0.17	1886-gar(Δ)	353.10	$817.40 \pm 0.60$	-0.52	1955-shi/bon(□)
338.55	$830.90 \pm 0.80$	0.54	1886-gar(Δ)	368.10	$804.40 \pm 0.60$	-0.59	1955-shi/bon(□)
351.25	$820.00 \pm 0.80$	0.49	1886-gar(Δ)	293.15	$867.03 \pm 1.00$	-1.42	1964-bre/ulu(∇)
383.55	$792.10 \pm 1.00$	0.55	1886-gar(Δ)	293.15	$868.00 \pm 1.00$	-0.45	1967-bar/fro(◆)
405.45	$773.40 \pm 1.00$	1.11	1886-gar(Δ)	293.15	$869.80 \pm 0.60$	1.35	1980-mey/awe(×)
419.35	$760.90 \pm 1.00$	0.96	1886-gar(Δ)				

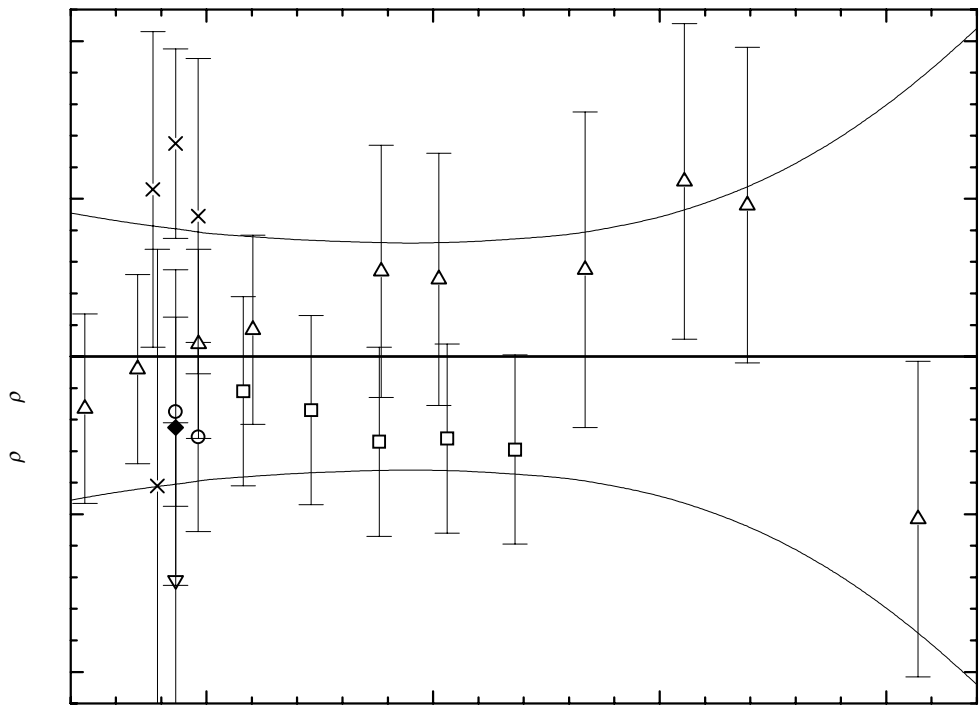
<sup>1)</sup> Not included in Fig. 1.

**Further references:** [1904-bou/bla-1, 1919-eyk, 1947-kaz/lib, 1977-toj/arc, 1992-rya/kru].

**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	$887.47 \pm 0.91$	330.00	$837.61 \pm 0.73$	410.00	$768.26 \pm 0.97$
280.00	$879.28 \pm 0.86$	340.00	$829.12 \pm 0.72$	420.00	$759.36 \pm 1.08$
290.00	$871.05 \pm 0.82$	350.00	$820.58 \pm 0.72$	430.00	$750.40 \pm 1.22$
293.15	$868.45 \pm 0.81$	360.00	$811.99 \pm 0.73$	440.00	$741.40 \pm 1.39$
298.15	$864.31 \pm 0.79$	370.00	$803.35 \pm 0.75$	450.00	$732.35 \pm 1.59$
300.00	$862.77 \pm 0.78$	380.00	$794.65 \pm 0.77$	460.00	$723.24 \pm 1.82$
310.00	$854.43 \pm 0.76$	390.00	$785.90 \pm 0.82$	470.00	$714.08 \pm 2.08$
320.00	$846.05 \pm 0.74$	400.00	$777.11 \pm 0.88$		

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.)

**Pentyl pentanoate** **[2173-56-0]** **C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>** **MW = 172.27** **174**

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{c,w} = 7.0915 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{c,uw} = 1.8358 \cdot 10^{-1}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 428.05 K
	$\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.10465 \cdot 10^3$
B	$-7.89720 \cdot 10^{-1}$
C	$-1.01140 \cdot 10^{-4}$

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

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
273.15	$881.10 \pm 0.60$	-0.29	1886-gar(O)	311.95	$849.10 \pm 0.60$	0.64	1886-gar(O)
286.85	$871.30 \pm 0.60$	1.50	1886-gar(O)	323.85	$838.80 \pm 0.80$	0.51	1886-gar(O)

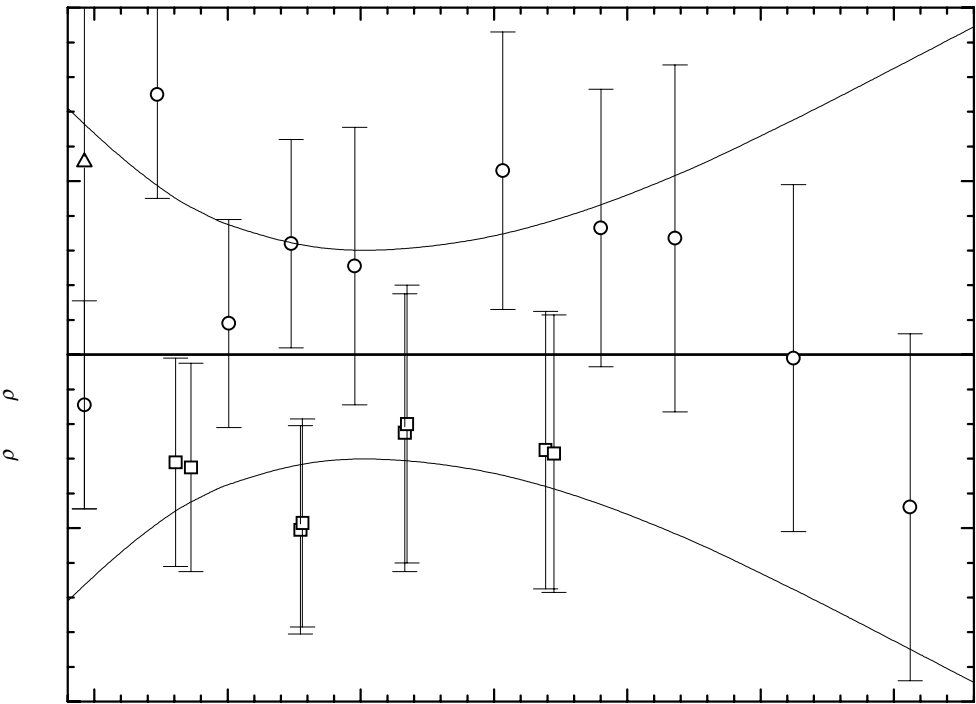
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Pentyl pentanoate (cont.)

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	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)
351.65	815.50 ± 0.80	1.06	1886-gar(○)	313.65	846.00 ± 0.60	-1.01	1948-vog-9(□)
370.05	799.30 ± 0.80	0.73	1886-gar(○)	314.05	845.70 ± 0.60	-0.97	1948-vog-9(□)
383.95	787.20 ± 1.00	0.67	1886-gar(○)	333.25	829.80 ± 0.80	-0.45	1948-vog-9(□)
406.15	767.20 ± 1.00	-0.02	1886-gar(○)	333.65	829.50 ± 0.80	-0.40	1948-vog-9(□)
428.05	747.20 ± 1.00	-0.88	1886-gar(○)	359.65	807.00 ± 0.80	-0.55	1948-vog-9(□)
273.15	882.50 ± 2.00	1.11	1924-lie(Δ)	361.25	805.60 ± 0.80	-0.57	1948-vog-9(□)
290.25	866.30 ± 0.60	-0.62	1948-vog-9(□)				

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

**Further references:** [1864-lan, 34-gil/dex, 53-jat/pha, 74-raj/mur-1].



**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	884.05 ± 1.42	320.00	841.58 ± 0.60	390.00	781.28 ± 1.11
280.00	875.60 ± 1.13	330.00	833.03 ± 0.60	400.00	772.58 ± 1.26
290.00	867.13 ± 0.90	340.00	824.46 ± 0.63	410.00	763.87 ± 1.41
293.15	864.45 ± 0.85	350.00	815.86 ± 0.68	420.00	755.13 ± 1.57
298.15	860.21 ± 0.77	360.00	807.25 ± 0.76	430.00	746.37 ± 1.73
300.00	858.63 ± 0.75	370.00	798.61 ± 0.86	440.00	737.59 ± 1.89
310.00	850.12 ± 0.65	380.00	789.95 ± 0.98		

Propyl 2-ethylpentanoate

[43164-27-8]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

175

**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	869.5 ± 2.0	1890-gar

Propyl heptanoate

[7778-87-2]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

176

**Table 1.** Coefficients of the polynomial expansion equation. Standard deviations (see introduction):  $\sigma_{\text{c,w}} = 2.8158 \cdot 10^{-1}$  (combined temperature ranges, weighted),  $\sigma_{\text{c,uw}} = 8.3407 \cdot 10^{-2}$  (combined temperature ranges, unweighted).

Coefficient	T = 273.15 to 427.85 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	1.08686 · 10 <sup>3</sup>
B	-6.76216 · 10 <sup>-1</sup>
C	-2.66113 · 10 <sup>-4</sup>

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

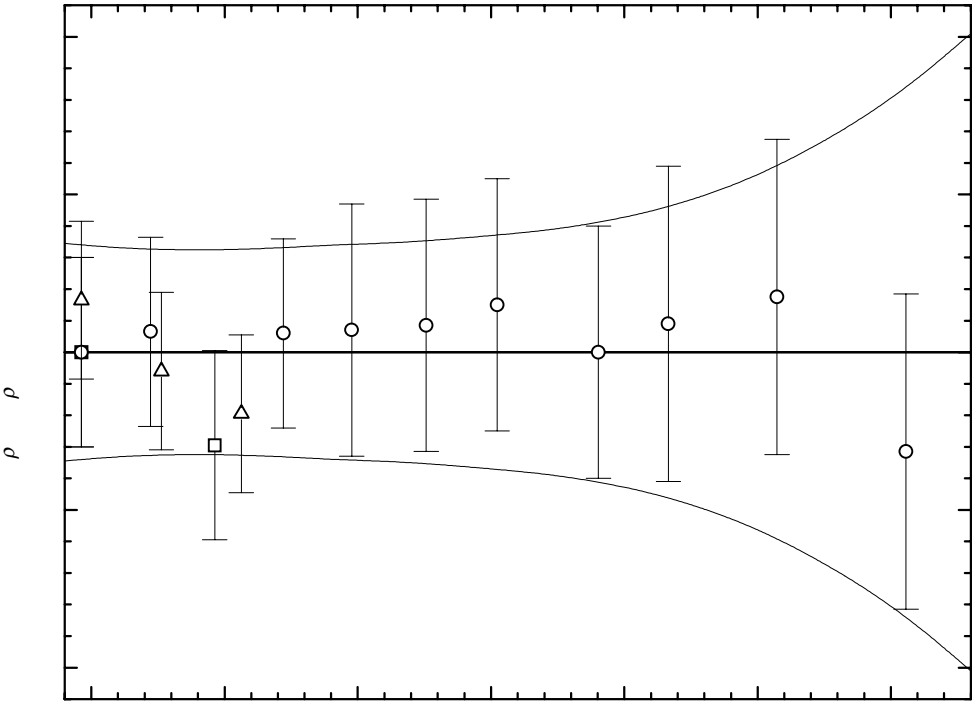
$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
273.15	882.30 ± 0.60	0.00	1886-gar(○)	403.65	770.90 ± 1.00	0.35	1886-gar(○)
286.15	871.70 ± 0.60	0.13	1886-gar(○)	427.85	748.20 ± 1.00	-0.63	1886-gar(○)
311.05	850.90 ± 0.60	0.12	1886-gar(○)	273.15	882.63 ± 0.50	0.33	1935-bil/gis(Δ)
323.85	840.10 ± 0.80	0.14	1886-gar(○)	288.15	869.79 ± 0.50	-0.12	1935-bil/gis(Δ)
337.85	828.20 ± 0.80	0.17	1886-gar(○)	303.15	857.02 ± 0.50	-0.39	1935-bil/gis(Δ)
351.15	816.90 ± 0.80	0.30	1886-gar(○)	273.15	882.30 ± 0.60	0.00	1943-hob/par(□)
370.15	800.10 ± 0.80	-0.00	1886-gar(○)	298.15	861.00 ± 0.60	-0.59	1943-hob/par(□)
383.25	788.80 ± 1.00	0.18	1886-gar(○)				

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

**Further references:** [1905-lum, 1919-eyk].

cont.

Propyl heptanoate (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	884.88 ± 0.69	320.00	843.22 ± 0.68	390.00	782.66 ± 0.99
280.00	876.66 ± 0.66	330.00	834.73 ± 0.69	400.00	773.80 ± 1.12
290.00	868.38 ± 0.65	340.00	826.19 ± 0.71	410.00	764.88 ± 1.29
293.15	865.76 ± 0.65	350.00	817.59 ± 0.74	420.00	755.91 ± 1.49
298.15	861.59 ± 0.65	360.00	808.94 ± 0.77	430.00	746.88 ± 1.73
300.00	860.05 ± 0.65	370.00	800.23 ± 0.82	440.00	737.81 ± 2.02
310.00	851.66 ± 0.66	380.00	791.47 ± 0.89		

1-Propylpentyl ethanoate

[500001-67-2]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

177

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	853.1 ± 2.0	1906-pex

2,2,4-Trimethylpentyl ethanoate

[500020-27-9]

C<sub>10</sub>H<sub>20</sub>O<sub>2</sub>

MW = 172.27

178

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	865.0 ± 0.4	1958-ano-13

