

5.1.2 Saturated Carboxylic Acids, C₇ - C₁₂

2,2-Dimethylpentanoic acid [1185-39-3] C₇H₁₄O₂ MW = 130.19 365

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	885.6 ± 0.7	1960-eid/puz

***d*-2,3-Dimethylpentanoic acid** [500043-00-5] C₇H₁₄O₂ MW = 130.19 366

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	921.0 ± 2.0	1931-lev/mar-2

2,4-Dimethylpentanoic acid [5868-33-7] C₇H₁₄O₂ MW = 130.19 367

Table 1. Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	917.8 ± 2.0	1959-deb/fur ¹⁾
298.15	910.0 ± 1.5	1964-hin/dre
298.15	910.0 ± 1.5	Recommended

¹⁾ Not included in calculation of recommended value.

3,3-Dimethylpentanoic acid [3177-74-0] C₇H₁₄O₂ MW = 130.19 368

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	934.8 ± 0.7	1958-kim/tan

3,4-Dimethylpentanoic acid

[3302-06-5]



MW = 130.19

369

Table 1. Experimental and recommended values with uncertainties.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg·m ⁻³	Ref.
298.15	921.0 ± 2.0	1935-lev/mar
298.15	923.9 ± 2.0	1950-mor/mar
298.15	926.7 ± 2.0	1952-adk/wil
298.15	923.9 ± 2.6	Recommended

2-Ethylpentanoic acid

[20225-24-5]



MW = 130.19

370

Table 1. Fit with estimated B coefficient for 2 accepted points. Deviation $\sigma_w = 0.080$.

Coefficient	$\rho = A + BT$
A	1196.06
B	-0.960

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

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg·m ⁻³	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg·m ⁻³	Ref.
293.15	914.8 ± 2.0	0.16	1890-gar
298.15	909.8 ± 1.0	-0.04	1936-lev/rot-1

Table 3. Recommended values.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg·m ⁻³
290.00	917.7 ± 1.5
293.15	914.6 ± 1.4
298.15	909.8 ± 1.3

Heptanoic acid

[111-14-8]



MW = 130.19

371

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction): $\sigma_{c,w} = 2.1241$ (combined temperature ranges, weighted), $\sigma_{c,uw} = 2.5110 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	$T = 273.15 \text{ to } 393.15 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.06045 \cdot 10^3$
B	$-2.05717 \cdot 10^{-1}$
C	$-9.58410 \cdot 10^{-4}$

cont.

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

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)	$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
273.15	933.20 ± 1.50	0.45	1886-gar(×)	288.15	920.99 ± 1.50	-0.61	1931-def ¹⁾
290.35	918.60 ± 2.00	-1.32	1893-eyk ¹⁾	303.15	908.63 ± 1.50	-1.38	1931-def ¹⁾
352.25	866.90 ± 2.00	-2.17	1893-eyk(×)	273.15	934.51 ± 0.50	1.76	1935-bil/gis(Δ)
288.15	921.52 ± 0.60	-0.08	1896-per(×)	288.15	922.14 ± 0.50	0.54	1935-bil/gis(Δ)
364.55	857.64 ± 1.00	-0.45	1896-per(×)	303.15	909.86 ± 0.50	-0.15	1935-bil/gis(Δ)
288.15	921.20 ± 0.50	-0.40	1905-lum(○)	353.15	867.00 ± 2.00	-1.27	1942-dor/mcc(×)
284.15	924.30 ± 0.60	-0.31	1930-bin/for(∇)	298.15	913.00 ± 0.60	-0.92	1948-jon/bow(◆)
293.15	917.40 ± 0.60	-0.38	1930-bin/for(∇)	293.15	917.60 ± 0.40	-0.18	1990-ber/esq(□)
303.15	908.30 ± 0.60	-1.71	1930-bin/for(∇)	298.15	914.30 ± 0.40	0.38	1990-ber/esq(□)
313.15	900.70 ± 0.60	-1.35	1930-bin/for(∇)	303.15	910.90 ± 0.40	0.89	1990-ber/esq(□)
333.15	883.70 ± 0.60	-1.84	1930-bin/for(∇)	308.15	907.00 ± 0.40	0.95	1990-ber/esq(□)
353.15	867.20 ± 0.60	-1.07	1930-bin/for(∇)	313.15	903.20 ± 0.40	1.15	1990-ber/esq(□)
373.15	849.30 ± 0.60	-0.94	1930-bin/for(∇)	318.15	899.80 ± 0.40	1.81	1990-ber/esq(□)
393.15	833.80 ± 0.60	2.36	1930-bin/for(∇)	323.15	896.20 ± 0.40	2.31	1990-ber/esq(□)
273.15	933.38 ± 1.50	0.63	1931-def(×)				

¹⁾ Not included in Fig. 1.

Further references: [1857-sta, 1862-lan, 1873-gri/sho, 1877-lie/jan, 1884-per, 1884-zan, 1890-gar, 1910-eis, 1915-dun, 1922-tro, 1929-vog-1, 1931-tru, 1936-pri/col, 1948-vog-2, 1949-tsv/mar, 1950-sac/sau, 1956-dag].

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	935.04 ± 1.23	310.00	904.58 ± 0.49	370.00	853.13 ± 1.27
280.00	927.71 ± 0.83	320.00	896.48 ± 0.58	380.00	843.88 ± 1.29
290.00	920.19 ± 0.58	330.00	888.19 ± 0.71	390.00	834.45 ± 1.31
293.15	917.78 ± 0.54	340.00	879.72 ± 0.88	400.00	824.82 ± 1.33
298.15	913.92 ± 0.49	350.00	871.05 ± 1.04		
300.00	912.48 ± 0.48	360.00	862.18 ± 1.18		

cont.

Heptanoic acid (cont.)

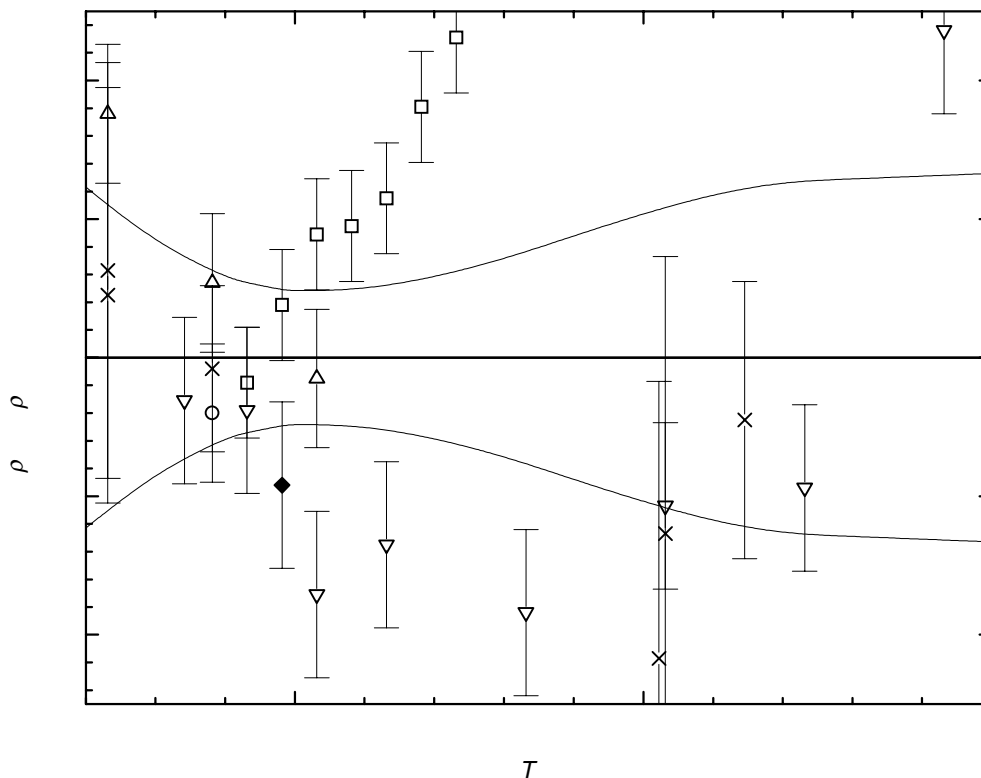


Fig. 1. The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the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

2-Methylhexanoic acid

[4536-23-6]

C₇H₁₄O₂

MW = 130.19

372

Table 1. Experimental and recommended values with uncertainties.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
298.15	909.0 ± 2.0	1929-lev/mik ¹⁾
290.15	908.5 ± 2.0	1954-fra-1 ¹⁾
293.15	918.0 ± 1.0	1946-mil/per
293.15	918.0 ± 1.0	Recommended

¹⁾ Not included in calculation of recommended value.

3-Methylhexanoic acid [3780-58-3] C₇H₁₄O₂ MW = 130.19 373

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	918.7 ± 2.0	1924-dew/wec

***l*-3-Methylhexanoic acid** [500043-02-7] C₇H₁₄O₂ MW = 130.19 374

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.
300.15	911.0 ± 2.0	1931-lev/mar-5

***d*-4-Methylhexanoic acid** [500043-01-6] C₇H₁₄O₂ MW = 130.19 375

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	923.0 ± 2.0	1931-lev/mar-2

5-Methylhexanoic acid [628-46-6] C₇H₁₄O₂ MW = 130.19 376

Table 1. Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
292.15	915.5 ± 2.0	1914-wal-1 ¹⁾
293.15	916.3 ± 0.7	1943-hen/hil
293.15	916.3 ± 0.7	Recommended

¹⁾ Not included in calculation of recommended value.

***l*-2-Propylbutanoic acid** [500043-03-8] C₇H₁₄O₂ MW = 130.19 377

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.
299.15	912.0 ± 2.0	1931-lev/mar-3

2,5-Dimethylhexanoic acid

[90201-13-1]



MW = 144.21

378

Table 1. Fit with estimated *B* coefficient for 5 accepted points. Deviation $\sigma_w = 1.470$.

Coefficient	$\rho = A + BT$
<i>A</i>	1174.63
<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.
293.15	911.0 ± 1.0	0.20	1879-car
303.15	903.0 ± 1.0	1.20	1879-car
313.15	893.0 ± 1.0	0.20	1879-car
323.15	885.0 ± 1.0	1.20	1879-car
273.15	926.0 ± 1.0	-2.80	1879-car

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	931.6 ± 3.6
280.00	922.6 ± 2.7
290.00	913.6 ± 2.1
293.15	910.8 ± 1.9
298.15	906.3 ± 1.7
310.00	895.6 ± 1.9
320.00	886.6 ± 2.6
330.00	877.6 ± 3.4

3,3-Dimethylhexanoic acid

[90808-83-6]



MW = 144.21

379

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	900.9 ± 0.7	1958-kim/tan

3,5-Dimethylhexanoic acid [60308-87-4] C₈H₁₆O₂ MW = 144.21 380

Table 1. Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	901.2 ± 1.0	1935-lev/mar
298.15	902.0 ± 1.5	1964-hin/dre
298.15	901.4 ± 1.0	Recommended

***d*-3,5-Dimethylhexanoic acid** [500043-05-0] C₈H₁₆O₂ MW = 144.21 381

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	899.0 ± 2.0	1932-lev/mar

4,5-Dimethylhexanoic acid [60308-81-8] C₈H₁₆O₂ MW = 144.21 382

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	912.0 ± 1.0	1935-lev/mar

2-Ethylhexanoic acid [149-57-5] C₈H₁₆O₂ MW = 144.21 383

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

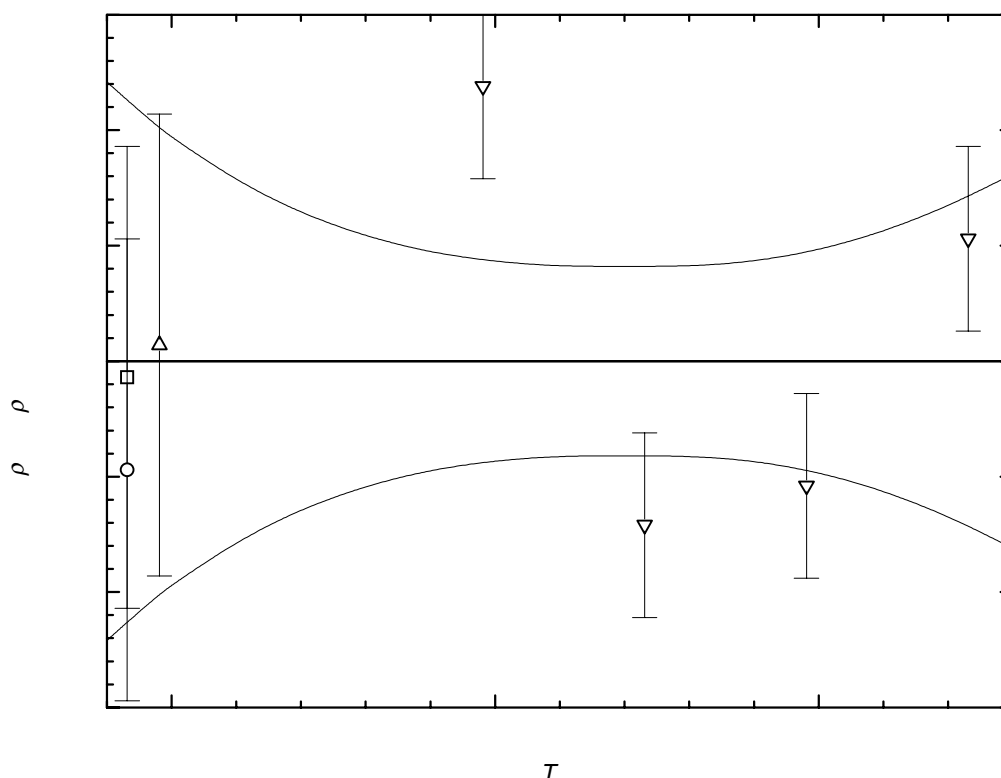
$\sigma_{\text{c,w}} = 1.1021$ (combined temperature ranges, weighted), $\sigma_{\text{c,uw}} = 2.7879 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	T = 293.15 to 423.11 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$9.66248 \cdot 10^2$
B	$1.90959 \cdot 10^{-1}$
C	$-1.35166 \cdot 10^{-3}$

cont.

2-Ethylhexanoic acid (cont.)**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)
298.15	903.10 \pm 1.00	0.07	1936-lev/rot-1(Δ)	348.13	870.10 \pm 0.40	1.19	1997-ste/chi-1(∇)
293.15	905.60 \pm 1.00	-0.47	1951-hau(\circ)	373.13	848.60 \pm 0.40	-0.71	1997-ste/chi-1(∇)
293.15	906.00 \pm 1.00	-0.07	1968-ano(\square)	398.12	827.50 \pm 0.40	-0.54	1997-ste/chi-1(∇)
323.15	891.30 \pm 0.40	4.49	1997-ste/chi-1 ¹⁾	423.11	805.60 \pm 0.40	0.53	1997-ste/chi-1(∇)

¹⁾ Not included in Fig. 1.**Further references:** [1939-ken/pla, 1949-oth/ser].**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 $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$).

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	907.95 ± 1.21	330.00	882.07 ± 0.54	390.00	835.13 ± 0.43
293.15	906.07 ± 1.13	340.00	874.92 ± 0.47	400.00	826.37 ± 0.48
298.15	903.03 ± 1.01	350.00	867.51 ± 0.43	410.00	817.33 ± 0.56
300.00	901.89 ± 0.97	360.00	859.82 ± 0.41	420.00	808.02 ± 0.67
310.00	895.55 ± 0.78	370.00	851.86 ± 0.41	430.00	798.44 ± 0.81
320.00	888.94 ± 0.64	380.00	843.63 ± 0.41		

***d*-3-Methylheptanoic acid** [500043-07-2] C₈H₁₆O₂ MW = 144.21 384

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
299.15	923.0 ± 2.0	1931-lev/mar-2

***l*-3-Methylheptanoic acid** [500043-08-3] C₈H₁₆O₂ MW = 144.21 385

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
296.15	909.0 ± 2.0	1931-lev/mar-5

***d*-4-Methylheptanoic acid** [500043-09-4] C₈H₁₆O₂ MW = 144.21 386

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
297.15	882.0 ± 2.0	1932-lev/mar

5-Methylheptanoic acid [1070-68-4] C₈H₁₆O₂ MW = 144.21 387

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	910.5 ± 2.0	1954-wic/vog

d-2-(2-Methylpropyl)butanoic acid [500043-10-7] C₈H₁₆O₂ MW = 144.21 388

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
303.15	899.0 ± 2.0	1932-lev/mar

Octanoic acid [124-07-2] C₈H₁₆O₂ MW = 144.21 389

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

$\sigma_{\text{c,w}} = 1.6874$ (combined temperature ranges, weighted), $\sigma_{\text{c,uw}} = 1.6955 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	$T = 273.15 \text{ to } 533.15 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.11609 \cdot 10^3$
B	$-6.19255 \cdot 10^{-1}$
C	$-2.86062 \cdot 10^{-4}$

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

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m ⁻³	Ref. (Symbol in Fig. 1)	T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m ⁻³	Ref. (Symbol in Fig. 1)
<i>crystal</i>				293.15	910.50 ± 0.60	0.53	1952-coo(◆)
283.15	1032.6 ± 5.0		1925-gar/ryd	348.15	866.20 ± 1.00	0.37	1952-gro/feu(×)
288.15	1027.4 ± 5.0		1925-gar/ryd	353.15	861.50 ± 1.00	-0.23	1956-dag(×)
78.15	1134.0 ± 3.0		1930-bil/fis-1	293.15	909.00 ± 0.50	-0.97	1958-cos/bow-1(O)
194.15	1075.0 ± 3.0		1930-bil/fis-1	313.15	893.00 ± 0.50	-1.12	1958-cos/bow-1(O)
<i>liquid</i>				333.15	876.70 ± 0.50	-1.34	1958-cos/bow-1(O)
273.15	927.00 ± 2.00	1.40	1884-zan(×)	353.15	860.50 ± 0.50	-1.23	1958-cos/bow-1(O)
293.15	910.00 ± 1.00	0.03	1899-sch-1(×)	373.15	844.20 ± 0.50	-0.99	1958-cos/bow-1(O)
295.15	913.00 ± 4.00	4.60	1910-har ¹⁾	393.15	828.00 ± 0.50	-0.42	1958-cos/bow-1(O)
291.25	911.60 ± 1.00	0.13	1913-har(×)	413.15	811.80 ± 0.60	0.38	1958-cos/bow-1(O)
343.15	870.80 ± 1.00	0.89	1925-hol/gen(×)	433.15	794.60 ± 0.60	0.41	1958-cos/bow-1(O)
298.15	905.80 ± 0.60	-0.23	1936-pri/col(Δ)	453.15	777.60 ± 0.60	0.86	1958-cos/bow-1(O)
353.15	861.50 ± 1.00	-0.23	1942-dor/mcc(×)	473.15	760.40 ± 0.60	1.35	1958-cos/bow-1(O)
298.15	906.40 ± 0.60	0.37	1948-jon/bow(∇)	493.15	742.00 ± 0.60	0.86	1958-cos/bow-1(O)
293.15	909.30 ± 1.00	-0.67	1948-vog-2(×)	513.15	723.20 ± 0.60	0.20	1958-cos/bow-1(O)
298.15	905.30 ± 1.00	-0.73	1948-vog-2(×)	533.15	703.00 ± 0.50	-1.62	1958-cos/bow-1(O)
293.15	911.00 ± 0.50	1.03	1950-mum/phi(□)	553.15	681.20 ± 1.00	-4.82	1958-cos/bow-1 ¹⁾
298.15	907.00 ± 0.50	0.97	1950-mum/phi(□)	573.15	656.70 ± 2.00	-10.49	1958-cos/bow-1 ¹⁾

¹⁾ Not included in Fig. 1.

Further references: [1845-feh, 1869-zin, 1884-per, 1886-gar, 1890-gar, 1910-eis, 1925-gar/ryd, 1929-hun/maa, 1931-def, 1943-que/was, 1946-ben/igo].

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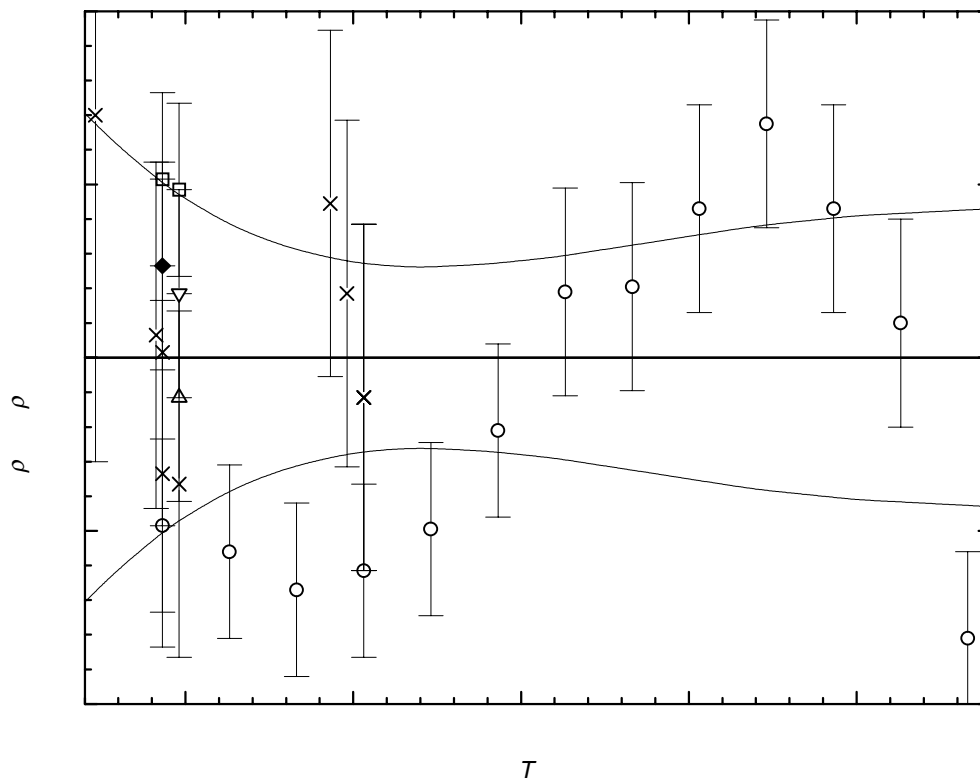


Fig. 1. The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the 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 $\rho = [1 + 1.75(1 - T/T_c)^{1/3} + 0.75(1 - T/T_c)][\rho_c + A(T_c - T) + B(T_c - T)^2 + C(T_c - T)^3 + D(T_c - T)^4]$).

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
270.00	928.04 ± 1.41	350.00	864.31 ± 0.55	450.00	779.50 ± 0.70
280.00	920.27 ± 1.22	360.00	856.09 ± 0.53	460.00	770.70 ± 0.73
290.00	912.45 ± 1.06	370.00	847.81 ± 0.52	470.00	761.85 ± 0.76
293.15	909.97 ± 1.01	380.00	839.47 ± 0.53	480.00	752.94 ± 0.78
298.15	906.03 ± 0.94	390.00	831.07 ± 0.54	490.00	743.97 ± 0.80
300.00	904.57 ± 0.92	400.00	822.62 ± 0.56	500.00	734.95 ± 0.82
310.00	896.63 ± 0.80	410.00	814.11 ± 0.58	510.00	725.87 ± 0.83
320.00	888.64 ± 0.71	420.00	805.54 ± 0.61	520.00	716.73 ± 0.84
330.00	880.59 ± 0.64	430.00	796.92 ± 0.64	530.00	707.53 ± 0.85
340.00	872.48 ± 0.59	440.00	788.24 ± 0.67	540.00	698.28 ± 0.86

2-Propylpentanoic acid [99-66-1] C₈H₁₆O₂ MW = 144.21 390

Table 1. Experimental and recommended values with uncertainties.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
288.25	908.2 ± 2.0	1919-eyk ¹⁾
354.75	830.5 ± 2.0	1919-eyk ¹⁾
293.15	905.3 ± 1.0	1890-gar
293.15	905.3 ± 1.0	Recommended

¹⁾ Not included in calculation of recommended value.

***d*-2-Propylpentanoic acid** [500043-12-9] C₈H₁₆O₂ MW = 144.21 391

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	882.0 ± 2.0	1932-lev/mar

***d*-3-Propylpentanoic acid** [500043-13-0] C₈H₁₆O₂ MW = 144.21 392

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	911.0 ± 2.0	1931-lev/mar-3

2,3,4-Trimethylpentanoic acid [90435-18-0] C₈H₁₆O₂ MW = 144.21 393

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	929.0 ± 1.0	1958-per/can

3,4,4-Trimethylpentanoic acid [75177-71-8] C₈H₁₆O₂ MW = 144.21 394

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	919.9 ± 1.0	1935-ste-1

***l*-2-Butylpentanoic acid** [500043-16-3] C₉H₁₈O₂ MW = 158.24 395

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	871.0 ± 2.0	1932-lev/mar

***l*-3-Butylpentanoic acid** [500043-17-4] C₉H₁₈O₂ MW = 158.24 396

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	908.0 ± 2.0	1931-lev/mar-3

2,6-Dimethylheptanoic acid [7494-12-4] C₉H₁₈O₂ MW = 158.24 397

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	897.5 ± 1.0	1929-von/teu

3,3-Dimethylheptanoic acid [67061-30-7] C₉H₁₈O₂ MW = 158.24 398

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	910.2 ± 0.7	1958-kim/tan

3,6-Dimethylheptanoic acid [44980-98-5] C₉H₁₈O₂ MW = 158.24 399

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.
299.15	901.0 ± 2.0	1932-lev/mar

2-Ethylheptanoic acid [3274-29-1] C₉H₁₈O₂ MW = 158.24 400

Table 1. Experimental and recommended values with uncertainties.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
303.15	891.6 ± 1.0	1960-tre/mil ¹⁾
298.15	893.5 ± 1.0	1960-tre/mil ¹⁾
293.15	896.9 ± 0.6	1960-tre/mil
293.15	896.9 ± 0.6	Recommended

¹⁾ Not included in calculation of recommended value.

***d*-2-(3-Methylbutyl)butanoic acid** [500043-20-9] C₉H₁₈O₂ MW = 158.24 401

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
299.15	901.0 ± 2.0	1932-lev/mar

2-Methyloctanoic acid [3004-93-1] C₉H₁₈O₂ MW = 158.24 402

Table 1. Experimental values with uncertainties.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
277.15	909.7 ± 2.0	1903-bou/bla-4
277.15	909.8 ± 1.0	1904-bou/bla-2

3-Methyloctanoic acid [6061-10-5] C₉H₁₈O₂ MW = 158.24 403

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
296.15	899.0 ± 2.0	1931-lev/mar-5

***l*-4-Methyloctanoic acid** [500043-22-1] C₉H₁₈O₂ MW = 158.24 404

Table 1. Experimental value with uncertainty.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
298.15	871.0 ± 2.0	1932-lev/mar

Nonanoic acid [112-05-0] C₉H₁₈O₂ MW = 158.24 405

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction): $\sigma_{c,w} = 4.9410 \cdot 10^{-1}$ (combined temperature ranges, weighted), $\sigma_{c,uw} = 1.1318 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	T = 285.65 to 453.15 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.13142 \cdot 10^3$
B	$-7.70717 \cdot 10^{-1}$

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)
<i>crystal</i>				288.15	908.70 ± 1.00	-0.64	1925-gar/ryd(×)
278.15	995.2 ± 5.0		1925-gar/ryd	288.15	909.70 ± 1.00	0.36	1925-gar/ryd(×)
283.15	991.6 ± 5.0		1925-gar/ryd	298.15	901.10 ± 1.00	-0.53	1925-gar/ryd(×)
<i>liquid</i>				323.32	881.30 ± 1.50	-0.94	1925-gar/ryd(×)
285.65	910.90 ± 1.00	-0.37	1882-kra(×)	288.15	909.32 ± 0.60	-0.02	1931-def(□)
292.65	906.80 ± 1.00	0.93	1882-kra(×)	293.15	905.52 ± 0.60	0.03	1931-def(□)
372.45	843.30 ± 1.00	-1.07	1882-kra(×)	303.15	897.82 ± 0.60	0.04	1931-def(□)
293.15	905.30 ± 1.00	-0.19	1890-gar(Δ)	293.15	905.74 ± 1.00	0.25	1938-alb(◆)
287.65	910.00 ± 1.00	0.27	1893-eyk(×)	298.15	902.46 ± 1.00	0.83	1938-alb(◆)
356.65	855.90 ± 1.00	-0.65	1893-eyk(×)	373.15	844.30 ± 1.00	0.47	1938-alb(◆)
293.15	905.70 ± 1.00	0.21	1915-dun(∇)	453.15	782.60 ± 1.00	0.43	1938-alb(◆)
298.15	902.20 ± 1.00	0.57	1915-dun(∇)	293.15	905.20 ± 0.60	-0.29	1950-mum/phi(○)
313.15	890.10 ± 1.00	0.03	1915-dun(∇)	298.15	901.30 ± 0.60	-0.33	1950-mum/phi(○)
323.15	883.00 ± 1.00	0.63	1915-dun(∇)				

Further references: [1872-zin/fra, 1884-per, 1886-gar, 1900-wal/ste, 1929-vog-1, 1934-car/jon, 1942-dor/mcc].

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

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
280.00	915.62 ± 1.00	330.00	877.09 ± 0.92	400.00	823.14 ± 1.24
290.00	907.92 ± 0.96	340.00	869.38 ± 0.94	410.00	815.43 ± 1.32
293.15	905.49 ± 0.95	350.00	861.67 ± 0.96	420.00	807.72 ± 1.40
298.15	901.63 ± 0.94	360.00	853.97 ± 1.00	430.00	800.02 ± 1.50
300.00	900.21 ± 0.94	370.00	846.26 ± 1.05	440.00	792.31 ± 1.60
310.00	892.50 ± 0.92	380.00	838.55 ± 1.10	450.00	784.60 ± 1.71
320.00	884.79 ± 0.92	390.00	830.84 ± 1.16	460.00	776.89 ± 1.82

cont.

Nonanoic acid (cont.)

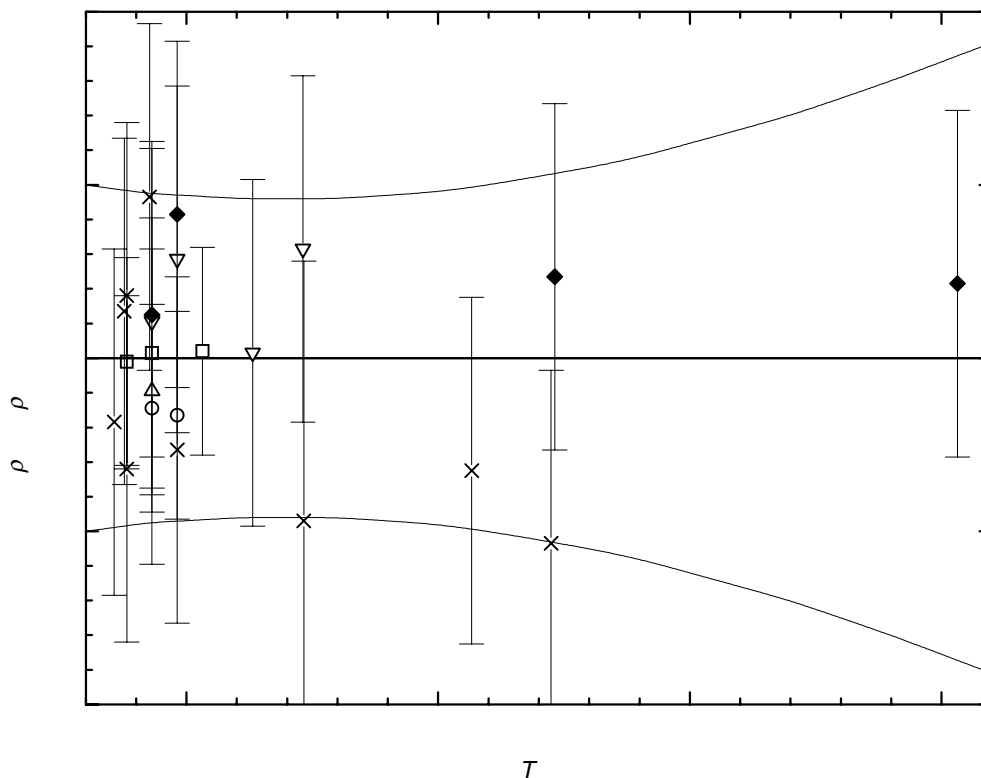


Fig. 1. The symbols show the deviation of the calculated from the experimental values from Table 2. The curves above and below the zero line indicate the calculated error region of the recommended values given in Table 3. The error bars represent the experimental errors. (Error bars smaller than the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

2-Butylhexanoic acid

[3115-28-4]

C₁₀H₂₀O₂

MW = 172.27

406

Table 1. Experimental and recommended values with uncertainties.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg·m ⁻³	Ref.
289.15	899.0 ± 2.0	1918-lev/cre ¹⁾
291.55	897.8 ± 2.0	1925-hes/bap ¹⁾
293.15	884.8 ± 1.0	1954-fra-1
293.15	884.8 ± 1.0	Recommended

¹⁾ Not included in calculation of recommended value.

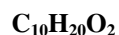
Decanoic acid**[334-48-5]****MW = 172.27****407**

Table 1. Coefficients of the polynomial expansion equation. Standard deviations (see introduction): $\sigma_{c,w} = 5.6689 \cdot 10^{-1}$ (combined temperature ranges, weighted), $\sigma_{c,uw} = 2.1408 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	T = 313.15 to 553.15 K $\rho = A + BT + CT^2 + DT^3 + \dots$
A	$1.05855 \cdot 10^3$
B	$-4.41430 \cdot 10^{-1}$
C	$-3.99958 \cdot 10^{-4}$

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)	$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{cal}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref. (Symbol in Fig. 1)
<i>crystal</i>				373.15	837.30 ± 0.50	-0.84	1958-cos/bow-1(□)
288.15	1026.6 ± 5.0		1925-gar/ryd	393.15	822.40 ± 0.60	-0.78	1958-cos/bow-1(□)
298.15	1017.6 ± 5.0		1925-gar/ryd	413.15	807.90 ± 0.60	-0.00	1958-cos/bow-1(□)
78.15	1109.0 ± 3.0		1930-bil/fis-1	433.15	792.50 ± 0.60	0.19	1958-cos/bow-1(□)
194.15	1055.0 ± 3.0		1930-bil/fis-1	453.15	776.80 ± 0.60	0.41	1958-cos/bow-1(□)
<i>liquid</i>				473.15	760.60 ± 0.60	0.45	1958-cos/bow-1(□)
353.15	853.10 ± 2.00	0.32	1942-dor/mcc(▽)	493.15	744.00 ± 0.80	0.41	1958-cos/bow-1(□)
348.15	858.30 ± 2.00	1.91	1952-gro/feu(○)	513.15	726.90 ± 0.80	0.19	1958-cos/bow-1(□)
353.15	853.10 ± 2.00	0.32	1956-dag(Δ)	533.15	709.00 ± 0.80	-0.51	1958-cos/bow-1(□)
313.15	881.70 ± 0.50	0.60	1958-cos/bow-1(□)	553.15	690.20 ± 1.00	-1.80	1958-cos/bow-1(□)
333.15	867.00 ± 0.50	-0.10	1958-cos/bow-1(□)	573.15	669.50 ± 2.00	-4.66	1958-cos/bow-1 ¹⁾
353.15	852.00 ± 0.50	-0.78	1958-cos/bow-1(□)				

¹⁾ Not included in Fig. 1.**Further references:** [1899-sch-1, 1900-ste, 1925-gar/ryd, 1925-hol/gen, 1929-hun/maa].**Table 3.** Recommended values (fit to the reliable experimental values according to the equations

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

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
310.00	883.27 ± 1.30	400.00	817.99 ± 0.98	490.00	746.22 ± 0.52
320.00	876.34 ± 1.28	410.00	810.33 ± 0.91	500.00	737.85 ± 0.56
330.00	869.32 ± 1.26	420.00	802.60 ± 0.83	510.00	729.39 ± 0.65
340.00	862.23 ± 1.23	430.00	794.78 ± 0.76	520.00	720.86 ± 0.77
350.00	855.06 ± 1.20	440.00	786.89 ± 0.68	530.00	712.24 ± 0.93
360.00	847.80 ± 1.16	450.00	778.92 ± 0.62	540.00	703.55 ± 1.15
370.00	840.47 ± 1.14	460.00	770.86 ± 0.56	550.00	694.78 ± 1.41
380.00	833.05 ± 1.10	470.00	762.73 ± 0.52	560.00	685.92 ± 1.73
390.00	825.56 ± 1.05	480.00	754.51 ± 0.51		

cont.

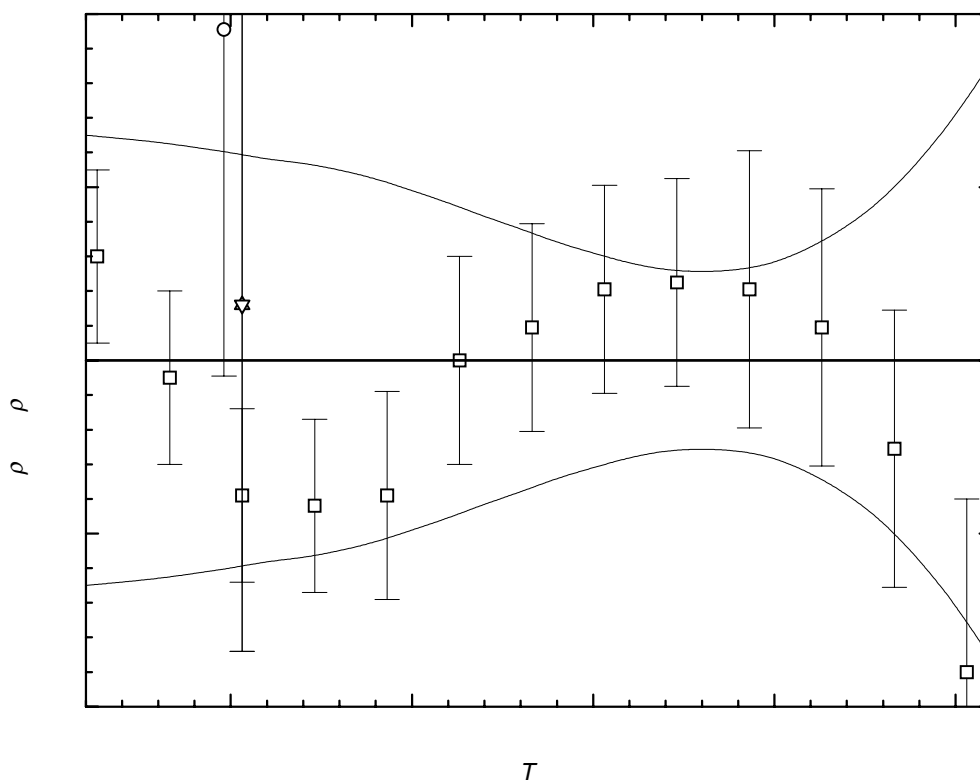
Decanoic acid (cont.)

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

2,2-Dimethyloctanoic acid [29662-90-6] C₁₀H₂₀O₂ MW = 172.27 408

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
293.15	902.2 ± 1.0	1960-pet/nik-1

2,7-Dimethyloctanoic acid [500043-24-3] C₁₀H₂₀O₂ MW = 172.27 409

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
293.15	907.4 ± 1.0	1936-kon/suz

3,3-Dimethyloctanoic acid [14352-59-1] C₁₀H₂₀O₂ MW = 172.27 410

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	912.9 ± 0.7	1958-kim/tan

3,7-Dimethyloctanoic acid [5698-27-1] C₁₀H₂₀O₂ MW = 172.27 411

Table 1. Experimental value with uncertainty.

$\frac{T}{\text{K}}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
291.15	897.0 ± 2.0	1923-von/kai

2-Ethyloctanoic acid [25234-25-7] C₁₀H₂₀O₂ MW = 172.27 412

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	848.1 ± 1.0	1960-pet/nik-1

***l*-3-Ethyloctanoic acid** [500043-33-4] C₁₀H₂₀O₂ MW = 172.27 413

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	899.0 ± 2.0	1931-lev/mar-3

4-Ethyloctanoic acid [16493-80-4] C₁₀H₂₀O₂ MW = 172.27 414

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	908.6 ± 2.0	1959-pet/nik

6-Methyl-2-ethylheptanoic acid [91008-77-4] C₁₀H₂₀O₂ MW = 172.27 415

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	906.5 ± 1.0	1936-kon/suz

6-Methyl-3-ethylheptanoic acid [500043-27-6] C₁₀H₂₀O₂ MW = 172.27 416

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
293.15	914.8 ± 1.0	1936-kon/suz

2-Methylnonanoic acid [24323-21-5] C₁₀H₂₀O₂ MW = 172.27 417

Table 1. Fit with estimated B coefficient for 2 accepted points. Deviation $\sigma_w = 1.120$.

Coefficient	$\rho = A + BT$
A	1160.78
B	-0.900

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

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m ⁻³	Ref.
273.15	912.7 ± 2.0	-2.24	1902-gue
298.15	893.0 ± 1.0	0.56	1929-lev/mik

Table 3. Recommended values.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³
270.00	917.8 ± 2.9
280.00	908.8 ± 2.2
290.00	899.8 ± 1.8
293.15	896.9 ± 1.7
298.15	892.4 ± 1.8

3-Methylnonanoic acid [35205-79-9] C₁₀H₂₀O₂ MW = 172.27 418

Table 1. Experimental values with uncertainties.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
293.15	901.2 ± 2.0	1922-lev/tay-1
293.15	898.3 ± 1.0	1959-pet/nik
293.15	898.9 ± 1.1	Recommended

***l*-3-Methylnonanoic acid** [500043-31-2] C₁₀H₂₀O₂ MW = 172.27 419

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.
299.15	899.0 ± 1.0	1931-lev/mar-5

***l*-4-Methylnonanoic acid** [500043-32-3] C₁₀H₂₀O₂ MW = 172.27 420

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	871.0 ± 1.0	1932-lev/mar

5-Methyl-2-propylhexanoic acid [500043-28-7] C₁₀H₂₀O₂ MW = 172.27 421

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	906.0 ± 1.0	1936-kon/suz

2,3,4,5-Tetramethylhexanoic acid [500043-34-5] C₁₀H₂₀O₂ MW = 172.27 422

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.
293.65	935.0 ± 2.0	1919-wil/hat

3,3-Dimethylnonanoic acid [22167-93-7] C₁₁H₂₂O₂ MW = 186.29 423

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	899.5 ± 1.0	1958-kim/tan

4,8-Dimethylnonanoic acid [7540-70-7] C₁₁H₂₂O₂ MW = 186.29 424

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.
287.15	897.0 ± 2.0	1923-von/kai
287.15	901.0 ± 2.0	1923-von/kai

2-Methyldecanoic acid [24323-23-7] C₁₁H₂₂O₂ MW = 186.29 425

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
293.15	895.9 ± 1.0	1961-nik/ogi

Undecanoic acid [112-37-8] C₁₁H₂₂O₂ MW = 186.29 426

Table 1. Fit with estimated B coefficient for 5 accepted points. Deviation $\sigma_w = 0.654$.

Coefficient	$\rho = A + BT$
A	1126.26
B	-0.780

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

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m ⁻³	Ref.	T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	$\rho_{\text{exp}} - \rho_{\text{calc}}$ kg · m ⁻³	Ref.
<i>crystal</i>				351.95	828.7 ± 4.0	-23.04	1919-eyk ¹⁾
273.27	1043.1 ± 5.0		1925-gar/ryd	298.15	892.2 ± 4.0	-1.50	1919-eyk ¹⁾
283.15	1037.3 ± 5.0		1925-gar/ryd	303.15	890.7 ± 2.0	0.90	1925-gar/ryd
293.15	994.8 ± 5.0		1925-gar/ryd	308.15	887.1 ± 2.0	1.20	1925-gar/ryd
298.15	990.5 ± 5.0		1925-gar/ryd	323.30	874.1 ± 2.0	0.01	1925-gar/ryd
<i>liquid</i>				303.15	888.9 ± 2.0	-0.90	1925-gar/ryd
318.35	868.2 ± 4.0	-9.75	1919-eyk ¹⁾	353.15	850.5 ± 1.0	-0.30	1942-dor/mcc

¹⁾ Not included in calculation of linear coefficients.

Table 3. Recommended values.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³
293.15	897.6 ± 4.0
298.15	893.7 ± 3.5
310.00	884.5 ± 2.4
320.00	876.7 ± 1.6
330.00	868.9 ± 1.2
340.00	861.1 ± 1.5
350.00	853.3 ± 2.2
360.00	845.5 ± 3.1

4-Butyloctanoic acid [500043-36-7] C₁₂H₂₄O₂ MW = 200.32 427

Table 1. Experimental value with uncertainty.

T K	$\rho_{\text{exp}} \pm 2\sigma_{\text{est}}$ kg · m ⁻³	Ref.
289.15	901.00 ± 2.00	1918-lev/cre

2,4-Dimethyldecanoic acid [97029-71-5] C₁₂H₂₄O₂ MW = 200.32 428

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	889.6 ± 1.0	1959-pet/nik
293.15	889.6 ± 1.0	1960-nik/ogi

3,3-Dimethyldecanoic acid [18000-48-1] C₁₂H₂₄O₂ MW = 200.32 429

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	895.4 ± 1.0	1958-kim/tan

Dodecanoic acid [143-07-7] C₁₂H₂₄O₂ MW = 200.32 430

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

$\sigma_{c,w} = 1.6687$ (combined temperature ranges, weighted), $\sigma_{c,uw} = 1.9232 \cdot 10^{-1}$ (combined temperature ranges, unweighted).

Coefficient	$T = 314.95 \text{ to } 553.15 \text{ K}$ $\rho = A + BT + CT^2 + DT^3 + \dots$
<i>A</i>	$1.08686 \cdot 10^3$
<i>B</i>	$-6.23745 \cdot 10^{-1}$
<i>C</i>	$-1.54722 \cdot 10^{-4}$

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)
<i>crystal</i>				323.40	870.70 ± 2.00	1.74	1925-gar/ryd(X)
308.15	1009.9 ± 5.0		1925-gar/ryd	343.15	857.30 ± 2.00	2.70	1925-hol/gen(X)
313.15	1005.5 ± 5.0		1925-gar/ryd	314.95	874.00 ± 2.00	-1.06	1929-hun/maa(X)
78.15	1099.0 ± 3.0		1930-bil/fis-1	331.15	862.40 ± 2.00	-0.94	1929-hun/maa(X)
286.15	1015.0 ± 3.0		1930-bil/fis-1	339.15	856.50 ± 2.00	-1.02	1929-hun/maa(X)
<i>crystal</i>				349.65	848.50 ± 2.00	-1.35	1929-hun/maa ¹⁾
316.75	875.00 ± 2.00	1.24	1882-kra-1(X)	364.65	837.00 ± 2.00	-1.83	1929-hun/maa(X)
323.15	869.00 ± 2.00	-0.14	1915-dun(X)	395.15	815.20 ± 2.00	-1.02	1929-hun/maa(X)
343.15	854.40 ± 2.00	-0.20	1915-dun(X)	408.65	805.10 ± 2.00	-1.03	1929-hun/maa(X)
363.15	838.60 ± 2.00	-1.34	1915-dun(X)	323.15	870.00 ± 1.00	0.86	1930-bin/for(V)
318.15	876.70 ± 2.00	3.95	1925-gar/ryd ¹⁾	333.15	862.20 ± 1.00	0.32	1930-bin/for(V)
318.25	874.40 ± 2.00	1.72	1925-gar/ryd(X)	353.15	847.80 ± 1.00	0.52	1930-bin/for(V)
323.15	871.30 ± 2.00	2.16	1925-gar/ryd(X)	372.66	832.20 ± 1.00	-0.72	1930-bin/for(V)

¹⁾ Not included in Fig. 1.

cont.

Dodecanoic acid (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)
393.15	817.60 ± 1.00	-0.12	1930-bin/for(∇)	393.15	816.80 ± 0.60	-0.92	1958-cos/bow-1(×)
413.15	803.20 ± 1.00	0.45	1930-bin/for(∇)	413.15	802.40 ± 0.60	-0.35	1958-cos/bow-1(×)
433.15	787.60 ± 1.00	-0.05	1930-bin/for(∇)	433.15	787.90 ± 0.60	0.25	1958-cos/bow-1(×)
353.15	847.70 ± 1.00	0.42	1942-dor/mcc(◆)	453.15	773.00 ± 0.80	0.57	1958-cos/bow-1(×)
348.15	851.60 ± 1.00	0.65	1952-gro/feu(○)	473.15	758.00 ± 0.80	0.91	1958-cos/bow-1(×)
353.15	847.70 ± 1.00	0.42	1956-dag(□)	493.15	742.20 ± 0.80	0.57	1958-cos/bow-1(×)
333.15	863.10 ± 1.00	1.22	1957-ham/lyd(Δ)	513.15	726.50 ± 0.80	0.46	1958-cos/bow-1(×)
343.15	856.20 ± 1.00	1.60	1957-ham/lyd(Δ)	533.15	709.60 ± 0.80	-0.73	1958-cos/bow-1(×)
333.15	859.80 ± 0.60	-2.08	1958-cos/bow-1(×)	553.15	692.60 ± 1.00	-1.89	1958-cos/bow-1(×)
353.15	845.40 ± 0.60	-1.88	1958-cos/bow-1(×)	573.15	675.00 ± 2.00	-3.53	1958-cos/bow-1 ¹⁾
373.15	831.10 ± 0.60	-1.46	1958-cos/bow-1(×)	343.15	854.60 ± 1.00	0.00	1958-met(×)

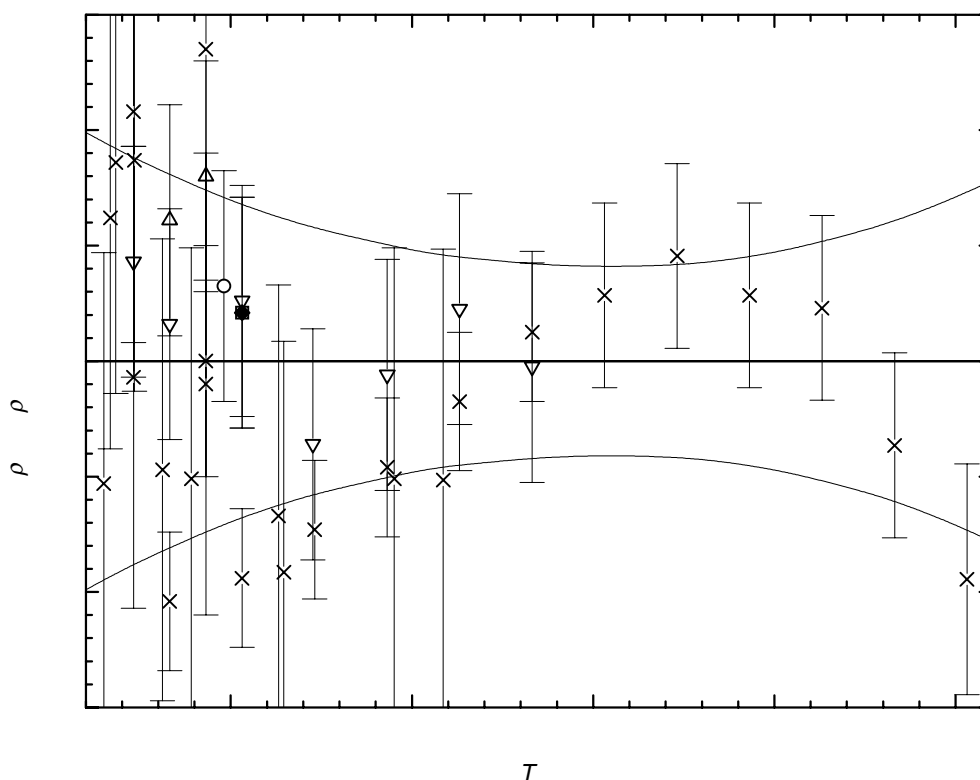
¹⁾ Not included in Fig. 1.**Further references:** [1893-eyk, 1899-sch-1, 1919-eyk, 1919-wae/pes].

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

$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{T}{K}$	$\frac{\rho \pm \sigma_{\text{fit}}}{\text{kg} \cdot \text{m}^{-3}}$
310.00	878.63 ± 1.98	400.00	812.60 ± 0.96	490.00	744.07 ± 0.89
320.00	871.41 ± 1.81	410.00	805.11 ± 0.91	500.00	736.30 ± 0.94
330.00	864.17 ± 1.66	420.00	797.59 ± 0.88	510.00	728.50 ± 1.01
340.00	856.90 ± 1.52	430.00	790.04 ± 0.85	520.00	720.67 ± 1.09
350.00	849.59 ± 1.39	440.00	782.45 ± 0.83	530.00	712.81 ± 1.18
360.00	842.26 ± 1.28	450.00	774.84 ± 0.82	540.00	704.92 ± 1.29
370.00	834.89 ± 1.18	460.00	767.19 ± 0.82	550.00	696.99 ± 1.42
380.00	827.49 ± 1.10	470.00	759.52 ± 0.83	560.00	689.04 ± 1.56
390.00	820.06 ± 1.03	480.00	751.81 ± 0.85		

3-Methylundecanoic acid

[65781-38-6]

C₁₂H₂₄O₂

MW = 200.32

431

Table 1. Fit with estimated B coefficient for 4 accepted points. Deviation $\sigma_w = 0.079$.

Coefficient	$\rho = A + BT$
A	1110.51
B	-0.750

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

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$	$\frac{\rho_{\text{exp}} - \rho_{\text{calc}}}{\text{kg} \cdot \text{m}^{-3}}$	Ref.
293.15	890.6 ± 0.6	-0.05	1948-pro/cas
298.15	886.8 ± 0.6	-0.10	1948-pro/cas
303.15	883.2 ± 0.6	0.05	1948-pro/cas
308.15	879.5 ± 0.6	0.10	1948-pro/cas

Table 3. Recommended values.

$\frac{T}{K}$	$\frac{\rho_{\text{exp}} \pm 2\sigma_{\text{est}}}{\text{kg} \cdot \text{m}^{-3}}$
290.00	893.0 ± 0.8
293.15	890.7 ± 0.7
298.15	886.9 ± 0.6
310.00	878.0 ± 0.7