

# Sound Speeds and Pipe Size Data

Installation Reference



# Sound Speeds and Pipe Size Data

## Installation Reference

BH043C21 EN F

May 2023

[panametrics.com](https://panametrics.com)

Copyright 2023 Baker Hughes company.

This material contains one or more registered trademarks of Baker Hughes Company and its subsidiaries in one or more countries. All third-party product and company names are trademarks of their respective holders.

[no content intended for this page]

**Sound Speed Data**

Table 1: Sound Speeds in Solids ..... 1  
Table 2: Sound Speeds in Fluids ..... 3  
Table 3: Sound Speeds in Water at Selected Temperatures ..... 15

**Pipe Size Data**

Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe .....21  
Table 5: Cast Iron Pipe Data - Standard Classes..... 24  
Table 6: Ductile Iron Pipe Data - Standard Classes ..... 26

[no content intended for this page]

## Sound Speed Data

The values in *Table 1* below are reproduced with permission: shear wave values from the *American Institute of Physics Handbook*, Smithsonian Tables; longitudinal values from the *Nondestructive Testing Handbook*, 2nd edition, Volume 7, *Ultrasonic Testing*.

©1991, The American Society of Nondestructive Testing.

**Table 1: Sound Speeds in Solids**

Material	Sound Speed* Shear Wave (25°C)		Sound Speed* Long. Wave (25°C)	
	m/s	ft/s	mm/μs	in./μs
Steel, 1% Carbon, hardened	3,150	10,335	5.88	0.2315
Carbon Steel	3,230	10,598	5.89	0.2319
Mild Steel	3,235	10,614	5.89	0.2319
Steel, 1% Carbon	3,220	10,565		
302 Stainless Steel	3,120	10,236	5.690	0.224
303 Stainless Steel	3,120	10,236	5.640	0.222
304 Stainless Steel	3,141	10,306	5.920	0.233
304L Stainless Steel	3,070	10,073	5.790	0.228
316 Stainless Steel	3,272	10,735	5.720	0.225
347 Stainless Steel	3,095	10,512	5.720	0.225
Aluminum	3,100	10,171	6.32	0.2488
Aluminum (rolled)	3,040	9,974		
Copper	2,260	7,415	4.66	0.1835
Copper (annealed)	2,325	7,628		
Copper (rolled)	2,270	7,448		
CuNi (70%Cu 30%Ni)	2,540	8,334	5.03	0.1980
CuNi (90%Cu 10%Ni)	2,060	6,759	4.01	0.1579
Brass (Naval)	2,120	6,923	4.43	0.1744
Gold (hard-drawn)	1,200	3,937	3.24	0.1276
Inconel	3,020	9,909	5.82	0.2291
Iron (electrolytic)	3,240	10,630	5.90	0.2323
*Please note these values are to be considered nominal. Solids may be inhomogenous and anisotropic. Actual values depend on exact composition, temperature, and to a lesser extent, on pressure or stress.				

Table 1: Sound Speeds in Solids

Material	Sound Speed* Shear Wave (25°C)		Sound Speed* Long. Wave (25°C)	
	m/s	ft/s	mm/μs	in./μs
Iron (Armco)	3,240	10,630	5.90	0.2323
Ductile Iron	3,000	9,843		
Cast Iron	2,500	8,203	4.55	0.1791
Monel	2,720	8,924	5.35	0.2106
Nickel	2,960	9,712	5.63	0.2217
Tin, rolled	1,670	5,479	3.32	0.1307
Titanium	3,125	10,253	6.10	0.2402
Tungsten, annealed	2,890	9,482	5.18	0.2039
Tungsten, drawn	2,640	8,661		
Tungsten, carbide	3,980	13,058		
Zinc, rolled	2,440	8,005	4.17	0.1642
Glass, Pyrex	3,280	10,761	5.61	0.2209
Glass, heavy silicate flint	2,380	7,808		
Glass, light borate crown	2,840	9,318	5.26	0.2071
Nylon	1,150	3,772	2.40	0.0945
Nylon, 6-6	1,070	3,510		
Polyethylene (HD)			2.31	0.0909
Polyethylene (LD)	540	1,772	1.94	0.0764
PVC, CPVC	1,060	3,477	2.40	0.0945
Acrylic	1,430	4,690	2.73	0.1075
Asbestos Cement			2.20	0.0866
Tar Epoxy			2.00	0.0787
Mortar			2.50	0.0984
Rubber			1.90	0.0748
*Please note these values are to be considered nominal. Solids may be inhomogenous and anisotropic. Actual values depend on exact composition, temperature, and to a lesser extent, on pressure or stress.				



Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Acetic anhydride (22)	(CH <sub>3</sub> CO) <sub>2</sub> O	1.082 (20°C)	1,180	3,871.4	2.5	0.769	8.274
Acetic acid, anhydride (22)	(CH <sub>3</sub> CO) <sub>2</sub> O	1.082 (20°C)	1,180	3,871.4	2.5	0.769	8.274
Acetic acid, nitrile	C <sub>2</sub> H <sub>3</sub> N	0.783	1,290	4,232.3	4.1	0.441	4.745
Acetic acid, ethyl ester (33)	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	0.901	1,085	3,559.7	4.4	0.467	5.025
Acetic acid, methyl ester	C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>	0.934	1,211	3,973.1		0.407	4.379
Acetone	C <sub>3</sub> H <sub>6</sub> O	0.791	1,174	3,851.7	4.5	0.399	4.293
Acetonitrile	C <sub>2</sub> H <sub>3</sub> N	0.783	1,290	4,232.3	4.1	0.441	4.745
Acetylacetone	C <sub>6</sub> H <sub>10</sub> O <sub>2</sub>	0.729	1,399	4,589.9	3.6		
Acetylen dichloride	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	1.26	1,015	3,330.1	3.8	0.400	4.304
Acetylene tetrabromide (47)	C <sub>2</sub> H <sub>2</sub> Br <sub>4</sub>	2.966	1,027	3,369.4			
Acetylene tetrachloride (47)	C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>	1.595	1,147	3,763.1		1.156 (15°C)	12.438 (59°F)
Alcohol	C <sub>2</sub> H <sub>6</sub> O	0.789	1,207	3,960	4.0	1.396	15.02
Alkazene-13	C <sub>15</sub> H <sub>24</sub>	0.86	1,317	4,320.9	3.9		
Alkazene-25	C <sub>10</sub> H <sub>12</sub> Cl <sub>2</sub>	1.20	1,307	4,288.1	3.4		
2-Amino-ethanol	C <sub>2</sub> H <sub>7</sub> NO	1.018	1,724	5,656.2	3.4		
2-Aminotolidine (46)	C <sub>7</sub> H <sub>9</sub> N	0.999 (20°C)	1,618	5,308.4		4.394 (20°C)	47.279 (68°F)
4-Aminotolidine (46)	C <sub>7</sub> H <sub>9</sub> N	0.966 (45°C)	1,480	4,855.6		1.863 (50°C)	20.045 (122°F)
Ammonia (35)	NH <sub>3</sub>	0.771	1,729 (-33°C)	5,672.6 (-27°F)	6.68	0.292 (-33°C)	3.141 (-27°F)
Amorphous Polyolefin		0.98	962.6 (190°C)	3158.2 (374°F)		26,600	286,000
t-Amyl alcohol	C <sub>5</sub> H <sub>12</sub> O	0.81	1,204	3,950.1		4.374	47.064
Aminobenzene (41)	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>	1.022	1,639	5,377.3	4.0	3.63	39.058
Aniline (41)	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>	1.022	1,639	5,377.3	4.0	3.63	39.058
Argon (45)	Ar	1.400 (-188°C)	853 (-188°C)	2798.6 (-306°F)			
Azine	C <sub>6</sub> H <sub>5</sub> N	0.982	1,415	4,642.4	4.1	0.992 (20°C)	10.673 (68°F)
Benzene (29, 40, 41)	C <sub>6</sub> H <sub>6</sub>	0.879	1,306	4,284.8	4.65	0.711	7.65
Benzol (29, 40, 41)	C <sub>6</sub> H <sub>6</sub>	0.879	1,306	4,284.8	4.65	0.711	7.65
Bromine (21)	Br <sub>2</sub>	2.928	889	2,916.7	3.0	0.323	3.475

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Bromo-benzene (46)	C <sub>6</sub> H <sub>5</sub> Br	1.522	1,170 (20°C)	3,838.6 (68°F)		0.693	7.456
1-Bromo-butane (46)	C <sub>4</sub> H <sub>9</sub> Br	1.276 (20°C)	1,019 (20°C)	3,343.2 (68°F)		0.49 (15°C)	5.272 (59°F)
Bromo-ethane (46)	C <sub>2</sub> H <sub>5</sub> Br	1.460 (20°C)	900 (20°C)	2,952.8 (68°F)		0.275	2.959
Bromoform (46, 47)	CHBr <sub>3</sub>	2.89 (20°C)	918	3,011.8	3.1	0.654	7.037
n-Butane (2)	C <sub>4</sub> H <sub>10</sub>	0.601 (0°C)	1,085 (-5°C)	3,559.7 (23°F)	5.8		
2-Butanol	C <sub>4</sub> H <sub>10</sub> O	0.81	1,240	4,068.2	3.3	3.239	34.851
sec-Butylalcohol	C <sub>4</sub> H <sub>10</sub> O	0.81	1,240	4,068.2	3.3	3.239	34.851
n-Butyl bromide (46)	C <sub>4</sub> H <sub>9</sub> Br	1.276 (20°C)	1,019 (20°C)	3,343.2 (68°F)		0.49 (15°C)	5.272 (59°F)
n-Butyl chloride (22, 46)	C <sub>4</sub> H <sub>9</sub> Cl	0.887	1,140	3,740.2	4.57	0.529 (15°C)	5.692 (59°F)
tert Butyl chloride	C <sub>4</sub> H <sub>9</sub> Cl	0.84	984	3,228.3	4.2	0.646	6.95
Butyl oleate	C <sub>22</sub> H <sub>42</sub> O <sub>2</sub>		1,404	4,606.3	3.0		
2, 3 Butylene glycol	C <sub>4</sub> H <sub>10</sub> O <sub>2</sub>	1.019	1,484	4,868.8	1.51		
Cadmium (7)	Cd		2,237.7 (400°C)	7,341.5 (752°F)		1.355cp (440°C)	14.579 (824°F)
Carbinol (40, 41)	CH <sub>4</sub> O	0.791 (20°C)	1,076	3,530.2	2.92	0.695	7.478
Carbitol	C <sub>6</sub> H <sub>14</sub> O <sub>3</sub>	0.988	1,458	4,783.5			
Carbon dioxide (26)	CO <sub>2</sub>	1.101 (-37°C)	839 (-37°C)	2,752.6 (-35°F)	7.71	0.137 (-37°C)	1.474 (-35°F)
Carbon disulphide	CS <sub>2</sub>	1.261 (22°C)	1,149	3,769.7		0.278	2.991
Carbon tetrachloride (33, 35, 47)	CCl <sub>4</sub>	1.595 (20°C)	926	3,038.1	2.48	0.607	6.531
Carbon tetrafluoride (14) (Freon 14)	CF <sub>4</sub>	1.75 (- 150°C)	875.2 (-150°C)	2,871.5 (-238°F)	6.61		
Cetane (23)	C <sub>16</sub> H <sub>34</sub>	0.773 (20°C)	1,338	4,389.8	3.71	4.32	46.483
Chloro-benzene	C <sub>6</sub> H <sub>5</sub> Cl	1.106	1,273	4,176.5	3.6	0.722	7.768
1-Chloro-butane (22, 46)	C <sub>4</sub> H <sub>9</sub> Cl	0.887	1,140	3,740.2	4.57	0.529 (15°C)	5.692 (59°F)
Chloro-diFluoromethane (3) (Freon 22)	CHClF <sub>2</sub>	1.491 (-69°C)	893.9 (-50°C)	2,932.7 (-58°F)	4.79		
Chloroform (47)	CHCl <sub>3</sub>	1.489	979	3,211.9	3.4	0.55	5.918
1-Chloro- propane (47)	C <sub>3</sub> H <sub>7</sub> Cl	0.892	1,058	3,471.1		0.378	4.067

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Chlorotrifluoromethane (5)	CClF <sub>3</sub>		724 (-82°C)	2,375.3 (-116°F)	5.26		
Cinnamaldehyde	C <sub>9</sub> H <sub>8</sub> O	1.112	1,554	5,098.4	3.2		
Cinnamic aldehyde	C <sub>9</sub> H <sub>8</sub> O	1.112	1,554	5,098.4	3.2		
Colamine	C <sub>2</sub> H <sub>7</sub> NO	1.018	1,724	5,656.2	3.4		
o-Cresol (46)	C <sub>7</sub> H <sub>8</sub> O	1.047 (20°C)	1,541 (20°C)	5,055.8 (68°F)		4.29 (40°C)	46.16 (104°F)
m-Cresol (46)	C <sub>7</sub> H <sub>8</sub> O	1.034 (20°C)	1,500 (20°C)	4,921.3 (68°F)		5.979 (40°C)	64.334 (104°F)
Cyanomethane	C <sub>2</sub> H <sub>3</sub> N	0.783	1,290	4,232.3	4.1	0.441	4.745
Cyclohexane (15)	C <sub>6</sub> H <sub>12</sub>	0.779 (20°C)	1,248	4,094.5	5.41	1.31 (17°C)	14.095 (63°F)
Cyclohexanol	C <sub>6</sub> H <sub>12</sub> O	0.962	1,454	4,770.3	3.6	0.071 (17°C)	0.764 (63°F)
Cyclohexanone	C <sub>6</sub> H <sub>10</sub> O	0.948	1,423	4,668.6	4.0		
Decane (46)	C <sub>10</sub> H <sub>22</sub>	0.730	1,252	4,107.6		1.26 (20°C)	13.55 (68°F)
1-Decene (27)	C <sub>10</sub> H <sub>20</sub>	0.746	1,235	4,051.8	4.0		
n-Decylene (27)	C <sub>10</sub> H <sub>20</sub>	0.746	1,235	4,051.8	4.0		
Diacetyl	C <sub>4</sub> H <sub>6</sub> O <sub>2</sub>	0.99	1,236	4,055.1	4.6		
Diamylamine	C <sub>10</sub> H <sub>23</sub> N		1,256	4,120.7	3.9		
1,2 Dibromo-ethane (47)	C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>	2.18	995	3,264.4		0.79 (20°C)	8.5 (68°F)
trans-1,2-Dibromoethene (47)	C <sub>2</sub> H <sub>2</sub> Br <sub>2</sub>	2.231	935	3,067.6			
Dibutyl phthalate	C <sub>8</sub> H <sub>22</sub> O <sub>4</sub>		1,408	4,619.4			
Dichloro-t-butyl alcohol	C <sub>4</sub> H <sub>8</sub> Cl <sub>2</sub> O		1,304	4,278.2	3.8		
2,3 Dichlorodioxane	C <sub>2</sub> H <sub>6</sub> Cl <sub>2</sub> O <sub>2</sub>		1,391	4,563.6	3.7		
Dichlorodifluoromethane (3) (Freon 12)	CCl <sub>2</sub> F <sub>2</sub>	1.516 (40°C)	774.1	2,539.7	4.24		
1,2 Dichloro ethane (47)	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	1.253	1,193	3,914		0.61	6.563
cis1,2-Dichloro-ethene (3, 47)	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	1.284	1,061	3,481			
trans1,2-Dichloro-ethene (3, 47)	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>	1.257	1,010	3,313.6			
Dichloro-fluoromethane (3) (Freon 21)	CHCl <sub>2</sub> F	1.426 (0°C)	891 (0°C)	2,923.2 (32°F)	3.97		
1-2-Dichlorohexafluoro-cyclobutane (47)	C <sub>4</sub> Cl <sub>2</sub> F <sub>6</sub>	1.654	669	2,194.9			

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
1-3-Dichloro-isobutane	C <sub>4</sub> H <sub>8</sub> Cl <sub>2</sub>	1.14	1,220	4,002.6	3.4		
Dichloro methane (3)	CH <sub>2</sub> Cl <sub>2</sub>	1.327	1,070	3,510.5	3.94	0.31	3.335
1,1-Dichloro-1,2,2,2 tetra fluoroethane	CClF <sub>2</sub> -CClF <sub>2</sub>	1.455	665.3 (-10°C)	2,182.7 (14°F)	3.73		
Diethyl ether	C <sub>4</sub> H <sub>10</sub> O	0.713	985	3,231.6	4.87	0.311	3.346
Diethylene glycol	C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>	1.116	1,586	5,203.4	2.4		
Diethylene glycol, monoethyl ether	C <sub>6</sub> H <sub>14</sub> O <sub>3</sub>	0.988	1,458	4,783.5			
Diethylenimine oxide	C <sub>4</sub> H <sub>9</sub> NO	1.00	1,442	4,731	3.8		
1,2-bis(DiFluor amino) butane (43)	C <sub>4</sub> H <sub>8</sub> (NF <sub>2</sub> ) <sub>2</sub>	1.216	1,000	3,280.8			
1,2-bis(DiFluor amino)-2-methylpropane (43)	C <sub>4</sub> H <sub>9</sub> (NF <sub>2</sub> ) <sub>2</sub>	1.213	900	2,952.8			
1,2-bis(DiFluor amino) propane (43)	C <sub>3</sub> H <sub>6</sub> (NF <sub>2</sub> ) <sub>2</sub>	1.265	960	3,149.6			
2,2-bis(DiFluor amino) propane (43)	C <sub>3</sub> H <sub>6</sub> (NF <sub>2</sub> ) <sub>2</sub>	1.254	890	2,920			
2,2-Dihydroxydiethyl ether	C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>	1.116	1,586	5,203.4	2.4		
Dihydroxy ethane	C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>	1.113	1,658	5,439.6	2.1		
1,3-Dimethyl-benzene (46)	C <sub>8</sub> H <sub>10</sub>	0.868 (15°C)	1,343 (20°C)	4,406.2 (68°F)		0.749 (15°C)	8.059 (59°F)
1,2-Dimethyl-benzene (29, 46)	C <sub>8</sub> H <sub>10</sub>	0.897 (20°C)	1,331.5	4,368.4	4.1	0.903 (20°C)	9.716 (68°F)
1,4-Dimethyl-benzene (46)	C <sub>8</sub> H <sub>10</sub>		1,334 (20°C)	4,376.6 (68°F)		0.662	7.123
2,2-Dimethyl-butane (29, 33)	C <sub>6</sub> H <sub>14</sub>	0.649 (20°C)	1,079	3,540			
Dimethyl ketone	C <sub>3</sub> H <sub>6</sub> O	0.791	1,174	3,851.7	4.5	0.399	4.293
Dimethyl pentane (47)	C <sub>7</sub> H <sub>16</sub>	0.674	1,063	3,487.5			
Dimethyl phthalate	C <sub>8</sub> H <sub>10</sub> O <sub>4</sub>	1.2	1,463	4,799.9			
Diiodo-methane	CH <sub>2</sub> I <sub>2</sub>	3.235	980	3,215.2			
Dioxane	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	1.033	1,376	4,514.4			
Dodecane (23)	C <sub>12</sub> H <sub>26</sub>	0.749	1,279	4,196.2	3.85	1.80	19.368
1,2-Ethanediol	C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>	1.113	1,658	5,439.6	2.1		
Ethanenitrile	C <sub>2</sub> H <sub>3</sub> N	0.783	1,290	4,232.3		0.441	4.745
Ethanoic anhydride (22)	(CH <sub>3</sub> CO) <sub>2</sub> O	1.082	1,180	3,871.4		0.769	8.274
Ethanol	C <sub>2</sub> H <sub>6</sub> O	0.789	1,207	3,960	4.0	1.39	14.956

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Ethanol amide	C <sub>2</sub> H <sub>7</sub> NO	1.018	1,724	5,656.2	3.4		
Ethoxyethane	C <sub>4</sub> H <sub>10</sub> O	0.713	985	3,231.6	4.87	0.311	3.346
Ethyl acetate (33)	C <sub>4</sub> H <sub>8</sub> O <sub>2</sub>	0.901	1,085	3,559.7	4.4	0.489	5.263
Ethyl alcohol	C <sub>2</sub> H <sub>6</sub> O	0.789	1,207	3,960	4.0	1.396	15.020
Ethyl benzene (46)	C <sub>8</sub> H <sub>10</sub>	0.867 (20°C)	1,338 (20°C)	4,389.8 (68°F)		0.797 (17°C)	8.575 (63°F)
Ethyl Bromide (46)	C <sub>2</sub> H <sub>5</sub> Br	1.461 (20°C)	900 (20°C)	2,952.8 (68°F)		0.275 (20°C)	2.959 (68°F)
Ethyl iodide (46)	C <sub>2</sub> H <sub>5</sub> I	1.950 (20°C)	876 (20°C)	2874 (68°F)		0.29	3.12
Ether	C <sub>4</sub> H <sub>10</sub> O	0.713	985	3231.6	4.87	0.311	3.346
Ethyl ether	C <sub>4</sub> H <sub>10</sub> O	0.713	985	3231.6	4.87	0.311	3.346
Ethylene bromide (47)	C <sub>2</sub> H <sub>4</sub> Br <sub>2</sub>	2.18	995	3264.4		0.79	8.5
Ethylene chloride (47)	C <sub>2</sub> H <sub>4</sub> Cl <sub>2</sub>	1.253	1,193	3914		0.61	6.563
Ethylene glycol	C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>	1.113	1,658	5439.6	2.1	17.208 (20°C)	185.158 (68°F)
d-Fenochone	C <sub>10</sub> H <sub>16</sub> O	0.947	1,320	4330.7		0.22	2.367
d-2-Fenecanone	C <sub>10</sub> H <sub>16</sub> O	0.947	1,320	4330.7		0.22	2.367
Fluorine	F	0.545 (-143°C)	403 (-143°C)	1322.2 (-225°F)	11.31		
Fluoro-benzene (46)	C <sub>6</sub> H <sub>5</sub> F	1.024 (20°C)	1,189	3900.9		0.584 (20°C)	6.283 (68°F)
Formaldehyde, methyl ester	C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	0.974	1,127	3697.5	4.02		
Formamide	CH <sub>3</sub> NO	1.134 (20°C)	1,622	5321.5	2.2	2.91	31.311
Formic acid, amide	CH <sub>3</sub> NO	1.134 (20°C)	1,622	5321.5		2.91	31.311
Freon R12			774.2	2540			
Furfural	C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	1.157	1,444	4737.5	3.7		
Furfuryl alcohol	C <sub>5</sub> H <sub>6</sub> O <sub>2</sub>	1.135	1,450	4757.2	3.4		
Fural	C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	1.157	1,444	4737.5	3.7		
2-Furaldehyde	C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	1.157	1,444	4737.5	3.7		
2-Furancarbox aldehyde	C <sub>5</sub> H <sub>4</sub> O <sub>2</sub>	1.157	1,444	4737.5	3.7		
2-Furyl-Methanol	C <sub>5</sub> H <sub>6</sub> O <sub>2</sub>	1.135	1,450	4757.2	3.4		
Gallium	Ga	6.095	2,870 (30°C)	9416 (86°F)			
Glycerin	C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>	1.26	1,904	6246.7	2.2	757.1	8,081.836

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Glycerol	C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>	1.26	1,904	6246.7	2.2	757.1	8,081.836
Glycol	C <sub>2</sub> H <sub>6</sub> O <sub>2</sub>	1.113	1658	5439.6	2.1		
50% Glycol / 50% H <sub>2</sub> O			1,578	5,177			
Helium (45)	He <sub>4</sub>	0.125 (-269°C)	183 (-269°C)	600.4 (-452°F)		0.025	.269
Heptane (22, 23)	C <sub>7</sub> H <sub>16</sub>	0.684 (20°C)	1,131	3,710.6	4.25	0.598 (20°C)	6.434 (68°F)
n-Heptane (29, 33)	C <sub>7</sub> H <sub>16</sub>	0.684 (20°C)	1,180	3,871.3	4.0		
Hexachloro- Cyclopentadiene (47)	C <sub>5</sub> Cl <sub>6</sub>	1.7180	1,150	3,773			
Hexadecane (23)	C <sub>16</sub> H <sub>34</sub>	0.773 (20°C)	1,338	4,389.8	3.71	4.32 (20°C)	46.483 (68°F)
Hexalin	C <sub>6</sub> H <sub>12</sub> O	0.962	1,454	4,770.3	3.6	70.69 (17°C)	760.882 (63°F)
Hexane (16, 22, 23)	C <sub>6</sub> H <sub>14</sub>	0.659	1,112	3,648.3	2.71	0.446	4.798
n-Hexane (29, 33)	C <sub>6</sub> H <sub>14</sub>	0.649 (20°C)	1,079	3,540	4.53		
2,5- Hexanedione	C <sub>6</sub> H <sub>10</sub> O <sub>2</sub>	0.729	1,399	4,589.9	3.6		
n-Hexanol	C <sub>6</sub> H <sub>14</sub> O	0.819	1,300	4,265.1	3.8		
Hexahydro benzene (15)	C <sub>6</sub> H <sub>12</sub>	0.779	1,248	4,094.5	5.41	1.31 (17°C)	14.095 (63°F)
Hexahydro phenol	C <sub>6</sub> H <sub>12</sub> O	0.962	1,454	4,770.3	3.6		
Hexamethylene (15)	C <sub>6</sub> H <sub>12</sub>	0.779	1,248	4,094.5	5.41	1.31 (17°C)	14.095 (63°F)
Hydrogen (45)	H <sub>2</sub>	0.071 (-256°C)	1,187 (-256°C)	3,894.4 (-429°F)		0.003 (-256°C)	0.032 (-429°F)
2-Hydroxy- toluene (46)	C <sub>7</sub> H <sub>8</sub> O	1.047 (20°C)	1,541 (20°C)	5,055.8 (68°F)		4.29 (40°C)	46.16 (104°F)
3-Hydroxy- toluene (46)	C <sub>7</sub> H <sub>8</sub> O	1.034 (20°C)	1,500 (20°C)	4,921.3 (68°F)		5.979 (40°C)	64.334 (104°F)
Iodo-benzene (46)	C <sub>6</sub> H <sub>5</sub> I	1.823	1,114 (20°C)	3,654.9 (68°F)		0.954	
Iodo-ethane (46)	C <sub>2</sub> H <sub>5</sub> I	1.950 (20°C)	876 (20°C)	2,874 (68°F)		0.29	3.12
Iodo-methane	CH <sub>3</sub> I	2.28 (20°C)	978	3,208.7		0.211	2.27
Isobutyl acetate (22)	C <sub>6</sub> H <sub>12</sub> O		1,180 (27°C)	3,871.4 (81°F)	4.85		

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Isobutanol	C <sub>4</sub> H <sub>10</sub> O	0.81 (20°C)	1,212	3,976.4			
Iso-Butane			1,219.8	4002			
Isopentane (36)	C <sub>5</sub> H <sub>12</sub>	0.62 (20°C)	980	3,215.2	4.8	0.34	3.658
Isopropanol (46)	C <sub>3</sub> H <sub>8</sub> O	0.785 (20°C)	1,170 (20°C)	3,838.6 (68°F)		2.718	29.245
Isopropyl alcohol (46)	C <sub>3</sub> H <sub>8</sub> O	0.785 (20°C)	1,170 (20°C)	3,838.6 (68°F)		2.718	29.245
Kerosene		0.81	1,324	4,343.8	3.6		
Ketohexa methylene	C <sub>6</sub> H <sub>10</sub> O	0.948	1,423	4,668.6	4.0		
Lithium fluoride (42)	LiF		2,485 (900°C)	8,152.9 (1652°F)	1.29		
Mercury (45)	Hg	13.594	1,449 (24°C)	4,753.9 (75°F)		0.114	1.226
Mesityloxide	C <sub>6</sub> H <sub>16</sub> O	0.85	1,310	4,297.9			
Methane (25, 28, 38, 39)	CH <sub>4</sub>	0.162 (-89°C)	405 (-89°C)	1,328.7 (-128°F)	17.5		
Methanol (40, 41)	CH <sub>4</sub> O	0.791 (20°C)	1,076	3,530.2	2.92	0.695	7.478
Methyl acetate	C <sub>3</sub> H <sub>6</sub> O <sub>2</sub>	0.934	1,211	3,973.1		0.407	4.379
o-Methylaniline (46)	C <sub>7</sub> H <sub>9</sub> N	0.999 (20°C)	1,618	5,308.4		4.394 (20°C)	47.279 (68°F)
4-Methylaniline (46)	C <sub>7</sub> H <sub>9</sub> N	0.966 (45°C)	1,480	4,855.6		1.863 (50°C)	20.095 (122°F)
Methyl alcohol (40, 44)	CH <sub>4</sub> O	0.791 (20°C)	1,076	3,530.2	2.92	0.695	7.478
Methyl benzene (16, 52)	C <sub>7</sub> H <sub>8</sub>	0.867	1,328 (20°C)	4,357 (68°F)	4.27	0.644	7.144
2-Methyl-butane (36)	C <sub>5</sub> H <sub>12</sub>	0.62 (20°C)	980	3,215.2		0.34	3.658
Methyl carbinol	C <sub>2</sub> H <sub>6</sub> O	0.789	1,207	3,960	4.0	1.396	
Methyl-chloroform (47)	C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub>	1.33	985	3,231.6		0.902 (20°C)	9.705 (68°F)
Methyl-cyanide	C <sub>2</sub> H <sub>3</sub> N	0.783	1,290	4,232.3		0.441	4.745
3-Methyl cyclohexanol	C <sub>7</sub> H <sub>14</sub> O	0.92	1,400	4,593.2			
Methylene chloride (3)	CH <sub>2</sub> Cl <sub>2</sub>	1.327	1,070	3,510.5	3.94	0.31	3.335
Methylene iodide	CH <sub>2</sub> I <sub>2</sub>	3.235	980	3,215.2			
Methyl formate (22)	C <sub>2</sub> H <sub>4</sub> O <sub>2</sub>	0.974 (20°C)	1,127	3,697.5	4.02		
Methyl iodide	CH <sub>3</sub> I	2.28 (20°C)	978	3,208.7		0.211	2.27

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
$\alpha$ -Methyl naphthalene	C <sub>11</sub> H <sub>10</sub>	1.090	1,510	4,954.1	3.7		
2-Methylphenol (46)	C <sub>7</sub> H <sub>8</sub> O	1.047 (20°C)	1,541 (20°C)	5,055.8 (68°F)		4.29 (40°C)	46.16 (104°F)
3-Methylphenol (46)	C <sub>7</sub> H <sub>8</sub> O	1.034 (20°C)	1,500 (20°C)	4,921.3 (68°F)		5.979 (40°C)	64.334 (104°F)
Milk, homogenized			1,548	5,080			
Morpholine	C <sub>4</sub> H <sub>9</sub> NO	1.00	1,442	4,731	3.8		
Naphtha		0.76	1,225	4,019			
Natural Gas (37)		0.316 (-103°C)	753 (-103°C)	2,470.5 (-153°F)			
Neon (45)	Ne	1.207 (-246°C)	595 (- 246°C)	1,952.1 (-411°F)			
Nitrobenzene (46)	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>	1.204 (20°C)	1,415 (20°C)	4,642.4 (68°F)		1.514	16.29
Nitrogen (45)	N <sub>2</sub>	0.808 (-199°C)	962 (-199°C)	3,156.2 (-326°F)		0.217 (-199°C)	2.334 (-326°F)
Nitromethane (43)	CH <sub>3</sub> NO <sub>2</sub>	1.135	1,300	4,265.1	4.0	0.549	5.907
Nonane (23)	C <sub>9</sub> H <sub>2</sub> O	0.718 (20°C)	1,207	3,960	4.04	0.99 (20°C)	10.652 (68°F)
1-Nonene (27)	C <sub>9</sub> H <sub>18</sub>	0.736 (20°C)	1,207	3,960	4.0		
Octane (23)	C <sub>8</sub> H <sub>18</sub>	0.703	1,172	3,845.1	4.14	0.73	7.857
n-Octane (29)	C <sub>8</sub> H <sub>18</sub>	0.704 (20°C)	1,212.5	3,978	3.50	0.737	.930)
1-Octene (27)	C <sub>8</sub> H <sub>16</sub>	0.723 (20°C)	1,175.5	3,856.6	4.10		
Oil of Camphor Sassafrassy			1,390	4,560.4	3.8		
Oil, Car (SAE 20a.30)		1.74	870	2,854.3		190	2,045.09 3
Oil, Castor	C <sub>11</sub> H <sub>10</sub> O <sub>10</sub>	0.969	1,477	4,845.8	3.6	0.670	7.209
Oil, Diesel		0.80	1,250	4,101			
Oil, Fuel AA gravity		0.99	1,485	4,872	3.7		
Oil (Lubricating X200)			1,530	5,019.9			
Oil (Olive)		0.912	1,431	4,694.9	2.75	100	1,076.365
Oil (Peanut)		0.936	1,458	4,783.5			
Oil (Sperm)		0.88	1,440	4,724.4			
Oil, 6			1,509 (22°C)	4,951 (72°F)			
2,2-Oxydi ethanol	C <sub>4</sub> H <sub>10</sub> O <sub>3</sub>	1.116	1,586	5,203.4	2.4		



Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Oxygen (45)	O <sub>2</sub>	1.155 (-186°C)	952 (-186°C)	3,123.4 (-303°F)		0.173	1.861
Pentachloroethane (47)	C <sub>2</sub> HCl <sub>5</sub>	1.687	1,082	3,549.9			
Pentalin (47)	C <sub>2</sub> HCl <sub>5</sub>	1.687	1,082	3,549.9			
Pentane (36)	C <sub>5</sub> H <sub>12</sub>	0.626 (20°C)	1,020	3,346.5		0.363	3.905
n-Pentane (47)	C <sub>5</sub> H <sub>12</sub>	0.557	1,006	3,300.5		0.41	4.413
Perchlorocyclopentadiene (47)	C <sub>5</sub> Cl <sub>6</sub>	1.718	1,150	3,773			
Perchloroethylene (47)	C <sub>2</sub> Cl <sub>4</sub>	1.632	1,036	3,399			
Perfluoro-1-Hepten (47)	C <sub>7</sub> F <sub>14</sub>	1.67	583	1,912.7			
Perfluoro-n-Hexane (47)	C <sub>6</sub> F <sub>14</sub>	1.672	508	1,666.7			
Phenyl (29, 40, 41)	C <sub>6</sub> H <sub>6</sub>	0.879	1,306	4,284.8	4.65	0.711	7.65
o-Phenyl acrolein	C <sub>9</sub> H <sub>8</sub> O	1.112	1,554	5,098.4	3.2		
Phenylamine (41)	C <sub>6</sub> H <sub>5</sub> NO <sub>2</sub>	1.022	1,639	5,377.3	4.0	3.63	39.058
Phenyl bromide (46)	C <sub>6</sub> H <sub>5</sub> Br	1.522	1,170 (20°C)	3,838.6 (68°F)		0.693	7.456
Phenyl chloride	C <sub>6</sub> H <sub>5</sub> Cl	1.106	1,273	4,176.5	3.6	0.722	7.768
Phenyl iodide (46)	C <sub>6</sub> H <sub>5</sub> I	1.823	1,114 (20°C)	3,654.9 (68°F)		0.954 (15°C)	10.265 (59°F)
Phenyl methane (16, 52)	C <sub>7</sub> H <sub>8</sub>	0.867 (20°C)	1,328 (20°C)	4,357 (68°F)	4.27	0.644	6.929
3-Phenyl propenal	C <sub>9</sub> H <sub>8</sub> O	1.112	1,554	5,098.4	3.2		
Phthalardione	C <sub>8</sub> H <sub>4</sub> O <sub>3L</sub>		1,125 (152°C)	3,691 (306°F)			
Phthalic acid, anhydride	C <sub>8</sub> H <sub>4</sub> O <sub>3</sub>		1,125 (152°C)	3,691 (306°F)			
Pthalic anhydride	C <sub>8</sub> H <sub>4</sub> O <sub>3</sub>		1,125 (152°C)	3,691 (306°F)			
Pimelic ketone	C <sub>6</sub> H <sub>10</sub> O	0.948	1,423	4,668.6	4.0		
Plexiglas, Lucite, Acrylic			2,651	8,698			
Polyterpene Resin		0.77	1,099.8 (190°C)	3,608.4 (374°F)		39,000	419,500
Potassium bromide (42)	KBr		1,169 (900°C)	3,835.3 (1652°F)	0.71	.715cp (900°C)	7.693 (1652°F)
Potassium fluoride (42)	KF		1,792 (900°C)	5,879.3 (1652°F)	1.03		

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Potassium iodide (42)	KI		985 (900°C)	3,231.6 (1652°F)	0.64		
Potassium nitrate (48)	KNO <sub>3</sub>	1.859 (352°C)	1,740.1 (352°C)	5,709 (666°F)	1.1	1.19 (327°C)	12.804 (621°F)
Propane (2, 13) (-45° to -130°C)	C <sub>3</sub> H <sub>8</sub>	0.585 (-45°C)	1,003 (-45°C)	3,290.6 (-49°F)	5.7		
1,2,3- Propanetriol	C <sub>3</sub> H <sub>8</sub> O <sub>3</sub>	1.26	1,904	6,246.7	2.2	.000757	
1-Propanol (46)	C <sub>3</sub> H <sub>8</sub> O	0.78 (20°C)	1,222 (20°C)	4,009.2 (68°F)			
2-Propanol (46)	C <sub>3</sub> H <sub>8</sub> O	0.785 (20°C)	1,170 (20°C)	3,838.6 (68°F)		2.718	29.245
2-Propanone	C <sub>3</sub> H <sub>6</sub> O	0.791	1,174	3,851.7	4.5	0.399	4.293
Propene (17, 18, 35)	C <sub>3</sub> H <sub>6</sub>	0.563 (-13°C)	963 (-13°C)	3,159.4 (9°F)	6.32		
n-Propyl acetate (22)	C <sub>5</sub> H <sub>10</sub> O <sub>2</sub>		1,280 (2°C)	4,199 (36°F)	4.63		
n-Propyl-alcohol	C <sub>3</sub> H <sub>8</sub> O	0.78 (20°C)	1,222 (20°C)	4,009.2 (68°F)		2.549	27.427
Propylchloride (47)	C <sub>3</sub> H <sub>7</sub> Cl	0.892	1,058	3,471.1		0.378	4.067
Propylene (17, 18, 35)	C <sub>3</sub> H <sub>6</sub>	0.563 (-13°C)	963 (-13°C)	(3159.4) (9°F)	6.32		
Pyridine	C <sub>6</sub> H <sub>5</sub> N	0.982	1,415	4,642.4	4.1	0.992 (20°C)	10.673 (68°F)
Refrigerant 11 (3, 4)	CCl <sub>3</sub> F	1.49	828.3 (0°C)	2,717.5 (32°F)	3.56		
Refrigerant 12 (3)	CCl <sub>2</sub> F <sub>2</sub>	1.516 (-40°C)	774.1 (-40°C)	2,539.7 (-40°F)	4.24		
Refrigerant 14 (14)	CF <sub>4</sub>	1.75 (- 150°C)	875.24 (-150°C)	2,871.5 (-238°F)	6.61		
Refrigerant 21 (3)	CHCl <sub>2</sub> F	1.426 (0°C)	891 (0°C)	2,923.2 (32°F)	3.97		
Refrigerant 22 (3)	CHClF <sub>2</sub>	1.491 (-69°C)	893.9 (50°C)	2,932.7 (122°F)	4.79		
Refrigerant 113 (3)	CCl <sub>2</sub> F-CClF <sub>2</sub>	1.563	783.7 (0°C)	2,571.2 (32°F)	3.44		
Refrigerant 114 (3)	CClF <sub>2</sub> -CClF <sub>2</sub>	1.455	665.3 (-10°C)	2,182.7 (14°F)	3.73		
Refrigerant 115 (3)	C <sub>2</sub> ClF <sub>5</sub>		656.4 (-50°C)	2,153.5 (-58°F)	4.42		
Refrigerant C318 (3)	C <sub>4</sub> F <sub>8</sub>	1.62 (-20°C)	574 (-10°C)	1,883.2 (14°F)	3.88		
Selenium (8)	Se		1,072 (250°C)	3,517.1 (482°F)	0.68		
Silicone (30 cp)		0.993	990	3,248		30	322.8

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Sodium fluoride (42)	NaF	0.877	2,082 (1000°C)	6,830.7 (1832°F)	1.32		
Sodium nitrate (48)	NaNO <sub>3</sub>	1.884 (336°C)	1,763.3 (336°C)	5,785.1 (637°F)	0.74	1.37 (336°C)	14.74 (637°F)
Sodium nitrite (48)	NaNO <sub>2</sub>	1.805 (292°C)	1,876.8 (292°C)	6,157.5 (558°F)			
Solvesso #3		0.877	1,370	4,494.8	3.7		
Spirit of wine	C <sub>2</sub> H <sub>6</sub> O	0.789	1,207	3,960	4.0	1.396	15.02
Sulfur (7, 8, 10)	S		1,177 (250°C)	3,861.5 (482°F)	-1.13		
Sulfuric Acid (1)	H <sub>2</sub> SO <sub>4</sub>	1.841	1,257.6	4,126	1.43	11.16	120.081
Tellurium (7)	Te		991 (450°C)	3,251.3 (842°F)	0.73		
1,1,2,2-Tetra bromo-ethane (47)	C <sub>2</sub> H <sub>2</sub> Br <sub>4</sub>	2.966	1,027	3,369.4			
1,1,2,2-Tetra chloro-ethane (67)	C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>	1.595	1,147	3,763.1		1.156 (15°C)	12.438 (59°F)
Tetrachloro ethane (46)	C <sub>2</sub> H <sub>2</sub> Cl <sub>4</sub>	1.553 (20°C)	1,170 (20°C)	3,838.6 (68°F)		1.19	12.804
Tetrachloro-ethene (47)	C <sub>2</sub> Cl <sub>4</sub>	1.632	1,036	3,399			
Tetrachloro-Methane (33, 47)	CCl <sub>4</sub>	1.595 (20°C)	926	3,038.1		0.607	6.531
Tetradecane (46)	C <sub>14</sub> H <sub>30</sub>	0.763 (20°C)	1,331 (20°C)	4,366.8 (68°F)		2.86 (20°C)	30.773 (68°F)
Tetraethylene glycol	C <sub>8</sub> H <sub>18</sub> O <sub>5</sub>	1.123	1,586	5,203.4	3.0		
Tetrafluoro-methane (14) (Freon 14)	CF <sub>4</sub>	1.75 (- 150°C)	875.24 (-150°C)	2,871.5 (-238°F)	6.61		
Tetrahydro-1,4-isoxazine	C <sub>4</sub> H <sub>9</sub> NO	1.000	1,442	4,731	3.8		
Toluene (16, 52)	C <sub>7</sub> H <sub>8</sub>	0.867 (20°C)	1,328 (20°C)	4,357 (68°F)	4.27	0.644	6.929
o-Toluidine (46)	C <sub>7</sub> H <sub>9</sub> N	0.999 (20°C)	1,618	5,308.4		4.394 (20°C)	47.279 (68°F)
p-Toluidine (46)	C <sub>7</sub> H <sub>9</sub> N	0.966 (45°C)	1,480	4,855.6		1.863 (50°C)	20.053 (122°F)
Toluol	C <sub>7</sub> H <sub>8</sub>	0.866	1,308	4,291.3	4.2	0.58	6.24
Tribromo-methane (46, 47)	CHBr <sub>3</sub>	2.89 (20°C)	918	3,011.8		0.654	7.037
1,1,1-Trichloro-ethane (47)	C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub>	1.33	985	3,231.6		0.902 (20°C)	9.705 (68°F)
Trichloro-ethene (47)	C <sub>2</sub> HCl <sub>3</sub>	1.464	1,028	3,372.7			

Table 2: Sound Speeds in Fluids

Substance	Chemical Formula	Specific Gravity	All data given at 25°C (77°F) unless otherwise noted.				
			Sound Speed		$\Delta v/^\circ\text{C}$	Kinematic Viscosity $\times 10^{-6}$	
			m/s	ft/s	m/s/°C	m <sup>2</sup> /s	ft <sup>2</sup> /s
Trichloro-fluoromethane (3) (Freon 11)	CCl <sub>3</sub> F	1.49	828.3 (0°C)	2,717.5 (32°F)	3.56		
Trichloro-methane (47)	CHCl <sub>3</sub>	1.489	979	3,211.9	3.4	0.55	5.918
1,1,2-Trichloro-1,2,2-Trifluoro-Ethane	CCl <sub>2</sub> F-CClF <sub>2</sub>	1.563	783.7 (0°C)	2,571.2 (32°F)			
Triethyl-amine (33)	C <sub>6</sub> H <sub>15</sub> N	0.726	1,123	3,684.4	4.47		
Triethylene glycol	C <sub>6</sub> H <sub>14</sub> O <sub>4</sub>	1.123	1,608	5,275.6	3.8		
1,1,1-Trifluoro-2-Chloro-2-Bromo-Ethane	C <sub>2</sub> HClBrF <sub>3</sub>	1.869	693	2,273.6			
1,2,2-Trifluoro trichloro-ethane (Freon 113)	CCl <sub>2</sub> F-CClF <sub>2</sub>	1.563	783.7 (0°C)	2,571.2 (32°F)	3.44		
d-1,3,3-Tri methylnor camphor	C <sub>10</sub> H <sub>16</sub> O	0.947	1,320	4,330.7		0.22	2.367
Trinitrotoluene (43)	C <sub>7</sub> H <sub>5</sub> (NO <sub>2</sub> ) <sub>3</sub>	1.64	1,610 (81°C)	5,282.2 (178°F)			
Turpentine		0.88	1,255	4,117.5		1.4	15.064
Unisis 800		0.87	1,346	4,416			
Water, distilled (49, 50)	H <sub>2</sub> O	0.996	1,498	4,914.7	-2.4	1.00	10.76
Water, heavy	D <sup>2</sup> O		1,400	4,593			
Water, sea		1.025	1,531	5,023	-2.4	1.00	10.76
Wood Alcohol (40, 41)	CH <sub>4</sub> O	0.791 (20°C)	1,076	3,530.2	2.92	0.695	7.478
Xenon (45)	Xe		630 (-109°C)	2,067 (-164°F)			
m-Xylene (46)	C <sub>8</sub> H <sub>10</sub>	0.868 (15°C)	1,343 (20°C)	4,406.2 (68°F)		0.749 (15°C)	8.059 (59°F)
o-Xylene (29, 46)	C <sub>8</sub> H <sub>10</sub>	0.897 (20°C)	1,331.5	4,368.4	4.1	0.903 (20°C)	9.716 (68°F)
<b>Note:</b> - Xylene (46) applications, the values of sound speed data for pure liquids can generally be obtained from Panametrics. Requests for sources must identify temperature and pressure range, and details of liquid composition.			1,334 (20°C)	4,376.6 (68°F)		0.662	7.8
Xylene hexafluoride	C <sub>8</sub> H <sub>4</sub> F <sub>6</sub>	1.37	879	2,883.9		0.613	6.595
Zinc (7)	Zn		3,298 (450°C)	10,820.2 (842°F)			

The values in Table 3 below are reproduced with permission from American Institute of Physics Handbook, ©McGraw-Hill Book Co.

**Table 3: Sound Speeds in Water at Selected Temperatures**

Water Temperature		Sound Speed	
°C	°F	m/s	ft/s
0	32.0	1,402	4,600
1	33.8	1,407	4,616
2	35.6	1,412	4,633
3	37.4	1,417	4,649
4	39.2	1,421	4,662
5	41.0	1,426	4,679
6	42.8	1,430	4,692
7	44.6	1,434	4,705
8	46.4	1,439	4,721
9	48.2	1,443	4,734
10	50.0	1,447	4,748
11	51.8	1,451	4,761
12	53.6	1,455	4,774
13	55.4	1,458	4,784
14	57.2	1,462	4,797
15	59.0	1,465	4,807
16	60.8	1,469	4,820
17	62.6	1,472	4,830
18	64.4	1,476	4,843
19	66.2	1,479	4,853
20	68.0	1,482	4,862
21	69.8	1,485	4,872
22	71.6	1,488	4,882
23	73.4	1,491	4,892
24	75.2	1,493	4,899
25	77.0	1,496	4,908
26	78.8	1,499	4,918
27	80.6	1,501	4,925
28	82.4	1,504	4,935
29	84.2	1,506	4,941
30	86.0	1,509	4,951
31	87.8	1,511	4,958
32	89.6	1,513	4,964
33	91.4	1,515	4,971
34	93.2	1,517	4,977
35	95.0	1,519	4,984
36	96.8	1,521	4,990
37	98.6	1,523	4,997
38	100.4	1,525	5,004
39	102.2	1,527	5,010
40	104.0	1,528	5,013
41	105.8	1,530	5,020
42	107.6	1,532	5,026
43	109.4	1,534	5,033
44	111.2	1,535	5,036
45	113.0	1,536	5,040
46	114.8	1,538	5,046
47	116.6	1,539	5,049
48	118.4	1,540	5,053
49	120.2	1,541	5,056
50	122.0	1,543	5,063
51	123.8	1,543	5,063
52	125.6	1,544	5,066
53	127.4	1,545	5,069
54	129.2	1,546	5,072
55	131.0	1,547	5,076
56	132.8	1,548	5,079
57	134.6	1,548	5,079
58	136.4	1,549	5,082
59	138.2	1,550	5,086
60	140.0	1,550	5,086
61	141.8	1,551	5,089
62	143.6	1,552	5,092
63	145.4	1,552	5,092
64	147.2	1,553	5,095
65	149.0	1,553	5,095
66	150.8	1,553	5,095
67	152.6	1,554	5,099
96	204.8	1,546	5,072
97	206.6	1,545	5,069
98	208.4	1,544	5,066
99	210.2	1,543	5,063
100	212.0	1,543	5,063
104	220.0	1,538	5,046
110	230.0	1,532	5,026

**Table 3: Sound Speeds in Water at Selected Temperatures**

Water Temperature		Sound Speed		Water Temperature		Sound Speed	
°C	°F	m/s	ft/s	°C	°F	m/s	ft/s
68	154.4	1,554	5,099	116	240.0	1,524	5,000
69	156.2	1,554	5,099	121	250.0	1,526	5,007
70	158.0	1,554	5,099	127	260.0	1,507	4,944
71	159.8	1,554	5,099	132	270.0	1,497	4,912
72	161.6	1,555	5,102	138	280.0	1,487	4,879
73	163.4	1,555	5,102	143	290.0	1,476	4,843
74	165.2	1,555	5,102	149	300.0	1,465	4,807
75	167.0	1,555	5,102	154	310.0	1,453	4,767
76	168.8	1,555	5,102	160	320.0	1,440	4,725
77	170.6	1,554	5,099	166	330.0	1,426	4,679
78	172.4	1,554	5,099	171	340.0	1,412	4,633
79	174.2	1,554	5,099	177	350.0	1,398	4,587
80	176.0	1,554	5,099	182	360.0	1,383	4,538
81	177.8	1,554	5,099	188	370.0	1,368	4,488
82	179.6	1,553	5,095	193	380.0	1,353	4,439
83	181.4	1,553	5,095	199	390.0	1,337	4,387
84	183.2	1,553	5,095	204	400.0	1,320	4,331
85	185.0	1,552	5,092	210	410.0	1,302	4,272
86	186.8	1,552	5,092	216	420.0	1,283	4,210
87	188.6	1,552	5,092	221	430.0	1,264	4,147
88	190.4	1,551	5,089	227	440.0	1,244	4,082
89	192.2	1,551	5,089	232	450.0	1,220	4,003
90	194.0	1,550	5,086	238	460.0	1,200	3,937
91	195.8	1,549	5,082	243	470.0	1,180	3,872
92	197.6	1,549	5,082	249	480.0	1,160	3,806
93	199.4	1,548	5,079	254	490.0	1,140	3,740
94	201.2	1,547	5,076	260	500.0	1,110	3,642
95	203.0	1,547	5,076				

## Pipe Size Data

In Table 4 below:

**A** is ANSI B 36.10 Steel pipe nominal wall thickness designation.

**B** is ANSI B 36.10 Steel pipe schedule numbers.

**C** is ANSI B 36.19 Stainless steel pipe schedule numbers.

**Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe**

Nominal Pipe Size (in.)	Outside Diameter (in.)	Wall Thickness (in.)	A Carbon Steel Wall Thickness Desig.	B Carbon Steel Schedule Number	C Stainless Steel Schedule Number		
1/8	0.405	0.049			10S		
		0.068	STD	40	40S		
		0.095	XS	80	80S		
1/4	0.540	0.065			10S		
		0.088	STD	40	40S		
		0.119	XS	80	80S		
3/8	0.675	0.065			10S		
		0.091	STD	40	40S		
		0.126	XS	80	80S		
1/2	0.840	0.065			5S		
		0.083			10S		
		0.109	STD	40	40S		
		0.147	XS	80	80S		
		0.187		160			
3/4	1.050	0.065			5S		
		0.083			10S		
		0.113	STD	40	40S		
		0.154	XS	80	80S		
		0.218		160			
		0.308	XXS				
1	1.315	0.065			5S		
		0.109			10S		
		0.133	STD	40	40S		
		0.179	XS	80	80S		
		0.250		160			
		0.358	XXS				
2	2.375	0.065			5S		
		0.109			10S		
		0.154	STD	40	40S		
		0.218	XS	80	80S		
		0.344		160			
		0.436	XXS				
		2 1/2	2.875	0.083	-	-	5S
				0.120	-	-	10S
				0.203	STD	40	40S
				0.276	XS	80	80S
0.375	-			160	-		
0.552	XXS			-	-		
3	3.500	0.083	-	-	5S		
		0.120	-	-	10S		
		0.216	STD	40	40S		
		0.300	XS	80	80S		
		0.438	-	160	-		
3 1/2	4.000	0.083			5S		
		0.120			10S		
		0.226	STD	40	40S		
		0.318	XS	80	80S		
		0.636	XXS		-		
		4	4.500	0.083			5S
0.120					10S		
0.237	STD			40	40S		
0.337	XS			80	80S		
0.438				120			

**Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe**

Nominal Pipe Size (in.)	Outside Diameter (in.)	Wall Thickness (in.)	A Carbon Steel Wall Thickness Desig.	B Carbon Steel Schedule Number	C Stainless Steel Schedule Number
1 1/4	1.660	0.065			5S
		0.109			10S
		0.140	STD	40	40S
		0.191	XS	80	80S
		0.250		160	
		0.382	XXS		
1 1/2	1.900	0.065			5S
		0.109			10S
		0.145	STD	40	40S
		0.200	XS	80	80S
		0.281		160	
		0.400	XXS		
6	6.625	0.109			5S
		0.134			10S
		0.280	STD	40	40S
		0.432	XS	80	80S
		0.562		120	
		0.719		160	
		0.864	XXS		
		8	8.625	0.109	
0.148					10S
0.250				20	
0.277				30	
0.322	STD			40	40S
0.406				60	
0.500	XS			80	80S
0.594				100	
0.719				120	
0.812				140	
0.875	XXS				
0.906				160	
6	6.625	0.109			5S
		0.134			10S
		0.280	STD	40	40S
		0.432	XS	80	80S

  

Nominal Pipe Size (in.)	Outside Diameter (in.)	Wall Thickness (in.)	A Carbon Steel Wall Thickness Desig.	B Carbon Steel Schedule Number	C Stainless Steel Schedule Number
4	4.500	0.531			
		0.674	XXS	160	
5	5.536	0.109			5S
		0.134			10S
		0.258	STD	40	40S
		0.375	XS	80	80S
		0.500		120	
		0.625		160	
		0.750	XXS		
14	14.000	0.156			5S
		0.188			10S
		0.250		10	
		0.312		20	
		0.375	STD	30	
		0.438		40	
		0.500	XS		
		0.594	-	60	
		0.625	XXS	-	
		0.750		80	
		0.938		100	
		1.094		120	
16	16.000	1.250		140	
		1.406		160	
		0.165			5S
		0.188			10S
		0.250		10	-
		0.312		20	
		0.375	STD	30	
		0.500	XS	40	
		0.656		60	
		0.844		80	
		1.031		100	
		1.219		120	
1.439		140			
1.594		160			



**Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe**

Nominal Pipe Size (in.)	Outside Diameter (in.)	Wall Thickness (in.)	A Carbon Steel Wall Thickness Desig.	B Carbon Steel Schedule Number	C Stainless Steel Schedule Number		
10	10.750	0.134			5S		
		0.165			10S		
		0.250		20			
		0.307		30			
		0.365	STD	40	40S		
		0.500	XS	60	80S		
		0.594		80			
		0.719		100			
		0.844		120			
		1.000	XXS	140			
12	12.750	0.156			5S		
		0.180			10S		
		0.250		20			
		0.330		30			
		0.375	STD		40S		
		0.406		40			
		0.500	XS		80S		
		0.562		60			
		0.688		80			
		0.844		100			
		1.000	XXS	120			
		1.125		140			
		1.312		160			
20	20.000	0.188			5S		
		0.218			10S		
		0.250		10			
		0.375	STD	20			
		0.500	XS	30			
		0.594		40			
		0.812		60			
		1.031		80			
		1.281		100			
		1.500		120			
		1.750		140			
		1.969		160			
		18	18.000	0.165			5S
				0.188			10S
0.250				10			
0.312				20			
0.375	STD						
0.438				30			
0.500	XS						
0.562				40			
0.750				60			
0.938				80			
1.156				100			
1.375				120			
1.562				140			
1.781				160			
30	30.000			0.250			5S
		0.312		10	10S		
		0.375	STD				
		0.500	XS	20			
		0.625		30			
		0.750		40			
32	32.000	0.312		10	32		
		0.375	STD				
		0.500	XS	20			
		0.625		30			
34	34.000	0.344		10	34		
		0.375	STD	-			
		0.500	XS	20			
		0.625		30			
		0.688		40			
36	36.000	0.312		10	36		
		0.375	STD				
		0.500	XS	20			
		0.625		30			
		0.750		40			

**Table 4: Standard ANSI Data for Carbon Steel and Stainless Steel Pipe**

Nominal Pipe Size (in.)	Outside Diameter (in.)	Wall Thickness (in.)	A	B	C	Nominal Pipe Size (in.)	Outside Diameter (in.)	Wall Thickness (in.)	A	B	C	
			Carbon Steel	Carbon Steel	Stainless Steel				Carbon Steel	Carbon Steel	Stainless Steel	
			Wall Thickness Desig.	Schedule Number	Schedule Number				Wall Thickness Desig.	Schedule Number	Schedule Number	
22	22.000	0.188			5S	26	26.000	0.312		10	26	
		0.218			10S			0.375	STD	-		
		0.250		10				0.500	XS	20		
		0.375	STD	20		28	28.000	0.312		10	28	
		0.500	XS	30				0.375	STD			
		0.875		60				0.500	XS	20		
		1.125		80		42	42.000	0.625		30	42	
		1.375		100				0.375	STD			
		1.625		120				0.500	XS	20		
		1.875		140				0.625		30		
2.125		160		48	48.000	0.750		40	48			
0.218			5S			0.375	STD					
24	24.000	0.250		10	10S	48	48.000	0.500	XS		48	
		0.375	STD	20								
		0.500	XS									
		0.562		30								
		0.688		40								
		0.969		60								
		1.219		80								
		1.531		100								
		1.812										

**Table 5: Cast Iron Pipe Data - Standard Classes**

Nominal Pipe Size (in.)	Class A		Class B		Class C		Class D	
	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)
3	3.80	0.39	3.96	0.42	3.96	0.45	3.96	0.48
4	4.80	0.42	5.00	0.45	5.00	0.40	5.00	0.52
6	6.90	0.44	7.10	0.48	7.10	0.51	7.10	0.55
8	9.05	0.46	9.05	0.51	9.30	0.56	9.30	0.60
10	11.10	0.50	11.10	0.57	11.40	0.62	11.40	0.68
12	13.20	0.54	13.20	0.62	13.50	0.68	13.50	0.75
14	15.30	0.57	15.30	0.66	15.65	0.74	15.65	0.82

Table 5: Cast Iron Pipe Data – Standard Classes

Nominal Pipe Size (in.)	Class A		Class B		Class C		Class D	
	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)
16	7.40	0.60	17.40	0.70	17.80	0.80	17.80	0.89
18	19.50	0.64	19.50	0.75	19.92	0.87	19.92	0.96
20	21.60	0.67	21.60	0.80	22.06	0.92	22.06	1.03
24	25.80	0.76	25.80	0.89	26.32	1.05	26.32	1.16
30	31.74	0.88	32.00	1.03	32.40	1.20	32.74	1.37
32	37.96	0.99	38.30	1.15	38.70	1.36	39.16	1.58
42	44.20	1.10	44.50	1.28	45.10	1.54	45.58	1.78
48	50.50	1.26	50.80	1.42	51.40	1.71	51.98	1.99
54	56.66	1.35	57.10	1.55	57.80	1.90	58.40	2.23
60	62.80	1.39	63.40	1.67	64.20	2.00	64.82	2.38
72	75.34	1.62	76.00	1.95	76.88	2.39		
84	87.54	1.72	88.54	2.22				
Nominal Pipe Size (in.)	Class E		Class F		Class G		Class H	
	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)	Outside Diameter (in.)	Wall Thickness (in.)
3								
4								
6	7.22	0.58	7.22	0.61	7.38	0.65	7.38	0.69
8	9.42	0.66	9.42	0.66	9.60	0.75	9.60	0.80
10	11.60	0.74	11.60	0.80	11.84	0.86	11.84	0.92
12	13.78	0.82	13.78	0.89	14.08	0.97	14.08	1.04
14	15.98	0.90	15.98	0.99	16.32	1.07	16.32	1.16
16	18.16	0.90	18.16	1.08	18.54	1.18	18.54	1.27
18	20.34	1.07	20.34	1.17	20.78	1.28	20.78	1.39
20	22.54	1.15	22.54	1.27	23.02	1.39	23.02	1.51
24	26.90	1.31	26.90	1.45	27.76	1.75	27.76	1.88
30	33.10	1.55	33.46	1.73				
32	39.60	1.80	40.04	2.02				
42								
48								
54								
60								
72								
84								

Table 6: Ductile Iron Pipe Data – Standard Classes

Nominal Pipe Size (in.)	Outside Diameter (in.)	Pipe Wall Thickness (in.)						
		Class 50	Class 51	Class 52	Class 53	Class 54	Class 55	Class 56
3	3.96		0.25	0.28	0.31	0.43	0.37	0.40
4	4.80		0.26	0.29	0.32	0.35	0.38	0.41
6	6.90	0.25	0.28	0.31	0.34	0.37	0.40	0.43
8	9.05	0.27	0.30	0.33	0.36	0.39	0.42	0.45
10	11.10	0.29	0.32	0.35	0.38	0.44	0.47	
12	13.20	0.31	0.34	0.37	0.40	0.43	0.46	0.49
14	15.30	0.33	0.36	0.39	0.42	0.45	0.48	0.51
16	17.40	0.34	0.37	0.40	0.43	0.46	0.49	0.52
18	19.50	0.35	0.38	0.41	0.44	0.47	0.50	0.53
20	21.60	0.36	0.39	0.42	0.45	0.48	0.51	0.54
24	25.80	0.38	0.41	0.44	0.47	0.50	0.53	0.56
30	32.00				0.51	0.55	0.59	0.63
36	38.30				0.58	0.63	0.68	0.73
42	44.50				0.65	0.71	0.77	0.83
48	50.80				0.72	0.79	0.86	0.93
54	57.10				0.81	0.89	0.97	1.05



## Customer Support Centers

### U.S.A.

The Boston Center  
1100 Technology Park Drive  
Billerica, MA 01821

U.S.A.

Tel: 800 833 9438 (toll-free)  
978 437 1000

E-mail: [panametricstechsupport@bakerhughes.com](mailto:panametricstechsupport@bakerhughes.com)

### Ireland

Sensing House  
Shannon Free Zone East  
Shannon, County Clare  
Ireland

Tel: +35 361 470200

E-mail: [panametricstechsupport@bakerhughes.com](mailto:panametricstechsupport@bakerhughes.com)

Copyright 2023 Baker Hughes company.  
This material contains one or more registered trademarks of Baker Hughes Company and its subsidiaries in one or more countries. All third-party product and company names are trademarks of their respective holders.

BH043C21 EN F (05/2023)

**Baker Hughes** ™