# The ABB Guide to

# Essential Field Data

The ABB Field Products easy reference to useful data for every day field use: Conversion Tables for Temperature, Viscosity and Pressure, with Viscosity and Density Data for some common gases.

## Temperature Conversion Tables

**TO CONVERT YOUR TEMPERATURE:**
1. Find its numerical value in the centre column e.g. 15.
2. If your temperature value is 15°F, look in the Left Hand (°C) column for the equivalent Centigrade value = –9.4°C.
3. Alternatively, if your temperature value is 15°C, look in the Right Hand (°F) column for the equivalent Fahrenheit value = 59.0°F.

**N.B.** For larger values (above 100) use the Interpolation Values table (far right) to add in the unit values for 1 – 9.

| °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F | °C | . | °F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -273.15 | -459.67 | | -107 | -160 | -256 | - 9.4 | 15 | 59.0 | 7.8 | 46 | 114.8 | 25.0 | 77 | 170.6 | 82 | 180 | 356 | 249 | 480 | 896 | 421 | 790 | 1454 | 593 | 1100 | 2012 | 766 | 1410 | 2570 | 938 | 1720 | 3128 | 1110 | 2030 | 3686 |
| -268 | -450 | | -101 | -150 | -238 | - 8.9 | 16 | 60.8 | 8.3 | 47 | 116.6 | 25.6 | 78 | 172.4 | 88 | 190 | 374 | 254 | 490 | 914 | 427 | 800 | 1472 | 599 | 1110 | 2030 | 771 | 1420 | 2588 | 943 | 1730 | 3146 | 1116 | 2040 | 3704 |
| -262 | -440 | | - 95.6 | -140 | -220 | - 8.3 | 17 | 62.6 | 8.9 | 48 | 118.4 | 26.1 | 79 | 174.2 | 93 | 200 | 392 | 260 | 500 | 932 | 432 | 810 | 1490 | 604 | 1120 | 2048 | 777 | 1430 | 2606 | 949 | 1740 | 3164 | 1121 | 2050 | 3722 |
| -257 | -430 | | - 90.0 | -130 | -202 | - 7.8 | 18 | 64.4 | 9.4 | 49 | 120.2 | 26.7 | 80 | 176.0 | 99 | 210 | 410 | 266 | 510 | 950 | 438 | 820 | 1508 | 610 | 1130 | 2066 | 782 | 1440 | 2624 | 954 | 1750 | 3182 | 1127 | 2060 | 3740 |
| -251 | -420 | | - 84.4 | -120 | -184 | - 7.2 | 19 | 66.2 | 10.0 | 50 | 122.0 | 27.2 | 81 | 177.8 | 100 | 212 | 413 | 271 | 520 | 968 | 443 | 830 | 1526 | 616 | 1140 | 2084 | 788 | 1450 | 2642 | 960 | 1760 | 3200 | 1132 | 2070 | 3758 |
| -246 | -410 | | - 78.9 | -110 | -166 | - 6.7 | 20 | 68.0 | 10.6 | 51 | 123.8 | 27.8 | 82 | 179.6 | 104 | 220 | 428 | 277 | 530 | 986 | 449 | 840 | 1544 | 621 | 1150 | 2102 | 793 | 1460 | 2660 | 966 | 1770 | 3218 | 1138 | 2080 | 3776 |
| -240 | -400 | | - 73.32 | -100 | -148 | - 6.1 | 21 | 69.8 | 11.1 | 52 | 125.6 | 28.3 | 83 | 181.4 | 110 | 230 | 446 | 282 | 540 | 1004 | 454 | 850 | 1562 | 627 | 1160 | 2120 | 799 | 1470 | 2678 | 971 | 1780 | 3236 | 1143 | 2090 | 3794 |
| -234 | -390 | | - 67.8 | - 90 | -130 | - 5.6 | 22 | 71.6 | 11.7 | 53 | 127.4 | 28.9 | 84 | 183.2 | 116 | 240 | 464 | 288 | 550 | 1022 | 460 | 860 | 1580 | 632 | 1170 | 2138 | 804 | 1480 | 2696 | 977 | 1790 | 3254 | 1149 | 2100 | 3812 |
| -229 | -380 | | - 62.2 | - 80 | -112 | - 5.0 | 23 | 73.4 | 12.2 | 54 | 129.2 | 29.4 | 85 | 185.0 | 121 | 250 | 482 | 293 | 560 | 1040 | 466 | 870 | 1598 | 638 | 1180 | 2156 | 810 | 1490 | 2714 | 982 | 1800 | 3272 | 1154 | 2110 | 3830 |
| -223 | -370 | | - 56.7 | - 70 | - 94 | - 4.4 | 24 | 75.2 | 12.8 | 55 | 131.0 | 30.0 | 86 | 186.8 | 127 | 260 | 500 | 299 | 570 | 1058 | 471 | 880 | 1616 | 643 | 1190 | 2174 | 816 | 1500 | 2732 | 988 | 1810 | 3290 | 1160 | 2120 | 3848 |
| -218 | -360 | | - 51.1 | - 60 | - 76 | - 3.9 | 25 | 77.0 | 13.3 | 56 | 132.8 | 30.6 | 87 | 188.6 | 132 | 270 | 518 | 304 | 580 | 1076 | 477 | 890 | 1634 | 649 | 1200 | 2192 | 821 | 1510 | 2750 | 993 | 1820 | 3308 | 1166 | 2130 | 3666 |
| -212 | -350 | | - 45.6 | - 50 | - 58 | - 3.3 | 26 | 78.8 | 13.9 | 57 | 134.6 | 31.1 | 88 | 190.4 | 138 | 280 | 536 | 310 | 590 | 1094 | 482 | 900 | 1652 | 654 | 1210 | 2210 | 827 | 1520 | 2768 | 999 | 1830 | 3326 | 1171 | 2140 | 3884 |
| -207 | -340 | | - 40.0 | - 40 | - 40 | - 2.8 | 27 | 80.6 | 14.4 | 58 | 136.4 | 31.7 | 89 | 192.2 | 143 | 290 | 554 | 316 | 600 | 1112 | 488 | 910 | 1670 | 660 | 1220 | 2228 | 832 | 1530 | 2786 | 1004 | 1840 | 3344 | 1177 | 2150 | 3902 |
| -201 | -330 | | - 34.4 | - 30 | - 22 | - 2.2 | 28 | 82.4 | 15.0 | 59 | 138.2 | 32.2 | 90 | 194.0 | 149 | 300 | 572 | 321 | 610 | 1130 | 493 | 920 | 1688 | 666 | 1230 | 2246 | 838 | 1540 | 2804 | 1010 | 1850 | 3362 | 1182 | 2160 | 3920 |
| -196 | -320 | | - 28.9 | - 20 | - 4 | - 1.7 | 29 | 84.2 | 15.6 | 60 | 140.0 | 32.8 | 91 | 195.8 | 154 | 310 | 590 | 327 | 620 | 1148 | 499 | 930 | 1705 | 671 | 1240 | 2264 | 843 | 1550 | 2822 | 1016 | 1860 | 3380 | 1188 | 2170 | 3938 |
| -190 | -310 | | - 23.3 | - 10 | 14 | - 1.1 | 30 | 86.0 | 16.1 | 61 | 141.8 | 33.3 | 92 | 197.6 | 160 | 320 | 608 | 332 | 630 | 1166 | 504 | 940 | 1724 | 677 | 1250 | 2282 | 849 | 1560 | 2840 | 1021 | 1870 | 3398 | 1193 | 2180 | 3956 |
| -184 | -300 | | - 17.8 | 0 | 32 | - 0.6 | 31 | 87.8 | 16.7 | 62 | 143.6 | 33.9 | 93 | 199.4 | 166 | 330 | 626 | 338 | 640 | 1184 | 510 | 950 | 1742 | 682 | 1260 | 2300 | 854 | 1570 | 2858 | 1027 | 1880 | 3416 | 1199 | 2190 | 3974 |
| -179 | -290 | | - 17.2 | 1 | 33.8 | 0 | 32 | 89.6 | 17.2 | 63 | 145.4 | 34.4 | 94 | 201.2 | 171 | 340 | 644 | 343 | 650 | 1202 | 516 | 960 | 1760 | 688 | 1270 | 2318 | 860 | 1580 | 2876 | 1032 | 1890 | 3434 | 1204 | 2200 | 3992 |
| -173 | -280 | | - 16.7 | 2 | 35.6 | 0.6 | 33 | 91.4 | 17.8 | 64 | 147.2 | 35.0 | 95 | 203.0 | 177 | 350 | 662 | 349 | 660 | 1220 | 521 | 970 | 1778 | 693 | 1280 | 2336 | 866 | 1590 | 2894 | 1038 | 1900 | 3452 | 1210 | 2210 | 4010 |
| -169 | -273 | -459.4 | - 16.1 | 3 | 37.4 | 1.1 | 34 | 93.2 | 18.3 | 65 | 149.0 | 35.6 | 96 | 204.8 | 182 | 260 | 680 | 354 | 670 | 1238 | 527 | 980 | 1796 | 699 | 1290 | 2354 | 871 | 1600 | 2912 | 1043 | 1910 | 3470 | 1216 | 2220 | 4028 |
| -168 | -270 | -454 | - 15.6 | 4 | 39.2 | 1.7 | 35 | 95.0 | 18.9 | 66 | 150.8 | 36.1 | 97 | 206.6 | 188 | 370 | 698 | 360 | 680 | 1256 | 532 | 990 | 1814 | 704 | 1300 | 2372 | 877 | 1610 | 2930 | 1049 | 1020 | 3488 | 1221 | 2230 | 4046 |
| -162 | -260 | -436 | - 15.0 | 5 | 41.0 | 2.2 | 36 | 96.8 | 19.4 | 67 | 152.6 | 36.7 | 98 | 208.4 | 193 | 380 | 716 | 366 | 690 | 1274 | 538 | 1000 | 1832 | 710 | 1310 | 2390 | 882 | 1620 | 2948 | 1054 | 1930 | 3506 | 1227 | 2240 | 4064 |
| -157 | -250 | -418 | -14.4 | 6 | 42.8 | 2.8 | 37 | 98.6 | 20.0 | 68 | 154.4 | 37.2 | 99 | 210.2 | 199 | 390 | 734 | 371 | 700 | 1292 | 543 | 1010 | 1850 | 716 | 1320 | 2408 | 888 | 1630 | 2966 | 1060 | 1940 | 3524 | 1232 | 2250 | 4082 |
| -151 | -240 | -400 | -13.9 | 7 | 44.6 | 3.3 | 38 | 100.4 | 20.6 | 69 | 156.2 | 37.8 | 100 | 212.0 | 204 | 400 | 752 | 377 | 710 | 1310 | 549 | 1020 | 1868 | 721 | 1330 | 2426 | 893 | 1640 | 2984 | 1066 | 1950 | 3542 | | | |
| -146 | -230 | -382 | -13.3 | 8 | 46.4 | 3.9 | 39 | 102.2 | 21.1 | 70 | 158.0 | 43 | 110 | 230 | 210 | 410 | 770 | 382 | 720 | 1328 | 554 | 1030 | 1886 | 727 | 1340 | 2444 | 899 | 1650 | 3002 | 1071 | 1960 | 3560 | | | |
| -140 | -220 | -364 | -12.8 | 9 | 48.2 | 4.4 | 40 | 104.0 | 21.7 | 71 | 159.8 | 49 | 120 | 248 | 216 | 420 | 788 | 388 | 730 | 1346 | 560 | 1040 | 1904 | 732 | 1350 | 2462 | 904 | 1660 | 3020 | 1077 | 1970 | 3578 | | | |
| -134 | -210 | -346 | -12.2 | 10 | 50.0 | 5.0 | 41 | 105.8 | 22.2 | 72 | 161.6 | 54 | 130 | 266 | 221 | 430 | 806 | 393 | 740 | 1364 | 566 | 1050 | 1922 | 738 | 1360 | 2480 | 910 | 1670 | 3038 | 1082 | 1980 | 3596 | | | |
| -129 | -200 | -328 | -11.7 | 11 | 51.8 | 5.6 | 42 | 107.6 | 22.8 | 73 | 163.4 | 60 | 140 | 284 | 227 | 440 | 824 | 399 | 750 | 1382 | 571 | 1060 | 1940 | 743 | 1370 | 2498 | 916 | 1680 | 3056 | 1088 | 1990 | 3614 | | | |
| -123 | -190 | -310 | -11.1 | 12 | 53.6 | 6.1 | 43 | 109.4 | 23.3 | 74 | 165.2 | 66 | 150 | 302 | 232 | 450 | 842 | 404 | 760 | 1400 | 577 | 1070 | 1958 | 749 | 1380 | 2516 | 921 | 1690 | 3074 | 1093 | 2000 | 3632 | | | |
| -118 | -180 | -292 | -10.6 | 13 | 55.4 | 6.7 | 44 | 111.2 | 23.9 | 75 | 167.0 | 71 | 160 | 320 | 238 | 460 | 860 | 410 | 770 | 1418 | 582 | 1080 | 1976 | 754 | 1390 | 2534 | 927 | 1700 | 3092 | 1099 | 2010 | 3650 | | | |
| -112 | -170 | -274 | -10.0 | 14 | 57.2 | 7.2 | 45 | 113.0 | 24.4 | 76 | 168.8 | 77 | 170 | 338 | 243 | 470 | 878 | 416 | 780 | 1436 | 588 | 1090 | 1994 | 760 | 1400 | 2552 | 932 | 1710 | 3110 | 1104 | 2020 | 3668 | | | |

**Interpolation Values**

| °C | . | °F |
|---|---|---|
| -0.56 | 1 | 1.8 |
| 1.11 | 2 | 3.6 |
| 1.67 | 3 | 5.4 |
| 2.22 | 4 | 7.2 |
| 2.78 | 5 | 9.0 |
| 3.33 | 6 | 10.8 |
| 3.89 | 7 | 12.6 |
| 4.44 | 8 | 14.4 |
| 5.00 | 9 | 16.2 |
| 5.56 | 10 | 18.0 |

**Temperature Conversion Formulae**

***Degrees Celsius - C***
C + 273.15 = K Kelvin
(C x 9/5) + 32 = F Fahrenheit
C x 4/5 = R Réaumur

***Degrees Fahrenheit - F***
F + 459.67 = Rankine
(F - 32) x 5/9 = C Celsius
(F - 32) x 4/9 = R Réaumur

***Degrees Réaumur - R***
R x 5/4 = C Celsius
(R x 9/4) + 32 = F Fahrenheit

## Viscosity Equivalents

| Seconds Saybolt Universal (SU) | Seconds Saybolt Furol (SSF) | Kinematic Viscosity Centistokes | Seconds Redwood (Standard) |
|---|---|---|---|
| 31 | – | 1.00 | 29 |
| 35 | – | 2.56 | 32.1 |
| 40 | – | 4.30 | 36.2 |
| 50 | – | .40 | 44.3 |
| 60 | – | 10.20 | 52.3 |
| 70 | 12.95 | 12.83 | 60.9 |
| 80 | 13.70 | 15.35 | 69.2 |
| 90 | 14.44 | 17.80 | 77.6 |
| 100 | 15.24 | 20.20 | 85.6 |
| 150 | 19.30 | 31.80 | 128 |
| 200 | 23.5 | 43.10 | 170 |
| 250 | 28.0 | 54.30 | 212 |
| 300 | 32.5 | 65.40 | 254 |
| 400 | 41.9 | 87.60 | 338 |
| 500 | 51.6 | 110 | 423 |
| 600 | 61.4 | 132 | 508 |
| 700 | 71.1 | 154 | 592 |

| Seconds Saybolt Universal (SU) | Seconds Saybolt Furol (SSF) | Kinematic Viscosity Centistokes | Seconds Redwood (Standard) |
|---|---|---|---|
| 800 | 81.0 | 176 | 677 |
| 900 | 91.0 | 198 | 762 |
| 1000 | 100.7 | 220 | 896 |
| 1500 | 150 | 330 | 1270 |
| 2000 | 200 | 440 | 1690 |
| 2500 | 250 | 550 | 2120 |
| 3000 | 300 | 660 | 2540 |
| 4000 | 400 | 880 | 3380 |
| 5000 | 500 | 1100 | 4230 |
| 6000 | 600 | 1320 | 5080 |
| 7000 | 700 | 1540 | 5920 |
| 8000 | 800 | 1760 | 6770 |
| 9000 | 900 | 1980 | 7620 |
| 10000 | 1000 | 2200 | 8460 |
| 15000 | 1500 | 3300 | 13700 |
| 20000 | 2000 | 4400 | 18400 |

$$\text{Kinematic Viscosity (Stokes)} = \frac{\text{Absolute Viscosity (Poise)}}{\text{Specific Gravity}}$$

$$1 \text{ Centistoke} = \frac{\text{Stoke}}{100} = 1 \text{ mm}^2 / \text{s}$$

$$1 \text{ Centipoise} = \frac{\text{Poise}}{100} = 1 \text{ mPas}$$

1 Stoke = 100 Centistokes = 100 $mm^2$ / s

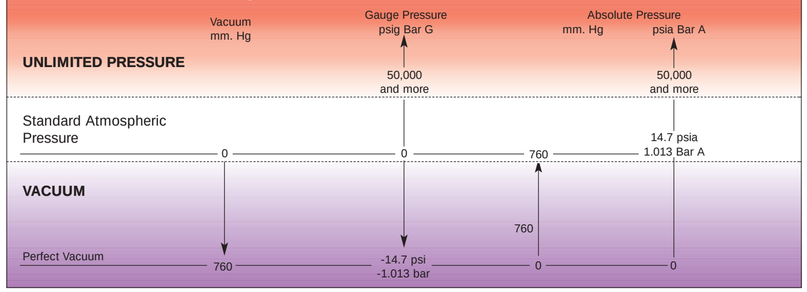
1 Poise = 100 Centipoise = 100 mPas

## Pressure Equivalents

| psi | atm | ft. Hd. $H_2O$ | in. $H_2O$ | $kg/cm^2$ | Metres $H_2O$ | in. Hg at 0ºC | mm. Hg | bar | Millibar (mbar) | kPa |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.0680 | 2.310 | 27.720 | 0.0700 | 0.704 | 2.043 | 51.884 | 0.0690 | 68.947 | 6.895 |
| 14.696 | 1 | 33.659 | 407.513 | 1.0330 | 10.351 | 30.019 | 762.480 | 1.0130 | 1013.0 | 101.325 |
| 0.433 | 0.0290 | 1 | 12.000 | 0.0300 | 0.305 | 0.884 | 22.452 | 0.0300 | 29.837 | 2.984 |
| 0.036 | 0.0025 | 0.833 | 1 | 0.0025 | 0.025 | 0.074 | 1.871 | 0.0025 | 2.486 | 0.249 |
| 14.233 | 0.9680 | 32.867 | 394.408 | 1 | 10.018 | 29.054 | 737.959 | 0.9810 | 980.662 | 98.066 |
| 1.422 | 0.0970 | 3.287 | 39.370 | 0.0990 | 1 | 2.905 | 73.796 | 0.0980 | 98.066 | 9.807 |
| 0.489 | 0.0330 | 1.131 | 13.575 | 0.0340 | 0.345 | 1 | 25.400 | 0.0340 | 33.753 | 3.375 |
| 0.019 | 0.0013 | 0.045 | 0.534 | 0.0014 | 0.0136 | 0.039 | 1 | 0.0010 | 1.329 | 0.133 |
| 14.503 | 0.9870 | 33.514 | 402.164 | 1.0200 | 10.2110 | 29.625 | 752.470 | 1 | 1000.0 | 100.00 |
| 0.014 | 0.0009 | 0.033 | 0.402 | 0.0010 | 0.0102 | 0.029 | 0.752 | 0.001 | 1 | 0.100 |
| 0.145 | 0.0098 | 0.335 | 4.021 | 0.0100 | 0.1020 | 0.296 | 7.525 | 0.010 | 10.000 | 1 |

All figures are @ 20°C unless otherwise stated.

**Pressure Values Relationships**




## Density and Viscosity of some Common Gases

| Meter fluid | | Density pn [g/cm³] at 0°C, 1013 mbar | Viscosity n [mPas = cP] 20°C |
|---|---|---|---|
| Acetylene | $C_2H_2$ | 0.0011747 | 0.0102 |
| Air | – | 0.0012928 | 0.01812 |
| Ammonia | $NH_3$ | 0.00077142 | 0.0098 |
| Argon | Ar | 0.0017836 | 0.0222 |
| Butane | $C_4H_{10}$ | 0.002703 | 0.0074 |
| Carbon Dioxide | $CO_2$ | 0.0019769 | 0.01463 |
| Carbon Monoxide | CO | 0.00125001 | 0.0177 |
| Chlorine | $Cl_2$ | 0.003220 | 0.01324 |
| Dissociated Ammonia | – | 0.0003740 | 0.0099 |
| Ethane | $C_2H_6$ | 0.0013566 | 0.0092 |
| Ethylene | $C_2H_4$ | 0.0012604 | 0.0101 |
| Helium | He | 0.00017847 | 0.0196 |
| Hydrogen | $H_2$ | 0.00008987 | 0.00886 |
| Hydrogen Chloride | HCl | 0.0016392 | 0.0143 |
| Hydrogen Sulphide | $H_2S$ | 0.0015362 | 0.0124 |
| Krypton | Kr | 0.003744 | 0.02496 |
| Methane | $CH_4$ | 0.0007168 | 0.0108 |
| Methyl Chloride | $CH_3Cl$ | 0.0023075 | 0.01061 |
| Neon | Ne | 0.0009000 | 0.0310 |
| Nitrogen | $N_2$ | 0.0012505 | 0.01752 |
| Nitrogen Oxide | NO | 0.0013402 | 0.0188 |
| Nitrous Oxide | $N_2O$ | 0.0019804 | 0.0146 |
| Oxygen | $O_2$ | 0.00142895 | 0.0203 |
| Propane | $C_3H_8$ | 0.00201963 | 0.0080 |
| Propylene | $C_3H_6$ | 0.0019140 | 0.0084 |
| Sulphur Dioxide | $SO_2$ | 0.0029262 | 0.0125 |

For **technical advice**
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