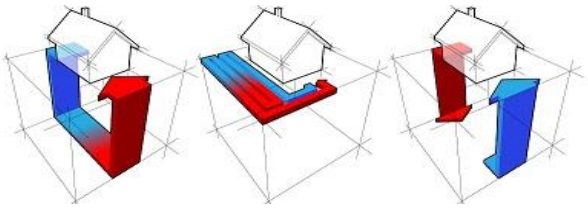
# Heat Transfer Fluids

# Kilfrost GEO

# Technical Data Sheet

The advanced low viscosity non-toxic heat transfer fluid engineered for higher efficiency and safer cooling. This document lists the physical data for Kilfrost GEO use in ground and water source heat pump systems.



## Volume ratio, freezing point and refractive index

| %v/v | Freezing Point (°C) | Refractive Index |
|---|---|---|
| **24** | -10 | 1.3631 |
| **32** | -15 | 1.3727 |
| **35** | -17.5 | 1.3769 |
| **39** | -20 | 1.3811 |
| **50** | -30 | 1.3949 |
| **60** | -40 | 1.4063 |

## Density (g/cm$^3$) of dilutions with temperature

| T (°C) | Dilution %v/v | | | | | |
|---|---|---|---|---|---|---|
| | 24% | 32% | 35% | 39% | 50% | 60% |
| **20** | 1.0997 | 1.1300 | 1.1442 | 1.1576 | 1.2047 | 1.2411 |
| **15** | 1.1017 | 1.1322 | 1.1464 | 1.1599 | 1.2073 | 1.2439 |
| **10** | 1.1037 | 1.1342 | 1.1485 | 1.1621 | 1.2098 | 1.2466 |
| **5** | 1.1055 | 1.1362 | 1.1506 | 1.1643 | 1.2122 | 1.2493 |
| **0** | 1.1073 | 1.1382 | 1.1526 | 1.1663 | 1.2145 | 1.2519 |
| **-5** | 1.1091 | 1.1401 | 1.1545 | 1.1683 | 1.2168 | 1.2545 |
| **-10** | - | 1.1419 | 1.1564 | 1.1703 | 1.2190 | 1.2570 |
| **-15** | - | - | 1.1582 | 1.1722 | 1.2212 | 1.2594 |
| **-20** | - | - | - | - | 1.2233 | 1.2618 |
| **-25** | - | - | - | - | 1.2253 | 1.2641 |
| **-30** | - | - | - | - | - | 1.2663 |

## Kinematic viscosity (mm²/s) of dilutions with temperature

| T (°C) | Dilution %v/v | | | | | |
|---|---|---|---|---|---|---|
| | 24% | 32% | 35% | 39% | 50% | 60% |
| **20** | 1.7556 | 2.1594 | 2.3872 | 2.6435 | 4.0102 | 6.1348 |
| **15** | 2.0030 | 2.4796 | 2.7494 | 3.0547 | 4.6992 | 7.3187 |
| **10** | 2.3105 | 2.8801 | 3.2038 | 3.5723 | 5.5795 | 8.8641 |
| **5** | 2.6985 | 3.3890 | 3.7829 | 4.2348 | 6.7247 | 10.921 |
| **0** | 3.1958 | 4.0467 | 4.5339 | 5.0978 | 8.2453 | 13.720 |
| **-5** | 3.8439 | 4.9117 | 5.5256 | 6.2440 | 10.310 | 17.622 |
| **-10** | - | 6.0703 | 6.8602 | 7.7972 | 13.186 | 23.211 |
| **-15** | - | - | 8.6877 | 9.9429 | 17.301 | 31.461 |
| **-20** | - | - | - | - | 23.358 | 44.060 |
| **-25** | - | - | - | - | 32.499 | 64.080 |
| **-30** | - | - | - | - | - | 97.619 |
| **-35** | - | - | - | - | - | 159.32 |

## Dynamic viscosity (mPa.s) of dilutions with temperature

| T (°C) | Dilution %v/v | | | | | |
|---|---|---|---|---|---|---|
| | 24% | 32% | 35% | 39% | 50% | 60% |
| **20** | 1.930 | 2.442 | 2.733 | 3.062 | 4.826 | 7.616 |
| **15** | 2.205 | 2.809 | 3.154 | 3.545 | 5.667 | 9.106 |
| **10** | 2.548 | 3.269 | 3.682 | 4.154 | 6.743 | 11.053 |
| **5** | 2.980 | 3.853 | 4.355 | 4.934 | 8.144 | 13.647 |
| **0** | 3.534 | 4.608 | 5.229 | 5.950 | 10.005 | 17.180 |
| **-5** | 4.256 | 5.601 | 6.383 | 7.300 | 12.535 | 22.112 |
| **-10** | - | 6.933 | 7.936 | 9.130 | 16.062 | 29.183 |
| **-15** | - | - | 10.064 | 11.660 | 21.115 | 39.630 |
| **-20** | - | - | - | - | 28.558 | 55.593 |
| **-25** | - | - | - | - | 39.804 | 80.972 |
| **-30** | - | - | - | - | - | 123.56 |
| **-35** | - | - | - | - | - | 202.42 |

### Specific heat (kJ/kg.°K) of dilutions with temperature

| T (°C) | Dilution %v/v | | | | | |
|---|---|---|---|---|---|---|
| | 24% | 32% | 35% | 39% | 50% | 60% |
| 20 | 3.503 | 3.308 | 3.217 | 3.129 | 2.827 | 2.615 |
| 15 | 3.487 | 3.289 | 3.196 | 3.108 | 2.805 | 2.596 |
| 10 | 3.471 | 3.270 | 3.176 | 3.087 | 2.782 | 2.577 |
| 5 | 3.455 | 3.251 | 3.156 | 3.066 | 2.760 | 2.557 |
| 0 | 3.439 | 3.232 | 3.136 | 3.045 | 2.738 | 2.538 |
| -5 | 3.425 | 3.214 | 3.117 | 3.025 | 2.717 | 2.519 |
| -10 | - | 3.197 | 3.098 | 3.005 | 2.695 | 2.499 |
| -15 | - | - | - | 2.985 | 2.674 | 2.480 |
| -20 | - | - | - | - | 2.653 | 2.461 |
| -25 | - | - | - | - | 2.632 | 2.443 |
| -30 | - | - | - | - | - | 2.424 |

### Thermal conductivity (W/m.°K) of dilutions with temperature

| T (°C) | Dilution %v/v | | | | | |
|---|---|---|---|---|---|---|
| | 24% | 32% | 35% | 39% | 50% | 60% |
| 20 | 0.544 | 0.526 | 0.518 | 0.510 | 0.483 | 0.461 |
| 15 | 0.537 | 0.519 | 0.511 | 0.503 | 0.478 | 0.456 |
| 10 | 0.529 | 0.512 | 0.504 | 0.497 | 0.472 | 0.451 |
| 5 | 0.521 | 0.504 | 0.497 | 0.490 | 0.466 | 0.446 |
| 0 | 0.512 | 0.496 | 0.489 | 0.482 | 0.460 | 0.440 |
| -5 | 0.503 | 0.488 | 0.482 | 0.475 | 0.453 | 0.435 |
| -10 | - | 0.480 | 0.473 | 0.467 | 0.446 | 0.429 |
| -15 | - | - | 0.465 | 0.459 | 0.439 | 0.422 |
| -20 | - | - | - | - | 0.432 | 0.416 |
| -25 | - | - | - | - | 0.424 | 0.409 |
| -30 | - | - | - | - | - | 0.403 |

## Materials compatibility

Kilfrost GEO is shown to be compatible with the following elastomers under the standard operating temperatures of a thermal fluid in closed loop cooling systems;

| | |
|---|---|
| Butyl Rubber | (IIR) |
| Ethylene | (EPDM) |
| Epoxy Resins | (EP) |
| Fluorocarbon Elastomers | (FPM) |
| Nitrile Rubber | (NBR) |
| Polyamides | (PA) |
| Polyethylene | (L/HDPE) |
| Polypropylene | (PP) |
| Polytetrafluoroethylene | (PTFE) |
| Polyvinyl Chloride | (PVC) |
| Styrene Butadiene | (SBR) |

Please note, aside from coolant composition, the quality and grade of elastomeric seals will also have an impact on compatibility. In particular, the quantity and type of filling agents and the processing techniques used in the production of the elastomeric components will affect the resulting compatibility with any coolant. Please contact Kilfrost for information on compatibility with any elastomer not listed in this guide.

Do not use in systems containing galvanized pipes, tanks, or fittings, or in systems with lead containing soft solder.

Further information available from:
Kilfrost.com