



proviflow

a proviron brand



Product Guide

Heat Transfer Fluids

Proviflow™ N
Proviflow™ L

Contents

- 3 Proviflow™ Range
- 4 Best Practice
- 6 Non Metallic Components
- 7 ASTM1384-05
Corrosion Standard
- 8 Specifications &
Physical Properties
- 9 Dilution
- 10 Product Data Proviflow™ N
- 15 Product Data Proviflow™ L



Proviflow™ Range

The Proviflow™ range of heat transfer fluids is formulated using OAT (Organic Acid Technology) inhibitors and has been designed to cope with the most demanding of conditions. It can be used in a wide variety of applications and offers excellent freeze point suppression as well as enhanced protection against corrosion, hard water scaling and bacterial growth.

All Proviflow™ fluids are tested to and exceed the ASTM1384-05 corrosion test standard. The range also contains a highly advanced reserve alkalinity additive. This ensures a longer and more efficient working life, limited disruption to processes, reduced maintenance costs and ultimately an improved return on capital employed.

PRODUCT APPLICATION TABLE

| Product | Base Chemistry | Ground/Air Source | Solar Thermal | Industrial Cooling | Process Cooling | Refrigeration | HVAC |
|--------------|----------------------|-------------------|---------------|--------------------|-----------------|---------------|------|
| Proviflow™ N | Monoethylene Glycol | ○ | | ○ | ○ | ○ | ○ |
| Proviflow™ L | Monopropylene Glycol | ○ | ○ | ○ | ○ | ○ | ○ |

In Solar Thermal applications, Proviflow™ L has demonstrated excellent, long-term thermal stability at temperatures of up to 160 °C. It can also withstand degradation at stagnation temperatures approaching 200 °C for short periods of time.

The longevity of a solar thermal heat transfer fluid is dependent on numerous variables, some of which are not fluid related. In order to ensure that you obtain the maximum possible lifespan from your fluid, you must ensure that stagnation events are kept to a minimum. Any excessive and unnecessary periods of fluid stagnation will lead to the degradation of any glycol based heat transfer fluid.



Food and drink refrigeration



Best Practice

All Proviflow™ products are designed and manufactured to the highest standards to give the end-user greater peace of mind in the knowledge that every product offers a long and efficient working life. In order to ensure this, we recommend our best practice advice.

Storage

Proviflow™ fluids are available in bulk and in IBC, 215 or 25 litre containers. Other container size requirements can be discussed further. All fluids have a shelf life of two years provided that they are kept in their sealed original containers and are stored indoors at ambient temperatures and away from direct sunlight.

Handling

For information on exposure and recommended personal protective equipment (PPE), please refer to the specific Safety Data Sheet of your fluid.

Commissioning

Before filling a system with your Proviflow™ fluid, please make sure that it is cleaned and flushed in order to ensure that any contaminants or deposits are removed.

In the first instance, it is recommended that de-ionised water is used for diluting. If local potable water is to be used, we recommend a maximum of 100ppm chloride content.

The dilution rate required varies between applications and the freeze protection desired. Please consult the applicable hardware manufacturer's instructions.

Once the dilution rate is established, please refer to our dilution table on page 9. Please note that the minimum volume of concentrate should be 20%. Any level of concentrate below 20% significantly reduces the inhibitor level within your fluid and will lead to the fluid breaking down.

Please note that Proviflow™ products must not be used in hardware or equipment containing galvanised materials.

All heat transfer fluids must be disposed of in accordance with applicable local and national regulations, whether this be excess virgin fluid on commissioning or existing system fluid which is to be replaced.



Renewable energy heat pumps



Miscibility with other fluids

All Proviflow™ fluids should be miscible with other manufacturers' fluids which have the same base of freeze suppressant. However, undesired reactions can occur and easily result in the breakdown of the fluid and reduce the working life. Indeed even usually compatible fluids may not be miscible if the existing fluid has already broken down before adding your Proviflow™ product. If in doubt, please contact us and a fluid compatibility test can be carried out.

After Care

All Proviflow™ fluids are produced to the highest standards with particular importance placed on efficiency, ease of service and a long working life. As well as best practice on mixing and installation, it is also essential to take care of your fluid post commissioning.

Proviron recommends that all in situ fluids are dosed and tested every six months to check for visible signs of degradation, change in pH and fluid concentration. As a rule and depending on product concentration, a fluid should have a pH between 7 and 10. For the fluid concentration, please refer to the product dilution table in this guide for the Refractive Index reading corresponding to the % volume.

All Proviflow™ fluids are free from any components categorized as CMR (carcinogenic, mutagenic or toxic to reproduction) and also contain no Phosphates, Nitrites, primary/secondary Amines, Silicates or Borates.



Data centre cooling

Disclaimer

Information contained in this publication is accurate to the best of the knowledge and the belief of the company. It is expressly provided that the information relating to the use of the products is given for information purposes only. No guarantee is provided to the client that the product is adapted to the specific use for which the client intends it. The client should perform his own tests to determine the suitability for a particular purpose. Our only intention is to rapidly provide the user with information on the technical properties of our products, it being understood that the client should adapt the information to the specific conditions of their use. It should be consulted together with the instructions from the applicable hardware manufacturer and in accordance with local and/or national laws and regulations.



Non Metallic Components

Proviflow™ fluids are compatible with the following non-metallic materials.

| | |
|---------------------------------------|-----------|
| Butyl Rubber | IIR |
| Ethylene/propylene/diene Rubber | EPDM |
| Fluorocarbon Rubber | FPM |
| Hydrogenated Nitrile Rubber | H-NBR |
| Natural Rubber (max +80 °C) | NR |
| Nitrile Butadiene Rubber (max +40 °C) | NBR |
| Polyamides | PA |
| Polychlorobutadiene | CR |
| Polyester Cross Linked | UP |
| Polyethylene (soft/hard) | LDPE/HDPE |
| Polypropylene | PP |
| Polytetrafluoroethylene | PTFE |
| Polyvinylchloride | PVC |
| Silicone Rubber | NIVQ |
| Styrene Butadiene Rubber (max 100 °C) | SBR |

The above list is intended as a guide and compatibility is also dependent on the quality of these materials. The use of inferior products could result in the breakdown of the fluid and/or the materials.



Food and drink process cooling



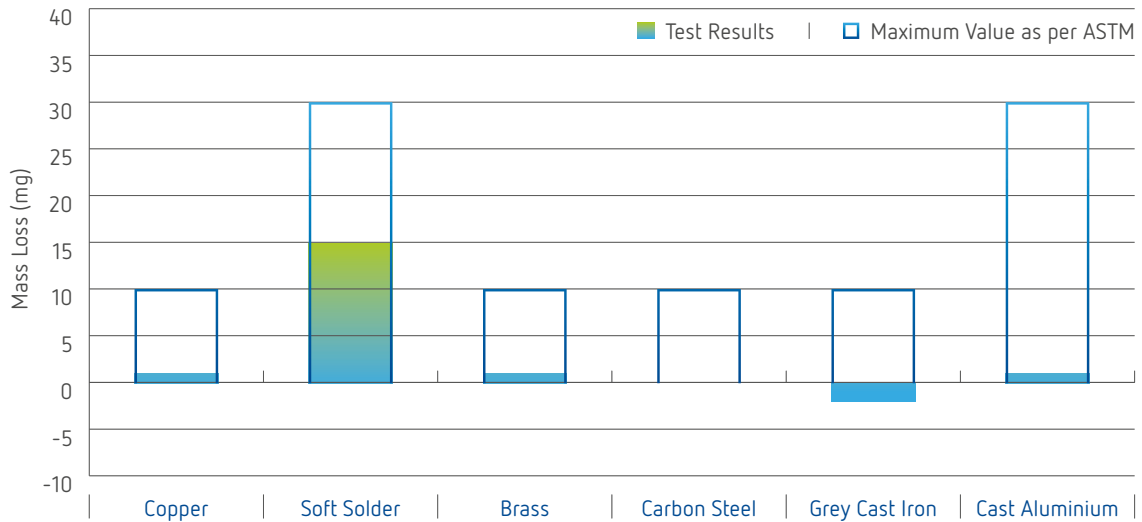
ASTM 1384-05 Corrosion Standard

In order to back-up the efficiency of its comprehensive additive pack, all Proviflow™ fluids have been tested independently to the ASTM 1384-05 corrosion standard.

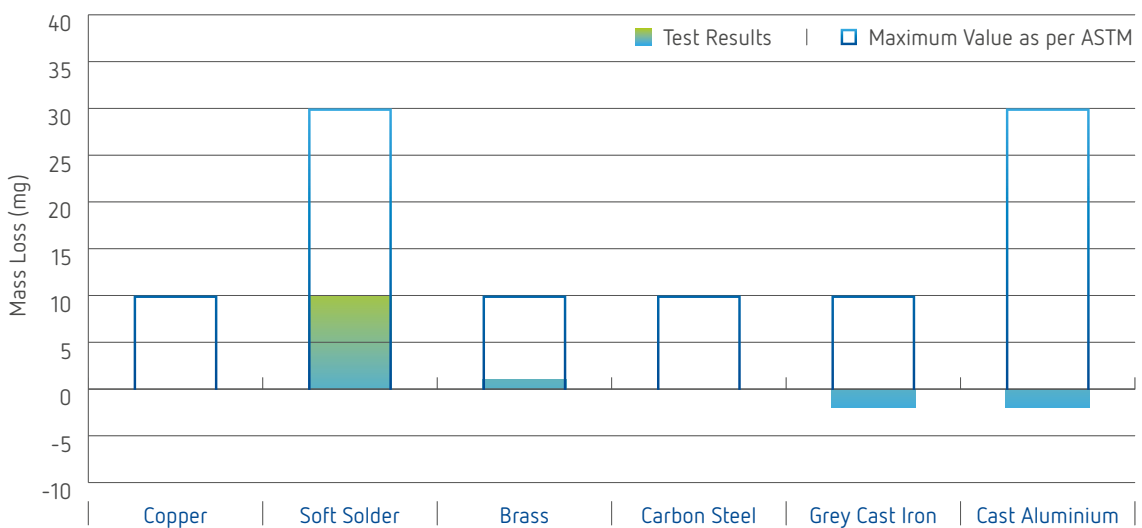
The test comprises of a range of metals commonly used in heat transfer applications and these are immersed in a diluted solution of Proviflow™ fluid using corrosive water. The metals are then tested over 336 hours at a temperature of 88 °C with the solution being constantly aerated to simulate in situ conditions. The metals are weighed before and after the test in order to measure any signs of corrosion that may have occurred during the test. In order to pass the test, the weights measured for each metal must stay within the tolerances stipulated in the test.

All Proviflow™ fluids pass the ASTM 1384-05 and indeed far exceed its expectations on weight loss tolerance. Please see the results below.

PROVIFLOW N RESULTS



PROVIFLOW L RESULTS



Specifications & Physical Properties

SPECIFICATIONS

| | Unit | Proviflow™ N | Proviflow™ L | Test Method |
|--------------------|------|---------------|---------------|---------------|
| Refractive Index | N/A | 1,429 - 1,433 | 1,430 - 1,435 | ASTM D1747-09 |
| Density | g/ml | 1,105 - 1,115 | 1,040 - 1,050 | ASTM D7042-11 |
| pH Range @ 50% v/v | N/A | 7,5 - 10,0 | 7,5 - 10,0 | ASTM E70-07 |

**All properties measured at 20 °C and in concentrate form unless otherwise stated*

PHYSICAL PROPERTIES

| | Unit | Proviflow™ N | Proviflow™ L | Test Method |
|------------------------|--------------------|--------------|--------------|---------------|
| Base Chemistry | N/A | MEG | MPG | N/A |
| Colour | N/A | Yellow | Blue | N/A |
| WGK Water Hazard Class | N/A | WGK1 | WGK1 | N/A |
| Temperature Range | °C | -40 to +160 | -50 to +160 | N/A |
| Boiling Point | °C | ca. 162 | ca. 150 | ASTM D1120-11 |
| Flash Point | °C | 124 | 115 | ASTM D92 |
| Kinematic Viscosity | mm ² /s | ca. 18,0 | ca. 41,0 | ASTM D7042-11 |
| Reserve Alkalinity | ml | >10 | >10 | ASTM D1121 |

**All properties measured at 20 °C and in concentrate form unless otherwise stated*

*** WGK (Wassergefährdungsklasse) - German Water Hazard Category*



Industrial cooling



Dilution

All Proviflow™ products are concentrated fluids and must be diluted before use. The values in the table below are the freeze points for varying levels of dilution of Proviflow™ products. Please refer to the level of freeze protection and freeze point required as indicated by the system manufacturer.

| Freezing Point °C | Proviflow™ N | | Proviflow™ L | |
|-------------------|--------------|---------|--------------|---------|
| | Volume % | R.I.* | Volume % | R.I.* |
| -10,0 | 22,3 | 1,35638 | 27,0 | 1,36338 |
| -11,0 | 24,0 | 1,35816 | 28,6 | 1,36532 |
| -12,0 | 25,9 | 1,36015 | 30,2 | 1,36711 |
| -13,0 | 27,3 | 1,36158 | 31,6 | 1,36880 |
| -14,0 | 28,6 | 1,36297 | 33,7 | 1,37118 |
| -15,0 | 29,9 | 1,36429 | 35,3 | 1,37287 |
| -16,0 | 31,2 | 1,36575 | 36,4 | 1,37415 |
| -17,0 | 32,5 | 1,36697 | 37,8 | 1,37580 |
| -18,0 | 33,6 | 1,36819 | 39,2 | 1,37733 |
| -19,0 | 34,9 | 1,36958 | 40,1 | 1,37829 |
| -20,0 | 36,0 | 1,37072 | 41,2 | 1,37947 |
| -25,0 | 41,5 | 1,37634 | 46,4 | 1,38520 |
| -30,0 | 46,0 | 1,38100 | 50,4 | 1,38938 |
| -35,0 | 49,6 | 1,38446 | 54,3 | 1,39338 |
| -40,0 | 52,9 | 1,38769 | 57,6 | 1,39674 |

* R.I. (Refractive Index), values measured at 20 °C

All freeze points in the above table are defined as being the point at which crystallization of the fluid begins.



Temperature regulation in public areas



Product Data • ProviFlow™ N

| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 60 | -30 | 1,1192 | 0,4006 | 2,933 | 65,899 | 58,880 | 313,22 |
| | -20 | 1,1152 | 0,3957 | 2,978 | 34,319 | 30,773 | 399,68 |
| | -10 | 1,1104 | 0,3905 | 3,025 | 19,520 | 17,580 | 465,68 |
| | 0 | 1,1049 | 0,3850 | 3,073 | 11,960 | 10,824 | 515,74 |
| | 10 | 1,0990 | 0,3795 | 3,122 | 7,806 | 7,103 | 553,30 |
| | 20 | 1,0928 | 0,3738 | 3,170 | 5,376 | 4,920 | 581,01 |
| | 30 | 1,0864 | 0,3681 | 3,218 | 3,878 | 3,570 | 600,88 |
| | 40 | 1,0798 | 0,3624 | 3,265 | 2,911 | 2,696 | 614,52 |
| | 50 | 1,0731 | 0,3568 | 3,311 | 2,261 | 2,107 | 623,18 |
| | 60 | 1,0664 | 0,3512 | 3,357 | 1,809 | 1,697 | 627,84 |
| | 70 | 1,0597 | 0,3458 | 3,401 | 1,486 | 1,402 | 629,30 |
| | 80 | 1,0531 | 0,3404 | 3,445 | 1,248 | 1,185 | 628,20 |
| | 90 | 1,0465 | 0,3351 | 3,488 | 1,070 | 1,022 | 625,05 |
| | 100 | 1,0400 | 0,3300 | 3,529 | 0,933 | 0,897 | 620,25 |
| | 110 | 1,0336 | 0,3250 | 3,569 | 0,826 | 0,799 | 614,16 |
| 55 | -30 | 1,1096 | 0,4083 | 3,039 | 54,898 | 49,476 | 270,81 |
| | -20 | 1,1061 | 0,4057 | 3,079 | 28,911 | 26,138 | 361,23 |
| | -10 | 1,1017 | 0,4025 | 3,121 | 16,614 | 15,081 | 430,56 |
| | 0 | 1,0966 | 0,3989 | 3,164 | 10,278 | 9,372 | 483,46 |
| | 10 | 1,0911 | 0,3951 | 3,207 | 6,768 | 6,203 | 523,48 |
| | 20 | 1,0853 | 0,3911 | 3,251 | 4,700 | 4,331 | 553,31 |
| | 30 | 1,0791 | 0,3869 | 3,295 | 3,416 | 3,166 | 575,06 |
| | 40 | 1,0729 | 0,3827 | 3,339 | 2,583 | 2,407 | 590,35 |
| | 50 | 1,0665 | 0,3784 | 3,382 | 2,020 | 1,894 | 600,47 |
| | 60 | 1,0601 | 0,3742 | 3,424 | 1,627 | 1,535 | 606,44 |
| | 70 | 1,0537 | 0,3699 | 3,466 | 1,344 | 1,276 | 609,08 |
| | 80 | 1,0473 | 0,3656 | 3,507 | 1,136 | 1,084 | 609,04 |
| | 90 | 1,0409 | 0,3614 | 3,546 | 0,978 | 0,940 | 606,86 |
| | 100 | 1,0346 | 0,3573 | 3,585 | 0,858 | 0,829 | 602,94 |
| | 110 | 1,0284 | 0,3532 | 3,623 | 0,763 | 0,742 | 597,65 |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 50 | -30 | 1,1000 | 0,4160 | 3,145 | 45,733 | 41,577 | 227,67 |
| | -20 | 1,0969 | 0,4156 | 3,179 | 24,355 | 22,203 | 322,14 |
| | -10 | 1,0930 | 0,4144 | 3,216 | 14,141 | 12,938 | 394,88 |
| | 0 | 1,0884 | 0,4128 | 3,254 | 8,832 | 8,115 | 450,70 |
| | 10 | 1,0832 | 0,4107 | 3,293 | 5,868 | 5,417 | 493,23 |
| | 20 | 1,0777 | 0,4084 | 3,333 | 4,109 | 3,813 | 525,24 |
| | 30 | 1,0719 | 0,4058 | 3,373 | 3,010 | 2,808 | 548,89 |
| | 40 | 1,0660 | 0,4030 | 3,413 | 2,292 | 2,150 | 565,86 |
| | 50 | 1,0599 | 0,4001 | 3,453 | 1,805 | 1,703 | 577,48 |
| | 60 | 1,0538 | 0,3971 | 3,492 | 1,463 | 1,388 | 584,79 |
| | 70 | 1,0476 | 0,3940 | 3,530 | 1,216 | 1,161 | 588,63 |
| | 80 | 1,0414 | 0,3909 | 3,568 | 1,033 | 0,992 | 589,67 |
| | 90 | 1,0353 | 0,3877 | 3,605 | 0,895 | 0,864 | 588,47 |
| | 100 | 1,0292 | 0,3846 | 3,642 | 0,788 | 0,766 | 585,45 |
| 110 | 1,0233 | 0,3815 | 3,677 | 0,705 | 0,689 | 580,97 | |
| 45 | -20 | 1,0896 | 0,4235 | 3,260 | 21,233 | 19,486 | 282,39 |
| | -10 | 1,0860 | 0,4240 | 3,292 | 12,431 | 11,446 | 358,63 |
| | 0 | 1,0817 | 0,4239 | 3,326 | 7,823 | 7,232 | 417,43 |
| | 10 | 1,0769 | 0,4233 | 3,362 | 5,235 | 4,861 | 462,52 |
| | 20 | 1,0717 | 0,4222 | 3,399 | 3,690 | 3,443 | 496,76 |
| | 30 | 1,0662 | 0,4208 | 3,435 | 2,720 | 2,551 | 522,36 |
| | 40 | 1,0605 | 0,4192 | 3,472 | 2,083 | 1,964 | 541,05 |
| | 50 | 1,0546 | 0,4174 | 3,509 | 1,649 | 1,564 | 554,20 |
| | 60 | 1,0487 | 0,4154 | 3,546 | 1,344 | 1,281 | 562,87 |
| | 70 | 1,0427 | 0,4133 | 3,582 | 1,122 | 1,076 | 567,93 |
| | 80 | 1,0368 | 0,4111 | 3,618 | 0,958 | 0,924 | 570,08 |
| | 90 | 1,0308 | 0,4088 | 3,652 | 0,833 | 0,808 | 569,88 |
| | 100 | 1,0249 | 0,4065 | 3,687 | 0,737 | 0,719 | 567,77 |
| | 110 | 1,0191 | 0,4041 | 3,720 | 0,662 | 0,649 | 564,13 |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 40 | -20 | 1,0787 | 0,4354 | 3,380 | 17,284 | 16,023 | 241,97 |
| | -10 | 1,0756 | 0,4384 | 3,406 | 10,245 | 9,525 | 321,80 |
| | 0 | 1,0718 | 0,4406 | 3,435 | 6,522 | 6,085 | 383,65 |
| | 10 | 1,0674 | 0,4420 | 3,465 | 4,411 | 4,132 | 431,37 |
| | 20 | 1,0626 | 0,4430 | 3,497 | 3,140 | 2,955 | 467,88 |
| | 30 | 1,0575 | 0,4434 | 3,529 | 2,336 | 2,209 | 495,48 |
| | 40 | 1,0522 | 0,4435 | 3,561 | 1,805 | 1,715 | 515,92 |
| | 50 | 1,0467 | 0,4433 | 3,594 | 1,441 | 1,376 | 530,62 |
| | 60 | 1,0411 | 0,4429 | 3,627 | 1,183 | 1,136 | 540,68 |
| | 70 | 1,0354 | 0,4422 | 3,659 | 0,995 | 0,961 | 547,00 |
| | 80 | 1,0298 | 0,4413 | 3,691 | 0,855 | 0,830 | 550,27 |
| | 90 | 1,0241 | 0,4403 | 3,723 | 0,749 | 0,731 | 551,09 |
| | 100 | 1,0185 | 0,4392 | 3,754 | 0,666 | 0,654 | 549,91 |
| 110 | 1,0129 | 0,4380 | 3,785 | 0,602 | 0,594 | 547,12 | |
| 35 | -10 | 1,0687 | 0,4480 | 3,483 | 9,006 | 8,427 | 284,37 |
| | 0 | 1,0652 | 0,4517 | 3,507 | 5,777 | 5,424 | 349,35 |
| | 10 | 1,0611 | 0,4546 | 3,534 | 3,935 | 3,708 | 399,75 |
| | 20 | 1,0566 | 0,4568 | 3,562 | 2,820 | 2,669 | 438,59 |
| | 30 | 1,0518 | 0,4585 | 3,591 | 2,111 | 2,007 | 468,22 |
| | 40 | 1,0467 | 0,4598 | 3,621 | 1,640 | 1,567 | 490,46 |
| | 50 | 1,0414 | 0,4606 | 3,651 | 1,316 | 1,264 | 506,75 |
| | 60 | 1,0360 | 0,4612 | 3,681 | 1,086 | 1,048 | 518,23 |
| | 70 | 1,0306 | 0,4615 | 3,711 | 0,918 | 0,891 | 525,81 |
| | 80 | 1,0251 | 0,4615 | 3,741 | 0,793 | 0,773 | 530,24 |
| | 90 | 1,0196 | 0,4614 | 3,770 | 0,697 | 0,684 | 532,09 |
| | 100 | 1,0142 | 0,4611 | 3,799 | 0,623 | 0,614 | 531,85 |
| | 110 | 1,0088 | 0,4607 | 3,828 | 0,565 | 0,560 | 529,93 |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 33 | -10 | 1,0634 | 0,4551 | 3,540 | 8,176 | 7,688 | 269,22 |
| | 0 | 1,0602 | 0,4600 | 3,561 | 5,275 | 4,975 | 335,47 |
| | 10 | 1,0564 | 0,4639 | 3,585 | 3,612 | 3,419 | 386,97 |
| | 20 | 1,0521 | 0,4672 | 3,611 | 2,602 | 2,473 | 426,76 |
| | 30 | 1,0474 | 0,4698 | 3,638 | 1,956 | 1,868 | 457,22 |
| | 40 | 1,0425 | 0,4719 | 3,665 | 1,527 | 1,465 | 480,18 |
| | 50 | 1,0374 | 0,4736 | 3,693 | 1,230 | 1,186 | 497,12 |
| | 60 | 1,0322 | 0,4749 | 3,721 | 1,019 | 0,987 | 509,17 |
| | 70 | 1,0269 | 0,4759 | 3,750 | 0,865 | 0,842 | 517,27 |
| | 80 | 1,0216 | 0,4767 | 3,778 | 0,749 | 0,733 | 522,16 |
| | 90 | 1,0163 | 0,4772 | 3,806 | 0,661 | 0,650 | 524,43 |
| | 100 | 1,0110 | 0,4775 | 3,833 | 0,592 | 0,586 | 524,58 |
| | 110 | 1,0057 | 0,4776 | 3,860 | 0,538 | 0,535 | 523,00 |
| 30 | -10 | 1,0582 | 0,4623 | 3,597 | 7,422 | 7,014 | 246,32 |
| | 0 | 1,0552 | 0,4683 | 3,616 | 4,816 | 4,564 | 314,50 |
| | 10 | 1,0516 | 0,4733 | 3,637 | 3,316 | 3,153 | 367,65 |
| | 20 | 1,0476 | 0,4776 | 3,660 | 2,400 | 2,291 | 408,88 |
| | 30 | 1,0431 | 0,4811 | 3,684 | 1,813 | 1,738 | 440,59 |
| | 40 | 1,0384 | 0,4841 | 3,710 | 1,421 | 1,369 | 464,66 |
| | 50 | 1,0335 | 0,4866 | 3,736 | 1,150 | 1,113 | 482,57 |
| | 60 | 1,0284 | 0,4887 | 3,762 | 0,956 | 0,930 | 495,50 |
| | 70 | 1,0233 | 0,4904 | 3,788 | 0,814 | 0,796 | 504,38 |
| | 80 | 1,0181 | 0,4918 | 3,815 | 0,708 | 0,695 | 509,97 |
| | 90 | 1,0129 | 0,4930 | 3,841 | 0,626 | 0,618 | 512,88 |
| | 100 | 1,0077 | 0,4939 | 3,867 | 0,563 | 0,559 | 513,61 |
| | 110 | 1,0026 | 0,4946 | 3,893 | 0,513 | 0,512 | 512,56 |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 25 | -10 | 1,0495 | 0,4743 | 3,692 | 6,317 | 6,019 | 207,64 |
| | 0 | 1,0470 | 0,4822 | 3,706 | 4,139 | 3,953 | 279,11 |
| | 10 | 1,0437 | 0,4890 | 3,723 | 2,875 | 2,754 | 335,07 |
| | 20 | 1,0400 | 0,4949 | 3,742 | 2,098 | 2,017 | 378,74 |
| | 30 | 1,0359 | 0,5000 | 3,762 | 1,597 | 1,542 | 412,58 |
| | 40 | 1,0315 | 0,5044 | 3,784 | 1,261 | 1,223 | 438,52 |
| | 50 | 1,0269 | 0,5082 | 3,806 | 1,027 | 1,001 | 458,08 |
| | 60 | 1,0221 | 0,5116 | 3,829 | 0,860 | 0,841 | 472,49 |
| | 70 | 1,0172 | 0,5145 | 3,853 | 0,736 | 0,724 | 482,69 |
| | 80 | 1,0123 | 0,5170 | 3,876 | 0,644 | 0,636 | 489,47 |
| | 90 | 1,0073 | 0,5193 | 3,900 | 0,573 | 0,569 | 493,46 |
| | 100 | 1,0024 | 0,5212 | 3,923 | 0,518 | 0,516 | 495,17 |
| | 110 | 0,9974 | 0,5228 | 3,947 | 0,474 | 0,475 | 495,01 |
| 20 | 0 | 1,0387 | 0,4961 | 3,796 | 3,557 | 3,424 | 235,89 |
| | 10 | 1,0359 | 0,5046 | 3,809 | 2,492 | 2,406 | 295,32 |
| | 20 | 1,0325 | 0,5122 | 3,823 | 1,834 | 1,776 | 341,99 |
| | 30 | 1,0287 | 0,5188 | 3,840 | 1,407 | 1,368 | 378,44 |
| | 40 | 1,0246 | 0,5247 | 3,858 | 1,119 | 1,092 | 406,68 |
| | 50 | 1,0203 | 0,5299 | 3,877 | 0,918 | 0,900 | 428,28 |
| | 60 | 1,0158 | 0,5345 | 3,897 | 0,773 | 0,761 | 444,49 |
| | 70 | 1,0112 | 0,5386 | 3,917 | 0,666 | 0,659 | 456,32 |
| | 80 | 1,0065 | 0,5423 | 3,938 | 0,586 | 0,582 | 464,56 |
| | 90 | 1,0017 | 0,5456 | 3,959 | 0,524 | 0,523 | 469,87 |
| | 100 | 0,9970 | 0,5485 | 3,980 | 0,476 | 0,477 | 472,77 |
| | 110 | 0,9922 | 0,5511 | 4,001 | 0,438 | 0,441 | 473,71 |



Product Data • ProviFlow™ L

| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 60 | -30 | 1,0726 | 0,3690 | 3,387 | 270,572 | 252,262 | 272,32 |
| | -20 | 1,0688 | 0,3647 | 3,420 | 108,341 | 101,363 | 419,63 |
| | -10 | 1,0637 | 0,3610 | 3,453 | 48,957 | 46,023 | 534,12 |
| | 0 | 1,0576 | 0,3578 | 3,485 | 24,503 | 23,169 | 623,11 |
| | 10 | 1,0506 | 0,3550 | 3,516 | 13,376 | 12,732 | 692,08 |
| | 20 | 1,0431 | 0,3525 | 3,546 | 7,865 | 7,540 | 745,21 |
| | 30 | 1,0351 | 0,3504 | 3,575 | 4,928 | 4,761 | 785,72 |
| | 40 | 1,0269 | 0,3484 | 3,603 | 3,263 | 3,177 | 816,10 |
| | 50 | 1,0184 | 0,3467 | 3,629 | 2,265 | 2,224 | 838,32 |
| | 60 | 1,0098 | 0,3452 | 3,655 | 1,639 | 1,623 | 853,94 |
| | 70 | 1,0012 | 0,3439 | 3,680 | 1,230 | 1,228 | 864,19 |
| | 80 | 0,9925 | 0,3427 | 3,704 | 0,952 | 0,959 | 870,09 |
| | 90 | 0,9839 | 0,3416 | 3,727 | 0,758 | 0,771 | 872,43 |
| | 100 | 0,9754 | 0,3407 | 3,750 | 0,619 | 0,634 | 871,87 |
| 110 | 0,9669 | 0,3398 | 3,771 | 0,516 | 0,533 | 868,94 | |
| 55 | -30 | 1,0664 | 0,3789 | 3,460 | 200,518 | 188,030 | 217,36 |
| | -20 | 1,0633 | 0,3770 | 3,489 | 82,759 | 77,836 | 369,52 |
| | -10 | 1,0587 | 0,3755 | 3,519 | 38,458 | 36,326 | 488,05 |
| | 0 | 1,0530 | 0,3743 | 3,547 | 19,754 | 18,759 | 580,45 |
| | 10 | 1,0465 | 0,3733 | 3,575 | 11,047 | 10,556 | 652,32 |
| | 20 | 1,0394 | 0,3726 | 3,602 | 6,643 | 6,391 | 707,95 |
| | 30 | 1,0319 | 0,3721 | 3,628 | 4,251 | 4,119 | 750,62 |
| | 40 | 1,0240 | 0,3717 | 3,653 | 2,870 | 2,803 | 782,91 |
| | 50 | 1,0159 | 0,3714 | 3,677 | 2,030 | 1,998 | 806,82 |
| | 60 | 1,0076 | 0,3712 | 3,701 | 1,494 | 1,483 | 823,94 |
| | 70 | 0,9993 | 0,3712 | 3,724 | 1,140 | 1,140 | 835,55 |
| | 80 | 0,9909 | 0,3711 | 3,746 | 0,896 | 0,904 | 842,67 |
| | 90 | 0,9826 | 0,3712 | 3,767 | 0,724 | 0,737 | 846,11 |
| | 100 | 0,9743 | 0,3713 | 3,787 | 0,599 | 0,614 | 846,56 |
| 110 | 0,9661 | 0,3715 | 3,807 | 0,506 | 0,523 | 844,55 | |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 50 | -20 | 1,0577 | 0,3893 | 3,559 | 63,218 | 59,771 | 318,89 |
| | -10 | 1,0536 | 0,3900 | 3,584 | 30,211 | 28,673 | 441,55 |
| | 0 | 1,0485 | 0,3908 | 3,609 | 15,925 | 15,189 | 537,41 |
| | 10 | 1,0424 | 0,3917 | 3,634 | 9,123 | 8,752 | 612,24 |
| | 20 | 1,0358 | 0,3927 | 3,657 | 5,610 | 5,417 | 670,41 |
| | 30 | 1,0286 | 0,3938 | 3,681 | 3,666 | 3,564 | 715,31 |
| | 40 | 1,0211 | 0,3949 | 3,703 | 2,524 | 2,472 | 749,54 |
| | 50 | 1,0133 | 0,3961 | 3,725 | 1,818 | 1,795 | 775,17 |
| | 60 | 1,0054 | 0,3972 | 3,747 | 1,362 | 1,355 | 793,82 |
| | 70 | 0,9974 | 0,3984 | 3,767 | 1,056 | 1,059 | 806,80 |
| | 80 | 0,9893 | 0,3996 | 3,787 | 0,843 | 0,852 | 815,15 |
| | 90 | 0,9813 | 0,4008 | 3,806 | 0,691 | 0,704 | 819,72 |
| | 100 | 0,9732 | 0,4020 | 3,825 | 0,579 | 0,595 | 821,19 |
| | 110 | 0,9653 | 0,4031 | 3,843 | 0,496 | 0,514 | 820,12 |
| 45 | -20 | 1,0521 | 0,4016 | 3,628 | 48,291 | 45,900 | 267,72 |
| | -10 | 1,0486 | 0,4044 | 3,649 | 23,732 | 22,633 | 394,59 |
| | 0 | 1,0439 | 0,4072 | 3,671 | 12,839 | 12,299 | 494,00 |
| | 10 | 1,0383 | 0,4100 | 3,692 | 7,534 | 7,256 | 571,84 |
| | 20 | 1,0321 | 0,4128 | 3,713 | 4,738 | 4,591 | 632,62 |
| | 30 | 1,0253 | 0,4155 | 3,734 | 3,162 | 3,084 | 679,77 |
| | 40 | 1,0182 | 0,4181 | 3,754 | 2,220 | 2,181 | 715,98 |
| | 50 | 1,0108 | 0,4207 | 3,773 | 1,629 | 1,612 | 743,36 |
| | 60 | 1,0032 | 0,4232 | 3,792 | 1,242 | 1,238 | 763,57 |
| | 70 | 0,9955 | 0,4257 | 3,811 | 0,978 | 0,983 | 777,94 |
| | 80 | 0,9877 | 0,4280 | 3,828 | 0,793 | 0,803 | 787,55 |
| | 90 | 0,9799 | 0,4304 | 3,846 | 0,660 | 0,673 | 793,26 |
| | 100 | 0,9722 | 0,4326 | 3,863 | 0,561 | 0,577 | 795,77 |
| | 110 | 0,9645 | 0,4348 | 3,879 | 0,486 | 0,504 | 795,65 |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 40 | -10 | 1,0435 | 0,4189 | 3,715 | 18,643 | 17,865 | 347,18 |
| | 0 | 1,0393 | 0,4237 | 3,733 | 10,350 | 9,959 | 450,20 |
| | 10 | 1,0342 | 0,4284 | 3,751 | 6,222 | 6,016 | 531,13 |
| | 20 | 1,0284 | 0,4328 | 3,769 | 4,002 | 3,892 | 594,55 |
| | 30 | 1,0221 | 0,4372 | 3,787 | 2,727 | 2,668 | 644,00 |
| | 40 | 1,0153 | 0,4413 | 3,804 | 1,953 | 1,924 | 682,23 |
| | 50 | 1,0082 | 0,4454 | 3,821 | 1,460 | 1,448 | 711,38 |
| | 60 | 1,0010 | 0,4492 | 3,838 | 1,132 | 1,131 | 733,18 |
| | 70 | 0,9936 | 0,4529 | 3,854 | 0,907 | 0,912 | 748,97 |
| | 80 | 0,9861 | 0,4565 | 3,870 | 0,746 | 0,757 | 759,86 |
| | 90 | 0,9786 | 0,4599 | 3,885 | 0,630 | 0,644 | 766,72 |
| | 100 | 0,9711 | 0,4632 | 3,900 | 0,543 | 0,559 | 770,29 |
| 110 | 0,9637 | 0,4664 | 3,915 | 0,477 | 0,495 | 771,14 | |
| 35 | -10 | 1,0385 | 0,4333 | 3,780 | 14,645 | 14,102 | 299,30 |
| | 0 | 1,0348 | 0,4402 | 3,795 | 8,344 | 8,064 | 406,02 |
| | 10 | 1,0301 | 0,4467 | 3,810 | 5,139 | 4,988 | 490,09 |
| | 20 | 1,0248 | 0,4529 | 3,825 | 3,380 | 3,299 | 556,21 |
| | 30 | 1,0188 | 0,4589 | 3,840 | 2,352 | 2,309 | 608,01 |
| | 40 | 1,0124 | 0,4646 | 3,854 | 1,718 | 1,697 | 648,28 |
| | 50 | 1,0057 | 0,4700 | 3,869 | 1,308 | 1,300 | 679,25 |
| | 60 | 0,9988 | 0,4752 | 3,883 | 1,032 | 1,033 | 702,66 |
| | 70 | 0,9917 | 0,4802 | 3,898 | 0,840 | 0,847 | 719,89 |
| | 80 | 0,9845 | 0,4849 | 3,911 | 0,702 | 0,713 | 732,08 |
| | 90 | 0,9773 | 0,4895 | 3,925 | 0,601 | 0,615 | 740,12 |
| | 100 | 0,9701 | 0,4939 | 3,938 | 0,525 | 0,542 | 744,75 |
| 110 | 0,9628 | 0,4981 | 3,951 | 0,468 | 0,486 | 746,58 | |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 33 | -10 | 1,0364 | 0,4391 | 3,806 | 26,700 | 25,761 | 280,02 |
| | 0 | 1,0330 | 0,4467 | 3,819 | 13,955 | 13,509 | 388,24 |
| | 10 | 1,0285 | 0,4540 | 3,833 | 7,992 | 7,771 | 473,58 |
| | 20 | 1,0233 | 0,4610 | 3,847 | 4,946 | 4,833 | 540,80 |
| | 30 | 1,0175 | 0,4676 | 3,861 | 3,268 | 3,212 | 593,54 |
| | 40 | 1,0112 | 0,4739 | 3,875 | 2,284 | 2,258 | 634,65 |
| | 50 | 1,0047 | 0,4799 | 3,888 | 1,674 | 1,667 | 666,35 |
| | 60 | 0,9979 | 0,4856 | 3,902 | 1,279 | 1,282 | 690,41 |
| | 70 | 0,9909 | 0,4911 | 3,915 | 1,013 | 1,022 | 708,23 |
| | 80 | 0,9839 | 0,4963 | 3,928 | 0,827 | 0,841 | 720,94 |
| | 90 | 0,9768 | 0,5013 | 3,941 | 0,694 | 0,710 | 729,45 |
| | 100 | 0,9696 | 0,5061 | 3,953 | 0,596 | 0,614 | 734,52 |
| 110 | 0,9625 | 0,5107 | 3,965 | 0,522 | 0,542 | 736,75 | |
| 30 | -10 | 1,0334 | 0,4478 | 3,845 | 11,504 | 11,132 | 250,96 |
| | 0 | 1,0302 | 0,4566 | 3,857 | 6,727 | 6,530 | 361,45 |
| | 10 | 1,0260 | 0,4650 | 3,868 | 4,244 | 4,136 | 448,72 |
| | 20 | 1,0211 | 0,4730 | 3,880 | 2,855 | 2,796 | 517,60 |
| | 30 | 1,0155 | 0,4806 | 3,893 | 2,029 | 1,998 | 571,78 |
| | 40 | 1,0095 | 0,4878 | 3,905 | 1,511 | 1,497 | 614,14 |
| | 50 | 1,0032 | 0,4947 | 3,917 | 1,172 | 1,168 | 646,95 |
| | 60 | 0,9966 | 0,5012 | 3,929 | 0,941 | 0,944 | 672,00 |
| | 70 | 0,9898 | 0,5074 | 3,941 | 0,778 | 0,786 | 690,70 |
| | 80 | 0,9829 | 0,5134 | 3,953 | 0,661 | 0,672 | 704,20 |
| | 90 | 0,9760 | 0,5191 | 3,964 | 0,574 | 0,588 | 713,44 |
| | 100 | 0,9690 | 0,5245 | 3,976 | 0,509 | 0,525 | 719,16 |
| 110 | 0,9620 | 0,5297 | 3,987 | 0,459 | 0,477 | 721,98 | |



| Concentrate % v/v | Temperature (°C) | Density (g/cm ³) | Thermal Conductivity (W/m K) | Specific Heat (kJ/kg J) | Dynamic Viscosity (mPa.s) | Kinematic Viscosity (mm ² /s) | Thermal Expansion K ⁻¹ (10 ⁻⁶ /°C) |
|----------------------|---------------------|---------------------------------|------------------------------------|----------------------------|---------------------------------|--|--|
| 25 | 0 | 1,0257 | 0,4731 | 3,918 | 5,423 | 5,288 | 316,49 |
| | 10 | 1,0219 | 0,4834 | 3,927 | 3,505 | 3,429 | 407,03 |
| | 20 | 1,0174 | 0,4931 | 3,936 | 2,411 | 2,370 | 478,70 |
| | 30 | 1,0123 | 0,5023 | 3,946 | 1,750 | 1,729 | 535,32 |
| | 40 | 1,0066 | 0,5110 | 3,955 | 1,329 | 1,320 | 579,81 |
| | 50 | 1,0006 | 0,5193 | 3,965 | 1,050 | 1,049 | 614,49 |
| | 60 | 0,9944 | 0,5272 | 3,975 | 0,858 | 0,862 | 641,20 |
| | 70 | 0,9879 | 0,5347 | 3,985 | 0,721 | 0,730 | 661,39 |
| | 80 | 0,9813 | 0,5418 | 3,994 | 0,622 | 0,634 | 676,24 |
| | 90 | 0,9746 | 0,5487 | 4,004 | 0,548 | 0,562 | 686,69 |
| | 100 | 0,9679 | 0,5552 | 4,013 | 0,492 | 0,509 | 693,51 |
| 110 | 0,9612 | 0,5614 | 4,023 | 0,450 | 0,468 | 697,35 | |
| 20 | 0 | 1,0211 | 0,4896 | 3,980 | 4,372 | 4,282 | 271,12 |
| | 10 | 1,0178 | 0,5017 | 3,986 | 2,894 | 2,844 | 364,99 |
| | 20 | 1,0137 | 0,5132 | 3,992 | 2,037 | 2,009 | 439,53 |
| | 30 | 1,0090 | 0,5240 | 3,999 | 1,509 | 1,496 | 498,62 |
| | 40 | 1,0037 | 0,5342 | 4,006 | 1,169 | 1,165 | 545,27 |
| | 50 | 0,9981 | 0,5440 | 4,013 | 0,941 | 0,942 | 581,87 |
| | 60 | 0,9921 | 0,5532 | 4,020 | 0,782 | 0,788 | 610,27 |
| | 70 | 0,9860 | 0,5620 | 4,028 | 0,668 | 0,678 | 631,98 |
| | 80 | 0,9797 | 0,5703 | 4,036 | 0,585 | 0,597 | 648,18 |
| | 90 | 0,9733 | 0,5782 | 4,043 | 0,523 | 0,538 | 659,87 |
| | 100 | 0,9669 | 0,5858 | 4,051 | 0,477 | 0,493 | 667,81 |
| | 110 | 0,9604 | 0,5930 | 4,059 | 0,441 | 0,459 | 672,67 |
| | 110 | 0,9604 | 0,5930 | 4,059 | 0,441 | 0,459 | 672,67 |





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