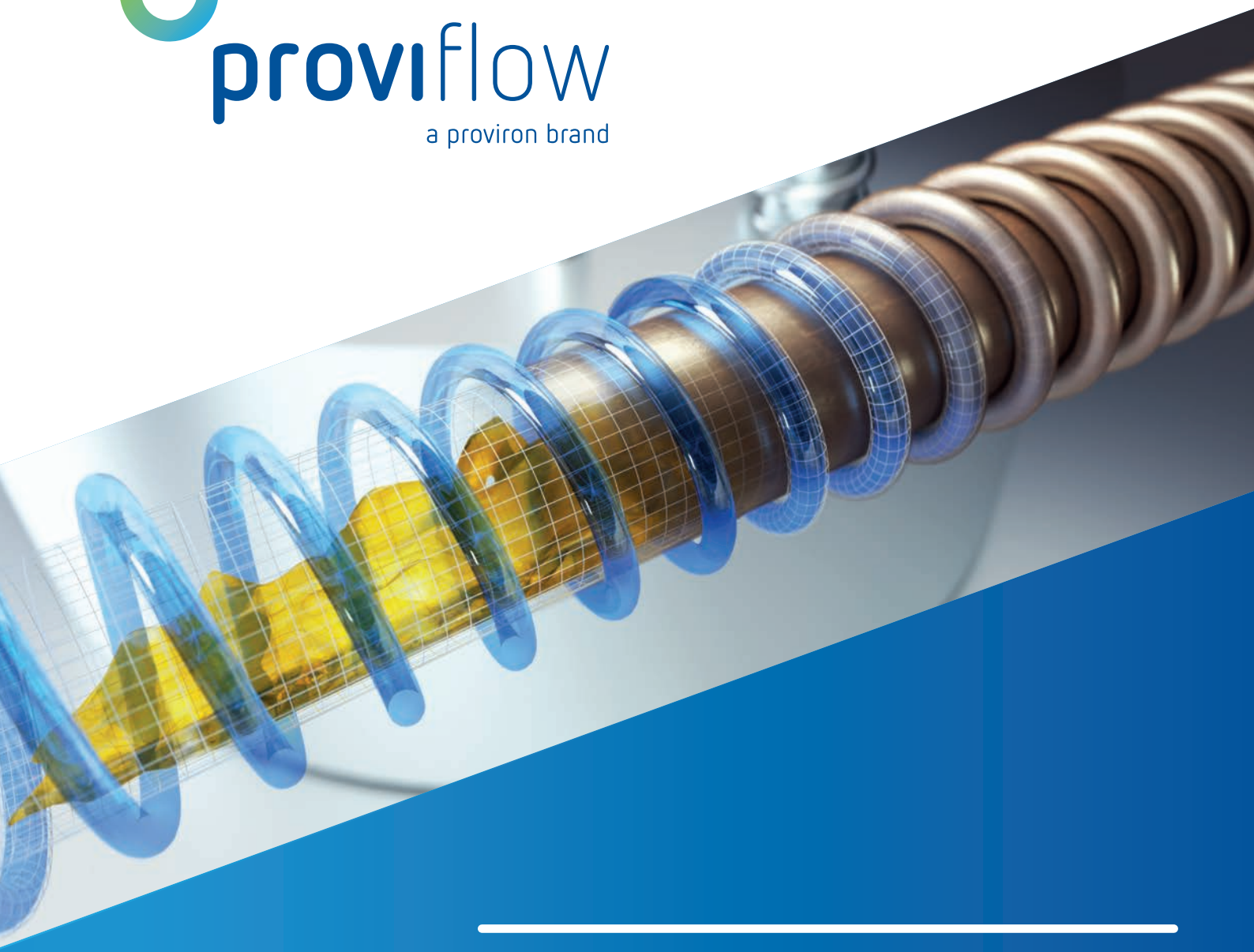
proviflow
a proviron brand



Product Guide
Heat Transfer Fluids

Proviflow® N
Proviflow® L
Proviflow® FG

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Proviflow® Range

Proviflow® L and **Proviflow® N** are formulated using **OAT (Organic Acid Technology) inhibitors** and have been designed to cope with the most demanding of conditions. They can be used in a wide variety of applications and offer excellent freeze point suppression as well as enhanced protection against corrosion, hard water scaling and bacterial growth. Also, Proviflow® L and Proviflow® N are free from Phosphates, Nitrites, primary/secondary Amines, Silicates and Borates.

Proviflow® FG is an MPG based heat transfer fluid with a specially formulated inhibitor package for use in food and drink applications, containing exclusively FDA approved components. Proviflow® FG has been registered by US NSF and classified as a HT1 heat transfer fluid for potential incidental food contact. Due to its low acute oral toxicity, Proviflow® FG can be used in a wide range of food and beverage cooling applications where safety and certainty matter.

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	○	○	○	○	○	○
Proviflow® FG	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, 200 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, especially when different kinds of inhibitor packages are mixed. 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.



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.

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.

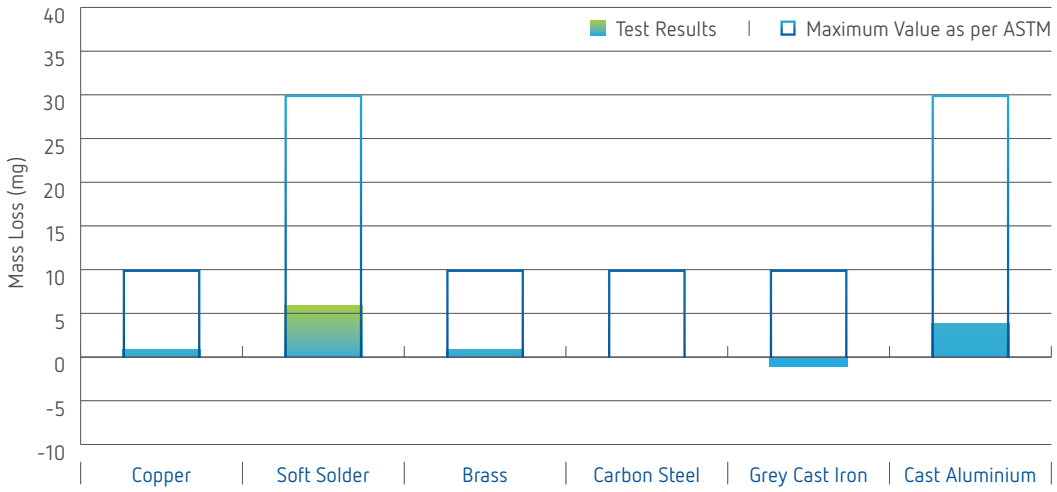
The test comprises of a range of metals commonly used in heat transfer applications and these are immersed in a diluted solution of Proviflow® fluid using corrosive water. The metals are then tested over 336 hours at a temperature of 88˚C with the solution being constantly aerated to simulate in situ 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.

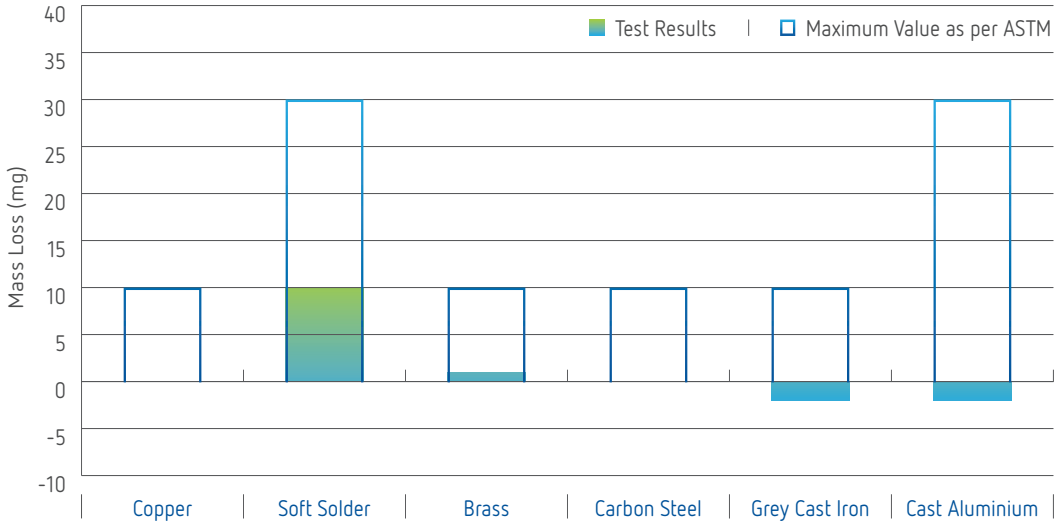


Food and drink process cooling

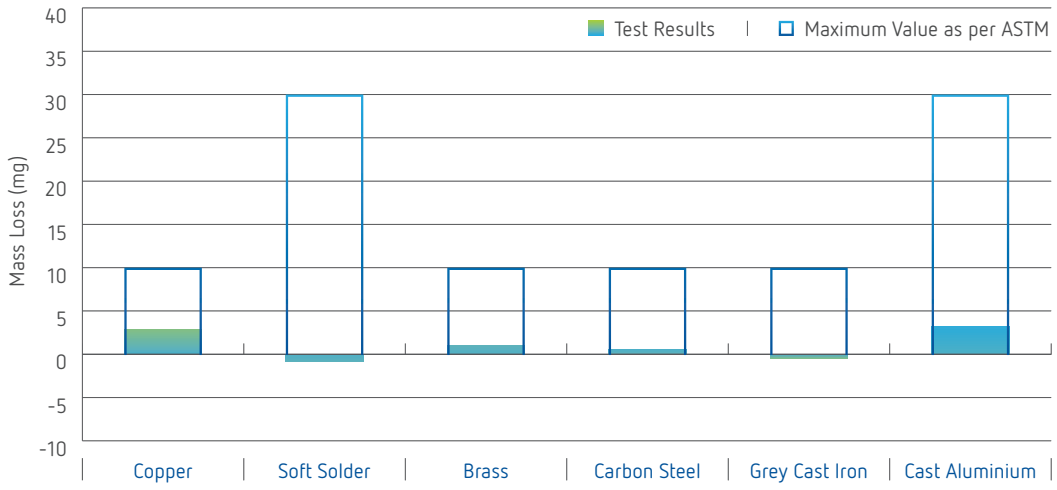
PROVIFLOW N RESULTS



PROVIFLOW L RESULTS



PROVIFLOW FG RESULTS



Specifications & Physical Properties

SPECIFICATIONS

	Unit	Proviflow® N	Proviflow® L	Proviflow® FG	Test Method
Refractive Index	N/A	1,429 - 1,433	1,430 - 1,435	1,430 – 1,435	ASTM D1747-09
Density	g/ml	1,105 - 1,115	1,040 - 1,050	1,048 – 1,058	ASTM D7042-11
pH Range @ 50% v/v	N/A	7,5 - 10,0	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	Proviflow® FG	Test Method
Base Chemistry	N/A	MEG	MPG	MPG	N/A
Colour	N/A	On request	On request	On request	N/A
Temperature Range	°C	-50 to +170	-45 to +160	-40 to +120	N/A
Boiling Point	°C	ca. 174	ca. 160	ca. 160	ASTM D1120-11
Flash Point	°C	124	115	110	ASTM D92
Kinematic Viscosity	mm^2/s	ca. 18,0	ca. 41,0	ca. 43	ASTM D7042-11
Reserve Alkalinity	ml	>10	>10	> 10	ASTM D1121

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

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. Freeze points are determined based on the ASTM D1177 standard.

For an additional margin of protection, we kindly advise you to select a temperature in this table that is at least **3°C lower** than the freeze point of the system. Contact us for more information.



Proviflow® N (based on mono ethylene glycol)				
Vol%	Wt%	Freezing point (°C)	Density @ 20°C (g/ml)	R.I. @ 20°C
20	21,8	-8,8	1,027	1,3540
21	22,8	-9,4	1,028	1,3550
22	23,9	-9,9	1,030	1,3561
23	25,0	-10,5	1,031	1,3572
24	26,0	-11,1	1,033	1,3583
25	27,1	-11,8	1,034	1,3593
26	28,1	-12,5	1,035	1,3604
27	29,2	-13,2	1,037	1,3615
28	30,2	-13,9	1,038	1,3625
29	31,3	-14,7	1,040	1,3636
30	32,3	-15,5	1,041	1,3647
31	33,4	-16,3	1,042	1,3657
32	34,4	-17,1	1,044	1,3668
33	35,4	-18,0	1,045	1,3678
34	36,5	-18,9	1,047	1,3689
35	37,5	-19,8	1,048	1,3699
36	38,5	-20,8	1,049	1,3710
37	39,5	-21,8	1,051	1,3720
38	40,6	-22,8	1,052	1,3731
39	41,6	-23,8	1,053	1,3741
40	42,6	-24,9	1,055	1,3752
41	43,6	-26,0	1,056	1,3762
42	44,6	-27,1	1,057	1,3772
43	45,7	-28,3	1,058	1,3783
44	46,7	-29,5	1,060	1,3793
45	47,7	-30,7	1,061	1,3803
46	48,7	-31,9	1,062	1,3814
47	49,7	-33,2	1,064	1,3824
48	50,7	-34,5	1,065	1,3834
49	51,7	-35,8	1,066	1,3844
50	52,7	-37,2	1,067	1,3854
51	53,7	-38,6	1,068	1,3865
52	54,7	-40,0	1,070	1,3875
53	55,7	-41,4	1,071	1,3885
54	56,7	-42,9	1,072	1,3895
55	57,7	-44,4	1,073	1,3905
56	58,6	-45,9	1,074	1,3915
57	59,6	-47,5	1,076	1,3925
58	60,6	-49,1	1,077	1,3935
59	61,6	-50,7	1,078	1,3945
60	62,6	-52,3	1,079	1,3955

Proviflow® L (based on mono propylene glycol)				
Vol%	Wt%	Freezing point (°C)	Density @ 20°C (g/ml)	R.I. @ 20°C
20	20,7	-6,9	1,016	1,3552
21	21,7	-7,4	1,017	1,3564
22	22,7	-7,8	1,018	1,3576
23	23,8	-8,3	1,019	1,3588
24	24,8	-8,8	1,020	1,3600
25	25,8	-9,4	1,020	1,3611
26	26,8	-9,9	1,021	1,3623
27	27,8	-10,6	1,022	1,3635
28	28,9	-11,2	1,023	1,3646
29	29,9	-11,9	1,024	1,3658
30	30,9	-12,6	1,025	1,3669
31	31,9	-13,3	1,026	1,3681
32	32,9	-14,1	1,027	1,3692
33	33,9	-14,8	1,028	1,3704
34	34,9	-15,7	1,028	1,3715
35	36,0	-16,5	1,029	1,3726
36	37,0	-17,4	1,030	1,3737
37	38,0	-18,3	1,031	1,3749
38	39,0	-19,3	1,031	1,3760
39	40,0	-20,2	1,032	1,3771
40	41,0	-21,3	1,033	1,3782
41	42,0	-22,3	1,034	1,3793
42	43,0	-23,4	1,034	1,3804
43	44,0	-24,5	1,035	1,3815
44	45,0	-25,6	1,036	1,3825
45	46,0	-26,8	1,036	1,3836
46	47,0	-27,9	1,037	1,3847
47	48,0	-29,2	1,038	1,3858
48	49,0	-30,4	1,038	1,3868
49	50,0	-31,7	1,039	1,3879
50	51,0	-33,0	1,039	1,3890
51	52,0	-34,4	1,040	1,3900
52	53,0	-35,7	1,040	1,3911
53	54,0	-37,2	1,041	1,3921
54	55,0	-38,6	1,041	1,3932
55	56,0	-40,1	1,042	1,3942
56	57,0	-41,6	1,042	1,3952
57	58,0	-43,1	1,043	1,3962
58	59,0	-44,7	1,043	1,3973
59	60,0	-46,2	1,044	1,3983
60	61,0	-47,9	1,044	1,3993

Proviflow® FG (based on mono propylene glycol)				
Vol%	Wt%	Freezing point (°C)	Density @ 20°C (g/ml)	R.I. @ 20°C
20,0	20,9	-7,3	1,018	1,3556
21,0	21,9	-7,7	1,020	1,3568
22,0	22,9	-8,2	1,021	1,3580
23,0	24,0	-8,7	1,022	1,3591
24,0	25,0	-9,2	1,023	1,3603
25,0	26,0	-9,7	1,024	1,3615
26,0	27,0	-10,3	1,025	1,3627
27,0	28,1	-11,0	1,026	1,3639
28,0	29,1	-11,6	1,027	1,3650
29,0	30,1	-12,3	1,028	1,3662
30,0	31,1	-13,0	1,029	1,3674
31,0	32,1	-13,8	1,030	1,3685
32,0	33,2	-14,6	1,031	1,3697
33,0	34,2	-15,4	1,032	1,3708
34,0	35,2	-16,3	1,033	1,3719
35,0	36,2	-17,2	1,034	1,3731
36,0	37,2	-18,1	1,035	1,3742
37,0	38,2	-19,1	1,036	1,3753
38,0	39,3	-20,1	1,037	1,3765
39,0	40,3	-21,1	1,038	1,3776
40,0	41,3	-22,2	1,039	1,3787
41,0	42,3	-23,3	1,039	1,3798
42,0	43,3	-24,4	1,040	1,3809
43,0	44,3	-25,6	1,041	1,3820
44,0	45,3	-26,8	1,042	1,3831
45,0	46,3	-28,0	1,043	1,3842
46,0	47,3	-29,3	1,043	1,3852
47,0	48,3	-30,6	1,044	1,3863
48,0	49,3	-31,9	1,045	1,3874
49,0	50,3	-33,3	1,046	1,3885
50,0	51,3	-34,7	1,046	1,3895
51,0	52,3	-36,1	1,047	1,3906
52,0	53,3	-37,6	1,048	1,3916
53,0	54,3	-39,1	1,048	1,3927
54,0	55,3	-40,6	1,049	1,3937
55,0	56,3	-42,2	1,049	1,3948
56,0	57,3	-43,8	1,050	1,3958
57,0	58,3	-45,4	1,051	1,3968
58,0	59,3	-47,1	1,051	1,3978
59,0	60,3	-48,8	1,052	1,3989
60,0	61,3	-50,6	1,052	1,3999

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
60	-30	1,119	0,401	2,933	65,9	58,9	313
	-20	1,115	0,396	2,978	34,3	30,8	400
	-10	1,110	0,391	3,025	19,5	17,6	466
	0	1,105	0,385	3,073	12,0	10,8	516
	10	1,099	0,380	3,122	7,8	7,1	553
	20	1,093	0,374	3,17	5,4	4,9	581
	30	1,086	0,368	3,218	3,9	3,6	601
	40	1,080	0,362	3,265	2,9	2,7	615
	50	1,073	0,357	3,311	2,3	2,1	623
	60	1,066	0,351	3,357	1,8	1,7	628
	70	1,060	0,346	3,401	1,5	1,4	629
	80	1,053	0,340	3,445	1,2	1,2	628
	90	1,047	0,335	3,488	1,1	1,0	625
	100	1,040	0,330	3,529	0,9	0,9	620
	110	1,034	0,325	3,569	0,8	0,8	614
55	-30	1,110	0,408	3,039	54,9	49,5	271
	-20	1,106	0,406	3,079	28,9	26,1	361
	-10	1,102	0,403	3,121	16,6	15,1	431
	0	1,097	0,399	3,164	10,3	9,4	483
	10	1,091	0,395	3,207	6,8	6,2	523
	20	1,085	0,391	3,251	4,7	4,3	553
	30	1,079	0,387	3,295	3,4	3,2	575
	40	1,073	0,383	3,339	2,6	2,4	590
	50	1,067	0,378	3,382	2,0	1,9	600
	60	1,060	0,374	3,424	1,6	1,5	606
	70	1,054	0,370	3,466	1,3	1,3	609
	80	1,047	0,366	3,507	1,1	1,1	609
	90	1,041	0,361	3,546	1,0	0,9	607
	100	1,035	0,357	3,585	0,9	0,8	603
	110	1,028	0,353	3,623	0,8	0,7	598

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
50	-30	1,100	0,416	3,145	45,7	41,6	228
	-20	1,097	0,416	3,179	24,4	22,2	322
	-10	1,093	0,414	3,216	14,1	12,9	395
	0	1,088	0,413	3,254	8,8	8,1	451
	10	1,083	0,411	3,293	5,9	5,4	493
	20	1,078	0,408	3,333	4,1	3,8	525
	30	1,072	0,406	3,373	3,0	2,8	549
	40	1,066	0,403	3,413	2,3	2,2	566
	50	1,060	0,400	3,453	1,8	1,7	577
	60	1,054	0,397	3,492	1,5	1,4	585
	70	1,048	0,394	3,53	1,2	1,2	589
	80	1,041	0,391	3,568	1,0	1,0	590
	90	1,035	0,388	3,605	0,9	0,9	588
	100	1,029	0,385	3,642	0,8	0,8	585
	110	1,023	0,382	3,677	0,7	0,7	581
45	-20	1,090	0,424	3,26	21,2	19,5	282
	-10	1,086	0,424	3,292	12,4	11,4	359
	0	1,082	0,424	3,326	7,8	7,2	417
	10	1,077	0,423	3,362	5,2	4,9	463
	20	1,072	0,422	3,399	3,7	3,4	497
	30	1,066	0,421	3,435	2,7	2,6	522
	40	1,061	0,419	3,472	2,1	2,0	541
	50	1,055	0,417	3,509	1,6	1,6	554
	60	1,049	0,415	3,546	1,3	1,3	563
	70	1,043	0,413	3,582	1,1	1,1	568
	80	1,037	0,411	3,618	1,0	0,9	570
	90	1,031	0,409	3,652	0,8	0,8	570
	100	1,025	0,407	3,687	0,7	0,7	568
	110	1,019	0,404	3,72	0,7	0,6	564

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
40	-20	1,079	0,435	3,38	17,3	16,0	242
	-10	1,076	0,438	3,406	10,2	9,5	322
	0	1,072	0,441	3,435	6,5	6,1	384
	10	1,067	0,442	3,465	4,4	4,1	431
	20	1,063	0,443	3,497	3,1	3,0	468
	30	1,058	0,443	3,529	2,3	2,2	495
	40	1,052	0,444	3,561	1,8	1,7	516
	50	1,047	0,443	3,594	1,4	1,4	531
	60	1,041	0,443	3,627	1,2	1,1	541
	70	1,035	0,442	3,659	1,0	1,0	547
	80	1,030	0,441	3,691	0,9	0,8	550
	90	1,024	0,440	3,723	0,7	0,7	551
	100	1,019	0,439	3,754	0,7	0,7	550
	110	1,013	0,438	3,785	0,6	0,6	547
35	-10	1,069	0,448	3,483	9,0	8,4	284
	0	1,065	0,452	3,507	5,8	5,4	349
	10	1,061	0,455	3,534	3,9	3,7	400
	20	1,057	0,457	3,562	2,8	2,7	439
	30	1,052	0,459	3,591	2,1	2,0	468
	40	1,047	0,460	3,621	1,6	1,6	490
	50	1,041	0,461	3,651	1,3	1,3	507
	60	1,036	0,461	3,681	1,1	1,0	518
	70	1,031	0,462	3,711	0,9	0,9	526
	80	1,025	0,462	3,741	0,8	0,8	530
	90	1,020	0,461	3,77	0,7	0,7	532
	100	1,014	0,461	3,799	0,6	0,6	532
	110	1,009	0,461	3,828	0,6	0,6	530

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	1,063	0,455	3,54	8,2	7,7	269
	0	1,060	0,460	3,561	5,3	5,0	335
	10	1,056	0,464	3,585	3,6	3,4	387
	20	1,052	0,467	3,611	2,6	2,5	427
	30	1,047	0,470	3,638	2,0	1,9	457
	40	1,043	0,472	3,665	1,5	1,5	480
	50	1,037	0,474	3,693	1,2	1,2	497
	60	1,032	0,475	3,721	1,0	1,0	509
	70	1,027	0,476	3,75	0,9	0,8	517
	80	1,022	0,477	3,778	0,7	0,7	522
	90	1,016	0,477	3,806	0,7	0,7	524
	100	1,011	0,478	3,833	0,6	0,6	525
	110	1,006	0,478	3,86	0,5	0,5	523
30	-10	1,058	0,462	3,597	7,4	7,0	246
	0	1,055	0,468	3,616	4,8	4,6	315
	10	1,052	0,473	3,637	3,3	3,2	368
	20	1,048	0,478	3,66	2,4	2,3	409
	30	1,043	0,481	3,684	1,8	1,7	441
	40	1,038	0,484	3,71	1,4	1,4	465
	50	1,034	0,487	3,736	1,2	1,1	483
	60	1,028	0,489	3,762	1,0	0,9	496
	70	1,023	0,490	3,788	0,8	0,8	504
	80	1,018	0,492	3,815	0,7	0,7	510
	90	1,013	0,493	3,841	0,6	0,6	513
	100	1,008	0,494	3,867	0,6	0,6	514
	110	1,003	0,495	3,893	0,5	0,5	513

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
25	-10	1,050	0,474	3,692	6,3	6,0	208
	0	1,047	0,482	3,706	4,1	4,0	279
	10	1,044	0,489	3,723	2,9	2,8	335
	20	1,040	0,495	3,742	2,1	2,0	379
	30	1,036	0,500	3,762	1,6	1,5	413
	40	1,032	0,504	3,784	1,3	1,2	439
	50	1,027	0,508	3,806	1,0	1,0	458
	60	1,022	0,512	3,829	0,9	0,8	472
	70	1,017	0,515	3,853	0,7	0,7	483
	80	1,012	0,517	3,876	0,6	0,6	489
	90	1,007	0,519	3,9	0,6	0,6	493
	100	1,002	0,521	3,923	0,5	0,5	495
	110	0,997	0,523	3,947	0,5	0,5	495
20	0	1,039	0,496	3,796	3,6	3,4	236
	10	1,036	0,505	3,809	2,5	2,4	295
	20	1,033	0,512	3,823	1,8	1,8	342
	30	1,029	0,519	3,84	1,4	1,4	378
	40	1,025	0,525	3,858	1,1	1,1	407
	50	1,020	0,530	3,877	0,9	0,9	428
	60	1,016	0,535	3,897	0,8	0,8	444
	70	1,011	0,539	3,917	0,7	0,7	456
	80	1,007	0,542	3,938	0,6	0,6	465
	90	1,002	0,546	3,959	0,5	0,5	470
	100	0,997	0,549	3,98	0,5	0,5	473
	110	0,992	0,551	4,001	0,4	0,4	474

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
60	-30	1,073	0,369	3,387	270,6	252,3	272
	-20	1,069	0,365	3,42	108,3	101,4	420
	-10	1,064	0,361	3,453	49,0	46,0	534
	0	1,058	0,358	3,485	24,5	23,2	623
	10	1,051	0,355	3,516	13,4	12,7	692
	20	1,043	0,353	3,546	7,9	7,5	745
	30	1,035	0,350	3,575	4,9	4,8	786
	40	1,027	0,348	3,603	3,3	3,2	816
	50	1,018	0,347	3,629	2,3	2,2	838
	60	1,010	0,345	3,655	1,6	1,6	854
	70	1,001	0,344	3,68	1,2	1,2	864
	80	0,993	0,343	3,704	1,0	1,0	870
	90	0,984	0,342	3,727	0,8	0,8	872
	100	0,975	0,341	3,75	0,6	0,6	872
	110	0,967	0,340	3,771	0,5	0,5	869
55	-30	1,066	0,379	3,46	200,5	188,0	217
	-20	1,063	0,377	3,489	82,8	77,8	370
	-10	1,059	0,376	3,519	38,5	36,3	488
	0	1,053	0,374	3,547	19,8	18,8	580
	10	1,047	0,373	3,575	11,0	10,6	652
	20	1,039	0,373	3,602	6,6	6,4	708
	30	1,032	0,372	3,628	4,3	4,1	751
	40	1,024	0,372	3,653	2,9	2,8	783
	50	1,016	0,371	3,677	2,0	2,0	807
	60	1,008	0,371	3,701	1,5	1,5	824
	70	0,999	0,371	3,724	1,1	1,1	836
	80	0,991	0,371	3,746	0,9	0,9	843
	90	0,983	0,371	3,767	0,7	0,7	846
	100	0,974	0,371	3,787	0,6	0,6	847
	110	0,966	0,372	3,807	0,5	0,5	845

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
50	-20	1,058	0,389	3,559	63,2	59,8	319
	-10	1,054	0,390	3,584	30,2	28,7	442
	0	1,049	0,391	3,609	15,9	15,2	537
	10	1,042	0,392	3,634	9,1	8,8	612
	20	1,036	0,393	3,657	5,6	5,4	670
	30	1,029	0,394	3,681	3,7	3,6	715
	40	1,021	0,395	3,703	2,5	2,5	750
	50	1,013	0,396	3,725	1,8	1,8	775
	60	1,005	0,397	3,747	1,4	1,4	794
	70	0,997	0,398	3,767	1,1	1,1	807
	80	0,989	0,400	3,787	0,8	0,9	815
	90	0,981	0,401	3,806	0,7	0,7	820
	100	0,973	0,402	3,825	0,6	0,6	821
	110	0,965	0,403	3,843	0,5	0,5	820
45	-20	1,052	0,402	3,628	48,3	45,9	268
	-10	1,049	0,404	3,649	23,7	22,6	395
	0	1,044	0,407	3,671	12,8	12,3	494
	10	1,038	0,410	3,692	7,5	7,3	572
	20	1,032	0,413	3,713	4,7	4,6	633
	30	1,025	0,416	3,734	3,2	3,1	680
	40	1,018	0,418	3,754	2,2	2,2	716
	50	1,011	0,421	3,773	1,6	1,6	743
	60	1,003	0,423	3,792	1,2	1,2	764
	70	0,996	0,426	3,811	1,0	1,0	778
	80	0,988	0,428	3,828	0,8	0,8	788
	90	0,980	0,430	3,846	0,7	0,7	793
	100	0,972	0,433	3,863	0,6	0,6	796
	110	0,965	0,435	3,879	0,5	0,5	796

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
40	-10	1,044	0,419	3,715	18,6	17,9	347
	0	1,039	0,424	3,733	10,4	10,0	450
	10	1,034	0,428	3,751	6,2	6,0	531
	20	1,028	0,433	3,769	4,0	3,9	595
	30	1,022	0,437	3,787	2,7	2,7	644
	40	1,015	0,441	3,804	2,0	1,9	682
	50	1,008	0,445	3,821	1,5	1,4	711
	60	1,001	0,449	3,838	1,1	1,1	733
	70	0,994	0,453	3,854	0,9	0,9	749
	80	0,986	0,457	3,87	0,7	0,8	760
	90	0,979	0,460	3,885	0,6	0,6	767
	100	0,971	0,463	3,9	0,5	0,6	770
	110	0,964	0,466	3,915	0,5	0,5	771
35	-10	1,039	0,433	3,78	14,6	14,1	299
	0	1,035	0,440	3,795	8,3	8,1	406
	10	1,030	0,447	3,81	5,1	5,0	490
	20	1,025	0,453	3,825	3,4	3,3	556
	30	1,019	0,459	3,84	2,4	2,3	608
	40	1,012	0,465	3,854	1,7	1,7	648
	50	1,006	0,470	3,869	1,3	1,3	679
	60	0,999	0,475	3,883	1,0	1,0	703
	70	0,992	0,480	3,898	0,8	0,8	720
	80	0,985	0,485	3,911	0,7	0,7	732
	90	0,977	0,490	3,925	0,6	0,6	740
	100	0,970	0,494	3,938	0,5	0,5	745
	110	0,963	0,498	3,951	0,5	0,5	747

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
33	-10	1,036	0,439	3,806	26,7	25,8	280
	0	1,033	0,447	3,819	14,0	13,5	388
	10	1,029	0,454	3,833	8,0	7,8	474
	20	1,023	0,461	3,847	4,9	4,8	541
	30	1,018	0,468	3,861	3,3	3,2	594
	40	1,011	0,474	3,875	2,3	2,3	635
	50	1,005	0,480	3,888	1,7	1,7	666
	60	0,998	0,486	3,902	1,3	1,3	690
	70	0,991	0,491	3,915	1,0	1,0	708
	80	0,984	0,496	3,928	0,8	0,8	721
	90	0,977	0,501	3,941	0,7	0,7	729
	100	0,970	0,506	3,953	0,6	0,6	735
	110	0,963	0,511	3,965	0,5	0,5	737
30	-10	1,033	0,448	3,845	11,5	11,1	251
	0	1,030	0,457	3,857	6,7	6,5	361
	10	1,026	0,465	3,868	4,2	4,1	449
	20	1,021	0,473	3,88	2,9	2,8	518
	30	1,016	0,481	3,893	2,0	2,0	572
	40	1,010	0,488	3,905	1,5	1,5	614
	50	1,003	0,495	3,917	1,2	1,2	647
	60	0,997	0,501	3,929	0,9	0,9	672
	70	0,990	0,507	3,941	0,8	0,8	691
	80	0,983	0,513	3,953	0,7	0,7	704
	90	0,976	0,519	3,964	0,6	0,6	713
	100	0,969	0,525	3,976	0,5	0,5	719
	110	0,962	0,530	3,987	0,5	0,5	722

Concentrate % v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/m K)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K⁻¹ (10⁻⁶/°C)
25	0	1,026	0,473	3,918	5,4	5,3	316
	10	1,022	0,483	3,927	3,5	3,4	407
	20	1,017	0,493	3,936	2,4	2,4	479
	30	1,012	0,502	3,946	1,8	1,7	535
	40	1,007	0,511	3,955	1,3	1,3	580
	50	1,001	0,519	3,965	1,1	1,0	614
	60	0,994	0,527	3,975	0,9	0,9	641
	70	0,988	0,535	3,985	0,7	0,7	661
	80	0,981	0,542	3,994	0,6	0,6	676
	90	0,975	0,549	4,004	0,5	0,6	687
	100	0,968	0,555	4,013	0,5	0,5	694
	110	0,961	0,561	4,023	0,5	0,5	697
20	0	1,021	0,490	3,98	4,4	4,3	271
	10	1,018	0,502	3,986	2,9	2,8	365
	20	1,014	0,513	3,992	2,0	2,0	440
	30	1,009	0,524	3,999	1,5	1,5	499
	40	1,004	0,534	4,006	1,2	1,2	545
	50	0,998	0,544	4,013	0,9	0,9	582
	60	0,992	0,553	4,02	0,8	0,8	610
	70	0,986	0,562	4,028	0,7	0,7	632
	80	0,980	0,570	4,036	0,6	0,6	648
	90	0,973	0,578	4,043	0,5	0,5	660
	100	0,967	0,586	4,051	0,5	0,5	668
	110	0,960	0,593	4,059	0,4	0,5	673
	110	0,960	0,593	4,059	0,4	0,5	673

Concentrate %v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/mK)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K-1 (10-6 /°C)
60	-30	1,075	0,366	3,364	296,9	276,3	289
	-20	1,071	0,361	3,399	117,8	110,0	435
	-10	1,065	0,357	3,433	52,8	49,5	548
	0	1,059	0,353	3,466	26,2	24,7	636
	10	1,052	0,349	3,498	14,2	13,5	704
	20	1,044	0,346	3,529	8,3	7,9	757
	30	1,036	0,344	3,558	5,2	5,0	797
	40	1,028	0,341	3,587	3,4	3,3	826
	50	1,019	0,339	3,615	2,3	2,3	848
	60	1,011	0,337	3,641	1,7	1,7	863
	70	1,002	0,336	3,667	1,3	1,3	873
	80	0,993	0,334	3,691	1,0	1,0	879
	90	0,984	0,333	3,715	0,8	0,8	881
	100	0,976	0,331	3,738	0,6	0,6	880
	110	0,967	0,330	3,76	0,5	0,5	877
55	-30	1,068	0,376	3,438	219,3	205,2	234
	-20	1,065	0,373	3,469	89,7	84,2	385
	-10	1,060	0,371	3,499	41,3	39,0	502
	0	1,054	0,369	3,529	21,1	20,0	593
	10	1,048	0,368	3,557	11,7	11,2	664
	20	1,041	0,367	3,585	7,0	6,7	719
	30	1,033	0,366	3,612	4,4	4,3	761
	40	1,025	0,365	3,638	3,0	2,9	793
	50	1,017	0,364	3,663	2,1	2,1	816
	60	1,008	0,364	3,687	1,5	1,5	833
	70	1,000	0,363	3,711	1,2	1,2	844
	80	0,991	0,363	3,733	0,9	0,9	851
	90	0,983	0,363	3,755	0,7	0,7	854
	100	0,975	0,362	3,776	0,6	0,6	854
	110	0,966	0,362	3,796	0,5	0,5	852

Concentrate %v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/mK)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K-1 (10-6 /°C)
50	-20	1,059	0,386	3,539	68,1	64,3	333
	-10	1,055	0,386	3,566	32,3	30,6	455
	0	1,050	0,386	3,592	16,9	16,1	549
	10	1,044	0,387	3,617	9,6	9,2	623
	20	1,037	0,387	3,642	5,9	5,7	681
	30	1,030	0,388	3,666	3,8	3,7	725
	40	1,022	0,388	3,689	2,6	2,6	759
	50	1,014	0,389	3,712	1,9	1,8	784
	60	1,006	0,390	3,734	1,4	1,4	802
	70	0,998	0,391	3,755	1,1	1,1	815
	80	0,990	0,392	3,775	0,9	0,9	823
	90	0,982	0,393	3,795	0,7	0,7	827
	100	0,974	0,393	3,814	0,6	0,6	828
	110	0,966	0,394	3,833	0,5	0,5	827
45	-20	1,054	0,399	3,61	51,7	49,1	281
	-10	1,050	0,401	3,633	25,2	24,0	407
	0	1,045	0,403	3,655	13,6	13,0	505
	10	1,039	0,405	3,677	7,9	7,6	582
	20	1,033	0,408	3,699	4,9	4,8	642
	30	1,026	0,410	3,72	3,3	3,2	689
	40	1,019	0,412	3,741	2,3	2,3	725
	50	1,011	0,414	3,761	1,7	1,7	751
	60	1,004	0,417	3,781	1,3	1,3	771
	70	0,996	0,419	3,8	1,0	1,0	785
	80	0,988	0,421	3,818	0,8	0,8	795
	90	0,980	0,423	3,836	0,7	0,7	800
	100	0,973	0,425	3,853	0,6	0,6	802
	110	0,965	0,427	3,87	0,5	0,5	802

Concentrate %v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/mK)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K-1 (10-6 /°C)
40	-10	1,045	0,416	3,7	19,7	18,9	358
	0	1,040	0,420	3,719	10,9	10,4	460
	10	1,035	0,424	3,738	6,5	6,3	540
	20	1,029	0,428	3,756	4,2	4,0	603
	30	1,023	0,432	3,775	2,8	2,8	652
	40	1,016	0,436	3,793	2,0	2,0	690
	50	1,009	0,440	3,81	1,5	1,5	719
	60	1,002	0,443	3,827	1,2	1,2	740
	70	0,994	0,447	3,844	0,9	0,9	756
	80	0,987	0,450	3,861	0,8	0,8	766
	90	0,979	0,453	3,876	0,6	0,7	773
	100	0,971	0,456	3,892	0,5	0,6	776
	110	0,964	0,459	3,907	0,5	0,5	777
35	-10	1,039	0,431	3,767	15,3	14,8	309
	0	1,036	0,437	3,783	8,7	8,4	415
	10	1,031	0,443	3,798	5,3	5,2	498
	20	1,026	0,449	3,814	3,5	3,4	564
	30	1,019	0,455	3,829	2,4	2,4	615
	40	1,013	0,460	3,845	1,8	1,7	655
	50	1,006	0,465	3,86	1,3	1,3	685
	60	0,999	0,470	3,875	1,1	1,1	709
	70	0,992	0,475	3,889	0,9	0,9	725
	80	0,985	0,480	3,903	0,7	0,7	737
	90	0,978	0,484	3,917	0,6	0,6	745
	100	0,970	0,488	3,931	0,5	0,5	750
	110	0,963	0,492	3,944	0,5	0,5	751

Concentrate %v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/mK)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K-1 (10-6 /°C)
33	-10	1,037	0,437	3,795	13,9	13,4	289
	0	1,034	0,444	3,809	8,0	7,7	396
	10	1,029	0,451	3,823	4,9	4,8	481
	20	1,024	0,457	3,837	3,3	3,2	548
	30	1,018	0,464	3,851	2,3	2,2	600
	40	1,012	0,470	3,866	1,7	1,7	641
	50	1,005	0,476	3,88	1,3	1,3	672
	60	0,998	0,481	3,894	1,0	1,0	696
	70	0,991	0,486	3,907	0,8	0,8	713
	80	0,984	0,491	3,921	0,7	0,7	726
	90	0,977	0,496	3,934	0,6	0,6	734
	100	0,970	0,501	3,946	0,5	0,5	739
	110	0,963	0,505	3,959	0,5	0,5	741
30	-10	1,034	0,446	3,835	11,9	11,5	258
	0	1,031	0,454	3,847	7,0	6,7	368
	10	1,027	0,462	3,859	4,4	4,3	455
	20	1,022	0,470	3,872	2,9	2,9	524
	30	1,016	0,477	3,884	2,1	2,0	577
	40	1,010	0,484	3,897	1,5	1,5	619
	50	1,004	0,491	3,91	1,2	1,2	652
	60	0,997	0,497	3,922	1,0	1,0	677
	70	0,990	0,503	3,934	0,8	0,8	695
	80	0,983	0,509	3,946	0,7	0,7	708
	90	0,976	0,515	3,958	0,6	0,6	718
	100	0,969	0,520	3,97	0,5	0,5	723
	110	0,962	0,525	3,981	0,5	0,5	726

Concentrate %v/v	Temperature (°C)	Density (g/cm³)	Thermal Conductivity (W/mK)	Specific Heat (kJ/kg J)	Dynamic Viscosity (mPa.s)	Kinematic Viscosity (mm²/s)	Thermal Expansion K-1 (10-6 /°C)
25	0	1,026	0,471	3,912	5,6	5,4	321
	10	1,022	0,481	3,921	3,6	3,5	412
	20	1,018	0,491	3,93	2,5	2,4	483
	30	1,013	0,500	3,94	1,8	1,8	539
	40	1,007	0,509	3,95	1,3	1,3	584
	50	1,001	0,517	3,96	1,1	1,1	618
	60	0,995	0,524	3,97	0,9	0,9	645
	70	0,988	0,532	3,98	0,7	0,7	665
	80	0,982	0,539	3,99	0,6	0,6	679
	90	0,975	0,546	4	0,6	0,6	690
	100	0,968	0,552	4,009	0,5	0,5	696
	110	0,961	0,558	4,019	0,5	0,5	700
20	0	1,021	0,489	3,977	4,4	4,3	274
	10	1,018	0,501	3,982	2,9	2,9	367
	20	1,014	0,512	3,989	2,1	2,0	442
	30	1,009	0,523	3,995	1,5	1,5	501
	40	1,004	0,533	4,003	1,2	1,2	547
	50	0,998	0,543	4,01	0,9	0,9	584
	60	0,992	0,552	4,018	0,8	0,8	612
	70	0,986	0,560	4,026	0,7	0,7	634
	80	0,980	0,569	4,033	0,6	0,6	650
	90	0,973	0,577	4,041	0,5	0,5	661
	100	0,967	0,584	4,049	0,5	0,5	669
	110	0,961	0,591	4,057	0,4	0,5	674

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