

# DOWCAL™

Inhibited glycol-based heat transfer fluids

Guide to products and application

**DOW**



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# DOWCAL™ Inhibited Glycol-based Fluids

## High performance heat transfer fluids offer sustainable solutions

### Advantages of DOWCAL™ Heat Transfer Fluids

What are DOWCAL™ Heat Transfer Fluids? Ethylene or Propylene glycol-based liquids with our signature corrosion inhibitors for optimum system performance, Dow offers a full range of DOWCAL™ Heat Transfer Fluids to meet your specific system requirements.

#### Long-lasting performance

DOWCAL™ Fluids are also long-lasting and can be operated for many years in properly maintained systems. Their special corrosion inhibitor package supports higher temperature operation compared to alternative technologies.

#### Corrosion protection

DOWCAL™ Fluids are formulated with carefully chosen corrosion inhibitors to provide protection to the metallic parts of process equipment, therefore improving process efficiency and reducing maintenance costs. DOWCAL™ 100 and DOWCAL™ 200 in particular are very efficient at protecting aluminum.

#### Expert technical support

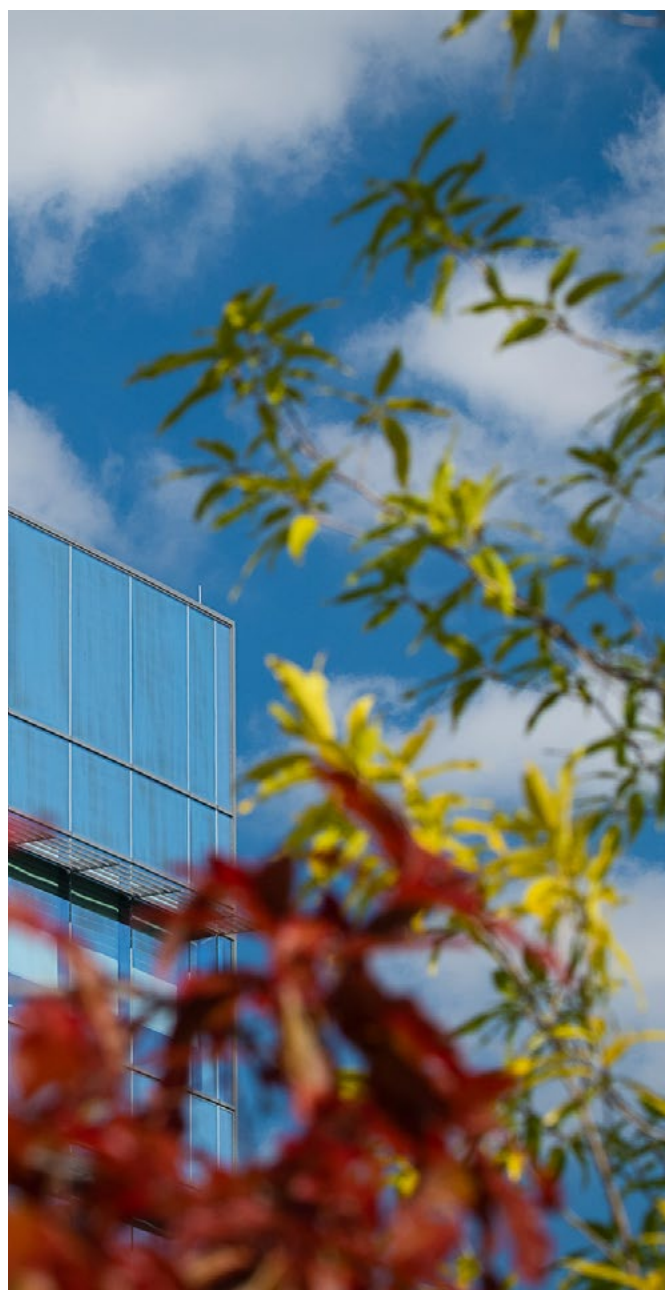
As a Dow heat transfer fluids customer, you have direct access to our industry leading heat transfer expertise, including our in-depth and highly diversified application experience. Dow heat transfer specialists will help you select the exact fluid you require, then work with you to properly install and optimize fluid operation for best results. Contact us as indicated on the back of this brochure to learn more about our services and to begin working with our experts on your successful heat transfer project.

### Sustainability

#### Safe for use

DOWCAL™ 100 & 200 Fluids are nitrite, borax, and CMR (carcinogenic, mutagenic, and reprotoxic) free.

DOWCAL™ 100E & DOWCAL™ 200E are free of Borate providing a better EH&S profile.



# Applications and product recommendations

## Construction and infrastructure

Application process	Recommended product(s)
<p><b>Ground source heat pumps:</b> DOWCAL™ Fluids are circulated through underground or underwater piping, carrying thermal energy to and from the building. To prevent freezing when the transfer fluid contacts the evaporating refrigerant at sub-zero temperatures, DOWCAL™ Fluids can be circulated in the captors/probes.</p>	<p><b>DOWCAL™ e-GEO</b> <b>DOWCAL™ p-GEO</b></p>
<p><b>Solar heating:</b> Active solar thermal systems, such as flat panel collectors, rely on the solar energy to heat-up DOWCAL™ Fluids, which are circulated in an area that requires heat.</p>	<p><b>DOWCAL™ 200</b></p>
<p><b>HVAC (Heating Ventilation and Air Conditioning):</b> Modern HVAC systems frequently use a glycol based heat transfer fluid to transport heat and cold from heating and cooling units to the consumers. When designing, installing or operating these water-based HVAC systems, DOWCAL™ Fluids provide the required system protection against freezing and corrosion and provide efficient heat transfer for years with minimal maintenance.</p>	<p><b>DOWCAL™ 100E</b> <b>DOWCAL™ 200E</b></p>
<p><b>Floor heating:</b> Massive damage can be inflicted on warehouse floors due to frost heaving. This risk is reduced by embedding a grid of tubing in the soil beneath the floor and heating it with DOWCAL™ Fluid.</p>	<p><b>DOWCAL™ 100</b> <b>DOWCAL™ 200</b></p>
<p><b>Snow melting systems:</b> A snow melting system consists of a network of pipes or tubing embedded in concrete or asphalt. A solution of heated DOWCAL™ Fluids and water is circulated through the pipes in order to melt snow and ice from bridges, service areas, roads and sidewalks.</p>	<p><b>DOWCAL™ 100</b> <b>DOWCAL™ 200</b></p>



# Applications and product recommendations

## Industrial

Application process	Recommended product(s)
<p><b>Process chilling, freeze protection and cooling:</b> The chemical and petrochemical industries use secondary cooling for chilling purposes or to remove heat generated during processing. The choice of product depends on the use. DOWCAL™ Fluids are often used for process chilling because they are nonflammable in aqueous solutions and are low in corrosivity.</p>	<p><b>DOWCAL™ 100E</b> <b>DOWCAL™ 200E</b></p>
<p><b>Process heating:</b> In batch processing environments, such as pharmaceutical batch processing / multipurpose reactors in the pharmaceutical, reactors must be cooled and heated. DOWCAL™ 100 and DOWCAL™ 200 have a wide temperature range making them suitable to be used in both hot and cold loops.</p>	<p><b>DOWCAL™ 100</b> <b>DOWCAL™ 200</b></p>
<p><b>Heat recovery:</b> Many industries operate heat recovery systems to improve the overall thermal efficiency of their processes. In this application, DOWCAL™ Fluids collect waste heat that would otherwise be expelled to the environment and pumps it to places where this thermal energy can be put to use.</p>	<p><b>DOWCAL™ 100</b> <b>DOWCAL™ 200</b></p>



# Applications and product recommendations

## Food and beverages

### Facts of food and beverages contact

DOWCAL™ N Fluid is based on propylene glycol which is generally recognized as safe by the United States Food and Drug Administration (FDA) in section 21CFR184.1666 and meets the specifications of the Food Chemicals Codex, 6th edition (2008). It can therefore be used in indirect food application.

In Europe, the ingredients in DOWCAL™ N Fluids are listed in the Commission Regulation (EU) No 1130/2011 concerning food additives authorized for use in foodstuffs intended for human consumption. Propylene glycol (PG) is classified as E1520 in an amendment to European Union Directive 95/2/EC, which regulates human food additives and it is listed in Annex I of the Commission Regulation (EU) No 10/2011 as an authorized monomer and additive for plastic materials and articles intended to come into contact with food.

Finally, DOWCAL™ N Fluid is approved by the National Sanitation Foundation (NSF). It is suitable as a heat transfer medium for food and beverage plants.

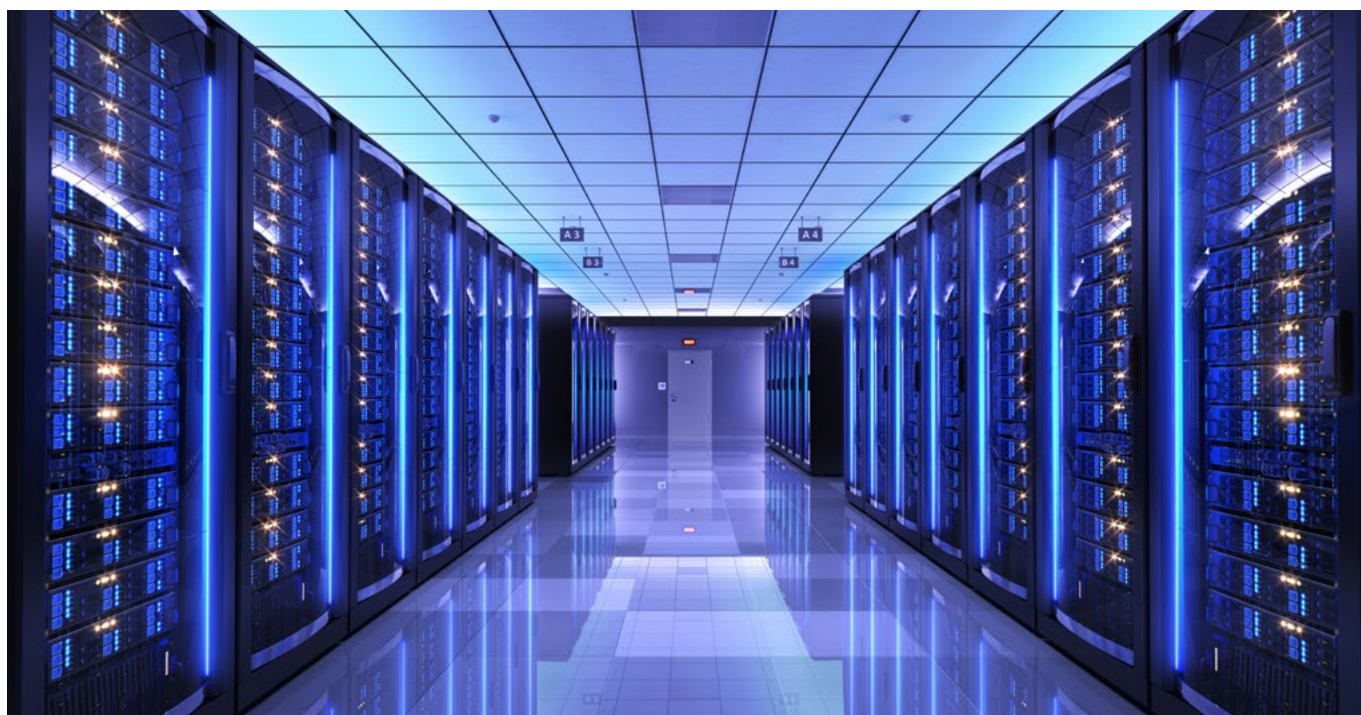
Application process	Recommended product(s)
<p><b>Cooling liquid:</b> DOWCAL™ N Fluid is widely used in the beverage industry to cool products such as beer, wine, milk and juices.</p>	<p><b>DOWCAL™ N</b></p>
<p><b>Fermentation cooling:</b> Breweries and wineries use DOWCAL™ N Fluid to cool fermentation and wort tanks. The fluid's anti-corrosive properties safeguard the integrity of the piping systems.</p>	
<p><b>Packaging of carbonated beverages:</b> DOWCAL™ N Fluid is used prior to bottling to cost-effectively chill and prevent loss of carbonation from carbonated beverages such as sparkling wines, champagne and beer.</p>	
<p><b>Refrigeration coil defrosting:</b> When moisture from the air condenses on the refrigeration coils of walk-in freezers and chillers, frost build-up can result in loss of refrigeration efficiency. Sprayed directly onto the coils, DOWCAL™ N Fluid will prevent frost formation and, because it is hygroscopic, DOWCAL™ N Fluid also absorbs condensation.</p>	



# Applications and product recommendations

## Other applications

Application process	Recommended product(s)
<p><b>Cooling of electronic systems and components:</b> Liquid cooling is an effective technology in removing heat generated by electronics in established power conversion sectors such as motor drives, wind and solar inverters. Other developing application is on battery cooling.</p>	<p><b>DOWCAL™ 100E</b> <b>DOWCAL™ 200E</b></p>
<p><b>Wind turbine systems:</b> There are large and complex power electronics and these systems go through significant thermal stresses and generate heat under load. The components in these converters are cooled with DOWCAL™ Fluid loop.</p>	
<p><b>Photo-voltaic (PV) inverters:</b> As the inverter works to convert DC power to AC power, it generates heat.</p>	
<p><b>DataCenter cooling:</b> DataCenter OEMs want to replace conventional air cooling technology with liquid cooling using DOWCAL™ Heat Transfer Fluids.</p>	
<p><b>Ice skating rinks:</b> Some of the most elite indoor ice arenas depend on DOWCAL™ Fluid to help keep the ice cool and consistent. For ice skating rinks, solutions containing DOWCAL™ Fluids are chilled by refrigeration equipment and then circulated through a network of pipes beneath the rink floor. The cold solution causes a layer of water to freeze into a smooth sheet of ice.</p>	



# Corrosion protection capabilities

DOWCAL™ Fluids are made for a very broad range of applications. The specially formulated inhibitor packages of DOWCAL™ Fluids are effective in minimizing corrosion of a wide variety of metals that are used in industrial and residential applications, reducing maintenance costs and extending the life of the process equipment.

These inhibitors minimize corrosion of metals in two ways. First, they passivate the surface of metals, reacting with the surface or forming a layer on the surface to prevent acids from attacking it. Second, the inhibitors in DOWCAL™ Fluids buffer any acids formed as a result of glycol oxidation. All glycols produce organic acids as degradation products. This degradation is accelerated in the presence of oxygen and/or heat. Left in solution, acids lower pH and contribute to corrosion. Properly formulated inhibitors such as those in DOWCAL™ Fluids neutralize these acids and contribute to a long fluid life time. Many commonly available coolants – such as fluids with pure organic acid technology (OAT) – have little ability to buffer these degradation products and therefore need to be changed more frequently.

The following data show the comparatively low corrosion of widely used metals caused by DOWCAL™ Fluid/water mixtures. The results were derived from tests performed

according to the widely known ASTM D 1384 corrosion test method and represent the weight loss of metallic plates in milligrams per specimen due to corrosion (ASTM D 1384, 88°C for 2 weeks, glycol concentration 33% by volume, air bubbling, corrosive water contains 100 ppm Cl<sup>-</sup>, 100 ppm SO<sub>4</sub><sup>2-</sup>, 100 ppm HCO<sub>3</sub><sup>-</sup>).

DOWCAL™ Fluids fall well within the generally accepted corrosion limits considered adequate under this test. Rates in excess of 10 mg (30 mg for aluminum) are generally evidence of inadequate corrosion protection.

While the other fluids tested at a concentration of 33% by volume can also perform acceptably, solutions containing lower concentrations of fluid are frequently required. The tables on this page show ASTM D1384 corrosion test results under the same conditions for various coolants at a 20% concentration by volume. For comparison purposes, pure water and uninhibited propylene glycol and ethylene glycol are included. The data shows that the DOWCAL™ Fluids demonstrate effective corrosion protection on all metals while the alternative products were more corrosive to aluminum. The tests also demonstrated that water and uninhibited glycols are highly corrosive, reinforcing the need for inhibited fluid protection.

		Non-inhibited ethylene glycol	Automotive coolant, MEG-based	OAT fluid, MEG-based	DOWCAL™ 100 Solution
1	Copper	-19	-1.4	-0.8	-0.6
2	Solder	-46	-1.1	-0.8	-0.8
3	Brass	-29	-0.4	-0.4	-0.9
4	Mild steel	-819	0.5	0.7	-0.2
5	Cast iron	-642	1.8	1.6	2.7
6	Aluminum	-111	-10.2	-16.0	0.1

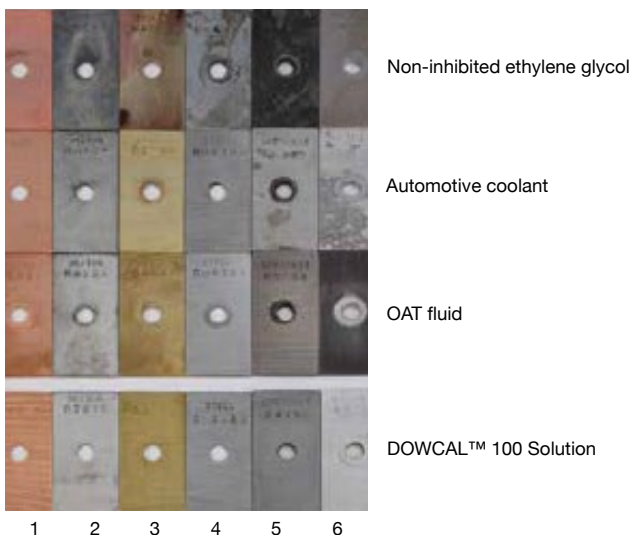
ASTM D1384 Corrosion test Results at 20% Concentration by volume Ethylene Glycol (Weight Difference [mg])

Typical values, not to be construed as specifications. Users should confirm results by their own tests.

		Non-inhibited propylene glycol	Industrial propylene glycol coolant	Alternative OAT fluid	DOWCAL™ 200 Solution
1	Copper	-12	-0.5	-1.3	-0.3
2	Solder	-55	-1	-1.8	-0.5
3	Brass	-31	-0.7	-1.4	0.3
4	Mild steel	-969	0.7	0.3	0.6
5	Cast iron	-700	1.5	0.3	1.3
6	Aluminum	-150	-11.3	-22	0.7

ASTM D1384 Corrosion test Results at 20% Concentration by volume Propylene Glycol (Weight Difference [mg])

Typical values, not to be construed as specifications. Users should confirm results by their own tests.





# Using DOWCAL™ Fluids

## Material compatibility

Solutions of DOWCAL™ Fluids are compatible with all metals, with the exception of zinc. The heat transfer fluid can dissolve zinc when hot and should, therefore, not be used in galvanized pipelines.

DOWCAL™ Fluids are compatible with most plastics and rubbers, such that they can be considered industry standards. The following table provides a list of compatible plastics and rubbers together with the materials' maximum recommended temperatures (in some cases the maximum use temperature is for the plastics, regardless of the fluid).

Materials	Ethylene glycol based fluid, e.g. DOWCAL™ 100	Propylene glycol based fluid, e.g. DOWCAL™ 200 & DOWCAL™ N
<b>Plastics</b>		
ABS	66°C	32°C
Acrylics	32°C	
Chlorinated polymer	110°C	
CPVC	93°C <sup>a</sup>	93°C <sup>b</sup>
Epoxy	143°C	99°C(U) <sup>c</sup>
Fluorocarbons FEP	199°C	199°C
Fluorocarbons TFE	249°C	249°C
Noryl	66°C	
Polyamides – Nylon	99°C	
Bisphenol A-Fumarate	110°C	88°C
Hydrogenated Bisphenol A-Bisphenol A	104°C	93°C
Isophthalic	43°C(U) <sup>c</sup>	88°C
Chlorinated polyesters	127°C	104°C
Polystyrenes	77°C	
Polyethylene	71°C	66°C
Polypropylene	116°C	66°C
PVC – Type 1	49°C	49°C <sup>d</sup>
PVC – Type 2	49°C	49°C <sup>d</sup>
Polyvinylidene chloride	88°C	
Vinylidene fluoride	143°C	138°C
Vinyl ester	104°C	104°C
Polymethylmethacrylate (PMMA)		70°C

## Fluid dilution requirements

Whenever possible, DOWCAL™ Fluids should be diluted with demineralized or distilled water. DOWCAL™ 100, DOWCAL™ 100E, DOWCAL™ 200 and DOWCAL™ 200E Fluids can also be mixed with other water within the limits of the following table. Local tap water typically meets these requirements. If water of adequate quality is not available, Dow or Dow's local distributor can supply ready-to-use solutions of DOWCAL™ Fluids.

<b>Rubbers</b>		
Butyl GR-1	93°C	
Fluoro Elastomers Viton A	182°C	38°C
Fluoro Elastomers KEL-F 3700	99°C	
Hard rubber	93°C	
Chlorosulfonated polyethylene (CSPE)	99°C	
Koroseal	71°C	
Natural rubber (GRS)	71°C	
Neoprene GR-M (CR)	77°C	32°C
Nitrile Buna M (NBR)	88°C	32°C
NORDEL™ EPDM	154°C	
Polyurethane	38°C	

- (a) But only if the solution contains 50% or less of ethylene glycol, according to BF Goodrich  
 (b) But not in a solution containing more than 25% of propylene glycol, according to BF Goodrich  
 (c) When U follows a recommended temperature range, the fluid was found to cause a problem with the plastic above the range, and is therefore unsuitable at higher temperatures  
 (d) The Geon Company, a major manufacturer of PVC resins and compounds, cautions against using PVC above 49°C  
 (e) Tested by Ecofys Netherlands BV, 2008

Table Sources: "Corrosion Resistance Tables," Second Edition, Philip A. Schweiter, P.E., 1986 BF Goodrich and The Geon Company

These are typical properties, not to be construed as specifications.

## Dilution water quality requirements

	DOWCAL™ 100 / 200
Chloride	<400 ppm*
Sulphate	<400 ppm*
Total hardness	<450 ppm (25°dH)

\*<100 ppm if the system contains aluminum or aluminum alloy components

## Using DOWCAL™ Fluids (continued)

### Expert technical support

As a Dow heat transfer fluids customer, you have direct access to our industry-leading heat transfer expertise, including our in-depth and highly diversified application experience. Dow heat transfer specialists will help you select the exact fluid you require, then work with you to properly install and optimize fluid operation for best results. Contact us as indicated on the back of this brochure to learn more about our services and to begin working with our experts on your successful heat transfer project.






### Fluid analysis recommendations

Experience confirms that DOWCAL™ Fluids can be used in installations for many years. However, the concentration of DOWCAL™ Fluids and the products' functional performance should be checked at intervals of one to two years. Please refer to the back cover of this brochure to find the toll-free number of the Dow Customer Information Group and ask for our fluid analysis procedure.

## Heat transfer fluid selection calculator

FLUIDFILE™ Software is designed to enable fast, efficient evaluation of the properties and performance of Dow heat transfer fluids under your actual system conditions, and in the units of measure you prefer. It makes choosing the right fluid easier and more convenient for both experienced professionals and first-time system designers.

You won't need prior experience with Dow heat transfer fluids to obtain the information you need to select the right fluid. To assist in your fluid decision-making, FLUIDFILE™ Software provides an overview of our fluids line, guidance in choosing a fluid chemistry including application information, plus profiles of the individual fluids. FLUIDFILE™ Software can be accessed from [www.dow.com](http://www.dow.com) website.

	Single temperature and concentration	Temperature range	Concentration range
<input type="checkbox"/> DOWCAL™ 100	Temperature 	20 °C	
<input type="checkbox"/> DOWCAL™ 200 <input type="checkbox"/> DOWCAL™ N	Concentration 		35 %
<input type="checkbox"/> WATER	Percent glycol <input checked="" type="radio"/> % Volume fluid <input type="radio"/> % Weight glycol <input type="radio"/> % Weight fluid		
<input type="checkbox"/> OTHER	Diameter 		27.2 mm
	<input checked="" type="radio"/> Pipe <input type="radio"/> Tube		
	Volumetric flow: 		6.28 m³/hour
	Fluid velocity 		3.00 m/sec

Si

## Selecting the right DOWCAL™ Fluid

	DOWCAL™ 100	DOWCAL™ 100E	DOWCAL™ 200	DOWCAL™ 200E	DOWCAL™ e-GEO	DOWCAL™ p-GEO	DOWCAL™ N
Based on ethylene glycol based	*	*			*		
Based on propylene glycol			*	*		*	*1
Recommended for cooling	*	*	*	*	*	*	*
Recommended for heating	*		*				
NSF certified <sup>2</sup>							*
Free from borate <sup>3</sup>		*		*	*	*	*

1: Based on high purity propylene glycol USP/EP

2: National Sanitation Foundation

3: DOWCAL™ 100E, 200E, e-Geo, p-GEO, and N grades are borate free, being manufactured without added borate.

These are typical properties, not to be construed as specifications.



## Product information

**DOWCAL™ 100** is an ethylene glycol-based heat transfer fluid used in various industrial applications, highly recommended for heating applications.

### Key benefits of DOWCAL™ 100

- Improved corrosion protection, in particular for aluminum alloys
- Suitable for use at a minimum 20% concentration for high and low temperatures
- Hard water stability to enable use with local tap water
- Compatible with commonly used elastomers
- Long fluid lifetime, lowering maintenance cost
- Free of nitrite, borax and CMR (carcinogenic, mutagenic, and reprotoxic)\*

### Typical properties of DOWCAL™ 100 Heat Transfer Fluid<sup>1</sup>

Composition (% by weight)		
	Ethylene glycol	91%
	Inhibitors	9%
Color		Colorless
Density at 20°C	g/cm <sup>3</sup>	1.135
pH of solution	(50% vol. in water)	7.6 – 8.2
Reserve alkalinity	mL (0.1 N HCl)	10
Freeze point (50% vol. in water)	°C	-36

1. Typical properties not to be construed as specification, complete sales specification is available on request.

\*DOWCAL™ 100 is nitrite and CMR free, being manufactured without added nitrite or CMR.

## Physical properties of DOWCAL™ 100 Fluid

The following data tables provide freezing and boiling point data as well as refractive index, density, dynamic and kinematic viscosity at 20°C for varying concentrations of DOWCAL™ Fluids. Specific heat, density, thermal conductivity and viscosity also

vary depending on both the concentration and temperature of DOWCAL™ Fluid. Specific properties depending on temperature and concentration can be calculated with Dow's FLUIDFILE™ software available at [www.dow.com](http://www.dow.com).

### Typical freezing, boiling points and other properties of DOWCAL™ 100 Fluid †\*

DOWCAL™ 100 Vol. %	DOWCAL™ 100 Wt. %	Freezing point °C	Refractive index @ 20°C	Boiling point °C @ 1 bara	Density g/cm³ @ 20°C	Dyn. viscosity mPa.s @ 20°C	Kin. viscosity mm²/s @ 20°C
5.0	5.6	-2.1	1.3386	100.5	0.983	1.07	1.03
10.0	11.2	-4.3	1.3442	101.1	1.001	1.26	1.22
15.0	16.7	-6.7	1.3498	101.7	1.016	1.49	1.43
20.0	22.1	-9.4	1.3554	102.4	1.029	1.77	1.69
21.0	23.2	-10.0	1.3565	102.5	1.031	1.83	1.75
22.0	24.3	-10.6	1.3576	102.7	1.033	1.89	1.81
23.0	25.3	-11.3	1.3588	102.8	1.036	1.96	1.87
24.0	26.4	-11.9	1.3599	102.9	1.038	2.03	1.93
25.0	27.5	-12.6	1.3610	103.1	1.040	2.09	1.99
26.0	28.5	-13.2	1.3621	103.2	1.042	2.17	2.06
27.0	29.6	-14.0	1.3632	103.3	1.044	2.24	2.13
28.0	30.6	-14.7	1.3643	103.5	1.046	2.32	2.20
29.0	31.7	-15.4	1.3654	103.6	1.048	2.40	2.27
30.0	32.7	-16.2	1.3665	103.8	1.050	2.48	2.35
31.0	33.8	-17.0	1.3676	103.9	1.052	2.57	2.43
32.0	34.8	-17.8	1.3687	104.0	1.053	2.65	2.51
33.0	35.9	-18.7	1.3698	104.2	1.055	2.75	2.59
34.0	36.9	-19.5	1.3709	104.3	1.057	2.84	2.68
35.0	38.0	-20.4	1.3720	104.5	1.059	2.94	2.77
36.0	39.0	-21.4	1.3731	104.6	1.060	3.04	2.86
37.0	40.0	-22.3	1.3742	104.8	1.062	3.14	2.96
38.0	41.0	-23.3	1.3752	104.9	1.064	3.25	3.06
39.0	42.1	-24.3	1.3763	105.1	1.065	3.36	3.16
40.0	43.1	-25.4	1.3774	105.2	1.067	3.48	3.27
41.0	44.1	-26.4	1.3785	105.4	1.068	3.60	3.38
42.0	45.1	-27.5	1.3796	105.5	1.070	3.72	3.49
43.0	46.1	-28.7	1.3806	105.7	1.071	3.85	3.60
44.0	47.2	-29.9	1.3817	105.9	1.073	3.98	3.73
45.0	48.2	-31.1	1.3828	106.0	1.074	4.12	3.85
46.0	49.2	-32.3	1.3838	106.2	1.076	4.26	3.98
47.0	50.2	-33.6	1.3849	106.4	1.077	4.41	4.11
48.0	51.2	-34.9	1.3859	106.5	1.079	4.56	4.25
49.0	52.2	-36.3	1.3870	106.7	1.080	4.71	4.39
50.0	53.2	-37.7	1.3880	106.9	1.081	4.88	4.54
51.0	54.2	-39.1	1.3891	107.1	1.083	5.04	4.69
52.0	55.2	-40.6	1.3901	107.3	1.084	5.22	4.85
53.0	56.2	-42.1	1.3912	107.5	1.085	5.40	5.01
54.0	57.1	-43.7	1.3922	107.7	1.087	5.58	5.18
55.0	58.1	-45.3	1.3932	107.9	1.088	5.77	5.35
60.0	63.0	<-51	1.3983	109.2	1.094	6.84	6.31
65.0	67.8	<-51	1.4033	110.8	1.100	8.10	7.43
70.0	72.6	<-51	1.4082	112.8	1.105	9.59	8.76
75.0	77.3	<-51	1.4130	115.4	1.111	11.4	10.3
80.0	82.0	<-51	1.4176	118.8	1.116	13.4	12.2
85.0	86.6	-50.9	1.4220	123.2	1.120	15.9	14.4
90.0	91.1	-40.8	1.4264	128.9	1.125	18.8	16.9
95.0	95.6	-34.5	1.4305	136.1	1.129	22.3	19.9
100.0	100.0	-28.7	1.4345	145.1	1.134	26.4	23.5

† Typical properties, not to be construed as specifications.

\* Temperature-dependent physical properties are provided in the FLUIDFILE™ Software.

Generally, for an extended margin of protection you should select a temperature in this table that is at least 3°C lower than the expected lowest ambient temperature. Contact Dow for information and further assistance with specific cases.

## Product information

**DOWCAL™ 200** is a propylene glycol-based heat transfer fluid for use in a wide range of applications, mainly recommended for heating applications. Low acute toxicity makes DOWCAL™ 200 especially suitable for applications where toxicity is a concern.

### Key benefits of DOWCAL™ 200

- Improved corrosion protection, in particular for aluminum alloys
- Suitable for use at a minimum 20% concentration
- Hard water stability to enable use with local tap water
- Compatible with commonly used elastomers
- Long fluid lifetime, lowering maintenance cost
- Free of nitrite, borax and CMR (carcinogenic, mutagenic, and reprotoxic)\*

### Typical properties of DOWCAL™ 200 Heat Transfer Fluid<sup>1</sup>

Composition (% by weight)		
	Propylene glycol	92%
	Inhibitors	8%
Color		Colorless
Density at 20°C	g/cm <sup>3</sup>	1.050
pH of solution	(50% vol. in water)	7.2 – 7.6
Reserve alkalinity	mL (0.1 N HCl)	10
Freeze point (50% vol. in water)	°C	-32

1. Typical properties not to be construed as specification, complete sales specification is available on request.

\*DOWCAL™ 200 is nitrite and CMR free, being manufactured without added nitrite or CMR.

# Physical properties of DOWCAL™ 200 Fluid

The following data tables provide freezing and boiling point data as well as refractive index, density, dynamic and kinematic viscosity at 20°C for varying concentrations of DOWCAL™ Fluids. Specific heat, density, thermal conductivity and viscosity also

vary depending on both the concentration and temperature of DOWCAL™ Fluid. Specific properties depending on temperature and concentration can be calculated with Dow's FLUIDFILE™ software available at [www.dow.com](http://www.dow.com).

## Typical freezing, boiling points and other properties of DOWCAL™ 200 Fluid †\*

DOWCAL™ 200 Vol. %	DOWCAL™ 200 Wt. %	Freezing point °C	Refractive index @ 20°C	Boiling point °C @ 1 bara	Density g/cm³ @ 20°C	Dyn. viscosity mPa.s @ 20°C	Kin. viscosity mm²/s @ 20°C
5.0	5.3	-1.6	1.3391	100	1.006	1.36	1.95
10.0	10.5	-3.3	1.3452	100	1.011	1.62	1.66
15.0	15.8	-5.3	1.3513	101	1.015	1.93	1.81
20.0	20.9	-7.5	1.3573	101	1.020	2.30	2.11
21.0	22.0	-8.0	1.3585	101	1.021	2.39	2.18
22.0	23.0	-8.5	1.3597	101	1.022	2.48	2.26
23.0	24.0	-9.1	1.3609	101	1.022	2.57	2.34
24.0	25.1	-9.6	1.3621	102	1.023	2.66	2.42
25.0	26.1	-10.2	1.3633	102	1.024	2.76	2.51
26.0	27.1	-10.8	1.3645	102	1.025	2.87	2.61
27.0	28.2	-11.4	1.3657	102	1.026	2.97	2.71
28.0	29.2	-12.1	1.3669	102	1.027	3.09	2.81
29.0	30.2	-12.7	1.3681	102	1.028	3.20	2.92
30.0	31.2	-13.4	1.3693	102	1.029	3.33	3.04
31.0	32.3	-14.1	1.3704	102	1.030	3.45	3.16
32.0	33.3	-14.8	1.3716	102	1.031	3.58	3.29
33.0	34.3	-15.6	1.3728	102	1.032	3.72	3.42
34.0	35.3	-16.4	1.3739	102	1.033	3.87	3.56
35.0	36.3	-17.2	1.3751	102	1.034	4.02	3.70
36.0	37.4	-18.0	1.3762	103	1.035	4.17	3.85
37.0	38.4	-18.9	1.3774	103	1.036	4.34	4.01
38.0	39.4	-19.8	1.3785	103	1.037	4.51	4.17
39.0	40.4	-20.7	1.3797	103	1.038	4.68	4.35
40.0	41.4	-21.7	1.3808	103	1.039	4.87	4.53
41.0	42.4	-22.7	1.3820	103	1.039	5.06	4.71
42.0	43.4	-23.7	1.3831	103	1.040	5.26	4.91
43.0	44.4	-24.8	1.3842	103	1.041	5.47	5.12
44.0	45.4	-25.8	1.3853	103	1.042	5.69	5.33
45.0	46.4	-27.0	1.3864	103	1.043	5.92	5.55
46.0	47.5	-28.1	1.3875	104	1.044	6.16	5.79
47.0	48.5	-29.3	1.3886	104	1.045	6.40	6.03
48.0	49.5	-30.5	1.3897	104	1.046	6.66	6.29
49.0	50.5	-31.8	1.3908	104	1.047	6.93	6.55
50.0	51.5	-33.1	1.3919	104	1.048	7.22	6.83
51.0	52.5	-34.5	1.3930	105	1.048	7.51	7.12
52.0	53.5	-35.9	1.3941	105	1.049	7.82	7.42
53.0	54.4	-37.3	1.3951	105	1.050	8.14	7.74
54.0	55.4	-38.7	1.3962	105	1.051	8.48	8.07
55.0	56.4	-40.3	1.3973	105	1.052	8.83	8.41
60.0	61.4	-48.5	1.4024	107	1.056	10.8	10.4
65.0	66.3	<-51	1.4074	108	1.059	13.3	12.8
70.0	71.2	<-51	1.4122	109	1.062	16.5	15.8
75.0	76.1	<-51	1.4168	111	1.064	20.4	19.5
80.0	80.9	<-51	1.4212	113	1.066	25.4	24.1
85.0	85.7	<-51	1.4253	116	1.066	31.6	29.8
90.0	90.5	<-51	1.4291	121	1.065	39.5	36.9
95.0	95.3	<-51	1.4327	129	1.062	49.5	45.7
100.0	100.0	<-51	1.4360	142	1.057	62.3	56.5

† Typical properties, not to be construed as specifications.

\* Temperature-dependent physical properties are provided in the FLUIDFILE™ Software.

Generally, for an extended margin of protection you should select a temperature in this table that is at least 3°C lower than the expected lowest ambient temperature. Contact Dow for information and further assistance with specific cases.

## Product information

DOWCAL™ 100E is an ethylene glycol-based heat transfer fluid especially suitable for use in cooling applications pharmaceutical and specialty chemical industry.

### Key benefits of DOWCAL™ 100E

- Improved corrosion protection, in particular for aluminum alloys
- Suitable for cooling, chilling and freeze protection
- Hard water stability to enable use with local tap water
- Compatible with commonly used elastomers
- Long fluid lifetime, lowering maintenance cost
- Free of nitrite, borate and CMR (carcinogenic, mutagenic, and reprotoxic)\*

### Typical properties of DOWCAL™ 100E Heat Transfer Fluid<sup>1</sup>

Composition (% by weight)		
	Ethylene glycol	94%
	Inhibitors	6%
Color		Colorless
Density at 20°C	g/cm <sup>3</sup>	1.114
pH of solution	(50% vol. in water)	8.0 – 8.8
Reserve alkalinity	mL (0.1 N HCl)	9.5
Freeze point (50% vol. in water)	°C	-36

1. Typical properties not to be construed as specification, complete sales specification is available on request.

\*DOWCAL™ 100E is nitrite, borate and CMR free, being manufactured without added nitrite, borate or CMR.



## Physical properties of DOWCAL™ 100E Fluids

The following data tables provide freezing and boiling point data as well as refractive index, density, dynamic and kinematic viscosity at 20°C for varying concentrations of DOWCAL™ Fluids. Specific heat, density, thermal conductivity and viscosity also

vary depending on both the concentration and temperature of DOWCAL™ Fluid. Specific properties depending on temperature and concentration can be calculated with Dow's FLUIDFILE™ software available at [www.dow.com](http://www.dow.com).

### Typical freezing, boiling points and other properties of DOWCAL™ 100E Fluid †\*

DOWCAL™ 100E Vol. %	DOWCAL™ 100E Wt. %	Freezing point °C	Refractive index @ 20°C	Boiling point °C @ 1 bara	Density g/cm³ @ 20°C	Dyn. viscosity mPa.s @ 20°C	Kin. viscosity mm²/s @ 20°C
5.0	5.6	-1.6	1.3389	101	1.003	1.23	1.23
10.0	11.0	-3.6	1.3443	101	1.012	1.40	1.38
15.0	16.4	-6.1	1.3498	102	1.020	1.59	1.56
20.0	21.7	-9.0	1.3551	102	1.028	1.82	1.77
21.0	22.7	-9.7	1.3562	103	1.030	1.87	1.81
22.0	23.8	-10.3	1.3573	103	1.032	1.92	1.86
23.0	24.8	-11.0	1.3583	103	1.033	1.97	1.91
24.0	25.9	-11.7	1.3594	103	1.035	2.02	1.96
25.0	26.9	-12.5	1.3605	103	1.036	2.08	2.01
26.0	27.9	-13.2	1.3615	103	1.038	2.14	2.06
27.0	29.0	-14.0	1.3626	103	1.039	2.19	2.11
28.0	30.0	-14.8	1.3637	103	1.040	2.25	2.17
29.0	31.0	-15.6	1.3647	104	1.042	2.32	2.22
30.0	32.0	-16.4	1.3658	104	1.043	2.38	2.28
31.0	33.1	-17.2	1.3668	104	1.045	2.45	2.34
32.0	34.1	-18.1	1.3679	104	1.046	2.52	2.41
33.0	35.1	-19.0	1.3689	104	1.048	2.59	2.47
34.0	36.1	-19.9	1.3699	104	1.049	2.66	2.54
35.0	37.1	-20.8	1.3710	104	1.050	2.74	2.61
36.0	38.1	-21.7	1.3720	105	1.052	2.82	2.68
37.0	39.1	-22.7	1.3731	105	1.053	2.90	2.75
38.0	40.1	-23.7	1.3741	105	1.054	2.98	2.83
39.0	41.1	-24.7	1.3751	105	1.056	3.06	2.90
40.0	42.1	-25.7	1.3761	105	1.057	3.15	2.98
41.0	43.1	-26.7	1.3772	105	1.058	3.24	3.07
42.0	44.1	-27.8	1.3782	106	1.059	3.34	3.15
43.0	45.1	-28.9	1.3792	106	1.061	3.44	3.24
44.0	46.1	-30.0	1.3802	106	1.062	3.54	3.33
45.0	47.1	-31.1	1.3812	106	1.063	3.64	3.43
46.0	48.0	-32.2	1.3823	106	1.064	3.75	3.52
47.0	49.0	-33.4	1.3833	106	1.066	3.86	3.62
48.0	50.0	-34.6	1.3843	107	1.067	3.98	3.73
49.0	51.0	-35.8	1.3853	107	1.068	4.10	3.83
50.0	52.0	-37.0	1.3863	107	1.069	4.22	3.95
51.0	52.9	-38.2	1.3873	107	1.070	4.35	4.06
52.0	53.9	-39.5	1.3883	107	1.072	4.48	4.18
53.0	54.9	-40.8	1.3893	108	1.073	4.62	4.30
54.0	55.9	-42.1	1.3902	108	1.074	4.76	4.43
55.0	56.8	-43.4	1.3912	108	1.075	4.90	4.56
60.0	61.7	-50.3	1.3961	109	1.081	5.72	5.29
65.0	66.5	<-51	1.4009	111	1.086	6.70	6.17
70.0	71.3	<-51	1.4056	113	1.091	7.88	7.22
75.0	76.0	<-51	1.4130	115	1.096	9.33	8.51
80.0	80.8	<-51	1.4148	119	1.101	11.1	10.1
85.0	85.6	-50.9	1.4192	123	1.106	13.4	12.1
90.0	90.3	-40.8	1.4236	129	1.111	16.3	14.7
95.0	95.1	-34.5	1.4278	136	1.115	20.2	18.1
100.0	100.0	-28.7	1.4319	145	1.119	25.7	22.9

† Typical properties, not to be construed as specifications.

\* Temperature-dependent physical properties are provided in the FLUIDFILE™ Software.

Generally, for an extended margin of protection you should select a temperature in this table that is at least 3°C lower than the expected lowest ambient temperature. Contact Dow for information and further assistance with specific cases.

## Product information

**DOWCAL™ 200E** is a propylene glycol-based heat transfer fluid for use in a wide range of applications, including HVAC (Heating, Ventilation & Air Conditioning), freeze protection and other industrial usage. Low acute toxicity makes DOWCAL™ 200E especially suitable for applications where toxicity is a concern.

### Key benefits of DOWCAL™ 200E

- Improved corrosion protection, in particular for aluminum alloys
- Suitable for use at a minimum 20% concentration
- Hard water stability to enable use with local tap water
- Compatible with commonly used elastomers
- Long fluid lifetime, lowering maintenance cost
- Free of nitrite, borate and CMR (carcinogenic, mutagenic, and reprotoxic)\*

### Typical properties of DOWCAL™ 200E Heat Transfer Fluid<sup>1</sup>

Composition (% by weight)		
	Propylene glycol	94%
	Inhibitors	6%
Color		Colorless
Density at 20°C	g/cm <sup>3</sup>	1.043
pH of solution	(50% vol. in water)	7.7 – 8.5
Reserve alkalinity	mL (0.1 N HCl)	9.0
Freeze point (50% vol. in water)	°C	-32

1. Typical properties not to be construed as specification, complete sales specification is available on request.

\*DOWCAL™ 200E is nitrite, borate and CMR free, being manufactured without added nitrite, borate or CMR.

## Physical properties of DOWCAL™ 200E Fluid

The following data tables provide freezing and boiling point data as well as refractive index, density, dynamic and kinematic viscosity at 20°C for varying concentrations of DOWCAL™ Fluids. Specific heat, density, thermal conductivity and viscosity also

vary depending on both the concentration and temperature of DOWCAL™ Fluid. Specific properties depending on temperature and concentration can be calculated with Dow's FLUIDFILE™ software available at [www.dow.com](http://www.dow.com).

### Typical freezing, boiling points and other properties of DOWCAL™ 200E Fluid †\*

DOWCAL™ 200E Vol. %	DOWCAL™ 200E Wt. %	Freezing point °C	Refractive index @ 20°C	Boiling point °C @ 1 bara	Density g/cm³ @ 20°C	Dyn. viscosity mPa.s @ 20°C	Kin. viscosity mm²/s @ 20°C
5.0	5.2	-1.2	1.3392	100	0.998	1.25	1.26
10.0	10.4	-2.8	1.3451	100	1.005	1.51	1.50
15.0	15.5	-4.7	1.3510	101	1.011	1.82	1.80
20.0	20.5	-7.0	1.3568	101	1.016	2.19	2.15
21.0	21.5	-7.5	1.3580	101	1.017	2.27	2.23
22.0	22.5	-8.0	1.3591	101	1.019	2.36	2.31
23.0	23.5	-8.6	1.3603	102	1.020	2.45	2.40
24.0	24.5	-9.2	1.3614	102	1.021	2.54	2.49
25.0	25.5	-9.8	1.3626	102	1.022	2.64	2.58
26.0	26.5	-10.4	1.3637	102	1.022	2.74	5.68
27.0	27.5	-11.0	1.3649	102	1.023	2.84	2.77
28.0	28.5	-11.7	1.3661	102	1.024	2.95	2.88
29.0	29.5	-12.4	1.3672	102	1.025	3.06	2.98
30.0	30.5	-13.0	1.3683	102	1.026	3.18	3.09
31.0	31.5	-13.8	1.3695	102	1.027	3.30	3.21
32.0	32.5	-14.5	1.3706	102	1.028	3.42	3.33
33.0	33.4	-15.3	1.3718	102	1.029	3.55	3.45
34.0	34.4	-16.1	1.3729	102	1.030	3.69	3.58
35.0	35.4	-16.9	1.3740	102	1.030	3.83	3.71
36.0	36.4	-17.7	1.3751	103	1.031	3.97	3.85
37.0	37.4	-18.6	1.3763	103	1.032	4.12	4.00
38.0	38.4	-19.4	1.3774	103	1.033	4.28	4.15
39.0	39.3	-20.4	1.3785	103	1.033	4.45	4.30
40.0	40.3	-21.3	1.3796	103	1.034	4.62	4.46
41.0	41.3	-22.2	1.3807	103	1.035	4.79	4.63
42.0	42.3	-23.2	1.3818	103	1.036	4.98	4.80
43.0	43.3	-24.2	1.3829	103	1.036	5.17	4.99
44.0	44.2	-25.3	1.3840	103	1.037	5.36	5.17
45.0	45.2	-26.3	1.3851	103	1.038	5.57	5.37
46.0	46.2	-27.4	1.3862	104	1.038	5.78	5.57
47.0	47.2	-28.5	1.3873	104	1.039	6.01	5.78
48.0	48.2	-29.7	1.3883	104	1.039	6.24	6.00
49.0	49.1	-30.8	1.3894	104	1.040	6.48	6.23
50.0	50.1	-32.0	1.3905	104	1.040	6.73	6.47
51.0	51.1	-33.3	1.3915	105	1.041	6.99	6.71
52.0	52.1	-34.5	1.3926	105	1.041	7.26	6.97
53.0	53.0	-35.8	1.3936	105	1.042	7.54	7.23
54.0	54.0	-37.1	1.3947	105	1.042	7.83	7.51
55.0	55.0	-38.5	1.3957	105	1.043	8.13	7.80
60.0	59.9	-45.6	1.4008	107	1.045	9.84	9.42
65.0	64.8	<-51	1.4057	108	1.047	11.9	11.4
70.0	69.7	<-51	1.4104	109	1.048	14.5	13.9
75.0	74.6	<-51	1.4150	111	1.049	17.7	16.9
80.0	79.6	<-51	1.4193	113	1.049	21.8	20.7
85.0	84.6	<-51	1.4234	116	1.048	27.0	25.7
90.0	89.7	<-51	1.4272	121	1.047	34.1	32.6
95.0	94.8	<-51	1.4308	129	1.045	45.1	43.1
100.0	100.0	<-51	1.4340	142	1.042	68.9	66.1

† Typical properties, not to be construed as specifications.

\* Temperature-dependent physical properties are provided in the FLUIDFILE™ Software.

Generally, for an extended margin of protection you should select a temperature in this table that is at least 3°C lower than the expected lowest ambient temperature. Contact Dow for information and further assistance with specific cases.

## Product information

**DOWCAL™ N** is a propylene glycol-based fluid that is low in acute oral toxicity and widely used to depress freeze points in food and beverage processing and in other applications. It features a specially formulated corrosion inhibitor package.

### Key benefits of DOWCAL™ N

- Better freeze protection
- NSF certified safe food additive
- Compatible with commonly used elastomers
- Long fluid life and low maintenance costs
- Greater cost-effectiveness
- Low acute oral toxicity

### Typical properties of DOWCAL™ N Heat Transfer Fluid<sup>1</sup>

Composition (% by weight)		
	Propylene glycol	95.5%
	Inhibitors	4.5%
Color		Colorless
Density at 20°C	g/cm <sup>3</sup>	1.050
pH of solution	(50% vol. in water)	9.5 – 10.5
Reserve alkalinity	mL (0.1 N HCl)	9
Freeze point (50% vol. in water)	°C	-31

1. Typical properties not to be construed as specification, complete sales specification is available on request.

## Physical properties of DOWCAL™ N Fluids

The following data tables provide freezing and boiling point data as well as refractive index, density, dynamic and kinematic viscosity at 20°C for varying concentrations of DOWCAL™ Fluids. Specific heat, density, thermal conductivity and viscosity also

vary depending on both the concentration and temperature of DOWCAL™ Fluid. Specific properties depending on temperature and concentration can be calculated with Dow's FLUIDFILE™ software available at [www.dow.com](http://www.dow.com).

### Typical freezing, boiling points and other properties of DOWCAL™ N Fluid †\*

DOWCAL™ N Vol. %	DOWCAL™ N Wt. %	Freezing point °C	Refractive index @ 20°C	Boiling point °C @ 1 bara	Density g/cm³ @ 20°C	Dyn. viscosity mPa.s @ 20°C	Kin. viscosity mm²/s @ 20°C
5.0	5.2	-1.6	1.3383	100	1.004	1.2	1.2
10.0	10.5	-3.3	1.3438	100	1.009	1.4	1.4
15.1	15.7	-5.1	1.3495	100	1.014	1.6	1.6
20.3	20.9	-7.1	1.3555	101	1.020	2.0	2.0
21.3	22.0	-7.6	1.3567	101	1.021	2.0	2.0
22.4	23.0	-8.0	1.3579	101	1.022	2.1	2.1
23.4	24.1	-8.6	1.3591	101	1.023	2.2	2.2
24.5	25.1	-9.1	1.3603	101	1.023	2.3	2.2
25.5	26.2	-9.6	1.3615	101	1.024	2.4	2.3
26.5	27.2	-10.2	1.3627	101	1.025	2.5	2.4
27.6	28.3	-10.8	1.3639	101	1.026	2.6	2.5
28.6	29.3	-11.4	1.3651	102	1.027	2.7	2.6
29.7	30.4	-12.0	1.3663	102	1.028	2.9	2.8
30.7	31.4	-12.7	1.3675	102	1.029	3.0	2.9
31.8	32.5	-13.4	1.3687	102	1.030	3.1	3.0
32.8	33.5	-14.1	1.3698	102	1.031	3.3	3.2
33.9	34.6	-14.8	1.3710	102	1.032	3.4	3.3
35.0	35.6	-15.6	1.3721	102	1.032	3.5	3.4
36.0	36.6	-16.4	1.3733	103	1.033	3.7	3.6
37.1	37.7	-17.3	1.3744	103	1.034	3.9	3.8
38.2	38.7	-18.2	1.3756	103	1.035	4.0	3.9
39.2	39.8	-19.1	1.3767	103	1.036	4.2	4.1
40.3	40.8	-20.1	1.3779	103	1.036	4.4	4.2
41.4	41.9	-21.1	1.3790	104	1.037	4.5	4.3
42.4	42.9	-22.1	1.3802	104	1.038	4.7	4.5
43.5	44.0	-23.2	1.3813	104	1.039	4.8	4.6
44.5	45.0	-24.3	1.3825	104	1.039	5.0	4.8
45.7	46.1	-25.5	1.3836	104	1.040	5.2	5.0
46.7	47.1	-26.7	1.3847	104	1.041	5.4	5.2
47.8	48.2	-27.9	1.3858	104	1.041	5.6	5.4
48.9	49.2	-29.3	1.3870	104	1.042	5.8	5.6
50.0	50.3	-30.6	1.3881	105	1.043	6.1	5.8
51.1	51.3	-32.1	1.3892	105	1.043	6.3	6.0
52.2	52.4	-33.5	1.3903	106	1.044	6.6	6.3
53.2	53.4	-35.0	1.3914	106	1.045	6.9	6.6
54.3	54.5	-36.6	1.3924	106	1.045	7.2	6.9
55.4	55.5	-38.2	1.3935	106	1.046	7.6	7.3
60.6	60.7	-47.1	1.3987	107	1.048	9.3	8.9
61.7	61.8	-49.0	1.3998	107	1.049	9.7	9.2
62.7	62.8	-51.0	1.4008	107	1.049	10.0	9.5
68.0	68.1	-51.0	1.4058	108	1.052	11.7	11.1
73.2	73.3	-51.0	1.4104	110	1.054	14.2	13.5
78.4	78.5	-51.0	1.4150	114	1.055	17.1	16.2
83.6	83.8	-51.0	1.4193	118	1.054	21.2	20.1
88.9	89.0	-51.0	1.4235	125	1.053	26.0	24.7
94.1	94.2	-51.0	1.4275	132	1.052	33.4	31.7
100.0	100.0	-51.0	1.4320	165	1.051	35.7	34.0

† Typical properties, not to be construed as specifications.

\* Temperature-dependent physical properties are provided in the FLUIDFILE™ Software.

Generally, for an extended margin of protection you should select a temperature in this table that is at least 3°C lower than the expected lowest ambient temperature. Contact Dow for information and further assistance with specific cases.

# DOWCAL™ Fluids

## Inhibited glycol-based heat transfer fluids

Guide to products and application



Seek Together™

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### Contact information

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