



# DOWCAL™ Geothermal Fluids

## Improved performance and safety for geothermal heat pumps



**Geothermal coils:** Approximately two and a half metres underground, this coil serves as part of a geothermal system enabled by Dow technology to heat and cool homes, schools and businesses.

### Enabling confidence in geothermal

As the market for geothermal systems continues to expand, the importance of choosing the right heat transfer fluid has also increased. **DOWCAL™ GEO-100** (ethylene glycol-based) and **DOWCAL™ GEO-200** (propylene glycol-based) geothermal fluids, part of a new generation of application-specific heat transfer fluids from Dow, were developed to provide geothermal heat pump installers and their customers with greater confidence and peace of mind.

DOWCAL™ Geothermal Fluids were designed to overcome the drawbacks of alternative fluids, providing greater assurance that geothermal systems will repay their initial investment costs in energy savings and in years of reliable, safe and economical operation. DOWCAL™ Geothermal Fluids offer reduced viscosity, increased heat capacity and thermal conductivity, and take advantage of the excellent heat transfer properties of water over a wide temperature range. DOWCAL™ GEO-100 and DOWCAL™ GEO-200 are on positive list of LAWA (German Working Group on water issues of the Federal States and the

Federal Government represented by the Federal Environment Ministry), meeting all requirements for new formulations.

### Expert technical support & fluid analysis

As a Dow 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.

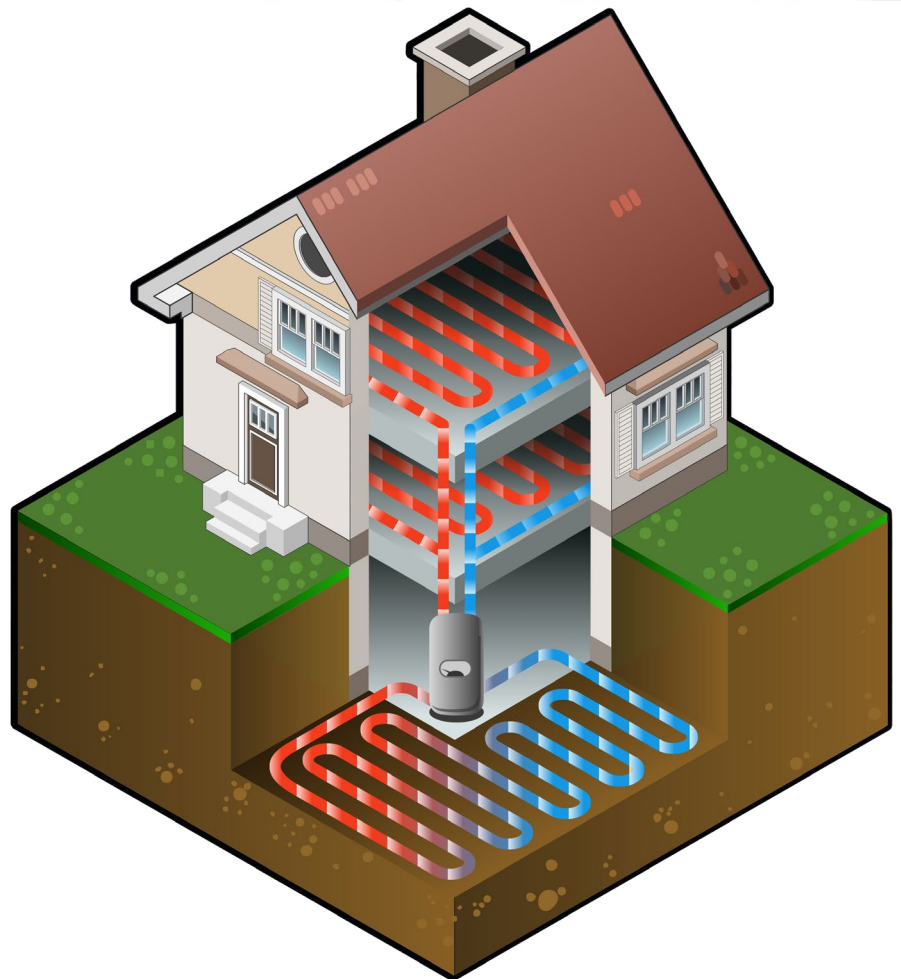
Experience confirms that DOWCAL™ Geothermal Fluids can be used in installations for many years. However, the concentration of DOWCAL™ Fluids and the products' functional performance should be checked at intervals of one to two years. Dow offers a fluid analysis service to evaluate fluid condition at regular use intervals and after prolonged storage. Contact us to learn more about our services and to begin working with our experts on your successful geothermal project.



## Operating in extreme temperatures

A ground source heat pump (GSHP) extracts the consistent subsurface temperature of the earth or surface water to provide efficient heating and cooling in private and industrial buildings while reducing energy use. A typical ground source heat pump will circulate geothermal fluids through the ground using the earth's constant temperature to exchange hot air for cooler in the summer and cold air for warmer in the winter.

To prevent freezing when the fluid contacts the evaporating refrigerant at sub-zero temperatures, DOWCAL™ GEO-100 or DOWCAL™ GEO-200 Fluids can be circulated in the captors/probes of the GSHP. Diluted to a 20% concentration, DOWCAL™ Geothermal Fluids provides corrosion protection while maintaining pumping efficiency.



## Advantages of DOWCAL™ Geothermal Fluids in ground source heat pumps

### Nonflammable

When diluted in water, DOWCAL™ Fluids are nonflammable as they have no measurable flash points. Therefore, they pose no fire hazard compared to alcohol-based fluid which have a low flash point.

### Reduced toxicity

DOWCAL™ GEO-200 Fluid is a propylene glycol-based fluid that is low in acute oral toxicity, and can be used where toxicity is a concern. By comparison, methanol is characterized as relatively high in both acute oral and inhalation toxicity.

DOWCAL™ GEO-100 and GEO-200 Fluids are circulated through underground or underwater piping, carrying thermal energy to and from the building.

### Efficient heat transfer

At the concentration supplied, DOWCAL™ Geothermal Fluids are not likely to be the limiting factor in heat transfer efficiency for the overall system. Changing from alcohol-based fluids to DOWCAL™ Geothermal Fluids will likely have no measurable impact on overall system heat transfer efficiency, even though the individual fluid coefficients differ.

### Reliable corrosion control

Using methanol, water or uninhibited glycols could lead to serious corrosion problems and equipment failure, whereas DOWCAL™ Geothermal Fluids offer peace of mind and confidence to both the GSHP installer and owner. It contains Dow signature corrosion inhibitors to protect metals.

### Fluid dilution requirements

Whenever possible, DOWCAL™ Geothermal Fluids should be diluted with demineralized or distilled water. DOWCAL™ Geothermal Fluids can also be mixed with other water according to certain requirements, which local tap water typically meets. If water of adequate quality is not available, Dow or Dow's local distributor can supply ready-to-use solutions of DOWCAL™ Geothermal Fluids.

# Typical properties<sup>†</sup> for DOWCAL™ Geothermal Fluids

## DOWCAL™ GEO-100

- Composition (% by volume)
- Ethylene Glycol: 95%
- Performance additive + water: 5%
- Colour: Colourless or dyed according to local requirements
- Specific gravity: 1.125 - 1.135 at 25°C
- pH of solution: 9.0 - 10.0
- Reserve alkalinity: 9.5 ml

## DOWCAL™ GEO-200

- Composition (% by volume)
- Propylene Glycol: 96%
- Performance additive + water: 4%
- Colour: Colourless or dyed according to local requirements
- Specific gravity: 1.048 - 1.058 at 25°C
- pH of solution: 9.0 - 10.0
- Reserve alkalinity: 9.0 ml

\*The graphic representations are presented here for illustrative purposes only and should not be construed as product specifications.

### DOWCAL™ GEO-100

Freezing point (°C)	Weight %
-9.3	20
-12.9	25
-17.0	30

### DOWCAL™ GEO-200

Freezing point (°C)	Weight %
-7.2	20
-10.1	25
-13.6	30

## Saturation properties at 20% volume concentration<sup>†</sup>

### DOWCAL™ GEO-100

Temp °C	Specific Heat kJ / (kg) (K)	Density kg/m <sup>3</sup>	Thermal conductivity W/mK	Viscosity mPa.s
-5	3.76	1038	0.458	3.65
0	3.77	1036	0.466	3.02
25	3.83	1029	0.498	1.46
50	3.88	1018	0.523	0.88
75	3.94	1004	0.540	0.59
100	4.00	987	0.549	0.43

### DOWCAL™ GEO-200

Temp °C	Specific Heat kJ / (kg) (K)	Density kg/m <sup>3</sup>	Thermal conductivity W/mK	Viscosity mPa.s
-5	3.92	1028	0.449	4.98
0	3.93	1027	0.456	4.05
25	3.99	1018	0.489	1.74
50	4.04	1006	0.514	0.95
75	4.09	991	0.530	0.60
100	4.15	972	0.540	0.43

## Saturation properties at 25% volume concentration<sup>†</sup>

### DOWCAL™ GEO-100

Temp °C	Specific Heat kJ / (kg) (K)	Density kg/m <sup>3</sup>	Thermal conductivity W/mK	Viscosity mPa.s
-10	3.65	1047	0.431	5.01
0	3.68	1045	0.444	3.45
25	3.74	1037	0.473	1.66
50	3.81	1025	0.496	0.97
75	3.87	1011	0.511	0.63
100	3.94	994	0.520	0.45

### DOWCAL™ GEO-200

Temp °C	Specific Heat kJ / (kg) (K)	Density kg/m <sup>3</sup>	Thermal conductivity W/mK	Viscosity mPa.s
-5	3.85	1034	0.425	6.47
0	3.87	1032	0.432	5.22
25	3.93	1022	0.462	2.12
50	3.99	1010	0.485	1.10
75	4.05	994	0.500	0.68
100	4.11	975	0.508	0.47

## Saturation properties at 30% volume concentration<sup>†</sup>

### DOWCAL™ GEO-100

Temp °C	Specific Heat kJ / (kg) (K)	Density kg/m <sup>3</sup>	Thermal conductivity W/mK	Viscosity mPa.s
-10	3.56	1055	0.411	6.19
0	3.59	1053	0.423	4.15
25	3.66	1044	0.450	1.92
50	3.73	1033	0.471	1.09
75	3.80	1018	0.485	0.70
100	3.87	1001	0.493	0.49

### DOWCAL™ GEO-200

Temp °C	Specific Heat kJ / (kg) (K)	Density kg/m <sup>3</sup>	Thermal conductivity W/mK	Viscosity mPa.s
-10	3.77	1040	0.397	11.80
0	3.81	1036	0.428	6.43
25	3.88	1026	0.456	2.43
50	3.95	1013	0.476	2.22
75	4.01	996	0.489	0.74
100	4.13	977	0.493	0.51

†Typical properties, not to be construed as specifications.



## About Dow

Dow (NYSE: DOW) combines global breadth, asset integration and scale, focused innovation and leading business positions to achieve profitable growth. The Company's ambition is to become the most innovative, customer centric, inclusive and sustainable materials science company, with a purpose to deliver a sustainable future for the world through our materials science expertise and collaboration with our partners. Dow's portfolio of plastics, industrial intermediates, coatings and silicones businesses delivers a broad range of differentiated science-based products and solutions for its customers in high-growth market segments, such as packaging, infrastructure, mobility and consumer care. Dow operates 106 manufacturing sites in 31 countries and employs approximately 35,700 people. Dow delivered sales of approximately \$39 billion in 2020. References to Dow or the Company mean Dow Inc. and its subsidiaries. For more information, please visit [www.dow.com](http://www.dow.com) or follow [@DowNewsroom](https://twitter.com/DowNewsroom) on Twitter.

## Product stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products - from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

## Customer notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including safety data sheets, should be consulted prior to use of Dow products. Current safety data sheets are available from Dow.

---

**www.dow.com**

Europe / Middle East	+ 989 832 1542	Asia / Pacific	+ 800 77 76 77 76
North America	800 441 4369		+ 60 37 958 3392
	989 832 1542	South Africa	+ 800 99 5078
Italy	+ 800 783 825		

Image: Adobe\_38835069

NOTICE: No freedom from infringement of any patent owned by Dow or others is to be inferred. Because use conditions and applicable laws may differ from one location to another and may change with time, Customer is responsible for determining whether products and the information in this document are appropriate for Customer's use and for ensuring that Customer's workplace and disposal practices are in compliance with applicable laws and other government enactments. The product shown in this literature may not be available for sale and/or available in all geographies where Dow is represented. The claims made may not have been approved for use in all countries. Dow assumes no obligation or liability for the information in this document. References to "Dow" or the "Company" mean the Dow legal entity selling the products to Customer unless otherwise expressly noted. NO WARRANTIES ARE GIVEN; ALL IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE ARE EXPRESSLY EXCLUDED.

®™ Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

© 2021 The Dow Chemical Company. All rights reserved.

2000010434

Form No. 180-01605-01-1021 S2D