

High-temperature heat transfer fluids

DOWTHERM™ and SYLTHERM™



DOW



The background of the advertisement is a photograph of an industrial facility. It features a complex network of large, polished metal pipes that curve and run across the scene. In the foreground, there are various pieces of machinery, including what appears to be a control panel with several circular gauges or pressure indicators. The lighting is dramatic, with a strong blue and cyan tint on the left side and a warmer, orange and red glow on the right side, suggesting a high-temperature environment. The overall composition is dynamic and emphasizes the scale and complexity of industrial operations.

Table of contents

There's a DOWTHERM™ or SYLTHERM™ fluid to meet your needs	3
Choose from our family of high-temperature fluids	4
Typical properties of DOWTHERM™ synthetic organic and SYLTHERM™ silicone heat transfer fluids	6
How to select the right heat transfer fluid	8
Heat transfer assistance from Dow	9
Recommendations for common applications	10

There's a DOWTHERM™ or SYLTHERM™ fluid to meet your needs

The family of DOWTHERM™ and SYLTHERM™ heat transfer fluids available from Dow are high performance products. The line includes two distinct fluid chemistries – synthetic organic and silicone.

You'll find an overview description of our full line of synthetic fluids, plus recommended applications on [page 10](#) of this brochure.

Because Dow offers the most comprehensive range of fluid options, we are uniquely equipped to thoroughly and fairly assess your performance and economic requirements, and then recommend the best fluid to meet your needs.

We're equipped to supply you globally

Our synthetic organic and silicone fluids are available globally, and our local technical service team is available to assist customers regionally. So whether your project is in Asia-Pacific, Europe, Latin America, the Middle East, Africa, India, North America, or anywhere else in the world, we can supply the fluid you need to make it a success.

Learn more at www.dowtherm.com

Visit our website for complete information about the full family of heat transfer fluids available from Dow, including fluid selection assistance, product technical data, application information and technical support resources.

Fluids for high-temperature process heating and single fluid process heating and cooling

DOWTHERM™ synthetic organic fluids offer excellent stability

Each of our DOWTHERM™ synthetic organic fluids offers exceptional thermal stability. This stability can translate into more efficient heat transfer, longer fluid life, and optimum operating economics. For example, DOWTHERM™ A Fluid has set the industry standard for over 90 years – precisely because of its excellent thermal stability in applications up to 400°C (750°F).

All DOWTHERM™ fluids feature vapor pressures lower than steam. Three DOWTHERM™ fluids – DOWTHERM™ RP Fluid, DOWTHERM™ MX Fluid, and DOWTHERM™ T Fluid – are designed to operate in non-pressurized or low-pressure heat transfer systems. DOWTHERM™ RP Fluid in particular has been shown to be more thermally stable than partially hydrogenated terphenyl and dibenzyl toluene fluids.

DOWTHERM™ J Fluid can be used in batch processing applications for single fluid process heating and cooling. And DOWTHERM™ Q Fluid offers long-term advantages as an economical replacement for hot oils in applications with moderate temperature requirements above 260°C (500°F).

SYLTHERM™ silicone fluids are long-lasting, odorless options

SYLTHERM™ 800, SYLTHERM™ XLT, and SYLTHERM™ HF silicone fluids are low viscosity fluids that offer excellent heat transfer performance and can provide exceptionally long service life (often more than 10 years) without periodic reclaiming. In addition, SYLTHERM™ 800 Fluid has the broadest operating range of any heat transfer fluid.

SYLTHERM™ fluids are essentially odorless, are low in acute oral toxicity, and, in the U.S., are not listed as reportable under SARA Title III, Section 313¹.

¹ You may need to comply with similar or additional legislation in other countries. Contact your Dow representative for information.

Applications for DOWTHERM™ synthetic organic fluids and SYLTHERM™ silicone fluids:

-100°C (-150°F) to 400°C (750°F)

- Indirect heating of process liquids and polymers
- Single fluid process heating and cooling (particularly pharmaceutical batch processing)
- Pipeline tracing to maintain process temperatures
- Energy heat recovery
- Low pressure cogeneration systems
- Drying and heating of bulk materials
- Solar energy collection and storage
- Gas processing
- Ebullient cooling
- LNG liquifaction

You not only get more fluid options, you get more support

Dow is more than just a supplier of heat transfer fluids; we are also a leading source of heat transfer expertise. No other company can match Dow's more than 90 years' experience as a fluid supplier. In addition, our fluids are used every day in Dow processing plants all over the world. This combination of fluid knowledge and applications expertise has made Dow the industry's leading source of technical support. Call on our experienced staff of fluid specialists. They can consult with you on the design, operation, and maintenance of your heat transfer system to help you achieve optimum performance and economy.

The FLUIDFILE™ Program makes evaluating and selecting heat transfer fluids faster, easier, and more precise. To use FLUIDFILE™, visit www.fluidfile.com.

Choose from our family of high-temperature fluids

DOWTHERM™ synthetic organic fluids

DOWTHERM™ A Fluid

With excellent thermal stability at 400°C (750°F), this fluid's maximum recommended film temperature is 427°C (800°F). Its recommended use temperature range in liquid phase operations is from 15°C (60°F) to 400°C (750°F) and in vapor phase from 257°C (495°F) to 400°C (750°F). With low viscosity to minimize startup problems, and a freezing point of 12°C (54°F), DOWTHERM™ A Fluid can be used without steam tracing in installations protected from the weather.

DOWTHERM™ G Fluid

As the most stable, low pressure liquid-phase fluid, DOWTHERM™ G Fluid offers low vapor pressure with high thermal stability and pumpability at moderately low temperatures. This efficient, medium-range heat transfer fluid has a recommended use temperature range of -7°C (20°F) to 360°C (680°F).

DOWTHERM™ J Heat Transfer Fluid

DOWTHERM™ J Heat Transfer Fluid can be used in liquid phase as low as -80°C (-110°F) and up to 315°C (600°F). In vapor phase, the range is from 181°C (358°F) to 315°C (600°F). This is the fluid of choice for the most demanding single fluid heating and cooling applications (batch processing). Thermal stability is excellent in both liquid and vapor phase.

DOWTHERM™ MX Heat Transfer Fluid

DOWTHERM™ MX Heat Transfer Fluid is a mixture of alkylated aromatics designed for use as an alternative to hot oils in liquid phase heat transfer systems. The normal operating temperature range for DOWTHERM™ MX Fluid is -23°C (-10°F) to 330°C (625°F).

DOWTHERM™ Q Fluid

Introduced as an alternative to hot oils, DOWTHERM™ Q Fluid has a recommended use temperature range of -35°C (-30°F) to 330°C (625°F). It combines high-temperature stability with low temperature pumpability and superior heat transfer – a combination hot oils can't match. Because of its superior thermal stability, this fluid can offer substantial economic savings over the life of your heat transfer project. It is ideally suited for waste heat recovery and LNG liquifaction.

DOWTHERM™ RP Heat Transfer Fluid

DOWTHERM™ RP Heat Transfer Fluid is a liquid phase fluid used in non-pressurized or low-pressure systems. It can be used in systems operating up to a maximum bulk temperature of 350°C (660°F) and a maximum film temperature of 375°C (710°F). DOWTHERM™ RP is the most thermally stable low-pressure organic fluid. In some cases, DOWTHERM™ RP Fluid can also be used to top up other low pressure fluids.

DOWTHERM™ T

This mixture of alkyl benzenes is intended for liquid phase operation in non-pressurized systems. DOWTHERM™ T Fluid has an optimum maximum use temperature of 288°C (550°F). It can be used to an extended bulk temperature of 316°C (600°F). It has good low temperature properties that allow for low temperature start-up, and good thermal stability at the maximum use temperature.

SYLTHERM™ silicone fluids

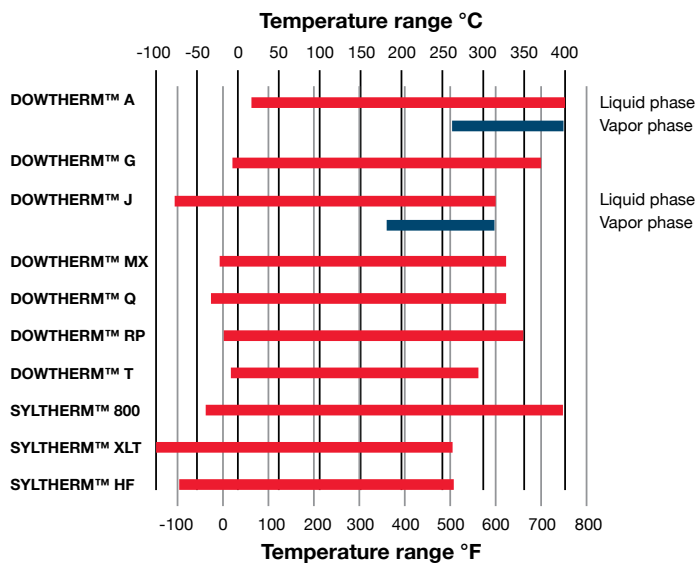
SYLTHERM™ 800 Fluid

SYLTHERM™ 800 Fluid is a highly stable, long-lasting, silicone fluid with a recommended operating temperature range of -40°C (-40°F) to 400°C (750°F), the broadest range of any heat transfer fluid. Operating continuously at the upper end of this range, SYLTHERM™ 800 Fluid exhibits low potential for fouling and can often remain in service for 10 years or more. The fluid is essentially odorless and is very low in acute oral toxicity. Silicone heat transfer fluids such as SYLTHERM™ 800 Fluid are not listed as reportable in the U.S. under SARA Title III, Section 313¹.

SYLTHERM™ XLT Fluid

SYLTHERM™ XLT Fluid will operate as low as -100°C (-150°F) and up to 260°C (500°F). This wide operating temperature range makes this silicone fluid especially well-suited for single fluid process heating and cooling (batch processing) systems in the pharmaceutical and fine chemical industries. In addition, SYLTHERM™ XLT Fluid has essentially no odor, is very low in acute oral toxicity, and is not listed as reportable in the U.S. under SARA Title III, Section 313¹.

DOWTHERM™ synthetic organic and SYLTHERM™ silicone heat transfer fluids



SYLTHERM™ HF Fluid

SYLTHERM™ HF Fluid is a specially formulated silicone polymer designed for use as a low temperature, liquid phase heat transfer medium. With a similar recommended use temperature range [-73°C (-100°F) to 260°C (500°F)] as SYLTHERM™ XLT Fluid, SYLTHERM™ HF Fluid also offers a closed-cup flash point above 63°C (145°F). In addition, SYLTHERM™ HF Fluid has essentially no odor, is very low in acute oral toxicity, and is not listed as reportable in the U.S. under SARA Title III, Section 313¹.

¹ You may need to comply with similar or additional legislation in other countries. Contact your Dow representative for information.



Typical properties of DOWTHERM™ synthetic organic and SYLTHERM™ silicone heat transfer fluids¹

English units											
		DOWTHERM™ A	DOWTHERM™ G	DOWTHERM™ J	DOWTHERM™ Q	DOWTHERM™ RP	DOWTHERM™ MX	DOWTHERM™ T	SYLTHERM™ 800 ²	SYLTHERM™ XLT	SYLTHERM™ HF
Temperature use range, °F	liquid vapor	60 to 750 495 ³ to 750	20 to 680	-110 to 600 358 ³ to 600	-30 to 625	-30 to 660	-10 to 625	14 to 550	-40 to 750	-150 to 500	-100 to 500
Density at ambient temperature, lb/ft ³	@ 25°C	65.9	65.1	53.7	60.0	64.0	64.0	54.3	58.1	53.1	54.1
Boiling range, °F		494	552	358	513	667	623	653	~397	~347	~410
Freezing point, °F		53.6	<40	<-100	-30	<30	-13	<-40	-76	-168	<-115
Flash point, °F, closed cup		236	≥80	136	249	381	329	370	320 ^a	116	145
Autoignition temperature, °F, ASTM E659-78		1139	810	788	773	725	788	707 ^b	725 ^b	662 ^b	671 ^b

SI units											
		DOWTHERM™ A	DOWTHERM™ G	DOWTHERM™ J	DOWTHERM™ Q	DOWTHERM™ RP	DOWTHERM™ MX	DOWTHERM™ T	SYLTHERM™ 800 ²	SYLTHERM™ XLT	SYLTHERM™ HF
Temperature use range, °C	liquid vapor	15 to 400 257 ³ to 400	-7 to 360	-80 to 315 181 ³ to 315	-35 to 330	-20 to 350	-23 to 330	-10 to 288	-40 to 400	-100 to 260	-73 to 260
Density at ambient temperature, kg/m ³	@ 25°C	1055.6	1043	859.9	961.5	1025.7	958.7	869.8	930.4	850.1	866.7
Boiling range, °C		257	289	181	267	353	328	345	~203	~175	~210
Freezing point, °C		12	<4	<-81	-35	<0	-25	<-40	-60	<-111	<-82
Flash point, °C, closed cup		113	137	57	120	194	165	188	160 ^a	47	63
Autoignition temperature, °C, ASTM E659-78		615	432	420	411	385	420	375 ^b	385 ^b	350 ^b	355 ^b

TDS with full product details are available on dow.com and FLUIDFILE™.

¹ Properties shown are typical and should not be considered specifications.

² Properties for aged fluid except flash point, viscosity.

³ Boiling point at atmospheric pressure.

^a Properties of fluid as supplied. Properties may differ after extended use.

^b ASTM D2155

How to select the right heat transfer fluid

First choose between high-temperature and low temperature fluids

The decision to choose a synthetic organic fluid, a silicone fluid, or an inhibited glycol-based fluid is largely based on application temperature requirements. If your heat transfer application has a maximum use temperature requirement above 175°C (350°F), you should investigate “high-temperature” synthetic organic and silicone fluids.

However, if your maximum use temperature will be lower than 175°C (350°F), or if you need freeze protection for a water-based system, consider using a “low temperature” inhibited glycol-based fluid.

Synthetic organic and silicone fluids are engineered to be thermally stable at temperatures up to 400°C (750°F). While operating at these elevated temperatures, these fluids exhibit vapor pressures much lower than steam, making them much more practical and less expensive to use. Some high-temperature fluids, such as DOWTHERM™ J and SYLTHERM™ Fluids, have broad operating temperature ranges. These fluids offer high-temperature stability, as well as low temperature pumpability and excellent heat transfer characteristics.

Inhibited glycol-based fluids, which are not covered in this brochure, are actually solutions of water and inhibited glycols. Dow offers a line of glycol based fluid; more information can be found on www.dowtherm.com.

What to consider when selecting a high-temperature synthetic organic or silicone fluid

Maximum recommended use temperature/thermal stability

For efficient performance and longer fluid life, choose a fluid with a maximum recommended use temperature above your system’s anticipated bulk fluid temperature. A synthetic organic or silicone fluid’s maximum recommended operating temperature is an indication of the high-temperature thermal stability properties of that fluid. Selection of a DOWTHERM™ or SYLTHERM™ Fluid with a maximum recommended use temperature above your highest anticipated operating temperature will provide optimum heat transfer efficiency, fluid life, and operating economy. All DOWTHERM™ and SYLTHERM™ Fluids exhibit excellent thermal stability within their recommended operating temperature ranges. Silicone fluids, in particular, exhibit low potential for fouling at elevated temperatures and, depending on service conditions, can last 10 years or longer when operating continuously at their recommended maximum operating temperatures.

Low temperature pumpability

If your system will be operated while exposed to cold winter weather, you’ll need a fluid offering low viscosity and, therefore, low temperature pumpability. Low temperature pumpability is especially critical if your system is subject to shutdown – whether planned or unplanned. If the heat transfer fluid in the system is not pumpable, system start-up can be difficult if not impossible.

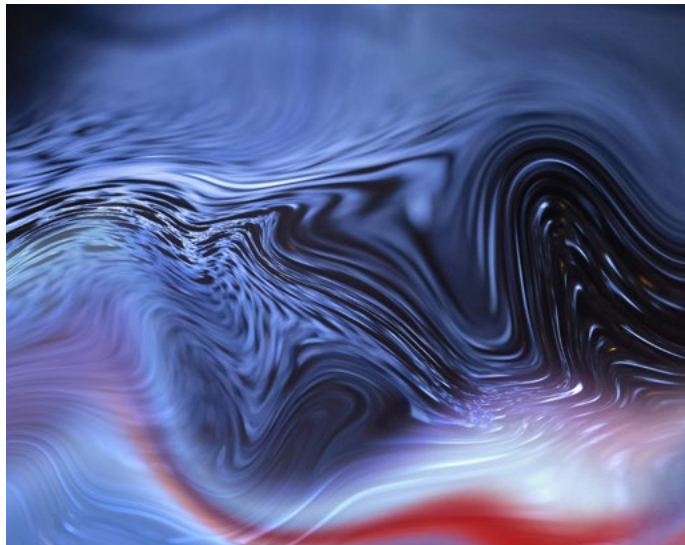
SYLTHERM™ silicone fluids offer excellent low temperature pumpability characteristics, experiencing little viscosity change down to the lower end of their recommended operating ranges. Some DOWTHERM™ synthetic organic fluids have very low crystal points so the fluids remain pumpable in extreme cold and the potential for prolonged costly system shutdown is minimized.

Flammability and fire hazards

Heat transfer systems occasionally experience vapor leaks to the atmosphere. Experience has shown that leaking vapors have usually cooled below the heat transfer fluid’s fire point.

Vapor pressure

Certain applications require the high operating range of a synthetic organic or silicone fluid – but combined with low vapor pressure. While all DOWTHERM™ and SYLTHERM™ fluids have vapor pressures lower than steam, DOWTHERM™ G and DOWTHERM™ RP Fluids are especially effective in systems with specific low vapor pressure requirements. Another reason for selecting a fluid that offers low vapor pressure is the potentially lower initial investment in expansion tanks and other specialized equipment.



Project economics and fluid recoverability

It is wise to look beyond initial cost when choosing your heat transfer fluid. Some fluids, such as hot oils, are less expensive at the outset – but those savings diminish significantly in the face of high yearly operating costs.

In evaluating potential long-term fluid cost, you'll want to consider two factors: 1) What effect will degradation and normal operational leakage have on annual fluid makeup requirements? 2) How often will a complete fluid change-out be necessary?

In choosing a high-temperature fluid from our line, you'll also want to take into account the differences in the degradation and fouling potential of synthetic organic and silicone fluids.

Long-term economics of synthetic organic fluids – While synthetic organic fluids are highly stable within their recommended operating ranges, some degradation can be expected over time. A fluid's tendency to degrade under your system's operating conditions has a direct impact on the fluid's long-term cost (due to fluid makeup and replacement expense over time). To maximize fluid life, select a synthetic organic fluid offering sufficient thermal stability to both accommodate your maximum planned operating temperature and allow for unplanned excursions above that level...even if the initial cost of the fluid is higher than that of a less stable fluid (see "Maximum recommended use temperature/thermal stability" on [page 8](#)).

Long-term economics of silicone fluids – In terms of initial purchase cost, silicone fluids are typically more expensive than synthetic organic fluids. However, in many cases, the use of

silicone fluids can result in lower long-term expenses because they do not degrade in the same manner as other fluids or require top-off refills. Although silicone polymers exhibit some thermally induced changes over time, a balanced, steady-state equilibrium composition is eventually attained. Depending on service conditions, this can reduce or eliminate the need for makeup fluid and extend fluid life to ten years or longer.

Fluid analysis can also reduce long-term expense – Regardless of which type of high-temperature fluid you choose, for maximum long-term economy it is wise to participate in a regular fluid testing program such as Dow's fluid analysis service. Dow provides free annual fluid analysis to qualifying customers to help them periodically assess fluid condition and help ensure that system problems are avoided.



Heat transfer assistance from Dow

Dow fluid specialists can help you design, operate, and maintain your heat transfer system for optimum performance and economy. For assistance and answers to your questions, just contact the Dow representative in your area. Here are just a few of the services we offer:

- System design consultation
- Piping specs and equipment information
- Operational troubleshooting
- Industrial hygiene service

- System leak detection
- Fluid consumption reports
- Fluid analysis
- Health & safety presentations

FLUIDFILE™ helps you evaluate and select the right fluid

To streamline and improve the accuracy of your fluid selection process, FLUIDFILE™ provides complete facts about the entire family of DOWTHERM™ and SYLTHERM™ heat transfer fluids. To use FLUIDFILE™, visit www.fluidfile.com.

Recommendations for common applications

Applications	Recommended fluids
Alternative energy solutions	
Concentrated solar power	DOWTHERM™ A
Polysilicon refinement and wafer preparation	DOWTHERM™ J, SYLTHERM™ XLT, SYLTHERM™ HF
Biofuel production	DOWTHERM™ Q, DOWTHERM™ G
Petrochemical and chemical processes	
Specialty chemicals production:	
Ethylene oxide, dimethyl terephthalate (DMT)	DOWTHERM™ A, DOWTHERM™ RP
Linear alkyl benzene (lab)	DOWTHERM™ A, DOWTHERM™ RP
Phthalic anhydride, formaldehyde, butanediol (BDO)	DOWTHERM™ A
Environmental test chambers, chiral processes	DOWTHERM™ J, SYLTHERM™ XLT, SYLTHERM™ HF
Oleo chemistry	DOWTHERM™ Q
Plastic and fibers industry	
Plastics & polymers production:	
Caprolactam, polyamide (nylon)	DOWTHERM™ A, DOWTHERM™ RP
Polyester, polyethylene terephthalate (PET)	DOWTHERM™ A, DOWTHERM™ RP
Polycarbonate	DOWTHERM™ G, DOWTHERM™ RP
Polystyrene	DOWTHERM™ Q
Polychlorinated biphenyl (PCB)	DOWTHERM™ T, SYLTHERM™ 800
Textile spinning machines	DOWTHERM™ A, DOWTHERM™ J
Textile dyeing	DOWTHERM™ T
Plastics molding	DOWTHERM™ A, DOWTHERM™ J
Oil and gas industry	
Reboilers/feed heaters in refineries	All Fluids
Offshore platforms	DOWTHERM™ T, DOWTHERM™ Q
Natural gas processing	DOWTHERM™ T, DOWTHERM™ Q
Liquefied natural gas (LNG) liquefaction	DOWTHERM™ A, DOWTHERM™ RP, DOWTHERM™ Q, DOWTHERM™ T
Asphalt processing	DOWTHERM™ Q, DOWTHERM™ T
Coal gasification	DOWTHERM™ G
Food and pharmaceutical industry	
Vegetable oil deodorizers	DOWTHERM™ A, DOWTHERM™ T, SYLTHERM™ 800, SYLTHERM™ XLT, SYLTHERM™ HF
Multi-purpose pharmaceutical plants	DOWTHERM™ J, SYLTHERM™ XLT, SYLTHERM™ HF, SYLTHERM™ 800

*Recommended thermal fluids per application are based on typical operational conditions that can be subject to change. Therefore, it is highly recommended to consult the Dow technical team prior to fluid selection for any of the listed applications. Dow thermal fluid solutions span a wide range of applications that are not limited to the list above.

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