



Paratherm MR™ HEAT TRANSFER FLUID

Single-Fluid Heating/Cooling • Non-Toxic

ENGINEERING BULLETIN MR 1000

The Paratherm MR™ mid-range heat transfer fluid is rated for service from 30°F to 550°F. It is efficient across the temperature range, thermally stable and cost-effective. Non-aromatic and non-toxic, the fluid is safe to use and is easy to dispose. Used or contaminated fluid can be safely combined with spent lubricating oils and recycled locally. Designed for a broad variety of applications such as batch reactors, laminating lines and plastics mold temperature control, the Paratherm MR is tough and durable. Engineered to provide outstanding performance under demanding conditions, it is easy and safe to handle — a pleasant alternative to synthetic aromatic fluids.

Environmental Safety

The MR fluid is plant friendly and safe to use. In the event of a release, the same simple clean-up procedures used for spills of light lubricating oils can be employed. Once gathered, it can be combined with spent lube oils and sent to the local oil recycler. The crystal-clear Paratherm MR fluid contains no SARA-reportable substances such as chlorinated hydrocarbons, aromatics, heavy metals, or sulfur or nitrogen compounds.

Fluid Toxicity

The Paratherm MR fluid is non-toxic. Where conventional fluids can produce dermatitis, the fluid is not expected to cause skin irritation on contact. And unlike other heat/cool liquids, the MR fluid emits no pungent or noxious odors. See the Material Safety Data Sheet (MSDS) before using this product.

Vapor Pressure

The MR fluid has an extraordinarily low vapor pressure — a fraction of an atmosphere at its maximum operating temperature of 550°F. This permits the designer considerable latitude in the choice of lower-cost equipment that does not need to be pressurized to prevent fluid boiling and pump cavitation.

Efficiency

The lower a heat transfer fluid's viscosity, the less energy will be required to pump it through the system. Paratherm MR fluid's viscosity is among the lowest of available heat/cool fluids. This, and the fluid's exceptionally low pressure drop means that less horsepower is needed for a given duty, and that a smaller pump and motor can be specified. And, lower power consumption continues to produce savings year after year.

Water in the System

Because the Paratherm MR is immiscible with water and is also slightly less dense, any water can be easily drained from the system's low point

Typical Properties*

Physical Properties

Base	Paraffinic Hydrocarbon
Appearance	Transparent, Bright Water White
Taste & Odor	Slight Odor
Optimum Use Range	30°F to 550°F (-1°C to 288°C)
Maximum Recommended Film Temperature	600°F (316°C)
Flash Point (coc)	ASTM D-92 300°F (149°C)
Fire Point (coc)	ASTM D-92 325°F (163°C)
Autoignition (AIT)	ASTM E659-78 621°F (327°C)
Atmospheric Boiling Point, 10% Fraction	ASTM D-1160 574°F (301°C)
Vapor Pressure, psia @ 200°F	0.000516
300°F	0.0128
400°F	0.177
500°F	1.16
550°F	3.19
Coefficient of Thermal Expansion /°F**	0.00038
Average Molecular Weight	<300
Density, lb/gal @ 75°F (24°C)	6.7
Pour Point (Crystal Point)	ASTM D-97 -80°F (-63°C)
Pumpability: Centrifugal @ 2,000 centipoise	-76°F (-60°C)
Heat of Vaporization (Calculated), BTU/lb	28,950
Total Acid Number (TAN)	ASTM D-974 0.01

* These are typical laboratory values, and are not guaranteed for all samples.

** Note: Normal practice is to size expansion tanks so that they are 1/4 to 1/3 full when the system is cold, and 2/3 to 3/4 full when the system is at the maximum normal operating temperature.

drain valves. Crack each low point valve and allow fluid to drain into a beaker or clear water glass. If you see a phase separation (one liquid "floating" on top of the other), continue to drain until no separation is observed. Chemically inert, the fluid will not attack seals and gasketing.

Storing Your Fluid

Containers of heat transfer fluid should be kept in non-hazardous dry areas only. Until ready for use, the container's tamper-evident safety seals *must* remain intact. Liquids should not be allowed to pool on the tops of steel drums. In the afternoon and evening when temperatures decrease, the heat transfer fluid will cool and contract slightly. A partial vacuum is created in the drum, and, if the bung's elastomeric seal is not perfect, liquid standing on the top of the drum can be drawn through, contaminating the fluid. If drums must be temporarily stored outside, store them on their *sides*.

Pre-Cleaning the System

For optimal performance of your system and its heat transfer fluid, we strongly suggest that piping, valves and other components be thoroughly cleaned before installation. Mill scale, weld spatter and slag, quench oils, protective lacquer and varnish coatings, and dust and dirt can act to

degrade the fluid, and can damage pumps and valves. Lodging in restrictions, these contaminants can easily create low flow conditions that cause premature failure of systems and fluid.

Inerting the System

Once installation and cleaning are complete, consider purging with inert gas. Such purging can reduce or eliminate air and water vapor, substantially reducing the chance of corrosion. And once purged, the system can be leak-tested by pressurizing the inert gas and using the simple soap-bubble detection method. And when the system is charged and started up, fluid oxidation will be minimal.

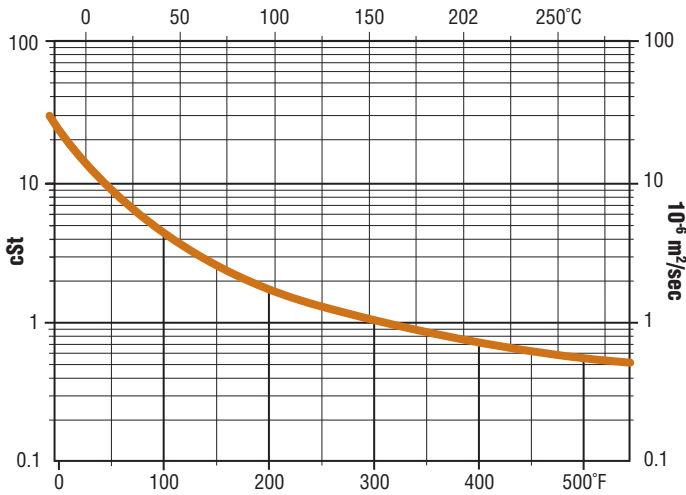
Charging the System

When charging the system, we suggest you fill from the bottom (a point near pump suction) using a small positive displacement pump — not the system pump. Charging from the system's low point can help reduce trapped air in the system, which will substantially reduce the entrainment of gas bubbles and resultant pump cavitation.

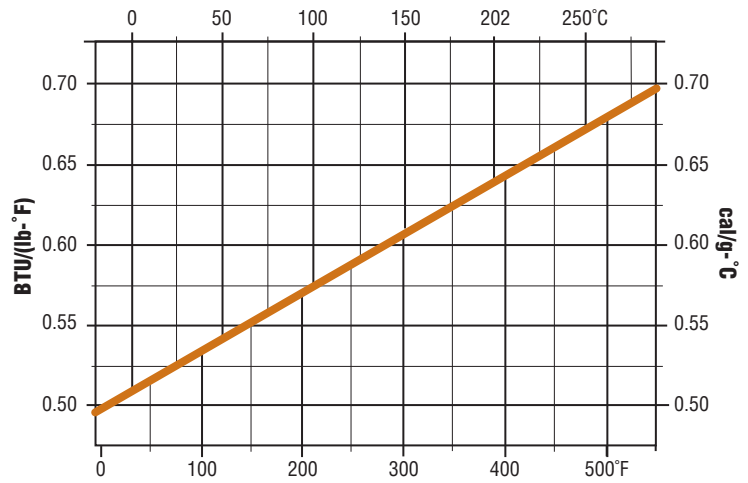
Fluid Disposal

Used or contaminated Paratherm fluids can be safely combined with spent lubricating oils and recycled locally (EPA, citation 57FR21524). We

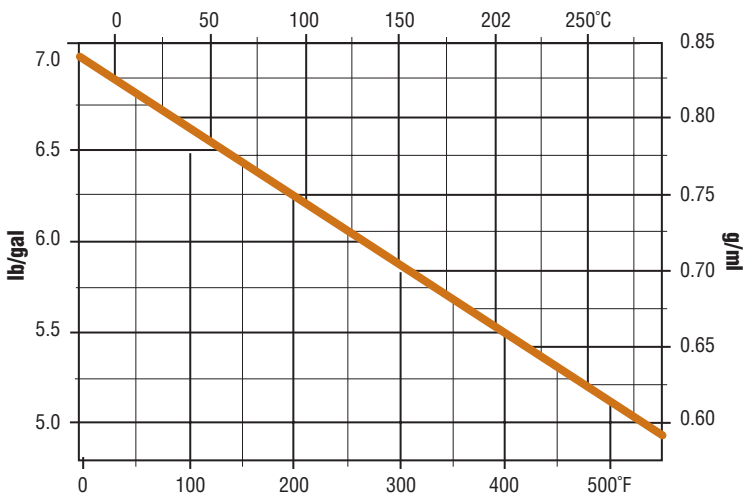
VISCOSITY



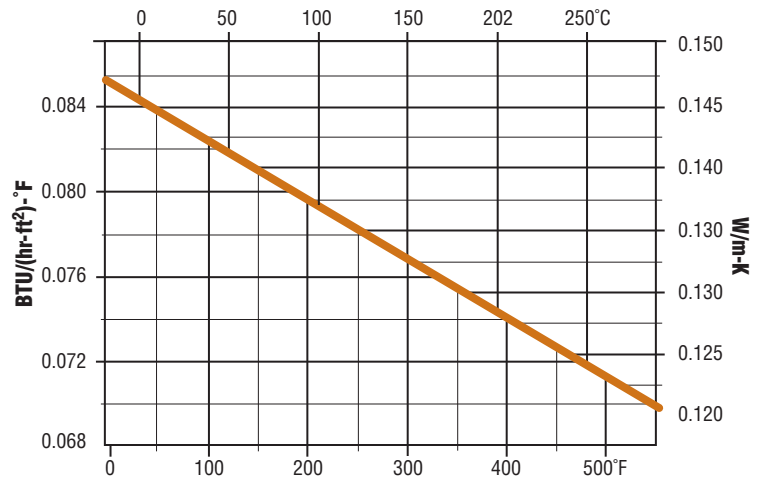
SPECIFIC HEAT



DENSITY



THERMAL CONDUCTIVITY



strongly encourage the recycling of used heat transfer fluid to conserve precious natural resources and to minimize the problem of liquid waste in landfills. Please check local, state and federal regulations first. *Liquids contaminated with chlorinated solvents or other regulated materials may require special handling, and may not be accepted by recyclers.*

Fluid Analysis

Overheating, oxidation and contamination of your heat transfer fluid will significantly reduce its ability to perform. Production levels and product quality will suffer, and in severe cases considerable damage to your thermal oil system can result. Periodic analysis of your fluid can assist in the detection of problems in the early stages, providing substantial savings. When you first charge your system with Paratherm heat transfer fluid, we offer the initial analysis at no charge to encourage a regular program of testing.

Quality Control

We thoroughly test each batch of heat transfer fluid to ensure conformance to product specifications. Each shipment is traceable to its master batch, with test results archived at Paratherm.

Technical Assistance

Our technical expertise is available to you in the conceptual stage, during planning and design, and through system construction, start-up and operation. We want to work closely with you in the recommendation of proven thermal fluid systems, components, supplies and procedures. We also advise on system cleaning and repair, should these become necessary. And if your application calls for fluids that we are unable to provide, Paratherm will assist you with the names and phone numbers of competitors' engineers that can help.

Additional Information

Paratherm has available technical data sheets covering a variety of thermal fluid and system topics including fire prevention, system performance tracking, recommended components, draining, flushing and charging and fluid analysis, among others. We'd be pleased to forward these to you upon request.



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Note: The information and recommendations in this literature are made in good faith and are believed to be correct as of the below date. You, the user or specifier, should independently determine the suitability and fitness of Paratherm heat transfer fluids for use in your specific application. We warrant that the fluids conform to the specifications in Paratherm literature. Because our assistance is furnished without charge, and because we have no control over the fluid's end use or the conditions under which it will be used, we make no other warranties—expressed or implied, including the warranties of merchantability or fitness for a particular use or purpose (recommendations in this bulletin are not intended nor should be construed as approval to infringe on any existing patent). The user's exclusive remedy, and Paratherm's sole liability is limited to refund of the purchase price or replacement of any product proven to be otherwise than as warranted. Paratherm Corporation will not be liable for incidental or consequential damages of any kind.