

MARLOTHERM® SH

heat transfer fluid



High-boiling-point,
low-viscosity
heat transfer fluid

-15° to 325°C
(5° to 620°F)

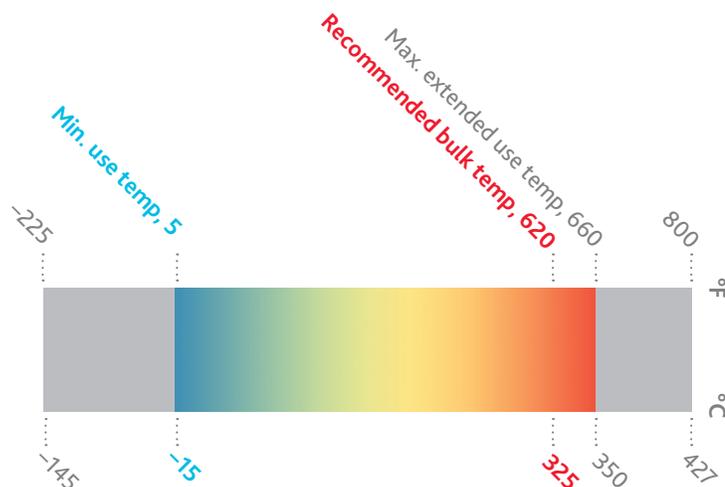
Max. extended use temp: 350°C (660°F)

MARLOTHERM

Heat transfer fluids by Eastman

MARLOTHERM® SH

heat transfer fluid



Eastman Marlotherm® SH heat transfer fluid is a synthetic heat transfer fluid that offers outstanding performance during both low-temperature start-up and high-temperature operation. It performs over the entire temperature range without being kept under pressure. When operating in a well-maintained heat transfer system, Marlotherm SH provides reliable, consistent performance over long periods of time.

Marlotherm SH is available globally. Contact your local Eastman sales representative for more information.

Physical and chemical characteristics

Marlotherm SH is a low-viscosity, synthetic organic heat transfer medium for use in the liquid phase in closed, forced-circulation heat transfer systems.

While there are industry standards for measuring the thermal stability of heat transfer fluids, there is no established standard for deriving a recommended bulk temperature limit.* The recommended bulk (325°C [620°F]) and maximum film (380°C [715°F]) temperatures are based on industry-standard thermal studies. We provide this recommended bulk temperature at which, in well-designed and maintained systems, the stability of the fluid will enable several years of operation without fluid exchange. The maximum extended use temperature would still be suitable for operating the fluid but with a significantly reduced lifetime.

Actual fluid life is dependent on the total system design and operation and can vary by heat transfer fluid chemistry. As fluid ages, the formation of low- and high-boiling compounds may result. Low-boiling compounds should be vented from the system as necessary to a safe location away from personnel and sources of ignition and in compliance with applicable regulations and laws. The high-boiling compounds can be very soluble in the fluid. Significant overheating or fluid contamination will accelerate decomposition and may result in increased high-boiler and solids concentrations. Excess solids can typically be filtered for removal.

Eastman recommends that systems using Marlotherm SH fluid be blanketed with an atmosphere of inert gas to protect against the effects of fluid oxidation on its performance and life expectancy. Pressure relief device(s) should be installed where required.

Marlotherm SH is noncorrosive to metals commonly used in the construction of heat transfer systems. To ensure optimal fluid life in use, annual fluid sampling and analysis is recommended for all heat transfer fluid systems.

While Marlotherm SH has a relatively high flash point, it is not classified as a fire-resistant heat transfer fluid. Consequently, the use of protective devices may be required to minimize fire risk, and users of Marlotherm SH should check with their safety and risk management experts for specific instructions.

*DIN 4754 stipulates that the supplier shall indicate the permissible feed temperature "at which the heat transfer medium will remain for use for at least one year." However, an exchange of the fluid after only a year of operation isn't economical, and increased maintenance is expected once the fluid reaches the end of its service life. Therefore, the maximum operating temperature should be recommended at a level that usually allows the user to operate the fluid continuously for several years.

Typical properties^a

| | |
|--------------------------------------------------------------------------------------|-----------------------------------------------------|
| Appearance | Liquid, clear |
| Composition | Dibenzyltoluene |
| Recommended bulk temperature | 325°C (620°F) |
| Maximum extended use temperature | 350°C (660°F) |
| Maximum film temperature | 380°C (715°F) |
| Normal boiling point | 392°C (738°F) |
| Pumpability, at 300 mm ² /s (cSt) | -1°C (30°F) |
| Pumpability, at 2000 mm ² /s (cSt) | -15°C (5°F) |
| Flash point, COC (ASTM D92) | 219°C (426°F) |
| Autoignition temperature (ASTM E659) | 459°C (858°F) |
| Autoignition temperature (DIN 51794) | 500°C (932°F) |
| Pour point (DIN ISO 3016) | -34°C (-29.2°F) |
| Minimum liquid temperatures for fully developed turbulent flow ($N_{Re} > 10,000$) | |
| 10 ft/sec, 1-in. tube (3.048 m/s, 2.54-cm tube) | 61°C (142°F) |
| 20 ft/sec, 1-in. tube (6.096 m/s, 2.54-cm tube) | 42°C (108°F) |
| Minimum liquid temperatures for transitional region flow ($N_{Re} > 2000$) | |
| 10 ft/sec, 1-in. tube (3.048 m/s, 2.54-cm tube) | 23°C (73°F) |
| 20 ft/sec, 1-in. tube (6.096 m/s, 2.54-cm tube) | 13°C (55°F) |
| Heat of vaporization at 350°C | 322 kJ/kg (138 Btu/lb) |
| Coefficient of thermal expansion @ 200°C | 0.000784°C (0.000435°F) |
| Kinematic viscosity at 100°C (ASTM D445) | 3.18 mm ² /s (cSt) |
| Kinematic viscosity at 40°C (ASTM D445) | 16.4 mm ² /s (cSt) |
| Average molecular weight | 272 |
| Pseudocritical temperature | 587°C (1089°F) |
| Pseudocritical pressure | 24.4 bar (354.2 psia) |
| Pseudocritical density | 331.3 kg/m ³ (20.68 lb/ft ³) |
| Liquid density at 25°C (ASTM D4052) | 1039 kg/m ³ (8.67 lb/gal) |
| Copper corrosion (ASTM D130) | 1a |
| Moisture content, maximum (ASTM E203) | 300 ppm |
| Dielectric constant @ 23°C (ASTM D924) | 2.7 |

^aThese data are based on samples tested in the laboratory and are not guaranteed for all samples. Contact us for complete sales specifications for Marlotherm SH fluid. Does not constitute an express warranty. See disclaimer on the back page of this bulletin.

Heat transfer fluid calculators

THERMINOL
Heat transfer fluids by Eastman

- Product comparison calculator** - Make side-by-side comparisons of up to six fluids for physical and performance properties, and heat transfer coefficients.
- Property by temperature table** - Create tables of physical properties in various units of measure, and in user-selected temperature increments (one fluid).
- Property by temperature plot** - Create plots of key physical properties of Thermanol fluids in user-selected units of measure. Plot up to 6 fluids.
- View fluid chart**

EASTMAN

To create your own customized table

with preferred properties, units of measure,
and temperature intervals, visit

Thermanol.com/resources

and download the Thermanol heat transfer fluid calculator.



www.therminol.com

For technical service, visit the contact page of our website, **Marlotherm.com**.

Liquid properties of Marlotherm® SH heat transfer fluid by temperature^a (SI UNITS)

| Temperature | | Liquid density | Liquid heat capacity | Liquid enthalpy ^b | Heat of vaporization | Liquid thermal conductivity | Liquid viscosity ^c | | Vapor pressure ^d |
|-------------|-----|-------------------|----------------------|------------------------------|----------------------|-----------------------------|-------------------------------|------------|-----------------------------|
| °C | °F | kg/m ³ | kJ/(kg·K) | kJ/kg | kJ/kg | W/(m·K) | cSt (mm ² /s) | cP (mPa·s) | kPa |
| 0 | 32 | 1055 | 1.49 | 26.0 | 530 | 0.1331 | 261 | 276 | — |
| 10 | 50 | 1048 | 1.53 | 41.1 | 524 | 0.1318 | 99.6 | 104 | — |
| 20 | 68 | 1042 | 1.56 | 56.5 | 518 | 0.1305 | 47.3 | 49.3 | — |
| 30 | 86 | 1035 | 1.60 | 72.3 | 513 | 0.1292 | 26.3 | 27.2 | — |
| 40 | 104 | 1029 | 1.63 | 88.5 | 507 | 0.1279 | 16.4 | 16.9 | — |
| 50 | 122 | 1022 | 1.67 | 105 | 501 | 0.1266 | 11.1 | 11.4 | — |
| 60 | 140 | 1015 | 1.71 | 122 | 496 | 0.1253 | 8.02 | 8.14 | — |
| 70 | 158 | 1009 | 1.74 | 139 | 490 | 0.1240 | 6.07 | 6.12 | — |
| 80 | 176 | 1002 | 1.78 | 157 | 485 | 0.1227 | 4.76 | 4.77 | — |
| 90 | 194 | 995 | 1.81 | 175 | 479 | 0.1214 | 3.85 | 3.83 | — |
| 100 | 212 | 989 | 1.85 | 193 | 474 | 0.1201 | 3.18 | 3.15 | — |
| 110 | 230 | 982 | 1.89 | 212 | 468 | 0.1188 | 2.68 | 2.63 | 0.015 |
| 120 | 248 | 975 | 1.92 | 231 | 463 | 0.1175 | 2.29 | 2.24 | 0.025 |
| 130 | 266 | 968 | 1.96 | 250 | 457 | 0.1162 | 1.99 | 1.92 | 0.040 |
| 140 | 284 | 961 | 2.00 | 270 | 452 | 0.1149 | 1.74 | 1.67 | 0.065 |
| 150 | 302 | 954 | 2.03 | 290 | 446 | 0.1136 | 1.54 | 1.47 | 0.101 |
| 160 | 320 | 947 | 2.07 | 311 | 440 | 0.1123 | 1.37 | 1.30 | 0.156 |
| 170 | 338 | 940 | 2.11 | 331 | 435 | 0.1110 | 1.23 | 1.15 | 0.235 |
| 180 | 356 | 933 | 2.14 | 353 | 429 | 0.1096 | 1.11 | 1.03 | 0.347 |
| 190 | 374 | 926 | 2.18 | 374 | 424 | 0.1083 | 1.01 | 0.931 | 0.505 |
| 200 | 392 | 919 | 2.22 | 396 | 418 | 0.1070 | 0.917 | 0.843 | 0.723 |
| 210 | 410 | 912 | 2.25 | 419 | 412 | 0.1057 | 0.840 | 0.766 | 1.02 |
| 220 | 428 | 904 | 2.29 | 441 | 406 | 0.1044 | 0.773 | 0.699 | 1.42 |
| 230 | 446 | 897 | 2.33 | 464 | 400 | 0.1030 | 0.714 | 0.640 | 1.95 |
| 240 | 464 | 890 | 2.37 | 488 | 394 | 0.1017 | 0.661 | 0.588 | 2.65 |
| 250 | 482 | 882 | 2.40 | 512 | 388 | 0.1004 | 0.615 | 0.542 | 3.56 |
| 260 | 500 | 874 | 2.44 | 536 | 382 | 0.0990 | 0.573 | 0.501 | 4.72 |
| 270 | 518 | 867 | 2.48 | 561 | 376 | 0.0977 | 0.536 | 0.465 | 6.20 |
| 280 | 536 | 859 | 2.52 | 586 | 370 | 0.0964 | 0.503 | 0.432 | 8.07 |
| 290 | 554 | 851 | 2.55 | 611 | 363 | 0.0950 | 0.472 | 0.402 | 10.4 |
| 300 | 572 | 843 | 2.59 | 637 | 356 | 0.0937 | 0.445 | 0.375 | 13.3 |
| 310 | 590 | 835 | 2.63 | 663 | 350 | 0.0923 | 0.420 | 0.351 | 16.8 |
| 320 | 608 | 827 | 2.67 | 689 | 343 | 0.0910 | 0.398 | 0.329 | 21.1 |
| 330 | 626 | 818 | 2.71 | 716 | 336 | 0.0896 | 0.378 | 0.309 | 26.4 |
| 340 | 644 | 810 | 2.75 | 743 | 329 | 0.0883 | 0.359 | 0.291 | 32.7 |
| 350 | 662 | 801 | 2.78 | 771 | 322 | 0.0869 | 0.342 | 0.274 | 40.2 |
| 360 | 680 | 792 | 2.82 | 799 | 314 | 0.0856 | 0.326 | 0.258 | 49.2 |

^aRecommended bulk temperature 325°C (620°F). These data are based on samples tested in the laboratory and are not guaranteed for all samples. Contact us for complete sales specifications for Marlotherm fluid. ^bLiquid enthalpy basis is -17.8°C (0°F) ^c1 cSt = 1 mm²/s and 1 mPa·s = 1 cP ^d100 kPa = 1 bar

Liquid properties of Marlotherm SH heat transfer fluid by temperature^a (ENGLISH UNITS)

| Temperature | | Liquid density | | Liquid heat capacity | Liquid enthalpy ^b | Heat of vaporization | Liquid thermal conductivity | Liquid viscosity ^c | | Vapor pressure |
|-------------|-----|----------------|--------------------|----------------------|------------------------------|----------------------|-----------------------------|-------------------------------|--------------------------|----------------|
| °F | °C | lb/gal | lb/ft ³ | Btu/(lb·°F) | Btu/lb | Btu/lb | Btu/(ft·h·°F) | lb/(ft·h) | cSt (mm ² /s) | psia |
| 20 | -7 | 8.84 | 66.1 | 0.351 | 6.93 | 230 | 0.0774 | 1510 | 588 | — |
| 40 | 4 | 8.78 | 65.7 | 0.360 | 14.0 | 227 | 0.0766 | 419 | 165 | — |
| 60 | 16 | 8.72 | 65.2 | 0.370 | 21.3 | 224 | 0.0758 | 163 | 64.4 | — |
| 80 | 27 | 8.66 | 64.8 | 0.379 | 28.8 | 221 | 0.0749 | 79.1 | 31.5 | — |
| 100 | 38 | 8.60 | 64.3 | 0.389 | 36.5 | 219 | 0.0741 | 45.0 | 18.1 | — |
| 120 | 49 | 8.54 | 63.9 | 0.398 | 44.4 | 216 | 0.0733 | 28.6 | 11.6 | — |
| 140 | 60 | 8.47 | 63.4 | 0.408 | 52.4 | 213 | 0.0725 | 19.7 | 8.02 | — |
| 160 | 71 | 8.41 | 62.9 | 0.417 | 60.7 | 211 | 0.0716 | 14.4 | 5.90 | — |
| 180 | 82 | 8.35 | 62.5 | 0.427 | 69.1 | 208 | 0.0708 | 11.0 | 4.53 | — |
| 200 | 93 | 8.29 | 62.0 | 0.436 | 77.8 | 205 | 0.0700 | 8.66 | 3.60 | 0.001 |
| 220 | 104 | 8.23 | 61.5 | 0.446 | 86.6 | 203 | 0.0691 | 7.02 | 2.94 | 0.002 |
| 240 | 116 | 8.16 | 61.1 | 0.456 | 95.6 | 200 | 0.0683 | 5.81 | 2.45 | 0.003 |
| 260 | 127 | 8.10 | 60.6 | 0.465 | 105 | 197 | 0.0674 | 4.89 | 2.08 | 0.005 |
| 280 | 138 | 8.04 | 60.1 | 0.475 | 114 | 195 | 0.0666 | 4.17 | 1.79 | 0.008 |
| 300 | 149 | 7.97 | 59.6 | 0.485 | 124 | 192 | 0.0658 | 3.60 | 1.56 | 0.014 |
| 320 | 160 | 7.91 | 59.1 | 0.494 | 134 | 189 | 0.0649 | 3.14 | 1.37 | 0.023 |
| 340 | 171 | 7.84 | 58.7 | 0.504 | 144 | 187 | 0.0641 | 2.76 | 1.21 | 0.036 |
| 360 | 182 | 7.78 | 58.2 | 0.514 | 154 | 184 | 0.0632 | 2.44 | 1.08 | 0.055 |
| 380 | 193 | 7.71 | 57.7 | 0.524 | 164 | 181 | 0.0624 | 2.18 | 0.975 | 0.083 |
| 400 | 204 | 7.64 | 57.2 | 0.534 | 175 | 179 | 0.0615 | 1.95 | 0.882 | 0.123 |
| 420 | 216 | 7.57 | 56.7 | 0.544 | 186 | 176 | 0.0607 | 1.76 | 0.802 | 0.178 |
| 440 | 227 | 7.51 | 56.2 | 0.554 | 196 | 173 | 0.0598 | 1.59 | 0.733 | 0.255 |
| 460 | 238 | 7.44 | 55.6 | 0.563 | 208 | 170 | 0.0590 | 1.45 | 0.672 | 0.360 |
| 480 | 249 | 7.37 | 55.1 | 0.573 | 219 | 167 | 0.0581 | 1.32 | 0.620 | 0.500 |
| 500 | 260 | 7.30 | 54.6 | 0.583 | 231 | 164 | 0.0573 | 1.21 | 0.573 | 0.685 |
| 520 | 271 | 7.23 | 54.1 | 0.593 | 242 | 161 | 0.0564 | 1.11 | 0.532 | 0.926 |
| 540 | 282 | 7.15 | 53.5 | 0.603 | 254 | 158 | 0.0555 | 1.03 | 0.496 | 1.24 |
| 560 | 293 | 7.08 | 53.0 | 0.614 | 266 | 155 | 0.0547 | 0.950 | 0.463 | 1.64 |
| 580 | 304 | 7.01 | 52.4 | 0.624 | 279 | 152 | 0.0538 | 0.881 | 0.434 | 2.14 |
| 600 | 316 | 6.93 | 51.8 | 0.634 | 291 | 149 | 0.0530 | 0.819 | 0.408 | 2.77 |
| 620 | 327 | 6.85 | 51.3 | 0.644 | 304 | 146 | 0.0521 | 0.763 | 0.384 | 3.56 |
| 640 | 338 | 6.77 | 50.7 | 0.654 | 317 | 142 | 0.0512 | 0.713 | 0.363 | 4.52 |
| 660 | 349 | 6.69 | 50.1 | 0.665 | 330 | 139 | 0.0504 | 0.667 | 0.344 | 5.70 |
| 680 | 360 | 6.61 | 49.5 | 0.675 | 344 | 135 | 0.0495 | 0.625 | 0.326 | 7.13 |

^aRecommended bulk temperature 325°C (620°F). These data are based on samples tested in the laboratory and are not guaranteed for all samples. Contact us for complete sales specifications for Marlotherm fluid. ^bLiquid enthalpy basis is -17.8°C (0°F) ^c1 cSt = 1 mm²/s and 1 mPa·s = 1 cP.

TLC Total Lifecycle Care[®]

Eastman's TLC Total Lifecycle Care[®] program is designed to support Marlotherm customers throughout their systems' life cycle. This comprehensive program includes system design support, start-up assistance, training, sample analysis, flush and refill fluids, and our fluid trade-in program.



In-service heat transfer fluid sample analysis

When Marlotherm heat transfer fluids are used within suggested temperature limits, they may provide years of trouble-free service. To help users get maximum life, Eastman offers testing of in-service heat transfer fluids to detect contamination, moisture, thermal degradation, and other conditions that may impact system performance. This comprehensive analysis includes acid number, kinematic viscosity, insoluble solids, low boilers, high boilers, and moisture content. Additional special analyses are available on request. Sample analysis includes sample collection kits that are easy to use. Most systems should be sampled annually. Users should also sample anytime a fluid-related problem is suspected.

FLUID GENIUS

Results of the test are presented in a detailed report that provides suggestions for corrective action. Test results are stored in a database for future reference. Customers can also access their specific test information via our new, advanced heat transfer fluid management platform, Fluid Genius™. It's a revolutionary patent-pending digital service that gives engineers and operations managers predictive insights to optimize heat transfer fluid performance—providing the ultimate edge. From sampling kits to expert guidance, our comprehensive service keeps you on track. Contact your account manager to get started on Fluid Genius—and keep your system up and running. To conduct your sample analysis, you will be provided with an all-inclusive, easy-to-use sample kit. Kit design may vary depending on fluid and shipping and lab requirements in the region. To learn more and request access to Fluid Genius, visit fluidgenius.net.

Technical service hotline

Experienced technical service specialists can help answer your questions regarding heat transfer fluid selection, system start-ups, system design, and operational issues. For questions in North America, call 800-433-6997. For questions in other regions, contact your local technical support representative.

System design support

Eastman regularly assists some of the world's largest engineering, chemical, and equipment manufacturing companies on the design and operation of heat transfer systems. Our liquid phase and vapor

phase design guide information and system design data have been field tested in numerous installations. Eastman also conducts engineering seminars for customers, engineering firms, and equipment manufacturers to cover a wide range of heat transfer fluid system design and operation issues. Customers can request a technical service visit to audit heat transfer systems for fluid loss and leak prevention opportunities.

Operational training

Eastman believes that by sharing our experience with customers, we can help improve system design, promote safety, and reduce overall cost. Customers can take advantage of Eastman's heat transfer system operation and product training programs. These programs are customized to suit the varied needs of frontline technicians, operations supervisors, maintenance technicians, and design engineers. Customers can also receive training assistance for dealing with important topics like fluid safety and handling.

Safety awareness training

At Eastman, we're "All in for Safety." We provide our customers safety awareness training that focuses on the design, start-up, operation, and maintenance of heat transfer fluid systems.

Start-up assistance

Eastman provides start-up assistance by reviewing procedures and offering suggestions to reduce typical problems. Customers can also receive help by calling their local Eastman technical specialist or through on-site assistance.

Flushing fluid and fluid refill

Liquid phase heat transfer systems can be cleaned with special cleaning fluids. After the system is flushed, the appropriate liquid phase heat transfer fluid can be added. For cleaning options, contact your local Eastman heat transfer fluid specialist.

Eastman's fluid sustainability support*

As part of our commitment to sustainability and the environment, Eastman offers a trade-in program for used Marlotherm and competitive heat transfer fluids. Depending on the fluid and its condition, it may be turned in for potential credit towards the purchase of new Marlotherm heat transfer fluid.

*Marlotherm reclamation service is only offered at our Germany location.

For more information, visit [Marlotherm.com](https://www.marlotherm.com).

EASTMAN

The results of **insight**™

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