

MARLOTHERM[®] XC

heat transfer fluid



High performance, wide-
temperature-range heat transfer
fluid for heating and cooling in the
most varied fields of applications

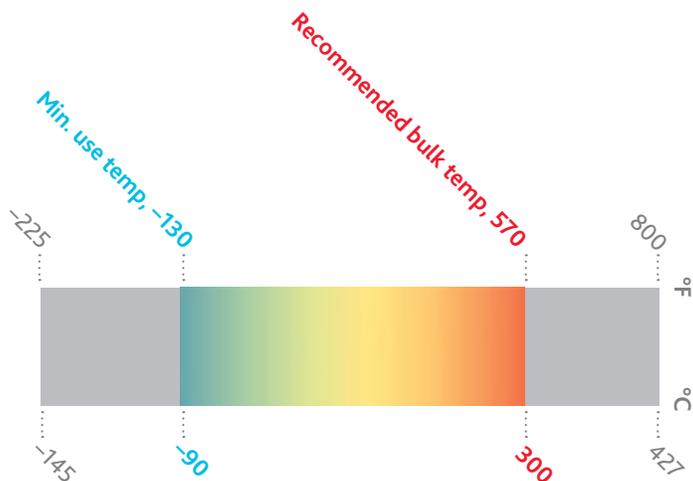
-90° to 300°C
(-130° to 570°F)

MARLOTHERM

Heat transfer fluids by Eastman

MARLOTHERM® XC

heat transfer fluid



Covering a temperature range from -90 to 300°C in a heat transfer circuit with a single heat transfer medium poses a real challenge. To solve this, physical parameters of the medium should be optimally coordinated. Eastman Marlotherm® XC heat transfer fluid meets these conditions in an optimum way.

Marlotherm XC is a high performance, synthetic organic heat transfer fluid designed especially for use in the liquid phase in closed heat transfer systems with forced circulation. Considering its superior physical and thermal properties, Marlotherm XC is very well suited for heat transfer processes that require excellent heating and/or cooling performance throughout its recommended temperature range.

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

Physical and chemical characteristics

Marlotherm XC is designed especially for use in the liquid phase in closed heat transfer systems with forced circulation.

Marlotherm XC, an aromatic hydrocarbon, has excellent thermal stability up to operating temperatures of 300°C , even after many years of use.

Because of its relatively high thermal conductivity, Marlotherm XC can be used in systems with temperature ranges from -90° to 300°C . Even at very low operating temperatures, the circulation pumps require comparatively little driving power due to the low viscosity of the fluid.

While Marlotherm XC has a relatively high normal boiling point ($152^{\circ}\text{C}/306^{\circ}\text{F}$), the recommended bulk temperature ($300^{\circ}\text{C}/570^{\circ}\text{F}$) and maximum film temperature ($320^{\circ}\text{C}/608^{\circ}\text{F}$) are greater. Therefore, proper care should be taken in the design of the system to minimize leakage, especially when operating above a bulk fluid temperature of 152°C (306°F).

The recommended bulk temperature and maximum film temperatures are based on industry-standard thermal studies and typical limitations of system equipment. Operation at or below these temperatures will result in reliable, consistent performance over long periods of times.

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 XC 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 XC is noncorrosive to metals commonly used in the construction of heat transfer systems.

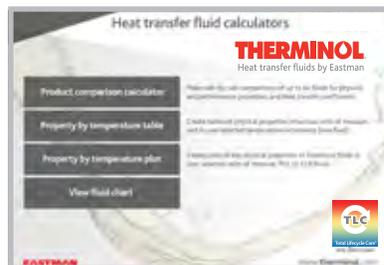
Marlotherm XC is not classified as a fire-resistant heat transfer fluid. Consequently, the use of protective devices may be required to minimize fire risk, and users of Marlotherm XC should check with their safety and risk management experts for specific instructions. To ensure optimal fluid life in use, annual fluid sampling and analysis is recommended for all heat transfer fluid systems.

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 would usually allow the user to operate the fluid continually for several years.

Typical properties^a

Appearance	Clear liquid
Composition	Cumene
Recommended bulk temperature	300°C (570°F)
Maximum film temperature	320°C (608°F)
Normal boiling point	152°C (306°F)
Pumpability, at 300 mm ² /s (cSt)	<-90°C (<-130°F)
Flash point, CC (ASTM D93)	38.8°C (102°F)
Fire point, COC (ASTM D92)	50°C (122°F)
Autoignition temperature (ASTM E659)	441°C (826°F)
Autoignition temperature (DIN 51794)	~420°C (~788°F)
Pour point (ISO 3016)	<-90°C (<-130°F)
Minimum liquid temperatures for fully developed turbulent flow (NRe > 10,000)	
10 ft/sec, 1-in. tube (3.048 m/s, 2.54-cm tube)	-84°C (-119°F)
20 ft/sec, 1-in. tube (6.096 m/s, 2.54-cm tube)	<-90°C (<-130°F)
Heat of vaporization at 300°C	144 kJ/kg (62.0 Btu/lb)
Coefficient of thermal expansion at 200°C	0.00159/°C (0.000882/°F)
Kinematic viscosity at 100°C (ASTM D445)	0.463 mm ² /s (cSt)
Kinematic viscosity at 40°C (ASTM D445)	0.779 mm ² /s (cSt)
Average molecular weight	120
Pseudocritical temperature	358°C (676°F)
Pseudocritical pressure	32.1 bar (465 psia)
Pseudocritical density	280 kg/m ³ (17.5 lb/ft ³)
Liquid density at 25°C (ASTM D4052)	857 kg/m ³ (7.15 lb/gal)
Copper corrosion (ASTM D130)	1a
Moisture content, maximum (ASTM E203)	<300 ppm
Dielectric constant @ 20°C	2.38

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



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.

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

Liquid properties of Marlotherm® XC 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
-90	-130	950	1.28	-103	470	0.154	9.17	8.71	—
-80	-112	942	1.32	-89.9	464	0.151	6.70	6.31	—
-70	-94	934	1.36	-76.6	458	0.149	5.06	4.72	—
-60	-76	926	1.40	-62.8	452	0.147	3.92	3.63	—
-50	-58	918	1.44	-48.6	446	0.144	3.11	2.86	—
-40	-40	910	1.48	-34.0	440	0.142	2.52	2.29	—
-30	-22	902	1.52	-18.9	433	0.140	2.08	1.88	—
-20	-4	894	1.57	-3.49	427	0.137	1.74	1.56	—
-10	14	886	1.61	12.4	421	0.135	1.48	1.31	—
0	32	878	1.65	28.6	414	0.133	1.28	1.12	—
10	50	869	1.69	45.3	407	0.130	1.11	0.968	0.225
20	68	861	1.73	62.5	401	0.128	0.980	0.844	0.443
30	86	853	1.77	80.0	394	0.126	0.870	0.742	0.825
40	104	844	1.82	97.9	387	0.123	0.779	0.658	1.46
50	122	836	1.86	116	381	0.121	0.703	0.588	2.48
60	140	827	1.90	135	374	0.119	0.639	0.529	4.03
70	158	819	1.94	154	367	0.117	0.585	0.479	6.34
80	176	810	1.98	174	360	0.114	0.538	0.436	9.67
90	194	801	2.03	194	353	0.112	0.498	0.399	14.3
100	212	792	2.07	214	345	0.110	0.463	0.367	20.7
110	230	783	2.11	235	338	0.108	0.432	0.338	29.2
120	248	774	2.15	257	330	0.105	0.406	0.314	40.3
130	266	764	2.20	278	323	0.103	0.382	0.292	54.6
140	284	755	2.24	301	315	0.101	0.361	0.273	72.7
150	302	745	2.28	323	307	0.098	0.343	0.255	95.2
160	320	735	2.33	346	298	0.096	0.327	0.240	123
170	338	725	2.37	370	290	0.094	0.312	0.226	157
180	356	715	2.42	394	281	0.092	0.299	0.214	197
190	374	704	2.46	418	272	0.090	0.288	0.202	245
200	392	693	2.51	443	263	0.087	0.277	0.192	301
210	410	682	2.56	468	253	0.085	0.268	0.183	367
220	428	670	2.61	494	243	0.083	0.260	0.174	443
230	446	658	2.66	520	233	0.081	0.253	0.166	530
240	464	645	2.71	547	222	0.078	0.247	0.159	630
250	482	632	2.76	575	211	0.076	0.242	0.153	742
260	500	618	2.82	603	199	0.074	0.237	0.147	868
270	518	604	2.89	631	187	0.072	0.233	0.141	1009
280	536	588	2.97	660	174	0.070	0.231	0.136	1165
290	554	572	3.06	690	159	0.067	0.229	0.131	1338
300	572	554	3.17	722	144	0.065	0.228	0.126	1528

^aRecommended bulk temperature 300°C (570°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. ^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 XC heat transfer fluid by temperature^a (ENGLISH UNITS)

Temperature		Liquid density		Liquid heat capacity	Heat of vaporization	Liquid enthalpy ^b	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
-130	-90	7.93	59.3	0.305	-44.3	202	0.0889	21.1	9.17	—
-120	-84	7.89	59.0	0.310	-41.2	201	0.0882	17.5	7.67	—
-100	-73	7.82	58.5	0.321	-34.9	198	0.0866	12.5	5.54	—
-80	-62	7.74	57.9	0.332	-28.3	195	0.0851	9.29	4.14	—
-60	-51	7.67	57.4	0.343	-21.6	192	0.0836	7.09	3.19	—
-40	-40	7.59	56.8	0.354	-14.6	189	0.0821	5.55	2.52	—
-20	-29	7.52	56.2	0.365	-7.4	186	0.0806	4.44	2.04	—
0	-18	7.44	55.7	0.376	0.0	183	0.0791	3.63	1.68	—
20	-7	7.37	55.1	0.387	7.6	180	0.0776	3.01	1.41	—
40	4	7.29	54.6	0.398	15.5	177	0.0761	2.54	1.20	0.022
60	16	7.22	54.0	0.409	23.6	174	0.0747	2.17	1.04	0.048
80	27	7.14	53.4	0.421	31.9	171	0.0732	1.87	0.904	0.098
100	38	7.06	52.8	0.432	40.4	167	0.0717	1.63	0.798	0.188
120	49	6.98	52.2	0.443	49.1	164	0.0702	1.44	0.711	0.340
140	60	6.90	51.6	0.454	58.1	161	0.0687	1.28	0.639	0.585
160	71	6.82	51.0	0.465	67.3	157	0.0673	1.15	0.579	0.966
180	82	6.74	50.4	0.476	76.7	154	0.0658	1.03	0.529	1.53
200	93	6.66	49.8	0.488	86.4	151	0.0643	0.937	0.486	2.35
220	104	6.58	49.2	0.499	96.2	147	0.0629	0.855	0.449	3.50
240	116	6.49	48.6	0.510	106	144	0.0614	0.785	0.417	5.07
260	127	6.40	47.9	0.522	117	140	0.0600	0.723	0.390	7.17
280	138	6.32	47.2	0.533	127	136	0.0585	0.670	0.366	9.90
300	149	6.23	46.6	0.545	138	132	0.0571	0.622	0.345	13.4
320	160	6.13	45.9	0.556	149	128	0.0556	0.581	0.327	17.8
340	171	6.04	45.2	0.568	160	124	0.0542	0.544	0.311	23.3
360	182	5.94	44.5	0.580	172	120	0.0528	0.511	0.296	30.0
380	193	5.84	43.7	0.592	183	116	0.0513	0.481	0.284	38.1
400	204	5.74	42.9	0.605	195	111	0.0499	0.455	0.273	47.8
420	216	5.64	42.2	0.617	208	107	0.0485	0.431	0.264	59.2
440	227	5.52	41.3	0.631	220	102	0.0471	0.409	0.255	72.5
460	238	5.41	40.5	0.645	233	96.7	0.0456	0.389	0.248	88.0
480	249	5.29	39.6	0.659	246	91.3	0.0442	0.371	0.242	106
500	260	5.16	38.6	0.675	259	85.7	0.0428	0.355	0.237	126
520	271	5.03	37.6	0.693	273	79.7	0.0414	0.339	0.233	149
540	282	4.88	36.5	0.713	287	73.4	0.0400	0.325	0.230	174
560	293	4.72	35.3	0.738	301	66.5	0.0386	0.313	0.228	203
572	300	4.62	34.6	0.757	310	62.0	0.0377	0.305	0.228	222

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TLC Total Lifecycle Care[®] program

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.

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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 access their specific test information via my.therminol.com.

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 Marlotherm 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.

EASTMAN

The results of insight[™]

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