



THERMINOL® 59

heat transfer fluid

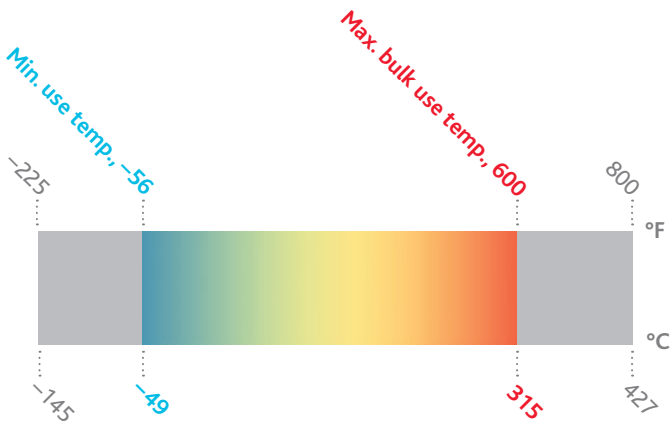
Wide operating range
with excellent
low-temperature performance

-49° to 315°C
(-56° to 600°F)

THERMINOL.
Heat Transfer Fluids by Eastman

THERMINOL® 59

heat transfer fluid



Eastman Therminol® 59 heat transfer fluid offers excellent low-temperature pumping characteristics (pumpable at $-49^{\circ}\text{C}/-56^{\circ}\text{F}$) for problem-free start-ups in cold climates while offering thermal stability at maximum bulk temperatures up to 315°C (600°F).

Therminol 59 is available globally. Contact your local Eastman Therminol sales representative for more information.

Physical and chemical characteristics

Therminol 59 fluid is designed for use in nonpressurized/low-pressure, indirect heating systems. While Therminol 59 has a relatively high normal boiling point ($289^{\circ}\text{C}/553^{\circ}\text{F}$), the recommended maximum bulk ($315^{\circ}\text{C}/600^{\circ}\text{F}$) and film ($345^{\circ}\text{C}/650^{\circ}\text{F}$) temperatures 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 288°C (550°F).

The recommended maximum bulk and film temperatures for Therminol 59 are based on industry-standard thermal studies. Operation at or below these temperature maximums can provide long service life under most operating conditions.

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 utilizing Therminol 59 fluid should 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.

Therminol 59 is noncorrosive to metals commonly used in the construction of heat transfer systems.

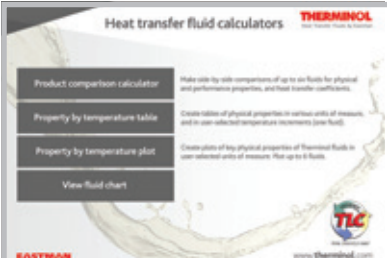
While Therminol 59 has a relatively high flash point, it is not classified as a fire-resistant heat transfer fluid. Consequently, the use of protective devices may be required to minimize fire risk, and users of Therminol 59 should check with their safety and risk management experts for specific instructions.



Typical properties^a

Appearance	Clear, yellow to dark amber liquid
Composition	Alkyl-substituted aromatic
Maximum bulk temperature	315°C (600°F)
Maximum film temperature	345°C (650°F)
Normal boiling point	289°C (553°F)
Pumpability, at 300 mm ² /s (cSt)	-37°C (-35°F)
Pumpability, at 2000 mm ² /s (cSt)	-49°C (-56°F)
Flash point, COC (ASTM D-92)	146°C (295°F)
Flash point, PMCC (ASTM D-93)	132°C (270°F)
Autoignition temperature (ASTM E-659)	372°C (702°F)
Autoignition temperature (DIN 51794)	404°C (760°F)
Pour point (ISO 3016)	-68°C (-90°F)
Minimum liquid temperatures for fully developed turbulent flow ($N_{Re} > 10,000$)	
10 ft/s, 1-in. tube (3.048 m/s, 2.54-cm tube)	17°C (63°F)
20 ft/s, 1-in. tube (6.096 m/s, 2.54-cm tube)	0°C (32°F)
Minimum liquid temperatures for transitional region flow ($N_{Re} > 2,000$)	
10 ft/s, 1-in. tube (3.048 m/s, 2.54-cm tube)	-16°C (4°F)
20 ft/s, 1-in. tube (6.096 m/s, 2.54-cm tube)	-24°C (-12°F)
Coefficient of thermal expansion at 200°C	0.000946/°C (0.000525/°F)
Heat of vaporization at maximum use temperature	226.9 kJ/kg (97.5 Btu/lb)
Total acidity (ASTM D-664)	<0.2 mg KOH/g
Average molecular weight	207
Pseudocritical temperature	514°C (957°F)
Pseudocritical pressure	22.3 bar (323 psia)
Pseudocritical density	287 kg/m ³ (17.9 lb/ft ³)
Chlorine content, ppm (DIN 51577)	<10 ppm
Copper corrosion (ASTM D-130)	<< 1a
Moisture content, maximum (ASTM E-203)	200 ppm
Dielectric constant @ 23°C (ASTM D-924)	2.52

^aThese data are based on samples tested in the laboratory and are not guaranteed for all samples. Contact us for complete sales specifications for Therminol 59 fluid. 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

www.therminol.com/resources

and download the Therminol heat transfer fluid calculator.

**For the technical service contact in your region,
visit the CONTACT US page on our website, www.therminol.com.**

Liquid properties of Therminol® 59 heat transfer fluid by temperature^a (SI units)

Temperature		Liquid density	Liquid heat capacity	Heat of vaporization	Liquid enthalpy ^b	Liquid thermal conductivity	Liquid viscosity ^c		Vapor pressure ^d
°C	°F	kg/m ³	kJ/(kg·K)	kJ/kg	kJ/kg	W/(m·K)	cP (mPa·s)	cSt (mm ² /s)	kPa
-49	-56	1024	1.46	388.5	-47.1	0.1256	2050	2000	—
-46	-51	1022	1.47	386.7	-42.7	0.1254	1180	1150	—
-40	-40	1018	1.49	383.2	-33.9	0.1251	454	446	—
-30	-22	1011	1.52	377.4	-18.8	0.1245	133	131	—
-20	-4	1003	1.55	371.7	-3.5	0.1239	53.3	53.1	—
-10	14	996	1.58	366.2	12.2	0.1233	26.5	26.6	—
0	32	989	1.62	360.7	28.2	0.1227	15.3	15.5	—
10	50	982	1.65	355.4	44.6	0.1220	9.87	10.1	—
20	68	974	1.68	350.2	61.2	0.1213	6.86	7.04	—
30	86	967	1.71	345.2	78.2	0.1206	5.05	5.22	—
40	104	960	1.75	340.2	95.5	0.1199	3.88	4.04	0.010
50	122	953	1.78	335.3	113.1	0.1191	3.08	3.23	0.021
60	140	945	1.81	330.6	131.0	0.1183	2.51	2.65	0.040
70	158	938	1.84	325.9	149.3	0.1175	2.09	2.23	0.072
80	176	931	1.88	321.4	167.9	0.1166	1.77	1.90	0.126
90	194	923	1.91	316.9	186.8	0.1157	1.52	1.64	0.212
100	212	916	1.94	312.6	206.1	0.1148	1.32	1.44	0.346
110	230	908	1.97	308.3	225.7	0.1139	1.16	1.27	0.549
120	248	901	2.01	304.1	245.6	0.1129	1.02	1.14	0.847
130	266	893	2.04	299.9	265.8	0.1120	0.912	1.02	1.28
140	284	886	2.07	295.9	286.4	0.1109	0.819	0.924	1.88
150	302	878	2.11	291.9	307.3	0.1099	0.740	0.842	2.71
160	320	871	2.14	287.9	328.5	0.1088	0.671	0.771	3.84
170	338	863	2.17	284.0	350.1	0.1077	0.613	0.710	5.34
180	356	855	2.21	280.2	372.0	0.1066	0.561	0.656	7.30
190	374	847	2.24	276.4	394.2	0.1055	0.516	0.609	9.84
200	392	839	2.27	272.5	416.8	0.1043	0.477	0.568	13.1
210	410	832	2.31	268.7	439.7	0.1031	0.442	0.531	17.2
220	428	823	2.34	264.9	463.0	0.1018	0.411	0.499	22.2
230	446	815	2.38	261.1	486.6	0.1006	0.383	0.470	28.5
240	464	807	2.41	257.3	510.5	0.0993	0.358	0.443	36.1
250	482	799	2.44	253.5	534.8	0.0980	0.335	0.420	45.3
260	500	790	2.48	249.6	559.4	0.0966	0.315	0.399	56.3
270	518	782	2.51	245.6	584.4	0.0953	0.297	0.380	69.4
280	536	773	2.55	241.6	609.7	0.0939	0.280	0.362	84.8
290	554	764	2.58	237.5	635.4	0.0924	0.265	0.347	103
300	572	755	2.62	233.4	661.4	0.0910	0.251	0.332	124
310	590	745	2.66	229.1	687.8	0.0895	0.238	0.319	148
320	608	736	2.69	224.7	714.5	0.0880	0.226	0.307	176
330	626	726	2.73	220.1	741.6	0.0865	0.215	0.297	207

^aMaximum recommended bulk temperature 315°C (600°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 Therminol 59 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 Therminol® 59 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 ^d
°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
-56	-49	8.55	64.0	0.349	167.1	-20.3	0.0726	4970	2000	—
-50	-46	8.53	63.8	0.352	166.3	-18.1	0.0725	2640	1070	—
-40	-40	8.49	63.5	0.356	164.9	-14.6	0.0723	1100	446	—
-20	-29	8.43	63.0	0.364	162.1	-7.4	0.0720	286	117	—
0	-18	8.36	62.5	0.373	159.4	0.0	0.0716	109	44.8	—
20	-7	8.29	62.0	0.381	156.7	7.5	0.0712	52.7	21.9	—
40	4	8.23	61.5	0.390	154.2	15.3	0.0708	30.2	12.7	—
60	16	8.16	61.0	0.398	151.7	23.1	0.0703	19.4	8.18	—
80	27	8.09	60.5	0.407	149.2	31.2	0.0699	13.5	5.74	—
100	38	8.02	60.0	0.416	146.8	39.4	0.0694	9.91	4.26	0.001
120	49	7.96	59.5	0.424	144.5	47.8	0.0689	7.63	3.31	0.003
140	60	7.89	59.0	0.433	142.2	56.4	0.0684	6.07	2.65	0.006
160	71	7.82	58.5	0.441	140.0	65.1	0.0679	4.95	2.19	0.011
180	82	7.75	58.0	0.450	137.8	74.0	0.0673	4.13	1.84	0.021
200	93	7.68	57.5	0.459	135.7	83.1	0.0668	3.50	1.57	0.036
220	104	7.62	57.0	0.468	133.6	92.4	0.0662	3.00	1.36	0.062
240	116	7.55	56.5	0.476	131.6	101.8	0.0656	2.61	1.19	0.102
260	127	7.48	55.9	0.485	129.6	111.4	0.0649	2.29	1.06	0.162
280	138	7.41	55.4	0.494	127.7	121.2	0.0643	2.03	0.945	0.251
300	149	7.34	54.9	0.503	125.8	131.2	0.0636	1.81	0.851	0.378
320	160	7.27	54.4	0.512	123.9	141.3	0.0629	1.62	0.771	0.557
340	171	7.19	53.8	0.520	122.0	151.7	0.0622	1.47	0.703	0.802
360	182	7.12	53.3	0.529	120.2	162.2	0.0615	1.33	0.645	1.13
380	193	7.05	52.7	0.538	118.3	172.8	0.0607	1.22	0.595	1.57
400	204	6.98	52.2	0.547	116.5	183.7	0.0600	1.11	0.551	2.14
420	216	6.90	51.6	0.556	114.7	194.7	0.0592	1.03	0.513	2.88
440	227	6.83	51.1	0.565	112.9	205.9	0.0584	0.948	0.479	3.81
460	238	6.75	50.5	0.574	111.1	217.3	0.0576	0.879	0.449	4.97
480	249	6.67	49.9	0.583	109.2	228.9	0.0567	0.817	0.422	6.41
500	260	6.59	49.3	0.593	107.4	240.7	0.0559	0.762	0.399	8.17
520	271	6.51	48.7	0.602	105.5	252.6	0.0550	0.713	0.378	10.3
540	282	6.43	48.1	0.611	103.6	264.7	0.0541	0.669	0.359	12.8
560	293	6.35	47.5	0.621	101.6	277.0	0.0532	0.629	0.342	15.9
580	304	6.26	46.9	0.630	99.6	289.6	0.0522	0.593	0.326	19.5
600	316	6.18	46.2	0.640	97.5	302.2	0.0513	0.560	0.313	23.6
620	327	6.09	45.5	0.649	95.4	315.1	0.0503	0.530	0.300	28.5

TLC Total Lifecycle Care[®]

In-service heat transfer fluid sample analysis

When Therminol 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.

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, and maintenance technicians to 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.

Flush fluid and fluid refill

Liquid phase heat transfer systems can be cleaned with Therminol[®] FF flushing fluid. After the system is flushed, the appropriate liquid phase Therminol heat transfer fluid can be added.

Fluid trade-in program*

As part of our commitment to sustainability and the environment, Eastman offers a trade-in program for used Therminol 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 Therminol heat transfer fluid.



*Available in North America. Contact your local sales representative for more information.



Eastman's TLC Total Lifecycle Care[®] program is designed to support Therminol 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 North America, call our hotline at 1-800-433-6997 or contact your local sales or technical representative.

For more information or to find the sales or technical contact nearest you, visit the "Contact us" page on our website:
www.therminol.com.

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