

# THERMINOL<sup>®</sup> XP

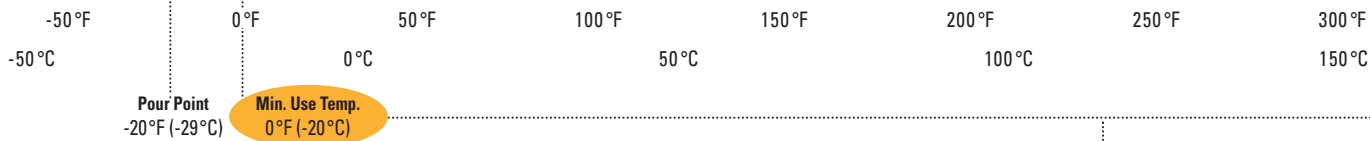
Heat Transfer Fluid By **Monsanto**

Heat Transfer Fluid  
With FDA/USP/NF  
Status

0°F to  
600°F



TM



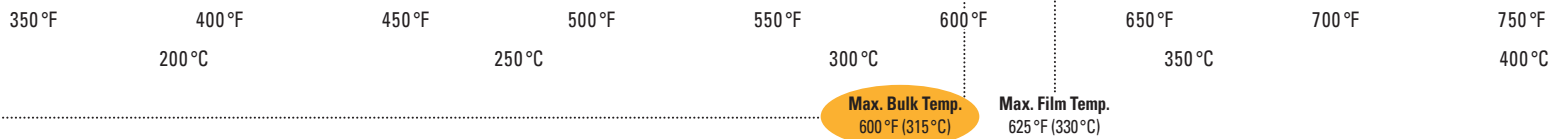
## OPTIMUM USE RANGE\*

Therminol® XP heat transfer fluid provides for reliable heat transfer to 600°F. This material has outstanding regulatory status for those seeking heat transfer fluids which have minimum environmental reporting requirements.

# THERMINOL® XP

Heat Transfer Fluid By **Monsanto**

In many parts of the world, especially Europe, Monsanto markets Therminol heat transfer fluids under the brand name "Santotherm®." Therminol XP and Santotherm XP are identical in composition and performance.



## TYPICAL PROPERTIES\* †

<b>Appearance</b>	Colorless, odorless liquid
<b>Composition</b>	White mineral oil, USP/NF
<b>Flash Point (ASTM D-92)</b>	182°C (360°F)
<b>Fire Point (ASTM D-92)</b>	196°C (385°F)
<b>Autoignition Temperature (ASTM D-2155)</b>	324°C (615°F)
<b>Kinematic Viscosity, at 40°C</b>	23.7 mm <sup>2</sup> /s (cSt)
<b>at 100°C</b>	4.06 mm <sup>2</sup> /s (cSt)
<b>Density at 25°C</b>	875 kg/m <sup>3</sup> (7.30 lb/gal)
<b>Specific Gravity (60°F/60°F)</b>	0.882
<b>Coefficient of Thermal Expansion at 200°C</b>	0.000892/°C (0.000495/°F)
<b>Average Molecular Weight</b>	350
<b>Pour Point</b>	-29°C (-20°F)
<b>Pumpability, at 2000 mm<sup>2</sup>/s (cSt)</b>	-20°C (-4°F)
<b>at 300 mm<sup>2</sup>/s (cSt)</b>	-1°C (30°F)
<b>Minimum Temperatures for Fully Developed Turbulent Flow (Re = 10000)</b>	
<b>10 ft/sec, 1-in tube</b>	72°C (162°F)
<b>20 ft/sec, 1-in tube</b>	51°C (123°F)
<b>Transition Region Flow (Re = 2000)</b>	
<b>10 ft/sec, 1-in tube</b>	30°C (85°F)
<b>20 ft/sec, 1-in tube</b>	17°C (63°F)
<b>Boiling Range, 10%</b>	332°C (630°F)
<b>90%</b>	416°C (780°F)
<b>Normal Boiling Point</b>	358°C (676°F)
<b>Heat of Vaporization at Maximum Use Temperature 315°C</b>	214 kJ/kg (91.9 Btu/lb)
<b>Optimum Use Range</b>	-20°C to 315°C (0°F to 600°F)
<b>Maximum Film Temperature</b>	330°C (625°F)
<b>Pseudocritical Temperature</b>	542°C (1007°F)
<b>Pseudocritical Pressure</b>	15.2 bar (220 psia)
<b>Pseudocritical Density</b>	280 kg/m <sup>3</sup> (17.5 lb/ft <sup>3</sup> )

\* These data are based upon samples tested in the laboratory and are not guaranteed for all samples.

Write us for complete sales specifications for Therminol XP fluid.

† Does not constitute an express warranty. See NOTICE on back page.

# P R O P E R T I E S   O F   T H E R M I N O L<sup>®</sup>   X P

Temperature		Liquid Density			Liquid Heat Capacity		Liquid Enthalpy**		Heat of Vaporization	
°F	°C	lb/gal	lb/ft <sup>3</sup>	kg/m <sup>3</sup>	Btu/lb-°F [cal/g-°C]	kJ/kg•K	Btu/lb	kJ/kg	Btu/lb	kJ/kg
-20	-29	7.59	56.8	909	0.376	1.57	-7.7	-17.8	193.4	449.6
0	-18	7.53	56.3	902	0.389	1.63	0.0	0.0	190.4	442.5
20	-7	7.47	55.9	895	0.403	1.68	7.9	18.4	187.3	435.4
40	4	7.41	55.4	888	0.416	1.74	16.1	37.4	184.2	428.2
60	16	7.35	55.0	881	0.429	1.79	24.6	57.0	181.1	421.0
80	27	7.29	54.6	874	0.442	1.85	33.3	77.3	178.0	413.7
100	38	7.24	54.1	867	0.454	1.90	42.2	98.1	174.8	406.4
120	49	7.18	53.7	860	0.467	1.95	51.4	119.5	171.7	399.0
140	60	7.12	53.2	853	0.479	2.00	60.9	141.5	168.5	391.6
160	71	7.06	52.8	846	0.491	2.06	69.6	164.0	165.3	384.2
180	82	7.00	52.4	839	0.503	2.11	78.5	187.2	162.1	376.7
200	93	6.94	51.9	832	0.515	2.16	87.7	210.8	158.8	369.2
220	104	6.88	51.5	824	0.527	2.20	97.1	235.1	155.6	361.7
240	116	6.82	51.0	817	0.538	2.25	106.8	259.8	152.3	354.1
260	127	6.76	50.6	810	0.550	2.30	116.7	285.1	149.1	346.5
280	138	6.70	50.1	803	0.561	2.35	126.8	310.9	145.8	338.9
300	149	6.64	49.7	796	0.572	2.39	137.1	337.3	142.5	331.3
320	160	6.58	49.2	788	0.583	2.44	147.6	364.1	139.2	323.6
340	171	6.52	48.7	781	0.594	2.48	158.3	391.5	135.9	315.9
360	182	6.45	48.3	773	0.604	2.53	169.2	419.3	132.6	308.2
380	193	6.39	47.8	766	0.614	2.57	180.3	447.6	129.3	300.5
400	204	6.33	47.3	758	0.625	2.61	191.6	476.4	125.9	292.7
420	216	6.27	46.9	751	0.635	2.66	203.1	505.7	122.6	284.9
440	227	6.20	46.4	743	0.645	2.70	214.8	535.5	119.2	277.1
460	238	6.14	45.9	735	0.654	2.74	226.7	565.7	115.8	269.3
480	249	6.07	45.4	728	0.664	2.78	238.8	596.3	112.4	261.4
500	260	6.01	44.9	720	0.673	2.82	251.1	627.4	109.0	253.5
520	271	5.94	44.4	712	0.683	2.86	263.6	658.9	105.6	245.5
540	282	5.87	43.9	703	0.692	2.89	276.3	690.8	102.2	237.6
560	293	5.80	43.4	695	0.701	2.93	289.2	723.2	98.7	229.5
580	304	5.73	42.9	687	0.709	2.97	302.3	756.0	95.3	221.4
600	316	5.66	42.3	678	0.718	3.00	315.6	789.2	91.8	213.3
620	327	5.58	41.8	669	0.726	3.04	329.1	822.7	88.2	205.1

\* Maximum recommended bulk temperature 600°F (315°C).

† These data are based upon samples tested in the laboratory and are not guaranteed for all samples. Write us for complete sales specifications for Therminol XP fluid.

\*\* The liquid enthalpy basis is zero at 0°F.

# H E A T   T R A N S F E R   F L U I D <sup>\* †</sup>

Liquid Thermal Conductivity			Liquid Viscosity			Vapor Pressure				Temperature	
Btu/ ft-hr-°F	kcal/ m-hr-°C	W/m•K	lb/ft-hr	cSt [mm <sup>2</sup> /s]	cP [mPa•s]	psia	mm Hg	kgf/cm <sup>2</sup>	kPa	°F	°C
0.0726	0.1080	0.1255	14700	6670	6070					-20	-29
0.0724	0.1077	0.1252	3400	1558	1406					0	-18
0.0722	0.1074	0.1249	1050	484	433					20	-7
0.0720	0.1071	0.1245	402	187.0	166.1					40	4
0.0717	0.1068	0.1241	182.7	85.7	75.5					60	16
0.0715	0.1064	0.1237	94.9	44.9	39.2					80	27
0.0712	0.1060	0.1232	54.8	26.1	22.7					100	38
0.0709	0.1056	0.1227	34.4	16.55	14.23					120	49
0.0706	0.1051	0.1222	23.1	11.21	9.56					140	60
0.0703	0.1046	0.1216	16.42	8.02	6.79					160	71
0.0700	0.1041	0.1210	12.18	6.01	5.04					180	82
0.0696	0.1036	0.1204	9.38	4.66	3.88	0.0018	0.091	0.00012	0.012	200	93
0.0692	0.1030	0.1198	7.43	3.73	3.07	0.0034	0.18	0.00024	0.023	220	104
0.0688	0.1025	0.1191	6.04	3.06	2.50	0.0063	0.33	0.00044	0.043	240	116
0.0684	0.1018	0.1184	5.02	2.56	2.07	0.011	0.58	0.00079	0.077	260	127
0.0680	0.1012	0.1176	4.23	2.18	1.750	0.019	1.0	0.0014	0.13	280	138
0.0676	0.1005	0.1169	3.63	1.885	1.500	0.032	1.7	0.0023	0.22	300	149
0.0671	0.0999	0.1161	3.15	1.650	1.301	0.053	2.7	0.0037	0.36	320	160
0.0666	0.0992	0.1153	2.76	1.460	1.140	0.084	4.3	0.0059	0.58	340	171
0.0661	0.0984	0.1144	2.44	1.303	1.008	0.129	6.7	0.0091	0.89	360	182
0.0656	0.0977	0.1135	2.17	1.172	0.898	0.196	10.1	0.0137	1.35	380	193
0.0651	0.0969	0.1126	1.948	1.062	0.805	0.289	15.0	0.0203	2.00	400	204
0.0646	0.0960	0.1116	1.757	0.967	0.726	0.420	21.7	0.0296	2.90	420	216
0.0640	0.0952	0.1107	1.592	0.886	0.658	0.600	31.0	0.0422	4.13	440	227
0.0634	0.0944	0.1097	1.449	0.815	0.599	0.841	43.5	0.0592	5.80	460	238
0.0628	0.0935	0.1086	1.324	0.752	0.547	1.16	60.1	0.0817	8.01	480	249
0.0622	0.0926	0.1076	1.214	0.697	0.502	1.58	81.9	0.111	10.9	500	260
0.0616	0.0916	0.1065	1.116	0.648	0.461	2.13	110	0.150	14.7	520	271
0.0609	0.0906	0.1053	1.028	0.604	0.425	2.82	146	0.198	19.5	540	282
0.0602	0.0896	0.1042	0.950	0.565	0.393	3.70	191	0.259	25.5	560	293
0.0596	0.0886	0.1030	0.879	0.529	0.363	4.80	248	0.337	33.1	580	304
0.0588	0.0876	0.1018	0.815	0.497	0.337	6.16	318	0.433	42.5	600	316
0.0581	0.0865	0.1005	0.757	0.468	0.313	7.82	405	0.550	54.0	620	327

TECHNICAL SERVICE HOTLINE (800) 433-6997



# PHYSICAL AND CHEMICAL CHARACTERISTICS

**As an indicator of purity, Therminol XP meets FDA specifications defined in 21 CFR 172.878 and requirements of United States Pharmacopeia (USP) and National Formulary (NF).** Also, a user should carefully review the information contained in a properly prepared Material Safety Data Sheet prior to making a fluid decision.

Monsanto recommends that systems utilizing Therminol XP fluid should be blanketed with an inert atmosphere. Inert gas blanketing minimizes fluid oxidation and helps maximize fluid life. A system pressure relief device also should be provided.

# THERMINOL<sup>®</sup> XP

Heat Transfer Fluid By **Monsanto**

While Therminol XP 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. The insurer of your property should be consulted relative to this matter.

Therminol XP is non-corrosive to metals commonly used in the design of heat transfer systems.

The recommended maximum bulk (600°F/315°C) and film (625°F/330°C) temperatures are based on detailed thermal studies. Operation at or below these temperature maximums will provide long service life under most operating conditions.

## **SAFETY AND HANDLING**

Material Safety Data Sheets may be obtained from Environmental Operations, Industrial Products Group, Monsanto Chemical Group. Heat transfer fluids are intended only for indirect heating purposes. Under no circumstances should this product contact or in any way contaminate food, animal feed, food products, food packaging materials, food chemicals, pharmaceuticals or any items which may directly or indirectly be ultimately ingested by humans. Any contact may contaminate these items to the extent that their destruction may be required. Precautions against ignitions and fires should be taken with this product.

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Maipu 1210 6th Floor  
Buenos Aires (1006) Argentina  
54-1-312-5313

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Interoc S.A.  
Calle Barron 229  
Santa Cruz de la Sierra  
5913-34.11.39

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Monsanto do Brasil LTDA  
Rua Paes Leme 524  
Edificio Passarelli  
05424-904 Pinheiros  
Caixa Postal 61535  
Sao Paulo-SP-Brazil  
55-11-817-6233

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Monsanto Chile C e I Ltda  
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56-2-231-6074

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506-220-1226

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5932-22.70.20

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Monsanto Guatemala Inc.  
12 Calle 1-25 Zona 10  
Edificio Geminis 10 Nivel 12  
Guatemala City, Guatemala  
502-2-353-177

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Monsanto Comercial SA de CV  
Bosques de Durazno 61  
3R Piso  
Bosques de las Lomas  
Mexico City DF 11700 Mexico  
52-5-251-2715

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**Lima**  
Rocsa Internacional  
Av. Bolivar 2100  
Lima 21 Peru  
5114-62.02.00

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Monsanto Puerto Rico Co.  
Bankers Finance Tower  
Suite 1913  
654 Munoz Rivera Av  
Hato Rey, Puerto Rico 00918  
809-758-1944

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**Montevideo**  
Basilio Bernat Representaciones  
P.O. Box 378  
Montevideo, Uruguay  
598-2-96-0732

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**Caracas**  
Monsanto Venezuela CA  
Avenida Francisco de Miranda  
Edificio Parque Cristal  
Torre Este, Piso 8, Ofc 8-12  
Los Palos Grandes  
Caracas 1060 Venezuela  
58-2-85.09.44

## Western Europe

### Benelux

Monsanto Europe SA  
Avenue de Tervuren 270-272  
P.O. Box 1  
B-1150 Brussels, Belgium  
32-2-776.41.11

### Technical Center

Monsanto Technical Center  
Rue Laid Burniat  
B-1348 Louvain-la-Neuve, Belgium  
32-10-47.12.11

### France

**Paris**  
Société Monsanto SA  
Immeuble Delalande  
16/32, rue Henri Regnault  
92411 Courbevoie  
Cedex, France  
33-1-41.16.43.00

### Germany/Austria/ Switzerland

**Düsseldorf**  
Monsanto (Deutschland) GmbH  
Immermannstrasse 3  
D-4000 Düsseldorf 1, Germany  
49-211-36.750

### Italy

**Milan**  
Monsanto Italiana SPA  
Via Melchiorre Gioia 8  
1-20124 Milan, Italy  
39-2-627.31

### Scandinavia

**Denmark**  
Smedeland 6  
DK-2600 Glostrup, Denmark  
45-42-45.77.99

### Spain/Portugal

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Monsanto España SA  
Avenida Diagonal 615-4B  
E-08028 Barcelona, Spain  
34-3-419.03.07

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**Basingstoke**  
Monsanto PLC  
Monsanto House  
Chineham Court  
Chineham  
Basingstoke (Hampshire)  
RG24 0UL  
United Kingdom  
44-256-572.88

## Eastern Europe

### Czech Republic

**Prague**  
Monsanto Europe SA  
NA Safrance 27  
10100 Praha 10 Vinohrady  
Czech Republic  
42-2-67312200

### Poland

**Warsaw**  
Monsanto Poland Inc.  
Intraco Building – 26th Floor  
Ul. Stawki 2  
00193 Warsaw, Poland  
48-2-635.14.71

### Romania

**Bucharest**  
Monsanto Europe SA  
Hotel Bucuresti – Locuinte  
Strada Lutherana 2-4  
Corp D2, Etaj 4, Apartament 12  
Sector 1  
Bucharest, Romania  
40-1-614.78.47

### Russian — C.I.S.

**Moscow**  
Monsanto Company  
Volkov Lane 19  
Moscow 12342 Russia, C.I.S.  
7-095-244.91.81

## Middle East/ Africa

### Greece

**Athens**  
Monsanto Hellas EPE  
Avenue Kifissias 64  
GR-151 25 Maroussi  
Athens, Greece  
30-1-689.75.50

### Kenya

**Nairobi**  
Monsanto Central Africa Inc.  
Norfolk Towers, Phase II  
Kijabe Street  
P.O. Box 47686  
Nairobi, Kenya  
254-2-21.29.97

### South Africa

**Transvaal**  
Monsanto South Africa (Pty) Ltd.  
Pangbourne House  
112 Pybus Road, 2nd Floor  
P.O. Box 78025  
Sandton 2146  
Transvaal, South Africa  
27-11-783.7505

### Turkey

**Istanbul**  
Monsanto Europe SA  
Bagdat Caddesi 225/1  
Kat 2, Daire 5  
Ciftehavuzlar, Kadikoy  
81030 Istanbul, Turkey  
90-1-302.09.54

## Asia Pacific

### Australia

**Melbourne**  
Monsanto Australia Ltd.  
600 St. Kilda Road  
12th Floor  
Melbourne  
Victoria, Australia 3004  
61-3-522-7122

### China

**Hong Kong**  
Monsanto Far East Ltd.  
3rd Floor, Centre Point  
181-185 Gloucester Road  
Hong Kong  
852-831-9121

### Shanghai

Monsanto Far East Ltd.  
Suite 437 Shanghai Centre  
1376 Nanjing Road West  
Shanghai 200040  
People's Republic of China  
86-21-279-8669

### India

**Bombay**  
Monsanto Chem of India Ltd.  
Wakefield House  
11 Spott Road – Ballard Estate  
P.O. Box 584  
Bombay 400038, India  
91-22-265-7691

### Indonesia

**Jakarta**  
Monsanto Indonesia  
Representative Office  
Permata Plaza, 9th Floor  
Jl. M. H. Thamrin No. 57  
Jakarta 10077, Indonesia  
62-21-390-3150

### Japan

**Tokyo**  
Monsanto Japan Ltd.  
31F, ARK Mori Bldg.  
12-32, Akasaka 1-chome  
Minato-ku, Tokyo 107 Japan  
81-3-5562-2600

### Korea

**Seoul**  
Monsanto Korea Inc.  
3rd Floor, Anglican Church Bldg.  
3-7 Jeong-Dong, Joong-gu  
Seoul 100-120, Korea  
82-2-736-7112

### Malaysia

**Kuala Lumpur**  
Monsanto (Malaysia) Sdn Bhd  
Level 1, Block D  
Kompleks Pejabat Damansara  
Jalan Dungan, Damansara Heights  
50490 Kuala Lumpur, Malaysia  
60-3-254-2266

### New Zealand

**Wellington**  
Monanto New Zealand Ltd.  
Suite C, Broderick Office Park  
19 Broderick Road  
Johnsonville  
Wellington WNM 6032, New Zealand  
64-4-4789-296

### Pakistan

**Karachi**  
Amin Feroz & Company Ltd.  
130-311 Cotton Exchange Bldg.  
I.I. Chundrigar Road  
Karachi 0227, Pakistan  
92-21-241-4172

### Philippines

**Manila**  
Monsanto Philippines Inc.  
Ground Floor  
King's Court II Bldg.  
2129 Pasong Tamo  
Makati, Metro Manila  
Philippines  
63-2-811-2314

### Singapore

Monsanto Singapore Co. Ltd.  
101 Thomson Road  
#19-00 United Square  
Singapore 1130  
65-250-2000

### Taiwan

**Taipei**  
Monsanto Far East Ltd.  
11th Floor  
1 President Tower  
#51 Keelung Road  
Section 2, Taipei, Taiwan  
Republic of China  
886-2-738-7867

### Thailand

**Bangkok**  
Monsanto Thailand Ltd.  
Panjathani Tower  
28th Floor  
127 Ratchadapisek Road  
Chongnonsee  
Bangkok 10120 Thailand  
66-2-681-0363

# Monsanto

**The Chemical Group  
a unit of Monsanto Company**  
800 N. Lindbergh Blvd.  
St. Louis, MO 63167

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