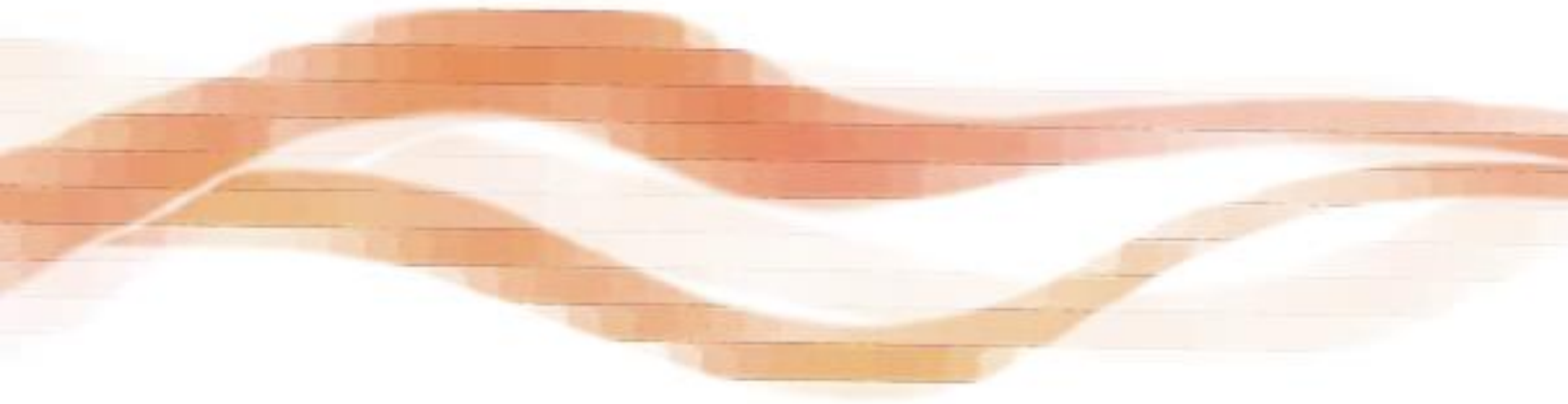
Dynalene HF-LO

engineering guide



DYNALENE

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Product Overview

Dynalene HF-LO is a high flash point, low odor, non-toxic heat transfer fluid. It was developed as an alternative to silicone oils for low-temperature applications. Dynalene HF-LO heat transfer fluid is also biodegradable and CFC free. Dynalene HF-LO has a recommended use temperature range of –100°F to 400°F for closed systems. It is essential that all personnel handling this product review and understand this manual and the Dynalene HF-LO material safety data sheet (MSDS). Please contact Dynalene for more information.

Freezing & Melting Point

Dynalene HF-LO has a freezing and melting point below -118°C (-180°F), allowing broader application to systems using cryogenic liquids or ultra-low temperature mechanical refrigeration equipment. This results in greater tolerance when lowering the surface film temperature.

Flash Point

Dynalene HF-LO heat transfer fluid has a closed cup flash point of >61°C (>141°F), and an open cup flash point of >68°C (>156°F). Like other hydrocarbon based heat transfer fluids, Dynalene HF-LO and its vapors may ignite if released into the environment and exposed to hot surfaces, sparks, open flames, or any other source of ignition.

Vapor Pressure

Vapor pressure is a critical property to be considered when calculating Net Positive Suction Head (NPSH), a major factor in the sizing of fluid handling equipment. Airtight containment is recommended to limit the escape of Dynalene HF-LO vapors to the environment, and to prevent the exposure of the fluid to moisture and oxygen. See Table 1 below for vapor pressures of Dynalene HF-LO at various temperatures.

Table 1. Vapor pressure of Dynalene HF-LO.

Temperature, °C (°F)	Vapor Pressure, mmHG (psi)
0 (32)	0.12 (0.002)
25 (77)	0.71 (0.014)
100 (212)	1.80 (0.035)

General Properties

General properties of Dynalene HF-LO can be found in Table 2.

Table 2. General properties of Dynalene HF-LO.

Property	
Composition	Aliphatic hydrocarbon blend
Appearance	Translucent, clear
Odor	Low hydrocarbon odor
Operating range, closed systems	-73°C to 204°C (-100°F to 400°F)
Operating range, open systems	-52°C to 58°C (-60°F to 135°F)
Freezing point	<-118°C (<-180°F)
Boiling point	>191°C (376°F)
Flash point (closed)	>61°C (>141°F)
Flash point (open)	>68°C (>156°F)
Fire point	72°C (162°F)
Autoignition temp.	>337°C (>640°F)
Critical temp.	394°C (741°F)
Critical pressure	27 bar (26.7 atm)
Molecular weight	162 g/mol
Dielectric constant	2.1 to 2.2

Packaging & Shipping

Dynalene HF-LO heat transfer fluid is available in 5 gallon pails, 55 gallon drums, and bulk quantities. Dynalene HF-LO heat transfer fluid has a shipping hazard classification of number 3 in the USA. Dynalene HF-LO is listed as a Combustible or Flammable Liquid when transported by highway or rail, but must be listed as a Flammable Liquid when shipped by air or waterway.

Shelf Life

Dynalene HF-LO heat transfer fluid will remain stable for a period of at least five years if:

(1) It is stored in the original unopened pail or drum
(2) The storage area is a dry environment below 100°F.

Partially full pails and drums should be blanketed with an inert gas such as nitrogen to eliminate oxygen from the container head space. Contact Dynalene for information on testing older material for continued suitability.

Metals Compatibility

Dynalene HF-LO heat transfer fluid has an acceptable compatibility rating when installed in vapor tight systems constructed within the temperature, pressure, and structural limitations of the following metals:

- Aluminum
- Brass
- Bronze (All)
- Carbon Steel
- Cast Steel
- Copper
- Copper Nickel (All)
- Hastelloy (All)
- Inconel
- Incoloy 825
- Monel
- Nickel
- Stainless Steel (All)
- Stainless Steel Clad
- Tantalum

Gasket & Polymer Compatibility

Dynalene HF-LO heat transfer fluid has an acceptable compatibility when used within the temperature and pressure limitation of the following polymers or gasketing materials:

- Acetal
- Aramid Fiber
- Chemraz (FFKM)
- Epoxy
- Fluorocarbon (FILM)
- Fluoroelastomer
- Glass Fiber
- Gylon Style 3500, 3504, & 3510
- Kalrez
- PEEK
- Polytetrafluoro-ethylene
- Teflon (All)
- Teflon Encapsulated Silicone
- Teflon Encapsulated Viton
- Telfon Impregnated Fiberglass
- Kel-F (CTE)
- Viton
- Resin Impregnated Carbon Graphite

General Installation Guidelines

The following recommendations are provided to assist the designer/user in achieving proper installation.

1 **Understanding the engineering guide**
Prior to purchasing any Dynalene HF-LO, review and understand all of the information contained in this manual—especially the sections titled 'Retrofitting for Dynalene HF-LO' and 'Preparing New Systems Using Dynalene HF-LO'. Only qualified personnel with expertise in safe handling of potentially hazardous liquids (in compliance with local, state, and federal regulations) should be involved with work processes of this nature.

2 **Moisture content**
Moisture content within Dynalene HF-LO in system operation is recommended to be less than 100 parts per million (.01% H_20 in Dynalene HF-LO). The freezing point, viscosity, and heat transfer coefficient of Dynalene HF-LO may be adversely affected if moisture content is above recommended levels. Moisture is heavier than Dynalene HF-LO and will drop out of the solution at greater than 100 ppm, depending upon liquid temperature.

In low temperature applications, excessive moisture in Dynalene HF-LO will impair heat transfer; this may result in frozen heat exchangers, seized regulators, etc. Desiccating Dynalene HF-LO as shown in Figure 1 (page 8) is one recommended method of removing moisture from Dynalene HF-LO. If a moisture analysis is required for your Dynalene HF-LO, contact Dynalene at 1-877-244-5525 or email info@dynalene.com.

3 **Presence of oxygen**

Limit the presence of oxygen within the wetted areas of a piped system. An inert gas, such as nitrogen, is the favored substitute to air in the vapor space. A replenishable supply of air or oxygen in contact with Dynalene HF-LO will promote premature fluid degradation. The basic fluid system sketch illustrated in Figure 1 (page 8), is an example of a typical Dynalene HF-LO heat transfer fluid system using an inert gas purge as a method of excluding oxygen. The inert gas pressure regulator BPV set point should be approximately 50% higher than the maximum Dynalene HF-LO vapor pressure value anticipated with the system.

4 **Maximum surface temperature**

Surface temperature of heat source components should not exceed 450°F (232°C). Fluid velocity should maintain a minimum of 8 feet per second (2.44 meters per second) over heated surfaces to avoid fluid breakdown.

5 **Using electric resistance heaters**

Electric resistance heaters used in Dynalene HF-LO heat transfer fluid applications are recommended not to exceed a maximum watt density of 28 watts per square inch. If you require a review on the heating equipment you have considered, consult Dynalene.

6 Using cryogenic fluid

Cooling HF-LO with a cryogenic fluid such as liquid nitrogen or LNG may cause HF-LO to freeze on the cold surfaces of the heat exchanger. These fluids operate at a temperature significantly lower than the freezing point of HF-LO, so system parameters such as flow rate and heat transfer surface area should be planned accordingly

7 **Pump equipment**

To eliminate cavitation when using Dynalene HF-LO near its boiling point, apply sufficient inert gas (nitrogen, argon) pressure in the head space.

8 **Available ancillary equipment**

Dynalene offers filtration and desiccation equipment to help maintain HF-LO fluid in good condition. Please contact equipment@dynalene.com for further information.

9 **Safety dos and don'ts**

- *Handling Dynalene HF-LO in the drum*: ensure drums containing Dynalene HF-LO are properly grounded and keep all drums away from sources of ignition, power tools, heat, smoking, and sparks.
- *Pumping Dynalene HF-LO into the system*: only pump Dynalene HF-LO in well-ventilated areas and wear the required personnel protective equipment as recommended in the Dynalene HF-LO MSDS.
- *System maintenance*: prior to cutting or welding systems that use Dynalene HF-LO, ensure all residual Dynalene HF-LO and its vapor are removed from the system. This can be

accomplished by fully purging and evacuating all fluid and vapors using the methods described in 'Retrofitting for Dynalene HF-LO.'

- *Draining Dynalene HF-LO from a system*: when draining Dynalene HF-LO from a system, be sure to use sealed connections on all pipes, tubes, and containment to minimize leakage of vapor and mists.

  As a precautionary measure, all systems using Dynalene HF-LO should be properly grounded.

Retrofitting for Dynalene HF-LO

Dynalene HF-LO heat transfer fluid is an excellent replacement for the fluid chemistries listed below:

- CFC Refrigerant
- Chlorinated Solvent
- HFC Refrigerant
- Hydrocarbon Based
- Alcohols (methanol, ethanol, isopropanol)
- Perfluorocarbon
- Silicone
- d-Limonene

Once the original liquid is removed, systems may retain small amounts of residual liquid in low lying areas such as piping traps, inverted coils, pump housings, valve housings, drain pipes, etc. The residual liquids must be removed for Dynalene HF-LO to function as specified.

The following recommendations are provided by Dynalene to assist the installer or end user in achieving a successful retrofit:

1: Determine the actual volume of the heat transfer fluid needed in the retrofit, use one of the following methods:

1. If the system drawing is available, perform a volume calculation based on size and length of piping, reservoirs, heat exchangers, pumps, and all other wetted components.
2. Drain the existing heat transfer fluid from the system and measure the volume removed. To account for the residual fluid left after draining, follow the steps in the next section.
   - To remove residual fluids, purge the existing system with compressed air or an inert gas such as nitrogen (for combustible liquids). For best results, purge intermittently to zero pressure once every two minutes: purge with pressure for one minute, and then release pressure in system for the next minute, collecting the fluid that comes out of the system. Continue this process for several minutes until there is no more fluid leaving the system.
   - Measure the volume of the residual fluid and add to the volume of the drained fluid to determine the total heat transfer fluid volume. If the fluid will not be re-used, combine all drained fluid into a vented container and dispose accordingly.

2: Final cleanout of any residual fluid or vapor using one of the methods below:

1 **System evacuation**
System evacuation is performed by creating a vacuum (usually more than 20 inches Hg / 508 torr) at room temperature within the existing system containing the residual liquid. As the

vacuum within the system increases, the boiling point of the residual liquid will decrease to below the internal temperature of the system and the liquid will evaporate.

2 **Air and inert gas evaporation**
Liquid evaporation using air or an inert gas, such as nitrogen, may be another feasible method of removing residual liquid from an existing piped system. This is performed by allowing an adequate volume of dry compressed air or inert gas to enter the existing system and flow through the wetted areas, including low points, evaporating the residual liquid. The effluent should exit the piped system at a point that is opposite the inlet air or inert gas connection, and should be collected via cold trap, adsorbent, or other gas collection method. It is recommended to use compressed air or inert gas with a dew point lower than –95°F (-70°C), and sufficiently below the evaporation point of liquid being removed.

3 **Dilution**
Dilution of residual fluid can be performed in conjunction with the system evacuation or evaporation methods. Selecting a dilution solvent that is miscible with the residual fluid and has a high vapor pressure. After diluting the residual fluid with the solvent, drain and follow system evacuation or evaporation methods above. Example solvents include alcohols, acetone and hydrocarbons with low boiling points. Contact Dynalene at 1-877-244-5525 or email info@dynalene with any additional questions about appropriate solvents.

Preparing New Systems Using Dynalene HF-LO

The following recommendations are provided to assist the installer or end user in achieving a proper installation:

1 **Flush the system**
Systems intending to use Dynalene HF-LO heat transfer fluid should be properly flushed clean after installing components such as pipes, valves, pumps, etc. Materials from welding operations, excess pipe joint compound, oils, and other unwanted contaminants must be removed completely prior to installing Dynalene HF-LO.

One recommended method of flushing a system clean is to use a dilution solvent that is completely miscible with the contaminants generated during an installation.

2 **Install line filtration**
Dynalene HF-LO should remain free of debris throughout the operational life of the liquid. An appropriately sized in-line strainer using a perforation size (1⁄32") or less, is recommended to be installed directly in the flow of fluid to allow the most effective particulate removal from the fluid. Providing filtration down to approximately 5 microns, combined with an in-line strainer as a prefilter, is the best method of keeping Dynalene HF-LO particulate free. Use of bypass and slip-stream filtration is also acceptable.

3 Install Desiccation Unit
Dynalene HF-LO will operate best if the moisture level is kept below 100 ppm. Too much moisture may cause water droplets to form in the system, and may freeze valves, impede heat

transfer, alter fluid properties, etc. A desiccation system may be required to keep fluid moisture levels low. Dynalene offers desiccation equipment and can assist with determining the specifications required for the system. Dynalene SX and TX units provide both desiccation and particle filtration. Contact Dynalene at 1-877-244-5525 or email info@dynalene for further information.

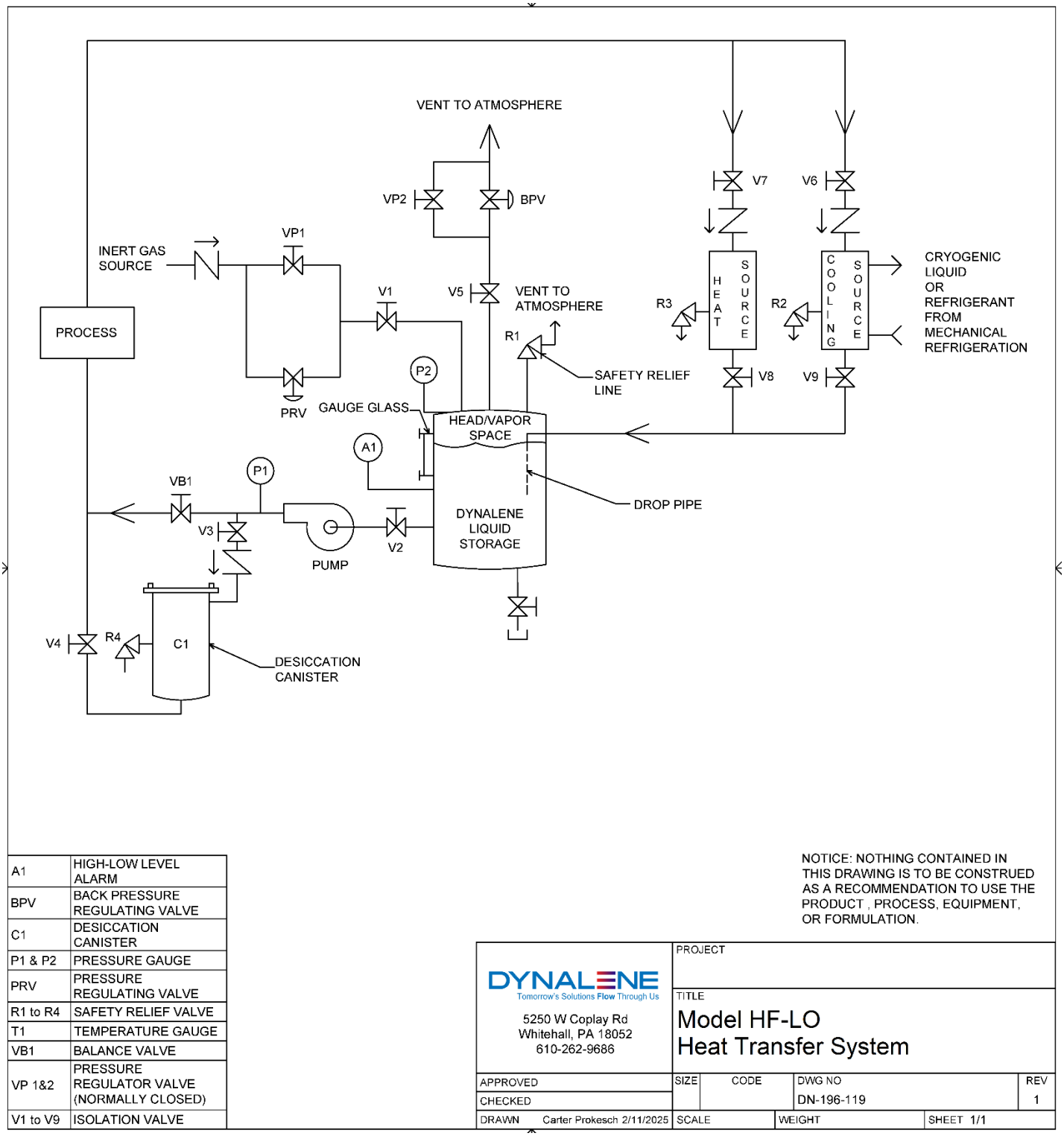
Ongoing Fluid Maintenance

Dynalene can provide a pre-labeled sample kit upon request, which includes the sample bottle, an instruction page, and an MSDS sheet. Dynalene offers the first sample analysis free of charge.

For best results:

1. Take a fluid sample when the system is at room temperature to prevent moisture from contaminating the Dynalene HF-LO. A minimum of 35 to 40 mL of fluid is required for complete testing.
2. Before filling up the sample bottle, allow the fluid to flow out for a few seconds into another container to clear any debris. Leave about ½ inch (1 cm) of airspace from the top of the sample bottle to minimize leakage. After closing the cap, secure by wrapping electrical tape around it several times.
3. It is best to take a fluid sample while the fluid is circulating to be sure it is representative of the entire system.

Basic heat transfer fluid system design



A1	HIGH-LOW LEVEL ALARM
BPV	BACK PRESSURE REGULATING VALVE
C1	DESICCATION CANISTER
P1 & P2	PRESSURE GAUGE
PRV	PRESSURE REGULATING VALVE
R1 to R4	SAFETY RELIEF VALVE
T1	TEMPERATURE GAUGE
VB1	BALANCE VALVE
VP 1&2	PRESSURE REGULATOR VALVE (NORMALLY CLOSED)
V1 to V9	ISOLATION VALVE

NOTICE: NOTHING CONTAINED IN THIS DRAWING IS TO BE CONSTRUED AS A RECOMMENDATION TO USE THE PRODUCT , PROCESS, EQUIPMENT, OR FORMULATION.

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PROJECT

TITLE
Model HF-LO
Heat Transfer System

APPROVED	SIZE	CODE	DWG NO	REV
CHECKED			DN-196-119	1
DRAWN Carter Prokesch 2/11/2025	SCALE		WEIGHT	SHEET 1/1

Figure 1. Basic Dynalene HF-LO heat transfer system.

Dynalene HF-LO Properties: SI Units

Properties of Dynalene HF-LO vs. temperature in SI units are given in Table 3.

Table 3. Properties of Dynalene HF-LO.

Temp	Viscosity	Thermal Cond.	Specific Heat	Density
°C	mPa·s	W/m·K	kJ/kg·K	kg/m^3
-73	70.2	0.1272	1.742	833
-70	52.7	0.1266	1.753	831
-60	23.9	0.1246	1.791	823
-50	13.3	0.1226	1.829	816
-40	8.40	0.1206	1.867	808
-30	5.80	0.1186	1.905	800
-20	4.20	0.1166	1.943	793
-10	3.20	0.1146	1.981	785
0	2.50	0.1126	2.019	778
10	2.00	0.1106	2.057	770
20	1.60	0.1086	2.095	762
30	1.40	0.1066	2.133	755
40	1.20	0.1046	2.171	747
50	1.00	0.1026	2.209	740
60	0.87	0.1006	2.247	732
70	0.77	0.0986	2.285	724
80	0.68	0.0966	2.323	717
90	0.60	0.0946	2.361	709
100	0.54	0.0926	2.399	702
110	0.49	0.0906	2.437	694
120	0.44	0.0886	2.475	686
130	0.40	0.0866	2.513	679
140	0.37	0.0846	2.551	671
150	0.34	0.0826	2.589	664
160	0.31	0.0806	2.627	656
170	0.29	0.0786	2.665	649
177	0.27	0.0772	2.692	643

Dynalene HF-LO Properties: English Units

Properties of Dynalene HF-LO vs. temperature in English units are given in Table 4.

Table 4. Properties of Dynalene HF-LO.

Temp	Viscosity	Thermal Cond.	Specific Heat	Density
°F	cP	BTU/hr·ft·°F	BTU/lb·°F	lb/ft^3
-100	72.5	0.0749	0.416	51.9
-80	28.0	0.0736	0.426	51.4
-60	14.1	0.0722	0.436	50.9
-40	8.40	0.0709	0.446	50.3
-20	5.50	0.0696	0.456	49.8
0	3.90	0.0683	0.466	49.3
20	2.90	0.0670	0.476	48.8
40	2.30	0.0657	0.487	48.2
60	1.80	0.0644	0.497	47.7
80	1.50	0.0631	0.507	47.2
100	1.20	0.0618	0.517	46.7
120	1.00	0.0605	0.527	46.1
140	0.87	0.0592	0.537	45.6
160	0.76	0.0579	0.547	45.1
180	0.66	0.0566	0.557	44.6
200	0.58	0.0553	0.567	44.0
220	0.52	0.0539	0.577	43.5
240	0.46	0.0526	0.587	43.0
260	0.41	0.0513	0.598	42.5
280	0.37	0.0500	0.608	41.9
300	0.34	0.0487	0.618	41.4
320	0.31	0.0474	0.628	40.9
340	0.28	0.0461	0.638	40.3
350	0.27	0.0455	0.643	40.1

Product Disclaimer

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