

## **Product Information**

Rev: 09.04

# **MARLOTHERM<sup>®</sup> LH Heat Transfer Fluid**

### **1. Product description**

MARLOTHERM<sup>®</sup> LH is a high-performance synthetic, organic heat-transfer medium for use in the liquid phase and in the vapour-liquid phase in closed, forced circulation heat transfer systems. The upper use limit lies at a heater outlet temperature of 360°C. The film temperature should not exceed the limit of 380°C either significantly or for a prolonged period.

MARLOTHERM<sup>®</sup> LH in the liquid phase is preferably used in unpressurized systems at working temperatures from 0° to 280°C. Due to its favourable viscosity behaviour, MARLOTHERM<sup>®</sup> LH is the ideal heat-transfer medium for heating and cooling processes.

In customary heat exchangers, MARLOTHERM<sup>®</sup> LH provides good heat transfer down to temperatures around 0°C. At working temperatures below 0°C, the heat-exchange surface is to be matched to the technical characteristics of MARLOTHERM<sup>®</sup> LH and the flow conditions.

MARLOTHERM<sup>®</sup> LH is best suited to the temperature control of vessels, reactors and processing machines which are both heated and cooled by means of a central heat-transfer system, and in systems in which several consumers have to be supplied at very different temperature levels. The heat-transfer systems should be designed and operated in accordance with the recommendations of DIN 4754 "heat-transfer installations working with organic heat-transfer fluids".

MARLOTHERM<sup>®</sup> LH can be used at working temperatures above 280°C in pressurized systems. The advantage offered by the use of MARLOTHERM<sup>®</sup> LH in this temperature range compared with "pressureless" use of MARLOTHERM SH has to be assessed in each individual case. Owing to its narrow boiling range of about 4°C, MARLOTHERM<sup>®</sup> LH can also be used in the vapour-liquid phase, e.g. for reactor cooling in exothermic processes.

Heat-transfer plants containing MARLOTHERM<sup>®</sup> LH can be started up without difficulty at temperatures down to about -30°C using centrifugal pumps with a rotating mechanical seal or permanent magnet drive, or using canned motor pumps.

At operating temperatures below the boiling point of the heat-transfer medium, MARLOTHERM<sup>®</sup> LH circuits are advantageously operated using an inert gas back pressure of less than 100 mbar at the expansion vessel. Nitrogen has proven to be suitable as an inert gas. Inert gas blanketing is the best protection against changes in the heat-transfer charge caused by oxidation. Antioxidants are unstable at operating temperatures above 200°C and are ineffective even after short operating times.

At operating temperatures above the boiling point of MARLOTHERM<sup>®</sup> LH, it is necessary to apply an inert gas back pressure which is sufficient to keep the heat-transfer medium in the liquid state and prevent vaporization via the expansion vessel.

## Product Information

Rev: 09.04

### MARLOTHERM<sup>®</sup> LH Heat Transfer Fluid

MARLOTHERM<sup>®</sup> LH is thermally stable up to an operating temperature of 300°C.

The MARLOTHERM<sup>®</sup> LH charge can be used for several years without significant changes. At higher temperatures, low-boiling and high-boiling decomposition products are formed. Their degree of formation rises with increasing operating temperature. The decomposition products remain completely dissolved in the MARLOTHERM<sup>®</sup> LH charge. The low ends should however be removed via the expansion vessel in order to maintain reliable operation of the heat-transfer system. To assist this measure, the temperature of the expansion vessel should be raised to about 150°C.

If used according to the recommended operation parameters, MARLOTHERM<sup>®</sup> LH forms no deposits on the walls and does not lead to accumulation of solids in the heat transfer circuit.

MARLOTHERM<sup>®</sup> LH circuits can be operated reliably and without high maintenance costs. In pressurized plants using MARLOTHERM<sup>®</sup> LH above its boiling point, stricter operating instructions must be observed.

To check the operating condition of heat-transfer systems, quality controls should be carried out at appropriate intervals on representative samples from the main stream of the circuit. Scope of testing and sampling have to be individually matched to the charge volume and the operating temperature of the heat transfer plant. The analysis can be carried out on request by Sasol Customer Service.

## 2. Typical physical and chemical properties

### Product data (specification)

Property	Value	Unit	Test Method
Appearance at 20 °C	liquid, clear	-	visual
Chlorine	< 10	ppm	DIN 51408
Acid number	≤ 0,02	mg KOH/g	DIN EN ISO 3682
Density at 20 °C	0,99 – 1,00	g/ml	DIN 51757
Viscosity at 20 °C	3,6 – 4,4	mm <sup>2</sup> /s	DIN 51562

## Product Information

Rev: 09.04

### MARLOTHERM<sup>®</sup> LH Heat Transfer Fluid

#### General product data

Property	Value	Unit	Test Method
Boiling range at 1013 mbar	approx. 278 - 282	°C	ASTM D 1078
Pourpoint	approx. – 30	°C	DIN ISO 3016
Density at 20°C	996	kg/m <sup>3</sup>	DIN 51 757
Kinematic viscosity at 20°C	4	mm <sup>2</sup> /s	DIN 51 562
Flash point	approx. 130	°C	EN 22719
Ignition temperature	approx. 450	°C	DIN 51 794
Permissible heater outlet temperature	360	°C	–
Permissible film temperature	380	°C	–
Pumpability limit	approx. – 30	°C	–

## Product Information

Rev: 09.04

### MARLOTHERM<sup>®</sup> LH Heat Transfer Fluid

#### 3. Material data for MARLOTHERM<sup>®</sup> LH

The physical constants for the thermal parameters are summarized in the following table:

Temperature		Density		Specific heat		Thermal conductivity		Viscosity kinematic		Vapour pressure	
°C	°F	kg/m <sup>3</sup>	lb/ft <sup>3</sup>	kJ/kg K	Btu/lb °F	W/m K	Btu/ft <sup>2</sup> hr °F	mm <sup>2</sup> /s	cSt	hPa	psi
-20	-4	1026	64.1	1.48	0.353	0.136	0.079	17	17	–	
0	32	1010	63.1	1.55	0.370	0.134	0.077	8.30	8.30	–	
20	68	996	62.2	1.62	0.387	0.132	0.076	4.00	4.00	–	
40	104	980	61.2	1.68	0.401	0.129	0.075	2.60	2.60	–	
60	140	966	60.3	1.75	0.418	0.127	0.073	1.90	1.90	–	
80	176	950	59.3	1.82	0.435	0.125	0.072	1.50	1.50	–	
100	212	936	58.4	1.88	0.449	0.122	0.070	1.10	1.10	2.2	0.03
120	248	920	57.4	1.95	0.466	0.120	0.069	0.86	0.86	6	0.09
140	284	906	56.6	2.02	0.482	0.118	0.068	0.71	0.71	15	0.22
160	320	890	55.6	2.08	0.497	0.115	0.066	0.61	0.61	33	0.48
180	356	873	54.5	2.15	0.514	0.113	0.065	0.54	0.54	68	0.99
200	392	856	53.4	2.22	0.530	0.111	0.064	0.47	0.47	131	1.90
220	428	839	52.4	2.29	0.547	0.109	0.063	0.43	0.43	237	3.44
240	464	822	51.3	2.35	0.561	0.106	0.061	0.39	0.39	408	5.92
260	500	804	50.2	2.42	0.578	0.104	0.060	0.36	0.36	672	9.75
280	536	786	49.1	2.49	0.595	0.102	0.059	0.32	0.32	1061	15.39
300	572	766	47.8	2.55	0.609	0.099	0.057	0.30	0.30	1619	23.49
320	608	747	46.6	2.62	0.626	0.097	0.056	0.28	0.28	2394	34.73
340	644	726	45.3	2.69	0.642	0.095	0.055	0.27	0.27	3442	49.93
360	680	703	43.9	2.75	0.657	0.092	0.053	0.26	0.26	4826	70.01

## Product Information

Rev: 09.04

# MARLOTHERM<sup>®</sup> LH Heat Transfer Fluid

### 4. Material compatibility

MARLOTHERM<sup>®</sup> LH does not corrode the usual metallic materials used in construction of plants und machinery.

MARLOTHERM<sup>®</sup> LH is compatible with pure graphite, PTFE und fluoroelastomers. These materials can be used as base materials for seals. In selecting the seals, note must be taken of the seal manufacturer's data for temperature resistance und mechanical strength of the material. Seals made of pure graphite have proven useful in heat-transfer plants using MARLOTHERM<sup>®</sup> LH, even when the operating temperatures regularly change greatly, e.g. as a result of frequent switching between heating und cooling processes. Of the materials which can be used, graphite provides the best compensation for operational temperature changes. To increase the strength und dimensional stability, the seals are advantageously provided with a metal insert, e.g. a sheet metal core.

Rubber-elastic binders swell on contact with MARLOTHERM<sup>®</sup> LH und should not be used in the seals for heat-transfer plants using MARLOTHERM<sup>®</sup> LH.

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### 5. Toxicological properties and safety

MARLOTHERM<sup>®</sup> LH is intended for use as a heat-transfer medium in closed plants. For safety and environmental reasons, escape of the heat-transfer medium is to be prevented or limited to a minimum amount by means of appropriate construction measures. When handling MARLOTHERM<sup>®</sup> LH, the usual guidelines and recommendations for handling organic liquids should be observed.

Details are to be found in the latest safety data sheet for MARLOTHERM<sup>®</sup> LH.

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### 6. Storage and transport

MARLOTHERM<sup>®</sup> LH has a virtually unlimited storage life when stored in closed metal containers (e.g. aluminium or steel). No special protective measures are necessary during storage of the heat-transfer medium. When handling MARLOTHERM<sup>®</sup> LH and when filling and operating a heat-transfer-system with MARLOTHERM<sup>®</sup> LH, care must be taken that the heat-transfer medium cannot enter the soil or sewer system. The product is almost insoluble in water.

If necessary, used MARLOTHERM<sup>®</sup> LH can be recycled or used for energy recovery observing local regulations.

Experience has shown that MARLOTHERM<sup>®</sup> LH charges do not have to be replaced even after many years of use. The used MARLOTHERM<sup>®</sup> LH can be reclaimed by fractional distillation for reuse as a heat-transfer medium. However, for economic reasons, amounts of approximately 10 t or more are required for distillation. The values of the residue content of MARLOTHERM<sup>®</sup> LH, the viscosity and the chlorine content of the goods are to be determined beforehand.

With regards to the classification of MARLOTHERM<sup>®</sup> LH under the regulations governing the transport of dangerous goods, reference should be made to the EU Safety Data Sheet.

## **Product Information**

Rev: 09.04

# **MARLOTHERM® LH Heat Transfer Fluid**

In general the waste code number for MARLOTHERM® LH will be determined by its application according to the EWC. In those cases in which it has not been used as heat transfer fluid follow your local regulations.

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### **7. Customer service**

MARLOTHERM® LH is just one of the comprehensive range of high performance heat transfer fluids offered by Sasol for the temperature range from – 70 to 360 °C: Detailed information is available on request. Sasol has more than 35 years experience in the field of heat transfer technology. This know-how is available to you, should you have any questions or problems. Whether you have questions about the choice of heat transfer medium for a certain application, about system design, troubleshooting, safety issues or specification problems, our experts are here to help you. Just give us a call! (Phone: +492365 49 2214 / 49 5371; fax +49 2365 49 9180)

An analytical routine check of the heat transfer medium should be part of the maintenance regulations. This check should be carried out at least once a year and is offered by Sasol to all users of MARLOTHERM®. The system parameters which are measured will allow our experts an accurate assessment of the condition of the material. This way, prolonged and trouble-free operation of the plant can be ensured. Faults in the plant are quickly detected and can be avoided in due time before more extensive damage and costs occur.

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