



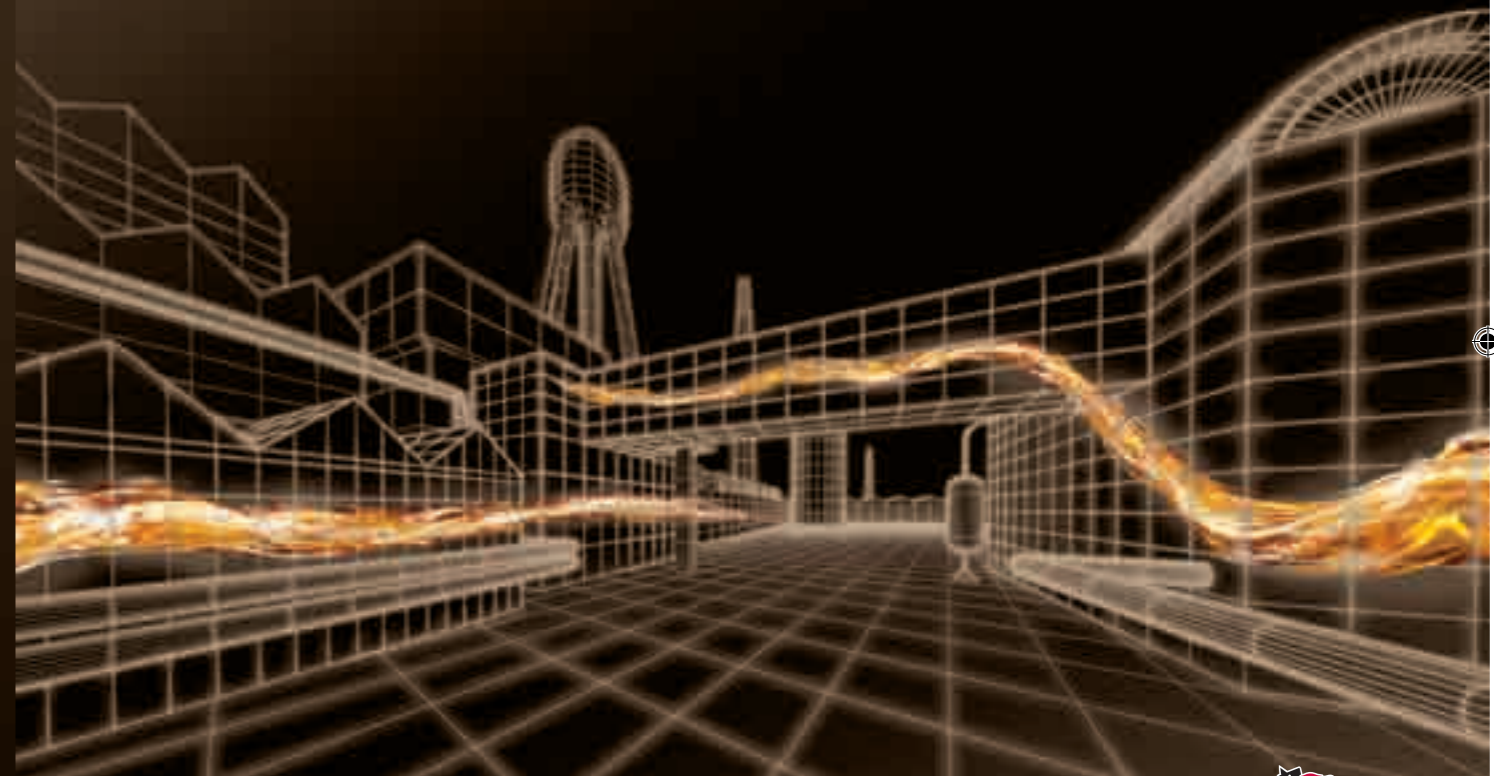
refining & marketing

Via Laurentina, 449 - 00142 Rome
Tel.: + 39 06 5988.1
eni.com



from eni research

choose the best
for industry



heat transfer
oils

agip lubricants
technology comes alive



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eni, through its **Agip brand**, is the leading company in the industrial lubricant market in Italy. Technical and commercial leadership is maintained and reinforced by **eni's** commitment to **technology, quality, environmental protection and technical customer support**.

technology

The internationally recognised advanced level of expertise and equipment at the San Donato Milanese laboratories generate the development of products and processes for the most modern production requirements.

quality

All plants in the lubricant production cycle operate in accordance to a certified quality management system in conformity with standard ISO 9002.

environment

Attention to the environment is one of the main guiding principles in product development and in the production cycle. All plants implement a certified environmental management system in conformity with standard ISO 14001.

technical support

The highly qualified technical manpower are the highly dispersed global operations, ensured outstanding technical back up support services to customers, security in total customers satisfaction.

The industrial product line includes lubricants and special products to satisfy all the lubrication requirements of any type of industrial plant at a qualitative level at the top of the market.

More information about application, characteristics and TDS is available on <https://nalis.eni.it/Alis> and by e-mail alis@eni.it

oils for heat transfer systems

The industrial heating of solids, liquids or gases is commonly carried out by a system of indirect heat transmission via a heat transfer fluid that transfers heat from a heat source to the point of use.

The advantages of an indirect system are:

- > precision in temperature control
- > uniformity of heating avoiding local overheating
- > multiuse from one heat source
- > maximum safety due to the separation of the user and the heat source.

Mineral heat transfer oils are used in modern plants for the industrial transmission of heat from a heat source to one or more users.

Mineral heat transfer oils has the following advantages:

- > they function in a wide range of temperatures (from ambient temperature to 280 - 300°C)
- > they may operate at atmospheric pressure, thus avoiding the necessity of high pressures which would require expensive plant
- > they provide excellent lubrication that ensures low wear on the pumps and valves
- > they have a protective capacity that ensures the absence of rust on metallic surfaces
- > they have a low pour point that allows starting the plant in the cold
- > low vapour tension that reduces the risk of vapour formation
- > use of a non-toxic, non-corrosive fluid that does not give collection or recovery problems.



heat transfer oils properties

The heat transfer fluids have the following characteristics:

- > easy transmission of heat using relatively small quantities of fluid, which, from a thermodynamic point of view, means having a high enough density, a good thermal conductivity and a high specific heat value
- > low vapour tension at the operating temperatures to allow use at low pressures in order to avoid the development of vapours and the risk of cavitations or flow irregularities
- > low viscosity in use to limit load leaks
- > no aggressiveness with metallic and rubber materials
- > good antifoam and air release properties
- > high flammability point.



stability to cracking

The term cracking means the breakdown of the oil molecule by the effects of temperature.

Unsaturated polymerised compounds leave carbonaceous deposits on the internal surfaces of tubes that increase cracking due to a decrease in the thermal exchange coefficient (K). It is fundamental to control the temperature of the oil in contact with the heating pipe and to avoid prolonged contact.

distillation range

Mineral heat transfer oils consist of a mixture of hydrocarbons and are characterised by a distillation range rather than a distillation temperature. In general reference is made to the temperature at the start of their distillation. This is a very important characteristic given that vapour sacs generated can cause cavitations in the pumps and alter the correct thermal exchange of the fluid and lead to cracking. In pressurised plant is possible to reach higher oil temperatures but only using low viscosity oils with narrow temperature range of distillation and high cracking temperatures.

resistance to oxidation

A high resistance to oxidation is another important characteristic of a heat transfer oil. It is advisable to maintain the temperature of the oil, at points of contact with air (expansion vessel), below 50/60°C (the threshold under which oxidation is relatively low). Produced from paraffin oils, **AGIP ALARIA** are characterised by a better resistance to oxidation than aromatic or naphtha oils.

Prandtl's number

Prandtl's number is useful for calculating convective thermal transfer whether free or forced by heat transfer fluids.

$$Pr = \frac{C_p \cdot \mu}{K}$$

- **C_p** specific heat at constant pressure expressed in [kcal/kg °C]
- **μ** dynamic viscosity expressed in [cP]
- **K** thermal conductivity expressed in [kcal/m h °C]

ISO 67/43-12 classifications

ISO - L	type	typical applications	use	temperature
QA	refined mineral oil or synthetic fluid	open circuit for heating pieces	open oil containers for heating of mechanical components	< 250°C
QB	refined mineral oil or synthetic fluid	closed circuit	heat transfer fluid heating system	< 300°C
QC	refined mineral oil or synthetic fluid	closed circuit with forced circulation	heat transfer fluid heating system	300 - 320°C
QD	high stability synthetic fluid	closed circuit with forced circulation	heat transfer fluid heating system	> 320°C
QE	refined mineral oil or synthetic fluid low viscosity in the cold	cooling circuits	unit with hot flow and/or cold flow	> - 30°C - < 200°C

agip alaria range

AGIP ALARIA is the range of very high quality AGIP heat transfer oils obtained from highly solvent refined paraffin mineral bases. They are recommended for filling closed and open circuit diathermic plants and guarantee an excellent stability to cracking and oxidation. These products are characterised by a restricted distillation interval and a very high initial distillation point.

AGIP ALARIA heat transfer oils are available in various grades to allow the user to choose the most appropriate product for their operative requirements.

AGIP ALARIA 2 - 3 - 7

Oils composed of carefully selected paraffin bases, suitable for filling closed or open circuit of heat transfer systems. They are characterised by high stability to oxidation and high stability to thermal decomposition (cracking).

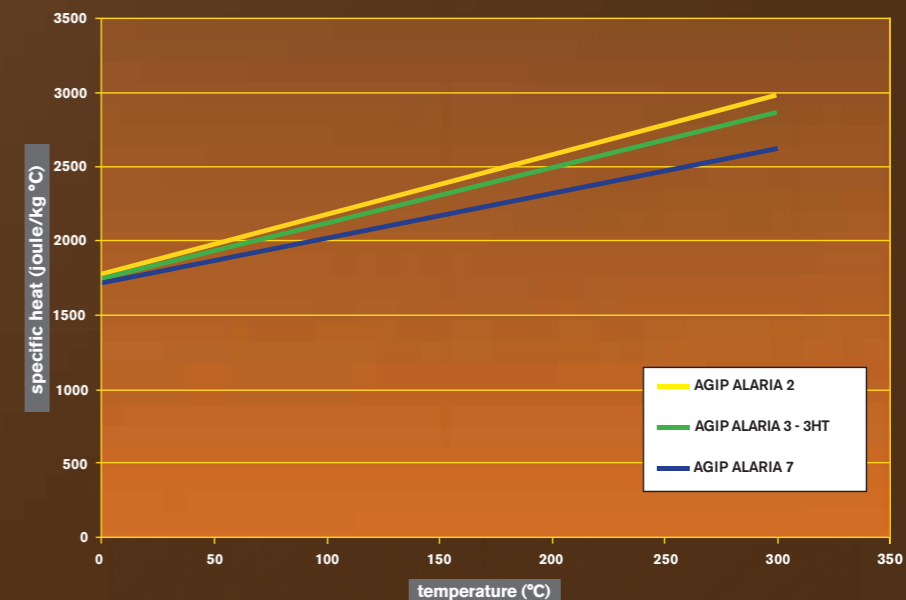
- Three viscosity gradations for a variety of types of use.
- Resistance to the formation of deposits and sludge at high temperatures.
- Notable demulsivity and air separation capacity.
- High resistance to oxidation.

AGIP ALARIA 3 HT

A diathermic oil composed of a carefully selected and highly refined paraffin base. It is very stable to oxidation and thermal decomposition.

- Resistance to the formation of deposits and sludge at high temperatures.
- Notable demulsivity and air separation capacity.
- High resistance to oxidation.

For use wherever the maximum temperature leaving the heater is higher than the usual.



operating conditions

Low viscosity oils are preferably used in plants operating at a high temperature, in particular in those pressurised by inert gas; firstly, because they resist cracking more efficiently and secondly, because their high conductivity permits faster heat transmission and starting the plant in a shorter time. More viscous gradations can be used in plants operating at a lower maximum temperature, normally non-pressurised, such as bitumen heating plants. Thermal conductivity (Q) increases with an increase in viscosity; however less viscous oil is often used as diathermic fluid despite a minor loss of heat load because it can be circulated faster, thus favouring faster heat transmission.

PRODUCTS	MAXIMUM WALL TEMPERATURE	MAXIMUM MASS TEMPERATURE
AGIP ALARIA 2	340°C	305°C
AGIP ALARIA 3	320°C	305°C
AGIP ALARIA 3 HT	345°C	315°C
AGIP ALARIA 7	315°C	300°C

AGIP ALARIA (typical values)		2	3	3HT	7
viscosity at 40°C	mm ² /s	16	31.3	30.4	95.3
viscosity at 100°C	mm ² /s	3.3	5.3	5.3	10.9
viscosity index	-	105	103	107	97
flash point P.M.	°C	194	206	218	230
flash point c.o.c.	°C	210	216	230	252
pour point	°C	-12	-9	-12	-9
neutralization number	mg KOH/g	≤ 0.03	≤ 0.03	≤ 0.03	≤ 0.03
conradson carbon residue	%p	0.01	0.019	0.018	0.097
copper corrosion (3h at 150°C)	-	1	1	1	1
dilatation coefficient	m ³ /°C	0.00067	0.00066	0.00066	0.00064
volumic mass	kg/m ³	856	870	860	889