

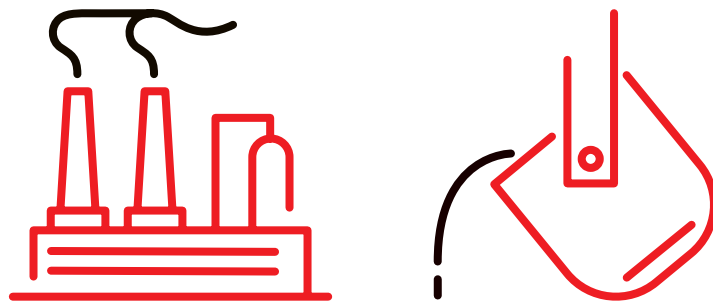


ECOSAFE PLUS 46

NON-FLAMMABLE HFC-HYDRAULIC FLUID

GLYCOL-FREE

Viscosity class ISO VG 46-68





SILCA: MORE THAN 30 YEARS OF KNOW-HOW AND INNOVATION

SILCA is an internationally operating service and sales company of the CALSITHERM group specialized in high temperature materials as well as lightweight thermal insulation in different fields of application. Over the past years, we have been the only German producer of calcium silicates to show that with innovative products you can continuously improve both safety and productivity. In refractory technologies, we cover all areas in a wide variety of industries, ranging from aluminium casting over domestic fireplaces and chimneys to heat treatment plants. In addition to the supply of material, we also offer a comprehensive service regarding technical demands and innovations. This service includes technical consultation, engineering, material supply including the assembly of high temperature facilities.

With our companies SILCA Italia, SILCA Insulation (SEA) Malaysia, SILCA South Africa, SILCA Mexico and SRS Amsterdam we are operating on a worldwide basis.

Consistent quality requires the systematical cooperation of all parties involved in the processes of production, sales and application. Thus, we develop efficient products that meet our customers' high quality requirements. The basis for our quality and innovation is our know-how gained from more than 30 years of experience.

The main keys of our success are the exceptional quality of our products, the high level of customer satisfaction as well as our motivated and qualified employees.

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Hydraulic fluid

ECOSAFE PLUS 46



Description

ECOSAFE PLUS 46 is a water-based, non-flammable, biologically degradable and environmentally compatible hydraulic fluid with an innovative, glycol-free formulation based on a mixture of polymers, poly-alcohols, esters, corrosion-inhibitors and anti-oxidation agents.

The colour enables leaks to be detected at an early stage.

In use ECOSAFE PLUS 46 demonstrates very stable physical and chemical properties (%-H₂O, viscosity, pH etc.) by reason of its high lubricity and the great stability of the raw materials from which they are composed.

Application

Thanks to its absolute non-flammability ECOSAFE PLUS 46 is suitable in particular for hydraulic circuits in the direct vicinity of heat sources.

The product has an extraordinarily long life; the optimized performance characteristics of the individual components in the formulation give the product its outstanding lubrication properties.

MOST IMPORTANT AREAS OF APPLICATION

- Pressure casting machines
- Foundry machines
- Centrifugal casting machines
- Continuous casting facilities
- Forging and extrusion presses
- Reels for bar and strip steel as well as upenders
- Manipulators for bars and billets
- Furnace charging and tipping devices
- Coke oven door mechanisms
- Clamping device for welding
- Cranes
- Lifting devices and elevators
- Forklift trucks
- Regulation and control technology
- Offshore industry
- Glass forming machines
- Machines for dolomite processing

Instructions for use

ECOSAFE PLUS 46 can be used in hydraulic systems, for which operating with water-based products is envisaged. The compatibility of ECOSAFE PLUS 46 with water-based hydraulic fluids, which are already in use, must be ascertained with the aid of appropriate tests.

Work can be carried out with ECOSAFE PLUS 46 at pressures of up to 250 bar. The suitability of the product for use with higher operating pressures can be checked with the supplier in accordance with the nature of the particular system. The ideal operating temperature for ECOSAFE PLUS 46 lies between +40 °C and +70 °C. However the product is also stable at lower temperatures (solidification point = -20 °C).

Advantages

ECOSAFE PLUS 46 offers the following advantages:

- very high safety characteristics thanks to its non-flammability
- there are no glycols in the formulation; the product is biologically degradable and environmentally compatible
- provides excellent protection against corrosion and wear
- good compatibility with elastomers, paints and other materials by reason the fact that it contains no glycol
- good compatibility with the most commonly employed servo valves
- good lubrication and - as a result - only limited heat development when used in hydraulic systems
- good characteristics in respect of ventilation and low formation of foam
- high stability of the viscosity values during the complete period of use

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ECOSAFE PLUS 46**Compatibility with elastomers**

Most of the safety seals and rings compatible with mineral oils can also be used with ECOSAFE PLUS 46. Seals made of the following materials can be used regardless of their form:

- Red and white silicone
- Viton® (fluorinated rubber)
- Teflon (PTFE, polytetrafluorethylene)
- EPDM (ethylene-propylene-diene rubber)
- Polyurethane (PUR)
- NBR (acrylonitrile-butadiene rubber)

The compatibility of ECOSAFE PLUS 46 with the elastomers listed above has been confirmed by an accredited laboratory following testing in accordance with the international standard ASTM D-472. This test involves standardized immersion without incident light for 166 hours at 80 °C. Following immersion variations in the following properties were measured: density, volume, mass and hardness.

The variations observed with the elastomers following immersion in the hydraulic fluid ECOSAFE PLUS 46 were not significant. Accordingly it is assumed that the product is compatible with the elastomers tested.

In no case may seals of leather impregnated with wax or seals of agglomerated cork, fibrous material and impregnated cotton be used.

Compatibility with pumps

ECOSAFE PLUS 46 can be used with most of the types of motor pumps and gear units, e.g. reciprocating pumps and vane pumps, that are used in hydraulic circuits.

Flexible components, which are as a rule compatible with mineral-oil-based hydraulic oils, can also be compatible; however compatibility with different types of elastomers should be checked in advance.

Compatibility with filters

Metal filters can be safely used with ECOSAFE PLUS 46 in so far as they contain no zinc, cadmium or magnesium.

The properties of the product mean that the filter capacity necessary is greater than with conventional lubricants based on mineral oils. Accordingly it is advisable to increase the filter capacity to a value two to three times higher than the maximum capacity of the pump in order to avoid cavitation.



Red silicone



White silicone



Viton®



Teflon



EPDM



Polyurethane



Vulkollan



NBR

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Fundamentally it is recommended that filter systems with a range between five microns and one micron (or less) are used. If filters with a movable cover are used, the opening should be carefully checked in respect of its ability to prevent the intake of air since through the intake of air the pump components could be subjected to more rapid wear as a result of cavitation.

In addition proper filtering of the fluid should be ensured. If necessary an additional filter circuit with an oil separator can be installed.

Compatibility with paints

In contrast to conventional non-combustible hydraulic fluids, ECOSAFE PLUS 46 contains no glycols in its formulation; most of the paints currently used in systems are not compatible with glycols. Accordingly ECOSAFE PLUS 46 can be expected to be less aggressive. However it is important to confirm the compatibility of the product with the particular paint with the manufacturer of the system. Appropriate measures must be taken if compatibility with the hydraulic fluid cannot be confirmed.

Compatibility with servo-valves

ECOSAFE PLUS 46 is compatible with most commonly used servo-valves (NAS 1638 class ≤ 7).

Tribological investigations

ECOSAFE PLUS 46 has been tested by accredited laboratories with the aid of tribological investigations whereby a comparison was carried out with a standard product in order to evaluate the properties of the lubricant:

- **„Wear test in the FOUR-BALL TESTER“** (ASTMD-4172): The results are comparable with the products used.
- **„BALL-DISK test“**: The results are comparable with the products used.
- **„Test in the mixed friction area according to Brugger“** (DIN 51347): The performance properties are much higher than with the conventional product.
- **„Test according to Vickers“** (derived from ASTM D2882) in comparison with a market-leader hydraulic oil based on water/glycol: After 600 hours continuous operation wear of the guide blades, stator and rotor was measured; this was only 25 % of the amount that was measured after the same period of continuous operation with the competitive product.
- **„GUIDE PLATE ON VANES test“**: ECOSAFE PLUS 46 passed the eight-hour test without noticeable faults whereby friction and temperature were lower than with a HFDU fluid. The damage to the surface on the guide vanes and disk was similar to or even somewhat less (less obvious) than with the reference product. The Ra surface parameter indicated that with ECOSAFE PLUS 46 the contact surfaces (guide vanes and disk) must be polished in all cases since the average roughness value Ra had decreased.

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Test conditions to Vickers		Method	Specifications according to standard	Unit	Conversion of standard values	Unit
Duration of the test		ASTM D2882	600	h	600	h
Discharge pressure			2,000	psi	13.79	MPa
Temperature of inlet fluid			65	°C	65	°C
Pump speed			1,200	rpm	1,200	1/min.
Outlet volume			7.5	gpm	34.096	l/min.
Results of the Vickers test		Method	Traditional product	Unit	ECOSAFE PLUS 46	Unit
Weight loss	Rotor	ASTM D2882	0.402	g	0.050	g
	Vanes		0.045	g	0.104	g
	Stator		4.159	g	1.523	g
	Total		4.606	g	1.677	g
Test according to Brugger		Method	Traditional product	Unit	ECOSAFE PLUS 46	Unit
Loading capacity		DIN 51347	39	N/mm²	79	N/mm²

Non-flammability tests

ECOSAFE PLUS 46 was subjected to non-flammability tests in order to evaluate its fire resistance and thereby also the safety situation in operational use. ECOSAFE PLUS 46 fulfilled the requirements whereby it passed the following tests:

- Determination of the afterglow time of fluids of low flammability on a wick (ISO 14935): This test measures the fire resistance of fluids in absorbent or combustible materials as well as the degree to which the fluids spread the fire.
- Contact with hot surfaces - ignition process (ISO 20823): Here a loss of fluid at low pressure on a surface at 700 °C is reproduced.
- Spray ignition test (ISO 15029): The fluid mist is sprayed over an acetylene-oxygen flame.

ECOSAFE PLUS 46 is a product which in addition has received certification of the American firm FM Global („FM APPROVED“), since several tests on fire resistance have been successfully passed. The certification (FM approval class 6930) has the number 3052383.

Physical-chemical properties

ECOSAFE PLUS 46 shows a high resistance to changes at the chemical level so that the risk of the formation of deposits is very low. By reason of this characteristic ECOSAFE PLUS 46 can be used in a long-term manner subject to the precondition that external contamination is eliminated through an effective filter system.

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ECOSAFE PLUS 46		Unit	
Appearance			clear liquid
Colour			red
Odour			typical
pH			8.5 - 9.0
Relative density	at 20 °C	g/ml	1.05 - 1.10
Solubility in water			complete
Kinematic viscosity (target range)	at 40 °C	mm ² /s	41.0 - 50.6
Inflammability			non-flammable
Pour point		°C	-20
Cloud point		°C	≥ 70

ECOSAFE PLUS 46		Unit	Reading
Kinematic viscosity	30 °C	mm²/s	60
	40 °C		42
	50 °C		31
	60 °C		23
Packaging			
Drums		kg	200
Tanks		kg	1.000

The properties mentioned are typical values obtained according to the listed methods. Product variations have to be taken into account. The data do not represent guaranteed properties and cannot be used for any warranty claim. Data are subject to technical modifications.

Storage

Preferably storage is carried out in a protected place at temperatures between -5 °C and +40 °C. The effect of sunlight and warmth is to be avoided. The maximum shelf life in the original drums is one year.

The tank for the fluid must be of a suitable size so that anomalous overheating of the hydraulic oil is avoided and in addition to ensure that the hydraulic oil is drawn in by the pump from a region in the tank in which the fluid is in a stationary state so that the possibility of air penetrating into the circuit is excluded.

In addition the following measures are recommended:

- provision of a plug with a venting valve with filter;
- paint compatible with the hydraulic fluid although the simpler solution is for the tank not to be painted;
- easy access for the maintenance of the filter and heat exchanger.

The ideal temperature for the use of the fluid in the tank is between 20 °C and 45 °C. To this end the tank should be equipped with a thermometer for checking the temperature. It is possible that a heat exchanger is to be recommended in addition in order to prevent anomalous overheating of the hydraulic fluid. The maximum permissible temperature in the tank is 50 °C without account being taken of the higher temperatures which will be reached in other parts of the circuit.

All components or metallic coatings in the circuit that contain zinc, cadmium and magnesium must be removed since ECOSAFE PLUS 46 is not compatible with these metals.

The use of aluminium is permissible in so far as the walls of the tank, which are of this metal, are always immersed in the hydraulic fluid.

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Technical customer service

In co-operation with the manufacturer SILCA guarantees technical customer service for the quality control of the product prior to its delivery to the customer and also for the period when the product is in use.

If a customer wishes to carry out quality control measures himself, it is recommended that these measures are based on the recommendations in this technical data sheet.

It is essential that samples are taken in the proper manner in order to ensure that the random sample as taken is representative of the fluid in circulation whereby account should be taken of the fact that contamination will be found to an increased extent at particular places, above all in the form of deposits on the base of the tank or on the surface of the fluid. The taking of samples at such points can give results which differ from the overall state of the actual hydraulic fluid.

The technical customer service provides checking of the following parameters:

- pH; the pH is determined with a pH measuring device. The pH should lie between 8.5 and 10. Values outside this range indicate external contamination or ageing of the fluid.
- Contamination (%); the percentage of the contamination in the hydraulic fluid is determined by checking of the sample taken in a centrifuge.
The mineral oil may show contamination whereby the values may not be more than 1 %; at higher percentages the product should be siphoned off. In addition the point should be found at which the contamination is occurring; this should be put in order.
- Viscosity at 40 °C; the viscosity of ECOSAFE PLUS 46 must lie in the range 41.0 to 50.6 mm²/s. The viscosity is determined with a CANNON-FENSKE or OSTWALD viscometer. Conventional hydraulic fluids based on water/glycol can overheat during use whereby water evaporates and the viscosity increases.
ECOSAFE PLUS 46 shows remarkable stability in respect of evaporation whereby its properties also remain constant over extended periods of time. If however an increase in the value of this parameter is measured, the original value can be restored by adding a definite percentage of water.
If on the other hand the viscosity lies below 41 mm²/s, then this indicates that water can be present in the system. This water must be removed and repair measures must be carried out without delay.

On the basis of the test results the technical customer service will determine whether correction measures are necessary and possible or whether the product must be replaced completely.

Commissioning of the system

Precautionary measures

ECOSAFE PLUS 46 is completely compatible with most commonly found elastomers; however it should always be checked that the material of the pumps as installed as well as the safety rings, seals and hoses are suitable for use with ECOSAFE PLUS 46.

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The presence of suitable filters and the filtering capacity are to be checked. If necessary a filter must be replaced by one recommended in this technical data leaflet.

New system:

For the use of the hydraulic fluid ECOSAFE PLUS 46 in a new system it is sufficient if the afore-mentioned precautionary measures are observed.

Situation that the system has been operated with a hydraulic fluid based on mineral oil:

Before ECOSAFE PLUS 46 can be used in a system that has already been used with another hydraulic fluid, the tank and all components of the hydraulic circuit must be thoroughly cleaned. The fire resistance of ECOSAFE PLUS 46 will be impaired if residues of mineral oil remain in the circuit. The cleaning process may depend on the particular type of the system and on the type of the hydraulic fluid.

As a rule however the following points hold good:

1. Consult the manufacturer of the hydraulic components in order to determine whether there are particular limits in respect of the compatibility with HFC fluids (water-glycol-fluids).
2. Drain off the complete amount of mineral oil from the tank.
3. Flush out the tank once or several times with a flushing product in order to completely remove all traces of mineral oil.
4. The system is to be emptied completely with the aid of an appropriate draining method in order to ensure that no mineral oil is left in pipes, hydraulic accumulators etc.
5. Clean all accessible surfaces manually.
6. Clean the filters.
7. Fill the system with that minimum quantity of ECOSAFE PLUS 46 that is needed to permit the system to function. Allow the fluid to circulate for 30 minutes at low pressure.
8. Drain off this quantity of ECOSAFE PLUS 46 used as cleaning fluid into a container.
The supernatant is mineral oil and should be disposed of as industrial waste whereas the oil below this can be kept and used for topping up at a later time.
9. Fill the system with ECOSAFE PLUS 46.
10. From this time on service checks of ECOSAFE PLUS 46 should be carried out in which the periodically to be checked parameters (viscosity, contamination, pH) are checked.
If on the first service day hydraulic oil is present as supernatant in the system tank, then this should be skimmed off.

Situation that the system has been operated with group HFDU (organic esters) hydraulic fluids:

Before ECOSAFE PLUS 46 can be used in a system that has already been used with another hydraulic fluid, the tank and all components of the hydraulic circuit must be thoroughly cleaned. The performance characteristics of ECOSAFE PLUS 46 can change if residues of oil are left in the circuit.

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The cleaning process may depend on the particular type of the system and on the type of the hydraulic fluid. As a rule however the following points hold good:

1. Consult the manufacturer of the hydraulic components in order to determine whether there are particular limits in respect of the compatibility with HFC fluids (water-glycol-fluids).
2. Drain off the complete amount of HFDU fluid from the tank.
3. Flush out the tank once or several times with a flushing product in order to completely remove all traces of residual oil.
4. The system is to be emptied completely with the aid of an appropriate draining method in order to ensure that no oil is left in pipes, hydraulic accumulators etc.
5. Clean all accessible surfaces manually.
6. Clean the filters.
7. Fill the system with that minimum quantity of ECOSAFE PLUS 46 that is needed to permit the system to function. Allow the fluid to circulate for 30 minutes at low pressure.
8. Drain off this quantity of ECOSAFE PLUS 46 used as cleaning fluid into a container.
The supernatant is residual oil and should be disposed of as industrial waste whereas the oil below this can be kept and used for topping up at a later time.
9. Fill the system with ECOSAFE PLUS 46.
10. From this time on service checks of ECOSAFE PLUS 46 should be carried out in which the periodically to be checked parameters (viscosity, contamination, pH) are checked.
If on the first service day oil is present as supernatant in the system tank, then this should be skimmed off.

Situation that the system has been operated with conventional HFC hydraulic oils:

ECOSAFE PLUS 46 is compatible without restriction with products of a similar composition; accordingly the replacing of a conventional HFC hydraulic fluid can take place in the form of gradual topping up. It is however recommended that the operating fluid is checked and analyzed in respect of its chemical-physical parameters.

If emptying of the tank is preferred, the empty tank can be filled for the first time with fresh ECOSAFE PLUS 46 after the tank has been cleaned (whereby this cleaning need not be so rigorous as in situations in which clean oil is used).

The checking of ECOSAFE PLUS 46 must take place in accordance with a plan whereby a sample should be sent to the technical customer service after the first operating week, a second sample after the first operating month and thereafter every quarter.

The cleanness of the filters should be checked at regular intervals in order to ensure that these do not become blocked. In addition it is recommended that a notice should be placed near the system with the following text:

„ATTENTION: The hydraulic system of this machine has been filled with the non-flammable hydraulic fluid ECOSAFE PLUS 46. Do not mix with other products.“

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Biological degradability

ECOSAFE PLUS 46 has been tested by accredited laboratories in accordance with OECD 310 F and found to be biologically degradable (biological degradability of 70 % after 28 days). Water-glycol hydraulic fluids as generally used show performance characteristics that are significantly lower (biological degradability of 45 % after 28 days).

The biological degradability is an important advantage of the new glycol-free technology since it provides a product that is safer not only in hygienic terms but also in respect of environmental aspects. In addition disposing of the product at the end of its service life is easier and cheaper than with a conventional product.

The biological degradability does not impair the technical properties of ECOSAFE PLUS 46; these remain stable; it is merely the disposal of the product after use that is made easier. No changes to the chemical-physical properties or to the biological composition of ECOSAFE PLUS 46 take place when it is being used.

Health and safety at the place of work

ECOSAFE PLUS 46 contains no toxic, carcinogenic, teratogenic or mutagenic substances. In addition thanks to its carefully selected raw materials ECOSAFE PLUS 46 is a bio-compatible hydraulic fluid that contains no environmentally harmful substances such as glycols and other substances and which does not reach exposure limits (PNEC, DNEL value etc.).

Naturally the precautionary measures and standards of industrial hygiene in respect of the handling of chemicals are to be observed at all times. Please see the technical data leaflet for more detailed information on this.

Disposal of waste

At the end of its service life the product can be disposed of, for example in a plant for the biological treatment of wastewater or in similar plants; it does not need to be treated as special waste or hazardous waste.

We recommend the user to ensure the best possible maintenance of the relevant health and safety conditions at the particular place of work and to maintain protection of the environment with observation of all the local, regional and national regulations during the use of the product as well as in connection with its disposal. Do not dispose of the containers/drums in the environment and attempt to give preference to every form of recycling material.

Note: The information provided here is not intended as a specification or guarantee or as possible suggestions for the infringement of a patent.

Other details

NC-Code: 34039910
890190

The code 890190 informs the user on the elimination of customs duties in situations where the product is used on ships or, as the case may be, offshore platforms.



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