

## Product Information

Electrical Insulation System  
Insulating and Cooling Liquid

# BecFluid® 9902

based on synthetic esters; not water hazardous;  
halogen-free; for type T1 electrical insulation materials

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## Product Description

BecFluid® 9902 is an electrical insulating fluid for electrical operating material in accordance with IEC classification type T 1 according to IEC 61099, halogen-free pentaerythrite-tetra fatty acid ester.

Pentaerythrite-tetra fatty acid ester-based electric insulating fluids are currently the only environmentally friendly alternative to conventional coolants which meet both the requirements of DIN VDE 0375 and the classification criteria as „not water hazardous“. (UBA, data sheet 770 of the Federal Ministry of Health, Berlin).

## Areas of application

Owing to the high fire point of more than 300°C, in accordance with VDE 0101 transformers with BecFluid® 9902 can be set up on sites where there is a fire risk without additional measures having to be taken to protect the structure, as is the case with transformers filled with Askarel.

Other areas of use are:

- pole-type transformers, also in the preservation of ground water;
- public distribution transformers in densely populated areas;
- small-capacity output transformers in urban areas;
- multiple contact switches on output transformers;
- thyristor cooling in power electronics.
- traction transformers
- converter
- Distribution transformers especially for marine and cruise ships
- Retrofilling of distribution transformers and power transformers

## Properties

In addition to the properties set out in IEC 61099 BecFluid® 9902 is characterised by the following features:

Good ecological compatibility, i.e.:

- readily biodegradable in accordance to OECD 301
- according to German Umweltbundesamt (UBA) „not water hazardous“
- low vapour pressure under operating conditions;

- easily disposable.

Low acute and chronic toxicity, i.e.:

- best classification in accordance with the Chemicals Act.

Exceptional thermal properties, i.e.:

- low thermal coefficient of expansion;
- heat transfer properties comparable with mineral oil.

Good dielectric properties, i.e.:

- low dependence of the dielectric properties on the effects of moisture;
- very good partial discharge behaviour.

Favourable behaviour in the event of explosion, i.e.:

- high fire point (>300°C);
- incapable of continuing to burn;
- no toxic gases as with PCB.

BecFluid® 9902 is further noted for its very good lubricating properties.

## Application

BecFluid® 9902 can be prepared with any conventional plant for use in transformers but during preparation, contamination with other insulating fluids has to be avoided not to lower the fire point and endanger the classification „not water hazardous“. The transformer filling conditions also comply with the known procedure for insulating fluids.

BecFluid® 9902 is compatible with all conventional insulating materials in transformer construction.

## Disposal

For disposal, it is recommended that used BecFluid® 9902 or remains of the insulating fluid be burnt in a suitable installation. Waste disposal code 130309 applies (readily biodegradable insulating and heat transmission oils) or alternatively disposal code 130308 (Synthetic Insulation- and Cooling Liquid) according to German Law.

## Regulations

BecFluid® 9902 is not subject to the regulations for land, sea and air transport. It does not require labelling in accordance with the Dangerous Substances Regulations.

**Table 1 – Physical properties following IEC 61 099**

Property	Test method	Requirement	Value	Unit
Colour	ISO 2211	< 200	O.K.	HU
Appearance	optical	clear, free of suspended substances and sediments	corresponds	-
Density at 20°C	ISO 3675	max. 1.00	0.97	kg/dm <sup>3</sup>
Kin. Viscosity				
- at 40°C	ISO 3104	max. 35.0	25	mm <sup>2</sup> /s
- at -20°C		max. 3000	1040	mm <sup>2</sup> /s
Flash point	ISO 2719	> 250	274	°C
Fire point	DIN ISO 2592	> 300	303	°C
Fracture index at 20°C	ISO 5661	± 0.01 of the value given by the manufacturer	1,453	-
Pour point	DIN ISO 3016	< -45	< -50	°C
Crystallisation	DIN VDE 0375 9.9	No crystals	None	-

**Table 2 – Chemical properties following IEC 61 099**

Property	Test method	Requirement	Value	Unit
Water content	IEC 60814	< 200	55	mg/kg
Neutralisation	DIN VDE 0375 9.11	< 0.03	< 0.03	mg KOH/g
Oxidation stability	IEC 60813			
- total acid content		< 0.3	< 0.3	mg KOH/g
- total sludge content		< 0.01	0.005	Weight-%

**Table 2 – Dielectric properties following IEC 61 099**

Property	Test method	Requirement	Value	Unit
Breakdown voltage	DIN IEC 60156 VDE 0370 Part 5	> 45	99	kV
Dielectric dissipation factor tan $\delta$ at 90°C and 50 Hz	DIN IEC 60247 VDE 0370 Part 2	< 0.03	0.005	-
Volume resistivity DC at 90°C	DIN IEC 60247 VDE 0370 Part 2	> 2	6	G $\Omega$ m

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