



ELECTRICAL OIL SERVICES

EOS® NTO

Uninhibited Electrical Insulating Oil

Description

Produced from selected virgin Naphthenic Feedstock, which fully meets the requirements of the International Standard IEC60296:2020 Ed.5 - Type B Classification TVBU general specifications and special applications and ASTM D3487-2016. The oil also fully meets the requirements of BS148:2020

Application

EOS® NTO products have a very low pour point, excellent oxidation stability and electrical properties making them suitable for the most demanding requirements set by leading global transformer manufacturers.

Table 4 - General specifications Type B (uninhibited and inhibited standard grade oils)

Property	Test method	Limits	
		Transformer oil	Low temperature switchgear oils
1 – Function			
Viscosity at 40 °C	ISO 3104 ^a or ASTM D7042	Max. 12 mm ² /s	Max. 3,5 mm ² /s
Viscosity at –30 °C ^b	ISO 3104 ^a or ASTM D7042	Max. 1,800 mm ² /s	–
Viscosity at –40 °C ^c	IEC 61868	–	Max. 400 mm ² /s
Pour point	ISO 3016	Max. – 40 °C	Max. – 60 °C
Water content	IEC 60814	Max. 30 mg/kg ^d / 40 mg/kg ^e	
Breakdown voltage	IEC 60156	Min. 30 kV / 70 kV ^f	
Density at 20 °C	ISO 12185 ^a or ISO 3675 or ASTM D7042	Max. 895 kg/m ³	
DDF at 90 °C	IEC 60247 ^a or IEC 61620	Max. 0,005	
2 – Refining/stability			
Colour	ISO 2049	Max. 1,5	
Appearance	–	Clear, free from sediment and suspended matter	
Acidity	IEC 62021-2 ^a or 62021-1	Max. 0,01 mg KOH/g	
Interfacial tension	IEC 62961 ^a or ASTM D971	Min. 40 mN/m	
Corrosive sulphur	DIN 51353	Not corrosive	
Potentially corrosive sulphur	IEC 62535	Not corrosive	
DBDS	IEC 62697-1	Not detectable (< 5 mg/kg)	
Inhibitors of IEC 60666	IEC 60666	Uninhibited (U): not detectable (< 0,01 %) Trace inhibited (T): ≥ 0,01 < 0,08% Inhibited oil (I): 0,08 % to 0,40 % (see 3.5 to 3.7)	
Metal passivator additives of IEC 60666	IEC 60666	Not detectable (< 5 mg/kg), or as agreed upon with the purchaser	
Other additives		See ^g	

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2-furfural and related compounds content	IEC 61198	Not detectable (< 0,05 mg/kg) for each individual compound ^h	
3 – Performance			
Oxidation stability	IEC 61125 Test duration ⁱ (U) Uninhibited oil: 164 h (T) Trace inhibited oil: 332 h (I) Inhibited oil: 500 h	For oils with other antioxidant additives and metal passivator additives, see 6.12.2	
– Total acidity ^j	4.8.4 of IEC 61125:2018	max. 1,2 mg KOH/g	
– Sludge ^j	4.8.1 of IEC 61125:2018	max. 0,8 %	
– DDF at 90 °C ^j	4.8.5 of IEC 61125:2018	max. 0,500	
4 – Health, safety and environment (HSE)^k			
Flash point	ISO 2719	Min. 135 °C	Min. 100 °C
PCA content ^l	IP 346	< 3 %	
PCB content	IEC 61619	Not detectable (< 2 mg/kg)	

Stray gassing under thermo-oxidative stress (see 6.19) is not included as a normative test for mineral oils Type B, because there has been insufficient data to determine appropriate limits. The requirement for a stray gassing test, as well as the limit values, if stipulated, can be negotiated between the user and supplier.

- a Reference method.
- b This is the standard LCSET for a transformer oil (see 6.1) and can be modified depending on the climatic condition of each country. Pour point should be minimum 10 °C below LCSET.
- b Standard LCSET for low temperature switchgear oil.
- d For bulk supply.
- e For delivery in drums and IBC.
- f After laboratory treatment (see 6.4).
- g The supplier shall declare the function and chemical family of all additives (3.3), and the concentrations in the cases of inhibitors antioxidants and passivators (3.4).
- h In agreement with the customer, oils with a higher furfural content can be delivered, when these values do not jeopardize the application.
- i In some countries there can be lower requirements for oxidation stability. At the end of oxidation stability.
- j At the end of oxidation stability tests.
- k In some countries there can be additional requirements, e.g. REACH in the EU.
- l Some individual PAH compounds can be determined by EN 16143.

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