

# ACCEPTANCE TESTS

## Evaluating unused insulating oils

### WHAT?

We screen unused or new types of transformer oil to assess whether they are suited for use in transformers.

### WHY?

Transformer oils need to maintain very specific physical, chemical, and electrical properties over a very long period to be an efficient cooling liquid and electrical insulator. Several international standards (for instance IEC 60296 or ASTM D3487) have been developed to assess this long-term quality.



### HOW?

We investigate the composition and quality of all major insulating oil brands and types on the market by performing several specific oil analyses. These tests detect, among other things, the gassing properties of the oil, the presence of corrosive sulphur, and the presence of specific additives that can affect the performance of the oil over time.

PROPERTY	UNIT	TEST METHOD	VALUE
<b>1-FUNCTION</b>			
Viscosity at 40°C	mm <sup>2</sup> /sec	ISO 3104 or ASTM D7042	max. 12
Viscosity at 30°C	mm <sup>2</sup> /sec	ISO 3104	max. 1800
Pour point	°C	ISO 3106	max. -40
Water content	mg/kg	IEC 60814	max. 30
Breakdown voltage	kV	IEC 60156	min. 12
Density at 20°C	g/ml	ASTM D4052	max. 0.895
DDF at 90°C		IEC 60247	max. 0.005
<b>2-REFINING/STABILITY</b>			
Appearance			Clear, free from sediment and suspended matter
Acidity	mg KOH/g	IEC 62021-1	max. 0.01
Interfacial tension	mN/m	ASTM D971	note 2
Total sulphur content	mg/kg	ISO 14596 or ASTM D5185	note 2
Corrosive sulphur		DIN 51353	absence
Corrosive sulphur		IEC 62535	non corrosive
Corrosive sulphur		Annex A of IEC 62535	non corrosive
Antioxidant additive (phenolic)	%	IEC 60666	note 1
2-Furfural and related compounds content	mg/kg	IEC 61198	max. 0.05 for each individual compound
<b>3-PERFORMANCE</b>			
Oxidation stability		IEC 61125 method C (test duration: see note1)	
> Total acidity	mg KOH/g		max. 1.2
> Sludge	%		max. 0.8
> DDF at 90°C			max. 0.500
Gassing	µl/min	IEC 60628 method A	note 2
<b>4-HEALTH, SAFETY AND ENVIRONMENT</b>			
Flash point (Pensky-Martens)	°C	ISO 2719 or ASTM D93	min. 135
PCA content	%	IP 346	max. 3
PCB content	mg/kg	IEC 61619	n.d.
<b>SUPPLEMENTARY TEST</b>			
Corrosive sulfur (after resin treatment)		Annex A of IEC 60296	non corrosive
DBDS	mg/kg	LBE method	n.d.
Passivator Irgamet 39	mg/kg	IEC 60666	n.d.
Passivator Irgamet 30	mg/kg	LBE method	n.d.
Passivator BTA	mg/kg	IEC 60666	n.d.
Passivator TTA	mg/kg	IEC 60666	n.d.

