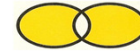


UniSource Energy, Inc.
Inhibited Transformer Oil
Typical Properties



Supplier Name	Specification	Specification	UNISOURCE
Product Name	D 3487	CSA-C50 Class B	UNISHIELD®
	Type II	Type II	62 TOM

Physical Properties	ASTM NO.			
Aniline Point, °C(°F)	D 611	Report		89.2
Color	D 1500	0.5 max.	0.5 max.	L 0.5
Flash Point, COC, °C(°F)	D 92	145 (293)min.	145 min.	168 (334)
Interfacial tension @ 25°C, dynes/centimeter	D 971	40 min.	40 min.	43
Pour Point, °C(°F)	D 97	-40(-40)max.	-40 max.	-44 (-47)
Spec.Gravity @ 15°C/15°C	D 1298	0.910 max	0.910 max.	0.867
Viscosity, SUS (cSt) @ 210°F (100°C)	D 88/D 445	36 (3.0) max.	(3.0 max.)	34.8 (2.59)
104°F (40°C)		66 (12) max	(12.0 max.)	59.3 (10.13)
32°F (0°C)		350 (76) max.	(76 max.)	273 (63.9)
-40 F (-40°C)		NA	(6000 max.)	3734
Visual Appearance	D1524	B & C	B & C	B & C
CHEMICAL PROPERTIES				
Oxidation Inhibitor*, mass %	D 2668/D 1473	0.3 max.	0.008 - 0.30	0.28
Corrosive sulfur, Tarnish Level	D 130			2e
Total Sulfur, ppm	D 4294			1.0
Corrosive sulfur	D 1275	Pass	Pass	Pass
Moisture, ppm	D 1315/D 1533	35 max.	35 max.	22
Neut. Number, mg KOH/g	D 974	0.03 max.	0.03 max.	<0.01
Oxidation stability				
Method A (acid/sludge)	D 2440			
72 hours				
sludge, mass %		0.1 max.	NA	0.02
Neut. value, mg KOH/g		0.3 max.	NA	< 0.01
164 hours				
sludge, mass %		0.2 max.	0.05 max.	0.01
Neut. value, mg KOH/g		0.4 max.	0.2 max.	< 0.01
Method B (rotating bomb)	D 2112	195 min.	195 min.	436
PCB Content	D 4059	ND	2 max.	ND (< 2 ppm)
ELECTRICAL PROPERTIES				
Dielectric breakdown voltage@ 60 hz				
Disc electrodes, kV	D 877	30 min.	30 min.	50
VDE electrodes, 0.04 in gap, kV	D 1816	20 min. **	24 min. **	30
VDE electrodes, 0.08 in gap, kV	D 1816	NA	56 min. ***	
Dielectric breakdown voltage				
- impulse, 25°C, kV				
Needle Negative to Sphere	D 3300	145 min.	145 min.	>300
Grounded, 25.4 mm gap, kV				
Power Factor @ 60 Hz, ppm (%)	D 924			
@ 25°C		0.05 max.	(0.0005 Max)	0.014
@ 100°C		0.30 max.	(0.005 Max)	0.147
Gassing tendency, µl/min,	D 2300	30 Max	NA	2.5

Chemical Abstract #

64742-53-6

** Following transport (unprocessed oil.)

Jul-12

*** After filtering, drying, and degasification (new processed oil.)

The values shown here are representative of current production.

Some are controlled by manufacturing specifications, while others are not.

All may vary within modest ranges.