Energize your BESS:

FR3™ fluid fuels performance

Battery Energy Storage Systems (BESS) are essential to strengthening grid stability and maximizing the value of renewable energy, ensuring power is available exactly when it's needed. As demand for energy continues to surge, BESS installations must operate efficiently with long term performance in mind. FR3™ fluid helps BESS assets with increased fire safety and loading capacity as well as delivering a higher return on investment.

Increase fire safety

- 2X higher flash and fire points*
- Zero reported fires in 25+ years
- K-class fluid

Exceptional reliability

- Easily handles high heat with up to 140 °C top fluid temperature
- No maintenance needed under normal operating conditions
- 8X longer paper insulation life*

Sustainability benefits

- 100% biodegradable in as little as 10 days**
- Reduce dependency on fossil-based materials in your transformers

Increased loading capacity

- Up to 20% more loading capacity* without impacting transformer lifespan
- Design a smaller transformer with the same loading capacity

Reduce CAPEX of installation

- FM Global approved – FR3 fluid is recognized as a safeguard equivalent to space separation, fire barriers and fire suppression systems. Using FR3™ fluid allows:
  - Reduced clearance requirements to buildings and equipment
  - Reduce need for costly fire-mitigation systems
  - Potentially reduce insurance premiums and liability service

FR3™ a Cargill brand

*Compared to mineral oil

**According to OPPTS 835.3100

Acceptable limits for receipt of shipments of FR3™ fluid

FR3™ fluid acceptance limits

	Standard test methods		ASTM D6871/IEEE C57.147	IEC 62770	FR3™ fluid
Property	**ASTM**	**ISO/IEC**	**As-received new fluid property requirements**	**Unused new fluid property requirements**	**Typical**
Physical					
Color	D1500	ISO 2211	≤ 1.0	–	0.5
Flash point PMCC (˚C)	D93	ISO 2719	–	≥ 250	260 - 270
Flash point COC (˚C)	D92	ISO 2592	≥ 275	–	320- 330
Fire point (˚C)	D92	ISO 2592	≥ 300	> 300	350 - 360
Pour point (˚C)	D97	ISO 3016	< -10	≤ -10	-21
Density at 20 ˚C (g/cm^3)	–	ISO 3675	–	≤ 1.0	0.92
Relative density (Specific gravity) 15 ˚C	D1298	–	≤ 0.96	–	0.92
Viscosity (mm^2/s)	D445	ISO 3104			
100 ˚C			15	≤ 15	7.7 - 8.3
40 ˚C			≤ 50	≤ 50	32 - 34
0 ˚C			≤ 500	–	190
-20 ˚C	–	–	–	–	650*
Visual examination	D1524	IEC 60247 4.2.1	Bright and clear	Clear, free from sediment and suspended matter	Clear, light green
Biodegradation	OECD 301B		Readily biodegradable	Readily biodegradable	Readily biodegradable
Aquatic and oral acute toxicity	OECD 202, 203, OECD 420		Non-toxic	Non-toxic	Non-toxic
Electrical					
Dielectric breakdown (kV)	D877	–	≥ 30	–	>45
Dielectric breakdown (kV)					
2 mm gap	D1816	–	≥ 35	–	60 - 70
2.5 mm gap	–	IEC 60156	–	≥ 35	70 - 80
Dielectric breakdown under impulse (kV) 25.4 mm gap	D3300	–	> 130	–	140
Gassing tendency (ml/min)	D2300	–	≤ 0	–	-79
Dissipation factor					
25 ˚C (%)	D924	–	≤ 0.20	–	0.010 - 0.15
90 °C (tan ∂)	–	IEC 60247	–	≤ 0.05	0.01 - 0.03
100 ˚C (%)	D924	–	≤ 4.0	–	1.00 - 3.85
Chemical					
Corrosive sulfur	D1275	IEC 62697	Non-corrosive	Non-corrosive	Non-corrosive
Water content (mg/kg)	D1533	IEC 60814	≤ 200	≤ 200	4 - 50
Acid number (mg KOH/g)	D974	IEC 62021.3	≤ 0.06	≤ 0.06	0.01 - 0.05
PCB content (mg/kg)	D4059	IEC 61619	Not detectable	Free from PCBs	Not detectable
Total additives	–	IEC 60666	–	Max weight fraction 5%	< 2%
Oxidation stability (48 h, 120 ˚C)	–	IEC 61125 IEC 62770			
Total acidity (mg KOH/g)	–	IEC 62621.3	–	≤ 0.6	0.1 - 0.3
Viscosity at 40 °C (mm^2/s)	–	ISO 3104	–	≤ 30% increase over initial	17% - 23% increase
Dissipation factor at 90 °C (tan ∂)	–	IEC 60247	–	≤ 0.5	0.1
Oxidation induction time 130 ˚C/500 psi (min)	D6186	–	–	–	62+2 min

Measurement of viscosity near pour point may be inaccurate.

NOTE: Specifications should be written referencing only the defined ASTM or IEC industry standard acceptance values and test methods. The listed 'typical' values are average values summarized from a significant number of data points over many years; they are not to be identified as acceptance values.
ASTM D6871 Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus. IEC 62770: Fluids for electrotechnical applications – Unused natural esters liquids for transformers and similar electrical equipment. A transformer filled with FR3 fluid complies with the transformer temperature operating range requirements defined in IEEE C57.12.00 and IEC 60076-1.

FR3™ a Cargill brand