



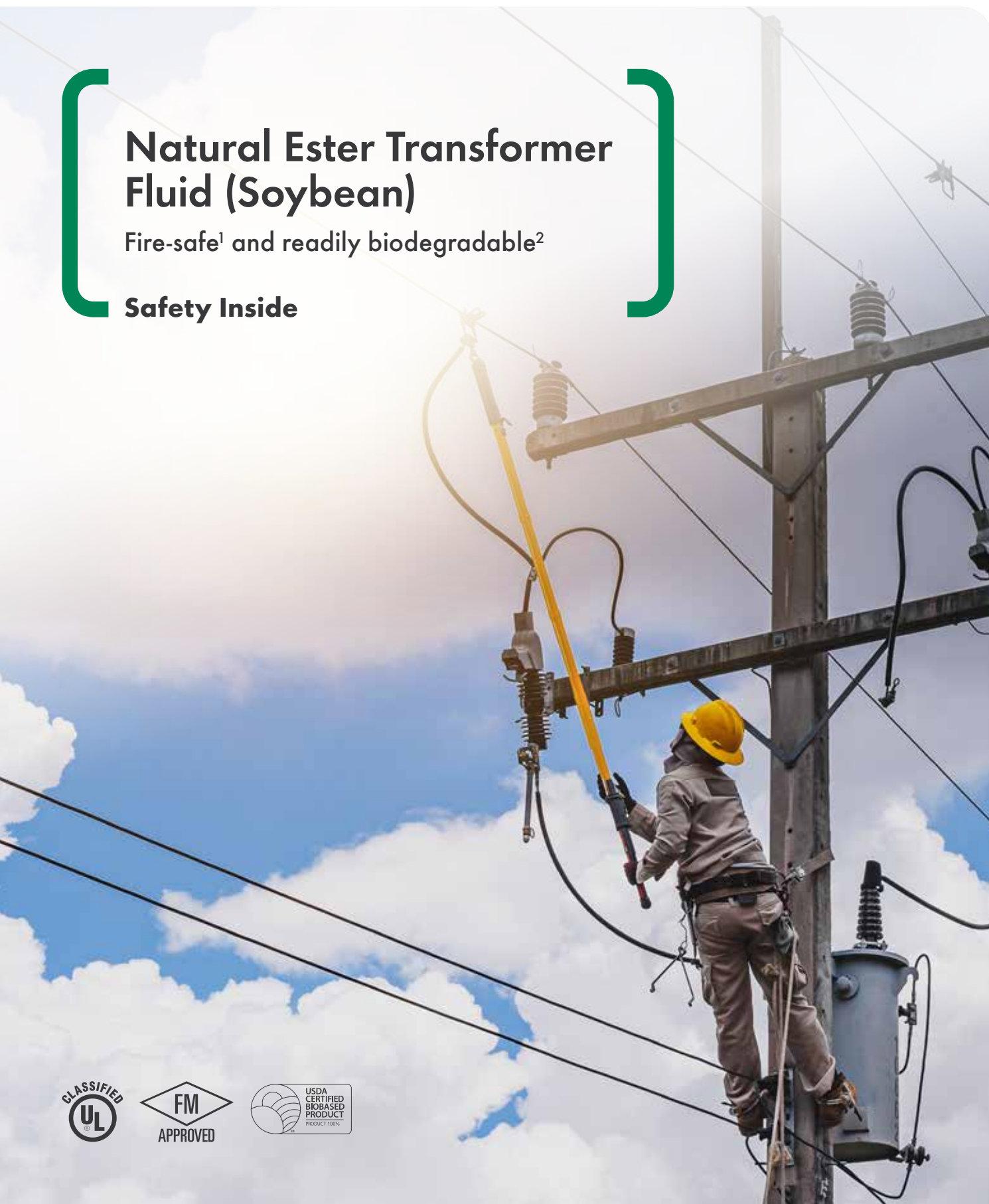
Shell
MIDEL
eN 1215

July 2025

Natural Ester Transformer Fluid (Soybean)

Fire-safe¹ and readily biodegradable²

Safety Inside



Shell MIDEL eN 1215

is our soybean-based natural ester transformer liquid.

Shell MIDEL has been used in hundreds of thousands of installations worldwide,³ providing excellent fire safety,¹ environmental protection,^{2,4} performance³ and helping to reduce costs,⁵ while enabling innovation.⁶





Shell MDEL eN 1215 is designed to provide an alternative transformer insulating fluid to conventional mineral oil and silicone fluid. Suitable for a wide range of transformer applications and ideal for non-breathing transformers located indoors or outside.³



Increased fire safety¹

- 100% fire safety record³
- High fire point (> 350 °C)
- Classified as K Class: less flammable fluid
- For indoor and outdoor installations
- Reduces the need for fire protection equipment⁷



Environmental protection

- Biobased vegetable oil⁸
- Readily biodegradable²
- Non-hazardous⁴
- No corrosive sulphur³



Asset life extension

- Slower rate of cellulose ageing than conventional mineral oil
- Longer cellulose lifetime at standard temperatures
- Option to run at a higher temperature for a standard lifetime for conventional mineral-oil-filled systems
- Enables a higher output of a transformer, without the need for high-temperature insulation



Enables innovation

- Allows for compact transformer design
- Permits flexibility and temporary overload resilience



Excellent moisture tolerance

- Absorbs large amounts of moisture with no reduction of breakdown voltage (up to 300 ppm)
- High moisture saturation limit (1,100 ppm @20°C) making precipitation of free water virtually impossible

Transformer fires are a frequent occurrence in the world's power networks. Such fires are notoriously unforgiving, spreading very quickly and causing extensive damage. Shell MDEL eN 1215 offers a tried and tested solution in terms of fire risk mitigation.¹

Shell MDEL's engineers, environmental and technical chemists have built close working relationships with end users and the major transformer manufacturers. They are also active in ASTM, IEEE, IEC and CIGRÉ working groups and regularly undertake extensive projects with industrial associations and academic bodies. Such depth of experience allows the Shell MDEL team to provide reliable, timely and expert technical guidance.



Shell MIDEL eN 1215 fluid properties

Property	Standard test methods		Requirement		Shell MIDEL eN 1215
	ASTM	ISO/IEC	ASTM D6871	IEC 62770	
Physical					
Colour	D1500	ISO 2049	≤ 1.0	≤ 1.0	0.5
Flash point PMCC (°C)	D93	ISO 2719	—	≥ 250	≥ 260
Flash point COC (°C)	D92	ISO 2592	≥ 275	≥ 250	≥ 315
Fire point (°C)	D92	ISO 2592	≥ 300	≥ 300	≥ 350
Pour point (°C)	D97	ISO 3016	≤ −10	≤ −10	−18
Density at 20 °C (g/cm³)	—	ISO 12185	—	≤ 1.0	0.92
Relative density (specific gravity) (15°C/15°C)	D1298	—	≤ 0.96	—	0.92
Viscosity (mm²/sec)	D445	ISO 3104			
at 100 °C	—	—	≤ 15	≤ 15	7.6
at 40 °C	—	—	≤ 50	≤ 50	32
at 0 °C	—	—	≤ 500	—	206
Appearance	D1524	—	Bright and clear	—	Bright and clear
Visual examination	—	IEC 62770:2024 Ch 4.2.1	—	Clear, free from water and suspended matter and sediment	Clear, free from water and suspended matter and sediment
Biodegradation – OECD 301 B, C, F²	—	—	—	Readily biodegradable	Readily biodegradable
Electrical					
Dielectric breakdown (kV) 1-mm gap	D1816	—	≥ 20	—	35
Dielectric breakdown (kV) 2-mm gap	D1816	—	≥ 35	—	55
Dielectric breakdown (kV) 2.5-mm gap	—	IEC 60156	—	≥ 35	≥ 75
Gassing tendency (µl/min)	D2300	—	≤ 0	—	−87.6
Power factor at 25 °C (%)	D924	—	≤ 0.2	—	≤ 0.20
Power factor at 100 °C (%)	D924	—	≤ 4.0	—	≤ 4.0
Dissipation factor at 90 °C (tan delta)	—	IEC 60247	—	≤ 0.05	≤ 0.03
Chemical					
Corrosive sulphur	D1275	IEC 62535	Non-corrosive	Non-corrosive	Non-corrosive
Water content (mg/kg)	D1533	IEC 60814	≤ 200	≤ 200	50
Acid number (mg KOH/g)	D974	IEC 62021.3	≤ 0.06	≤ 0.06	≤ 0.04
PCB content (mg/kg)	D4059	—	Not detectable	—	Not detectable
Oxidation stability (48 h)	D2440	IEC 61125			
Total acidity (mg KOH/g)	—	IEC 62021.3	—	≤ 0.6	≤ 0.07
Viscosity at 40 °C (mm²/sec)	—	ISO 3104	—	≤ 30% over initial	15.7%
Dielectric dissipation factor @ 90 °C		IEC 60247		≤ 0.5	0.05

The displayed typical values are not to be identified as acceptance values.

Why Shell MIDELE eN 1215?



Helps reduce owner risk, land space and costs (construction and insurance)⁵

Fire resilience, personnel safety^{1,2,4}



Helps increase performance³

Hotter running, sustainable overloading



Lowers environmental harm^{2,4}

Readily biodegradable, non-hazardous



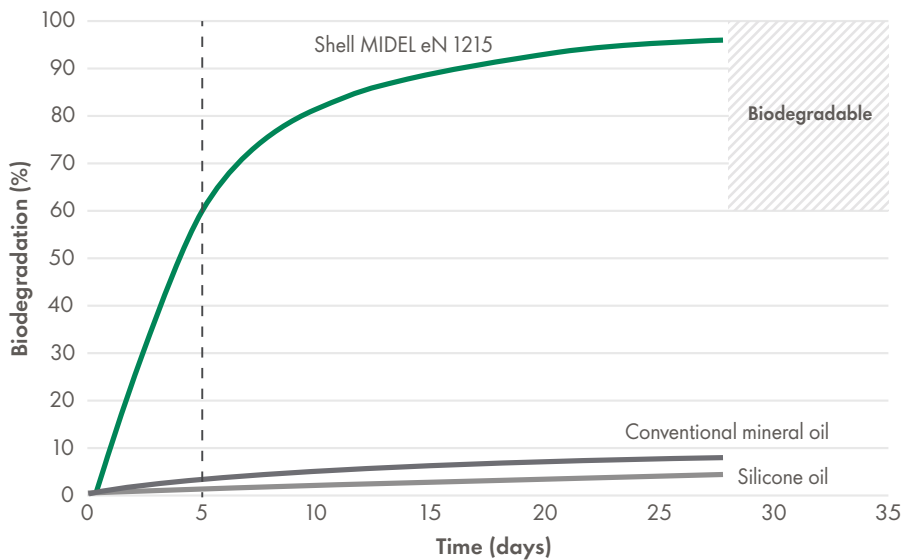
Helps deliver higher return on investment^{3,9}

Improved transformer reliability,
longer asset life





Environmental protection



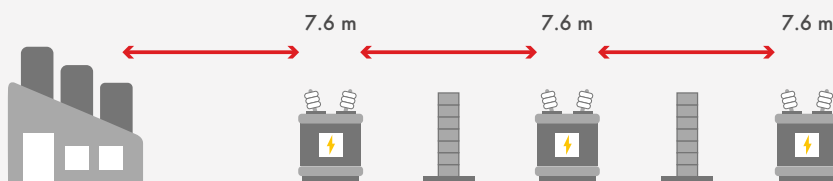
- Renewable vegetable oil
- Lower carbon footprint than conventional mineral oil¹⁰
- Bio-sourced⁸
- The chart shows that Shell MIDELE n 1215 achieves 60% biodegradability well within the 28 days required by OECD 301 B test.²
- May enable reductions in containment measures
- Non-hazardous⁴

Comparative degradation rates of transformer fluids.

This line graph shows biodegradation over time of Shell MIDELE n 1215, which is significantly higher than that of a conventional mineral oil or silicone liquid and meets the requirement for readily biodegradable classification as fully described in the text.

K2 classification (IEC 61039) – reduces the need for fire-protection equipment and saves space.⁷

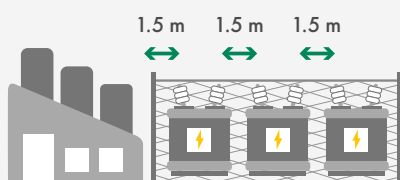
Minimum required clearances for an example transformer, fluid volume 2,000–19,000 L⁷



O Class: 7.6 m

Reinforced concrete, which is

- expensive
- carbon intensive to manufacture and transport.



K Class: 1.5 m

- unrated walls
- no blast walls/shared containment
- no fire suppression system
- minimal concrete and land use

- smaller bill of materials
- lower financial and carbon costs
- faster, simpler substation build.

Graphic illustrating the smaller required clearance of 1.5 metres between transformers using a K Class fluid, in comparison with a required clearance of 7.6 metres and the need for reinforced concrete blast walls for transformers using an O Class fluid.

Minimum required clearance for an FM Approved less-flammable fluid⁷ in an advanced transformer: **0.9 m Potential substation footprint reduction³**

Blast/fire-wall requirements are determined by insulation thermal classification.



For more information, please contact your Shell representative or visit [Shell.com/ShellMIDEL](https://www.shell.com/ShellMIDEL)

References

- ¹ Shell MIDEL fluids are classified as K Class, with high fire and flash points, and are less flammable. These properties can prevent a transformer fire and save the property, people and environment in its surroundings. FM Approved, UL classified.
- ² Shell MIDEL eN 1215 can be claimed as readily biodegradable according to OECD 301 test (product).
- ³ Shell MIDEL customer data. Please refer to properties table on page five of this brochure for Shell MIDEL fluid specification values.
- ⁴ Non-hazardous according to the CLP regulation and GHS guidance.
- ⁵ May reduce insurance premiums due to proven fire safety and FM Approval. Potential reduction in fire barriers leading to cost reductions for construction and land space. Can reduce asset downtime related to fire issues and moisture ingress. Advice should not override countries' local legislation and laws.
- ⁶ Allows for compact transformer design. Permits flexibility and temporary overload resilience.
- ⁷ FM Global Data Sheet 5-4 (April 2025), spacing based on fire clearances only. Advice should not override countries' local legislation and laws.
- ⁸ Shell MIDEL eN 1215 has 100% Biobased Carbon Content. Tested according to ASTM D6866-21 method. Reported results are accredited to ISO/IEC 17025:2017 Testing Accreditation PJLA #59423 standards and all chemistry was performed at Beta Analytic testing laboratory and counted in their accelerators in Miami, Florida, August 2021.
- ⁹ Slower rate of cellulose ageing than conventional mineral oil. Longer cellulose lifetime at standard temperatures. Option to run at a higher temperature, for a standard transformer lifetime. Provides a higher power output, without the need for high temperature insulation.
- ¹⁰ Natural ester in a typical transformer application has a lower carbon footprint of production than conventional mineral oil. Comparison of cradle-to-grave carbon footprint of dielectric fluids: Shell MIDEL eN 1215 against conventional mineral oil. Scope of the comparative assessment includes transformer, the engineering works, land use, safety structures and replacement (owing to fire) of transformer assets. Southwest Environmental Limited, Comparative Life Cycle Analysis: Bio-Ester, Synthetic Ester and Mineral Based Transformer Oils, report, 2020. <https://www.shell.com/investors/disclaimer-and-cautionary-note.html>

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