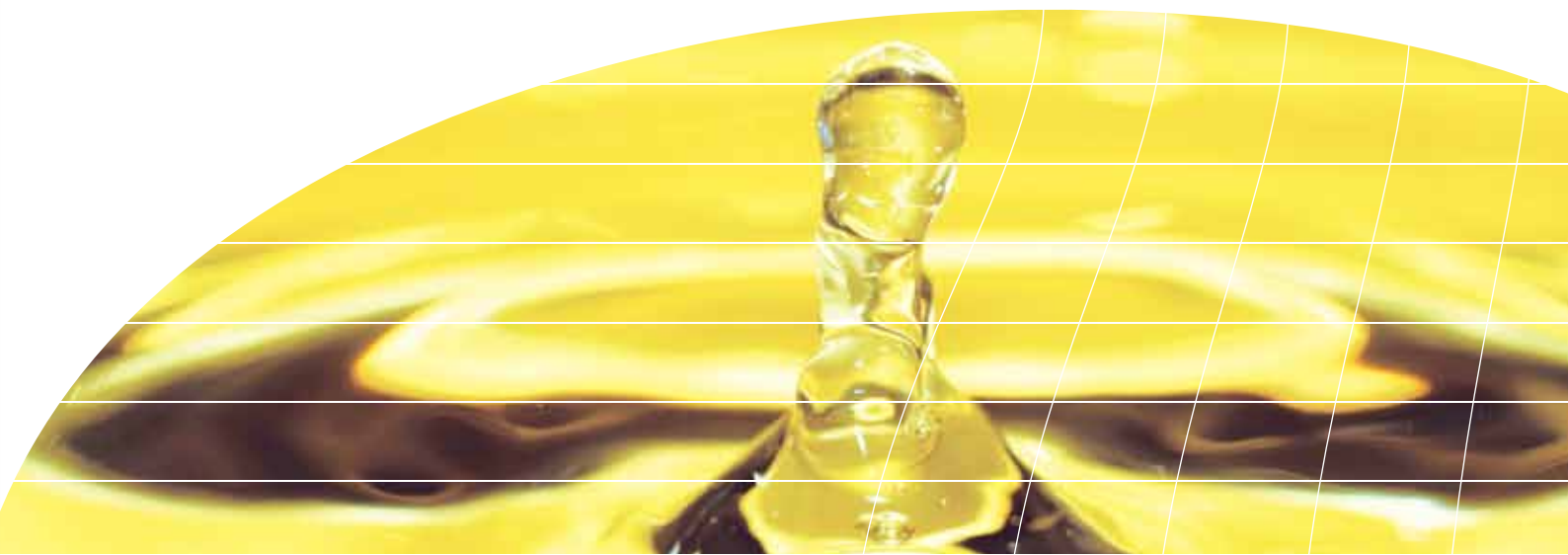


ISOVOLTINE

Transformer oils



The right choice in lubricants

TOTAL

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تهران، کیلومتر ۲۱ بزرگراه لشگری (جاده مخصوص کرج)

روبروی پالایشگاه نفت پارس، پلاک ۱۳



TOTAL

ISOVOLTINE TRANSFORMER OIL

Safety and longevity

In operation, a transformer reaches very high temperatures. It requires a lubricant to prevent overheating and break down. Each component of the transformer has a different electrical potential and therefore there is a constant risk of short circuiting. In this instance, an insulating element is required to avoid damage to the equipment and prevent down time of the transformer.

The lubricant is critical as it ensures a well performing transformer

TOTAL has developed the ISOVOLTINE range of transformer oils. These are extremely effective in their ability to insulate components of the transformer and ensure efficient cooling in the system. In addition, they enable outstanding protection against oxidation and prevent wear of the core, windings and other insulating materials.

Cooling – Insulating – Protecting

■ ISOVOLTINE oils performance at a glance

- Superior insulating properties due to: high dielectric breakdown voltage, volume resistivity, interfacial surface tension and absence of polar substances
- Outstanding resistance to oxidation
- Very high purity levels minimize power factors and help to prevent temperature rises
- Excellent cooling properties due to good fluidity and heat transfer capacities
- Highly refined oil ensures chemical stability and durability in service
- Ultra efficient protection of equipment due to non corrosive nature and cleaning properties

■ Your benefits

- Reduction of breakdowns and maintenance cost
- Extension of life time of the transformer and the oil
- Improvement of safety and efficiency

A FULL RANGE OF LUBRICANTS DEDICATED TO TRANSFORMERS OPERATION

Compared performances

Your benefits	ISOVOLTINE II	ISOVOLTINE II-T	ISOVOLTINE II-TX	ISOVOLTINE BIO
Nature	Non-inhibited naphthenic mineral oil	Traced inhibited naphthenic mineral oil	Inhibited naphthenic mineral oil	Synthetic esters biodegradable oil
Norms & specifications	IEC60296 (U) TPC I002 (100-04) JIS C 2320 Type I BS EN 60296	IEC 60296 (T) ASTM D 3487 Type I TPC I002 (100-04) JIS C 2320 Type I BS EN 60296	IEC 60296 (I) ASTM D 3487 Type II	IEC 61099 IEC 61100 - K3 class Biodegradable according to OECD 301B
Usage	For transformers, rheostats and circuit breakers using mineral oils In all operating conditions			
Savings on maintenance costs	★★★★★	★★★★★	★★★★★	★★★★★
Length of service life	★★★★	★★★★	★★★★★	★★★★★
Biodegradable	-	-	-	★★★★★
Safety	★★★★	★★★★	★★★★	★★★★★
Fight overheat risks	★★★★★	★★★★★	★★★★★	★★★★★
Insulating capacity	★★★★★	★★★★★	★★★★★	★★★★★

All oils in the ISOVOLTINE range have a high flash point. This reduces the risk of accidental fires. In case of accidental spillage, the eco toxicity characteristics ensure easy and efficient removal and minimal damage to the environment . This also ensures that any associated safety risks are minimized.

ISOVOLTINE BIO

Dielectric biodegradable oil

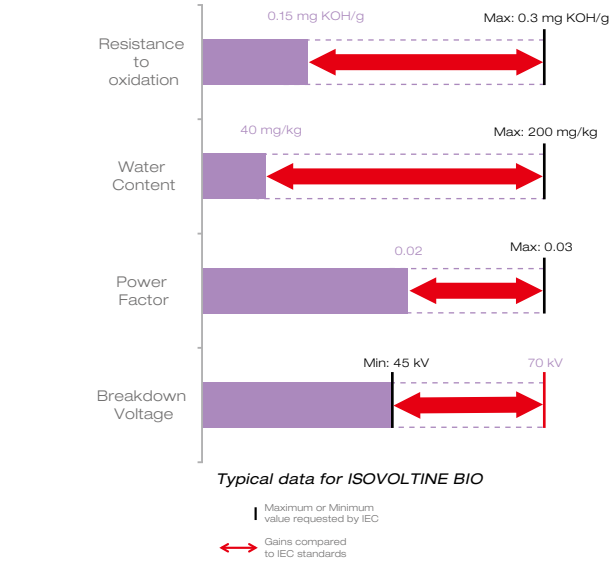
In areas where there is a chance of environmental contamination, TOTAL has developed ISOVOLTINE BIO, a dielectric oil based on **synthetic esters**

- ISOVOLTINE BIO: a **biodegradable oil**
- Certified biodegradable within 28 days according to OCDE 301B
 - Considered non dangerous for aquatic environment by the German UBA

ISOVOLTINE BIO: the choice for **safety** - Classified K3 according to IEC 61100. **Risk of fire minimized** due to

- Extremely high ignition point (>300°C)
- Net Calorific Value (<32MJ/kg)

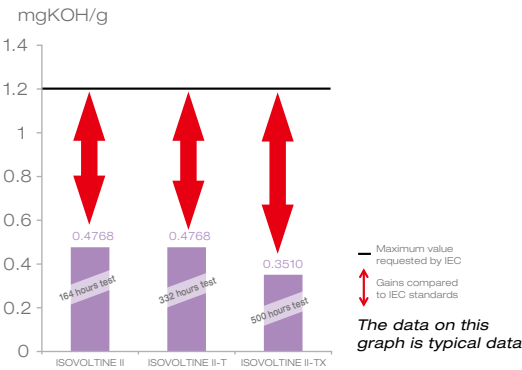
ISOVOLTINE BIO meets the requirements of IEC 61099. Its outstanding **oxidation resistance, cooling properties, insulating strength** and other properties make it the perfect choice to protect equipment.



PERFORMANCE OF ISOVOLTINE OILS

ISOVOLTINE oils have been tested by Doble, an independent laboratory. Standards requirements of IEC 60296 were all exceeded.

Resistance to Oxidation



ISOVOLTINE oils present a strong **resistance to oil degradation**. Tested to the stringent conditions of IEC 61125C, ISOVOLTINE products all showed outstanding **anti-oxidation properties**

Benefits:

- Long life of the oil
- Better protection of your equipment in time

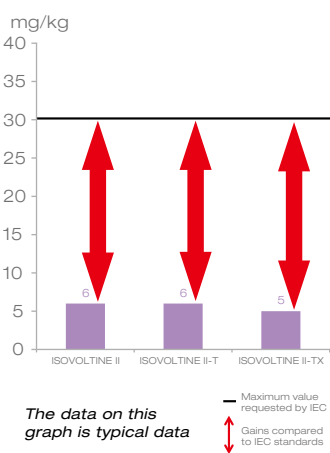
Oils are by nature dielectric however impurities may reduce these properties and put equipment at risk. Maintaining minimal levels of impurities (such as moisture for example) will ensure that the oil retains its performance characteristics for longer and not conduct electricity.

Tests indicate that ISOVOLTINE oils are extremely pure . The particular blending process ensures an astonishingly low level of impurities, and therefore a really low power factor.

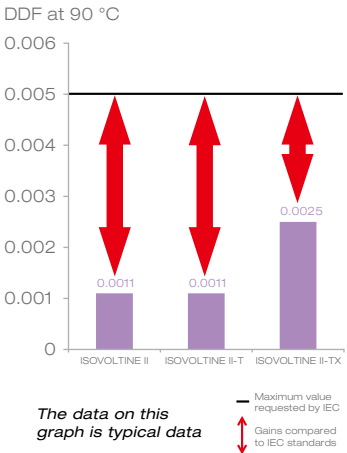
Benefits:

- Better insulation
- Safety and protection of the equipment

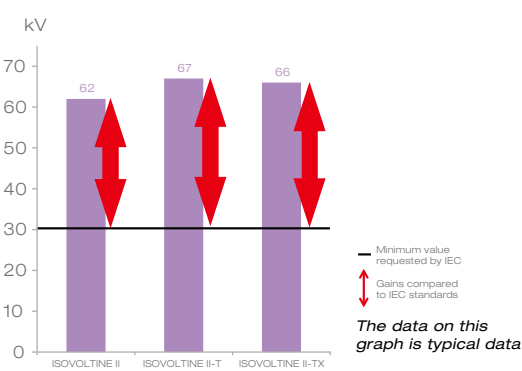
Water Content



Power Factor



Dielectric Breakdown Voltage



The resistance of oils is limited to a level of high voltage, above which it breaks down (consequently losing its properties). In addition, impurities in the oil (such as sludge, fibers, solid suspension, etc.) alter the resistance to voltage.

Thanks to purification technology, ISOVOLTINE oils are stable and have a high dielectric breakdown voltage.

Benefits:

- Protection against electric arcs and breakdowns
- Long life of the oil



TOTAL Lubrificants' commitments for industry

TOTAL Lubrificants division is made up of more than 1,000 staff across the world. It operates in more than 150 countries through its network of subsidiaries and distributors.

Our commitment: to help you get the very best out of your equipment in order to optimize the profitability of your industrial processes.

Visit our worldwide website to get more information on our entire range of products and solutions

www.lubricants.total.com/pro/industry.html

TOTAL produces standard finished lubricants complying with the world's most stringent certifications.

Customized advice

Benefit from our specialist expertise in transformer lubrication and the additional services we can offer you for your business:

- Recommending the right product for your application and advice on product management
- Ongoing technical support and assistance
- Training your employees how to use and maintain our products

ANAC INDUS oil analyses

Optimize operating costs of your equipment

Oil is the lifeblood of your machines and the pointer to their health. The precision of the ANAC INDUS analyses made in our laboratories, provides tangible benefits as regards productivity and maintenance costs savings.

The advantages of ANAC INDUS TRANSFO

- **Monitoring** of the machine's mechanical state and of the lubricant's residual qualities, **without dismantling or stoppage.**
- **Detection of abnormalities** in order to predict maintenance operations and avoid unexpected shutdowns as well as costly repairs.
- **Extension of lubricant service life** and optimization of drain intervals

Our specialists will support you to implement a successful oil analysis program, according to your equipment and operating conditions.

4 good reasons to choose TOTAL

A major company

TOTAL Lubrifiants is a subsidiary of TOTAL. The Group is the world's fifth largest integrated oil and gas company* and employs more than 96,000 people on five continents. TOTAL Lubrifiants produces and sells its products under the TOTAL brand in more than 150 countries.

Safe and eco-friendly products

Elements designed to reduce the risk of toxicity and VOC emissions and encourage recycling and elimination from the environment are incorporated into the formulation of every new product. TOTAL Lubrifiants renews its ISO 14001 certification every three years, as a guarantee of its long-term commitment.

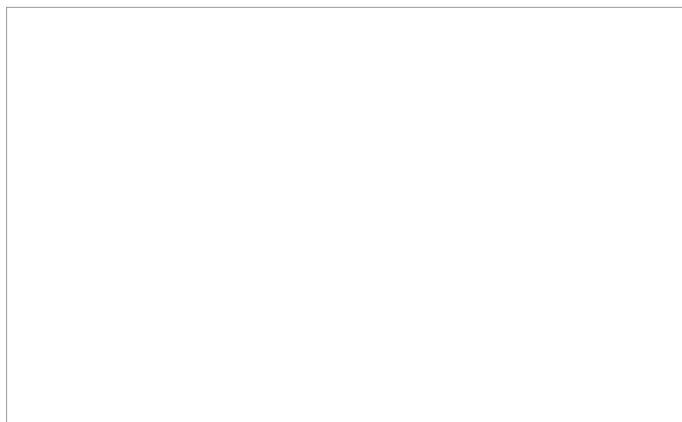
Innovation

Thanks to a major investment in R&D and close cooperation with equipment manufacturers, TOTAL Lubrifiants creates high-technology products with substantial added value, for optimal performance and protection of your machinery.

Partnership

The wide range of TOTAL products means that you can find the maintenance lubricants or specialized products to meet your every need. By choosing TOTAL, you can be fully confident that our team will work with you to enhance your productivity and reduce your maintenance costs.

**Based on market capitalization (in dollars) as of December 31, 2012.*



The right choice in lubricants

TOTAL