



Shell Diala S4 ZX-IG

Premium Inhibited Electrical Insulating Oil

Shell Diala S4 ZX-IG is an electrical insulating oil from Shell which meets the performance of both IEC 60296 higher oxidation stability and low sulphur as well as ASTM D3487 Type II. In addition it has been designed to meet the gas absorbing challenges presented by specialised equipment such as high voltage instrument transformers and bushings. It offers an extended oil life with the peace of mind of zero sulphur content. Shell Diala S4 ZX-IG is manufactured from zero sulphur base oils produced using Shell's GTL (gas-to-liquid) technology. These base oils offer a high degree of compositional consistency and have an excellent response to anti-oxidant. The product is free from PCBs, DBDS and passivators, containing only DBPC antioxidant, and a low level of aromatic hydrocarbon (for gas absorption behaviour). Shell Diala S4 ZX-IG meets both the established and new industry copper corrosion tests.

Technical Data Sheet

- Extra Performance
- Meets IEC 60296 - Higher Oxidation Stability & Low Sulphur Content
- Meets the performance of ASTM D3487 Type II

DESIGNED TO MEET CHALLENGES

Performance, Features & Benefits

▪ Extended oil life

Shell Diala S4 ZX-IG is a fully inhibited gas absorbing oil giving outstanding oxidation performance and an extended oil life.

It has the ability to absorb gases such as hydrogen which can develop under partial discharge conditions. This makes Shell Diala S4 ZX-IG the recommended Shell product for special applications with high voltage gradients, such as bushings and instrument transformers requiring gas absorbing properties.

▪ Transformer protection

Shell Diala S4 ZX-IG is manufactured from a zero sulphur* base oil, making it intrinsically non-corrosive towards copper, without the need for passivation or other additives (apart from the DBPC antioxidant, and a low level of aromatic hydrocarbon (for gas absorption behaviour)).

Shell Diala S4 ZX-IG meets all relevant tests for copper corrosion, namely the established DIN 51353 (Silver Strip Test), ASTM D1275, and also the latest more severe tests: IEC 62535 and ASTM D1275B.

*Sulphur content below 1ppm detection limit of ASTM D5185

▪ System efficiency

The good low temperature viscometric properties of the oil ensure proper heat transfer inside the transformer, even from very low starting temperatures.

Shell Diala S4 ZX-IG is specially dried and handled to achieve a low water content and retain a high breakdown voltage at point of delivery. This enables it to be used in many applications without further treatment.

Main Applications



Specifications, Approvals & Recommendations

- IEC 60296 (Edition 5 year 2020); Type A, fully inhibited high grade oils
- IEC 60296 Ed4 (2012): Table 2 Transformer Oil (I) (Inhibited oil) Section 7.1 ("Higher oxidation stability & low sulphur content")
- ASTM D3487 Type II performance

For a full listing of equipment approvals and recommendations, please consult your local Shell Technical Helpdesk.

Typical Physical Characteristics

Properties			Method	IEC 60296 Table 2 + section 7.1 limits minimum	IEC 60296 Table 2 + section 7.1 limits maximum	ASTM D3487 Table 1, type II minimum	ASTM D3487 Table 1, type II maximum	Shell Diala S4 ZX-IG Typical
Appearance			IEC 60296	Clear, free from sediment and suspended matter	Clear, free from sediment and suspended matter	Clear, free from sediment and suspended matter	Clear, free from sediment and suspended matter	Complies
Density	@20°C	kg/m ³	ISO 3675		895			806
Kinematic Viscosity	@100°C	mm ² /s	ASTM D445				3	2.7
Kinematic Viscosity	@40°C	mm ² /s	ISO 3104 or ASTM D445		12			9.4
Kinematic Viscosity	@0°C	mm ² /s	ASTM D445				76	58
Kinematic Viscosity	@-30°C	mm ² /s	ISO 3104		1 800			381
Flashpoint P.M.	°C		ISO 2719	135				158
Pour Point	°C		ISO 3016		-40			-42
Neutralisation value	mg KOH/g		IEC 62021-1		0.01			0.01
Total Sulphur Content	mg/kg		ASTM D5185		500			1
Corrosive Sulphur			DIN 51353	Not corrosive				Not corrosive
Potentially Corrosive Sulphur			IEC 62535	Not corrosive				Not corrosive
Corrosive Sulphur			ASTM D1275 B			Not corrosive	Not corrosive	Not corrosive
Breakdown Voltage Untreated	kV		IEC 60156	30				59
Breakdown Voltage After Treatment	kV		IEC 60156	70				75
Dielectric Breakdown Voltage as received@60 Hz, VDE, 1 mm gap	kV		ASTM D1816			20		36
Dielectric Breakdown Voltage after processing@60 Hz, VDE, 1 mm gap	kV		ASTM D1816			28		complies
Dielectric Breakdown Voltage, impulse	kV		ASTM D3300			145		288
Dielectric Dissipation Factor	@90°C	DDF	IEC 60247		0.005			0.001
Dielectric Dissipation Factor (Power Factor)	@25°C	DDF	ASTM D924				0.05	0.001
Dielectric Dissipation Factor (Power Factor)	@100°C	DDF	ASTM D924				0.3	0.001
Aniline Point	°C		ASTM D611			63		114
Interfacial Tension	@25°C	mN/m	ASTM D971			40		53
Gassing Tendency	mm ³ /min		IEC 60628 A	No general requirement				-5
Gassing Tendency	mm ³ /min		ASTM D2300				30	
Oxidation Stability	minutes		ASTM D2112			195		650
Oxidation Stability	500 hours @ 120°C		IEC 61125 C					Section 7.1 Limits
Total Acidity	mg KOH/g		IEC 61125 C		0.3			0.02
Sludge	%m		IEC 61125 C		0.05			0.05
Dielectric Dissipation Factor	@90°C	DDF	IEC 61125 C		0.05			0.001
Oxidation Stability			ASTM D2440					

Properties			Method	IEC 60296 Table 2 + section 7.1 limits minimum	IEC 60296 Table 2 + section 7.1 limits maximum	ASTM D3487 Table 1, type II minimum	ASTM D3487 Table 1, type II maximum	Shell Diala S4 ZX-IG Typical
sludge	72 h	% m	ASTM D2440				0.1	0.01
Total acid	72 h	mg KOH/g	ASTM D2440				0.3	0.01
Sludge	164 h	% m	ASTM D2440				0.2	0.01
Total acid	164h	mg KOH/g	ASTM D2440				0.4	0.01
Water content (drums and IBC)		mg/kg	IEC 60814		40			6
Water content (Bulk)		mg/kg	IEC 60814		30			6
Water content		mg/kg	ASTM D1533				35	7
2-Furfural and related compounds content		mg/kg	IEC 61198	Not detectable				complies
Metal passivator additives		mg/kg	IEC 60666	Not detectable				complies
Oxidation inhibitor content (DBPC)		% mass	IEC 60666	0.08	0.4	0.08	0.3	0.2
PCA Content		% mass	IP346		3			Complies
PCB content		mg/kg	IEC 61619	Not detectable				Complies

These characteristics are typical of current production. Whilst future production will conform to Shell's specification, variations in these characteristics may occur.

Health, Safety & Environment

Health and Safety

Shell Diala S4 ZX-IG is unlikely to present any significant health or safety hazard when properly used in the recommended application and good standards of personal hygiene are maintained.

Shell Diala S4 ZX-IG is free from polychlorinated biphenyls (PCB).

Avoid contact with skin. Use impervious gloves with used oil. After skin contact, wash immediately with soap and water.

Guidance on Health and Safety is available on the appropriate Safety Data Sheet, which can be obtained from <https://www.epc.shell.com>

Protect the Environment

Take used oil to an authorised collection point. Do not discharge into drains, soil or water.

Additional Information

Storage precautions

The critical electrical properties of Shell Diala are easily compromised by trace contamination with foreign material. Typically encountered contaminants include moisture, particles, fibres and surfactants. Therefore, it is imperative that electrical insulating oils be kept clean and dry.

It is strongly recommended that storage containers be dedicated for electrical service and include air-tight seals. It is further recommended that electrical insulating oils are stored indoors in climate-controlled environments.

Advice

Advice on applications not covered here may be obtained from your Shell representative.