



ZSCHIMMER & SCHWARZ

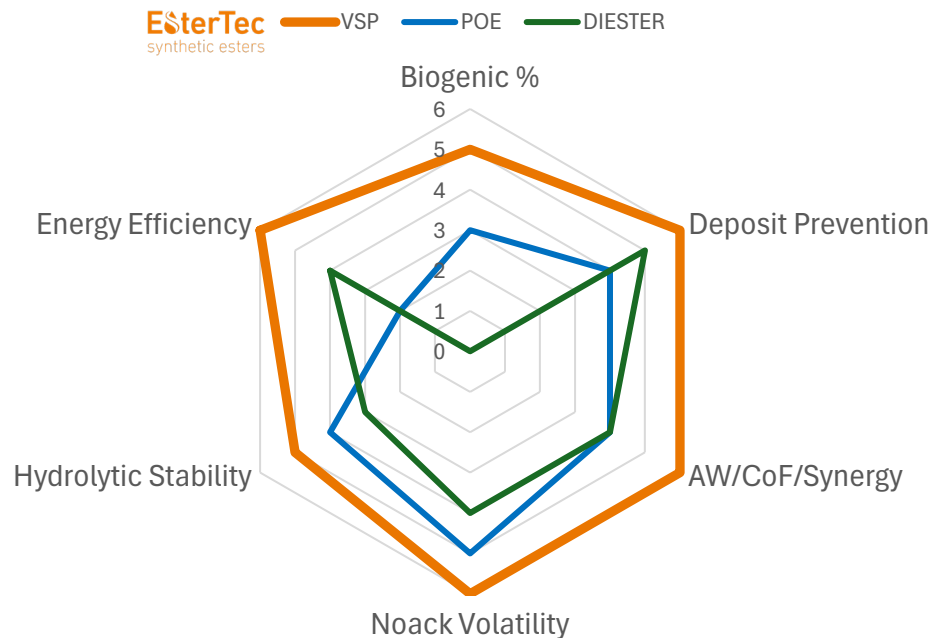
ZSCHIMMER & SCHWARZ GROUP – LUBRICANTS DIVISION

**Innovating
Collaborating
Introducing:**

EsterTec[®]
synthetic esters

August 26, 2026

Enhancing Your Formulation Toolbox with:



EsterTec[®]
synthetic esters

Performance Features

- ▶ Low Pour Point
- ▶ High Flash Point
- ▶ Low Foam Tendency
- ▶ Good Demulsibility
- ▶ Reduced sludge and deposits
- ▶ Not Corrosive to Copper
- ▶ Good Oxidative Stability
- ▶ Strong Dielectric Properties
- ▶ Good Thermal Conductivity
- ▶ Clear with Low Odor & Color



Performance Benefits

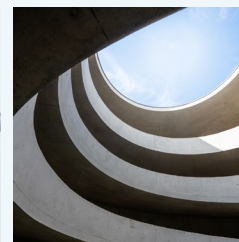
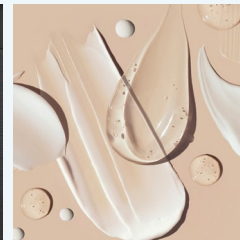
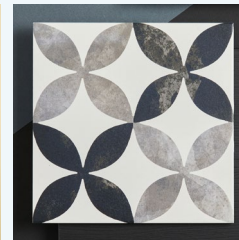
- ▶ Superior lubricity for reduced friction and enhanced wear protection
- ▶ Expand the temperature operating window
- ▶ Longer life due to best-in-class thermal, oxidative and hydrolytic stability
- ▶ High VI for fluid energy efficiency
- ▶ More cost effective than standard synthetic esters

Designed for:

- ▶ Engine oils and Driveline fluids with extended life
- ▶ Industrial Lubricant formulations that outperform mineral oil products
 - Hydraulic Fluids
 - Compressor Oils
 - Metalworking Fluids
 - Gear Oils
 - Circulating/Bearing Oils
- ▶ Dielectric fluid quality available

Z&S Business Divisions

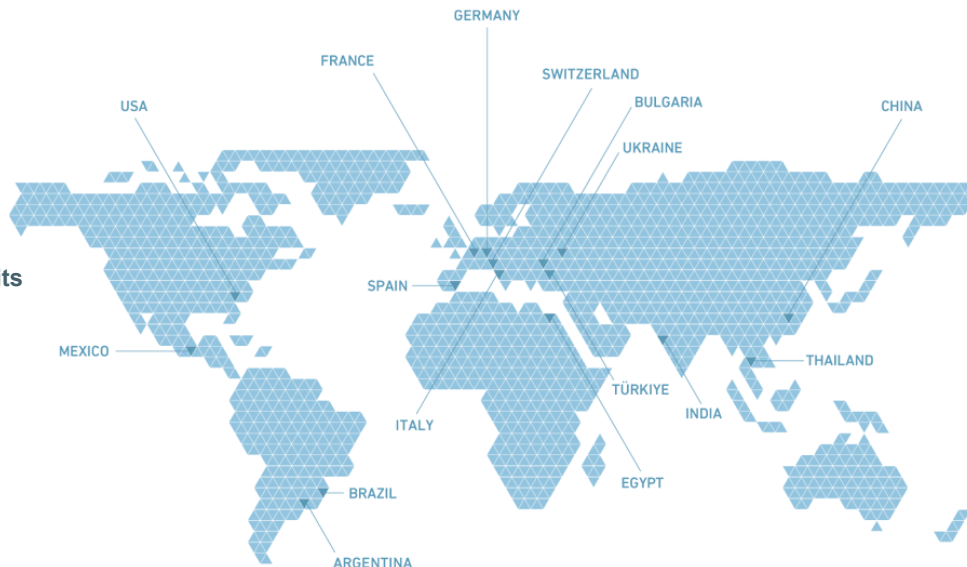
- ▶ Lubricants
- ▶ Leather Auxiliaries
- ▶ Fiber & Textile Auxiliaries
- ▶ Ceramic Auxiliaries
- ▶ Personal Care
- ▶ Cleaning Specialties
- ▶ Industrial Specialties



Zschimmer & Schwarz Group – Company Profile



28 subsidiaries
in 17 countries
on 5 continents
with 21 production units



-  Lubricant Components
-  Industrial Specialties
-  Fibre/Textile Auxiliaries
-  Personal Care
-  Ceramic Auxiliaries
-  Cleaning Specialties
-  Leather Auxiliaries



1894

Foundation of the
company in Chemnitz,
Germany

First in-house
production

1909



1959 - 2019

Rapid globalisation.
New company
headquarters in
Oberlahnstein.



Joining the United Nations
Global Compact

2021



2020-26

Z&S Commitment to Sustainability



EsterTec AT Lab Testing Capabilities – Ready to Support your Formulation Development Program

- ▶ High and low temperature viscosity, pour point.
- ▶ Flash and fire point
- ▶ Foam tendency, Air release, Demulsibility
- ▶ Oxidative stability with DSC, RPVOT
- ▶ Deposit formation with Pan test and Panel Coker test
- ▶ Volatility by TGA (NOACK) and VOC methods
- ▶ Hydrolytic stability
- ▶ Copper corrosion
- ▶ Friction, Wear and Extreme Pressure measurements
- ▶ Material compatibility, seal swell testing
- ▶ Dielectric properties
- ▶ Thermal Conductivity



Introduction to VSP synthetic ester technology

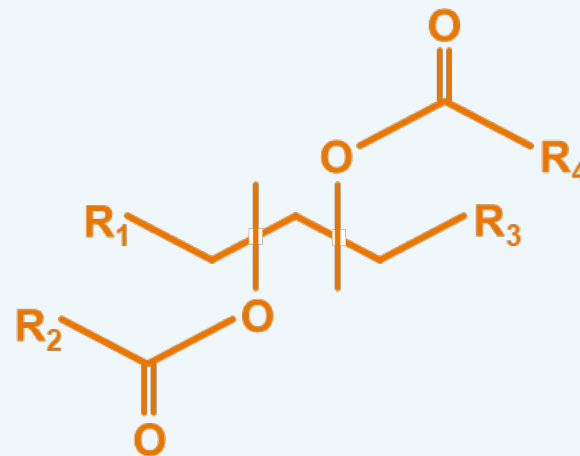
EsterTec
synthetic esters



A New Ester Technology Is Now Available

- ▶ Novel structure, unique production process
- ▶ Based on standard raw materials that are globally and readily available commodities
- ▶ High stability vicinal ester molecular positioning
- ▶ Steric hindrance that improves oxidative stability
- ▶ Secondary alcohols on adjacent carbons improve hydrolytic stability

“VSP” Synthetic Esters with Improved Performance



VSP Molecular Structure

A Novel Molecular Technology Platform. Exceptional Performance in a Wide Viscosity Range

Product Name	ESTERTEC 2N-1416	ESTERTEC 2LN-1418	ESTERTEC 2L-1425	ESTERTEC 2G-1432	ESTERTEC 7GX-1446	ESTERTEC 7GX-1468	ESTERTEC 7GX-14100	ESTERTEC 8LX-14150
KV100, cSt	3.6	4.1	5	7	9	11	14	18
KV40, cSt	16	18	25	32	46	68	100	150
Viscosity Index	115	125	140	180	165	155	140	130
Pour Point, °C	-60	-40	-25	-42	-40	-40	-35	-30
Density	0.895	0.893	0.890	0.890	0.900	0.915	0.925	0.935
NOACK volatility, %	9	7	3	1	1	1	1	1
Biogenic Content, %	64	65	70	74	60	50	40	30
Oxidative Stability	☑	☑	☑	☑	☑	☑	☑	☑
Hydrolytic Stability	☑	☑	☑	☑	☑	☑	☑	☑
Friction/Wear Reduction	☑	☑	☑	☑	☑	☑	☑	☑
Deposit Tendency	☑	☑	☑	☑	☑	☑	☑	☑
Energy Efficiency Advantage	☑	☑	☑	☑	☑	☑	☑	☑
Cost/Performance Advantage	☑	☑	☑	☑	☑	☑	☑	☑

EsterTec® 2N-1416

Performance Data

Ester Class		VSP	Diester				Polyol Ester		Glyceryl Ester	PAO
	Test Method	EsterTec 2N-1416	DIDA	DINA	DIOA	DOA	TMP C7/8/10	TMP-C7	C8/10	PAO 3.6
KV100, cSt	ASTM D7042	3.6	3.6	3.1	2.7	2.3	4.0	3.4	4.0	3.6
KV40, cSt	ASTM D7042	16	14	11	9	8	18	14	15	15
Pour Point, °C	ASTM D5950	-60	-60	-60	-60	-50	-65	-65	-15	-60

Density	ASTM D4052	0.896	0.920	0.923	0.930	0.925	0.950	0.963	0.950	0.82
EsterTec Density Advantage	Δ	---	2.6%	2.9%	3.7%	3.1%	5.7%	7.0%	5.7%	---

4-Ball Wear, mm*	ASTM D4172	0.52	0.84	0.79	0.89	1.00	0.74	0.65	0.69	0.84
Wear Protection Advantage**	Δ	---	59%	55%	63%	69%	50%	37%	44%	59%

Coefficient of Friction*	ASTM D4172	0.167	0.208	0.221	0.247	0.223	0.183	0.217	0.196	---
CoF Advantage, %	Δ	---	25%	32%	48%	34%	10%	30%	17%	---

Noack Volatility, weight % loss	ASTM D6375	9%	15%	19%	26%	32%	5%	10%	8%	13-17%
---------------------------------	------------	----	-----	-----	-----	-----	----	-----	----	--------

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

EsterTec® 2LN-1418

Performance Data

Ester Class		VSP	Diester	Polyol Ester				Glyceryl	PAO
	Test Method	EsterTec 2LN-1418	DIDA	TMP-C9	TMP C8/10	NGDC	TMP C7/8/10	C8/10	PAO 4.1
KV100, cSt	ASTM D7042	4.1	3.6	4.6	4.4	4.0	4.0	4.0	4.1
KV40, cSt	ASTM D7042	18	14	21	20	18	18	15	18
Pour Point, °C	ASTM D5950	-40	-60	-50	-40	0	-65	-15	-65
Density, g/ml	ASTM D4052	0.893	0.92	0.94	0.94	0.90	0.95	0.95	0.82
Density Advantage	Δ	---	2.9%	5.0%	5.0%	0.8%	6.0%	6.0%	---
4-Ball Wear, mm*	ASTM D4172	0.50	0.84	0.77	0.65	0.72	0.74	0.69	0.82
Wear Protection Advantage**	Δ	---	63%	57%	43%	52%	55%	49%	60%
Coefficient of Friction*	ASTM D4172	0.175	0.208	0.215	0.173	0.191	0.183	0.196	---
CoF Advantage, %	Δ	---	19%	23%	-1%	9%	5%	12%	---
Noack Volatility, weight % loss	ASTM D 6375	7%	15%	3%	6%	12%	5%	8%	10 – 14%

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

EsterTec® 2G-1432

Performance Data

Ester Class		VSP	Diester	Polyol Ester					PAO
	Test Method	EsterTec 2G-1432	DTDA/1	TMP-TO	PE 4810	NGDO	PE C7/9	TMP C8/10	PAO 7
KV100, cSt	ASTM D7042	7.0	5.4	9.4	6.1	5.8	5.0	4.4	7
KV400, cSt	ASTM D7042	32	27	46	32	24	25	20	39
Pour Point, °C	ASTM D5950	-42	-60	-40	-5	-30	-55	-40	-43
Density, g/ml	ASTM D4052	0.890	0.915	0.917	0.96	0.903	0.985	0.94	0.83
EsterTec Density Advantage	Δ	---	2.7%	2.9%	7.3%	1.4%	9.6%	5.3%	---
4-Ball Wear, mm*	ASTM D4172	0.63	0.75	0.77	0.58	0.72	0.81	0.65	0.80
Wear Protection Advantage**	Δ	---	27%	30%	-18%	21%	35%	6%	33%
Coefficient of Friction*	ASTM D4172	0.182	0.210	0.246	0.168	0.201	0.204	0.173	---
CoF Advantage, %	Δ	---	15%	35%	-8%	10%	12%	-5%	---
Noack Volatility, weight % loss	ASTM D6375	1%	7%	1%	1%	5%	5%	4%	5 – 6%

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

EsterTec® 7GX-1446

Performance Data

Ester Class		VSP	Polyol Ester			Aromatic	PAO
	Test Method	EsterTec 7GX-1446	TMP+C18	PE + C5/9	PE+2EH	Trimellitate	PAO-8
KV100, cSt	ASTM D7042	9	9	7	6	8	8
KV40, cSt	ASTM D7042	46	46	46	46	50	48
Pour Point, °C	ASTM D5950	-40	-40	-40	-15	-50	-48

Density, g/ml	ASTM D4052	0.900	0.915	0.970	0.980	0.970	0.83
EsterTec Density Advantage	Δ	---	1.6%	7.2%	8.2%	7.2%	---

4-Ball Wear, mm*	ASTM D4172	0.61	0.77	0.89	0.95	0.99	0.74
Wear Protection Advantage**	Δ	---	34%	47%	52%	55%	30%

Coefficient of Friction*	ASTM D4172	0.178	0.218	0.227	0.235	0.257	---
CoF Advantage, %	Δ	---	22%	28%	32%	44%	---

Noack Volatility, weight % loss	ASTM D6375	1.5%	3%	3%	6%	4%	3 – 4%
---------------------------------	------------	------	----	----	----	----	--------

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

EsterTec® 7GX-1468

Performance Data

Ester Class		VSP	Polyol Ester			
	Test Method	EsterTec 7GX-1468	PE+C18	DPE + C5/10	PE+C5/9	Complex
KV100, cSt	ASTM D7042	11	12	10	8.6	11
KV40, cSt	ASTM D7042	68	67	68	68	68
Pour Point, °C	ASTM D5950	-40	-20	-40	-30	-15

Density	ASTM D4052	0.915	0.926	0.990	0.960	0.98
EsterTec Density Advantage	Δ	---	1%	8.2%	4.9%	7.1%

4-Ball Wear, mm*	ASTM D4172	0.73	0.69	0.82	0.95	0.89
Wear Protection Advantage**	Δ	---	-10%	17%	34%	27%

Coefficient of Friction*	ASTM D4172	0.178	0.184	0.212	0.207	0.243
CoF Advantage, %	Δ	---	39%	42%	33%	36%

Noack Volatility, weight % loss	ASTM D6375	<1%	<1%	2%	4%	1%
---------------------------------	------------	-----	-----	----	----	----

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

EsterTec[®] 7GX-14100

Performance Data

Ester Class		VSP	Polyol Ester		
	Test Method	EsterTec 7GX-14100	DPE+C18	DPE + C5/9	Complex
KV100, cSt	ASTM D7042	14	18	12	14
KV40, cSt	ASTM D7042	100	110	100	100
Pour Point, °C	ASTM D5950	-35	-25	-35	-30
Density, g/ml	ASTM D4052	0.925	0.930	0.990	0.950
EsterTec Density Advantage	Δ	---	0.5%	6.6%	2.6%
4-Ball Wear, mm*	ASTM D4172	0.78	0.85	0.82	0.87
Wear Protection Advantage**	Δ	---	13%	8%	16%
Coefficient of Friction*	ASTM D4172	0.198	0.205	0.222	0.220
CoF Advantage, %	Δ	---	4%	12%	11%
Noack Volatility, weight % loss	ASTM D6375	1%	1%	1%	1%

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

EsterTec® 8LX-14150

Performance Data

Ester Class		VSP	Polyol Ester		
	Test Method	EsterTec 8LX-14150	DPE+C5/9	DPE + C5/12	Complex
KV100, cSt	ASTM D7042	18	18	19	20
KV40, cSt	ASTM D7042	150	160	170	150
Pour Point, °C	ASTM D5950	-30	-30	-25	-30
Density, g/ml	ASTM D4052	0.935	0.980	0.970	0.962
EsterTec Density Advantage	Δ	---	4.8%	3.7%	2.9%
4-Ball Wear, mm*	ASTM D4172	0.80	0.90	0.88	0.85
Wear Protection Advantage**	Δ	---	17%	14%	9%
Coefficient of Friction*	ASTM D4172	0.180	0.246	0.232	0.200
CoF Advantage, %	Δ	---	37%	29%	11%
Noack Volatility, weight % loss	ASTM D6375	<1%	<1%	<1%	<1%

*40kg load, 1200 rpm, 75C, 52100 steel, 1 hour

**Considering the Hertzian contact diameter of 0.3mm

Hydrolytic Stability, ISO 15 – 150 Viscosity Grades

ESTERTEC VSP DEMONSTRATES BEST-IN-CLASS HYDROLYTIC STABILITY COMPARED TO DIESTERS, POLYOL ESTERS AND PAO

All esters compared with no inhibitor or passivation additives

ASTM D2619	ESTERTEC 2N-1416	ESTERTEC 2G-1432	ESTERTEC 8LX-14150	NGDO	DIOA	DTDA/1	PE C7/9	TMP C8/10	Pass/Fail*
Oil Tan Δ, mg KOH/g	0.01	0.01	0.12	2.90	0.16	0.05	0.10	0.05	<0.2
Water Layer Acidity, mg KOH	0.84	0.56	0.28	18.0	3.47	3.75	1.65	1.26	<5.0
Copper Corrosion Rating, ASTM D130	1b	1b	1b	2	1b	1b	1b	1b	<2

Rating Scale:
0-2 = HIGH
2-5 = MED
>5 = LOW



*Typical limits for a formulated lubricant



ZSCHIMMER & SCHWARZ

THANK YOU

zslubes.com

estertec.com