

Skydrol™ aviation hydraulic fluids

Formulated to meet the changing demands of the aviation industry



EASTMAN

aviation solutions

 **SKYDROL**
HYDRAULIC FLUIDS
from eastman



Before the invention of Type V hydraulic fluids, the aviation market offered three fluids, each approved by every manufacturer. With multiple phosphate ester fluids now available, airlines have more options than ever before when it comes to optimizing fluid use to best meet the needs of their fleets.

In some cases, one fluid can provide optimal operation for all aircraft in the fleet. However, use of two or even three different fluids to reach peak performance across a fleet is more common today. With more than 100 years of combined industry experience among Eastman's technical services team members, we are uniquely able to provide personalized expertise to support your fluid selection.

The Eastman advantage

Sample analysis program

- Complimentary sample bottle kits ease the process, assuring clean and safely transported samples.
- Testing is performed at company-operated labs which use methods custom designed for phosphate ester hydraulic fluids.
- Helpful analysis reports include recommendations to improve your operations and data that other fluid analysis labs don't offer.
- Fluid analysis results are reviewed by Eastman technical experts.
- This is offered at no cost to Skydrol customers, including our distributors' customers.
- MySkydrol site offers convenient access to tools, including sample kit order forms, sample results, and fleet analysis. Visit Eastman.com/MySkydrol.

Technical expertise

- Dedicated aviation hydraulic fluid experts skilled at solving customer problems
- Answers to questions specific to your fleets' systems
- Innovative fluid development laboratory, advancing the science of fire-resistant hydraulic fluids
- Root-cause analysis supported by our expert staff of research scientists



What's the right Skydrol fluid(s) for your fleet?

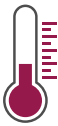
Skydrol™ PE-5 aviation hydraulic fluid

World's best-selling Type V aviation hydraulic fluid

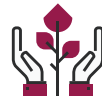
Key benefits



Reduced maintenance and increased performance—longest fluid life of any phosphate-ester fluid under high-moisture, low-moisture, high-temperature, and mild-temperature conditions



Faster cold starts—ideal combination of density (specific gravity) and low-temperature viscosity, allowing up to 25% better hydraulic system efficiency



Reduced waste—longer fluid life reduces volume for disposal as waste

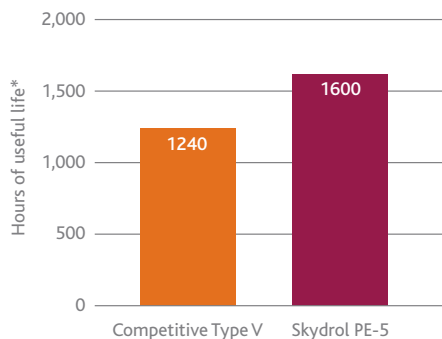


System reliability—offers erosion protection at 3000 and 5000 psi, allowing decreased maintenance and downtime



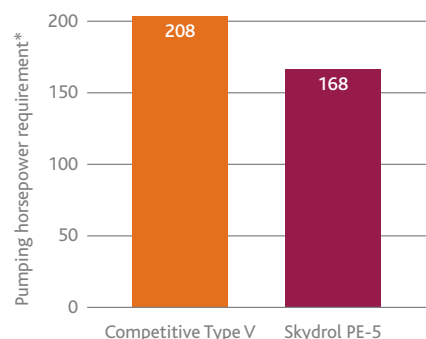
Compatible with your fleet—normal fluid top-up for conversion and fully compatible with existing Type IV and V fluids

Longest fluid life



*Fluid tested @ 257°F (125°C) and 0.5% H₂O, laboratory conditions

Low-temperature performance



*At -65°F (-54°C) viscosity



Skydrol™ 5 aviation hydraulic fluid

Lighter weight and the first Type V fluid on the market

Key benefits



Fuel savings—lowest-density phosphate ester hydraulic fluid, offering weight reductions



Paint compatibility—less aggressive toward aircraft paints



System reliability—higher-temperature capability than Type IV fluids, offering thermal stability and erosion resistance



Fire resistance—improved fire resistance over Type IV fluids in spray ignition tests

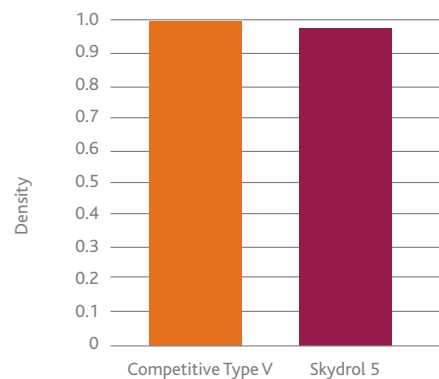


Safety—new base stock reduces potential health concerns.

Most phosphate ester products use tributyl phosphate as a major ingredient, but Skydrol 5 has a unique formulation built on a new base stock, triisobutyl phosphate. This makes Skydrol 5 the lightest weight of any phosphate ester hydraulic fluid, allowing weight savings on the plane and fuel savings for the bottom line.

Airframe manufacturers and operators are becoming more conscious of the benefits of weight savings in today's competitive environment. Skydrol 5 sets a new standard as the lowest-density phosphate ester-based hydraulic fluid. The use of Skydrol 5 can translate into 5 to 120 lb of weight savings, depending on the aircraft model, directly leading to reduced fuel burn.

Lower density equates to weight reductions





Skydrol™ LD-4 aviation hydraulic fluid

World's best-selling Type IV aviation hydraulic fluid

Key benefits



System reliability—high-temperature capability offers thermal stability and erosion protection in valves.



Proven formulation—reputation as the premier aviation hydraulic fluid, with no change in formulation since its inception more than 35 years ago



Skydrol™ 500B-4 aviation hydraulic fluid

Longest service history in phosphate ester products

Key benefits



Proven track record—longest service history among phosphate ester fluids



Less irritating—only commercially available standard-density fluid favored for its lower irritation potential, making it the most user-friendly aviation phosphate ester



System reliability—contains the same breakthrough anti-erosion additive and acid scavenger found in Skydrol LD-4

Which hydraulic fluids are approved for your fleet?

Manufacturer	Skydrol PE-5	Skydrol 5	Skydrol LD-4	Skydrol 500B-4
Airbus ¹	✓		✓	✓
Antonov (An-148 and 158)			✓	
ATR	✓		✓	✓
Beriev (Be-200)			✓	
Boeing ²	✓	✓	✓	✓
Bombardier ³			✓	✓
British Aerospace			✓	✓
Cessna		✓	✓	✓
COMAC	✓		✓	
Embraer	✓		✓	✓
Fokker		✓	✓	✓
Gulfstream ⁴	✓	✓	✓	✓
Ilyushin (IL-86 and 96)			✓	
Lockheed		✓	✓	✓
McDonnell Douglas Corp.	✓	✓	✓	✓
Mitsubishi			✓	
SAE International	✓	✓	✓	✓
Irkut Sukhoi Superjet			✓	
Tupolev (Tu-204 and Tu-214)			✓	

¹Skydrol 500B-4 is not approved in A320NEO family. Skydrol 500B-4 and LD-4 are not approved in A350 or A380. All Skydrol fluids, including Skydrol 5, are approved in A220.

²Skydrol hydraulic fluids are not approved in B787.

³Skydrol 500B-4 is not approved in Global Express.

⁴Skydrol 5 and Skydrol 500B-4 are not approved in G6 series.



What physical properties does your fleet require in a hydraulic fluid?

Property	Units	Skydrol PE-5	Skydrol 5	Skydrol LD-4	Skydrol 500B-4	Test method
Viscosity -65°F/-54°C 100°F/38°C 210°F/99°C	cSt	1068 9.75 3.38	2085 9.23 3.13	1164 11.10 3.91	2678 11.67 3.84	ASTM D445
Pour point	°F °C	<-80 <-62	<-80 <-62	<-80 <-62	<-80 <-62	ASTM D97
Specific gravity @ 25°C	°C	0.996	0.977	1.011	1.056	Eastman 116-B
Density @ 25°C	g/cc lb/gal	0.9927 8.284	0.9737 8.126	1.0080 8.412	1.0532 8.789	Eastman 116-B
Acid number	mg KOH/g	0.03	0.03	0.03	0.03	ASTM D974
Moisture content	%w/w	0.07	0.07	0.07	0.07	ASTM D1744
Foaming Sequence 1 Sequence 2 Sequence 3	mL, sec	109, 53 54, 30 157, 59	79, 30 57, 32 81, 32	50, 25 10, 5 40, 20	100, 35 20, 15 110, 40	ASTM D892-63
Particle count		AS4059 Class 7 or better				SAE ARP598
Specific heat 38°C 93°C 120°C 149°C	cal/g/°C	0.453 — 0.461 —	0.402 0.437 — 0.472	0.437 0.472 — 0.507	0.418 0.453 — 0.487	ASTM D2766
Thermal conductivity 100°F 200°F 300°F	cal/(sec·cm·°C)	0.000344 0.000289 0.000263	0.000283 0.000259 0.000246	0.000326 0.000298 0.000277	0.000315 0.000299 0.000278	ASTM D2717
Surface tension @ 25°C	dynes/cm	29.4	—	28.2	26.7	Du Noüy balance
Heat of combustion	BTU/lb	13,291	13,100	13,700	13,400	ASTM D240
Bulk modulus	psi	235,000	210,000	231,000	242,000	BMS3-11
Four-ball wear test 4 kg 10 kg 40 kg	mm	0.30 0.41 0.65	0.20 0.46 0.77	0.33 0.43 0.69	0.36 0.45 0.68	ASTM D4172

Fire-resistance properties

Property	Units	Skydrol PE-5	Skydrol 5	Skydrol LD-4	Skydrol 500B-4	Test method
Flash point	°F/°C	339/171	331/166	346/174	366/186	ASTM D92
Fire point	°F/°C	376/191	362/183	360/182	410/210	ASTM D92
AIT	°F/°C	796/424	871/466	877/469	957/514	ASTM D2155
Hot manifold drip		Does not burn in tray	Does not burn in tray	Does not burn in tray	Does not burn in tray	AMS 3150C
High-pressure spray		Will not ignite	Will not ignite	Will not ignite	Will not ignite	AMS 3150C
Low-pressure spray		No increase	No increase	No increase	No increase	AMS 3150C
Wick flammability		>40 cycles	>40 cycles	>40 cycles	>40 cycles	AMS 3150C

These data are based on samples tested in the laboratory and are not guaranteed for all samples. Contact us for complete sales specifications. Does not constitute an express warranty. See disclaimer on the back of this bulletin.

If you'd like help selecting the best fluid for your fleet, contact your Eastman aviation representative or contact us at Eastman.com/Aviation.



EASTMAN

The results of insight™

Eastman Corporate Headquarters

P.O. Box 431
Kingsport, TN 37662-5280 U.S.A.

U.S.A. and Canada, 800-EASTMAN (800-327-8626)
Other Locations, +(1) 423-229-2000

www.eastman.com/locations

Although the information and recommendations set forth herein are presented in good faith, Eastman Chemical Company ("Eastman") and its subsidiaries make no representations or warranties as to the completeness or accuracy thereof. You must make your own determination of its suitability and completeness for your own use, for the protection of the environment, and for the health and safety of your employees and purchasers of your products. Nothing contained herein is to be construed as a recommendation to use any product, process, equipment, or formulation in conflict with any patent, and we make no representations or warranties, express or implied, that the use thereof will not infringe any patent. NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS AND NOTHING HEREIN WAIVES ANY OF THE SELLER'S CONDITIONS OF SALE.

Safety Data Sheets providing safety precautions that should be observed when handling and storing our products are available online or by request. You should obtain and review available material safety information before handling our products. If any materials mentioned are not our products, appropriate industrial hygiene and other safety precautions recommended by their manufacturers should be observed.

© 2020 Eastman. Eastman brands referenced herein are trademarks of Eastman or one of its subsidiaries or are being used under license. The ® symbol denotes registered trademark status in the U.S.; marks may also be registered internationally. Non-Eastman brands referenced herein are trademarks of their respective owners.