



PRODURO™ TO-4+ TRANSMISSION/DRIVE TRAIN OILS (TDTO)

Introduction

PRODURO™ TO-4+ Oils are premium heavy duty transmission/drive train oils designed to meet the Caterpillar TO-4 lubricant specification. These exceptional formulations maximize the life of the frictional materials in Caterpillar powershift transmissions, eliminate the chatter in wet brake mechanisms and protect drive train gears against wear. The PRODURO product line is specially formulated with Petro-Canada's 99.9% pure HT base oils and high performance additives.

PRODURO TO-4+ is available in the following viscosity grades: SAE 10W, SAE 30, SAE 50, and SAE 60.

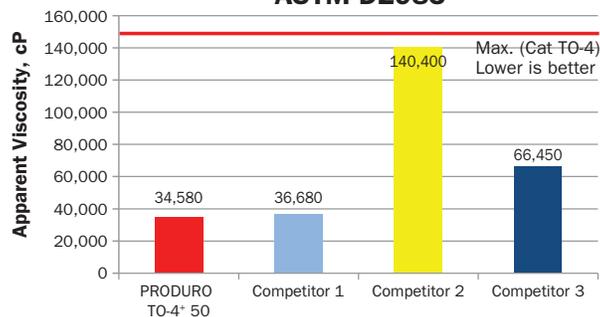
Some of these PRODURO TO-4+ grades go beyond traditional TO-4 fluids as they can meet multi-grade specifications. Because they provide reliable performance over a wider range of temperatures, components will operate under optimal viscosity longer, resulting in better protection and less wear.

PRODURO TO-4+ SAE	ALSO SUITABLE FOR CAT TO-4
10W	5W
30	15W
50	-
60	-

Features and Benefits

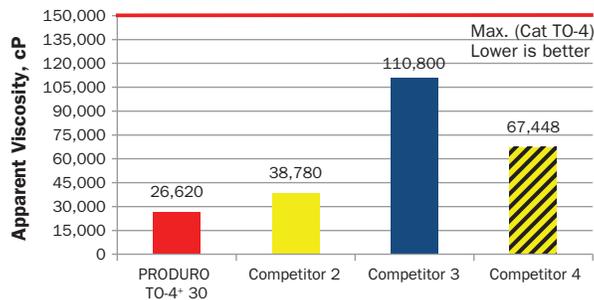
- **Better Protection**
 - Multigrade performance provides wider ambient and operating temperature ranges for optimal viscosity to better prevent wear

Brookfield Viscosity (-15°C) ASTM D2983



PRODURO TO-4+ 50 demonstrates excellent fluidity and low temperature flow as a Mono-grade SAE 50. The lower the Apparent Viscosity, the better the low temperature flow performance.

Brookfield Viscosity (-25°C) ASTM D2983



PRODURO TO-4+ 30 demonstrates excellent fluidity and low temperature flow as a Mono-grade SAE 30. The lower the Apparent Viscosity, the better the low temperature flow performance.

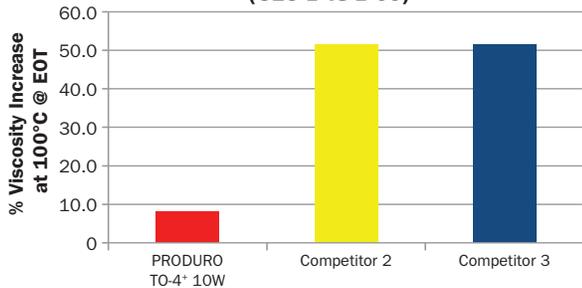
What is the HT difference?

Petro-Canada Lubricants starts with the HT purity process to produce water-white, 99.9% pure base oils. The result is a range of lubricants, specialty fluids and greases that deliver maximum performance for our customers.



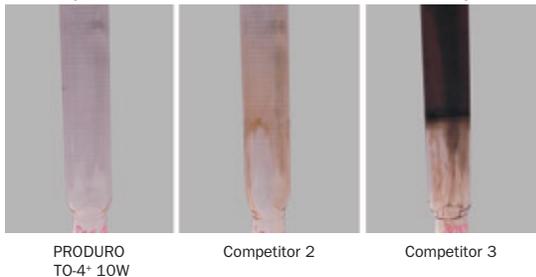
- Outstanding resistance to oil breakdown. Extends component life by minimizing deposit build-up and keeping fresh oil properties for extended periods of time
- Leading edge formulations significantly improves wear properties over oils in transmissions and gears

DKA Oxidation Test, 170°C-192h (CEC L-48-B-00)



PRODURO TO-4+ 10W showed one of the best results on oxidation control with just 8% viscosity increase at end of test (EOT). The lower the result, the better the performance for possible extended drain potential.

Pictures showing the level of sludge/deposits formed in the test tubes at EOT (CEC L-48-B-00 at 170°C for 192 hours)



DKA Test is used as an indication of resistance of the oil to high temperature oxidation.

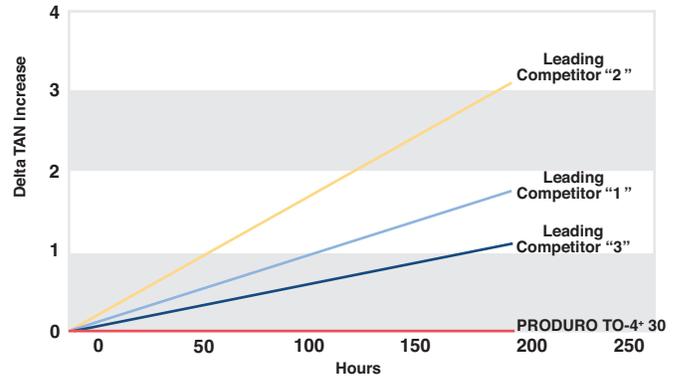
The combination of Petro-Canada Lubricants base oils and the selection of the right additives gives PRODURO TO-4+ 10W excellent thermo-oxidation stability prolonging the life of the oil and equipment parts.

- Minimizes wear in high pressure hydraulic pump systems

Longer Oil Life

- Outstanding resistance to oil degradation due to the advanced formulations that contains 99.9% pure Petro-Canada base stocks

DKA Oxidation Test, 160°C-192 hrs (CEC L-48-B-00)



In the DKA oxidation test, product performance is measured by how much the acidity of the oil (TAN) increases over time (therefore the flatter the line the better.) Compared to the leading competitors, Petro-Canada's PRODURO TO-4+ 30 advanced formulation resists oil degradation best.

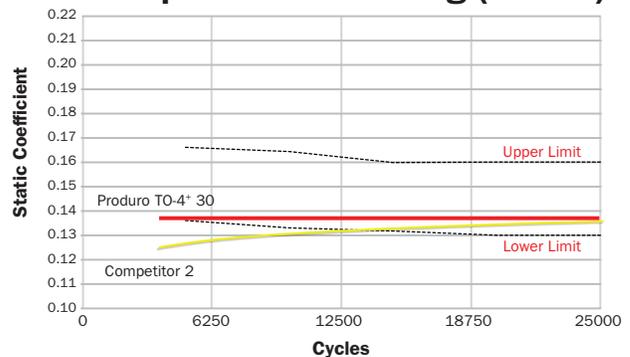
Smoother Operation

- Oil formulation carefully balances lubricity and functional properties
- Operation of powershift clutches and wet brake mechanisms optimized
- Minimizes clutch plate wear and brake chatter

Lower Operational Costs

- Reduces maintenance costs
- Increases reliability
- Increases equipment availability

Static Coefficient vs. Test Cycles Caterpillar VC-70 Testing (FRRET)



From the Caterpillar VC-70 Testing, Petro-Canada Lubricants' PRODURO TO-4+ 30 meets the Static Coefficient requirements using one common Friction material found in Caterpillar equipment and within the Caterpillar TO-4 Specification (Friction Sequence FRRT). The Competitor 2 using a different chemistry, fails to meet the minimum Static Coefficient limit to at least 15000 cycles.

Static Frictional Coefficient above the Caterpillar minimum requirement limit is better, as the friction plates will engage properly, reducing slippage, wear, heat generation and increasing potential stopping power in wet brake applications and transferring of power to the wheels for efficiency. Please note that all products meet the Dynamic Coefficient bands for the same frictional material.

Applications

PRODURO™ TO-4+ transmission/drive train oils (TDTO) are designed for use in Caterpillar off-highway vehicles. They are formulated to meet the Caterpillar TO-4 specification, Caterpillar TO-2 (obsolete), API GL-3 for Gear (obsolete), Allison C-4 for Transmission (obsolete), API CD for Diesel Engine (obsolete) and Eaton/Vickers (M-2950/I-280-S).

PRODURO TO-4+ Oils are recommended for use in hydraulics, manual transmissions and drive lines, where a TO-4 oil is recommended. Other OEM's Specifications include Dana Power shift, Tremac, Euclid, Komatsu's KES 07.868.1, Komatsu-Dresser, Komatsu microclutch transmission oil specification and ZF's TE-ML 03C (SAE 10W-and SAE 30) and TE-ML 07F (SAE 30) classification.

PRODURO TO-4+ (30,50,and 60 grades) are suitable for use in Eaton Manual transmissions under the standard drain category as quoted in Eaton TCM T0021EN-US.

PRODURO TO-4+ (TDTO) Fluids are recommended for the following Caterpillar vehicle systems:

- Powershift and Hydrostatic Transmissions⁴
- Wet Brake Mechanisms
- Differentials and Final Drives
- Hydraulics

For components requiring a Caterpillar FD-1 oil, Petro-Canada Lubricants recommends the PRODURO FD-1 product line. Consult the latest Caterpillar SEBU 6250 for applicable applications.

Grade Selection

APPLICATION	PRODURO TO-4+			
	10W ⁴	30	50	60
Powershift Transmissions ⁴ , °C (°F)	-21 (-6) to +10 (+50)	-9 (+16) to +35 (+95)	+5 (+41) to +37 (+98.6)	Not recommended
Hydrostatic Transmissions ⁴ , °C (°F)	-20 (-4) to +40 (+104)	+5 (+41) to + 50 (+122)	N/A	N/A
Final Drives On-Highway ² , °C (°F)	-30 (-22) to 0 (+32)	-25 (-13) to +25 (+77)	-18 (0) to +50 (+122)	-11 (+12.2) to +55 (+131)
Final Drives Off-Highway ³ , °C (°F)	-30 (-22) to -10 (+14)	-25 (-13) to +15 (+59)	-18 (0) to +34 (+93)	-11 (+12.2) to +55 (+131)
Hydraulics, °C (°F)	-25(-13) to +50 (+122)	-15 (+5) to +50 (+122)	N/A	N/A
Output Transfer Gears	-32 (-26) to +30 (+86)	-20 (-4) to +50 (+122)	N/A	N/A
Powershift Transmissions (797)	Not recommended	-9 (16) to +50 (+122)	+3 (+37) to +55 (+131)	N/A
Hydraulic Systems (M Series Motor Graders)	-5 (+23) to +40 (+104)	+10 (+50) to +50 (+122)	N/A	N/A
Track Roller Fram Recoil Spring/ Pivot Shaft Bearing	-32 (-26) to +0 (+32)	-22 (-8) to +25 (+77)	+3 (+37) to +50 (+122)	+3 (+37) to +52 (+126)
Drive Axles (Small /Med)	-27 (-17) to +15 (+59)	-22 (-8) to +43 (+109)	+3 (+41) to +50 (+122)	N/A
Drive Axles (Large)	-27 (-17) to +0 (+32)	-22 (-8) to +20 (+68)	-18 (0) to +43 (+109)	-7 (+19) to +52 (+126)
Starting Engine Transmissions	-32 (-26) to +20 (+68)	-12 (+10) to +25 (+77)	N/A	N/A
Variable pitch fans	Not recommended	-17 (+1) to +25 (+77)	-12 (+10) to + 52 (+126)	Not recommended
Backhoe Loaders (Rear Axles)	Not recommended	-27 (-17) to +40 (+104)	+3 (+41) to +52 (+126)	+8 (+46) to +55 (+131)

Note: Ambient temperature range in °C (°F)

¹Caterpillar models 768C, 769C, -10°C to 22°C (-40°F to 72°F)

²Wheeled vehicles e.g. tractors, loaders, skidders, compactors and off-highway trucks

³Tracked vehicles e.g. tractors, pipelayers, skidders and loader

⁴Refer to "Caterpillar Machine Fluids Recommendations" service publication SEBU 6250 (Most Recent Version) for more specific information.

Typical Performance Data

PROPERTY	TEST METHOD	PRODURO™ TO-4+			
		10W	30	50	60
Density @ 15°C, kg/l	D4052	0.856	0.873	0.888	0.8950
Flash Point, °C (°F)	D92	239 (462)	259 (498)	257 (495)	253 (487)
Viscosity cSt @ 40°C (SUS @ 100°F) cSt @ 100°C (SUS @ 210°F)	D445	35.4 (181) 6.3 (47)	88.5 (459) 11.0 (64)	213.9 (1104) 18.3 (94)	368.9 (1980) 26.4 (133)
Viscosity Index	D2270	128	110	96	96
Brookfield Viscosity, cP @ °C (°F)	D2983	48,100 @ -35 (-31)	80,200 @ -26 (-15)	33,780 @ -15 (+5)	36,960 @ -10 (+14)
Cold Cranking Viscosity, cP @ °C (°F)	D5293	5,219 @ -25 (-13)	10,433 @ -20 (-4)	11,800 @ -10 (+14)	12,909 @ -5 (+23)
Borderline Pumping Viscosity cP @ °C (°F)	D4684	13,967 @ -25 (-13)	9,892 @ -20 (-4)	27,069 @ -15 (+5)	
Pour Point, °C (°F)	D5950	-33 (-27)	-27 (-17)	-30 (-22)	-24 (-11)
Zinc, % wt	D4951	0.12	0.13	0.13	0.12
Calcium, % wt	D4951	0.30	0.31	0.31	0.31
Phosphorus, % wt	D4951	0.10	0.12	0.11	0.11
Sulfated Ash	D874	1.00	1.34	1.13	1.22
Foaming 1	D892	0/0	0/0	20/0	20/0
2		15/0	0/0	20/0	20/0
3		0/0	0/0	0/0	0/0
TBN	D2896	7.80	8.40	8.60	8.80

The values quoted above are typical of normal production. They do not constitute a specification.

To order product or to learn more about how Petro-Canada Lubricants can help your business visit: lubricants.petro-canada.com or contact us at: lubecsr@petrocanadalsp.com



IM-7857E (2019.03)

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