
NOTICE

The Cat CD/TO-2 transmission/drive train oil specification has been obsolete since 1990. The obsolete CD/TO-2 specification is tied ONLY to the also obsolete API CD oil category. The "TO-2" oil specification existed only as CD/TO-2. Specification claims of CF/TO-2, ATF/TO-2, Cat TO-2 and other similar "TO-2" claims are not accurate. Caterpillar does not monitor or support the obsolete Cat CD/TO-2 specification. Use of CD/TO-2 oils, or the use of oils claiming to meet "TO-2" in machine compartments where Cat TO-4 specification oils are required is NOT recommended and their use is at the user's risk.

Applications

Transmission/Drive Train oils are recommended for use in Powershift Transmissions, certain Direct Drive Transmissions, certain Final Drives, Differentials and Final Drives, Drive Axles, Transfer Drives, hydrostatic drive/hydraulic and certain Electric Drive systems of various machines.

The details of the applications of Transmission/Drive Train oils are given in the "Lubricant Viscosity" section of this Special Publication.

Cat TDTO (Transmission/Drive Train Oil)

Cat TDTO exceeds the requirements of the Cat TO-4 transmission/drive train oil specification by passing five more Cat tests.

Cat TDTO is balanced to give maximum frictional material life in powershift transmissions. Cat TDTO also helps eliminate brake chatter in wet brake applications in Cat machines. This oil passes the requirements for the TO-4 oil specification which includes the frictional requirements and gear wear requirements. This oil is offered in several lubricant viscosity grades.

Cat TDTO-TMS (Transmission/Drive Train Oil-Transmission Multi-Season)

Cat TDTO-TMS exceeds the requirements of the Cat TO-4M transmission/drive train oil Performance Requirements by passing additional Cat tests.

Cat TDTO-TMS is synthetic multigrade oil that is developed to provide optimal performance in transmissions, wet brakes, final drives, and hydraulic compartments that must operate in wide range of temperatures. Cat TDTO-TMS can be used in Cat machine compartments where Cat TO-4 and TO-4M oils are recommended. This oil can be used in other manufacturer machines that recommend TO-4 or TO-4M Performance Requirements oils.

TDTO-TMS is specifically formulated to reduce transmission gears wear, improve the performance and efficiency of transmissions in cold weather, especially for machines with electronic controls, and to ensure long life and excellent performance for gears, bearings, and friction disc materials.

NOTICE

Cat Transmission oils are formulated for transmissions and drive trains only, and should not be used in engines. Shortened engine life will result.

NOTICE

Do not use the Cat GO (Gear Oil) or commercial gear oil in the machine compartments unless specifically recommended by Caterpillar. The gear oil can cause seals to fail. The seals can also leak. The gear oil may not be compatible with friction materials. The oil can reduce the efficiency of the transmission and the brake performance.

Cat TDTO-Cold Weather

Cat TDTO Cold Weather is a synthetic lubricant blend that provides superior performance and protection in transmissions, torque converters, final drives, hydraulics, and/or wet brakes at temperatures down to -40°F (-40°C). The special formulation creates optimal friction performance and controls transmission slippage while eliminating clutch glazing. Cat TDTO Cold Weather has excellent compatibility with all materials used in Cat machines, including friction materials, seals, and elastomers. The outstanding thermal stability and oxidation resistance gives Cat TDTO Cold Weather long drain intervals.

Commercial Transmission/Drive Train Oils

Note: Non-Caterpillar commercial oils are as a group typically second or third choice oils. Within this grouping of second and/or third choice oils there are typically tiered levels of performance.

NOTICE

Cat does not warrant the quality or performance of non-Cat fluids.

Commercial oils that are substituted for the Cat TDTO must comply with the requirements of the Cat TO-4 or the Cat TO-4M transmission/drive train oil Performance Requirements.

Note: Commercial multigrade oils must meet the requirements of the Cat TO-4M specification to be used in transmissions. Multigrade oils that use high molecular weight polymers as viscosity index improvers may lose the viscosity effectiveness. This effectiveness may be lost by the temporary shear of the polymer viscosity index improver. Permanent shear of the polymer viscosity index improver may also occur. These types of multigrade oils are not recommended for Caterpillar drive train compartments. The Cat TO-4M Performance Requirements include a test for the shear stability of multigrade oil.

Cat SATO (Special Application Transmission Oil)

Cat Special Application Transmission Oil (SATO) is multi-grade, semi-synthetic oil. This new Cat oil is introduced for use in all medium wheel loaders for factory fill and service fill.

Cat SATO is applicable in all Medium Wheel Loader, including but not limited to the following models:

- 966K XE, 966M XE, 972M XE (Advanced Power Train Transmission)
- 950M, 962M, 966M, 972M, 980M, 982M (Powershift Transmission)

Note: Cat SATO should not be used in lower power train components including final drives, axles, and differentials.

Cat SATO offers the following benefits:

- Excellent cold start performance.
- Improved oxidation stability compared to the semi-synthetic base stocks.
- Extended oil drain interval for powershift transmissions. The oil drain interval is 2000 hrs for SATO compared to 1000 hrs for TDTO 10 or 30.

For the wheel loaders filled with SATO, topping off with other products from the Cat TDTO family should be limited to less than 10% maximum of sump capacity. The use of higher viscosity fluids for top-off can adversely affect cold start performance. When switching from Cat SATO to Cat TDTO or from Cat TDTO to Cat SATO, no special compartment flushing or alternative procedures are required. Follow standard oil change procedures as outlined in the machine Operation and Maintenance Manual.

Final Drive and Axle Oil

Final Drive and Axle Oils are classified by the Cat FD-1 (Final Drive - 1) oil Performance Requirements. The Cat FD-1 Performance Requirements was developed by Caterpillar for use in certain highly loaded Cat final drives and axles that do **not** contain friction material.

Cat FDAO (Final Drive and Axle Oil), Cat FDAO SYN, or commercial FD-1 are the preferred oil types to maximize gear and bearing life in machine compartments where recommended for use.

Applications

Final Drive and Axle oils are recommended for use in certain Final Drives, Axles, and Differentials. The details of the applications of these oils are given in the "Lubricant Viscosity" section of this Special Publication.

Cat FDAO (Final Drive and Axle Oil)

Cat FDAO is blended specifically for applications with high load and high temperature conditions. In these conditions, the protection of gears and bearings is a primary concern. Cat FDAO is the preferred lubricant for Cat final drives and axles that formerly specified Cat TO-4 oils and that do not contain friction materials. This oil should not be used in compartments that contain friction material unless Cat FDAO or oil meeting Cat FD-1 (Final Drive oil Performance Requirements - 1) has been specified because these oils do not develop a sufficient friction coefficient to satisfy the requirements of most clutches and brakes.

The performance of the Cat FDAO equaled or exceeded the performance of Cat TDTO in 18 of 18 tests for the following characteristics:

- Gear and bearing protection
- Physical properties and chemical properties

Cat FDAO also has the following qualities:

- Compatible with the Cat TDTO oils and the seals for the related compartments
- Excellent protection against rust

- Excellent protection against copper corrosion
- Minimizes foaming
- Extended life of the oil due to low rate of oxidation
- Reduced downtime due to extended oil change intervals

Cat FDAO SYN

Cat FDAO SYN is a full synthetic, natural multigrade (non-viscosity improved) final drive and axle oil that is designed for operation in a wide temperature range. Cat FDAO SYN is the preferred oil for extremely cold or hot environments. Cat FDAO SYN exceeds the requirements of Cat FD-1 specification.

Cat FDAO SYN is the preferred lubricant for Cat off-highway truck differentials, front wheels, and final drives that operate under high load factors and/or that are operated continuously (multiple shifts per day).

Cat FDAO SYN is formulated for optimizing component life and for extending the oil change intervals. Cat FDAO SYN use in off-highway truck final drives offers the following:

- Extends the oil drain intervals for off-highway truck final drives as compared to Cat FDAO SAE 60 and FD-1 oils as well as Cat TDTO and TO-4 oils
- Increases bearing life and gear life compared to the use of Cat FDAO SAE 60 and FD-1 oils as well as Cat Cat TDTO or TO-4 oils

The S·O·S oil analysis program is recommended when extending the oil drain intervals.

Commercial Final Drive and Axle Oil

Commercial oils that are substituted for Cat FDAO must comply with the Cat FD-1 final drive oil Performance Requirements.

Note: Non-Caterpillar commercial oils that meet the Cat FD-1 Performance Requirements are second choice oils.

Cat FDAO SYN is formulated for optimizing component life and for extending the oil change intervals. Cat FDAO SYN use in off-highway trucks final drives offers the following:

- Extends the oil drain intervals for off-Highway Trucks final drives as compared to Cat TDTO and TO-4 oils
- Increases bearing life and gear life compared to the use of Cat TDTO or TO-4 oils.

The S·O·S oil analysis program is recommended when extending the oil drain intervals.

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Gear Oil

SMCS Code: 7000; 7551; 7581

NOTICE

Do not use the Cat GO (Gear Oil) or commercial gear oil in the machine compartments unless specifically recommended by Caterpillar. The gear oil can cause seals to fail. The seals can also leak. The gear oil may not be compatible with friction materials. The oil can reduce the efficiency of the transmission and the brake performance.

Applications

Gear oils are recommended for use in certain Direct Drive Transmissions, Differentials, Final Drives, Transfer drives, Circle Drives (excavators), and other applications. The details of the applications of these oils are given in the "Lubricant Viscosity" section of this Special Publication.

Cat GO (Gear Oil)

Cat GO offers maximum protection against the following damage: scoring of the gear teeth, pitting of the gear teeth and pitting of the parts in roller bearings. Cat GO provides excellent stability under high temperature conditions. Cat GO also has superior low temperature performance. This oil also gives protection against rust and corrosion. Some applications require additives for the extreme pressures that can occur at the surfaces/edges of the components. For these applications, Cat GO provides the extra protection.

When the use of gear oil is specified, use Cat GO or Cat Synthetic GO in order to maximize the component life.

NOTICE

Cat GO is not the same as Cat TDTO, and does not meet Cat TO-4 or TO-4M oil Performance Requirements. Cat GO or commercial gear oils should not be used in compartments that specify Cat TO-4 or TO-4M oil.

NOTICE

Cat GO is not the same as Cat FDAO, and does not meet the Cat FD-1 oil Performance Requirements. Cat GO or commercial gear oil should not be used in compartments that specify Cat FD-1 oil.

Commercial Gear Oils**NOTICE**

Cat does not warrant the quality or performance of non-Cat fluids.

Gear lubricants are classified by the API service category and by the SAE viscosity grade that is defined in "SAE J306".

If the Cat GO or Cat Synthetic GO cannot be used, select a commercial oil that meets the "API GL-5" specification.

Note: Non-Caterpillar commercial "API GL-5" gear oils are as a group second choice oils.

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Multipurpose Tractor Oil

SMCS Code: 7000; 7581

Application

Multipurpose Tractor Oils are recommended for use in certain Axles, Final Drives, Implement Steering, Rear Drive Axles, and other applications. The details of the applications of these oils are given in the "Lubricant Viscosity" section of this Special Publication.

Cat MTO is multigrade oil that can be used in cold weather operations. Refer to the "Viscosity Tables" in the "Lubricant Viscosities" section of this Special Publication for details.

Cat MTO (Multipurpose Tractor Oil)**NOTICE**

Cat MTO is not the same as Cat TDTO, and does not meet Cat TO-4 or TO-4M transmission/drive train oil specifications. Cat MTO should not be used in compartments that specify Cat TO-4 or TO-4M oil.

NOTICE

Cat MTO is not the same as Cat FDAO, and does not meet the Cat FD-1 oil specification. Cat MTO should not be used in compartments that specify Cat FD-1 oil.

Cat MTO is multigrade oil that is developed, tested and approved by Caterpillar to provide optimal protection for components where approved for use. Cat MTO offers the following service qualities: improved braking and clutching, enhanced control and extended life in clutches and wet brakes, superior anti-wear properties, thermal stability, and oxidation resistance for long service life in severe applications.

Commercial Multipurpose Tractor Oils

Note: Non-Caterpillar commercial multipurpose tractor oils are as a group second choice oils.

NOTICE

Cat does not warrant the quality or performance of non-Cat fluids.

If Cat MTO is not available, use an oil that meets the "Ford/New Holland M2C134-D" specification. The oil must also satisfy the requirements of the following commercial machine systems:

- Multipurpose tractor transmission
- Hydraulic drives on agricultural tractors and on industrial tractors
- Final drives on agricultural tractors and on industrial tractors

Cat Compactor Oil

Cat Compactor Oil is recommended for use in compactor vibrator drums and other applications. The details of the applications of these oils are given in the "Lubricant Viscosity" section of this Special Publication.

Cat compactor oil is a premium PAO (polyalphaolefin) synthetic gear oil with no viscosity improver. This lubricant has an ISO viscosity grade to 220 and a minimum viscosity index of 152. This lubricant can be used in cold weather operations. Refer to the "Viscosity Tables" in the "Lubricant Viscosities" section of this Special Publication for details.

Commercial oil for this application should have a full synthetic base stock with no viscosity improvers and an ISO viscosity grade to 220, and a minimum viscosity index of 150.**

Automatic Transmission Oil

Automatic Transmission Oils are classified by the Cat AT-1 (Automatic Transmission - 1) oil Performance Requirements. Caterpillar developed AT-1 for use in automatic transmissions of on-highway trucks and in Caterpillar CX Series on-highway transmissions.

Cat ATF-HD2 automatic transmission fluid is the preferred oil to maximize the life and performance of automatic transmissions where recommended for use.

Application

Automatic Transmission oils are recommended for use in automatic transmissions of on-highway trucks and in Caterpillar CX Series on-highway transmissions. Refer to the Operation and Maintenance Manual for information for details.

NOTICE

Do not use Cat TDTO fluids in CX Series on-highway automatic transmissions.

Cat ATF-HD2

Cat ATF-HD2 fluid is synthetic automatic transmission fluid developed to provide optimal performance in Caterpillar CX Series on-highway transmissions. Cat ATF fluid can be used in automatic transmissions that are designed to operate with fluids meeting Cat AT-1 or Dexron-III(H) Performance Requirements. Consult your Caterpillar dealer for Cat ATF-HD2 availability.

Cat ATF-HD2 increases the standard oil drain interval for CX Series on-highway automatic transmission (4 to 6 times) over second choice oils when following the maintenance interval schedule for oil filter changes and for oil sampling that is stated in the Operation and Maintenance Manual for your particular transmission.

Note: Proper warm up procedures should be followed when the temperature is less than -23°C (-10°F). In order to maintain optimum operating conditions of the bearing components, allow the engine to warm up for about 20 minutes. As an alternative, properly sized transmission heater can be installed. Follow all instructions and consult your Caterpillar dealer for cold weather operation of Cat CX Series on-highway automatic transmissions.

Commercial Fluids

For use in Cat CX Series on-highway automatic transmissions, commercial fluids must comply with the requirements of Cat AT-1 specification or the requirements of Dexron-III(H).

Note: Non-Caterpillar commercial oils that meet the Cat AT-1 Performance Requirements are second choice oils.

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Lubricant Viscosities

SMCS Code: 1000; 7000; 7581

Selecting the Viscosity

Ambient temperature is the temperature of the air in the immediate vicinity of the machine. The temperature may differ due to the machine application from the generic ambient temperature for a geographic region. When selecting the proper oil viscosity for use, review **both** the regional ambient temperature and the potential ambient temperature for a given machine application. Generally, use the higher temperature as the criterion for the selection of the oil viscosity. Generally, use the highest oil viscosity that is allowed for the ambient temperature when you start the machine. Refer to the "Lubricant Viscosities for Ambient Temperatures" tables for guidance. In cold-weather applications, the preferred method is to use properly sized machine compartment heaters and a higher viscosity grade oil. Thermostatically controlled heaters that circulate the oil are preferred.

The proper oil viscosity grade is determined by the minimum ambient temperature (the air in the immediate vicinity of the machine). Ambient temperature is the temperature when the machine is started and while the machine is operated. To determine the proper oil viscosity grade, refer to the "Min" column in the table. This information reflects the coldest ambient temperature condition for starting a cold machine and for operating a cold machine. Refer to the "Max" column in the table to select the oil viscosity grade for operating the machine at the highest temperature that is anticipated. Unless specified otherwise in the "Lubricant Viscosities for Ambient Temperatures" tables, use the highest oil viscosity that is allowed for the ambient temperature when you start the machine.

Machines that are operated continuously should use oils that have the higher oil viscosity in the final drives and in the differentials. The oils that have the higher oil viscosity will maintain the highest possible oil film thickness. Refer to this Special Publication, General Information for Lubricants article, Lubricant Viscosities tables, and any associated footnotes. Consult your Cat dealer if additional information is needed.