

Lubricant Service Designations for Automotive Manual Transmissions, Manual Transaxles, and Axles

API 1560
EIGHTH EDITION, APRIL 2013



AMERICAN PETROLEUM INSTITUTE

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Downstream Segment

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Foreword

This publication describes API automotive gear lubricant service designations. It is designed to assist manufacturers and users of automotive equipment in the selection of transmission, transaxle, and axle lubricants based on gear design and operating conditions. Where special performance requirements apply, the descriptions in the publication conform to the automotive lubricants test language developed by ASTM International. API standards are published as an aid to procurement of standardized equipment and materials. These standards are not intended to inhibit purchasers or producers from purchasing or producing products made to specifications other than those of API.

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1 Introduction

This document was prepared by the Lubricants Group of the American Petroleum Institute to assist manufacturers and users of automotive equipment in the selection of transmission, transaxle, and axle lubricants for the operating conditions described.

In some axles, some transmissions, and some transaxles, gears of different designs are available for a variety of service conditions. Selecting a lubricant for specific applications involves careful consideration of the operating conditions and the chemical and physical characteristics of the lubricant. The American Petroleum Institute has released lubricant service designations for automotive manual transmissions, transaxles, and axles. Each designation refers to the performance required of a gear lubricant for a specific type of automotive service. These designations also recognize the possibility that lubricants may be developed for more than one service classification and may be so designated.

In developing the language for the service classifications, the Lubricants Group recognized a need to supplement the descriptions for certain gear lubricants, particularly those for hypoid gears, by referring to a series of tests that would serve to provide more detailed information on the performance requirements of such lubricants. These series of tests were developed by Section B.03 of Subcommittee D02.B on Automotive Lubricants of ASTM International Committee D02, and reference is made to these test procedures in the API service designations described below.

Due to changes in manufacturers' recommended practices or due to the unavailability of testing hardware, the Service Designations API GL-1, GL-2, GL-3, and GL-6 are not in current use. The designations listed in Section 3 replace all previous API gear lubricant designations.

Automotive gear lubricants are identified by viscosity grade in addition to performance level. SAE J306 defines the requirements for viscosity grade classification. This standard also defines requirements for shear stability and for proper labeling and usage of SAE viscosity number designations.

Note: Automatic or semiautomatic transmissions, fluid couplings, torque converters, and tractor hydraulic systems usually require special lubricants. Consult the manufacturer or lubricant supplier for the proper lubricant.

2 Normative References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ASTM D5760 *Standard Specification for Performance of Manual Transmission Gear Lubricants*

ASTM D7450 *Standard Specification for Performance of Rear Axle Gear Lubricants Intended for API Category GL-5 Service*

SAE J306 *Surface Vehicle Standard Automotive Gear Lubricant Viscosity Classification*

SAE J2360 *Surface Vehicle Standard Lubricating Oil, Gear Multipurpose (Metric) Military Use*

3 Service Designations in Current Use

3.1 API GL-4

The designation API GL-4 denotes lubricants intended for axles with spiral bevel gears operating under moderate to severe conditions of speed and load, or axles with hypoid gears operating under moderate conditions of speed and load. Axles equipped with limited-slip differentials have additional frictional requirements that are normally defined by the axle manufacturer.

API GL-4 oils may be used in selected manual transmission and transaxle applications where API MT-1 lubricants are unsuitable. In all cases, the equipment manufacturer's specific lubricant quality recommendations should be followed.

Although this service designation is still used commercially to describe lubricants, test equipment for performance verification is not currently available. Lubricant end users are advised to request appropriate supporting documentation on previously tested lubricants from their suppliers.

3.2 API GL-5

The designation API GL-5 denotes lubricants intended for gears, particularly hypoid gears, in axles operating under various combinations of high-speed/shock load and low-speed/high-torque conditions. The performance specifications for API GL-5 are defined in the most recent version of ASTM D7450. Frictional requirements for axles equipped with limited-slip differentials are normally defined by the axle manufacturer.

Another widely recognized performance specification for automotive gear lubricants is SAE J2360. Lubricants approved under SAE J2360 satisfy the requirements of API Category GL-5. SAE J2360 contains performance requirements that exceed those of API Category GL-5. For example, SAE J2360 has requirements for elastomer compatibility and gear cleanliness after oxidation that are not contained in API GL-5.

3.3 API MT-1

The designation API MT-1 denotes lubricants intended for nonsynchronized manual transmissions used in buses and heavy-duty trucks. Lubricants meeting the requirements of API MT-1 service provide protection against the combination of thermal degradation, component wear, and oil-seal deterioration, which is not provided by lubricants in current use meeting only the requirements of API GL-4 or 5.

API MT-1 does not address the performance requirements of synchronized transmissions and transaxles in passenger cars and heavy-duty applications. API MT-1 lubricants should not be mixed with engine oils in the same transmission unit. Transmission manufacturers' specific lubricant quality recommendations should be followed.

The performance specifications of API MT-1 are defined in the most recent version of ASTM D5760.

4 Service Designations not in Current Use

4.1 API GL-1

The designation API GL-1 denotes lubricants intended for manual transmissions operating under such mild conditions that straight petroleum or refined petroleum oil may be used satisfactorily. Oxidation and rust inhibitors, defoamers, and pour depressants may be added to improve the characteristics of these lubricants. Friction modifiers and extreme pressure additives shall not be used.

API GL-1 lubricants are generally not satisfactory for most passenger car manual transmissions. However, these lubricants have been used in some truck and tractor manual transmissions. Lubricants meeting service designation API MT-1 are an upgrade in performance over lubricants meeting API GL-1 and are preferred by major commercial vehicle manual transmission manufacturers. In all cases, the transmission manufacturer's lubricant quality recommendations should be followed.

4.2 API GL-2

The designation API GL-2 denotes lubricants intended for automotive worm-gear axles operating under such conditions of load, temperature, and sliding velocities that lubricants satisfactory for API GL-1 service will not suffice. Products suited for this type of service contain anti-wear or film-strength improvers specifically designed to protect worm gears

4.3 API GL-3

The designation API GL-3 denotes lubricants intended for manual transmissions operating under moderate to severe conditions and spiral-bevel axles operating under mild to moderate conditions of speed and load. These service conditions require a lubricant having load-carrying capacities exceeding those satisfying API GL-1 service but below the requirements of lubricants satisfying API GL-4 service.

Gear lubricants designated for API GL-3 service are not intended for axles with hypoid gears. Some transmission and axle manufacturers specify engine oils for this service. The manufacturer's specific lubricant quality recommendations should be followed.

4.4 API GL-6

The designation API GL-6 denotes lubricants intended for gears designed with a very high pinion offset. Such designs typically require protection from gear scoring in excess of that provided by API GL-5 gear oils. A shift to more modest pinion offsets and the obsolescence of original API GL-6 test equipment and procedures have greatly reduced the commercial use of API GL-6 gear lubricants.



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