

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

API PUBLICATION 1560
SEVENTH EDITION, JULY 1995

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005



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

Manufacturing, Distribution and Marketing Department

API PUBLICATION 1560
SEVENTH EDITION, JULY 1995

**American
Petroleum
Institute**



SPECIAL NOTES

1. API PUBLICATIONS NECESSARILY ADDRESS PROBLEMS OF A GENERAL NATURE. WITH RESPECT TO PARTICULAR CIRCUMSTANCES, LOCAL, STATE, AND FEDERAL LAWS AND REGULATIONS SHOULD BE REVIEWED.
2. API IS NOT UNDERTAKING TO MEET THE DUTIES OF EMPLOYERS, MANUFACTURERS, OR SUPPLIERS TO WARN OR PROPERLY TRAIN AND EQUIP THEIR EMPLOYEES, AND OTHERS EXPOSED, CONCERNING HEALTH AND SAFETY RISKS AND PRECAUTIONS, NOR UNDERTAKING THEIR OBLIGATIONS UNDER LOCAL, STATE, OR FEDERAL LAWS.
3. INFORMATION CONCERNING SAFETY AND HEALTH RISKS AND PROPER PRECAUTIONS WITH RESPECT TO PARTICULAR MATERIALS AND CONDITIONS SHOULD BE OBTAINED FROM THE EMPLOYER, THE MANUFACTURER OR SUPPLIER OF THAT MATERIAL, OR THE MATERIAL SAFETY DATA SHEET.
4. NOTHING CONTAINED IN ANY API PUBLICATION IS TO BE CONSTRUED AS GRANTING ANY RIGHT, BY IMPLICATION OR OTHERWISE, FOR THE MANUFACTURE, SALE, OR USE OF ANY METHOD, APPARATUS, OR PRODUCT COVERED BY LETTERS PATENT NEITHER SHOULD ANYTHING CONTAINED IN THE PUBLICATION BE CONSTRUED AS INSURING ANYONE AGAINST LIABILITY FOR INFRINGEMENT OF LETTERS PATENT.
5. GENERALLY, API STANDARDS ARE REVIEWED AND REVISED, REAFFIRMED, OR WITHDRAWN AT LEAST EVERY FIVE YEARS. SOMETIMES A ONE-TIME EXTENSION OF UP TO TWO YEARS WILL BE ADDED TO THIS REVIEW CYCLE. THIS PUBLICATION WILL NO LONGER BE IN EFFECT FIVE YEARS AFTER ITS PUBLICATION DATE AS AN OPERATIVE API STANDARD, OR WHERE AN EXTENSION HAS BEEN GRANTED, UPON REPUBLICATION. STATUS OF THE PUBLICATION CAN BE ASCERTAINED FROM THE API AUTHORIZING DEPARTMENT [TELEPHONE (202) 682-8000]. A CATALOG OF API PUBLICATIONS AND MATERIALS IS PUBLISHED ANNUALLY AND UPDATED QUARTERLY BY API, 1220 L STREET, N.W., WASHINGTON, DC 20005.

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 the American Society for Testing and Materials (ASTM).

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.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any federal, state, or municipal regulation with which this publication may conflict.

Suggested revisions are invited and should be submitted to the director of the Manufacturing, Distribution and Marketing Department, American Petroleum Institute, 1220 L Street, N.W., Washington, D.C. 20005.

CONTENTS

	Page
1 INTRODUCTION.....	1
2 REFERENCES.....	1
3 SERVICE DESIGNATIONS IN CURRENT USE	
3.1 API GL-1.....	1
3.2 API GL-4.....	1
3.3 API GL-5.....	1
3.4 API MT-1	2
4 SERVICE DESIGNATIONS NOT IN CURRENT USE	
4.1 API GL-2.....	2
4.2 API GL-3.....	2
4.3 API GL-6.....	2

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

1 Introduction

This document was prepared by the Lubricants Committee 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, a need was recognized 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 the American Society for Testing and Materials (ASTM) Committee D-2, 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-2, GL-3, and GL-6 are not in current use. The designations listed in Section 3 replace all previous API gear lubricant designations.

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

2 References

The most recent editions of the following standards, codes, and specifications are referenced in this publication:

ASTM¹

STP-512A *Laboratory Performance Tests for Automotive Gear Lubricants Intended for API GL-5 Service*

¹American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103-1187.

DOD²

MIL-L-2105D *Lubricating Oil Gear, Multipurpose (Metric)*

3 Service Designations in Current Use

3.1 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 many 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.

3.2 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 (see note) gears operating under moderate speeds and loads. These oils may be used in selected manual transmission and transaxle applications where MT-1 lubricants are unsuitable. The manufacturer's specific lubricant quality recommendations should be followed.

Although this service designation is still used commercially to describe lubricants, some test equipment used for performance verification is no longer available. Procedures to define this performance are currently being reviewed for adoption by ASTM.

Note: Frictional requirements for axles equipped with limited-slip differentials are normally defined by the axle manufacturer.

3.3 API GL-5

The designation API GL-5 denotes lubricants intended for gears, particularly hypoid (see note) gears, in axles operating

²Department of Defense's *Lubricating Oil Gear Multipurpose (Metric)* is available from the U.S. Government Printing Office, Washington, D.C. 20402.

under various combinations of high-speed/shock load and low-speed/high-torque conditions. Lubricants qualified under U.S. Military Specification MIL-L-2105D (formerly MIL-L-2105C) satisfy the requirements of the API GL-5 service designation, although the API designation does not require military approval. Performance test details are in ASTM Publication STP-512A.

Note: Frictional requirements for axles equipped with limited-slip differentials are normally defined by the axle manufacturer.

3.4 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-1, 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.

4 Service Designations not in Current Use

4.1 API GL-2

The designation API GL-2 denotes lubricants intended for automotive worm-gear axles operating under such condi-

tions 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.

4.2 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 API Category "CC" or "CD" motor oils for this service. The manufacturer's specific lubricant quality recommendations should be followed.

4.3 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.

American Petroleum Institute
1220 L Street, Northwest
Washington, D.C. 20005



Order No. F15607