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Standard Specification for Performance of Manual Transmission Gear Lubricants[1]

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1. Scope

1.1 This specification lists the test methods and acceptance criteria for determining the acceptability of lubricants used in nonsynchronized heavy duty manual transmissions.

1.2 The values stated in SI units are to be regarded as ~~the~~ standard. ~~The values given in parentheses~~No other units of measurement are ~~for information only.~~ included in this standard.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D130 Test Method for Corrosiveness to Copper from Petroleum Products by Copper Strip Test

D892 Test Method for Foaming Characteristics of Lubricating Oils

D5182 Test Method for Evaluating the Scuffing Load Capacity of Oils (FZG Visual Method)

D5579 Test Method for Evaluating the Thermal Stability of Manual Transmission Lubricants in a Cyclic Durability Test

D5662 Test Method for Determining Automotive Gear Oil Compatibility with Typical Oil Seal Elastomers

D5704 Test Method for Evaluation of the Thermal and Oxidative Stability of Lubricating Oils Used for Manual Transmissions and Final Drive Axles

2.2 *Federal Standards:*[3]

Federal Standard No. 791C, Method 3430.2~~Method3430.2~~ Compatibility Characteristics of Universal Gear Lubricants

Federal Standard No. 791C, Method 3440.1~~Method3440.1~~ Storage Solubility Characteristics of Universal Gear Lubricants

2.3 ~~*Military Standard:*~~[4] *SAE Publications:*[4]

~~MIL-PRF-2105ELubricating Oil, Gear, Multipurpose~~ SAE J2360 Lubricating Oil, Gear Multipurpose (Metric) Military Use

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 ~~*nonsynchronized transmission, n*~~nonsynchronized transmission, *n*—a transmission having no means for synchronizing the speeds of engaging elements. Typical heavy-duty manual transmissions have no such means for gear engagement by the shift lever, but may have such means for pneumatic engagement of auxiliary range gears.

3.1.2 ~~*oil seal compatibility, n*~~oil seal compatibility, *n*—*in lubricants for lubricating manual transmissions and final drive axles*, prevention of chemical or thermal degradation of seal elastomers typically observed as hardening, cracking, or excessive swelling in a manner which would result in oil leakage.

3.1.3 ~~*thermal oxidation, n*~~thermal oxidation, *n*—*in lubricants used for lubricating manual transmissions and final drive axles*, deterioration of the lubricant under high-temperature conditions which is observed as viscosity increase of the lubricant, insolubles formation in the lubricant, deposit formation on the parts, or a combination thereof.

4. Performance Classification

4.1 ~~*MT-1*—The temporary designation MT-1 has been assigned to identify the category for manual transmissions, apart from API Service Category GL-4. (See~~ API Category MT-1—The designation API Category MT-1 identifies the category of lubricants

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

~~[3] Information available from Commanding Officer, Army Materials and Mechanics Research Center, Attention: AMXMR-TMS, Watertown, MA 02127.~~

[3] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

~~[4] Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.~~

[4] Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001, http://www.sae.org.

intended for use in nonsynchronized manual transmissions, apart from API Service Category GL-4. See Appendix X1 for background information on this category.)

5. Performance Requirements

5.1 API Category MT-1 performance requirements for candidate gear lubricants are provided in Table 1.

TABLE 1 API Category MT-1 Category Tests and Acceptance Criteria

Test Item	Minimum	Maximum
Test Method D5704 for[A]		
Test Method D5704		
Viscosity increase, %	...	100 %
Pentane insolubles, %	...	3.0 %
Toluene insolubles, %	...	2.0 %
Carbon/varnish rating	7.5	...
Sludge rating	9.4	...
Sludge rating	9.4	...
Test Method D5662[B]		
Test Method D5662		
Polyacrylate 150°C, 240 h		
Polyacrylate @ 150°C, 240 h		
Elongation, change %	no limit	−60
Elongation change, %	−60	+no limit
Hardness change, points	−35	+5.0
Hardness change, points	−35	+5
Volume change, %	−5	+30
Volume change, %	−5	+30
Fluoroelastomer 150°C, 240 h		
Fluoroelastomer @ 150°C, 240 h		
Elongation change, %	no limit	−75
Elongation change, %	−75	+no limit
Hardness change, points,	−5	+10
Hardness change, points,	−5	+10
Volume change, %	−5	+15
Volume change, %	−5	+15
Test Method D5579[C]	better than passing reference oil[D]	...
Test Method D5579	better than passing reference oil[A]	...
Test Method D130	...	2a
Test Method D130[B]	...	2a
Test Method D5182		
Failing load stage	11	...
Test Method D892 foam tendency only		
Test Method D892 , foam tendency only		
Sequence I, mL	...	20
Sequence II, mL	...	50
Sequence III, mL	...	20
Federal Test Method 791C, Method 3430.2	compatible with MIL-PRF-2105E oils[E]	...
Federal Standard No. 791C, Method 3430.2	compatible with reference oils[C]	...
Federal Test Method 791C, Method 3440.1	pass[F]	...
Federal Standard No. 791C, Method 3440.1	pass[D]	...

[A] Test Method D5704isucce iss defully complineted Su beommiy tthe me D02.B0 ballot on June 23, 1994. The ev olution of thest st lands and data used to de fivelo p limitas is defing red in Rfesearench Rep oril t D02-1353. Aes stat red in 6.1.2/L-60-1 dasultas used for MT-1 approval may no t be generated prior to TMC calibration ofe the test stand for all MT-1 parameters.

[B] Test MethodD5662 success fully completed Subcommittee D02.B0 ballot on June 2r 3, 1994. T he evolution of d ata used to develop limits is defined in Research Report D0 12-1348°C.

[C] TShall bes compat Mible withod D5579 suix specific ressfullyerence ompils that may be obtained C frommi tthe ASTM Te D02 ballst Monitof Juring Ce 24, 1994nter (TMC).

[D] Defined by the mean of five prior tests of TMC 151 Reference Oil in observed stand.

[E]Shall be com patible withspecific reference oils when tested in accordance with Federal Test Method791C, Method3430.2. Reference oils may be obtained from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

[F]Shall pass the performance requirements as specified in the MIL-PRF- SAE J213605E when tested in accordance with 791C, Method3440.1.