



The Future of the NLGI GC-LB Specification

Dr Gareth Fish PhD CLS CLGS

Update July 2019

NLGI License Approvals

As of May 2019, 306 total products licensed

- 42 (13.7%) as LB
- 3 (1.0%) as GA
- 8 (2.6%) as GC
- 253 (82.7%) as GC-LB

This is 29 above May 2014 and includes a few new suppliers and products

ASTM D4950 Automotive Greases Tests Status

OK ASTM tests

- D217 Cone Penetration
- D1264 Water Washout
- D1742 Storage Bleed
- D1743 Rust
- D2266 4-Ball Wear
- D2596 4-Ball EP

Problematic ASTM tests

- D2265 and D566 Dropping Point
- D3527 HT Grease Life
- D4290 HT Grease Leakage
- D4170 Fretting Wear
- D4289 Elastomer Compatibility
- D4693 LT Torque

A 10 year plan to replace GC-LB so that it more relevant to the grease industry is being defined

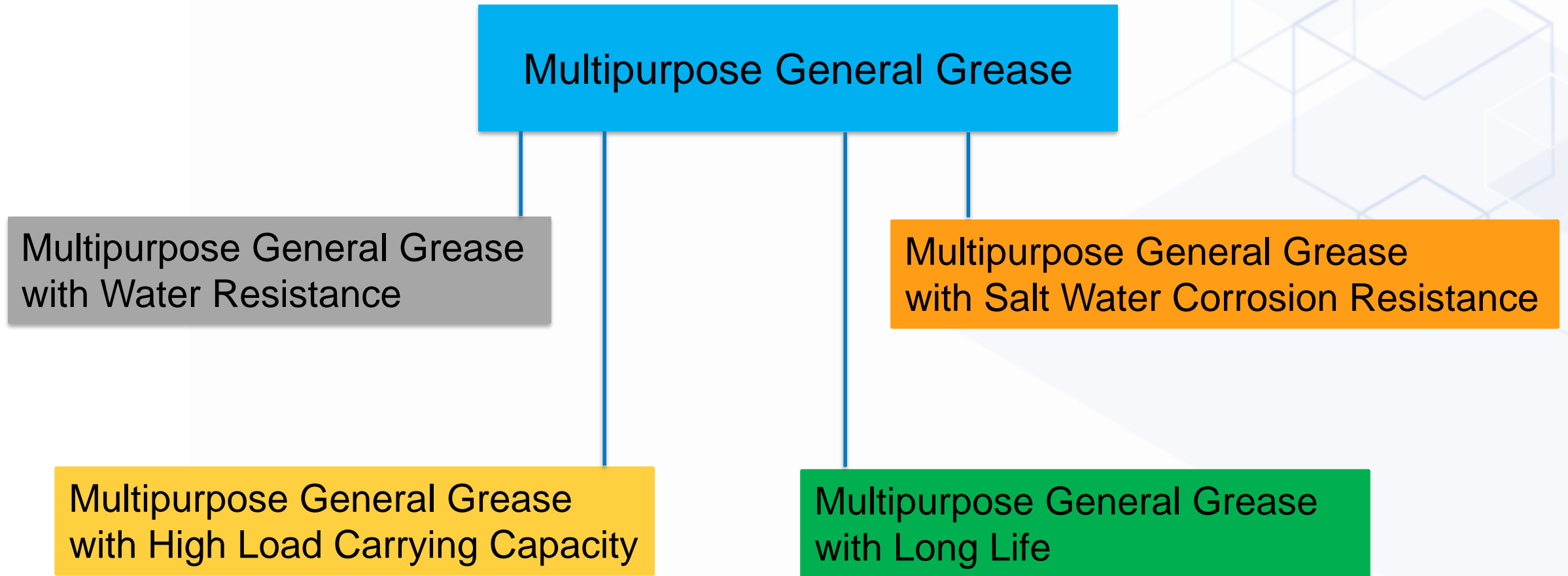
The Future of NLGI GC-LB

- The current premise that we need a grease performance standard for automotive service greases is significantly distance from reality
- Almost no service requirements for automotive greases today
 - >90% of applications are sealed for life
 - Currently many OEMs who specify GC-LB greases think that current performance standard is inadequate
- Most new GC-LB approvals offer GC-LB plus
 - With better water resistance
 - Higher Load carrying capacity
 - Better salt water resistance
 - Long Life Grease

Short Term Proposal

- Develop a multipurpose grease (MPG) with a higher performance specification to replace GC-LB
- Define also four sub-categories also for licensing which they meet MPG + the characteristic listed below
 - With better water resistance
 - Higher load carrying capacity
 - Better salt water resistance
 - Long life Grease

NLGI Future Grease Classifications



Multipurpose General Grease

Existing tests keep same limits as GC-LB

- ASTM D217 with an NLGI penetration class and W100k
- ASTM D471 Elastomer compatibility
- ASTM D942 Oxidation Stability
- ASTM D1264 Water Washout
- ASTM D1478 Low Temperature Torque
- ASTM D1742 Static Oil Bleed
- ASTM D1743 Rust Rating
- ASTM D1831 Roll Stability
- ASTM D2266 4-Ball Wear
- ASTM D2596 4-Ball EP
- ASTM D4048 Copper Corrosion
- ASTM D6184 HT Bleed

Reportable only Tests

- ASTM D2265 Dropping Point

No longer Specified Tests

- ASTM D566 Dropping Point
- ASTM D3527 High-Temperature Grease Life
- ASTM D4170 Fretting Wear Weight Loss
- ASTM D4289 CR and NBR-L compatibility
- ASTM D4290 Wheel Bearing Grease Leakage
- ASTM D4693 Low Temperature Torque

Multipurpose General Grease – Part 1

Property	ASTM test method	Units	Minimum	Maximum	Source
Consistency class	D217		220 – 250 (#3); 265 – 295 (#2); 310 – 340 (#1)		ASTM D4950
Prolonged worked penetration (Δ 100k)	D217	dmm		#3 = +30 #2 = +40 #1 = +50	Test data
Elastomer compatibility NBR 28PX (ISO 13229)	D471 (70 hours 100 °C)	Δ Hardness (Shore A) Δ Volume percent Δ Ultimate Tensile strength (%) Δ Elongation at Break (%)	-15 -5 -50 -50	+5 +30 +50 +50	ASTM D4950 ISO 13229 and ASTM D2000
Oxidation Stability (pressure drop)	D942	kPa (psi)		35.0 (5.0)	General automotive specs
Water washout	D1264	wt%		15.0	ASTM D4950
LT Torque at -40 °C Starting torque Running torque	D1478	mNm (g·cm)		1000 (10,200) 100 (1020)	ISO 12924

Multipurpose General Grease – Part 2

Property	ASTM test method	Units	Minimum	Maximum	Source
Static oil bleed (by NLGI grade)	D1742	wt%		#3 = 4.0 #2 = 6.0 #1 = 8.0	Test data
Rust rating	D1743	rating	pass		ASTM D4950
Roll stability (2 hours at RT)	D1831	dmm		<30 all grades	Test data
Dropping Point	D2265	°C	Report value – No minimum Defined		NLGI #1925
4-Ball Wear Scar Diameter	D2266	mm		0.60	ASTM D4950
4-Ball EP Last non-seizure load Weld point Load wear Index (LWI)	D2596	kg	80 200 30		ASTM D4950
Copper corrosion (24 hours 100 °C)	D4048	rating		1B	General specifications
HT Bleed (by NLGI grade)	D6184	wt%		#3 = 4.0 #2 = 6.0 #1 = 8.0	Test data

New Test Methods Utilized within the Subclasses

Proposed methods to be utilized

- ASTM D4049 Water spray off
- ASTM D4170 Fretting wear weight loss
- ASTM D5706 SRV step Load
- ASTM D5969 10% synthetic seawater (SSW)
- ASTM D6138 Emcor (SSW or NaCl solution)
- ASTM D7342 Wet penetration stability
- ASTM D7594 SRV fretting test
- ASTM D8022 Wet roll stability

Optional methods

- ASTM D2509 Timken OK load test
- ASTM D3336 Pope HT grease life
- DIN 51821 FE9 grease life

Multipurpose General Grease - with Water Resistance

As Multipurpose grease but with following additions

- D1264 washout with tighter limits
- D4049 spray off
- D7342 Wet penetration stability
- D8022 Wet roll stability

Property	ASTM test method	Units	Minimum	Maximum	Source
Water washout	D1264	wt%		#3 = 3.0 #2 = 5.0 #1 = 8.0	Test data
Water spray off	D4049	wt%		#3 = 20 #2 = 30 #1 = 40	Test data
Wet penetration stability (Penetration change, ΔW100k)	D7342	dmm		50	Test data
Wet roll stability (Penetration change)	D8022	dmm		50*	Test data

Multipurpose General Grease with Seawater / Salt Water Corrosion Resistance

- As Multipurpose grease but with following additions
 - D5969 10% synthetic seawater?
 - D6138 Emcor with synthetic sea water or NaCl solution

Property	ASTM test method	Units	Minimum	Maximum	Source
Bearing rust 10% synthetic seawater	D5969	rating	Pass		General specifications
Emcor rust Synthetic seawater	D6138	rating		1/1	General specifications
Emcor rust 3% NaCl solution	D6138	rating		2/2	General specifications

Multipurpose General Grease with High Load Carrying Capacity

- As Multipurpose grease but with following additions
 - ASTM D2266 4-Ball Wear tighter limit
 - 0.50 mm v 0.60 mm for MPG
 - ASTM D2596 4-Ball EP Higher load limits and LWI
 - Last non-seizure load (100 kg or 126 kg)
 - Weld point (315 kg)
 - Load wear Index (LWI) (45 kg)
 - Fretting wear
 - ASTM D4170 (to be run in duplicate)
 - Weight loss reduced to 5 mg max (reduced from 10 mg in LB classification)
 - ASTM D7594
 - Friction and wear scar limits need to be defined
 - **D2509 Optional**
 - **60 pounds OK load**

Multipurpose General Grease with High Load Carrying Capacity

Property	ASTM test method	Units	Minimum	Maximum	Source
4-Ball Wear Wear scar diameter	D2266	mm		0.50	General specifications
4-Ball EP Last non-seizure load Weld point Load wear Index (LWI)	D2596	kg	100 or 126 315 45		General specifications
SRV step Load	D5706	N	1200		General specifications
Fretting wear (weight loss)	D4170*	mg		5.0	General specifications
Fretting wear scar by SRV	D7594	µm		tbd	Developing specifications
Optional					
Timken OK Load	D2509	pounds	60		Marketing claims

* Average of two duplicate runs

Multipurpose General Grease with Long life

- As Multipurpose grease but with following additions
 - ASTM D2266 4-Ball Wear tighter limit
 - 0.50 mm v 0.60 mm for MPG
 - Fretting wear
 - ASTM D4170 (to be run in duplicate)
 - Weight loss reduced to 5 mg max (reduced from 10 mg in LB classification)
 - ASTM D7594
 - Friction and wear scar limits need to be defined
 - Enhanced Oxidation life test
 - D942 with tighter limits / longer duration / higher temperature (120 °C)
 - Long life test - This would need to be defined
 - ASTM D3336 HT Grease Life (Pope Test) – Only really applicable for electric motors
 - FAG FE9 (DIN 51821) is a non-starter
 - ROF+ is challenging as the test method is not standardized
 - Develop a new life test to replace ASTM D3527 (will take at least 5 years)

Multipurpose General Grease with Long life

Property	Test method	Units	Minimum	Maximum	
4-Ball Wear Wear scar diameter	D2266	mm		0.50	General specifications
Fretting wear (weight loss)	D4170*	mg		5.0	General specifications
Fretting wear scar by SRV	D7594	µm		tbd	Developing specifications
Oxidation Stability (pressure drop)	D942	kPa (psi)		20.0 (3.0)	General specifications
Grease Life Test Method					
New test method	D8XXX	hours	XXX		
Bearing Life F_{50} at 120 °C, 140 °C or higher?	DIN 51821	hours	100		ISO 12924
Bearing life F_{50} at 150 °C	D3336	hours	500		Marketing claims
Bearing life F_{50} at 150 °C	ROF+	hours	XXX		

Your trusted source for market trends, industry insights and
the lubrication challenges of today's advanced hardware



LUBRIZOL ADDITIVES 360

lubrizoladditives360.com