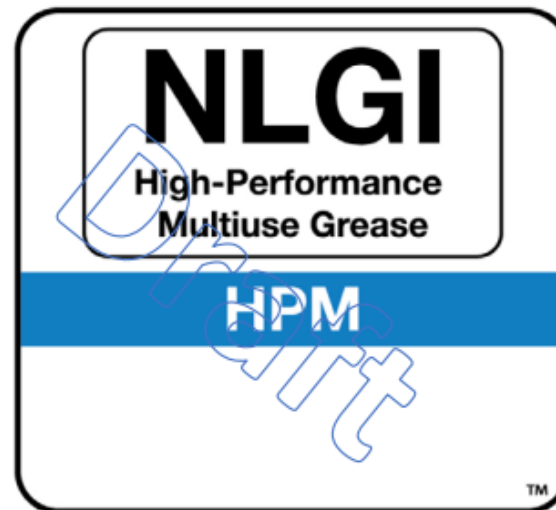


Elevating Grease Standards

HPM Driving the Future of Performance Lubricants

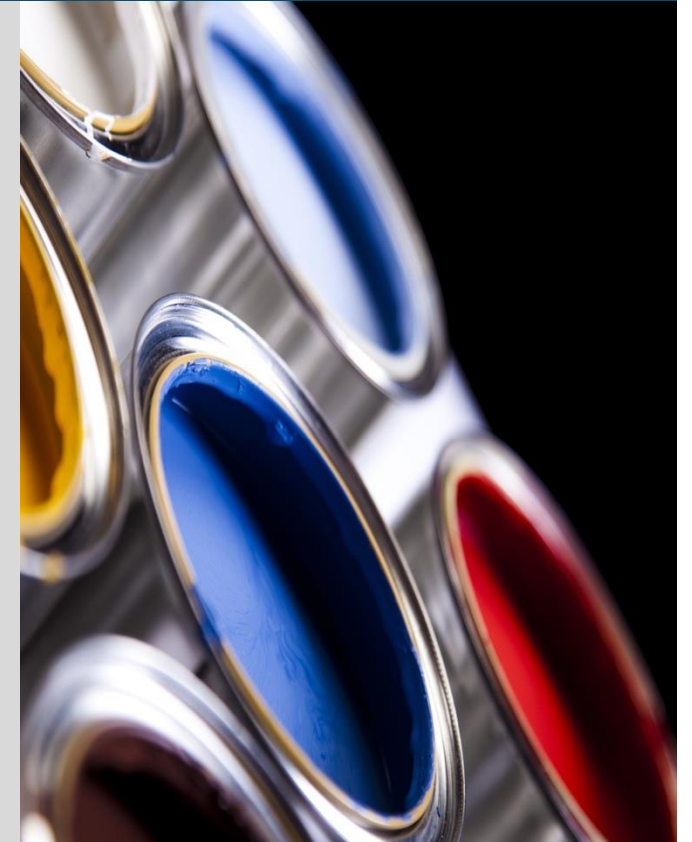


Why Did NLGI Create HPM?



Evolving technology requires a new, high standards of grease

- Program for greases used in various lubricating applications.
- NLGI GC/LB had become the defacto specification for a “good” grease
- NLGI recognized, through the efforts of a specification working group, that current applications may be better served by an updated specification
- Adopted by the NLGI Board of Directors in early 2020
- Specification’s limits are “challenging yet achievable”
- NLGI still offers the GC-LB certification and will continue to do so until there is no longer a need for GC-LB.
- Additional specifications for high temperature and long-life are in development



HPM CORE Specification



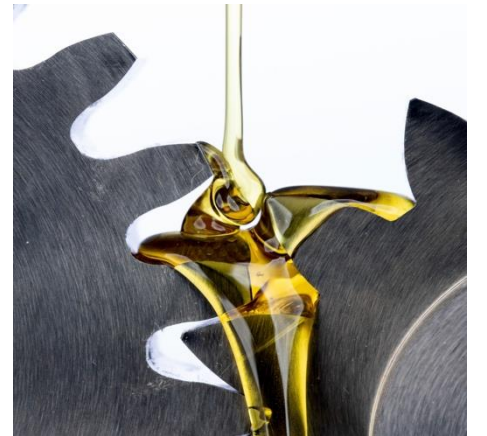
Structural stability of the grease

Operating range (moderate)

Tribology - load and wear performance

Performance in wet environments

Compatibility with materials



HPM CORE Specification



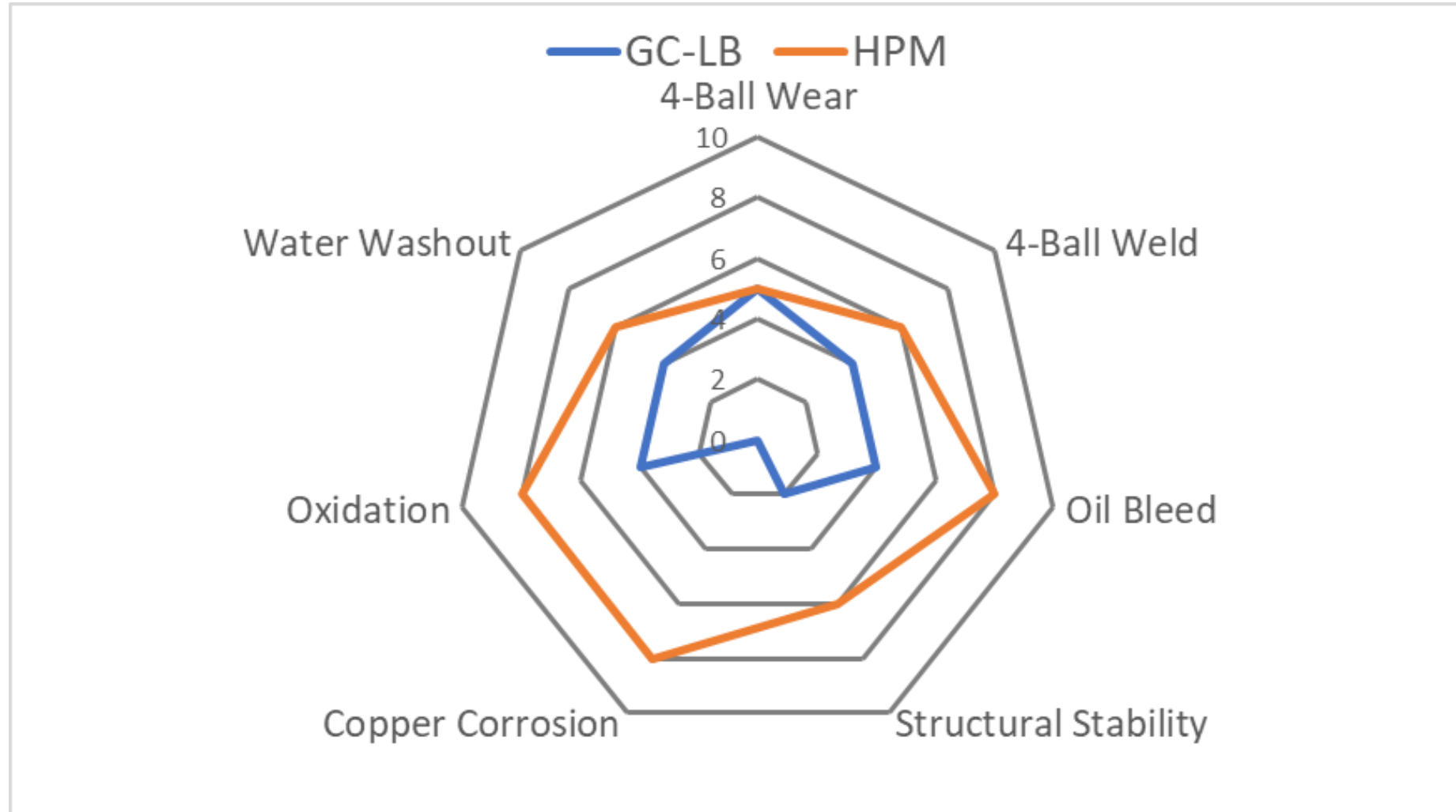
Test method	Property	Conditions	Units	Min	Max	Specification focus
ASTM D217	Cone Penetration of Lubricating Grease	60 Stokes	dmm	220	340	Structural stability of the grease
ASTM D217	Cone Penetration of Lubricating Grease	100K strokes	dmm	-30	30	
ASTM D1831	Roll Stability of Lubricating Grease [using 1/2 scale penetration]	2 hr. @ RT, 1/2 scale	dmm	-10%	+10%	
ASTM D1742	Oil Separation from Lubricating Grease During Storage	24 hr @ 25 °C	wt.%		5.0	
ASTM D942	Oxidation of Lubricating Greases by the Oxygen Pressure Vessel Method	100 hr @ 100 °C	kPa (psi)		35 (5.1)	Operating range (moderate)
ASTM D6184	Oil Separation from Lubricating Grease (Conical Sieve Method)	30 hr. @ 100 °C	wt.%		7.0	
ASTM D1478	Low Temperature Torque of Ball Bearing Grease Starting Torque Running Torque	@-20 °C	mNm (g·cm)		1000 (10,200) 100 (1,020)	
ASTM D2266	Wear Prevention of Lubricating Grease (Four-Ball), Wear Scar Diameter	75 °C, 40 kg, 1200 r/min, 60 min	mm		0.60	Tribology - load and wear performance
ASTM D2596	Extreme-Pressure Properties of Lubricating Grease (Four-Ball), Weld point	1770 r/min @ 27 °C	kgf	250		
ASTM D1264	Determining the Water Washout Characteristics of Lubricating Greases	60 min @ 79 °C	wt.%		10	Performance in wet environments
ASTM D1743	Determining Corrosion Preventive Properties of Lubricating Greases	48 hr. @ 52 °C	rating	Pass		
ASTM D6138	Determination of Corrosion-Preventive Properties of Lubricating Greases Under Dynamic Wet Conditions (Emcor Test)	Distilled, 2 bearings	rating		0,1	
ASTM D4048	Detection of Copper Corrosion from Lubricating Grease	24 hr. @ 100 °C	rating		1B	Compatibility with materials
ASTM D4289	Elastomer compatibility of Lubricating Greases and Fluids [using NBR standard reference elastomer per ISO 13226] Δhardness Δ Volume	168 hr. @ 120 °C	Shore A points % change	-15 -5	+2 +30	

HPM Versus GC-LB



Property	HPM	GC-LB
Structure and stability of grease	4 Tests Two extended stability tests Dropping Point removed	3 tests No extended mechanical stability Dropping Point included
Operating range	3 tests High temp oil bleed (100°C) Ball bearing torque @ -20°C No dynamic bearing test (for +HT) Industrial tests	3 Tests Wheel bearing life and leakage tests Tapered roller bearing torque @ -40°C Wheel bearing tests
Tribology - load and wear performance	2 Tests Fretting wear in +HL tag	3 tests Fretting wear test included
Performance in wet environments	3 tests Washout has tighter spec Added dynamic Emcor corrosion	3 Tests No dynamic corrosion Test
Compatibility with materials	2 Tests One Elastomer Added Cu corrosion (cage material)	2 Tests Two Elastomers No Cu corrosion needed

HPM Versus GC-LB

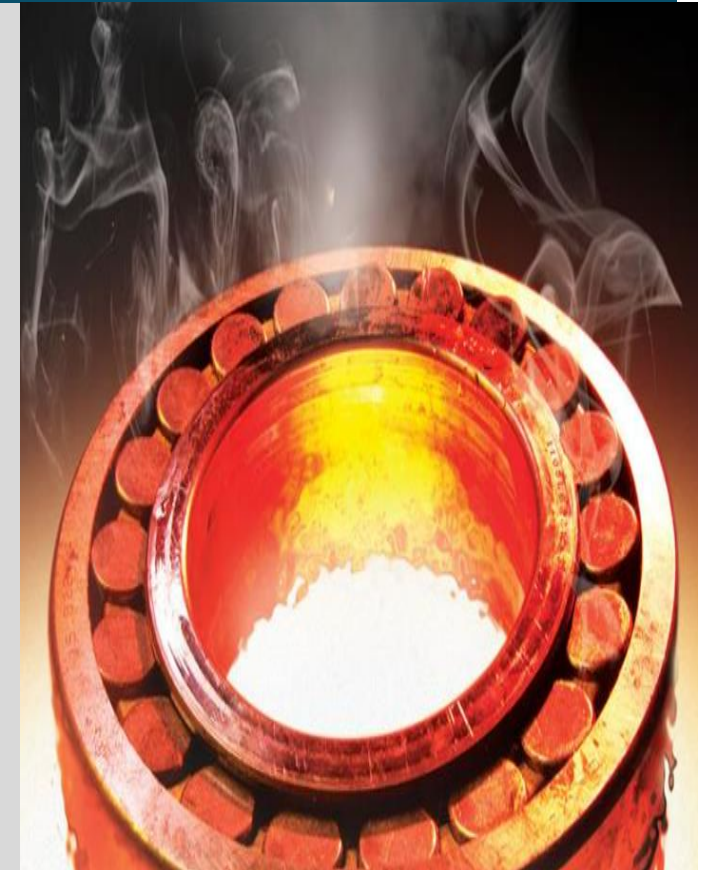


The Elimination of the Dropping Point



Thickener Neutral Approach

- This method is NOT a good indicator of operation at elevated temperatures
- It remains an excellent quality assurance test / tool to indicate proper gel formation
- For GC-LB, Dropping Point eliminates all simple soap greases from contention
- With its elimination in the HPM, there is no limitation on what thickener COULD be certified



Enhancement Tags



Water Resistance (+WR)

Tightened washout specification
Added water spray resistance
Added water to mechanical stability

Corrosion Resistance (+CR)

Same corrosion tests but made more severe
Added synthetic sea-water
Added NaCl solution

High Load (+HL)

Tighter spec for wear and EP
Added fretting wear
Added two wear/EP tests using SRV

Low Temperature (+LT)

Lower torque temperature
Added pumpability at low temperature
Added flow pressure at low temperature

Enhancement Tags



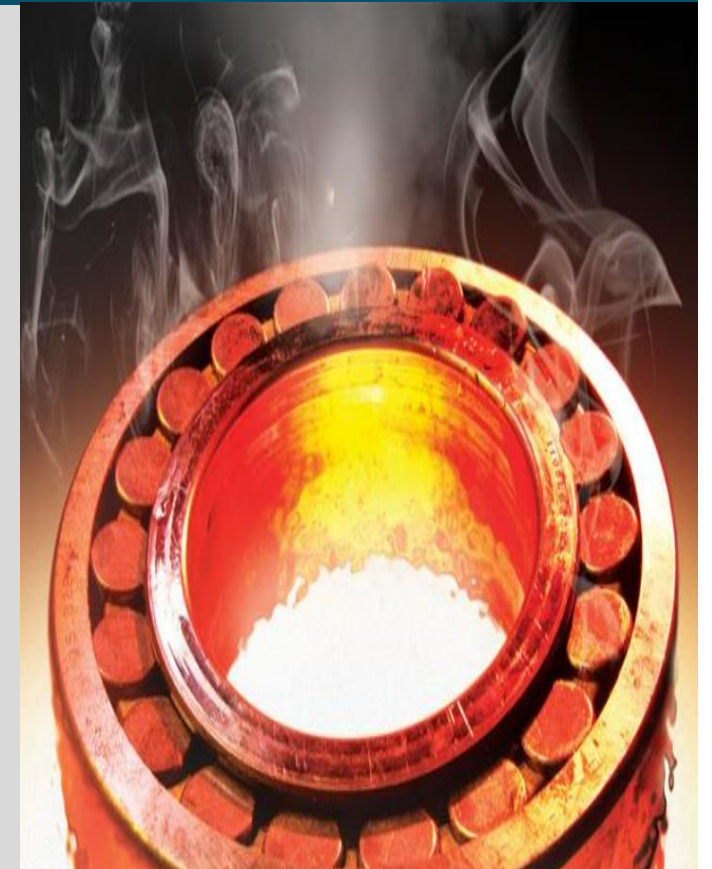
	Test method	Property	Conditions	Units	Min	Max	Comment
Water Resistance (+WR)	ASTMD1264	Determining the Water Washout Characteristics of Lubricating Greases	60 min @ 79 °C	wt.%		5.0	Tightened washout specification
	ASTM D4049	Determining the Resistance of Lubricating Grease to Water Spray	5 min @ 38 °C	wt.%		40	Added water spray resistance
	ASTM D8022	Roll Stability of Lubricating Grease in Presence of Water [using 1/2 scale penetration]	20% Water, 2hr, RT	1/10 mm	-15%	+15%	Added water to mechanical stability
Corrosion Resistance (+CR)	ASTM D5969	Corrosion-Preventive Properties of Lubricating Greases in Presence of Dilute Synthetic Sea Water Environments	10% Syn Sea Water, 48 hr @ 52 °C	Rating	Pass		Same corrosion tests but made more severe
	ASTM D6138	Determination of Corrosion-Preventive Properties of Lubricating Greases Under Dynamic Wet Conditions (Emcor Test)	100 wt% Syn Sea Water, 2 bearings	Rating		1, 2	Added synthetic sea-water
	ASTM D6138	Determination of Corrosion-Preventive Properties of Lubricating Greases Under Dynamic Wet Conditions (Emcor Test)	0.5 N NaCl Solution, 2 bearings	Rating		2, 3	Added NaCl solution
High Load (+HL)	ASTM D2266	Wear Preventive Characteristics of Lubricating Grease (Four-Ball Method) Wear Scar Diameter	75 °C, 40 kg, 1200 r/min, 60 min	Mm		0.50	Tighter spec for wear and EP. Added fretting wear. Added two wear/EP tests using SRV.
	ASTM D2596	Measurement of Extreme-Pressure Properties of Lubricating Grease (Four-Ball Method), Weld point	1770 r/min @ 27 °C	Kgf	400		
	ASTM D5706	Determining Extreme Pressure Properties of Lubricating Greases Using a High-Frequency, Linear-Oscillation (SRV) Test Machine	Procedure B @ 80 °C	N	800		
	ASTM D4170	Fretting Wear Protection by Lubricating Greases	22 hr @ RT, 2 runs	mg		5.0	
	ASTM D7594	Determining Fretting Wear Resistance of Lubricating Greases Under High Hertzian Contact Pressures Using a High-Frequency, Linear-Oscillation (SRV) Test Machine	100 N, 0.3 mm stroke, 4 hr @ 50 °C	mm		0.500	
Low Temperature (+LT)	ASTM D1478	Low Temperature Torque of Ball Bearing Grease Starting Torque	@ -30 °C	mNm (g·cm)		1000 (10,200) 100 (1,020)	Lower torque temperature
		Running Torque					
	US Steel LT-37	Grease Mobility	@ -20 °C	g/min	10		Added pumpability at low temp
	DIN 51805-2	Determination of flow pressure of lubricating greases	@ -30 °C	mbar		1400	Added flow pressure at low temp

High Temperature (+HT) and Long-Life (+LL) Enhancement Tags



Developing further critical standards

- Recognized that the ASTM D3527 Wheel Bearing Life test is not suitable
 - FE9, SKF ROF+, FE8 etc. Are not suitable for this level of spec
 - ✓ Too expensive, limited test stands etc.
 - NLGI is forming a consortium of interested parties to develop and commercialize a new high performance bearing test rig
 - Expected to be complete and active in approximately 3 years
- Other high temp and long-life tests will be included and are being studied by the committee
- Don't believe we can launch the two tags without the bearing test in place



Grease Manufacturers and Marketers

- Can be used as development guide for high performance greases
- Provides a tool to characterise grease for given operating conditions
- Easily understand your products has passed testing
- Enhanced marketing benefits



Benefits for Equipment Owners / Grease Users



Equipment Owners / Grease Users

- + Ensures products meet performance standards
- + Instills confidence in your selection of a grease
- + Streamline your options
- + Reduced overall cost of ownership
- + Helps weed through false marketing claims

Benefits for OEMs and Grease Specifiers



OEMs and Grease Specifiers

- Help customers select the right grease
- Identify where high-performance grease is required
- Ease in creating grease specifications for equipment



HPM Marketing Strategies



Increasing awareness via multi-channel approach



HPM Approved Products



Industry embracing a new, high standards already



HPM Marketing Strategies



Increasing awareness via multi-channel approach



HPM Stats



28 Products

**18 Global
Brands Represented**

**64% Have
Enhancement Tags**

**2 New HPM
Products in Queue**

Four Step HPM Grease Certification Process



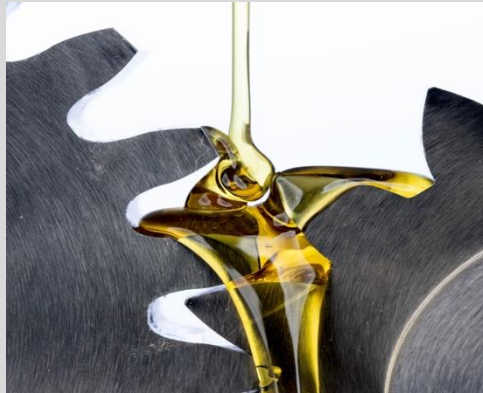
1. Submit application paperwork along with data set
2. Submit signed Trademark & License Agreements
3. Submit additional Branded Product Names
4. Submit payment

Renewal Process



HPM Annual Renewal Process

- 100% of products tested annually for quality control
 - All testing done by NLGI
- Submit renewal paperwork
- Submit payment



Want More Information?



Scan QR Code or check NLGI website



Questions?

