



Lopal

Stock Code: 603906.SH/2465.HK

LOPAL INDUSTRIAL OIL PRODUCT MANUAL



FULL SERIES OF PRODUCT INTRODUCTION
AND INDUSTRY SOLUTIONS

G L O B A L B R A N D L O P A L C H I N A





LOPAL INDUSTRIAL OIL



New energy technology company listed on both the A-share and H-share markets

Stock Abbreviation: Lopal Tech Stock Code: 603906.SH / 2465.HK

Founded in Nanjing, Jiangsu Province in 2003, Lopal officially listed on the Shanghai Stock Exchange in 2017, becoming an A-share listed automotive fine chemicals company. In 2024, it successfully entered the Hong Kong Stock Exchange, becoming a dual-listed new energy technology company with both A-shares and H-shares.

Today, Lopal has grown into an international enterprise group with green new energy core materials as its main business segment. It owns more than 30 wholly-owned and shareholding companies, cooperates with nearly 100 well-known companies worldwide, and exports its products to more than 30 countries and regions. In 2022, Lopal's total revenue exceeded 14 billion yuan, representing a year-on-year increase of over 200%.

World Brand Green Industry

Focusing on the development and application of core materials for green new energy, Lopal's business scope covers multiple mainstream pillar industries and emerging industries. In the field of lithium battery core materials, Lopal continuously develops more advanced and efficient lithium iron phosphate, new energy battery electrolytes, solid-state battery cathode materials, and higher purity battery-grade lithium carbonate products. In the field of hydrogen energy core materials, Lopal has successfully developed various high-quality catalyst products, continuously leveraging its advantages in the three major stages of hydrogen production, storage, and utilization. In the new energy chemicals sector, Lopal actively explores and develops various new materials with environmentally friendly properties in areas such as automotive lubricants, environmentally friendly automotive urea, automotive maintenance products, and disinfection products, reducing resource consumption and waste generation.

Today, Lopal's lithium iron phosphate cathode materials, automotive lubricants, and automotive urea businesses have successfully entered the ranks of global and domestic leaders. Its lithium carbonate smelting, solid-state battery materials, hydrogen energy, and biotechnology businesses have successfully built unique competitiveness and are rapidly expanding their market share with a global ambition to become number one.



International Certification

Lopal aspires to become an international lubricant brand and achieve the grand goal of selling products worldwide. To break the industrial and market barriers between countries, in addition to API Certification, Lopal lubricant products have successively obtained certifications from authoritative institutions in developed economies such as Japan and Europe.



Eaton Certification



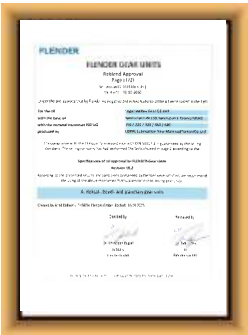
CCS Quality Certification



FLENDER Certification



Parker Certification



FLENDER Certification



RDE 90235 Certification



Approval Certificate for Explosion Protection



Blue Angel Certification



Siemens Certification

Domestic Recognition Certificates

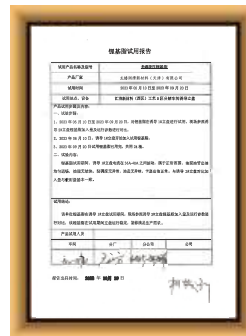
As one of China's Top 500 Brands, Lopal has obtained certifications from numerous national authoritative institutions and well-known cooperative manufacturers. Lopal's high quality is not only a solemn commitment to users, but also a direct embodiment of a high sense of responsibility. The reason why Lopal's products have so many certifications is that they are widely recognized and highly trusted by cooperative manufacturers in terms of both product quality and R&D level.



Shimadzu Certification



Oceanwide Group Certification



Weiqlao Group Certification



NGC Certification



Zhangjiakou Energy Business
Division Certification



Datang International Panshan Power
Generation Co., Ltd. Certification



MPG Roller Press Gearbox
Test Project Report



Huatuo Mining Certification



Ocean-Going Vessel Certification



CNBM Certification



Jiangsu Shendun Certification

Lopal Lubrication Solution for Wind Power Industry

Wind Rider, Boost Energy Efficiency

Lopal Lubrication Solution for Thermal Power Industry

Tap Potential, Improve Efficiency

Lopal Lubrication Solution for Iron and Steel Industry

High-Efficiency Lubrication for Steel Making

Lopal Lubrication Solution for Cement Industry

**Withstand Severe Working Conditions,
Empower the Industry**

Lopal Lubrication Solution for General Manufacturing Industry

Made in China, Intelligent Lubrication



Lopal Lubrication Solution for Marine Industry

Professional Lubrication for Your Voyage



Lopal Industrial Lubricants Product Manual

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Lopal Hypal Hydraulic Oil

Lopal Hypal M1 High Pressure Anti-wear Hydraulic Oil

This product is blended from deeply refined high-quality base oils and premium additives through advanced production processes. It features excellent performance, meets a number of international and OEM standards, and can be widely used for lubrication of hydraulic and transmission systems in industrial, marine and mobile equipment. This product is graded into grades 32, 46, 68, etc., according to kinematic viscosity at 40℃.

Product Features

- Outstanding anti-wear performance, passing a variety of hydraulic pump tests, effectively extending the service life of pumps and systems;
- Good hydrolytic stability, rust and corrosion resistance, and excellent thermal oxidation stability;
- Excellent foam inhibition and air release properties;
- Good water separation and demulsibility, enabling rapid oil-water separation and avoiding oil emulsification;
- Excellent dry and wet filterability, minimizing filter clogging, passing various high-precision oil filters smoothly, and effectively maintaining system cleanliness.

Field of Application

- Widely used in hydraulic and transmission systems of industrial, marine and mobile equipment; also suitable for lubrication of general load gear drives, bearings and other industrial machinery;
- Applicable to high-pressure piston pump systems.

Technical Specifications

- GB 11118.1-2011 (L-HM)
- Bosch Rexroth RDE 90235
- Denison HF-0;
- Vickers M-2950-S/I-286-S
- Cincinnati Machine P68、P69、P70
- DIN 51524 (II)
- AFNOR NFE48-603 (HM)
- U.S.Steel 126、127、136
- JCMAS HK
- ISO 11158(L-HM)

Product Properties

Item	Typical Data			Test Method
	32	46	68	
ISO Viscosity Grade	32	46	68	
Kinematic Viscosity (40℃), mm²/s	31.81	44.96	68.22	GB/T 265
Viscosity Index	114	115	112	GB/T 1995
Flash Point (Open Cup), ℃	242	244	246	GB/T 3536
Pour Point, ℃	-36	-33	-30	GB/T 3535
Demulsibility (54℃), min	10	10	10	GB/T 7305
Cleanliness	9	9	9	DL/T 432

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal Hypal M2 High Pressure Ashless Anti-wear Hydraulic Oil

This product is blended from high-quality base oils and imported high-grade ashless composite additives through advanced processes and technologies, and has passed the Denison HF-0 new T6H20C mixed pump test. It is specially suitable for lubrication of high-pressure hydraulic systems with silver and copper components. This product is graded into grades 32, 46, 68, etc., according to kinematic viscosity at 40°C.

Product Features

- Excellent anti-wear performance and high load-carrying capacity, providing reliable lubrication for hydraulic pumps and ensuring normal operation of equipment;
- Excellent demulsibility and water separation performance, preventing oil viscosity reduction and insufficient oil film load-carrying capacity caused by water mixing, and effectively extending equipment service life;
- Good oxidation stability, delaying oil aging and enabling long-term use in high-temperature environments;
- Excellent corrosion and rust resistance, effectively preventing corrosion and rust of metal parts caused by the intrusion of a large amount of water or acidic substances.

Field of Application

- Suitable for medium and high-pressure hydraulic equipment in metallurgy, coal, electric power, construction and other industries, especially for precision high-pressure hydraulic systems with copper and silver components.

Technical Specifications

- GB 11118.1-2011 (L-HM)
- Denison HF-0、HF-1、HF-2
- DIN 51524 (II)
- Cincinnati Machine P68、P69、P70
- ISO 11158(L-HM)
- Vickers M-2950-S/I-286-S

Product Properties

Item	Typical Data			Test Method
ISO Viscosity Grade	32	46	68	
Kinematic Viscosity (40°C), mm ² /s	30.02	44.96	68.15	GB/T 265
Viscosity Index	117	113	107	GB/T 1995
Flash Point (Open Cup), °C	242	246	248	GB/T 3536
Pour Point, °C	-30	-33	-30	GB/T 3535
Demulsibility (54°C), min	10	10	10	GB/T 7305
Cleanliness	9	9	9	DL/T 432

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal Hypal M5 Low Temperature Hydraulic Oil

This product is blended from high viscosity index base oils and selected high-quality multi-functional additives, with excellent viscosity-temperature performance. It is specially suitable for use under extreme temperature conditions, such as open-air, cold regions, and medium and high-pressure hydraulic systems with large ambient temperature changes or severe working conditions. This product is graded into grades 32, 46, 68, etc., according to kinematic viscosity at 40°C.

Product Features

- Fully inheriting the high anti-wear quality of Lopal HM anti-wear hydraulic oil, with better high and low temperature performance than HM, providing excellent low-temperature starting performance, low-temperature fluidity and high-temperature protection, effectively extending the service life of the oil;
- Outstanding anti-wear performance, passing a variety of hydraulic pump tests, effectively extending the service life of pumps and systems;
- Excellent viscosity-temperature performance, shear stability and oxidation stability, small viscosity change makes the hydraulic system work more stably;
- Good hydrolytic stability, rust and corrosion resistance, and excellent thermal oxidation stability;Excellent foam inhibition and air release properties;
- Good dry and wet filterability, minimizing filter clogging.

Field of Application

- This product is suitable for medium and high-pressure hydraulic systems under severe and heavy load working conditions;
- Suitable for medium and high-pressure hydraulic systems in open-air, cold regions and with large ambient temperature changes, such as hydraulic systems of engineering machinery, construction machinery, mining machinery, oilfield machinery, ships and vehicles.

Technical Specifications

- GB 11118.1-2011 (L-HV)
- ISO 11158(L-HV)
- Denison HF-0
- Vickers M-2950-S/I-286-S
- Cincinnati Milacron P68、P69、P70
- DIN 51524 (III)
- AFNOR NFE48-6039 (HV)

Product Properties

Item	Typical Data			Test Method
	32	46	68	
ISO Viscosity Grade	32	46	68	
Kinematic Viscosity (40°C), mm²/s	32.09	47.22	69.07	GB/T 265
Viscosity Index	158	157	142	GB/T 1995
Flash Point (Open Cup), °C	228	232	238	GB/T 3536
Pour Point, °C	-42	-45	-36	GB/T 3535
Demulsibility (54°C), min	6	12	9	GB/T 7305
Cleanliness	9	9	9	DL/T 432

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal Hypal M7 SHV Low Condensation Anti-wear Hydraulic Oil

This product is formulated from imported hydrotreated Group III base oils, viscosity index improvers and multi-functional hydraulic oil composite additives. It has better low-temperature performance than HV low-temperature anti-wear hydraulic oil, and is specially suitable for lubrication of outdoor operation machinery in severe cold areas in winter. This product is graded into grades 22, 32, 46, etc., according to kinematic viscosity at 40°C.

Product Features

- Fully inheriting the high anti-wear quality of Lopal HM anti-wear hydraulic oil, with better high and low temperature performance than HM, providing excellent low-temperature starting performance, low-temperature fluidity and high-temperature protection, effectively extending the service life of the oil;
- Outstanding anti-wear performance, passing a variety of hydraulic pump tests, effectively extending the service life of pumps and systems;
- Excellent viscosity-temperature performance, shear stability and oxidation stability, small viscosity change makes the hydraulic system work more stably;
- Good hydrolytic stability, rust and corrosion resistance, and excellent thermal oxidation stability;
- Excellent foam inhibition and air release properties;
- Good dry and wet filterability, minimizing filter clogging.

Field of Application

- This product is specially suitable for medium and high-pressure hydraulic systems of outdoor operation machinery with large ambient temperature changes or severe working conditions in severe cold areas in winter, such as hydraulic systems of engineering machinery, construction machinery, mining machinery, oilfield machinery, ships and vehicles. Applicable to ambient temperature below -30°C.

Technical Specifications

- GB 11118.1-2011 (L-HS)
- Denison HF-0
- Vickers M-2950-S/I-286-S
- Cincinnati Machine P68、P69、P70
- AFNOR NFE48-603 (HV)
- U.S.Steel 126、127、136
- JCMAS HK
- ISO 11158 L-HS)
- DIN 51524-3

Product Properties

Item	Typical Data		Test Method
	32	46	
ISO Viscosity Grade	32	46	
Kinematic Viscosity (40°C), mm ² /s	31.01	42.36	GB/T 265
Viscosity Index	175	203	GB/T 1995
Flash Point (Open Cup), °C	228	230	GB/T 3536
Pour Point, °C	-48	-45	GB/T 3535
Demulsibility (54°C), min	5	3	GB/T 7305
Cleanliness	9	9	DL/T 432

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal Hypal M9 Highly Clean Hydraulic Oil

This product is precisely formulated from high-quality base oils with the addition of multi-functional additives such as anti-wear, anti-oxidant, rust-proof, metal passivation and pour point depressants. Based on the original lubricant production facilities, reasonable transformation has been carried out with the adoption of multi-stage filtration equipment and precision filter bags, enabling the produced hydraulic oil to meet the high cleanliness requirements of the specified grade. In addition to strict regulations on cleanliness, the oil also has the performance of high-quality anti-wear hydraulic oil. Products meeting NAS Class 7 and NAS Class 6 requirements are available, and the product is graded into grades 22, 32, 46, 68, etc., according to kinematic viscosity at 40°C.

Product Features

- Excellent FZG performance, passing a variety of hydraulic pump tests, effectively extending the service life of pumps and systems;
- Good hydrolytic stability, rust and corrosion resistance, and excellent thermal oxidation stability;
- Good water separation and demulsibility, enabling rapid oil-water separation and avoiding oil emulsification;
- Excellent dry and wet filterability, minimizing filter clogging with excellent anti-contamination capacity;
- Special cleanliness performance, no excessive solid particles and other soluble impurities allowed, ensuring the stable and normal operation of hydraulic devices.

Field of Application

- High cleanliness hydraulic oil is suitable for imported or domestic medium and high-pressure hydraulic equipment in metallurgy, coal, electric power and construction industries, especially for highly automated hydraulic equipment equipped with precision hydraulic components (such as electro-hydraulic servo valves, digital valves, proportional valves) with strict cleanliness requirements.

Technical Specifications

- GB 11118.1-2011 (L-HM)
- ISO 11158 (L-HM)
- Denison HF-0
- Vickers M-2950-S/I-286-S
- Cincinnati Milacron P68、P69、P70
- DIN 51524 (II)
- AFNOR NFE48-603 (HM)

Product Properties

Item	Typical Data				Test Method
ISO Viscosity Grade	32	32S	46	46S	
Kinematic Viscosity (40°C), mm²/s	31.87	31.07	45.62	45.28	GB/T 265
Viscosity Index	116	116	115	115	GB/T 1995
Flash Point (Open Cup), °C	234	234	240	240	GB/T 3536
Pour Point, °C	-36	-36	-30	-30	GB/T 3535
Air Release Value (50°C), min	3.6	3.2	5.0	4.5	SH/T 0308
Demulsibility (54°C), min	10	10	10	10	GB/T 7305
Cleanliness, Grade	7	6	7	6	NAS 1638

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal Hypal M11 HFD Fire-Resistant Hydraulic Fluid (Water-Glycol Type)

This product is blended with water and glycol as the base fluid, plus various additives such as anti-wear agents, oiliness agents and rust inhibitors, and is suitable for hydraulic systems with fire hazards.

Product Features

- Excellent fire resistance, the unique water-based formula can reduce temperature and isolate air to avoid fire in case of leakage;
- Good oxidation stability and low-temperature fluidity, few oxidative decomposition products at high temperature and easy start-up at low temperature;
- Good lubricity and anti-wear performance, ensuring reliable lubrication for delivery pumps under high temperature and high pressure;
- Excellent rust resistance and shear stability with a long service life.

Field of Application

- Suitable for hydraulic systems operating in open flame and high-temperature environments, such as fire-proof hydraulic systems in iron and steel, coal mine, chemical industry, mechanical processing and other industries;
- Service temperature range: -40~60℃.

Technical Specifications

- GB/T 21449-2008
- ISO 12922

Product Properties

Item	Typical Data	Test Method
ISO Viscosity Grade	46	
Appearance	Red Transparent Liquid	Visual Inspection
Kinematic Viscosity (40℃), mm ² /s	45.96	GB/T 265
Viscosity Index	210	GB/T 1995
Density (20℃), g/cm ³	1.07	GB/T 1884
Pour Point, ℃	-51	GB/T 3535
Copper Strip Corrosion (50℃, 3h)	1a	GB/T 5096
pH Value (20℃)	9.3	ISO 20843

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- Maximum service temperature: not more than 55℃ for open oil tanks and 65℃ for closed oil tanks. Excessively high temperature will cause excessive water evaporation, leading to an increase in the viscosity of hydraulic fluid and affecting its use;
- Attention should be paid to the compatibility with metals and non-metals when using this product;
- It cannot be mixed with mineral oil-based, emulsion-based and ester-based hydraulic media. Therefore, the hydraulic system should be thoroughly cleaned before filling with this product;
- During use, check the oil appearance, viscosity, pH value, foam and other conditions regularly (generally 3 months), and handle problems in a timely manner if found.

Lopal Hypal M12 HFD Fire-Resistant Hydraulic Fluid (Ester Type)

This product is blended with specific high-quality synthetic esters as base oil, plus additives such as anti-oxidant, anti-corrosion and anti-wear agents, and is suitable for hydraulic systems with fire hazards.

Product Features

- Excellent lubrication performance and material compatibility, greatly reducing equipment friction and extending equipment operation time;
- High viscosity index, good viscosity-temperature characteristics and low-temperature fluidity with a wide service temperature range;
- Excellent flame retardancy with high flash point and ignition point, and the operating temperature and working pressure are higher than those of water-glycol type fire-resistant hydraulic fluid;
- Biodegradable.

Field of Application

- Suitable for fire-resistant and safe hydraulic systems in iron and steel, ceramic manufacturing, coal mine and machinery industries, such as hydraulic systems with fire hazards in continuous casting production lines, blast furnaces, furnace dismantling machines, hot rolling mills, foundries in the iron and steel industry;
- Operating temperature range: -35~150℃, operating pressure up to 40MPa.

Technical Specifications

- Q/320192 LPSH 90-2022
- NB/SH/T 6045-2021
- ISO 12922

Product Properties

Item	Typical Data		Test Method
	46	68	
ISO Viscosity Grade			
Kinematic Viscosity (40℃), mm ² /s	47	68.1	GB/T 265
Viscosity Index	195	188	GB/T 1995
Flash Point (Open Cup), ℃	286	310	GB/T 3536
Pour Point, ℃	-42	-25	GB/T 3535
Manifold Ignition Test (400℃)	Pass	Pass	SH/T 0567

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- When this product replaces mineral oil hydraulic oil, the mineral oil content in the system should be less than 5%;
- When replacing water-based fire-resistant hydraulic fluid, the water content in the system should be less than 0.2%;
- When replacing other ester-type fire-resistant hydraulic fluids, attention should be paid to the applicability of compatibility and sealing performance.

Lopal Hypal M14 Hydraulic Guide Rail Oil

Changdong M14 Hydraulic Guide Rail Oil is blended from paraffinic mineral base oils and selected additives, suitable for lubrication of combined hydraulic and guide rail systems. This product is graded into grades 68, 100, 150, 220, etc., according to kinematic viscosity at 40℃.

Product Features

- Good friction reduction performance, which can minimize vibration or intermittent sliding (stick-slip) of machine tools at low speed with excellent stick-slip characteristics to prevent the "crawling" phenomenon;
- Good oxidation stability and filterability, extending equipment service life;
- Good foam resistance and air release property, ensuring sensitive, accurate and stable operation of hydraulic systems;
- Excellent anti-wear performance, corrosion resistance, rust resistance and compatibility with sealing parts.

Field of Application

- This product is suitable for general low and medium-pressure hydraulic systems and machine tools with combined hydraulic and guide rail lubrication systems;
- Can be used for lubrication of precision machine tool guide rails.

Technical Specifications

- GB 11118.1-2011 L-HG
- MAG P47、P50
- GM LS2
- ISO 11158-2023 (E) HG
- US Military A-A-59113A-2015
- ISO 19378 GA&GB

Product Properties

Item	Typical Data				Test Method
	68	100	150	220	
Kinematic Viscosity (40℃), mm ² /s	68.78	105.2	153.3	215.4	GB/T 265
Viscosity Index	108	105	107	105	GB/T 1995
Flash Point (Open Cup), ℃	238	248	258	254	GB/T 3536
Pour Point, ℃	-33	-27	-21	-18	GB/T 3535
Copper Strip Corrosion	1b	1b	1b	1b	GB/T 5096
Acid Value (as KOH), mg/g	0.24	0.26	0.26	0.23	GB/T 4945

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal Hypal M15 DP Environment-Friendly Hydraulic Oil (Biodegradable)

Lopal environment-friendly hydraulic oil series are HEES class environment-friendly high-quality hydraulic oils based on saturated biodegradable synthetic esters. The product is recommended for most vane pumps, gear pumps and piston pumps, and for hydraulic devices requiring biodegradability, non-toxicity and environmental protection under high temperature and high pressure. This product is graded into grades 32 and 46 according to kinematic viscosity at 40°C.

Product Features

- Renewable raw material content >90%, biodegradable, non-toxic and environmental friendly, WGK Grade 1;Compatible with a variety of metals and sealing materials commonly used in hydraulic systems;
- Excellent high and low temperature performance, fully meeting the requirements of outdoor hydraulic equipment in winter;
- Good thermal-oxidative stability, effectively controlling sediments and particles to improve the performance of hydraulic pumps and control valves;
- Excellent anti-wear protection, maximizing equipment service life and reducing maintenance costs;
- Unique rust and corrosion inhibitors to avoid corrosion of multi-metal components;
- Certified by the "Blue Angel" and awarded national invention patent.

Field of Application

- This product is suitable for hydraulic equipment with environmental sensitivity requirements (non-toxic to the environment, easily biodegradable, which can greatly reduce the negative impact of lubricating oil on the environment due to leakage, splashing, evaporation, residues in packaging materials and improper disposal);
- Hydraulic transmission systems of high-pressure equipment operating under extreme weather conditions (high temperature, extreme cold);
- Suitable for engineering machinery, water conservancy industry, dredgers, forest machinery, sea-going ships, mining, drilling, wind power generation, tunnel engineering and other industries.

Technical Specifications

- ISO 15380

Swedish Standard SS 15 54 34

Blue Angle ECO-Label
- EU-ECO Label

Bosch Rexroth RD 90221

NB/SH/T 6086-2024
- VDMA 24568 HEES

JCMAS HKB

Product Properties

Test Item	Test Result		Test Method
	32	46	
Kinematic Viscosity (40°C), mm²/s	31.96	46.56	GB/T 265
Viscosity Index	180	197	GB/T 1995
Pour Point, °C	-54	-48	GB/T 3535
Flash Point (Open Cup), °C	262	263	GB/T 3536
Copper Strip Corrosion (100°C, 3h), Grade	1a	1a	GB/T 5096
Liquid Phase Corrosion (Method A/B)	No Rust	No Rust	GB/T 11143
Biodegradability (Ready Biodegradability Rate), %	> 80	> 80	CEC-L-33-A-93
Biotoxicity (Acute Aquatic Biotoxicity)	No Acute Toxicity (Non-Toxic)	No Acute Toxicity (Non-Toxic)	GB/T 15441;ASTM D6081 GB/T 16488

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

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Lopal IndRev Gear Industrial Gear Oil

Lopal IndRev Gear G1 Medium Duty Industrial Closed Gear Oil

This product is refined from high-quality base oils and multi-functional composite additives through advanced blending technology. It has strong load-carrying capacity, excellent thermal oxidation stability and corrosion resistance, ensuring smooth and efficient gear operation. It is graded into grades 100, 150, 220, 320, 460, etc., according to kinematic viscosity at 40℃ to meet different working condition requirements.

Product Features

- Medium extreme pressure capacity, meeting the use requirements of various medium and light load industrial enclosed gearboxes;
- Good rust resistance and demulsibility, effectively preventing mechanical part corrosion when water enters the gear oil during operation;
- Good oxidation stability and thermal stability, ensuring a long service life of the oil.

Field of Application

- Suitable for lubrication of low-speed large enclosed gear drives with tooth surface contact stress less than 1100MPa in mining, cement, chemical fertilizer and metallurgical industries.

Technical Specifications

- GB 5903-2011 L-CKC
- ISO 12925-1-2024 CKC
- DIN 51517 Part 3 (CLP)
- U.S.Steel 224

Product Properties

Item	Typical Data					Test Method
ISO Viscosity Grade	100	150	220	320	460	
Kinematic Viscosity (40℃), mm²/s	97.03	149.5	230.3	314.1	458.3	GB/T 265
Kinematic Viscosity (100℃), mm²/s	10.73	14.38	19.66	23.7	31.1	GB/T 265
Viscosity Index	93	94	98	95	98	GB/T 1995
Flash Point (Open Cup), ℃	242	246	248	248	264	GB/T 3536
Pour Point, ℃	-21	-21	-18	-15	-15	GB/T 3535
FZG Gear Test, Failure Stage	12	12	>12	>12	>12	NB/SH/T 0306

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- Select oil products with appropriate quality and viscosity grades according to the equipment oil specifications; storage containers must be special, waterproof and moisture-proof during storage and transportation to prevent mechanical impurities from mixing in; prevent foreign matter contamination; prevent mixing with other oil products, and different types of gear oils shall not be mixed either.

Lopal IndRev Gear G2 Heavy Duty Industrial Closed Circuit Gear Oil

This product is formulated from high viscosity index high-quality lubricant base oils with the addition of multi-functional composite additives through advanced blending technology. It meets the requirements of L-CKD gear oil in the enclosed industrial gear oil standard GB5903-2011 and the ISO 12925 L-CKD standard at the same time, and its performance reaches the leading level of similar products at home and abroad. This product is graded into grades 100, 150, 220, 320, 460, etc., according to kinematic viscosity at 40°C.

Product Features

- Strong extreme pressure capacity, meeting the use requirements of various heavy load industrial enclosed gearboxes and bearings;
- Good demulsibility, able to quickly separate water entering the gearbox;
- Good oxidation stability and thermal stability, reducing sludge formation.

Field of Application

- Suitable for lubrication of low-speed large enclosed gear drives with tooth surface contact stress greater than 1100MPa in iron and steel, mining, cement and papermaking machinery industries.

Technical Specifications

- GB 5903-2011 L-CKD
- AIST (US Steel) No.224
- ANSI/ AGMA 9005-F16
- ISO 12925-1-2024 CKD
- Cincinnati EP Gear Oils

Product Properties

Item	Typical Data					Test Method
	100	150	220	320	460	
ISO Viscosity Grade	100	150	220	320	460	
Kinematic Viscosity (40°C), mm ² /s	96.3	148.3	208.9	333.1	467.5	GB/T 265
Kinematic Viscosity (100°C), mm ² /s	11.1	14.44	18.34	24.94	31.21	GB/T 265
Viscosity Index	99	95	97	96	97	GB/T 1995
Flash Point (Open Cup), °C	242	246	248	252	262	GB/T 3536
Pour Point, °C	-27	-21	-18	-15	-12	GB/T 3535
FZG Gear Test, Failure Stage	>12	>12	>12	>12	>12	NB/SH/T 0306

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- Select oil products with appropriate quality and viscosity grades according to the equipment oil specifications; storage containers must be special, waterproof and moisture-proof during storage and transportation to prevent mechanical impurities from mixing in; prevent foreign matter contamination; prevent mixing with other oil products, and different types of gear oils shall not be mixed either.

Lopal IndRev Gear G3 KMP Heavy Duty Industrial Closed Circuit Gear Oil (Micropitting resistance)

This product is refined from high-quality base oils and multi-functional imported composite additives through advanced blending technology, which can effectively prevent the occurrence of micropitting during the operation of gear equipment; it also has the performance of traditional heavy load industrial gear oil, ensuring smooth gear operation and extending equipment service life. This product is graded into grades 320, 460, 680, etc., according to kinematic viscosity at 40℃.

Product Features

- Excellent anti-micropitting protection performance, effectively reducing the risk of premature damage to gear surfaces;
- Excellent thermal oxidation stability, inhibiting the formation of oil oxides and improving the high-temperature operation capacity of equipment;
- Excellent load-carrying and anti-wear performance, reducing maintenance intervals and extending equipment service life;
- Good corrosion resistance and foam resistance, effectively inhibiting corrosion and bubble formation.

Field of Application

- Suitable for gear lubrication of plastic extrusion gearboxes;
- Widely used for gear lubrication of equipment in papermaking, iron and steel, textile, logging and cement industries.

Technical Specifications

- Flender AS7300-16.2
- GB 5903-2011
- DIN 51517-4
- ANSI/ AGMA 9005-F16
- SEB 181226
- AIST 224
- David Brown S1.53 101E
- CM P63, P74, P35
- ISO 12925-2024 CKSMP

Product Properties

Item	Typical Data			Test Method
	320	460	680	
ISO Viscosity Grade	320	460	680	
Kinematic Viscosity (40℃), mm ² /s	320.7	478.5	691.6	GB/T 265
Kinematic Viscosity (100℃), mm ² /s	26.80	34.04	43.69	GB/T 265
Viscosity Index	107	105	107	GB/T 1995
Flash Point, ℃	244	254	268	GB/T 3536
Pour Point, ℃	-18	-15	-12	GB/T 3535
FZG Gear Test, Failure Stage	>12	>12	>12	NB/SH/T 0306

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- Select oil products with appropriate quality and viscosity grades according to the equipment oil specifications; storage containers must be special, waterproof and moisture-proof during storage and transportation to prevent mechanical impurities from mixing in; prevent foreign matter contamination; prevent mixing with other oil products, and different types of gear oils shall not be mixed either.

Lopal IndRev Gear G5 XHP Heavy Duty Industrial Closed Circuit Gear Oil (Fully Synthetic PAO)

This product is made from polyalphaolefin (PAO) synthetic base oils and high-quality multi-functional composite additives through advanced blending technology. It has excellent performance superior to mineral oil products in harsh environments, has passed the German FLENDER certification, and its performance complies with international standards. This product is graded into grades 100, 150, 220, 320, 460, 680, etc., according to kinematic viscosity at 40°C.

Product Features

- Excellent load-carrying capacity and anti-wear performance, extending equipment service life;
- Good corrosion and rust resistance, effectively inhibiting the occurrence of corrosion and wear of components;
- Excellent low-temperature fluidity, ensuring the normal start-up and operation of gearboxes at low temperatures;
- Excellent heat resistance and stability, preventing oil deterioration at high temperature, no coking and no sediment during long-term use at high temperature.

Field of Application

- Scope Suitable for various industrial heavy load gear sets and other gears with gear load, gear lubrication mainly by boundary lubrication under heavy load or impact load and low speed conditions, and lubrication of enclosed gear machinery under extreme temperature conditions.
- Service temperature: -30~150°C.

Technical Specifications

- | | | |
|---------------------|------------------------|-----------------------|
| Flender AS7300-16.2 | NB/SH/T 0467-2010 | GB 5903-2011 |
| DIN 51517 Part III | ANSI/ AGMA 9005-F16 | SEB 181226 |
| AIST 224 | David Brown S1.53 101E | ISO 12925-1-2024 CTPR |

Product Properties

Item	Typical Data						Test Method
	100	150	220	320	460	680	
ISO Viscosity Grade	100	150	220	320	460	680	
Kinematic Viscosity (40°C), mm ² /s	100.5	150.0	222	317.9	456.9	702.9	GB/T 265
Kinematic Viscosity (100°C), mm ² /s	15.87	22.09	30.46	41.03	55.20	78.78	GB/T 265
Viscosity Index	169	175	179	184	188	195	GB/T 1995
Flash Point (Open Cup), °C	226	232	238	242	248	252	GB/T 3536
Pour Point, °C	-51	-48	-45	-42	-40	-36	GB/T 3535
FZG Gear Test, Failure Stage	>12	>12	>12	>12	>12	>12	NB/SH/T 0306

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Foreign Products Of The Same Type

- In terms of service performance, it can replace similar products at home and abroad such as Mobil SHC 600 series, Shell Omala S4 GX series, Great Wall No.4406 Synthetic Heavy Load Industrial Gear Oil.

Lopal IndRev Gear G7 EP Worm Gear Oil

This product is blended from high viscosity index high-quality base oils and multi-functional composite additives through advanced process technology. It has excellent high-temperature oxidation stability, anti-wear and friction reduction performance, as well as rust and corrosion resistance, which can effectively protect the worm gear matching components bearing vibration and impact loads in the transmission system and ensure reliable power transmission. This product is graded into grades 220, 320, 460, etc., according to kinematic viscosity at 40℃.

Product Features

- Excellent lubricity and high load-carrying capacity, effectively protecting worm gears under vibration and impact loads;
- Good oxidation stability, extending oil change interval and reducing equipment maintenance costs;
- Good corrosion and rust resistance, especially effective for bronze materials;
- Good oil-water separation and foam resistance, endowing equipment with optimal operating efficiency.

Field of Application

- Suitable for lubrication of heavy-loaded cylindrical worm gear pairs with copper-steel matching under vibration and impact during transmission, including gears and spur cylindrical gears of the equipment, as well as other mechanical equipment working in humid environments.

Technical Specifications

- SHT 0094-1991(L-CKE/P)
- ISO 12925-1-2024 CKE

Product Properties

Item	Typical Data			Test Method
	220	320	460	
ISO Viscosity Grade	220	320	460	
Kinematic Viscosity (40℃), mm²/s	223.7	321.8	440.5	GB/T 265
Kinematic Viscosity (100℃), mm²/s	19.97	24.14	30.26	GB/T 265
Viscosity Index	103	95	98	GB/T 1995
Flash Point (Open Cup), °C	250	252	262	GB/T 3536
Pour Point, °C	-15	-15	-12	GB/T 3535
Copper Strip Corrosion (100℃, 3h), Grade	1a	1a	1a	GB/T 5096
Demulsibility (82℃)	15	15	15	GB/T 7305

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- Select oil products with appropriate quality and viscosity grades according to the equipment oil specifications; storage containers must be special, waterproof and moisture-proof during storage and transportation to prevent mechanical impurities from mixing in; prevent foreign matter contamination; prevent mixing with other oil products, and different types of gear oils shall not be mixed either.

03

Lopal IndRev SRO Guide Rail Oil

Lopal IndRev SRO E1 Guide rail oil

This product is formulated from mineral base oils and carefully selected additives, suitable for guide rail lubrication of machine tools such as grinders, lathes, planers, boring machines and drilling machines. The designed formula can provide good friction performance for guide rails and chutes of various materials (including steel-on-steel, steel-on-polymer), and reduce tremor and crawling. This product is graded into grades 32, 68, 100, 220, etc., according to kinematic viscosity at 40°C.

Product Features

- Good anti-wear performance, reducing wear;
- Good oxidation stability, rust and corrosion resistance;
- Good stick-slip characteristics, preventing the "crawling" phenomenon.

Field of Application

- Suitable for lubrication of metal guide rails of various equipment;
- Low viscosity guide rail oils (32, 68) are suitable for lubrication of horizontal guide rails;
- High viscosity guide rail oils (100, 220) are suitable for lubrication of vertical guide rails.

Technical Specifications

- SH/T 0361-1998
- ISO 19378 GA&GB
- US Military A-A-59113A

Product Properties

Item	Typical Data			Test Method
ISO Viscosity Grade	68	100	220	
Kinematic Viscosity (40°C), mm ² /s	64.1	103.2	215.6	GB/T 265
Kinematic Viscosity (100°C), mm ² /s	8.4	11.35	18.90	GB/T 265
Viscosity Index	100	100	98	GB/T 1995
Flash Point (Open Cup), °C	238	244	258	GB/T 3536
Pour Point, °C	-33	-30	-18	GB/T 3535
Stick-Slip Characteristic (Difference Between Static and Dynamic Friction Coefficients)	0.071	0.071	0.071	SH/T 0361 Appendix A

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

04

Lopal IndRev ACOM Air Compressor Oil

Lopal IndRev ACOM L1 DAB Air Compressor Oil

This product is carefully formulated from deeply refined high-quality mineral base oils with the addition of various functional additives, and can be used for lubrication of various fixed or reciprocating air compressors. This product is graded into six grades including 46, 68, 100, 150 according to kinematic viscosity at 40°C.

Product Features

- Excellent anti-wear performance, effectively protecting the compressor;
- Excellent oxidation stability and thermal stability, reducing the possibility of carbon deposition at high temperature;
- Excellent rust and corrosion resistance, preventing corrosion and rust of cylinders and exhaust valves.

Field of Application

- Suitable for lubrication and sealing of medium-load reciprocating air compressors and positive displacement compressors.

Technical Specifications

- GB/T 12691-2021 (L-DAB)
- DIN 51506 (VDL)
- ISO 6521-1-2019 DAB

Product Properties

Item	Typical Data			Test Method
	46	100	150	
ISO Viscosity Grade	46	100	150	
Kinematic Viscosity (40°C), mm ² /s	45.84	101.6	142	GB/T 265
Kinematic Viscosity (100°C), mm ² /s	6.88	11.4	14.72	GB/T 265
Viscosity Index	105	98	103	GB/T 1995
Flash Point (Open Cup), °C	226	248	268	GB/T 3536
Pour Point, °C	-21	-24	-15	GB/T 3535
Demulsibility, min	5	5	7	GB/T 7305
Mechanical Impurities, %	/	/	/	GB/T 511

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- During storage and transportation, the used containers, oil tanks, pipelines, valves, etc. shall be thoroughly cleaned and inspected to be qualified to prevent contamination;
- Storage and transportation containers must be special and stored indoors or in a controllable climatic environment as much as possible;
- Storage containers must be waterproof and moisture-proof to prevent mechanical impurities from entering;
- The product must be clearly marked during transportation to prevent confusion with other types of petroleum products.

Lopal IndRev ACOM L2 DAH Oil Injection Rotary Air Compressor Oil

This product is carefully formulated from deeply refined hydrotreated mineral base oils with the addition of various functional additives, and can be used for lubrication of light-load rotary air compressors. This product is graded into grades 32, 46, 68, etc., according to kinematic viscosity at 40°C.

Product Features

- Excellent oxidation stability with a long service life;
- Excellent anti-wear performance, protecting the compressor;
- Excellent oil-water separation performance;
- Outstanding rust and corrosion resistance.

Field of Application

- Suitable for lubrication of rotary (screw and vane) air compressors with exhaust temperature below 100°C and effective working pressure of 800KPa–1500KPa, or exhaust temperature of 100°C~110°C and effective working pressure below 800KPa.

Technical Specifications

- GB/T 12691–2021
- ISO/TS 6521–2–2021 DAH

Product Properties

Item	Typical Data		Test Method
	46	68	
ISO Viscosity Grade	46	68	
Kinematic Viscosity (40°C), mm²/s	45.8	67.3	GB/T 265
Kinematic Viscosity (100°C), mm²/s	6.88	8.643	GB/T 265
Viscosity Index	105	99	GB/T 1995
Flash Point (Open Cup), °C	226	254	GB/T 3536
Pour Point, °C	–21	–22	GB/T 3535
Demulsibility, min	7	8	GB/T 7305
Mechanical Impurities, %	/	/	GB/T 511

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- During storage and transportation, the used containers, oil tanks, pipelines, valves, etc. shall be thoroughly cleaned and inspected to be qualified to prevent contamination;
- Storage and transportation containers must be special and stored indoors or in a controllable climatic environment as much as possible;
- Storage containers must be waterproof and moisture-proof to prevent mechanical impurities from entering;
- The product must be clearly marked during transportation to prevent confusion with other types of petroleum products.

Lopal IndRev ACOM L3 XP Synthetic Air Compressor Oil

This product is carefully formulated by blending imported API Group IV and API Group V synthetic base oils with deeply hydrotreated base oils and adding various additives. Synthetic air compressor oil has outstanding oxidation and thermal degradation resistance, far exceeding mineral oil products. The unique formula design helps reduce equipment failures, as well as carbon deposition and contamination of various components, thus saving maintenance costs. This product is graded into grades 32, 46, 68, etc., according to kinematic viscosity at 40°C.

Product Features

- Excellent low-temperature fluidity and good comprehensive chemical properties, meeting the requirements of long-term normal operation under various harsh environments;
- High viscosity index, reducing the change of oil viscosity with operating temperature;
- Service life of more than 6000 hours, far exceeding mineral air compressor oils;
- Excellent thermal oxidation stability, safe and reliable for long-term use at high temperature;
- Excellent surface properties, the oil has low foaming tendency and excellent demulsibility.

Field of Application

- Suitable for lubrication of light, medium and heavy-load screw air compressors and medium and small reciprocating compressors.

Technical Specifications

■ Q/3200 LPSH 33-2017

■ GB/T 12691-2021

■ ISO/TS 6521-2-2021 DAH

Product Properties

Item	Typical Data			Test Method
	32	46	68	
ISO Viscosity Grade	32	46	68	
Kinematic Viscosity (100°C), mm ² /s	6.134	7.142	9.392	GB/T 265
Kinematic Viscosity (40°C), mm ² /s	33.4	44.08	64.23	GB/T 265
Viscosity Index	133	122	126	GB/T 1995
Flash Point (Open Cup), °C	234	236	246	GB/T 3536
Pour Point, °C	-39	-39	-42	GB/T 3535
Demulsibility (40-37-3, 54°C), min	10	10	10	GB/T 7305
Copper Strip Corrosion (100°C, 3h), Grade	1b	1b	1b	GB/T 5096
Rotating Bomb Oxidation Test, min	1500	1500	1500	NB/SH/T 0193

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Foreign Products Of The Same Type

- In terms of service performance, it can replace similar products at home and abroad such as Hoffmon 8004 Semi-synthetic Compressor Oil, Great Wall No.4503 Semi-synthetic Air Compressor Oil.

Lopal IndRev ACOM L4 XHP Fully Synthetic Air Compressor Oil (PAO)

This product is blended from imported synthetic base oils and a variety of selected additives. The unique formula design helps reduce equipment failures, as well as carbon deposition and contamination of various components, thus saving maintenance costs. This product is graded into grades 32, 46, 68, etc., according to kinematic viscosity at 40°C.

Product Features

- Excellent low-temperature fluidity and good comprehensive chemical properties, meeting the requirements of long-term normal operation under various harsh environments;
- Service life of more than 8000 hours, far exceeding mineral air compressor oils;
- Excellent thermal oxidation stability, safe and reliable for long-term use at high temperature;
- Excellent chemical stability and low volatility, reducing the possibility of carbon deposition and colloid formation.

Field of Application

- Suitable for lubrication of light, medium and heavy-load screw air compressors and medium and small reciprocating compressors;
- Used as a replacement special oil for Atlas Copco air compressor after-sales market;
- Can be used for Fusheng and other domestic brand air compressors.

Technical Specifications

Q/320192 LPSH 227-2021

GB/T 12691-2021

ISO/TS 6521-2-2021 DAJ

Product Properties

Item	Typical Data			Test Method
	32	46	68	
ISO Viscosity Grade	32	46	68	
Kinematic Viscosity (40°C), mm²/s	32.3	46.1	66.5	GB/T 265
Kinematic Viscosity (100°C), mm²/s	6.14	7.80	10.1	GB/T 265
Viscosity Index	141	139	137	GB/T 1995
Flash Point (Open Cup), °C	242	248	254	GB/T 3536
Pour Point, °C	-66	-60	-57	GB/T 3535
Demulsibility (54°C), min	10	10	10	GB/T 7305
Rotating Bomb Oxidation Test, min	2600	2600	2600	GB/T 511

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Foreign Products Of The Same Type

- In terms of service performance, it can replace similar products at home and abroad such as Mobil Rarus SHC1020 series, Shell Corena S4R series, Great Wall No.4506 Synthetic Compressor Oil series.

05

Lopal IndRev VP Vacuum Pump Oil

Lopal IndRev VP P1 Vacuum Pump Oil

This product is blended from high-quality mineral base oils with a variety of selected additives, suitable for sealing and lubrication of various mechanical vacuum pumps. This product is graded into grades 46, 68, 100, etc., according to kinematic viscosity at 40°C.

Product Features

- Low saturated vapor pressure, able to maintain high ultimate vacuum and fast pumping speed when used at relatively high ambient temperature;
- Good oil-water separation capacity, excellent foam resistance and oxidation stability;
- Good sealing and lubricating properties;
- High flash point with safety guarantee performance;
- Low volatility;
- High viscosity index.

Field of Application

- Suitable for sealing and lubrication of various positive displacement vacuum pumps (mechanical vacuum pumps), and also for lubrication of the transmission system of roots vacuum pumps (mechanical booster pumps).

Technical Specifications

- SH/T 0528-1992

Product Properties

Item	Typical Data			Test Method
	46	68	100	
ISO Viscosity Grade	46	68	100	
Kinematic Viscosity (40°C), mm ² /s	46.11	67.58	99.45	GB/T 265
Flash Point (Open Cup), °C	228	234	268	GB/T 3536
Pour Point, °C	-21	-18	-15	GB/T 3535
Demulsibility, min	5	5	5	GB/T 7305

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Points For Attention

- Store the oil in a cool and dry place;
- After the oil drum is opened and used, cover the remaining oil with a sealed cover and use up the remaining part as soon as possible. Do not mix with other powder and liquid impurities;
- Environment and tools shall be kept clean. If cleaned with solvent, dry it before use;
- Select oil products with corresponding precision and quality according to the structural precision and service environment of the vacuum pump.

06

Lopal IndRev STG Turbine Oil

Lopal IndRev STG T1L-TSA Turbine Oil

This product is blended from high-quality base oils and multi-functional additives such as anti-wear, anti-foam, anti-oxidant, rust-proof, anti-corrosion and demulsifying agents, with excellent performance. This product is graded into grades 32, 46, 68, etc., according to kinematic viscosity at 40℃.

Product Features

- Excellent oil-water separation performance;
- Excellent rust and corrosion resistance, protecting equipment and preventing corrosion and rust caused by water entering the system;
- Good demulsibility and foam resistance;
- Excellent oxidation resistance with a long service cycle.

Field of Application

- Suitable for lubrication and sealing of steam turbine units, gas turbine units and water turbine units in electric power, large and medium-sized ships and other industries.

Technical Specifications

- GB 11120-2011
- Siemens TLV 901304 / 901305
- Alstom HTGD 90117 V0001 X
- DIN 51515 Part I & II
- GEK 46506E
- GEK 32568F
- British Standard 489:1999
- ISO 8068:2024 (L-TSA, L-TGA)

Product Properties

Item	Typical Data			Test Method
	32	46	68	
ISO Viscosity Grade	32	46	68	
Kinematic Viscosity (40℃), mm ² /s	33.2	45.52	64.28	GB/T 265
Viscosity Index	113	111	109	GB/T 1995
Density (20℃), g/cm ³	0.852	0.873	0.875	GB/T 1884
Flash Point (Open Cup), °C	226	234	242	GB/T 3536
Pour Point, °C	-42	-33	-18	GB/T 3535
Demulsibility (54℃), min	5	5	7	GB/T 7305

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

07

Lopal IndRev CPS Marine Oil

Lopal IndRev CPS H1 Marine Medium-Speed Trunk Piston Diesel Engine Oil

This product is refined from high-quality mineral base oils and selected high-performance additives.

Product Features

- Excellent extreme pressure and anti-wear performance, significantly improving power and reducing fuel consumption;
- Excellent lubrication performance, reducing engine operating noise and vibration, repairing wear and extending equipment service life;
- Good environmental protection performance, reducing exhaust gas and particulate pollutant emissions of marine diesel engines;
- Good total base number retention performance, effectively preventing acid value rise caused by various oxides and extending equipment service life;
- Excellent water separation performance and mixing adaptability.

Field of Application

- Suitable for the lubrication of cylinders and crankcases of marine medium-speed trunk-piston diesel engines.

Technical Specifications

GB / T 38049-2019

Product Properties

Item	Typical Data										Test Method
Product Grade	3012	3020	3030	3040	3050	4012	4020	4030	4040	4050	
Base Number (as KOH), mg/g	12	20	30	40	50	12	20	30	40	50	SH/T 0251
Kinematic Viscosity (100°C), mm ² /s	11.26	10.75	10.64	10.62	11.17	13.64	13.90	13.50	13.61	13.43	GB/T 265
Viscosity Index	105	101	103	104	105	98	100	97	100	99	GB/T 1995
Flash Point, °C	236	238	238	236	236	256	258	260	262	258	GB/T 3536
Pour Point, °C	-18	-18	-18	-21	-21	-15	-15	-15	-15	-15	GB/T 3535
Liquid Phase Corrosion (Method B, 24h)	No Rust	No Rust	No Rust	No Rust	No Rust	No Rust	No Rust	No Rust	No Rust	No Rust	GB/T 11143

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal IndRev CPS H2 Marine Cylinder Oil

This product is refined from high-quality mineral base oils and selected high-performance additives.

Product Features

- Excellent anti-wear performance, significantly improving power and reducing energy consumption;
- Excellent lubrication performance, reducing engine operating noise and vibration, repairing wear and extending equipment service life;
- Good viscosity-temperature performance, corrosion resistance, detergency and dispersancy, and thermal oxidation stability, significantly extending equipment service life;
- Excellent acid neutralization performance and mixing adaptability.

Field of Application

- Suitable for cylinder lubrication of two-stroke crosshead marine diesel engines fueled with high-sulfur diesel oil or heavy residual oil.

Technical Specifications

- GB / T 38049-2019

Product Properties

Item	Typical Data			Test Method
Product Grade	5040	5070	50100	
Base Number (as KOH), mg/g	40	70	100	SH/T 0251
Kinematic Viscosity (100℃), mm²/s	19.94	20.52	19.91	GB/T 265
Viscosity Index	100	100	103	GB/T 1995
Flash Point, ℃	264	268	262	GB/T 3536
Pour Point, ℃	-12	-12	-15	GB/T 3535
Mechanical Impurities, %	/	/	/	GB/T 511

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal IndRev CPS H3 Marine System Oil

This product is refined from high-quality mineral base oils and selected high-performance additives.

Product Features

- Excellent anti-wear performance, significantly improving power and reducing energy transmission consumption;
- Excellent lubrication performance, reducing engine operating noise and vibration, repairing wear and extending equipment service life;
- Good viscosity-temperature performance, corrosion resistance, detergency and dispersancy, reducing equipment maintenance frequency;
- Excellent water separation performance and mixing adaptability.

Field of Application

- Suitable for crankcase lubrication of low-speed crosshead two-stroke marine diesel engines.

Technical Specifications

- GB / T 38049-2019

Product Properties

Item	Typical Data				Test Method
	3005	3008	4005	4008	
Product Grade	3005	3008	4005	4008	
Base Number (as KOH), mg/g	5	8	5	8	SH/T 0251
Kinematic Viscosity (100℃), mm²/s	11.14	11.98	14.02	14.75	GB/T 265
Viscosity Index	100	102	100	99	GB/T 1995
Flash Point, ℃	268	262	262	262	GB/T 3536
Pour Point, ℃	-18	-18	-15	-15	GB/T 3535
Mechanical Impurities, %	/	/	/	/	GB/T 511

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

08

Lopal WinPower Wind Turbine Oil

Lopal WinPower V1 Fully Synthetic Wind Turbine Gear Oil

This product is formulated with polyalphaolefin synthetic base oil and imported multi-functional composite additives via advanced blending technology. It features excellent viscosity-temperature characteristics and thermal stability, as well as good low-temperature fluidity, and is graded into grades 220, 320, etc., according to kinematic viscosity at 40°C.

Product Features

- Excellent low-temperature performance, providing continuous and outstanding protection for equipment under harsh environments;
- Superior corrosion and rust resistance, effectively inhibiting corrosion and wear of components;
- Excellent anti-wear and anti-micropitting performance, effectively reducing gear surface wear and extending equipment service life;
- Outstanding thermal oxidation stability, inhibiting the formation of oil oxidation products and prolonging the oil change interval.

Field of Application

- This product is suitable for the lubrication of low-speed and heavy-load wind turbine gearboxes, such as main step-up gearboxes, yaw gearboxes and pitch gearboxes.

Technical Specifications

- GB/T 33540.3-2017
- Flender AS7300-16.1-2020
- DIN 51517 Part III
- ANSI/AGMA 9005-F16
- ISO 12925-1-2024 CTPR

Product Properties

Item	Typical Data		Test Method
ISO Viscosity Grade	220	320	
Kinematic Viscosity (40°C), mm²/s	217.8	315.9	GB/T 265
Kinematic Viscosity (100°C), mm²/s	26.5	36.08	GB/T 265
Viscosity Index	155	152	GB/T 1995
Flash Point (Open Cup), °C	270	270	GB/T 3536
Pour Point, °C	-48	-46	GB/T 3535
FZG Gear Test, Failure Stage	> 12	> 12	NB/SH/T 0306

- Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Foreign Products Of The Same Type

- In terms of service performance, it can replace similar domestic and foreign products such as Mobil SHC gear oil series, Fuchs RENOL UNISYN CLP series, and Great Wall special oil for wind power generation equipment transmission system (synthetic type).

09

Lopal BetterRun Industrial Lubricating Grease

Lopal BetterRun R1 General Lithium Grease

This product is made of refined mineral oil thickened with fatty acid lithium soap, added with antioxidants, rust inhibitors and other additives, and produced via advanced lithium hydroxide oil-based dispersion technology. It is suitable for various lubrication methods. Grade 1# can be used in centralized lubrication systems, and Grade 2# and 3# can be used for manual grease injection.

- Product Features
- Excellent mechanical stability and colloidal stability, reducing friction between bearings and wear between components;
 - Good water washout resistance and rust resistance, applicable to mechanical components in humid environments or in contact with water;
 - Strong versatility and long service life.

- Field of Application
- Suitable for lubrication of rolling bearings, sliding bearings, and other friction parts in various mechanical equipment, such as bearings in machine tools, motors, tractors, and construction machinery;
 - Operating temperature: -20~120℃.

Technical Specifications

GB/T 7324-2010

Product Properties

Test Item	Typical Data			Test Method
NLGI Grade	1#	2#	3#	Visual Inspection
Appearance	Yellow to Brown Uniform Smooth Grease			GB/T 269
Working Penetration, 0.1mm	320	278	227	GB/T 4929
Dropping Point, °C	197	198	200	SH/T 0109
Water Washout Loss (38°C, 1h), %	2.1	1.9	1.2	GB/T 269
Extended Working Penetration (100,000 Cycles), 0.1mm	331	298	255	GB/T 5018
Corrosion Resistance	Pass	Pass	Pass	

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal BetterRun R2 Extreme Pressure Lithium Grease

This product is a multi-purpose extreme pressure lithium grease, made of high viscosity refined mineral oil thickened with 12-hydroxystearic acid lithium soap and added with various additives such as antioxidants, rust inhibitors and extreme pressure agents.

Product Features

- Excellent extreme pressure and anti-wear performance, effectively preventing wear of friction pairs;
- Good mechanical stability, maintaining good mechanical stability during use without softening or loss;
- Excellent rust resistance, ensuring the protection of equipment in humid or water-containing environments;
- Excellent pumpability, meeting the grease supply requirements of centralized lubrication systems.

Field of Application

- Suitable for the lubrication of bearings and gears of high-load equipment, such as calenders, forging machines, mining machinery, construction machinery, metallurgical equipment and other various equipment;
- Grade 00#, 0# and 1# are suitable for centralized lubrication systems.
- Service Temperature: -20~120℃.

Technical Specifications

- GB/T 7323-2019

Product Properties

Test Item	Typical Data			Test Method
NLGI Consistency Grade	00#	2#	3#	
Working Penetration, 0.1mm	415		235	GB/T 269
Dropping Point, °C	172	205	210	GB/T 4929
Oil Separation on Steel Mesh (100°C, 30h), %	—	1.9	0.5	NB/SH/T 0324
Extended Working Penetration (100,000 Cycles), 0.1mm	432	295	258	GB/T 269
Extreme Pressure Performance (Four-Ball Method) PB, N	618	785	785	SH/T 0202

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal BetterRun R3 Extreme Pressure Complex Lithium Grease

This product is manufactured via a special process, using a new type of complex lithium soap thickener to thicken deeply refined base oil and adding a variety of high-efficiency additives such as antioxidants, rust inhibitors and extreme pressure agents.

Product Features

- Excellent high temperature resistance, no loss at higher temperatures or in harsh environments, providing effective protection for bearings and friction pairs;
- Good extreme pressure and anti-wear performance, meeting the bearing lubrication requirements of mechanical equipment under high load or certain shock load;
- Good oxidation stability, ensuring a long service life of the grease during use.

Field of Application

- Suitable for the lubrication of various heavy machinery and bearings under high temperature and high load, such as large motors, couplings, hot oil pump bearings, vibrating screens, quarrying equipment, etc.
- Service Temperature: -20~180℃.

Technical Specifications

NB/SH/T 0535-2019

Product Properties

Test Item	Typical Data		Test Method
NLGI Consistency Grade	2#	3#	
Working Penetration, 0.1mm	275	230	GB/T 269
Dropping Point, °C	305	310	GB/T 3498
Oil Separation on Steel Mesh (100°C, 30h), %	1.0	0.5	NB/SH/T 0324
Water Washout Loss (38°C, 1h), %	1.26	0.55	SH/T 0109
Extended Working Penetration (100,000 Cycles), 0.1mm	295	250	GB/T 269
Extreme Pressure Performance (Four-Ball Method) PD, N	3089	3089	SH/T 0202

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal BetterRun R4 Low-Temperature General Lithium Grease

This product is made of synthetic base oil thickened with high-grade fatty acid lithium soap, added with various additives such as antioxidants and rust inhibitors, and produced via advanced technology.

Product Features

- Low starting and running torque, ensuring good operation of lubricated parts in low-temperature environments;
- Good mechanical stability, colloidal stability, oxidation stability and extreme pressure performance, ensuring good lubrication of the application parts.

Field of Application

- Mainly suitable for the lubrication of various bearings, gears and other friction parts of mechanical equipment in cold regions;
- Service Temperature: -40~120℃.

Technical Specifications

Q/320192 LPSH 160

Product Properties

Test Item	Typical Data	Test Method
NLGI Consistency Grade	2#	
Working Penetration, 0.1mm	278	GB/T 269
Dropping Point, °C	205	GB/T 4929
Apparent Viscosity (-30℃, 10s ⁻¹), Pa · s	750	SH/T 0048
Extended Working Penetration (100,000 Cycles), 0.1mm	295	GB/T 269

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal BetterRun R5 Molybdenum Disulfide Extreme Pressure Lithium Grease

This product is manufactured via a special process, using 12-hydroxystearic acid lithium soap to thicken deeply refined mineral oil and adding functional additives such as antioxidants, rust inhibitors, extreme pressure agents and molybdenum disulfide.

Product Features

- Excellent shock load resistance, effectively reducing wear on the metal surface of friction pairs;
- Good rust resistance, preventing corrosion of bearings during operation;
- Stable soap fiber structure, maintaining good grease consistency under a certain shear force.

Field of Application

- Suitable for the lubrication of heavy-load gears and bearings such as steel rolling machinery, mining machinery and heavy hoisting machinery, especially for parts with shock load;
- Suitable for the lubrication of certain bearing bushes, pivot pins, slide rails, gears, chains and steel wire ropes;
- Service Temperature: -20~120℃.

Technical Specifications

NB/SH/T 0587-2016

Product Properties

Test Item	Typical Data			Test Method
	1#	2#	3#	
NLGI Consistency Grade	1#	2#	3#	
Working Penetration, 0.1mm	329	276	244	GB/T 269
Dropping Point, ℃	195	200	207	GB/T 4929
Oil Separation on Steel Mesh (100℃, 24h), %	2.4	1.5	0.3	NB/SH/T 0324
Water Washout Loss (38℃, 1h), %	3.6	2.2	1.2	SH/T 0109
Extended Working Penetration (100,000 Cycles), 0.1mm	350	292	256	GB/T 269
Extreme Pressure Performance (Four-Ball Method) PB, N	696	696	696	SH/T 0202

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal BetterRun R7 High Temperature Grease

This product is a long-life bearing grease manufactured via a special process, using a new type of complex metal soap to thicken synthetic base oil and adding a variety of high-efficiency additives.

Product Features

- Excellent high and low temperature resistance, no oil slinging or loss at high temperature and high speed, which can prolong the grease adding interval;
- Certain extreme pressure performance, able to reduce wear of lubricated parts;
- Good rust resistance, ensuring the protection and lubrication of equipment in humid or water-containing environments;
- Excellent oxidation stability, preventing high-temperature deterioration of the grease and ensuring a long service life at high temperatures;

Field of Application

- Suitable for the lubrication of high-temperature bearings in the production of petrochemical, textile, printing and dyeing, iron and steel and other industries, as well as motor bearings of various models.
- Service Temperature: -30~180°C.

Technical Specifications

Q/320192 LPSH 158

Product Properties

Test Item	Typical Data	Test Method
NLGI Consistency Grade	2#	
Working Penetration, 0.1mm	275	GB/T 269
Dropping Point, °C	311	GB/T 3498
Oil Separation on Steel Mesh (100°C, 24h), %	1.27	NB/SH/T 0324
Evaporation Loss (180°C, 1h), %	2.0	SH/T 0109
Apparent Viscosity (-20°C, 10s ⁻¹), Pa · s	570	SH/T 0048
Maximum Non-Seizure Load (Four-Ball Method) PB, N	883	SH/T 0202

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

Lopal BetterRun R8 Roller Bearing Grease

This product is manufactured via a special process, using a new type of complex metal soap to thicken high-viscosity mineral base oil and adding a variety of high-efficiency additives such as antioxidants, rust inhibitors and extreme pressure anti-wear agents.

Product Features

- Excellent water scouring resistance and rust resistance, ensuring the protection and lubrication of equipment in humid or water-containing environments;
- Excellent high temperature resistance and thermal stability, with a long service life at higher temperatures;
- Excellent extreme pressure and anti-wear performance, meeting the bearing lubrication requirements of mechanical equipment under high load or certain shock load.

Field of Application

- Suitable for harsh lubrication conditions such as water drenching, heavy load and high temperature, roller bearings of roughing, intermediate and finishing mills of small and medium-sized rolling mills, and roller bearings of vertical rolling mills;
- Service Temperature: -20~180℃.

Technical Specifications

NB/SH/T 0948-2017

Product Properties

Test Item	Typical Data			Test Method
NLGI Grade	1#	2#	3#	
Working Penetration, 0.1mm	323	275	232	GB/T 269
Dropping Point, °C	298	300	310	GB/T 3498
Water Washout Loss (38℃, 1h), %	1.2	0.7	0.55	SH/T 0109
Extended Working Penetration (100,000 Cycles), 0.1mm	350	298	256	GB/T 269
Extreme Pressure Performance (Four-Ball Method) PD, N	3089	3089	3089	SH/T 0202/T 0202

Note: The above data are typical values of the current product, and the data of each batch may fluctuate within the allowable range of quality standards. We reserve the right to modify the data.

10

Lopal Vextra Robot Lubricating Oil

Lopal Vextra X1 XHP Robot Gearbox Gear Oil 150# (PAG)

Lopal Jijie X1 XHP Robot Gearbox Gear Oil 150# (PAG) is specially designed for compact robot gearboxes. This product is formulated with high-performance, high viscosity index polyether base oil, combined with a variety of high-performance additives such as extreme pressure anti-wear agents, friction reducers, antioxidants and rust inhibitors. It is suitable for multi-axis and multi-stage reducers of industrial robots such as ABB, especially for cycloidal pin wheel RV reducers.



Product Features

- Excellent anti-wear performance and high seizure load capacity.
- Ultra-high viscosity index, providing maximum protection for bearings under high and low temperature conditions.
- Excellent antioxidant and rust resistance, extending oil service life.
- Good rubber compatibility, no deformation or hardness change of rubber parts after long-term immersion.
- It is a rare ashless product in China, which can reduce the formation of sludge, making it particularly suitable for precision equipment such as robots.
- Extremely low friction coefficient, minimizing the probability of problems caused by robot bearing wear.

Field of Application

- Widely used in industrial, shipping and mobile hydraulic and transmission systems, also suitable for the lubrication of gear transmission devices, bearings and other industrial machinery under normal load;
- Suitable for high-pressure piston pump systems.
- Suitable for robot equipment requiring polyether type robot gear oil, can be used in multi-axis and multi-stage reducers of industrial robots such as ABB, and is especially suitable for cycloidal pin wheel RV reducers.

Technical Specifications

- NB_SH_T 6040-2021 Lubricating Oil for Cycloidal Pin Wheel (RV) Reducers of Robots

Product Properties

Test Item		Unit	Quality Index	Test Result	Test Method
Appearance		—	Clear and Transparent	Clear and Transparent	
Kinematic Viscosity (40℃)		mm ² /s	Reported	148.8	GB/T 265
Kinematic Viscosity (100℃)		mm ² /s	Not less than 130	29.08	GB/T 265
Viscosity Index		—	Reported	236	GB/T 1995
Density (20℃)		g/cm ³	Not less than 200	1.0531	GB/T 1884
Flash Point (Open Cup)		℃	Not higher than -36	266	GB/T 3536
Pour Point		℃	Not more than Trace	-51	GB/T 3535
Water Content (Mass Fraction)		%	Not more than 50/0	Trace	GB/T 260
Foam Characteristics (Foam Tendency/Foam Stability)	24℃	mL/mL	Not more than 50/0	0/0	GB/T 12579
	93.5℃		Not more than 50/0	0/0	
	Post-24℃	—	No Rust	10/0	
Liquid Phase Corrosion (Method A)		N	Not less than 784	No Rust	GB/T 11143
Maximum Non-Seizure Load, PB		mm	Not more than 0.5	1863	GB/T 3142
Wear Scar Diameter (392N, 75℃, 60min, 1200r)		—		0.32	SH/T 0189
Friction Coefficient				0.04	SH/T 0762
Seal Material Compatibility Test FPM (100℃, 168h)					NB/SH/T 0877
Hardness Change		%	Reported	0	
Volume Change		%		7	
Tensile Strength Change		%		5	
Elongation Change				-0.4	
Oxidation Stability (121℃, 312h)					SH/T 0123
Kinematic Viscosity Increase at 100℃		%	Not more than 6	4.5	
Sediment Value		mL	Not more than 0.1	0	

The information provided in the typical data does not constitute specifications but is based on current production instructions and may be subject to allowed production tolerances. We reserve the right to make modifications.

Lopal Vextra X2 XHP

Special Robot Gearbox Gear Oil 150# (PAO)

Lopal Vextra X2 XHP Special Robot Gearbox Gear Oil 150# (PAO) is a high-performance synthetic gear oil specially designed for compact robot gearboxes. It is formulated with imported PAO base oil and a variety of imported high-performance additives, suitable for multi-axis and multi-stage reducers of industrial robots such as KUKA, especially for harmonic reducers.



Product Features

- Excellent anti-wear performance and high seizure load capacity;
- High viscosity index, providing maximum protection for bearings under high and low temperature conditions;
- Excellent antioxidant and rust resistance, extending oil service life;
- Good rubber compatibility, no deformation or hardness change of rubber parts after long-term immersion.

Field of Application

- Suitable for robot equipment requiring PAO-type robot gear oil, applicable to multi-axis and multi-stage reducers of industrial robots such as KUKA, and especially for harmonic reducers.

Technical Specifications

NB/SH/T 6040-2021 Lubricating Oil for Cycloidal Pin Wheel (RV) Reducers of Robots.

Product Properties

Test Item		Unit	Quality Index	Test Result	Test Method
Appearance		—	Clear and Transparent	Clear and Transparent	Visual Inspection
Kinematic Viscosity (40℃)		mm ² /s	135-165	156.2	GB/T 265
Kinematic Viscosity (100℃)		mm ² /s	Reported	22.46	GB/T 265
Viscosity Index		—	Not less than 130	172	GB/T 1995
Density (20℃)		g/cm ³	Reported	0.8396	GB/T 1884
Flash Point (Open Cup)		℃	Not less than 200	234	GB/T 3536
Pour Point		℃	Not higher than -36	-54	GB/T 3535
Water Content (Mass Fraction)		%	Not more than Trace	Trace	GB/T 260
Foam Characteristics (Foam Tendency/Foam Stability)	24℃	mL/mL	Not more than 50/0	0/0	GB/T 12579
	93.5℃		Not more than 50/0	0/0	
	Post-24℃	—	Not more than 50/0	10/0	
Liquid Phase Corrosion (Method A)		N	No Rust	No Rust	GB/T 11143
Maximum Non-Seizure Load, PB		mm	Not less than 784	1500	GB/T 3142
Wear Scar Diameter (392N, 75℃, 60min, 1200r)		—	Not more than 0.5	0.36	SH/T 0189
Friction Coefficient			—	0.04	SH/T 0762
Seal Material Compatibility Test FPM (100℃, 168h)					NB/SH/T 0877
Hardness Change		%		0	
Volume Change		%		-9.8	
Tensile Strength Change		%	Reported	-6	
Elongation Change				-3.1	
Oxidation Stability (121℃, 312h)					SH/T 0123
Kinematic Viscosity Increase at 100℃		%	Not more than 6	2.4	
Sediment Value		mL	Not more than 0.1	0	

The information provided in the typical data does not constitute specifications but is based on current production instructions and may be subject to allowed production tolerances. We reserve the right to make modifications.

10

Lopal Engine Coolant

Lopal Coolant C08 dedicated for Commercial vehicle

Compliant Standards GB 29743.1
Q/3200 LPSH 15
ASTM D3306/D4985

Scope of Application Suitable for the engine coolant systems of light and heavy load diesel engines, vehicles, engineering machinery and other equipment.



Freezing Point (°C)|Boiling Point (°C) SH/T 0089|15psi Boiling Point (°C)

-18°C|≥105.5°C|123°C
-25°C|≥107°C|125°C
-35°C|≥108°C|128°C
-40°C|≥109°C|129°C
-45°C|≥110°C|131°C

Packing Specifications 4kg 9kg 16kg 18kg 200kg 1000kg

Product Features

- Anti-freezing, anti-boiling, anti-scaling
- Anti-rusting, anti-corrosion, anti-foaming
- Anti-boiling and anti-freezing, rapid heat dissipation
- Protect water tank and extend service life
- Super defoaming performance, prevent cavitation
- Chinese Invention Patent ZL 200910033214.8

Appendix

1.ISO Viscosity Table

Industrial oils are classified according to the ISO viscosity classification system approved by the International Organization for Standardization (ISO). The ISO system is based on viscosity at 40°C. The ISO viscosity ranges are summarized in the following table:

ISO Viscosity Grade	Mid-point at 40°C (cSt)	Viscosity Range	
		Minimum	Maximum
2	2.2	1.98	2.42
3	3.2	2.88	3.52
5	4.6	4.14	5.06
7	6.8	6.12	7.48
10	10	9.00	11.0
15	15	13.5	16.5
22	22	19.8	24.2
32	32	28.8	35.2
46	46	41.4	50.6
68	68	61.2	74.8
100	100	90.0	110
150	150	135	165
220	220	198	242
320	320	288	352
460	460	414	506
680	680	612	748
1000	1000	900	1100
1500	1500	1350	1650

2.NLGI Grease Consistency Classification System

NLGI Grade	Worked Penetration at 25℃
000	445-475
00	400-430
0	355-385
1	310-340
2	265-295
3	220-250
4	175-205
5	130-160
6	85-115

3.AGMA Technical Specifications for Industrial Enclosed Gear Drives

Reference for viscosity grade selection								
		ISO Viscosity Grade						
Temperature		Pitch Line Velocity of Final Gear, ft/min						
Oil Sump Temperature (° F)	Ambient Temperature (° F)	<1000	1000-2000	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000
<60	-40 ~ -10	68	68	46	46	46	32	32
60 ~ 90	-10 ~ +20	100	100	68	68	46	32	32
90 ~ 150	20 ~ 40	150	150	150	68	68	68	46
150 ~ 190	40 ~ 80	320	220	220	150	100	100	100
190 ~ 210	80 ~ 120	460	460	320	320	220	150	100
>210	>120	Consult the Manufacturer						

4. Advanced lubricant additive

High-quality lubricant formulations use many chemical additives, which are either single-purpose or multi-purpose components. Below are some common additive types and their descriptions.

- **Adhesive:** Composed of viscous substances, used to form and maintain a uniform film on metal surfaces.
- **Anti-wear agent:** Composed of substances adsorbed or concentrated on metal surfaces, used to form a film that prevents direct metal-to-metal contact. This term refers to substances that enhance the anti-wear properties of petroleum oils, allowing loads two or even three times that of traditional petroleum oils.
- **Defoamer:** When added to liquids, it weakens the oil film between foam bubbles and promotes the rupture of foam bubbles.
- **Anti emulsifier:** Quickly separates oil from water to avoid rusting.
- **Detergent:** A neutral to highly alkaline metallic agent with excellent neutralization and cleaning properties. When added to oil, it reduces the level of acidic substances generated by burning high-sulfur fuels to keep the engine clean.
- **Dispersant:** Keeps organic substances suspended in oil to reduce the formation of harmful precipitates.
- **Extreme pressure agent:** Composed of more reactive substances than anti-wear agents, it reacts with metal surfaces to form an oil-insoluble surface filling layer, reducing friction, controlling wear and preventing surface scuffing. Automotive hypoid gears require lubricating oils with highly active extreme pressure agents.
- **Friction Modifier:** A general category of substances used to change the friction characteristics of lubricating oils, which can adjust the friction force crucial for improving fuel combustion efficiency or energy saving. It can also reduce creep and chatter in oil-immersed clutch applications.
- **Antioxidant:** Composed of peroxide decomposers, used to convert peroxides into harmless substances.
- **Chain reaction stopping agent:** Interrupts the chain reaction between oxygen radicals and hydrocarbon radicals to prevent or slow down the formation of acidic substances, polymers and sediments.
- **Metal passivator:** Slows down the pro-oxidation catalytic effect of metals in the lubrication system. Metal surfaces or particles are covered by the deactivator to form a barrier layer that prevents catalytic reactions. The most catalytically active metal is copper, followed by lead and iron. Some additives can act as chain reaction inhibitors, peroxide decomposers and/or metal deactivators at the same time.
- **Pour point depressant:** Improves the low-temperature fluidity of mineral oils and prevents wax formation at low temperatures.
- **Rust inhibitor:** Enhances the rust resistance of lubricating oils and reduces the probability of component rusting. The basic test standard for rust inhibitors is the ASTM D 665 rust test (pass/fail test).
- **Spectral method:** A laboratory testing method for measuring the concentration of metal particles smaller than 10 microns.
- **Viscosity index improver:** Composed of high molecular weight polymers, it improves the viscosity index of lubricating oils by winding and unwinding in response to temperature changes. It does not affect the pour point of the oil and has sufficient viscosity at high temperatures.

5.Understanding Oil Analysis

- **Viscosity:** Viscosity is probably the most important single property of lubricating oil and a major indicator of the oil's load-bearing capacity. Viscosity is defined as the resistance to flow at 40°C, usually expressed in centistokes (cSt).
- **Wear Metals:** The content of these metals can indicate micro-level wear before it can be detected by traditional methods. The presence of wear can be determined not only by the absolute value of metals, but more importantly, by the relative increase or change trend of one or more metals.

Metal	Source
Iron	Cylinders, gears, piston rings, crankshafts, cylinder liners, bearings, rust
Chromium	Plating on piston rings, bearings and cylinder liners
Lead	Bearing plating layer
copper	Hydraulic pump, bearing cover, lining, bronze components
Tin	Bearing plating, compressors
Aluminum	Pistons, bearings, pumps, fans, compressor impellers, valves
Nickel	valve
Silver	Plating on bearings and bushings
Manganese	Trace elements in gas turbine components

- **Contaminants:** The following elements may indicate oil contamination. The combination of contaminants and metals may create harmful operating conditions in machinery.

Contaminant	Source
Silicon	Abrasive dust, sealants, defoamers
Boron	Antifreeze, oil additives
Sodium	Antifreeze, oil additives
Potassium	Antifreeze, oil additives
Acid	Oil degradation (TAN)
Oxide	Thermal degradation of oil
Water	Antifreeze, process water, condensation
Ethylene Glycol	Antifreeze
Fuel	Fuel system
Carbon Black	Incomplete combustion, air leakage
Chlorine	Waste gas, seawater

■ Additive: A chemical substance added to oil to impart or improve a certain property of the oil.

Additive	Function
Magnesium	Dispersant/Detergent (TBN)
Calcium	Dispersant/Detergent (TBN)
Barium	Dispersant/Detergent
Phosphorus	Anti-wear
Zinc	Anti-wear
Molybdenum	Anti-wear

6.Cleaning and Oil Change of Hydraulic Systems

- After the maintenance of some hydraulic equipment, the system is cleaned with metal cleaner or soapy water, and then hydraulic oil is added for test run, resulting in excessive foam and unstable oil pressure. At this time, users usually think the quality of this brand of hydraulic oil is poor; after draining the oil and replacing it with another brand, the equipment works normally, so they conclude that the former oil is inferior and the latter is better.
- In fact, this is an injustice—the former oil takes the blame for the latter. The surfactant components remaining in the system from metal cleaners and soapy water contaminate the former oil, reducing its foam resistance and causing abnormal equipment operation. Draining the former oil also flushes the system clean at the same time, so the latter oil works normally. Similar situations occur frequently.

7.Hazards of Water Contamination in Hydraulic Oil

- Water and impurities in water can react with hydraulic oil to form acids, colloids and sludge; water can also precipitate additives in the oil and affect the filterability of the oil.
- The most important effect of water is to reduce lubricity. Trace amounts of water dissolved in hydraulic oil will accelerate the wear of high-stress components. Studies on the fatigue life of rolling bearings with mineral oil containing $(100-400) \times 10^{-6}$ water show that the bearing life is reduced by 30%~70%.
- Corrode and rust metal components.

8.Main Differences Between Internal Combustion Engine Oil and Mineral Hydraulic Oil

- Internal combustion engine oil is developed and produced according to the operating conditions of engines, and it requires high performance such as detergency and dispersancy. Hydraulic oil is mainly used in various hydraulic systems and cannot be used as internal combustion engine oil due to its lack of detergency and dispersancy. In addition, internal combustion engine oil fails to meet the requirements of hydraulic oil in terms of demulsibility, hydrolytic stability and other properties, so it cannot replace hydraulic oil either.

9.Can Industrial Gear Oil Replace Mineral Hydraulic Oil

- The main additives in industrial gear oil are compounds such as active sulfur and phosphorus. It generally has high viscosity and excellent extreme pressure performance, but it is easy to corrode copper parts and its hydrolytic stability cannot meet the requirements of hydraulic oil. Except that the rust and oxidation resistant L-CKB industrial gear oil of the same viscosity grade can replace L-HL hydraulic oil, other industrial gear oils cannot be used to replace mineral hydraulic oil at will.

10. On the Mixing of Hydraulic Oils

Hydraulic oil products of the same type and viscosity grade from different manufacturers cannot generally be mixed. Because although the two oils are exactly the same in type and viscosity, their chemical compositions are unknown, and it is unclear whether antagonistic reactions will occur between additives after mixing. Therefore, there are two treatment methods for this situation: First, conduct a compatibility and storage stability test first, determine the main properties after mixing, and then decide whether to mix them. Second, drain the old oil in the equipment, flush the system clean with the new oil to be filled, and then inject the new oil for operation.

11. Precautions for the Storage and Application of Grease

- The package shall be well-sealed to prevent the intrusion of water and dust and the oxidative deterioration of grease.
- Handle and load/unload grease with care as much as possible, keep it upright if possible, avoid heavy impact, and do not roll it along the edge of the barrel.
- Store grease indoors as much as possible to avoid sun exposure and rain; if indoor storage conditions are not available for the time being, weatherproof measures shall be taken.
- Smooth the surface of grease after use to prevent oil separation; do not mix it with different types of grease, and do not use grease after heating and melting it.

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Lopal Industrial Lubricating Oil is a core fine chemicals brand of Lopal Technology for the light and heavy industry sectors. Its products cover the main categories of lubricating oils, greases and fluids, including industrial equipment oils, engineering machinery oils, industrial greases and other market segments. It has obtained certifications from major international authoritative organizations and numerous mainstream OEM certifications from Eaton, Denison and other enterprises, and its products are sold to many countries and regions around the world. Based on the accumulation of advanced lubrication technology and rich experience in OEM customer service, Lopal Lubricants provides global users with energy-saving, environment-friendly and high-performance lubrication technology solutions.

