Maintenance-free Lubrication Systems

"Keeping Machinery Running All Over the World"

LUBE Hybrid Centralized Lubrication Systems

LHL

One with the Earth

eco-friendly

* Reduces your overall running costs
* Minimizes Lubricant Consumption
* Eliminates Cutting Fluid Contamination
* Minimizes Energy Consumption
* Reduces Co2 Emissions
* Maintenance-Free Centralized Lubrication Systems
* Drastically reduces man hour labor costs
* Maintains accuracy and performance of your machines and their essential parts
* Easily retrofitted on your existing equipment

LUBE Corp

LUBE USA

LUBE Hybrid Lubricants

Development was based on our 45-year history of successes and failures

Problems with oil lubrication

* Oil washed away by cutting fluid. (Causing Rust)
* Oil mixed into cutting fluid causing deterioration and/or decomposition of cutting fluid. (Terrible Odor)
* Large oil consumption and frequent oil refilling significantly increasing operational costs.

Problems with grease lubrication

* Grease solidification and hardening
* Used grease accumulating on guides and other parts that require frequent cleaning.
* Reintroduction of contamination caught by accumulated grease back into the machine parts.

Advantages of Oil
Liquidity, Excellent Transport Property, No Solidification

Integrating the Advantages of Oil and Grease

Advantages of Grease
High Load-carrying Capacity, Wear Resistance, Water Resistance, Excellent Oil Film Maintenance Property, Adherent Property

LHL resolves these problems.

Features of Lube Hybrid Lubricants

Operating temperature range: 20 to + 120 deg C

- **Excellent load-carrying capacity and wear resistance**
  The excellent load-carrying capacity and wear resistance prevents seizures and excessive wear.
- **Excellent water resistance and corrosion resistance**
  LHL is resistant to emulsification and softening even when water is introduced. In addition, its excellent corrosion resistance prevents the development of rust.
- **Excellent migration property**
  Developed for centralized lubrication systems, LHL has supreme migration properties allowing it to penetrate into even the smallest of wear surfaces. By supplying the correct amount of LHL at the right time guarantees proper lubrication.

Typical Properties of LUBE Hybrid Lubricants (LHL) for Machine Tools

LHL Typical Properties Chart

Test Item		LHL-60	LHL-140	LHL-300
Appearance		Semi-fluid	Semi-fluid	Semi-fluid
Color		Brown	Yellow	Yellow
Worked Penetration		460	460	440
Copper corrosion test (100°C, 24 h)		Pass	Pass	Pass
Evaporation Loss (99°C, 22 h) % by mass		1.45	0.19	0.14
Oil separation (100°C, 24 h) % by mass		NA	NA	NA
Oxidation stability (99°C, 100 h) kPa		34	29	20
Load carrying Capacity Measured in High Speed 4 Ball Test N	LNL	618	1236	784
	WL	1960	3920	3922
	LWI	317	649	470
Thickener		Lithium soap	Lithium soap	Lithium complex soap
Base Oil		Highly refined mineral oil	Highly refined mineral oil	Highly refined mineral oil
(Base Oil) Kinetic Viscosity mm2/s	(40°C)	63.29	138.8	331.2
	(100°C)	7.79	14.30	26.21
(Base Oil) Viscosity Index		84	101	104
Operating temp range (°C)		0.89	0.91	0.90
Specific Gravity		-20~130	-20~130	-20~130

Designed for applications for all types of machine tools and precision machines, LHL lubrication systems offer maintenance-free centralized lubrication and long-term reliability of operation.

(1) Reduces your total maintenance and running costs.
(2) Maintains accuracy and performance of your machine and their essential moving parts.
(3) Improves the Environment.
(Reducing power consumption, excessive oil consumption & cutting fluid replacement and disposal)

Comparison of Lubricant Consumption and Associated Costs for Machine Tools

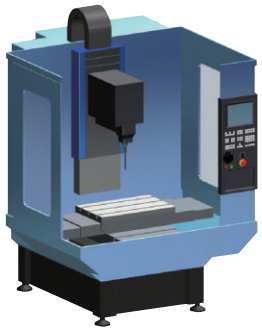
Comparison with oil

<<Small Machining Center manufacturing hydraulic system parts >>

Tool size #30

Number of lubrication points(X,Y,Z) 23 points in total

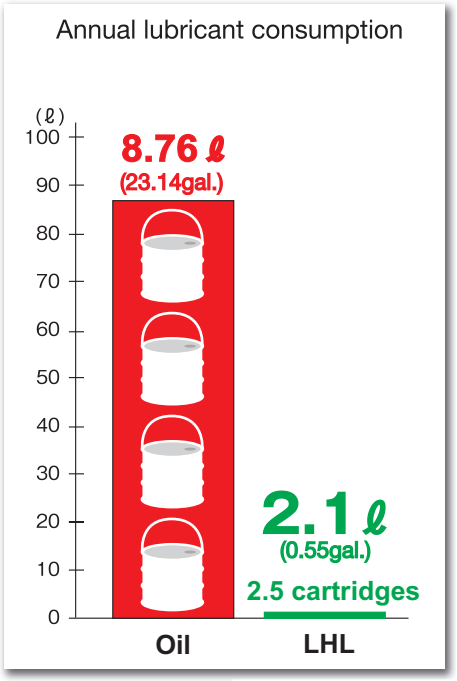
Lubrication System	Oil/SLR System	LHL PDI System
# of lubrication points	23	23
Lubricant	#68	LHL-140
Cutting Fluid	Water-Soluble	
Lubricant volume/cycle	2.5 cc	1.45 cc
Lubrication cycles/day	96 cycles / day	4 cycles / day
Lubricant consumption/yr.	87.6 liter / 23.14 gallons	2.1 liter / 0.55 gallons

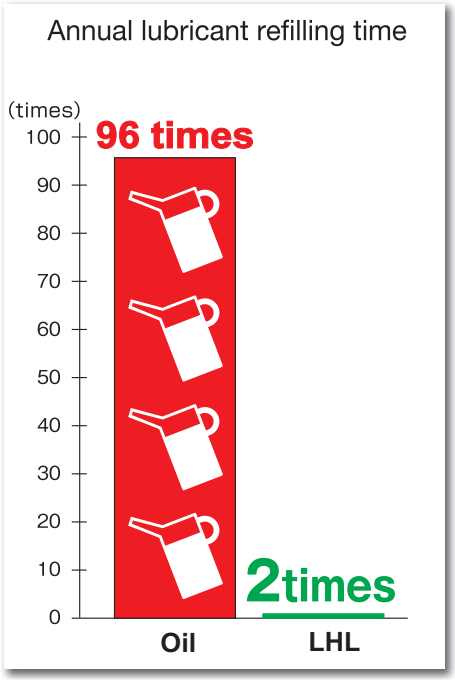


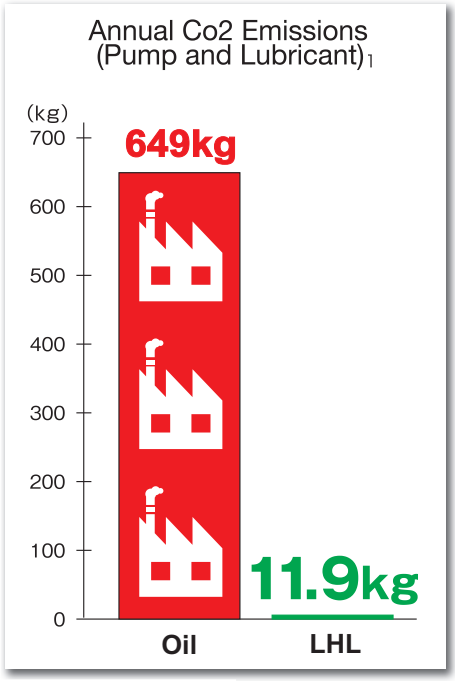
Additional more comprehensive data available on request. Many other machinery data also available.

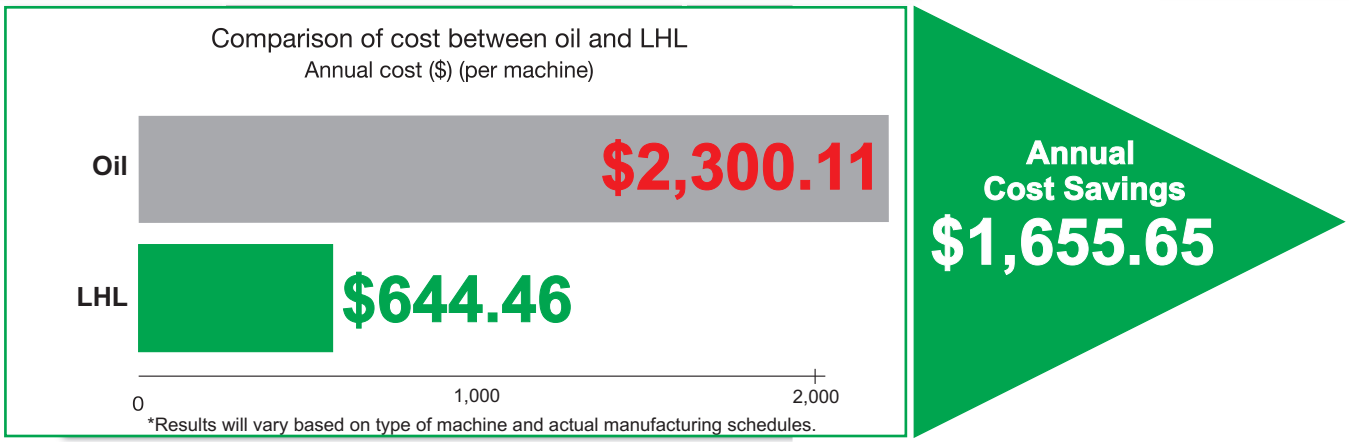
Comparison of annual consumption between oil and LHL

oil LHL per machine









<<Conditions for calculation>>

Machine operation hours: Assuming that the machine operates for 6,000 hours per year.

Annual oil consumption: Based on our formulas for calculating required oil quantity for guides and ball screws.

Quantity of LHL consumed : Based on our standard LHL Quantity & Interval Table. 60m/min. travelling speed gives 5 hours interval.

★ The comparison above is just for reference. Actual oil and LHL quantities required for each lubrication cycle, the annual consumptions and costs vary depending on the actual machine operating conditions, lubrication conditions, essential parts size and other factors.

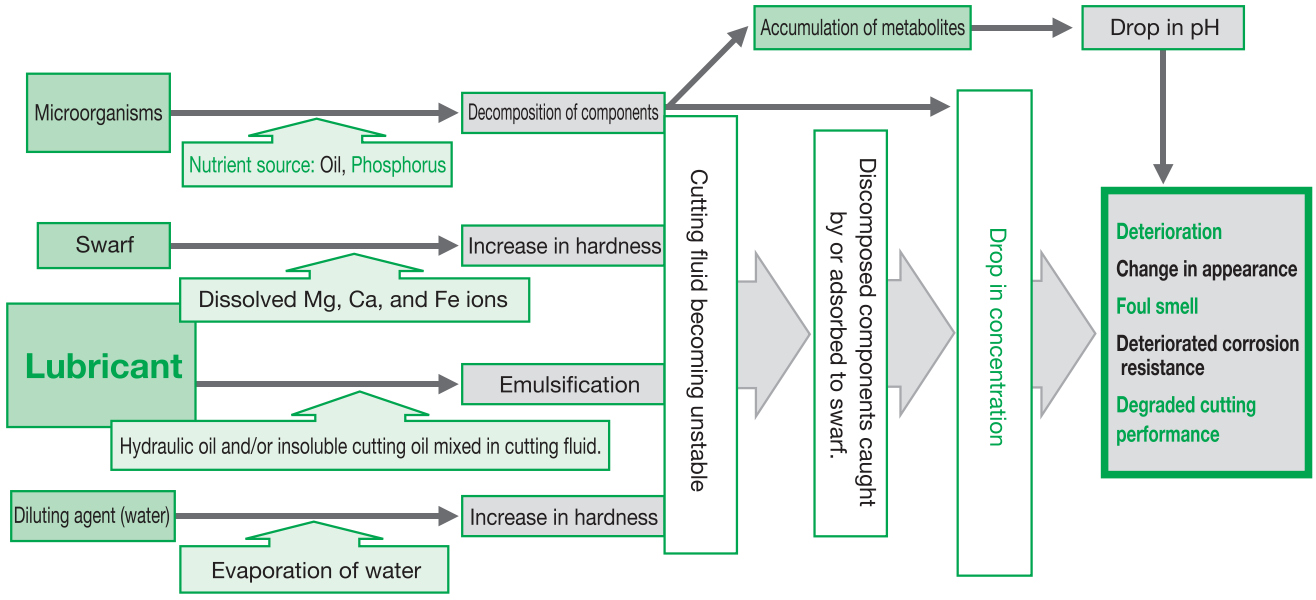
★ Co2 emission was calculated based on the data from Minist. of Environment and power companies.

Lubrication Oil $2.8/L, LHL-140(700ml) $29/pc Labor $0.7/min Power $0.16/kw Calculated based on a carbon offset of $0.048/kg

Operating Life of Cutting Fluid

The deterioration and or shortened operating life of the cutting fluid is partly caused by lubrication oil and or hydraulic oil mixing into the cutting fluid.
The LHL systems minimize the potential of lubricant mixing in with the cutting fluids, reducing it to less than one-tenth that of standard oil lubrication systems.

Relationship between the deterioration of cutting fluid and tramp oil in the cutting fluid.

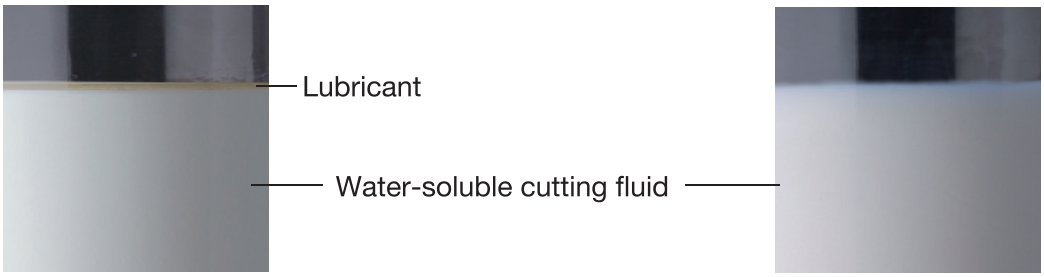


Source: Materials provided by Kyodo Yushi Co., Ltd.

Machine User A: Investigation of tramp oil in cutting fluid

The results may be different from what shown in the photo below depending on conditions.

Details of investigation: Investigating the conditions of the cutting fluid sampled out of the machining centers located in the same machining line.



Cutting fluid sampled from a machine lubricated with oil

Equipped with a centralized oil lubrication system
Lubricant: Daphne Multiway 68MT

Cutting fluid sampled from a machine lubricated with LHL

LHL lubrication system installed December 2006

Being in the same machining line, periodic maintenance for the cutting fluids of these two machines was performed at the same time. The cutting fluid samples were collected randomly while the coolant pumps were running, followed by a three day waiting period to allow the fluids to settle clearly. Tramp oil was easily observed in the fluid sample from the machine lubricated with oil, while it was barely noticeable in the sample collected from the machine lubricated with LHL.

The amount of lubricant delivered by an LHL system is 90% to 95% less than that of an oil system. When considering the potential for lubricating oil getting mixed with the cutting fluid, compared to LHL, these percentages make it quite obvious that there will be a significant reduction. The primary reasons for the volume reduction is based on the LHL's outstanding load carrying capacities, combined with excellent water resistance and adhesion properties.

Services Provided by LUBE

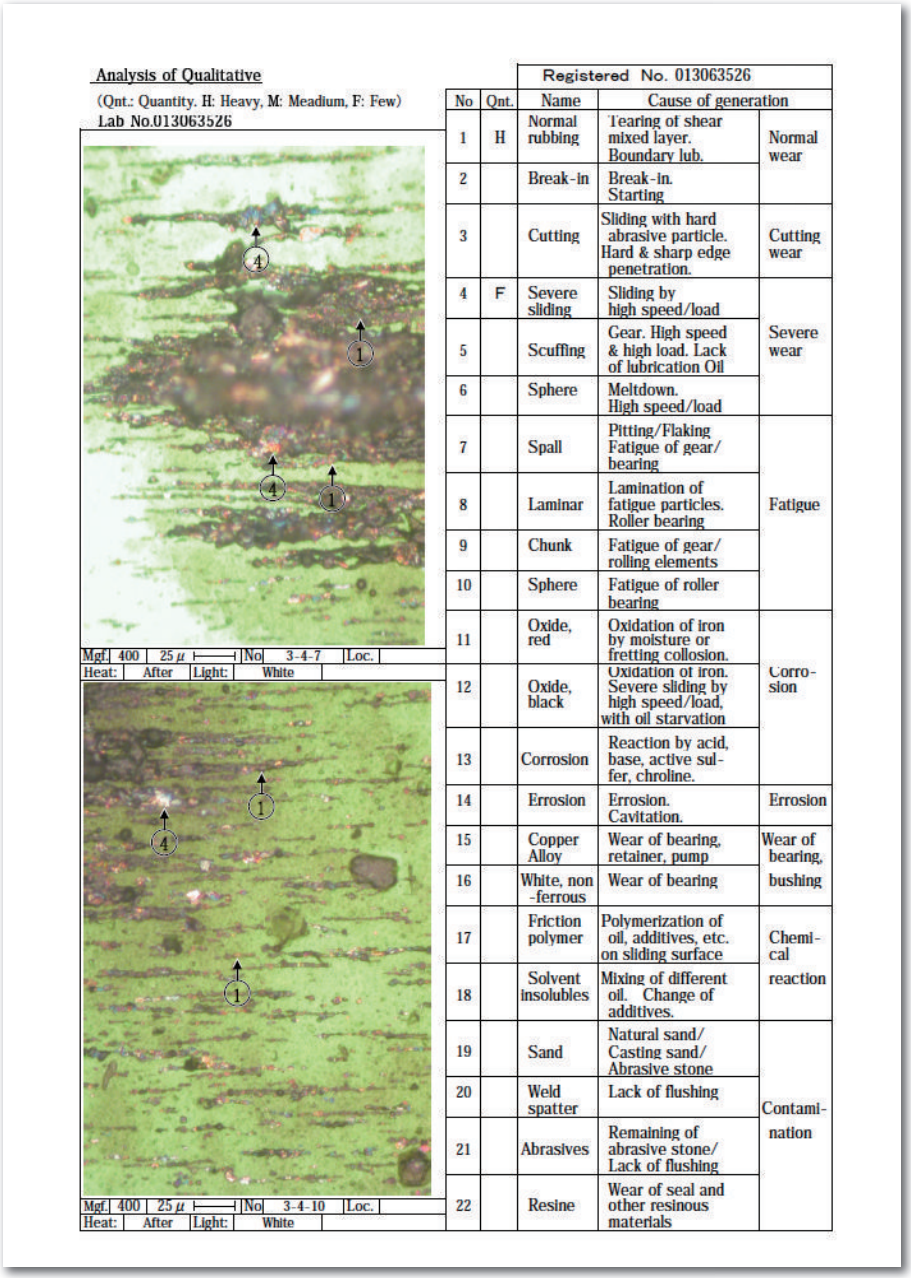
World-standard Seminars on Lubrication Technologies

Lube USA offers technical training seminars prepared specifically for your manufacturing facility. These seminars encompass all of the following focal points:

1) Importance of proper lubrication for machine life and repeatability
2) Basic understanding and troubleshooting of the lubrication systems themselves
3) Importance of choosing the correct lubricants for each application.
4) Lubricant compatibilities and potential issues.
5) Alternative cost saving applications enhancing your bottom line cost of manufacturing.

Diagnosis of lubrication status with LRA analysis Lube Real lubrication film Analysis

Lube USA offers a series of analysis (ferrography, soap, IR and iron particle density analysis) of your lubrication system and lubricants to understand the actual state of lubrication film for your specific application. Based on the analysis, we provide you with our observations and opinions of the results. We then offer solutions best suited to your environment and operating conditions to minimize your overall operating costs while at the same time enhancing your machine life and repeatability.



Analysis of Qualitative

(Qnt.: Quantity. H: Heavy, M: Meadium, F: Few)

Lab No.013063526

Mgf. 400 25 μ No 3-4-7 Loc.
Heat: After Light: White

Mgf. 400 25 μ No 3-4-10 Loc.
Heat: After Light: White

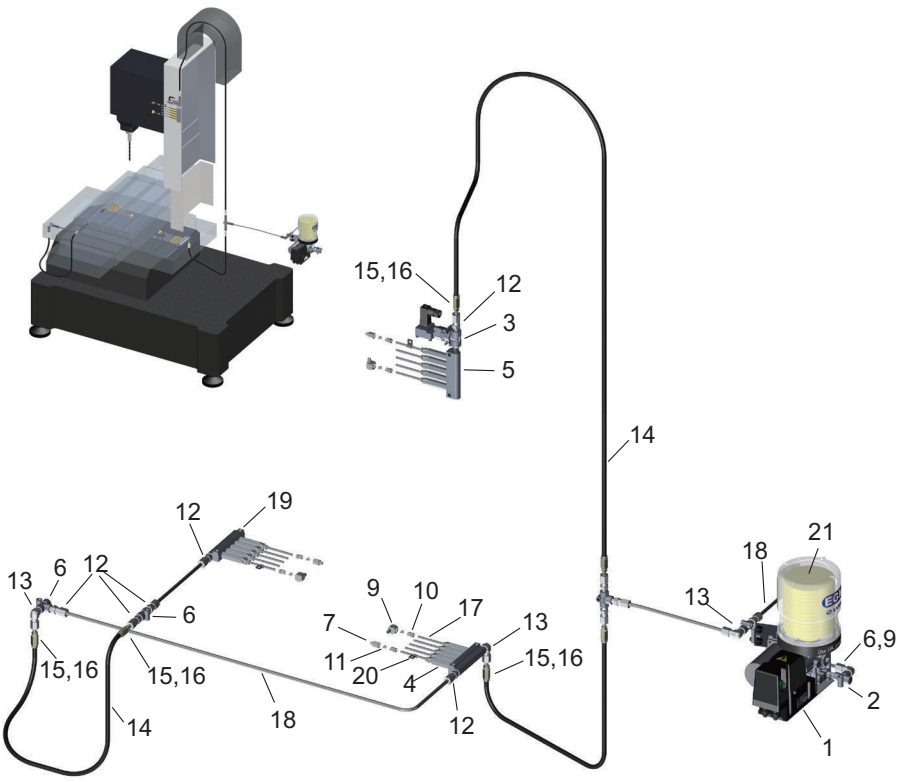
Registered No. 013063526

No	Qnt.	Name	Cause of generation	
1	H	Normal rubbing	Tearing of shear mixed layer. Boundary lub.	Normal wear
2		Break-in	Break-in. Starting	
3		Cutting	Sliding with hard abrasive particle. Hard & sharp edge penetration.	Cutting wear
4	F	Severe sliding	Sliding by high speed/load	Severe wear
5		Scuffing	Gear. High speed & high load. Lack of lubrication Oil	
6		Sphere	Meltdown. High speed/load	
7		Spall	Pitting/Flaking Fatigue of gear/ bearing	Fatigue
8		Laminar	Lamination of fatigue particles. Roller bearing	
9		Chunk	Fatigue of gear/ rolling elements	
10		Sphere	Fatigue of roller bearing	
11		Oxide, red	Oxidation of iron by moisture or fretting collosion.	Corro-sion
12		Oxide, black	Oxidation of iron. Severe sliding by high speed/load, with oil starvation	
13		Corrosion	Reaction by acid, base, active sul-fer, chroline.	
14		Errosion	Errosion. Cavitation.	Errosion
15		Copper Alloy	Wear of bearing, retainer, pump	Wear of bearing, bushing
16		White, non -ferrous	Wear of bearing	
17		Friction polymer	Polymerization of oil, additives, etc. on sliding surface	Chemi-cal reaction
18		Solvent insolubles	Mixing of different oil. Change of additives.	
19		Sand	Natural sand/ Casting sand/ Abrasive stone	Contami-nation
20		Weld spatter	Lack of flushing	
21		Abrasives	Remaining of abrasive stone/ Lack of flushing	
22		Resine	Wear of seal and other resinous materials	

Standard System Layout

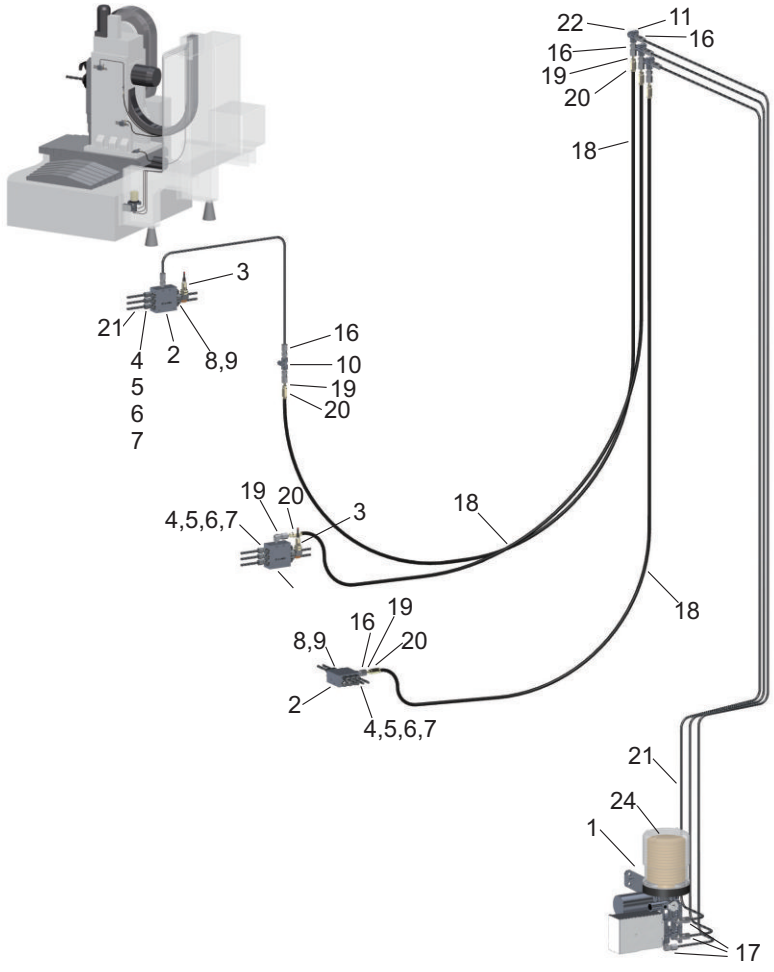
“Positive Displacement Injector System”

	Part Description	Quantity
1	Motor-driven grease pump	1
2	Pressure gauge	1
3	Pressure switch	1
4	Metering valve	15
5	Junction	3
6	Junction	3
7	Elbow adapter	3
8	Straight adapter	12
9	Straight connector	2
10	Compression bushing	30
11	Compression sleeve	30
12	High-pressure straight fitting	6
13	High-pressure elbow fitting	4
14	High-pressure flexible hose	8m
15	Hose sleeve	6
16	Hose stud	6
17	Steel tubing 4mm	8m
18	Steel tubing 6mm	2m
19	Plug	3
20	Pipe clip	6
21	Grease cartridge	1

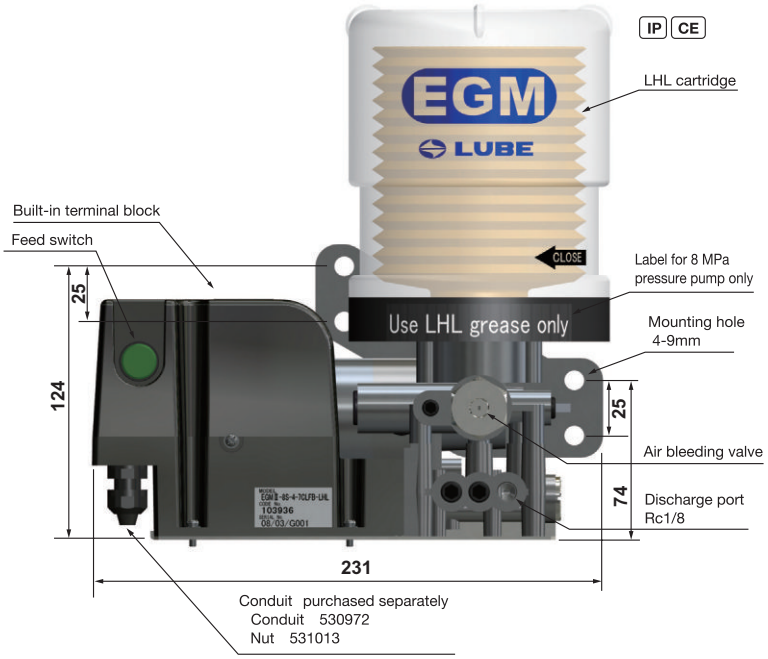


“Series Progressive System”

	Part Description	Quantity
1	EGM-MP	1
2	Progressive valve	3
3	Proximity sensor	3
4	Check assembly	15
5	Clamping ring	15
6	Sleeve	15
7	Cap nut	15
8	Washer	3
9	Plug	3
10	Junction	1
11	Junction	3
12	Elbow adapter	3
13	Elbow adapter	12
14	Compression bushing	15
15	Compression sleeve	15
16	High-pressure fitting	10
17	High-pressure fitting	4
18	Flexible hose	10
19	Hose sleeve	6
20	Hose stud	6
21	Steel tubing 6mm	28
22	Blanking plug	3
23	Pipe clip	10
24	Grease cartridge	1

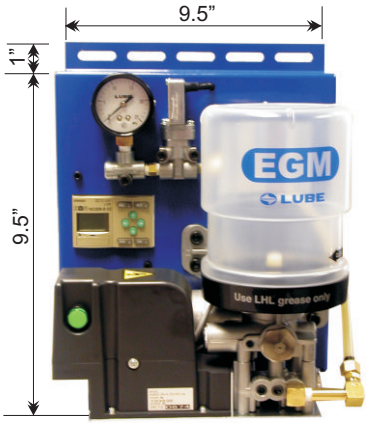


EGM II Pump



Specifications of EGM II Pump	
Power	DC24V
Power consumption	45.6 W
Discharge pressure	8 MPa for LHL system only
Discharge time	7 min 30 sec maximum
Interval	Discharge time x 3
Wiring methods	Terminal connection
Feed switch	Available Optional for PDI pump only
Grease level switch	Available
Solenoid cover	Noncombustible plastic UL94-V0
Protection Class	IP54
CE approval	Approved
Pump air bleeding	Run the pump by pressing the optional Feed Switch, or through machine control panel if the optional Feed Switch is not available with the pump.

Although the Feed Switch provides a dry contact to activate the pump, its capacity is not sufficient to sustain the power required to run the pump. Therefore, the power needs to be provided directly to the pump from the machine control panel.



Specifications of the Panel	
Input Voltage	**88 to 264 VAC 50/60Hz**
Output Voltage	**DC24V 6.5A**
Controller	
Discharge Time	**1 sec to 7:30sec (Smart P.S.+30 sec)**
Interval Time	**Preset at 4 hr. Fully Adjustable**
Interval Count	**Available on request**
Monitoring	
Pressure Rise	**Integrated 55kg Pressure Switch**
Pressure Relief	**Preset at 10 min Fully Adjustable**
Lubricant Level	**Integrated Low Level Switch**
Watch Dog Timer	**1 hr timer for Manual Mode**
Dummy Signal	**2 min signal used as needed**
Emergency output contact	**Dry Contact for integration back to machine controller**

Additional Inputs available for monitoring critical lubrication points

LHL series

Grease cartridge for EGM series pump

400 mL

700 mL

PDI valve

Highly reliable direct pressure driven valve. Push-to-connect fitting and parallel thread offer easy installation to the junction and tubing connection.

MG2

MG2C
w/push-to-connect fitting

Junction
Model : JVPA

Progressive valve

Capable of electrically monitoring the movement of the valve indicator pin with a proximity switch.

SP valve

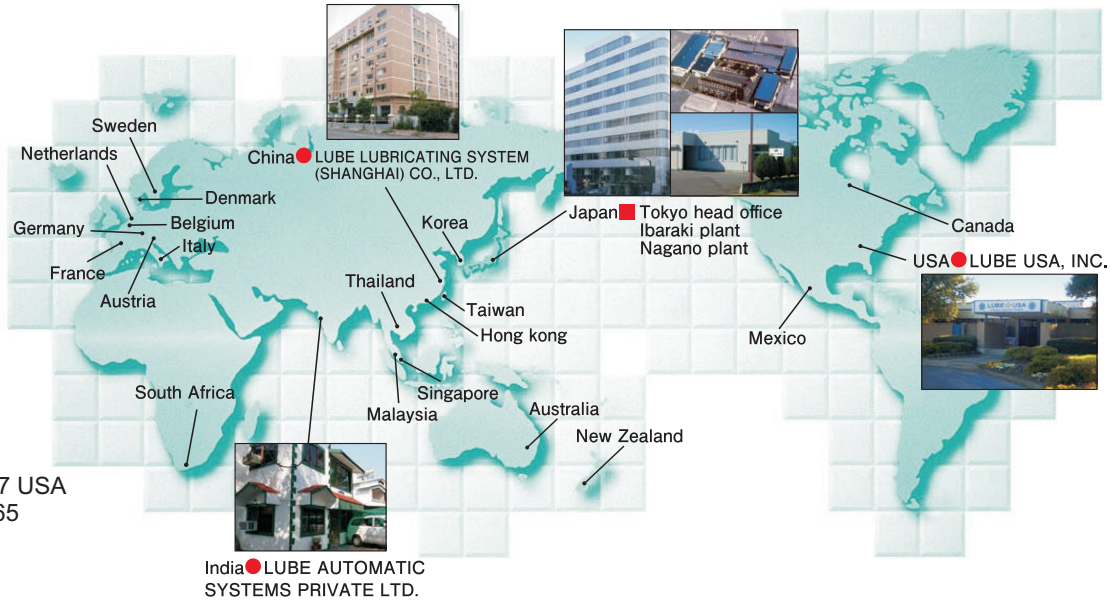
USA

Company Profile

Lube USA's comprehensive assortment of lubrication equipment includes a complete line of products that are available for immediate delivery. You can depend on Lube USA products to pump the right amount, when you need it, where you need it. Call us today for more information and learn why so many other successful companies are turning to Lube USA for all of their lubrication products and services.

History

Founded in 1987, Lube USA Inc. is headquartered in Greenville, South Carolina. In 1992, Lube USA merged with Lube Corporation, headquartered in Tokyo, Japan. The product line of Lube Corporation plus their 40+ years of serving the lubrication systems industry lead to the perfect match between Lube USA and Lube Corporation. Since the Merger, Lube USA has been serving the industries such as Machine Tool, Metal Forming, Metal Stamping, Plastic Injection Molding, Packaging, Food Processing, Wood Working, Automotive and the Textile industries. Today, the entire product line offered by Lube USA is manufactured at either of Lube Corporation's two manufacturing facilities located in Japan. Ibaraki, which opened in 1964 and Nagano, which opened in 1989. Lube USA products are used wherever bearings, ball screws, high speed spindles, conveyors, or any other mechanical parts must be centrally, automatically and precisely lubricated with oil or grease.



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