

## Bearing Performance LB-GM

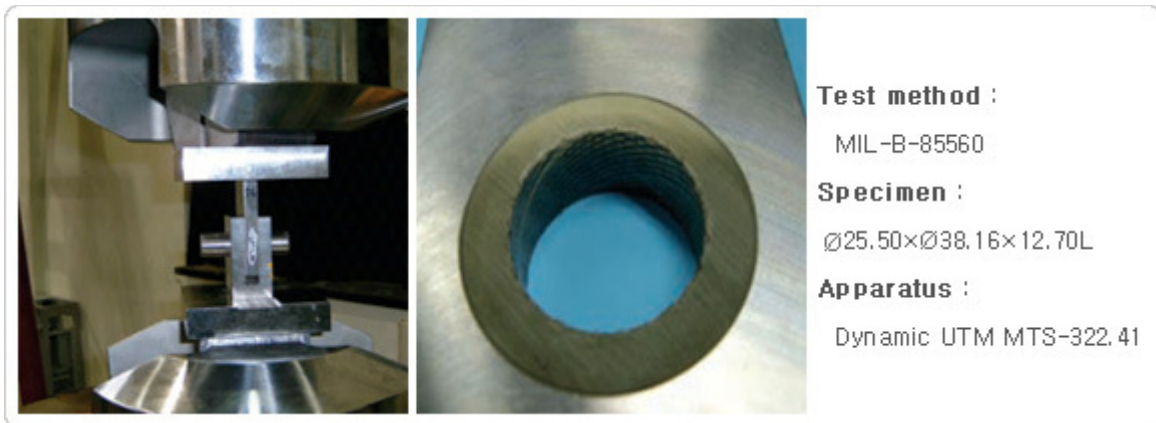
### Mechanical Properties

Mechanical properties of LB - GM composite bearing is shown in Table 1. Fig. 2 shows the test device for the testing of load-deformation of LB-GM bearing in accordance with MIL-B-85560 specifications.

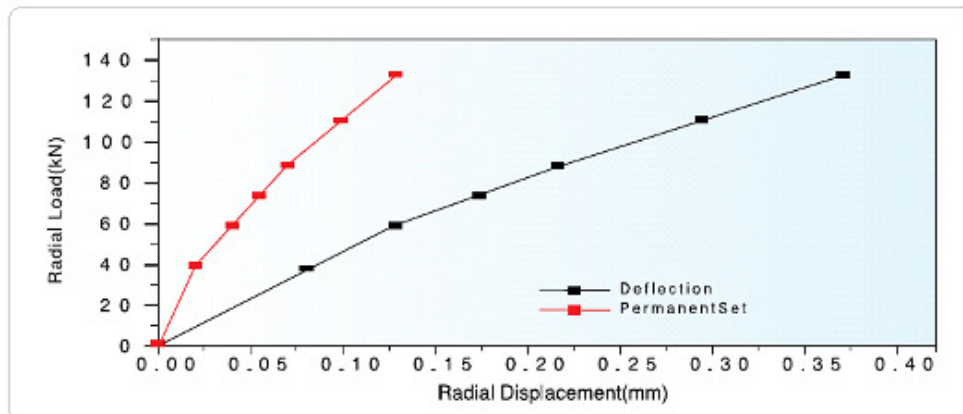
Generally, composite bearing accompanies permanent deformation in addition to the elastic deflection under radial load. This permanent deformation results from compaction between bearing layer and backing layer. Fig.3 shows the relation between elastic deflection and permanent set under radial load

< Table 1 > Mechanical properties of LB - GM

Properties	Units	Values
Maximum compressive strength	MPa	430
Static loading strength	MPa	240
Radial rupture strength	MPa	550
Hardness	HRM	95
Density	g/cm <sup>3</sup>	2.0



< Fig 2> Typical static radial load test setup of LB-GM



< Fig 3> Permanent set and deflection of LB-GM

## Thermal Properties

Operating temperature of LB-GM composite bearing is between -100~+160 °C . And coefficient of thermal expansion is similar to the coefficient of thermal expansion of steel. So the bearing can exhibit its performance without separating from housing even though exposed extreme temperature change.

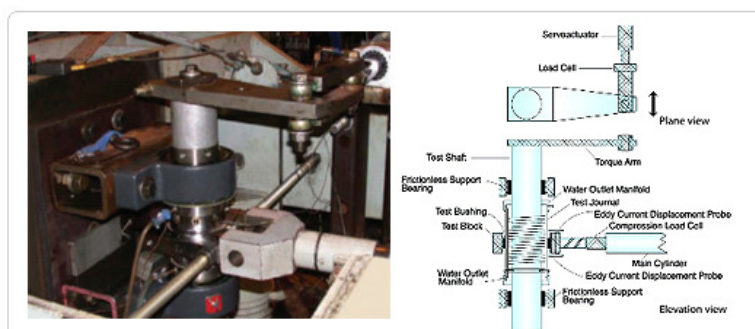
< Table 2> Coefficient of thermal expansion for LB-GM composite bearing, steel and aluminum

	Units	LB-GM Bearing	Steel	Aluminum
Coefficient of thermal expansion(25~150°C)	μm /m°C	13 x 10 <sup>-6</sup>	11 x 10 <sup>-6</sup>	24 x 10 <sup>-6</sup>

## Bearing Properties

< Table 3> Bearing properties of LB-GM composite bearing

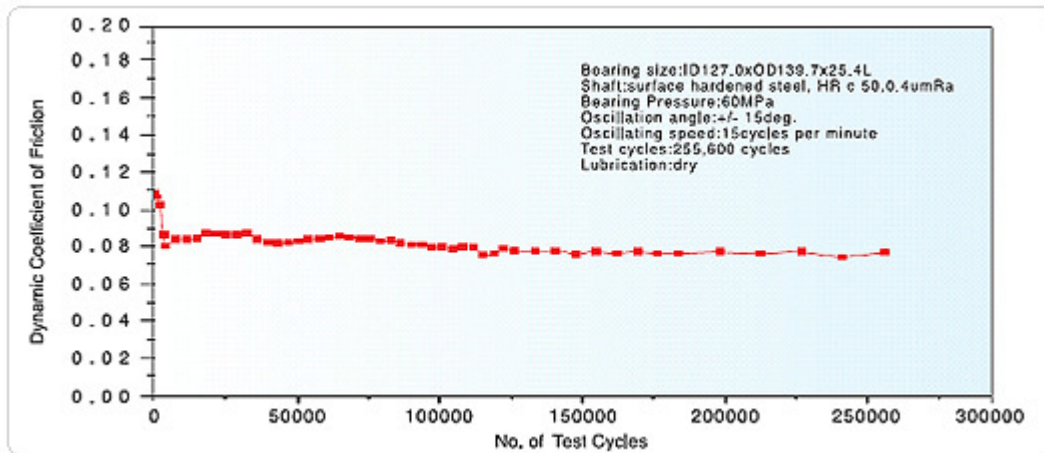
		Units	LB-GM /M 457	LB-GM /M 450
Maximum load	static	MPa	240	140
	dynamic	MPa	140	35
Maximum sliding speed		m/sec	0.2	2.5
Maximum PV value		MPa x m/sec	1.8	2.0
Frictional coefficient(dry)		-	0.03~0.12	0.03~0.08
Maximum operating temp		°C	160	180
Minimum operating temp		°C	-100	-100



< Fig 4> Over view of bearing tester

### Coefficient of Friction

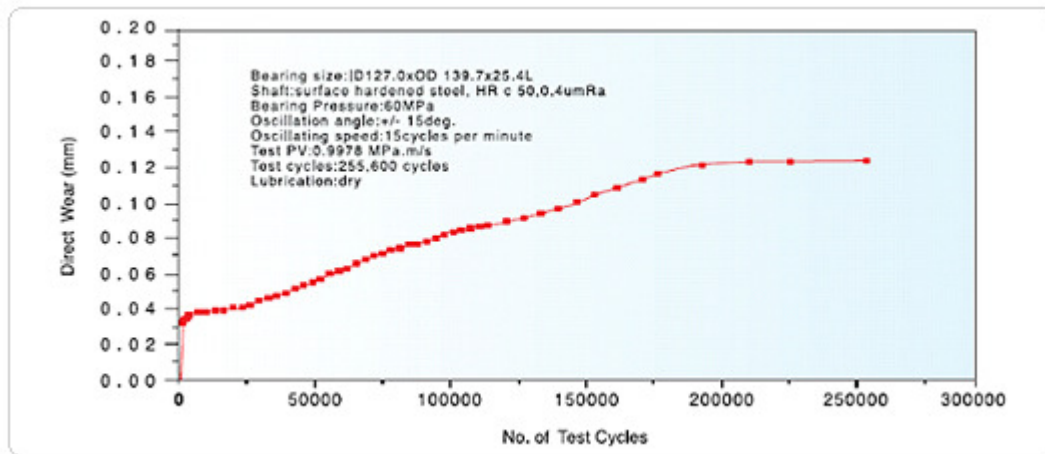
The dynamic coefficient of friction for LB-GM /M-457 composite bearing is between 0.03 & 0.12, depending upon loads, type of movement, sliding speed, operating temperature, micro finish of mating surface. Fig.5 shows the change of dynamic coefficient of friction under oscillating load. At the beginning of test, coefficient of friction is being kept up on steady-state conditions



< Fig 5 > Dynamic coefficient of friction of LB-GM ®/M-457 bearing  
 (Tested by Powertech Labs Inc., B.C, Canada)

## Bearing wear

Bearing wear occurs due to many kinds of factors. Fig.6 shows the test results under bearing pressure of 60 MPa at room temperature. There shows rapid wear during initial thousands of cycles. During this period, there happens transfer of PTFE on the surface of shaft and redistribution of fiber on the sliding direction, resulting into smooth bearing surfaces. After some initial wear, wear rate shows steady progress. Direct wear stays under 0.12mm after 256,000 cycles.



< Fig 6> Direct wear of LB-GM /M-457 bearing  
(Tested by Powertech Labs Inc., B.C, Canada)

< Fig 7> shows the shaft and bearing after finishing all test cycles.

< Fig 8> shows contact area which was highly polished and journal contact surface had a significant amount of wear debris (lubricant film) adhering to the contact face.

< Fig 9> shows close up view of bushing center of contact surface. There did not appear to be any damage to the journal contact surface other than minor polishing.



Fig. 7 LB-GM /M-457 test bushing and journal



Fig. 8 Close up view of LB-GM /M-457 journal contact surface



Fig. 9 Close up view of bushing center of contact surface



**AUTOLUBRIFICANTES**

## Chemical Properties

LB-GM /M-457 composite bearing have resisting power to various kinds of chemical substances. Also they have dimensional stability even after exposed into sea water or fresh-water for a long time

< Table 4 > Chemical resistance of LB-GM /M-457 bearing composite.

Alcohols		Gases		Acids(10%)	
Methanol	○	Butane	○	Hydrochloric acid	○
Ethyl alcohol	○	Ozone	○	Boric acid	○
Allyl alcohol	×	Nitrogen	○	Acetic acid	○
Butyl alcohol	×	Natural gas	○	Sulphuric acids	○
Propyl alcohol	○	Acetylene	○	Nitric acids	×
Isopropanol	○	Hydrogen	○	Carbonic acids	×
Hydroxy acetone	○	Fluorine	×	Hydrofluoric acid	×
		Chlorine gas	×		
Solvents		Salts		Alkalies(10%)	
Acetone	○	Sodium acetate	○	Sodium hydroxide	○
Toluene	○	Sodium carbonate	○	Calcium hydroxide	○
Methyl ethyl ketone	○	Ammonium nitrate	○	Ammonium hydroxide	×
Trichloroethane	×	Ammonium chloride	○	Magnesium hydroxide	○
Benzene	×	Magnesium sulphate	○		
Oils		Fuels		Others	
Gear oil	○	Kerosene	○	Freon	○
Motor oil	○	Jet fuel	○	Formaldehyde	○
Hydraulic oil	○	Diesel	○	Sodium nitrate	○
Linseed oil	○	Petroleum	○	Ethylene glycol	○
		Sodium hydroxide	○	Ammonia	×
				100°C water	×

○ resistant × non resistant