

Technology · Precision · Innovation

Fluid Dynamic Bearing



TPI[®]
BEARINGS

Professional FDB Manufacturer

Company Profile

1966.8.25 Company Established

Main Products:

- Ball/Roller Bearings
- Angular Contact Ball Bearings
- Needle Bearings
- Fluid Dynamic Bearings



www.tpi.tw

Fan Requirements

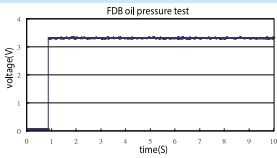
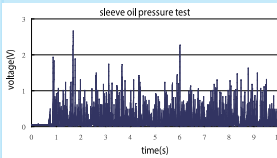
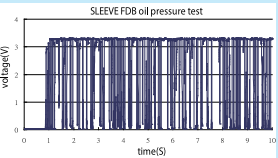
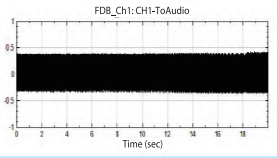
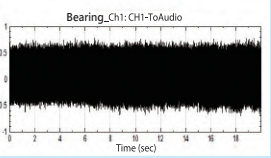
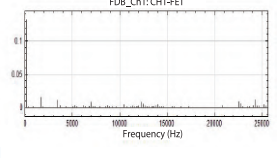
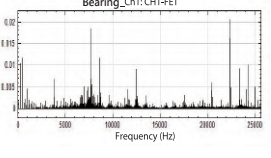
Trending

Fan Requirements	Bearing Requirements	Copper FDB	Deep Groove Ball Bearing	Powder Metallurgy Bearing	Powder Metallurgy FDB	Main Applications
Thinning	Thinning	●	△	○	○	Application end thinning
Large Blade	High Load	●	●	△	△	High flow demand
High RPM	Stability	●	●	△	△	High flow demand
Impact Resistant	Impact Resistant	●	△	△	○	Application end use requirements
Quiet	Silent	●	△	○	○	Application end use requirements
Reliability	Non-contact	●	△	△	△	Product service life requirements
Customization	Design Flexibility	●	△	△	△	Customization

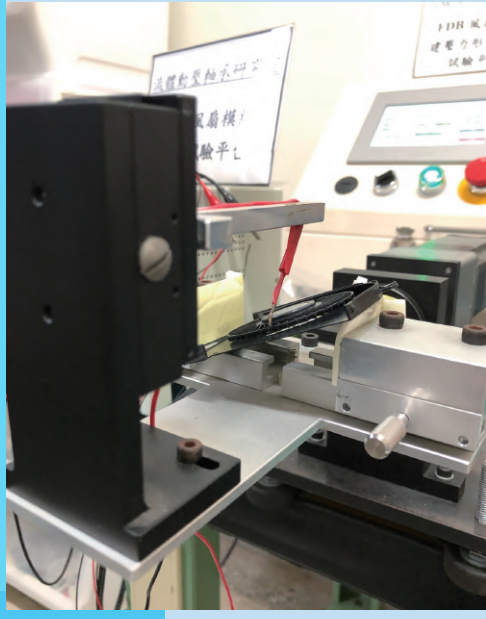
Symbols ● =Excellent ○ = Good △ = General

Bearing Systems

Comparison

	Copper FDB	Deep Groove Ball Bearing	Powder Metallurgy Bearing	Powder Metallurgy FDB
Product Features	Precision turning (one-piece molded)		Powder sintering (porous, permeable)	Powder sintering (porous, permeable)
Materials	Lead-free copper		Sintered powder metallurgy	Sintered powder metallurgy
Lubrication Conditions	Full lubrication (non-contact)		General	Boundary lubrication (contact)
Service Life	Excellent		General	General
Vibration Resistance	Excellent		General	General
System Noise Elimination	Excellent		General	General
Customization Extent	Excellent		General	General
Oil Film Formation Test				
Oil Film Formation Rate	100%		0%	40%
Vibration resistance comparison original vibration signal (acceleration gauge)				
Vibration resistance comparison after filtration				

1.Wobble Test



2.Room Temperature Durability Test



3.Constant High-temperature Test



4.Programmable Stepped Temperature-control Test



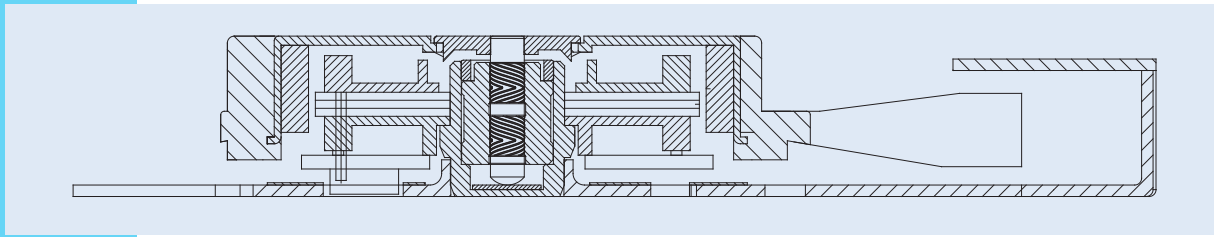
5.DC Variable Speed Test



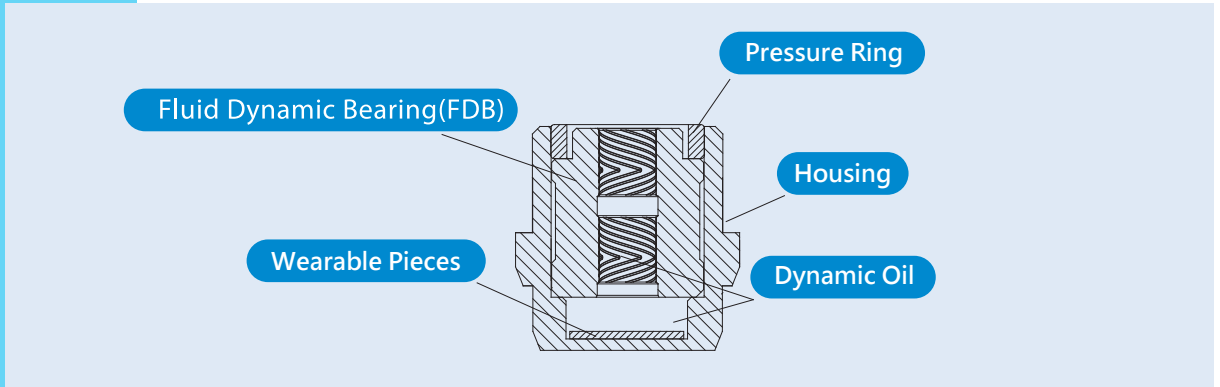
6.Constant-temperature Constant-humidity Fatigue Test



FDB Fan System

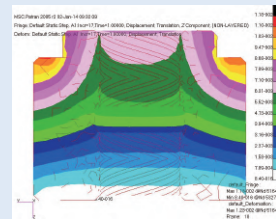
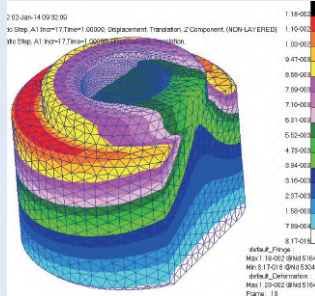
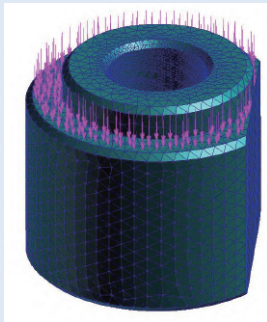


FDB Bearing System



FDB Oil Film Pressure And Bearing System Finite Element Analysis

Structural Analysis Analysis Software: MSC, MARC

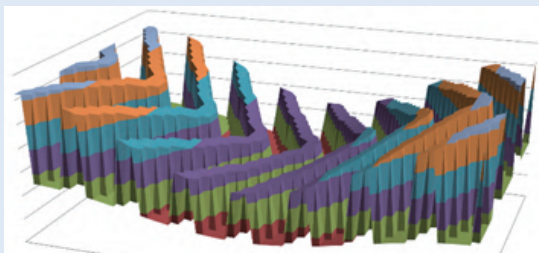


Displacement

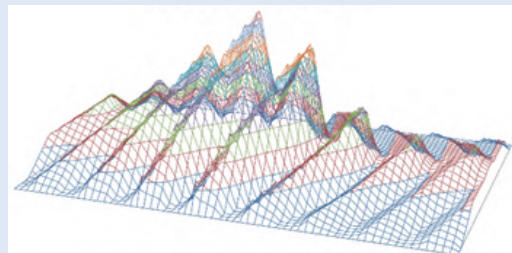
Stress

Oil Film Simulation Analysis Software: TPI Own

1. FDB – Herring-bone Grid Design

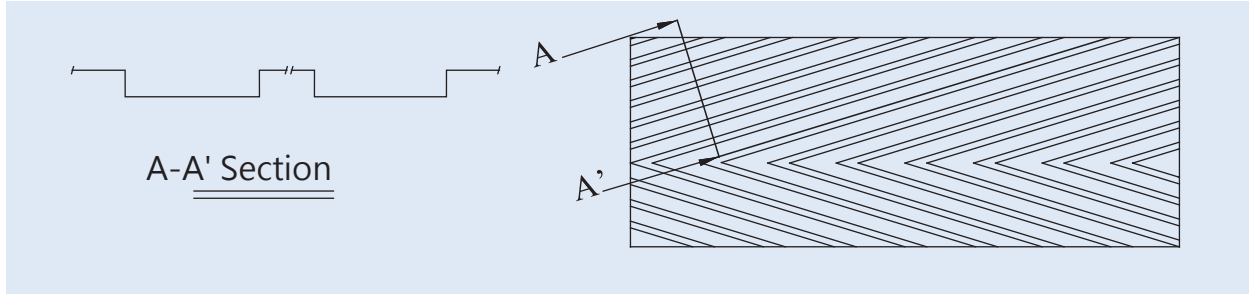


2. FDB – Pressure Field Calculation

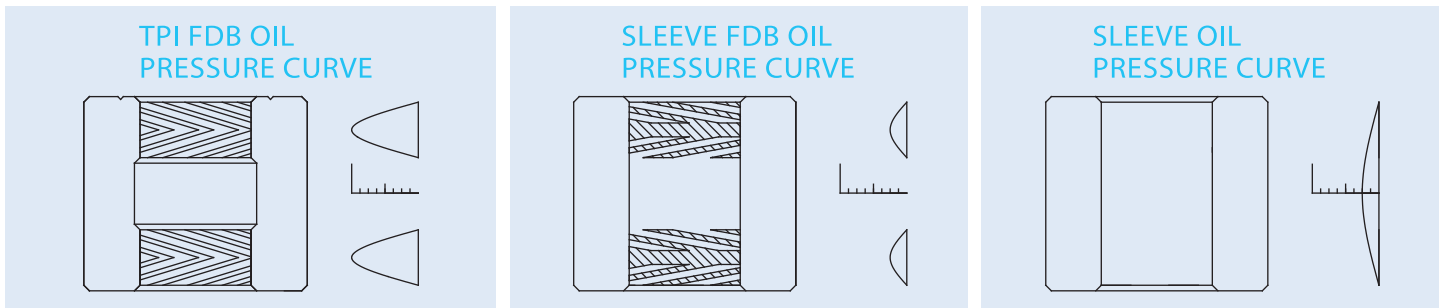


Groove Function:

- Store dynamic oil pressure
- Establish high-pressure shaft-supporting rotation center
- Prevent leakage of dynamic oil (surrogated pressure field characteristics)
- Increase oil film rigidity



Comparison of Pressure Curve Establishment [Theoretical Simulation]:



TPI FDB Application Realms



TPI FDB Application Test Results

Inner Diameter (mm)	Φ1.2	Φ1.5	Φ2.0	Φ3.0
Conditions				
Max. speed (RPM) (Customer End Application Results)	15000	15000	10000	23000

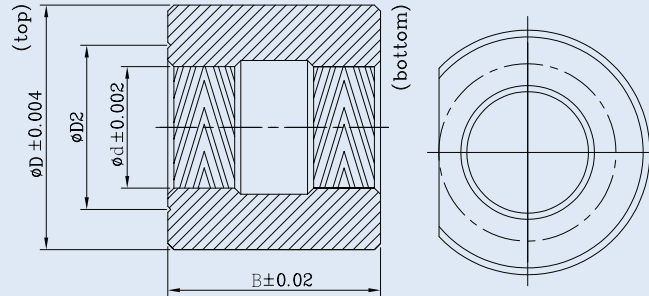
TPI FDB ID Specifications and Standard Bearing Dimensions

Unit: mm

ID Specifications	Φ1.5	Φ2.0	Φ3.0
Diagram			
2 DGBB Design	BB 4015	BB 5020	BB 8030

Groove Direction:
 Clockwise CW (from top view)
 Counterclockwise CCW (from bottom view)

Materials: Copper
 Number of grooves: upper and lower grooves, 8 each



Model Name Meanings	H	15	X	040	X	045	/	LT43
Features	Rotation Direction	ID	OD	Broad(Height)	Special Requirement	Oil Type		
Notation	F (CCW)	15	040	016 020 025 030 ⋮	N Forward and Backward Rotation	LT43 LT44		
	H (CW)	20 30	080					

Unit: mm

d ID	D OD	B Broad (Height)	Standard Model Name	D2 (CW identification symbol and dimension)	D-cut	Fan Height	Corresponding Rotation (rpm)
1.2	4.0	2.0	H12X040X020N	2.7	2.9	4~6	LT43: below 6000rpm LT44: above 6000rpm
		2.5	H12X040X025N			4~6	
1.5	4.0	2.0	H15X040X020N	2.7	2.9	4~6	LT43: below 6000rpm LT44: above 6000rpm
		2.5	H15X040X025N			4~6	
		3.0	H15X040X030N			6~10	
		4.0	H15X040X040N			6~10	
2	4.0	1.6	H20X040X016N	2.7	2.9	3~4	LT43: below 6000rpm LT44: above 6000rpm
		2.0	H20X040X020N			3~4	
		3.0	H20X040X030N			5~6	
		4.0	H20X040X040N			7~10	
3	8.0	7.5	H30X080X075N	5	5.4	15~25	LT43: below 6000rpm LT44: above 6000rpm
		8.5	H30X080X085N			15~25	
		9.5	H30X080X095N			25~40	
		10.5	H30X080X105N			25~40	

Note: Contact TPI for special requirements.

Lubricators Frequently Used in TPI FDB

Lubricator	Applicable Scenario
LT 43	General Purpose and wear-resistant dynamic oil, applicable temperature is: -40 °C – 150 °C
LT 44	Low-rpm and wear-resistant dynamic oil, applicable temperature is: -40 °C – 150 °C
LXT23	Automotive lubricant, featuring low-temperature start-up dynamic oil, applicable temperature is: -40 °C – 200 °C

Note: Contact TPI for special requirements.



FDB

Patents

Dynamic Bearing Structure

Dynamic Bearing Air Escape Structure

Non-directional Dynamic Bearing Structure

Fluid Dynamic Bearing Structure

Dynamic bearing structure used for bearing heat dissipation fan, and its assembly method

Dynamic Bearing and Manufacturing Method

Formation Method of Fluid Dynamic Bearing and Air Escape Groove

Fan Device and Its Bearing component

Dynamic Bearing

Dynamic bearing structure used for bearing heat dissipation fan

Fluid Dynamic Bearing Structure

Dynamic Bearing Structure

A Dynamic Bearing Structure

Double Edge Dynamic Bearing Structure

Bearing and Fan using Dynamic Bearing Structure and Assembly Method of Dynamic

Formation of Air Escape Groove and Fluid Dynamic Bearing

Fan Device and Its Bearing Component

Dynamic Bearing Parts

Fluid Dynamic Bearing

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