

HANKOOK MATERIAL

Self Lubrication

KOB

| **Company name** : Hankook Material Co., Ltd.
| **Address** : 12 Namdongdong-ro 345 beon-gil, Namdong-gu, Incheon, Korea
| **Contact** : T. +82-32-817-4497, F. +82-32-816-8566, E. kob@kob21.com

KOB
Self Lubrication



HANKOOK MATERIAL strives to produce best-quality products

HANKOOK MATERIAL reshapes the future of technology with consistent investment and development.

HANKOOK MATERIAL develops and produces competitive products through continuous investment and developments, which are supplied to a broad spectrum of customers ranging from manufacturers of cars, industrial machinery and machine tools at home, to manufacturers of industrial machinery, heavy equipment and molds in the rest of Asia and Europe.

We promise to make every effort to increase the value of our customers with the top priority on customer-first management by supplying the highest quality products to our customers.

It is HANKOOK MATERIAL that enables you to experience customer delight away from merely meeting expectations to exceeding them.

We will do our best to be a company that develops collaboratively with customers by providing high quality systems through continuous R&D and investment.

Sincerely,
All executives and employees at HANKOOK MATERIAL



Globalization

2022

10

Expanded large-size centrifugal casting machine line (Φ700) (direct-squeeze type)

2021

3

Expanded CNC machining line

2020

1

Expanded CNC machining line

2019

6

Installed automatic centrifugal casting machine

2014

4

Expanded machining line; self-developed material for KOB7

2012

4

INNO-BIZ certification

7

Started to produce oilless bearings; started to export(Europe, Japan, etc.)

2008

2

Certified as an enterprise specialized in parts and materials; R&D-dedicated department certified

3

ISO 14001:2004 certification

4

Certified as Top Venture Company

2007

2

Expanded large-size centrifugal casting machine line (Φ500) (direct-squeeze type)

2006

11

Won SME Entrepreneur Award (div. of nonmetal)

2005

5

Expanded 500 kg CH dual-type induction furnace

2004

9

Expanded large-size centrifugal casting machine line (Φ500) (indirect-squeeze type)

Domestic

2003

6

Developed HCA material (HB: min. 300, with wear resistance greater than SPX)

2002

11

Received the Great Technology Prize awarded by the Korea Foundry Society

12

ISO 9001:2000 certification

2001

5

Took lead of an industry-academia collaborative development project (for improving the properties of material for bearings via centrifugal or sand casting)

6

Developed SPX material (HB: min. 240, proven high wear resistance)

2000

4

Took lead of an industry-academia collaborative development project (for 4 types of high-strength copper alloys)

Establish

1997

3

Installed 1 set of large-size centrifugal casting machine (Φ300)

1996

9

Installed 1 set of large-size centrifugal casting machine (Φ300)

11

Renamed to Hankook Material Co., Ltd.

1994

5

Established the Company (Jinyang Industry Co.); installed high-frequency induction furnace (250 kW, 500 kg)

CERTIFICATIONS

03



INNO-Biz Certificate (Korean)



Certificate designated as a Promising Export SME Enterprise



INNO-Biz Certificate (Korean)



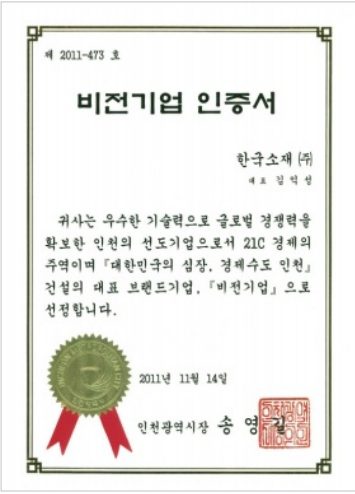
INNO-Biz Certificate (English)



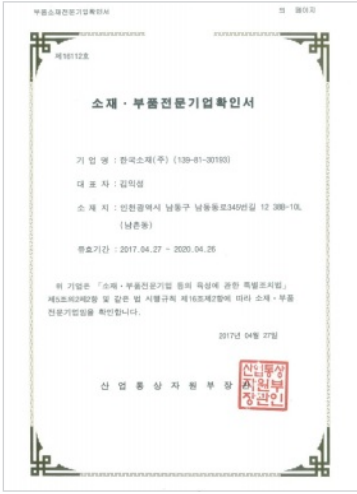
Certificate of Root-Tech Company



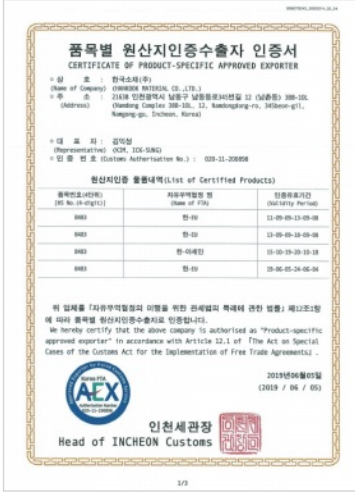
Certificate of accreditation of affiliated R&D Center



Certificate designated as an Envisioning Company



Certificate of Parts/Materials Specialist Firm



Certificate of Product-Specific Approved Exporter

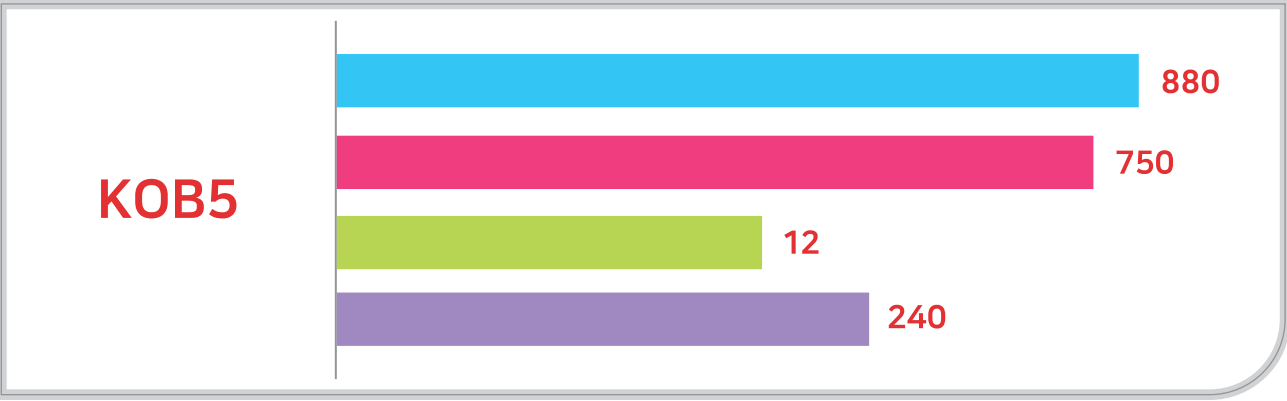
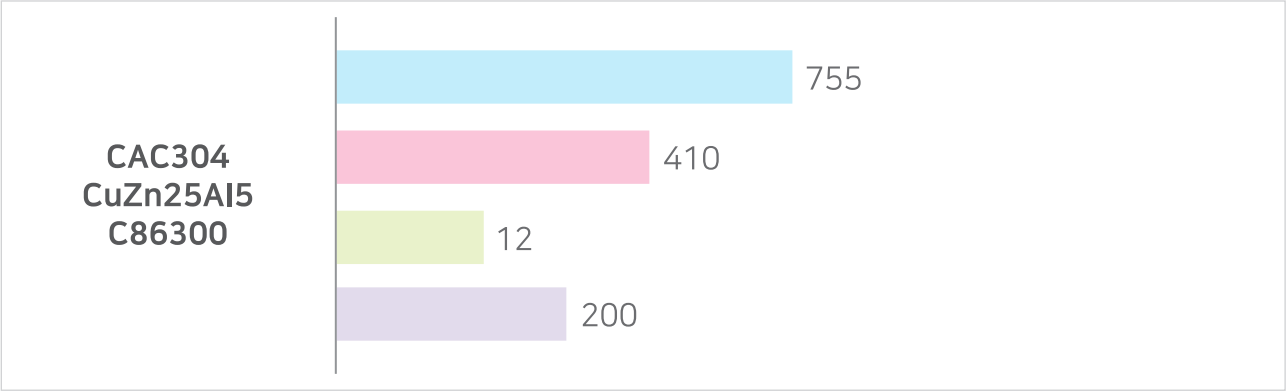
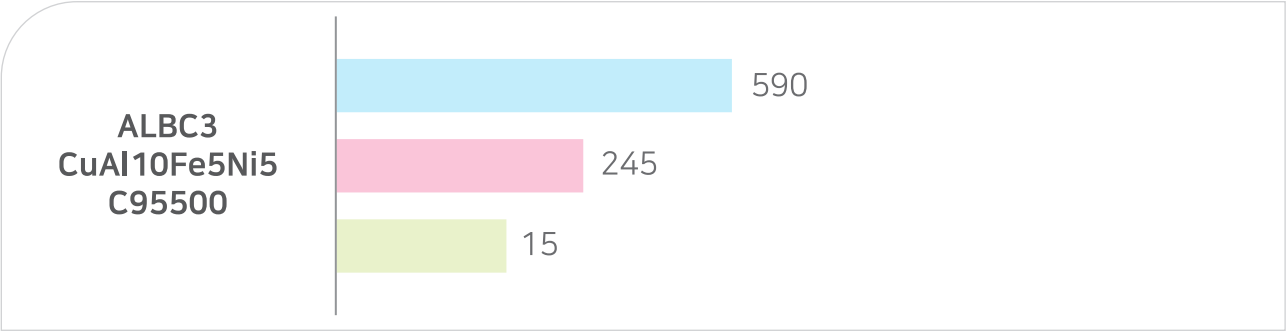
04

HANKOOK MATERIAL KOB5

New Copper Alloy for extreme demands.

Mechanical Property

- Tensile Strength(Mpa)
- Yield Strength(Mpa)
- Elogation(%)
- Hardness(HB)



Oilless Bearings

Oilless bearings are ideal, for applications subjected to high load motion, low speed motion, low temperature, corrosive environments, intrusion of foreign matters, impact load and vibration, and the structural inability of the machinery to lubricate. Or where oil lubrication is not effective, which can accordingly improve a machine’s design performance, labor and cost savings and productivity. There are various kinds of materials and shapes for oilless bearings depending on their final applications, such as high-performance plastic, metal, copper alloy, Teflon and ceramic.



Applications

- Where lubrication is not structurally made possible or is dangerous
- Where the product could be contaminated or the rate of failure increases, caused by oil lubrication
- Applications subjected to high or low temperature, in submerged (salt water) condition, or in contact with chemicals
- To prevent decrease in productivity by avoiding downtime during oil lubrication
- Where lubrication is ineffective due to harsh operating conditions such as frequent stopping
- Applications subjected to impact, vibration, high load, low speed, likelihood of rusting or foreign matter penetration
- Applications subjected to sliding motions or angular pitching motion



Necessity

- Wide range of shapes and materials available, which serve as substitutes replacing ball or roller bearings
- Helps reduce downtime for lubrication, bringing greater productivity



Advantages & Disadvantages by types of lubrication

	Dry lubrication (solid lubes used)	Liquid lubrication (oil or water-based)
Advantages	<ul style="list-style-type: none">- Can be used in high/low temperatures- Can be used in corrosive atmospheres- Can be applied for high-load low-speed motions, reciprocating motions, impact load, angular pitching motions, and discontinuous frequent stop motions where oil lubrication is not effective- 100% self-lubricating in no need of external oiling	<ul style="list-style-type: none">- Ideal for high speed in light and medium load* Prevents friction between two moving surfaces of metals by forming oil film via continuous rotating by centrifugal force in the clearance of shaft and housing
Disadvantages	<ul style="list-style-type: none">- In principle, limited to low-speed applications, not allowable for use under high-speed conditions* The use in high speed condition may cause seizure or shorten life cycle of bearing as solid lubricant has higher friction coefficient than liquid lubricant.	<ul style="list-style-type: none">- Constant lubrication required- Use in low/high temperature conditions not allowed- Use in corrosive atmospheres not allowed- Not suitable for high-load & low-speed motion, reciprocating motion, impact load, angular pitching motion, and discontinuous frequent stop motion where oil film is difficult to be formed- Not suitable for use in high load and high speed (service life reduced due to excessive PV value)



PRODUCT INTRODUCTION

07

COPPER ALLOY CASTING



08

HANKOOK MATERIAL will move forward together with customers by delivering best-quality solutions through consistent R&D and investment.

CASTING PART



PRODUCT INTRODUCTION

09

MACHINING PART



TECHNICAL DATA

10

KOB1

- Features
- High performance proven under operating conditions at high loads and low speeds
 - Superb chemical and corrosion resistance

Range of services		
Lubricating condition	Dry	Periodically lubricated
Operating temp range, °C	-40~+300	-40~+150
Max allowable pressure, P N/mm ²	90(150)	90(150)
Max allowable speed, V m/s	0.50	100
PV limit value, N/mm ² , m/s	1.65	3.25

* The value in parentheses is the allowable static equivalent load for a bearing, that is, the bearing pressure (0.1 m/min) on static load without sliding or with sliding at very slow speeds lower than 0.0017 m/s.

Mechanical properties					
Specific gravity	–	7.9	Hardness	HB	210
Tensile strength	Mpa	755	Longitudinal elastic modulus	N/mm ²	105,000
Elongatio	%	12	Yield strength	Mpa	410
Thermal conductivity	W/m°C	87.8			

* The values in the above table are not the standard values but general ones.

KOB5

Features

- Has load capacity higher than KOB1
- Excellent wear resistance proven in high-load and low-speed applications

Range of services		
Lubricating condition	Dry	Periodically lubricated
Operating temp range, °C	-40~+150	
Max allowable pressure, P N/mm²	100(150)	
Max allowable speed, V m/s	0.25	0.50
PV limit value, N/mm², m/s	1.65	3.25

* The value in parentheses is the allowable static equivalent load for a bearing, that is, the bearing pressure (0.1 m/min) on static load without sliding or with sliding at very slow speeds lower than 0.0017 m/s.

Mechanical properties					
Specific gravity	–	7.9	Hardness	HB	240
Tensile strength	Mpa	880	Longitudinal elastic modulus	N/mm²	98,000
Elongation	%	12	Yield strength	Mpa	750

*The values in the above table are not the standard values but general ones.

HANKOOK MATERIAL will move forward together with customers by delivering best-quality solutions through consistent R&D and investment.

KOB7

Features

- Has load capacity higher than KOB5
- Excellent wear resistance proven in high-load and low-speed applications

Range of services		
Lubricating condition	Dry	Periodically lubricated
Operating temp range, °C	-40~+150	
Max allowable pressure, P N/mm²	120(150)	
Max allowable speed, V m/s	0.10	0.25
PV limit value, N/mm², m/s	1.65	3.25

* The value in parentheses is the allowable static equivalent load for a bearing, that is, the bearing pressure (0.1 m/min) on static load without sliding or with sliding at very slow speeds lower than 0.0017 m/s.

Mechanical properties					
Specific gravity	–	7.8	Hardness	HB	260
Tensile strength	Mpa	900	Longitudinal elastic modulus	N/mm²	98,000
Elongation	%	6			

* The values in the above table are not the standard values but general ones.

KOB AB

- Features
- Usable in submerged application
 - Excellent heat-resistance

Range of services		
Lubricating condition	Dry	Periodically lubricated
Operating temp range, °C	-250~+400	-40~+150
Max allowable pressure, P N/mm²	24	
Max allowable speed, V m/s	0.25	0.50
PV limit value, N/mm², m/s	1.25~1.65	2.45

* The value in parentheses is the allowable static equivalent load for a bearing, that is, the bearing pressure (0.1 m/min) on static load without sliding or with sliding at very slow speeds lower than 0.0017 m/s.

Mechanical properties					
Specific gravity	–	7.6	Hardnes	HB	160
Tensile strength	Mpa	590	Longitudinal elastic modulus	N/mm ²	108,000
Elongation	%	15	Thermal conductivity	W/m°C	58.6

* The values in the above table are not the standard values but general ones.

Copper alloy castings																				
Material specification																				
Formal name	Code	Chemical Composition																		
		Major elements										Residual elements								
		Cu	Sn	Pb	Zn	Fe	Ni	PO	Al	Mn	SO	Sn	Pb	Zn	Fe	Sb	Ni	PO	Al	Si
Yellow brass	CAC201	83.0 ~88.0	-	-	11.0 ~17.0	-	-	-	-	-		0.1	0.5	-	0.2	-	0.2	-	0.2	-
	CAC202	65.0 ~70.0	-	0.5 ~3.0	24.0 ~4.0	-	-	-	-	-		1.0		-	0.8	-	1.0	-	0.5	-
	CAC203	58.0 ~64.0	-	0.5 ~3.0	30.0 ~41.0	-	-	-	-	-		1.0	-	-	0.8	-	1.0	-	0.5	-
High strength brass	CAC301	55.0 ~60.0	-	-	33.0 ~42.0	0.5 ~1.5	-	-	0.5 ~1.5	0.1 ~1.5		1.0	0.4	-	-	-	1.0	-	-	0.1
	CAC302	55.0 ~60.0	-	-	30.0 ~42.0	0.5 ~2.0	-	-	0.5 ~2.0	0.1 ~3.5		1.0	0.4	-	-	-	1.0	-	-	0.1
	CAC303	60.0 ~65.0	-	-	22.0 ~28.0	2.0 ~4.0	-	-	3.0 ~5.0	2.5 ~5.0		0.5	0.2	-	-	-	0.5	-	-	0.1
	CAC304	60.0 ~65.0	-	-	22.0 ~28.0	2.0 ~4.0	-	-	5.0 ~7.5	2.5 ~5.0		0.2	0.2	-	-	-	0.5	-	-	0.1
Bronze	CAC401	79.0 ~83.0	2.0 ~4.0	3.0 ~7.0	8.0 ~12.0	-	-	-	-			-	-	-	0.35	0.2	1.0	0.05	0.01	0.01
	CAC402	86.0 ~90.0	7.0 ~9.0	-	3.0 ~5.0	-	-	-	-			-	1	-	0.2	0.2	1.0	0.05	0.01	0.01
	CAC403	86.5 ~89.5	9.0 ~11.0	-	1.0 ~3.0	-	-	-	-			-	1	-	0.2	0.2	1.0	0.05	0.01	0.01
	CAC406	83.0 ~87.0	4.0 ~6.0	4.0 ~6.0	4.0 ~6.0	-	-	-	-			-	-	-	0.3	0.2	1.0	0.05	0.01	0.01
	CAC407	86.0 ~90.0	5.0 ~7.0	3.0 ~5.0	3.0 ~5.0	-	-	-	-			-	-	-	0.2	0.2	1.0	0.05	0.01	0.01
	CAC408	84.0 ~88.0	4.0 ~6.0	5.0 ~7.0	5.0 ~7.0	-	-	-	-			-	-	-	0.3	0.2	-	0.05	0.01	0.01
	CAC411	90.0 ~96.0	3.0 ~5.0	1.0 ~3.0	1.0 ~3.0	-	0.1 ~1.0	-	-		0.2 ~0.6	-	0.25	-	0.5	0.2	1.0	0.05	0.01	0.01
Phosphor bronze	CAC502A	87.0 ~91.0	9.0 ~12.0	-	-	-	-	0.05 ~0.20	-			-	0.3	0.3	0.2	0.05	1.0	-	0.01	0.01
	CAC502B	87.0 ~91.0	9.0 ~12.0	-	-	-	-	0.15 ~0.50	-			-	0.3	0.3	0.2	0.05	1.0	-	0.01	0.01
	CAC503A	84.0 ~88.0	12.0 ~15.0	-	-	-	-	0.05 ~0.20	-			-	0.3	0.3	0.2	0.05	0.5	-	0.01	0.01
	CAC503B	84.0 ~88.0	12.0 ~15.0	-	-	-	-	0.15 ~0.50	-			-	0.3	0.3	0.2	0.05	0.5	-	0.01	0.01
Leaded tin bronze	CAC602	82.0 ~86.0	9.0 ~11.0	4.0 ~6.0	-	-	-	-	-			-		1.0	0.3	0.3	1.0	0.1	0.01	0.01
	CAC603	77.0 ~81.0	9.0 ~11.0	9.0 ~11.0	-	-	-	-	-			-	-	1.0	0.3	0.5	1.0	0.1	0.01	0.01
	CAC604	74.0 ~78.0	7.0 ~9.0	14.0 ~16.0	-	-	-	-	-			-		1.0	0.3	0.5	-	0.1	0.01	0.01
	CAC605	70.0 ~76.0	6.0 ~8.0	16.0 ~22.0	-	-	-	-	-			-	-	1.0	0.3	0.5	-	0.1	0.01	0.01
Aluminium Bronze	CAC701	85.0 ~90.0	-	-	-	1.0 ~3.0	0.1 ~1.0	-	8.0 ~10.0			1.0	0.1	0.5	-	-	-	-	-	-
	CAC702	80.0 ~88.0	-	-	-	2.5 ~5.0	1.0 ~3.0	-	8.0 ~10.5			1.0	0.1	0.5	-	-	-	-	-	-
	CAC703	78.0 ~85.0	-	-	-	3.0 ~6.0	3.0 ~6.0	-	8.5 ~10.5			1.0	0.1	0.5	-	-	-	-	-	-
	CAC704	71.0 ~84.0	-	-	-	2.0 ~5.0	1.0 ~4.0	-	6.0 ~9.0			1.0	0.1	0.5	-	-	-	-	-	-