

IKO

## PILLOBALLS

- PILLOBALL Spherical Bushings - Insert Type
- PILLOBALL Rod Ends - Insert Type
- PILLOBALL Rod Ends - Die-cast Type
- PILLOBALL Rod Ends - Maintenance-free Type



K29

IKO

## ■ Structure and Features

IKO PILLOBALLs are compact self-aligning spherical bushings that can support a large radial load and a bi-directional axial load at the same time.

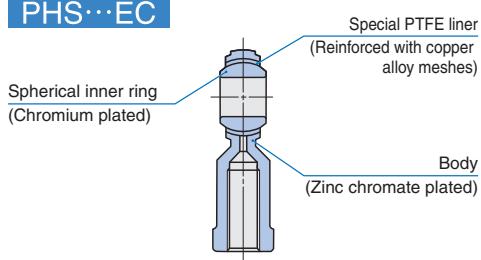
These bushings are classified by sliding surface types, namely, insert type, die-cast type and maintenance-free type. In the insert type, a spherical inner ring makes contact with the special copper alloy bushing with superior run-in properties. In the die-cast type, a spherical inner ring makes direct contact with the bore surface of the body of special zinc die-cast alloy. In the maintenance-free type, a spherical inner ring makes contact with the special PTFE liner of maintenance-free type. Thus, a smooth rotational and oscillatory motion can be achieved with superior anti-wear and loading properties in each type.

PILLOBALL Rod Ends have either a female thread in the body or a male thread on the body, and they can be easily assembled onto machines.

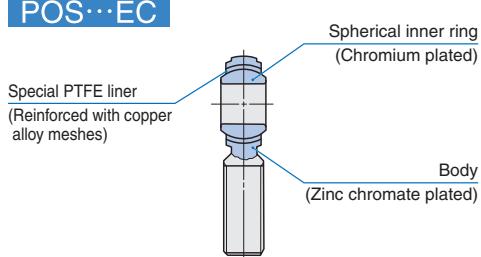
PILLOBALLs are used in control and link mechanisms in machine tools, textile machines, packaging machines, etc. The maintenance-free type is especially suitable for loading in one direction and is the best choice for machines in which oil must be avoided such as food processing machines, or machines which cannot be re-lubricated.

### Structures of maintenance-free type PILLOBALLs

**PHS...EC**

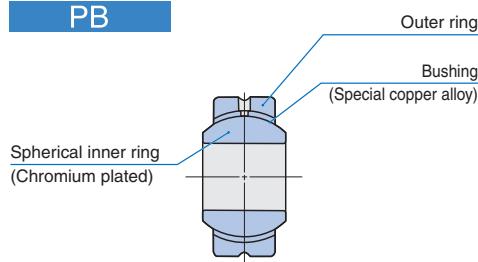


**POS...EC**

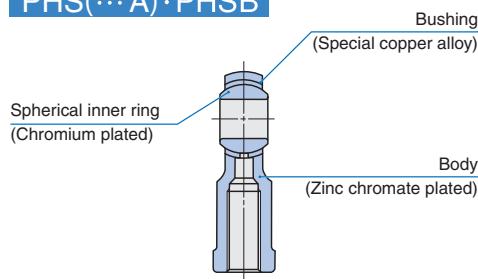


### Structures of lubrication type PILLOBALLs

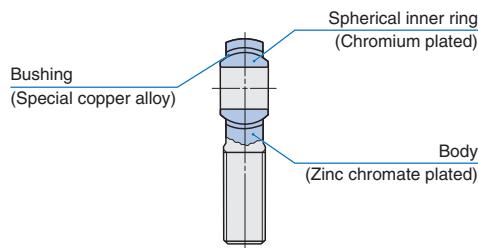
**PB**



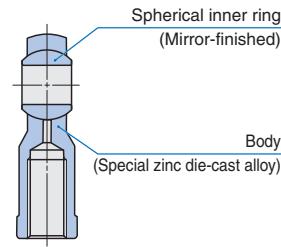
**PHS(...A) · PHSB**



**POS(...A) · POSB**



**PHSA**



K

PB  
PHS  
PHSB  
POS  
POSB  
PHSA



## ■ Types

In PILLOBALLs, the types shown in Table 1 are available.

**Table 1 Type**

Type	Lubrication type		Maintenance-free type	
	Spherical Bushings	Rod end	Rod end	Rod end
Insert type	PB	PHS(···A) · PHSB POS(···A) · POSB	—	PHS ··· EC POS ··· EC
Die-cast type	—	PHSA	—	—

### Lubrication Type PILLOBALL Spherical Bushings Insert Type PB

This type has superior anti-wear properties and high rigidity. It consists of a spherical inner ring, an outer ring, and a bushing of special copper alloy with superior run-in properties inserted in between. The spherical surface of the inner ring is chromium plated after heat treatment and grinding. This type is assembled with a shaft and a housing.

When especially large radial and/or axial loads are applied, Spherical Bushings with molybdenum disulfide ( $\text{MoS}_2$ ) treated inner and outer rings are recommended. (See page K1.)

### Lubrication Type PILLOBALL Rod Ends Insert Type PHS(···A), POS(···A), PHSB and POSB

This type has superior wear-resistant and corrosion-resistant properties as well as high rigidity. It consists of a spherical inner ring of which the spherical surface is chromium plated after heat treatment and grinding, a body with a zinc chromate plated outer surface, and an inserted bushing of special copper alloy having superior run-in properties. PHS, which has a female thread in the body, and POS, which has a male thread on the body, are available. For PHS and POS sizes 5 to 18, an A is appended after the dimensions as a model code.

### Lubrication Type PILLOBALL Rod Ends Die-cast Type PHSA

The spherical inner ring of this type is mirror-finished after heat treatment and is built in a body of special zinc die-cast alloy. The sliding surfaces of the inner ring and body are in close contact with each other. Thus, this type is an economical rod end with superior anti-wear and loading properties.

### Maintenance-free Type PILLOBALL Rod Ends PHS ··· EC, POS ··· EC

This type has superior anti-corrosion properties as the

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body is zinc chromate treated and the spherical inner ring is chromium plated on the sphere surface after heat treatment and grinding.

A special PTFE liner, reinforced with copper alloy meshes, which is superior in anti-wear properties with little creep deformation is used for lining on the sliding surface of the body, and this type is maintenance-free.

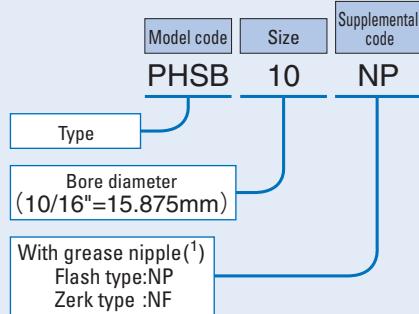
PHS ··· EC, which has a female thread in the body, and POS ··· EC, which has a male thread on the body, are available.

## ■ Identification number

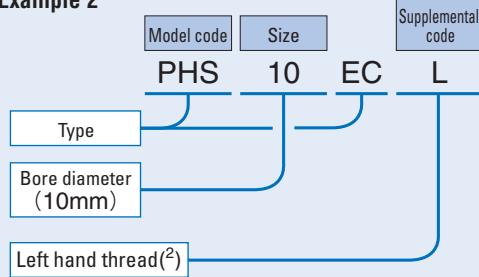
The identification number of PILLOBALLs consists of a model code, a size and any supplemental codes as shown in the examples.

### Examples of identification number

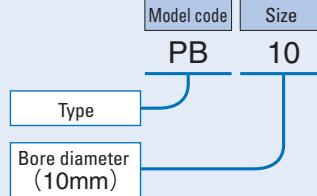
#### Example 1



#### Example 2



#### Example 3



Notes<sup>(1)</sup> Shapes of grease nipple are shown in Fig.1. In case of no indication of grease nipple type, grease nipple is not prepared.

<sup>(2)</sup> Right hand thread is indicated with no code.





## Maximum Operating Load

The recommended value of bushing load is obtained by multiplying the dynamic load capacity  $C_d$  by a numerical factor, which differs depending on the bushing type and load condition. For PILLOBALL Rod Ends, the static load capacity  $C_s$  must also be considered in determining the applicable bushing load. Table 6 shows the guidelines for maximum operating load of PILLOBALLS. When axial loads are added in addition to radial loads, bending stress occurs in the body. Pay attention to this bending stress.

**Table 6 Maximum operating load**

Type	Load direction	
	Constant	Alternate
PB	$\leq 0.3C_d$	$\leq 0.6C_d$
PHS(-A), POS(-A), PHSB, POSB	$\leq 0.3C_d$	$\leq 0.2C_s$
PHSA	$\leq 0.16C_s$	
PHS-EC, POS-EC	$\leq 0.3C_s$	$\leq 0.2C_s$

Remark  $C_d$  is the dynamic load capacity and  $C_s$  is the static load capacity.

## Equivalent radial load

PILLOBALLs can take radial and axial loads at the same time. When the magnitude and direction of loads are constant, the equivalent radial load can be obtained by the following equation.

$$P = F_r + YF_a \dots \text{(2)}$$

where,  $P$  : Equivalent radial load, N

$F_r$  : Radial load, N

$F_a$  : Axial load, N

$Y$  : Axial load factor (Refer to Table 7.)

**Table 7 Axial load factor  $Y$**

Type	0.1	0.2	0.3	0.4	0.5	> 0.5
PB						
PHS(-A), POS(-A)	1	2	3	4	5	Unusable
PHSB, POSB						
PHS-EC	1	2	3			Unusable
POS-EC						

## Life

The life of PILLOBALLs is defined as the total number of oscillating motions during which the PILLOBALLs can be operated without failure or malfunction due to wear, increase in internal clearance, increase in sliding torque and operating temperature, etc.

As the actual life is affected by many factors such as the material of the sliding surface, the magnitude and direction of load, lubrication, sliding velocity, etc., the calculated life can be used as a measure of expected service life.

### ① Life of lubrication type PILLOBALLs

PB · PHS(-A) · POS(-A) · PHSB · POSB

#### [1] Confirmation of $pV$ value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the  $pV$  diagram in Fig.2.

When the operating conditions are out of the permissible range, please consult IKO.

The contact pressure  $p$  and the sliding velocity  $V$  are obtained from the following equations.

$$p = \frac{50P}{C_{dt}} \dots \text{(3)}$$

$$V = 5.82 \times 10^{-4} d_k \beta f \dots \text{(4)}$$

where,  $p$  : Contact pressure, N/mm<sup>2</sup>

$P$  : Equivalent radial load, N

(Refer to equation (2).)

$C_{dt}$  : Dynamic load capacity considering temperature increase, N

(Refer to equation (1).)

$V$  : Sliding velocity, mm/s

$d_k$  : Sphere diameter, mm

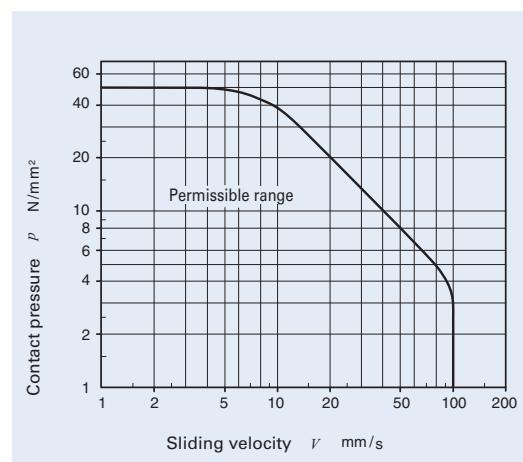
(Refer to the dimensional tables.)

$2\beta$  : Oscillating angle degrees (Refer to Fig.3.)

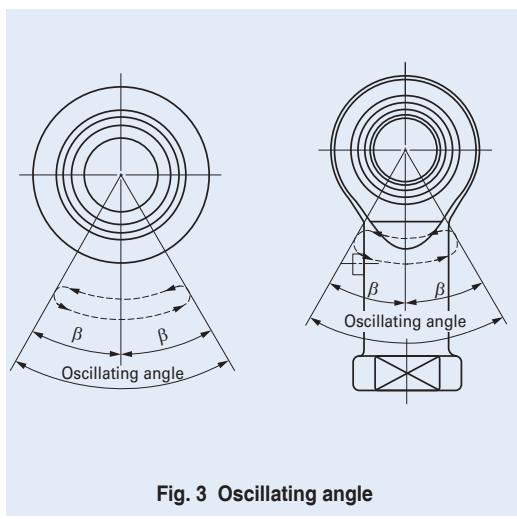
when  $\beta < 5^\circ$ ,  $\beta = 5$

when rotating,  $\beta = 90$

$f$  : Number of oscillations per minute, min<sup>-1</sup>



**Fig. 2  $pV$  diagram of lubrication type PILLOBALLs**



[2] Life calculation

The life of lubrication type PILLOBALLS can be calculated by the following equations.

$$G = \frac{3.18 b_1 b_2 b_3}{\sqrt{d_k} \beta} \left( \frac{C_{dt}}{P} \right)^2 \times 10^5 \quad \dots \dots \dots (5)$$

$$L_h = \frac{G}{60f} \quad \dots \dots \dots (6)$$

where,  $G$  : Life (Total number of oscillations)

$b_1$  : Load directional factor (Refer to Table 8.)

$b_2$  : Lubrication factor (Refer to Table 8.)

$b_3$  : Sliding velocity factor (Refer to Fig. 4.)

$C_{dt}$  : Dynamic load capacity considering temperature increase, N  
(Refer to equation (1).)

$P$  : Equivalent radial load, N  
(Refer to equation (2).)

$L_h$  : Life in hours, h

$f$  : Number of oscillations per minute,  $\text{min}^{-1}$

Table 8 Load directional factor  $b_1$  and lubrication factor  $b_2$  for lubrication type PILLOBALLS

Load directional factor $b_1$		Lubrication factor $b_2$	
Load direction		Periodical lubrication	
Constant	Alternate	None	Regular
1	5	1	15



Fig. 4 Sliding velocity factor for lubrication type PILLOBALLS

② Life of maintenance-free type PILLOBALLS PHS…EC · POS…EC

[1] Confirmation of  $pV$  value

Before attempting to calculate the life, make sure that the operating conditions are within the permissible range by referring to the  $pV$  diagram in Fig.5.

When the operating conditions are out of the permissible range, please consult IKO.

The contact pressure  $p$  and sliding velocity  $V$  are obtained from equations (3) and (4) on page K6.

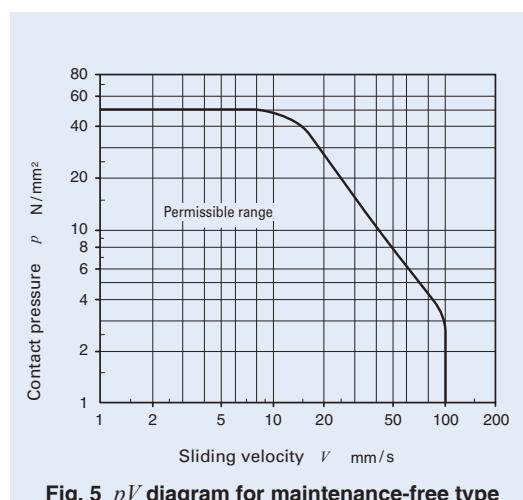


Fig. 5  $pV$  diagram for maintenance-free type PILLOBALL Rod Ends

K

PB  
PHS  
PHSB  
POS  
POSB  
PHSA

1N=0.102kgf=0.2248lbs. K34  
1mm=0.03937inch



## [2] Life calculation

The life of maintenance-free type PILLOBALL Rod Ends is obtained from the total sliding distance  $S$  which is given in Fig.5 for the contact pressure  $p$  obtained from equation (3).

The total number of oscillations and life in hours can be obtained from the following equations.

$$G = 16.67 \times b_1 \times \frac{Sf}{V} \quad \dots \dots \dots (7)$$

$$L_h = \frac{G}{60f} \quad \dots \dots \dots (8)$$

where,  $G$  : Life (Total number of oscillations)  
 $b_1$  : Load directional factor (Refer to Table 9.)  
 $S$  : Total sliding distance m  
 $f$  : Number of oscillations per minute min<sup>-1</sup>  
 $V$  : Sliding velocity mm/s  
 $L_h$  : Life in hours h

Table 9 Load directional factor for maintenance-free type PILLOBALLS  $b_1$

Load direction	Constant	Alternate
Load directional factor $b_1$	1	0.2 <sup>(1)</sup>

Note<sup>(1)</sup> This value is applicable when the load changes comparatively slowly. When the load changes rapidly, please consult IKO, as the factor decreases sharply.



Fig. 6 Contact pressure and total sliding distance for maintenance-free type PILLOBALL Rod Ends

## Lubrication

Maintenance-free type PILLOBALL Rod Ends have a sliding surface lined with a self-lubricating lining. Therefore, they can be used without lubrication. Lubrication type PILLOBALLs are not provided with prepacked grease. Perform proper lubrication for use. Operating without lubrication will increase the wear of the sliding contact surfaces and cause seizure.

## Oil Hole and Grease Nipple

Table 10 shows the specifications of oil hole and grease nipple on the outer ring or body. Further, lubrication nozzle models compatible with the grease nipple are shown in Table 11.

For PILLOBALLs without an oil hole and grease nipple, apply grease directly on the spherical surface.

Table 10 Specifications of oil hole and grease nipple

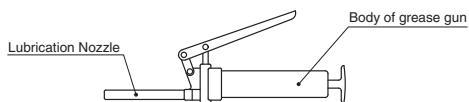
Type	Bore diameter of inner ring $d$ mm	Specification
		PB
PHS(...A)	$d \leq 4$	None
	$4 < d$	With grease nipple
POS(...A)	$d \leq 4$	None
	$4 < d \leq 6$	1 oil hole
PHSB · POSB	$6 < d$	With grease nipple
		None <sup>(1)</sup>
PHSA		With grease nipple
PHS · EC, POS · EC		None

Note<sup>(1)</sup> Grease Nipple is available for size 4 or larger with supplemental code.

Table 11 Types and Dimension of Lubrication Nozzles

Type	Dimension
A-5126T	
A-5120R	
B-5120R	

Remark HSP-3(Yamada Corporation)can be used for them.  
The above nozzles can be attached on the standard grease gun shown below.





## ■ Operating Temperature Range

The maximum allowable temperature for Lubrication type PILLOBALLs is +180°C for the insert type and +80°C for the die-cast type.

The maximum allowable temperature for Maintenance-free type PILLOBALL Rod Ends is +150°C.

## ■ Precautions for Use

### ① Tightening depth

The recommended tightening depth of the screw into the PILLOBALL Rod End body is shown below.

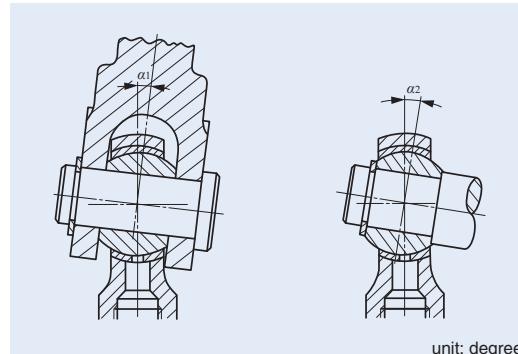
Insert type and maintenance-free type: 1.25 times the nominal thread dia. or more.

Die-cast type: 2 times the nominal thread dia. or more.

### ② Allowable tilting angle

The allowable tilting angle differs depending on the mounting structure as shown in Table 12 and Table 13.

Table 12 Allowable tilting angle



unit: degree

d Bore diameter mm	PB <sup>(1)</sup> , PHS(…A), POS(…A) PHS … EC, POS … EC		PHSA	
	$\alpha_1$	$\alpha_2$	$\alpha_1$	$\alpha_2$
3	7	13	—	—
4	7	13	—	—
5	8	13	7	13
6	8	13	7	13
8	8	14	8	14
10	8	14	8	14
12	8	13	8	13
14	10	16	9	16
16	9	15	9	15
18	9	15	9	15
20	9	15	9	15
22	10	15	9	15
25	9	15	—	—
28	9	15	—	—
30	10	17	—	—

Note<sup>(1)</sup> In the case of the PB series,  $\alpha_2$  is applicable in general.

Table 13 Allowable tilting angle for inch series

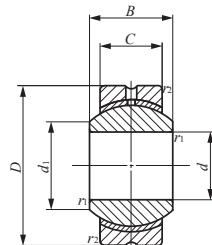
unit: degree

With female thread	With male thread	$\alpha_1$	$\alpha_2$
PHSB 2	POSB 2	8	16
PHSB 2.5	POSB 2.5	7	12
PHSB 3	POSB 3	6	10
PHSB 4	POSB 4	7	13
PHSB 5	POSB 5	6	10
PHSB 6	POSB 6	6	11
PHSB 7	POSB 7	7	11
PHSB 8	POSB 8	6	9
PHSB 10	POSB 10	7	11
PHSB 12	POSB 12	6	10
PHSB 16	POSB 16	7	14

K

PB  
PHS  
PHSB  
POS  
POSB  
PHSA

1N=0.102kgf=0.2248lbs. K36  
1mm=0.03937inch

**IKO****PILLOBALL**Lubrication Type PILLOBALL Spherical Bushings **Insert Type**

PB

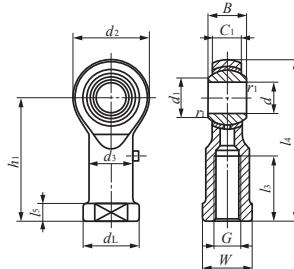
Identification number	Mass (Ref.) g	Boundary dimensions mm						Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		$d$	$D$	$C$	$B$	$d_1$	$r_{s \min}^{(1)}$	Ball dia. mm (inch)		
<b>PB 5</b>	8.5	5	16	6	8	7.7	0.2	11.112 ( $\frac{7}{16}$ )	3 270	7 850
<b>PB 6</b>	13	6	18	6.75	9	9	0.2	12.700 ( $\frac{1}{2}$ )	4 200	10 100
<b>PB 8</b>	24	8	22	9	12	10.4	0.2	15.875 ( $\frac{5}{8}$ )	7 010	16 800
<b>PB 10</b>	39	10	26	10.5	14	12.9	0.2	19.050 ( $\frac{3}{4}$ )	9 810	23 500
<b>PB 12</b>	58	12	30	12	16	15.4	0.2	22.225 ( $\frac{7}{8}$ )	13 100	31 400
<b>PB 14</b>	84	14	34	13.5	19	16.9	0.3	25.400 ( $\frac{1}{2}$ )	16 800	40 400
<b>PB 16</b>	111	16	38	15	21	19.4	0.3	28.575 ( $\frac{1}{1}\frac{1}{8}$ )	21 000	50 400
<b>PB 18</b>	160	18	42	16.5	23	21.9	0.3	31.750 ( $\frac{1}{1}\frac{1}{4}$ )	25 700	61 600
<b>PB 20</b>	210	20	46	18	25	24.4	0.3	34.925 ( $\frac{1}{1}\frac{3}{8}$ )	30 800	74 000
<b>PB 22</b>	265	22	50	20	28	25.8	0.3	38.100 ( $\frac{1}{1}\frac{1}{2}$ )	37 400	89 700
<b>PB 25</b>	390	25	56	22	31	29.6	0.6	42.862 ( $\frac{11}{16}$ )	46 200	111 000
<b>PB 28</b>	410	28	62	25	35	32.3	0.6	47.625 ( $\frac{1}{1}\frac{7}{8}$ )	58 400	140 000
<b>PB 30</b>	610	30	66	25	37	34.8	0.6	50.800 ( $\frac{2}{2}$ )	62 300	149 000

Note<sup>(1)</sup> Minimum allowable value of chamfer dimensions  $r_1$  and  $r_2$ 

Remarks 1. The outer ring has an oil groove and an oil hole.

2. No grease is prepakced. Perform proper lubrication.

## Lubrication Type PILLOBALL Rod Ends Insert Type/With Female Thread



PHS(···A)

Identification number	Mass (Ref.) g	Boundary dimensions mm													Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		Thread G	$d_2$	$C_1$	B	$d_1$	$l_4$	$h_1$	$l_3$	$l_5$	W	$d_3$	$d_L$	$r_{1smin}^{(1)}$	Ball dia. mm (inch)		
PHS 3	5.7	3 M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 (5/16)	1 750	3 670
PHS 4	11.9	4 M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 (3/8)	2 480	4 680
PHS 5A	16.5	5 M 5×0.8	16	6	8	7.7	35	27	14	4	9	9	11	0.2	11.112 (7/16)	3 270	5 730
PHS 6A	25	6 M 6×1	18	6.75	9	9	39	30	14	5	11	10	13	0.2	12.700 (1 1/2)	4 200	6 910
PHS 8A	43	8 M 8×1.25	22	9	12	10.4	47	36	17	5	14	12.5	16	0.2	15.875 (5/8)	7 010	10 200
PHS 10A	72	10 M10×1.5	26	10.5	14	12.9	56	43	21	6.5	17	15	19	0.2	19.050 (3/4)	9 810	13 300
PHS 12A	107	12 M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 (7/8)	13 100	16 900
PHS 14A	160	14 M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	16 800	20 900
PHS 16A	210	16 M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 (1 1/8)	21 000	25 400
PHS 18A	295	18 M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 (1 1/4)	25 700	30 200
PHS 20	380	20 M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 (1 3/8)	30 800	35 500
PHS 22	490	22 M22×1.5	50	20	28	25.8	109	84	43	12	32	30	37	0.2	38.100 (1 1/2)	37 400	41 700
PHS 25	750	25 M24×2	60	22	31	29.6	124	94	48	12	36	33.5	42	0.6	42.862 (11/16)	46 200	72 700
PHS 28	950	28 M27×2	66	25	35	32.3	136	103	53	12	41	37	46	0.6	47.625 (1 7/8)	58 400	87 000
PHS 30	1 130	30 M30×2	70	25	37	34.8	145	110	56	15	41	40	50	0.6	50.800 (2)	62 300	92 200

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$ Remarks 1. Neither oil hole nor grease nipple is provided for PHS with an inner ring bore diameter  $d$  of 4 mm or less.

For others, a grease nipple is provided on the body.

2. No grease is prepacked. Perform proper lubrication.

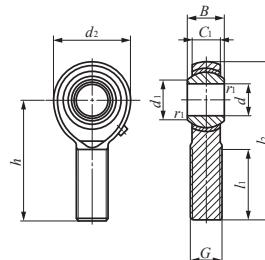
3. When a metric fine thread specification for inner ring bore diameter  $d$  of 8 mm to 14 mm is required, please contact IKO.

K

PB  
PHS  
PHSB  
POS  
POSB  
PHSA

**IKO****PILLOBALL**

Lubrication Type PILLOBALL Rod Ends Insert Type/With Male Thread



POS(···A)

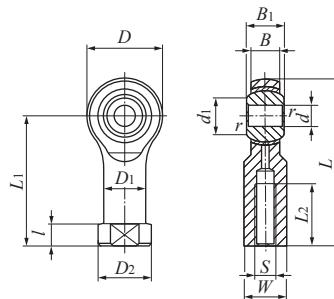
Identification number	Mass (Ref.) g	Boundary dimensions mm										Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		d	Thread G	$d_2$	$C_1$	B	$d_1$	$l_2$	$h$	$l_1$	$r_{1s\ min}^{(1)}$			
POS 3	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 ( $\frac{5}{16}$ )	1 750	1 220
POS 4	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 ( $\frac{3}{8}$ )	2 480	2 060
POS 5A	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 ( $\frac{7}{16}$ )	3 270	3 340
POS 6A	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 ( $\frac{1}{2}$ )	4 200	4 730
POS 8A	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 ( $\frac{5}{8}$ )	7 010	8 640
POS 10A	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 ( $\frac{3}{4}$ )	9 810	13 300
POS 12A	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 ( $\frac{7}{8}$ )	13 100	16 900
POS 14A	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 ( $1\frac{1}{2}$ )	16 800	20 900
POS 16A	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 ( $1\frac{1}{8}$ )	21 000	25 400
POS 18A	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 ( $1\frac{1}{4}$ )	25 700	30 200
POS 20	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 ( $1\frac{3}{8}$ )	30 800	35 500
POS 22	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 ( $1\frac{1}{2}$ )	37 400	41 700
POS 25	650	25	M24×2	60	22	31	29.6	124	94	57	0.6	42.862 ( $1\frac{11}{16}$ )	46 200	72 700
POS 28	875	28	M27×2	66	25	35	32.3	136	103	62	0.6	47.625 ( $1\frac{7}{8}$ )	58 400	87 000
POS 30	1 070	30	M30×2	70	25	37	34.8	145	110	66	0.6	50.800 ( $2\frac{1}{2}$ )	62 300	92 200

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$ Remarks1. Neither oil hole nor grease nipple is provided for POS with an inner ring bore diameter  $d$  of 4 mm or less.For those with an inner ring bore diameter  $d$  of 5 to 6 mm, an oil hole is provided on the body. For others, a grease nipple is provided on the body.

2. No grease is prepacked. Perform proper lubrication.

3. When a metric fine thread specification for inner ring bore diameter  $d$  of 8 mm to 14 mm is required, please contact IKO.

Inch series PILLOBALL Rod Ends | Insert Type/With Female Thread



PHSB

Identification number	Mass (Ref.) g	Boundary dimensions mm(inch)													Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N		
		d	Thread class 3B	D	B	B1	d1	L	l	L1	L2	W	D1	D2	$r_{s\min}^{(1)}$ mm (inch)			
<b>PHSB 2</b>	6.8	3.175 ( .1250)	-32UNC ( .1380)	11.91 ( .469)	4.75 ( .187)	6.35 ( .250)	4.75 ( .187)	26.57 (1.046)	4.75 ( .187)	20.62 ( .812)	9.53 ( .375)	6.35 ( .250)	6.35 ( .250)	7.92 ( .312)	0.3 ( .012)	7.938 ( $\frac{5}{16}$ )	1 850	5 840
<b>PHSB 2.5</b>	11	3.967 ( .1562)	-32UNC ( .1640)	14.27 ( .562)	5.56 ( .219)	7.14 ( .281)	6.32 ( .249)	29.36 (1.156)	4.75 ( .187)	22.23 ( .875)	9.53 ( .375)	7.14 ( .281)	7.14 ( .281)	8.74 ( .344)	0.3 ( .012)	9.525 ( $\frac{3}{8}$ )	2 600	8 210
<b>PHSB 3</b>	14	4.826 ( .1900)	-32UNF ( .1900)	15.88 ( .625)	6.35 ( .250)	7.92 ( .312)	7.77 ( .306)	34.93 (1.375)	4.75 ( .187)	26.97 (1.062)	14.27 ( .562)	7.92 ( .312)	7.92 ( .312)	10.31 ( .406)	0.3 ( .012)	11.112 ( $\frac{7}{16}$ )	3 460	9 090
<b>PHSB 4</b>	23	6.350 ( .2500)	-28UNF ( .2500)	19.05 ( .750)	7.14 ( .281)	9.53 ( .375)	9.02 ( .355)	42.85 (1.687)	4.75 ( .187)	33.32 (1.312)	19.05 ( .750)	9.53 ( .375)	9.53 ( .375)	11.89 ( .468)	0.5 ( .020)	13.097 ( $\frac{33}{64}$ )	4 590	13 200
<b>PHSB 5</b>	36	7.938 ( .3125)	-24UNF ( .3125)	22.23 ( .875)	8.74 ( .344)	11.10 ( .437)	11.35 ( .447)	46.02 (1.812)	4.75 ( .187)	34.93 (1.375)	19.05 ( .750)	11.10 ( .437)	11.10 ( .437)	12.70 ( .500)	0.5 ( .020)	15.875 ( $\frac{5}{8}$ )	6 800	16 500
<b>PHSB 6</b>	59	9.525 ( .3750)	-24UNF ( .3750)	25.40 (1.000)	10.31 ( .406)	12.70 ( .500)	13.13 ( .517)	53.98 (2.125)	6.35 ( .250)	41.28 (1.625)	23.80 (1.937)	14.27 ( .562)	14.27 ( .562)	17.45 ( .687)	0.5 ( .020)	18.256 ( $\frac{23}{32}$ )	9 230	21 600
<b>PHSB 7</b>	82	11.112 ( .4375)	-20UNF ( .4375)	28.58 (1.125)	11.10 ( .437)	14.27 ( .562)	14.88 ( .586)	60.33 (2.375)	6.35 ( .250)	46.02 (1.812)	26.97 (1.062)	15.88 ( .625)	15.88 ( .625)	19.05 ( .750)	0.5 ( .020)	20.638 ( $\frac{13}{16}$ )	11 200	26 100
<b>PHSB 8</b>	132	12.700 ( .5000)	-20UNF (1.312)	33.32 ( .500)	12.70 ( .625)	15.88 ( .698)	17.73 (2.781)	70.64 ( .250)	6.35 (2.125)	53.98 (1.187)	30.15 (1.750)	19.05 ( .750)	19.05 ( .750)	22.23 ( .875)	0.5 ( .020)	23.812 ( $\frac{15}{16}$ )	14 800	36 200
<b>PHSB 10</b>	191	15.875 ( .6250)	-18UNF ( .6250)	38.10 (1.500)	14.27 ( .562)	19.05 ( .750)	21.31 ( .839)	82.55 (3.250)	7.92 ( .312)	63.50 (2.500)	38.10 (1.500)	22.23 ( .875)	22.23 ( .875)	25.40 (1.000)	0.5 ( .020)	28.575 ( $1 \frac{1}{8}$ )	20 000	39 300
<b>PHSB 12</b>	286	19.050 ( .7500)	-16UNF ( .7500)	44.45 (1.750)	17.45 ( .687)	22.23 ( .875)	24.84 ( .978)	95.25 (3.750)	7.92 ( .312)	73.03 (2.875)	44.45 (1.750)	25.40 (1.000)	25.40 (1.000)	28.58 (1.125)	0.5 ( .020)	33.338 ( $1 \frac{5}{16}$ )	28 500	55 000
<b>PHSB 16</b>	998	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	11.07 ( .436)	104.78 (4.125)	53.98 (2.125)	38.10 (1.500)	38.10 (1.500)	44.45 (1.750)	0.5 ( .020)	47.625 ( $1 \frac{7}{8}$ )	59 300	86 800

Note<sup>(1)</sup>  $r_s$  min stands for minimum allowable value of chamfer  $r$ .

Remark No grease is prepacked. Perform proper lubrication.

K

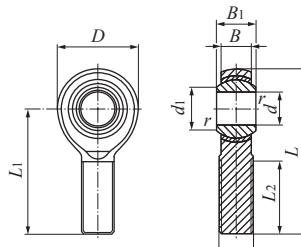
PB  
PHS  
PHSB  
POS  
POSB  
PHSA

1N=0.102kgf=0.2248lbs. K40  
1mm=0.03937inch



## PILLOBALL

Inch series PILLOBALL Rod Ends | Insert Type/With Male Thread



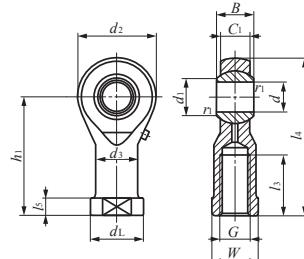
POSB

Identification number	Mass (Ref.) g	Boundary dimensions mm(inch)										Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		d	Thread S class 3A	D	B	B <sub>1</sub>	d <sub>1</sub>	L	L <sub>1</sub>	L <sub>2</sub>	r <sub>s min</sub> <sup>(1)</sup>			
<b>POSB 2</b>	5.4	3.175 ( .1250)	-32UNC ( .1380)	11.91 ( .469)	4.75 ( .187)	6.35 ( .250)	4.75 ( .187)	29.77 (1.172)	23.80 ( .937)	12.70 ( .500)	0.3 ( .012)	7.938 ( 5/16)	1 850	2 160
<b>POSB 2.5</b>	9.1	3.967 ( .1562)	-32UNC ( .1640)	14.27 ( .562)	5.56 ( .219)	7.14 ( .281)	6.32 ( .249)	35.71 (1.406)	28.58 (1.125)	15.88 ( .625)	0.3 ( .012)	9.525 ( 3/8)	2 600	3 370
<b>POSB 3</b>	14	4.826 ( .1900)	-32UNF ( .1900)	15.88 ( .625)	6.35 ( .250)	7.92 ( .312)	7.77 ( .306)	39.70 (1.563)	31.75 (1.250)	19.05 ( .750)	0.3 ( .012)	11.112 ( 7/16)	3 460	4 850
<b>POSB 4</b>	23	6.350 ( .2500)	-28UNF ( .2500)	19.05 ( .750)	7.14 ( .281)	9.53 ( .375)	9.02 ( .355)	49.20 (1.937)	39.67 (1.562)	25.40 (1.000)	0.5 ( .020)	13.097 ( 33/64)	4 590	8 870
<b>POSB 5</b>	36	7.938 ( .3125)	-24UNF ( .3125)	22.23 ( .875)	8.74 ( .344)	11.10 ( .437)	11.35 ( .447)	58.72 (2.312)	47.63 (1.875)	31.75 (1.250)	0.5 ( .020)	15.875 ( 5/8)	6 800	14 200
<b>POSB 6</b>	54	9.525 ( .3750)	-24UNF ( .3750)	25.40 (1.000)	10.31 ( .406)	12.70 ( .500)	13.13 ( .517)	61.93 (2.438)	49.23 (1.938)	31.75 (1.250)	0.5 ( .020)	18.256 ( 23/32)	9 230	21 600
<b>POSB 7</b>	77	11.112 ( .4375)	-20UNF ( .4375)	28.58 (1.125)	11.10 ( .437)	14.27 ( .562)	14.88 ( .586)	68.28 (2.688)	53.98 (2.125)	34.93 (1.375)	0.5 ( .020)	20.638 ( 13/16)	11 200	26 100
<b>POSB 8</b>	122	12.700 ( .5000)	-20UNF ( .5000)	33.32 (1.312)	12.70 ( .500)	15.88 ( .625)	17.73 ( .698)	78.59 (3.094)	61.93 (2.438)	38.10 (1.500)	0.5 ( .020)	23.812 ( 15/16)	14 800	36 200
<b>POSB 10</b>	186	15.875 ( .6250)	-18UNF ( .6250)	38.10 (1.500)	14.27 ( .562)	19.05 ( .750)	21.31 ( .839)	85.73 (3.375)	66.68 (2.625)	41.28 (1.625)	0.5 ( .020)	28.575 ( 1 1/8)	20 000	39 300
<b>POSB 12</b>	295	19.050 ( .7500)	-16UNF ( .7500)	44.45 (1.750)	17.45 ( .687)	22.23 ( .875)	24.84 ( .978)	95.25 (3.750)	73.03 (2.875)	44.45 (1.750)	0.5 ( .020)	33.338 ( 1 5/16)	28 500	55 000
<b>POSB 16</b>	1129	25.400 (1.0000)	-12UNF (1.2500)	69.85 (2.750)	25.40 (1.000)	34.93 (1.375)	32.23 (1.269)	139.70 (5.500)	104.78 (4.125)	53.98 (2.125)	0.5 ( .020)	47.625 ( 1 7/8)	59 300	112 000

Note<sup>(1)</sup>  $r_s$  min stands for minimum allowable value of chamfer  $r$ .

Remark No grease is prepacked. Perform proper lubrication.

Lubrication Type PILLOBALL Rod Ends Die-cast Type/With Female Thread



PHSA

Identification number	Mass (Ref.) g	Boundary dimensions mm													Static load capacity $C_s$ N	
		d	Thread G	$d_2$	$C_1$	B	$d_1$	$l_4$	$h_1$	$l_3$	$l_5$	W	$d_3$	$d_L$	$r_{1smin}^{(1)}$	
<b>PHSA 5</b>	17	5	M 5×0.8	17	6	8	7.7	35.5	27	16	4	9	9	11	0.2	11.112 ( $\frac{7}{16}$ ) 5 470
<b>PHSA 6</b>	25	6	M 6×1	19.5	6.75	9	9	39.7	30	16	5	11	10	13	0.2	12.700 ( $\frac{1}{2}$ ) 6 760
<b>PHSA 8</b>	45	8	M 8×1.25	24	9	12	10.4	48	36	19	5	14	12.5	16	0.2	15.875 ( $\frac{5}{8}$ ) 10 200
<b>PHSA 10</b>	70	10	M10×1.5	28	10.5	14	12.9	57	43	23	6.5	17	15	19	0.2	19.050 ( $\frac{3}{4}$ ) 13 100
<b>PHSA 12</b>	105	12	M12×1.75	32	12	16	15.4	66	50	27	6.5	19	17.5	22	0.2	22.225 ( $\frac{7}{8}$ ) 16 400
<b>PHSA 14</b>	155	14	M14×2	36	13.5	19	16.9	75	57	30	8	22	20	25	0.3	25.400 ( $1\frac{1}{8}$ ) 20 000
<b>PHSA 16</b>	190	16	M16×2	40	15	21	19.4	84	64	36	8	22	22	27	0.3	28.575 ( $1\frac{1}{8}$ ) 23 900
<b>PHSA 18</b>	290	18	M18×1.5	45	16.5	23	21.9	93.5	71	40	10	27	25	31	0.3	31.750 ( $1\frac{1}{4}$ ) 28 800
<b>PHSA 20</b>	400	20	M20×1.5	49	18	25	24.4	101.5	77	43	10	30	27.5	34	0.3	34.925 ( $1\frac{3}{8}$ ) 33 400
<b>PHSA 22</b>	500	22	M22×1.5	54	20	28	25.8	111	84	47	12	32	30	37	0.3	38.100 ( $1\frac{1}{2}$ ) 40 400

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$

Remarks 1. A grease nipple is provided on the body.

2. No grease is prepacked. Perform proper lubrication.

3. When a metric fine thread specification for inner ring bore diameter  $d$  of 8 mm to 14 mm is required, please contact IKO.

K

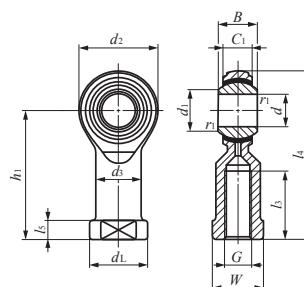
PB  
PHS  
PHSB  
POS  
POSB  
PHSA

1N=0.102kgf=0.2248lbs. K42  
1mm=0.03937inch



## PILLOBALL

Maintenance-free Type PILLOBALL Rod Ends With Female Thread



PHS ... EC

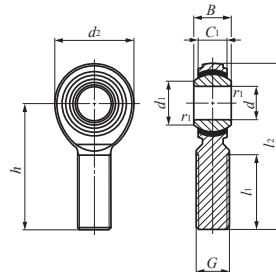
Identification number	Mass (Ref.) g	Boundary dimensions mm														Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N
		Thread $G$	$d_2$	$C_1$	$B$	$d_1$	$l_4$	$h_1$	$l_3$	$l_5$	$W$	$d_3$	$d_L$	$r_{1smin}^{(1)}$			
PHS 3EC	5.7	3 M 3×0.5	12	4.5	6	5.2	27	21	10	3	5.5	5	6.5	0.2	7.938 ( $\frac{5}{16}$ )	3 500	2 480
PHS 4EC	11.9	4 M 4×0.7	14	5.3	7	6.5	31	24	12	4	8	8	9.5	0.2	9.525 ( $\frac{3}{8}$ )	4 950	3 260
PHS 5EC	16.5	5 M 5×0.8	16	6	8	7.7	35	27	12.5	4	9	9	11	0.2	11.112 ( $\frac{7}{16}$ )	6 540	4 010
PHS 6EC	25	6 M 6×1	18	6.75	9	9	39	30	13.5	5	11	10	13	0.2	12.700 ( $\frac{1}{2}$ )	8 410	4 940
PHS 8EC	43	8 M 8×1.25	22	9	12	10.4	47	36	16	5	14	12.5	16	0.2	15.875 ( $\frac{5}{8}$ )	14 000	7 760
PHS 10EC	72	10 M10×1.5	26	10.5	14	12.9	56	43	19.5	6.5	17	15	19	0.2	19.050 ( $\frac{3}{4}$ )	19 600	10 500
PHS 12EC	107	12 M12×1.75	30	12	16	15.4	65	50	24	6.5	19	17.5	22	0.2	22.225 ( $\frac{7}{8}$ )	26 200	13 700
PHS 14EC	160	14 M14×2	34	13.5	19	16.9	74	57	27	8	22	20	25	0.2	25.400 (1)	33 600	17 200
PHS 16EC	210	16 M16×2	38	15	21	19.4	83	64	33	8	22	22	27	0.2	28.575 ( $1\frac{1}{8}$ )	42 000	21 100
PHS 18EC	295	18 M18×1.5	42	16.5	23	21.9	92	71	36	10	27	25	31	0.2	31.750 ( $1\frac{1}{4}$ )	51 400	25 100
PHS 20EC	380	20 M20×1.5	46	18	25	24.4	100	77	40	10	30	27.5	34	0.2	34.925 ( $1\frac{3}{8}$ )	61 600	30 000
PHS 22EC	490	22 M22×1.5	50	20	28	25.8	109	84	41	12	32	30	37	0.2	38.100 ( $1\frac{1}{2}$ )	74 700	36 400

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$

Remarks 1. Neither oil hole nor grease nipple is provided.

2. When a metric fine thread specification for inner ring bore diameter  $d$  of 8 mm to 14 mm is required, please contact IKO.

Maintenance-free Type PILLOBALL Rod Ends With Male Thread



POS ... EC

Identification number	Mass (Ref.) g	Boundary dimensions mm										Dynamic load capacity $C_d$ N	Static load capacity $C_s$ N	
		$d$	Thread $G$	$d_2$	$C_1$	$B$	$d_1$	$l_2$	$h$	$l_1$	$r_{1s\min}^{(1)}$			
<b>POS 3EC</b>	5.0	3	M 3×0.5	12	4.5	6	5.2	33	27	15	0.2	7.938 ( $\frac{5}{16}$ )	3 500	1 220
<b>POS 4EC</b>	8.1	4	M 4×0.7	14	5.3	7	6.5	37	30	17	0.2	9.525 ( $\frac{3}{8}$ )	4 950	2 060
<b>POS 5EC</b>	12.5	5	M 5×0.8	16	6	8	7.7	41	33	20	0.2	11.112 ( $\frac{7}{16}$ )	6 540	3 340
<b>POS 6EC</b>	19	6	M 6×1	18	6.75	9	9	45	36	22	0.2	12.700 ( $\frac{1}{2}$ )	8 410	4 730
<b>POS 8EC</b>	32	8	M 8×1.25	22	9	12	10.4	53	42	25	0.2	15.875 ( $\frac{5}{8}$ )	14 000	7 760
<b>POS 10EC</b>	54	10	M10×1.5	26	10.5	14	12.9	61	48	29	0.2	19.050 ( $\frac{3}{4}$ )	19 600	10 500
<b>POS 12EC</b>	85	12	M12×1.75	30	12	16	15.4	69	54	33	0.2	22.225 ( $\frac{7}{8}$ )	26 200	13 700
<b>POS 14EC</b>	126	14	M14×2	34	13.5	19	16.9	77	60	36	0.2	25.400 ( $1\frac{1}{8}$ )	33 600	17 200
<b>POS 16EC</b>	185	16	M16×2	38	15	21	19.4	85	66	40	0.2	28.575 ( $1\frac{1}{8}$ )	42 000	21 100
<b>POS 18EC</b>	260	18	M18×1.5	42	16.5	23	21.9	93	72	44	0.2	31.750 ( $1\frac{1}{4}$ )	51 400	25 100
<b>POS 20EC</b>	340	20	M20×1.5	46	18	25	24.4	101	78	47	0.2	34.925 ( $1\frac{3}{8}$ )	61 600	30 000
<b>POS 22EC</b>	435	22	M22×1.5	50	20	28	25.8	109	84	51	0.2	38.100 ( $1\frac{1}{2}$ )	74 700	36 400

Note<sup>(1)</sup> Minimum allowable value of chamfer dimension  $r_1$

Remarks1. Neither oil hole nor grease nipple is provided.

2. When a metric fine thread specification for inner ring bore diameter  $d$  of 8 mm to 14 mm is required, please contact IKO.

K

PB  
PHS  
PHSB  
POS  
POSB  
PHSA

1N=0.102kgf=0.2248lbs. K44  
1mm=0.03937inch