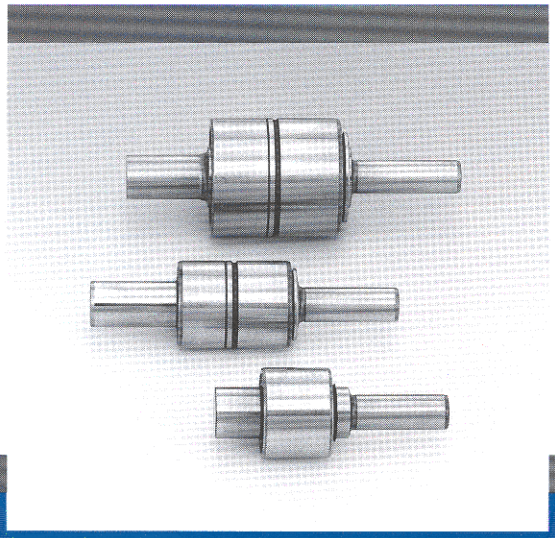
Koyo®

HIGH PERFORMANCE WATER PUMP BEARINGS



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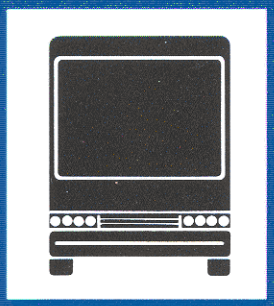
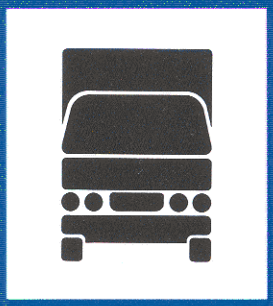




KOYO SEIKO CO.,LTD.

CAT.NO.285E

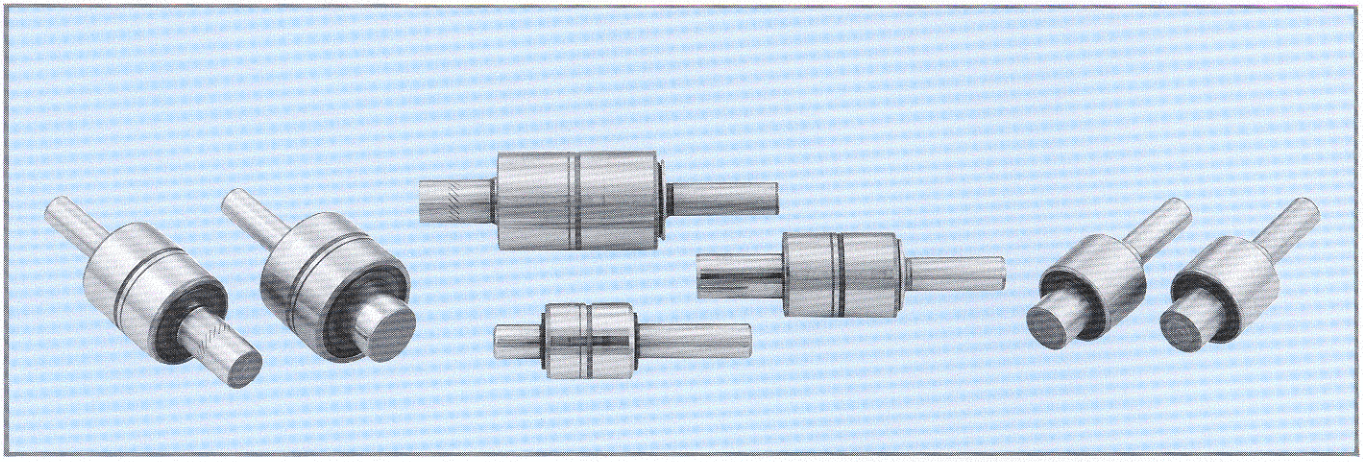
Introduction

With modern automotive engines requiring ever higher performance and reliability, there is an increasing demand for highly sophisticated water pump bearings; one of the key engine components.

In response to this demand, Koyo has been able to draw from its long experience of water pump bearing production and many years of research & development to develop a range of high-performance and high-durability water pump bearings.

This catalog presents the full range of Koyo water pump bearings, including the recently developed Koyo high performance bearings. We trust this catalog will be useful to you.

Koyo Water Pump Bearings



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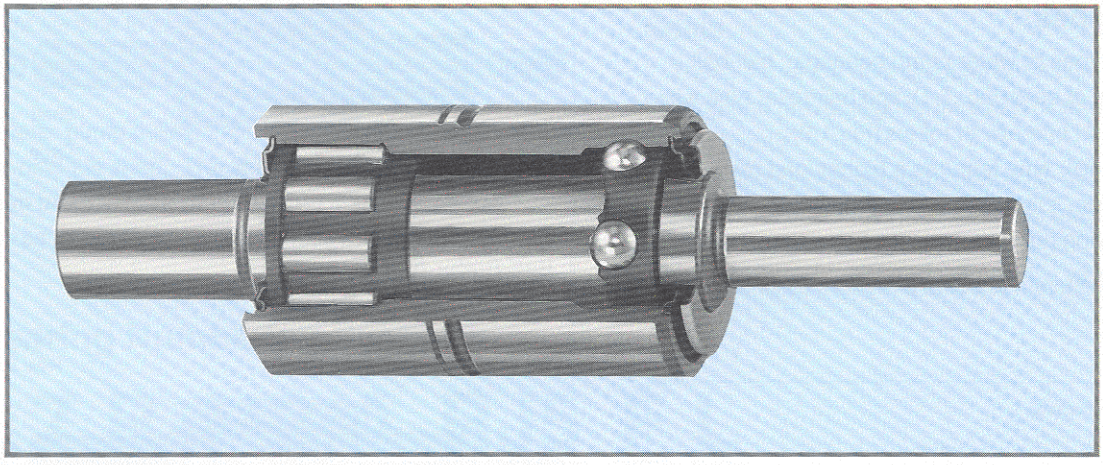


Features

1. Tripled water resistance

This is achieved by using a highly watertight triple lip seal and long-life grease.

2. Tripled service life — in comparison with conventional bearings —

Rolling contact fatigue strength is improved markedly by the use of high refining bearing steel (HRS).

3. Widely applicable

Various shaft designs are available depending on the assembly design.

1. Water Pump Bearing Construction and Types

1) Bearing construction

Water pump bearings are used primarily with automotive water pumps and basically consist of a sealed bearing with two rows of rolling elements spaced further apart than standard double row bearings.

A shaft is used for the inner race of the bearing and it extends beyond the side face of the outer ring so that the pump impeller and driving pulley can be attached.

2) Bearing types

There are two types of water pump bearings: ball-ball type with two rows of balls (Fig. 1.1), and ball-roller type with one row of balls and one row of rollers (Fig.1.2).

Since the ball-roller type features a higher load rating on the roller (front) side, it is suitable for designs where the position of the driving pulley or fan coupling causes a large load on the front row.

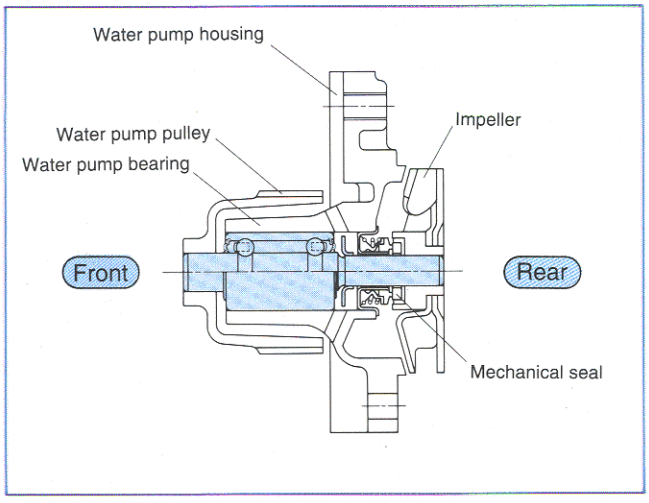


Fig. 1.1 Example Application of Ball-Ball type

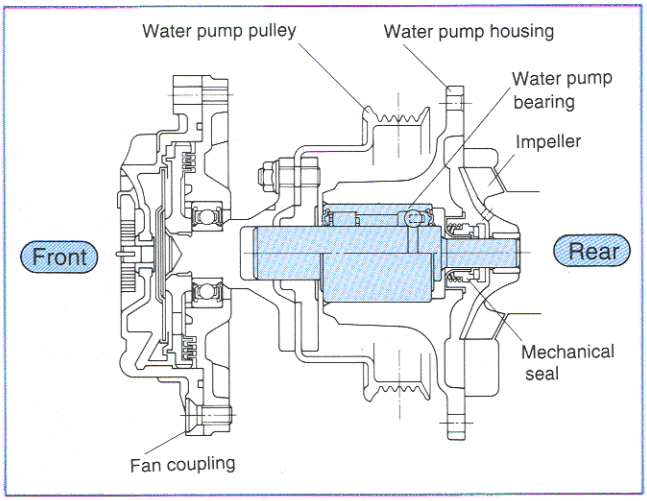
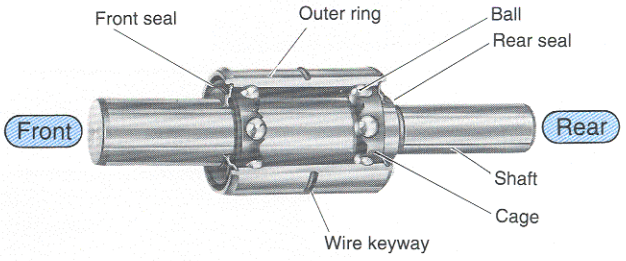


Fig. 1.2 Example Application of Ball-Roller type

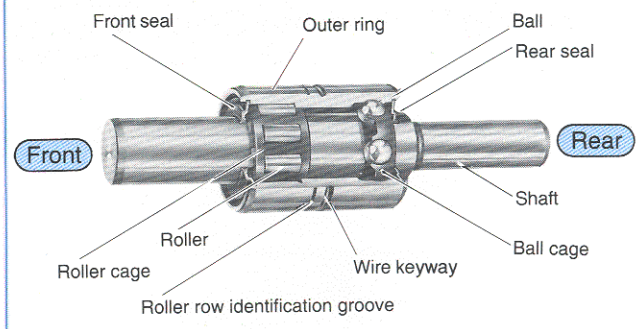
3) Component nomenclature and bearing dimension series

■ Component nomenclature

Ball-Ball type



Ball-Roller type



■ Water pump bearing dimension series

Dimension (mm)		Ball-Ball type	Ball-Roller type
Outer ring outside diameter	Shaft diameter		
26	12	○	○
28	17.2	○	○
30	15	–	○
	15.918	○	○
	16	○	–
	17.2	○	○
35	17.5	○	○
	18	–	○
38.1	18.961	○	○
41	22	–	○
42	22	–	○
47.625	25.4	○	–

4) Component functions

Outer ring

Designed to press fit into the water pump housing. It is made of high carbon chromium bearing steel.

- *Wire keyway*
  A circular groove can be added at the center of the outer ring to be used for a wire key.
- *Roller row identification groove*
  Ball-roller type bearings are provided with a groove on the outside surface to identify the roller side.

Shaft

The water pump pulley, impeller and fan coupling are all pressed onto the shaft. The shaft is made of high carbon chromium bearing steel or carburized steel. There are many sizes available to enable various applications.

Rolling elements (balls and rollers)

High precision balls or balls and rollers are used, of a size determined by the dimensions of the bearing and made of high carbon chromium bearing steel.

Cages

To ensure smooth rotation, the rolling elements are guided by a light-weight and high performance fiber-glass reinforced plastic (FRP) cage.

Seals

These serve the dual purpose of retaining grease in the bearing and preventing the intrusion of water and solid contaminants.

In addition to the standard double lip seal, triple lip seals are also available for applications that require high sealing performance.

The standard seals are made of nitrile butadiene rubber.

2. Bearing Numbering System

W 7 R 112 A RJ5 F L

Water Pump Bearing

Shaft material code

(No code) : High carbon chromium bearing steel
L : Carburized steel
HR : High refining steel (HRS)

Seal material code

(No code) : Nitrile butadiene rubber
F : Fluoro rubber

Rear seal code

(No code) : RS type seal
RR6 : RR6 type seal
RJ5 : RJ5 type seal
RJ7 : RJ7 type seal
See page 7 for the shape of each type of seal.

Supplementary code

A, B, C,...
Assigned to distinguish bearings that have the same shaft diameter and length but differ in shape.

Shaft length (mm)

Type code

B : Ball-Ball type
R : Ball-Roller type

Shaft diameter number

No.	Shaft diameter (mm)	No.	Shaft diameter (mm)
2	12 or 12.037	8	18
5	15	9	18.916
6	15.918	22	22
7	17.2 or 17.5	25	25.4

3. Bearing Life and Safety Coefficient

1) Bearing service life

The water pump bearing service life can be calculated in the same way as that for general bearings.

When a given group of identical bearings are rotated under the same conditions, the total number of revolutions until 90% of the bearings are left without flaking (i.e. a service life of 90% reliability) is defined as the bearing service life.

2) Bearing basic dynamic load rating and rating life

Basic dynamic load rating

Basic dynamic load rating indicates bearings' resistance to rolling fatigue, i.e. load carrying capacity. It is defined by the magnitude of a pure radial load under which the bearing basic rating life is one million revolutions, with the inner ring being rotated and the outer ring fixed or vice versa.

This basic dynamic load rating (Cr) is specified for each bearing in the bearing dimension tables.

Basic rating life

The relationship between bearing basic dynamic load rating, dynamic equivalent load and basic rating life can be expressed by equation (3-1) shown below.

When a bearing is rotated at a constant speed, it is usual to express the rating life in hours calculated by using equation (3-2).

Total number of revolutions

$$L_{10} = \left(\frac{C}{P}\right)^{p} \quad \text{(3-1)}$$

Hours

$$L_{10h} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^{p} \quad \text{(3-2)}$$

Where

L_{10} : Basic rating life, 10^6 revolutions
L_{10h} : Basic rating life, h
P : Equivalent load, N
C : Basic dynamic load rating, N
n : Rotational speed, rpm
p : Ball bearing (ball row) ..... $p = 3$
Roller bearing (roller row) ..... $p = 10/3$

The required water pump bearing service life differs according to the vehicle type and size. Consult Koyo for details.

3) Basic static load rating and safety coefficient

Basic static load rating

When a bearing receives an excessive static load or impact at extremely low rotational speed, permanent deformation is produced locally on the rolling element and raceway contact surface. This permanent deformation increases with load, and eventually will be significant enough to present smooth rotation of the bearing.

Basic static load rating refers to the contact stress acting at the center of the rolling element and the raceway surface: the point which is exposed to the maximum load.

The stress is estimated as follows:

Ball bearing (ball row) : 4 200 MPa
Roller bearing (roller row) : 4 000 MPa

The total permanent deformation due to such a stress on rolling elements and raceway is approximately one ten-thousandth of the rolling element diameter.

This basic static load (Cor) is specified for each bearing in the bearing dimension tables.

Safety coefficient

The safety coefficient concerning the basic static load rating is expressed by equation (3-3).

$$f_s = \frac{C_0}{P_0} \quad \text{(3-3)}$$

Where

f_s : Safety coefficient
C_0 : Basic static load rating, N
P_0 : Static equivalent load, N

For water pump bearings, select a bearing of appropriate dimensions such that the safety coefficient will be:

1.0 minimum for ball row
1.5 minimum for roller row

4) Water pump bearing life calculation

Rolling elements of each water pump bearing row are exposed to loads as listed below (Fig. 3.1).

Load due to belt tension.
Load due to mass of fan, fan coupling and water pump pulley.
Load due to unbalanced mass of fan, fan coupling and water pump pulley.

To calculate these loads, various factors need to be taken into account, such as the belt type, number of pulleys and their arrangement, and vibration.

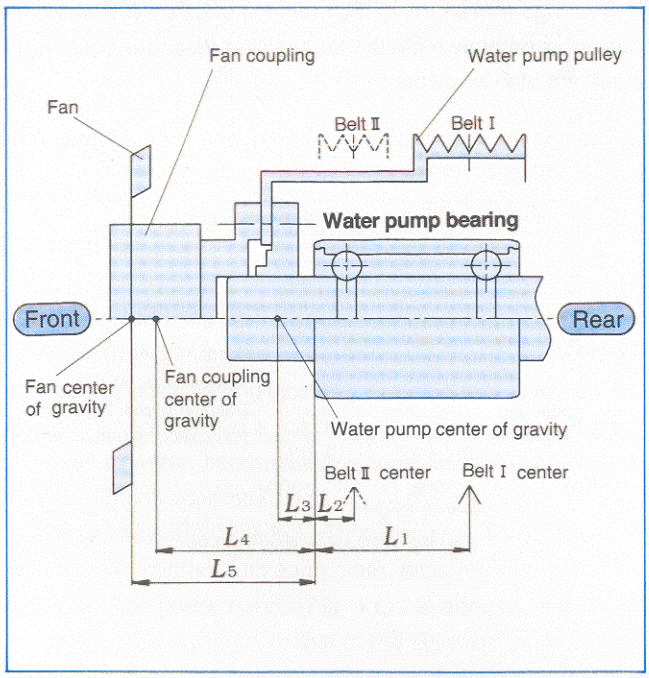


Fig. 3.1 Loads on Water Pump Bearing

Koyo has a computerized system capable of calculating them which can be accessed from all our branches and sales offices.

To enable us to calculate these loads and bearing life, provide dimensions L_1 to L_5 indicated in Fig. 3.1, as well as water pump specifications (Table 3.1) and belt driving system specifications (Fig. 3.2).

Table 3.1 Water Pump Specifications

Specifications		
Engine speed (max.), rpm		
Required life, h		
Mass, kg		Fan
		Fan coupling
		Water pump pulley
Unbalanced mass, g·cm		Fan
		Fan coupling
		Water pump pulley
Maximum power consumption, kW (or torque, N·m)		Water pump
		Power steering pump
		Air compressor
		Alternator
Fan rotation speed (max.), rpm		
Belt		Type (V-ribbed or cogged)
		Initial tension, N
		Mass per unit length, kg/m
		Coefficient of friction with pulley
Vibration on bearing (radial/axial), m/s²		
Water pump housing		Bore diameter, mm
		Outside diameter (average), mm
		Material

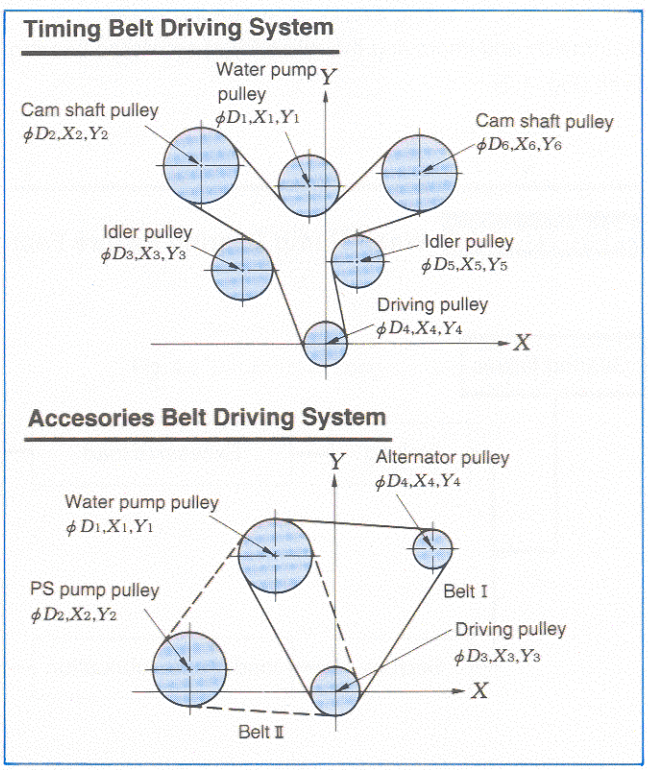


Fig. 3.2 Belt Driving System Pulley Layout

4. Bearing Performance

To ensure the best possible performance of water pump bearings, it is important to select the most suitable type of bearing for a given set of conditions.

1) Improvement in shaft durability and estimated bearing life reliability

Strength of shaft

The shaft is designed such that, even if excessive loads are exerted due to the unbalanced mass of the fan coupling, resonance or excessive belt tension, stresses will not be concentrated at the shaft fillet (Fig. 4.1).

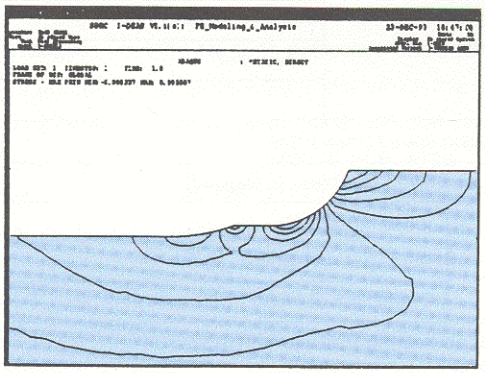


Fig. 4.1 Stress Distribution around the Shaft Fillet

Estimated bearing life reliability

Rollers with optimal crowning prevent local load concentration, ensuring evenness in bearing stress distribution and improving the reliability of estimated bearing lives (Fig. 4.2).

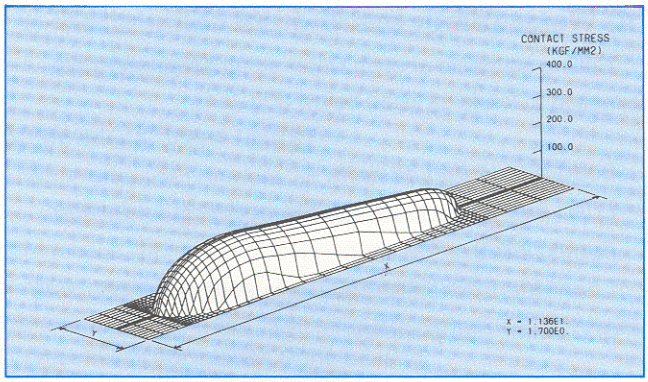


Fig. 4.2 Stress Distribution of Roller

Long-life steel

Bearings with shafts of high refining steel (HRS), which has approximately triple the fatigue life of standard bearing steel, are also available.

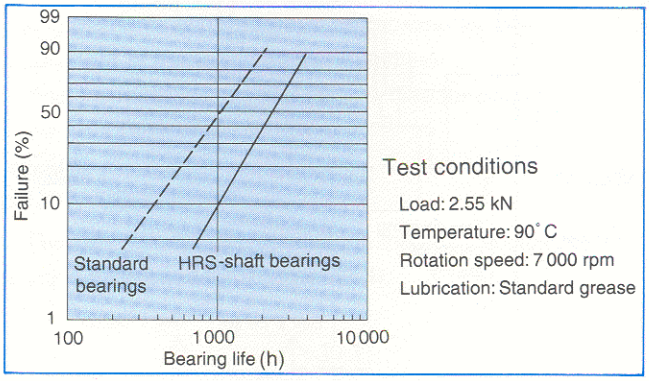
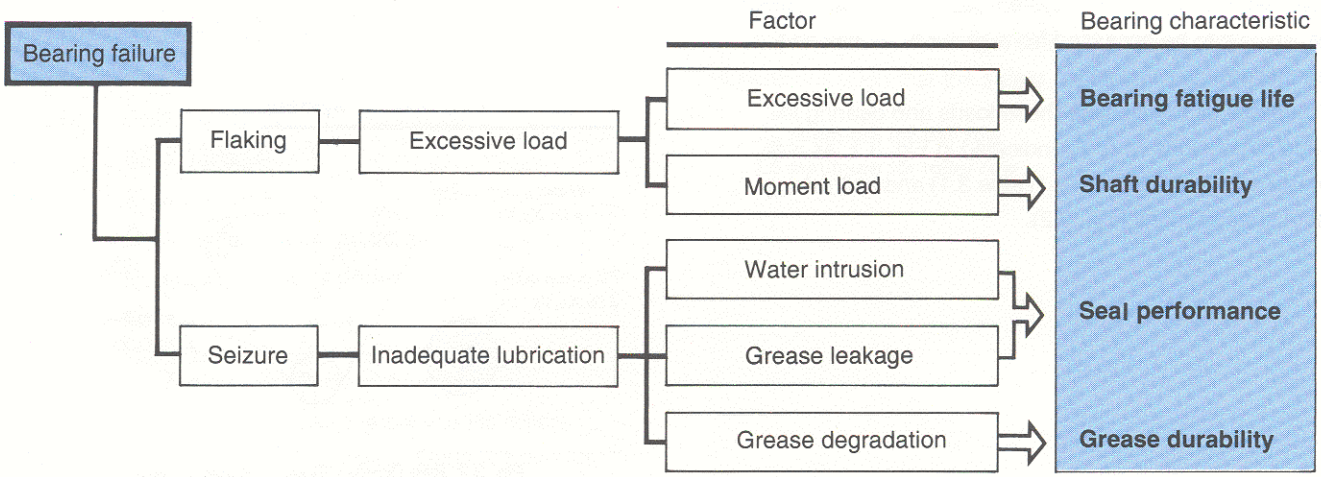


Fig. 4.3 HRS-shaft Bearing Life

Reference **Water Pump Bearing Failure Factors**



2) Seal performance

Standard seal

Standard water pump bearings are provided with RS or RR6 type seals (Fig. 4.4).
Both types have a main lip which prevents grease leakage and a dust lip which prevents intrusion of moisture and solid contaminants.

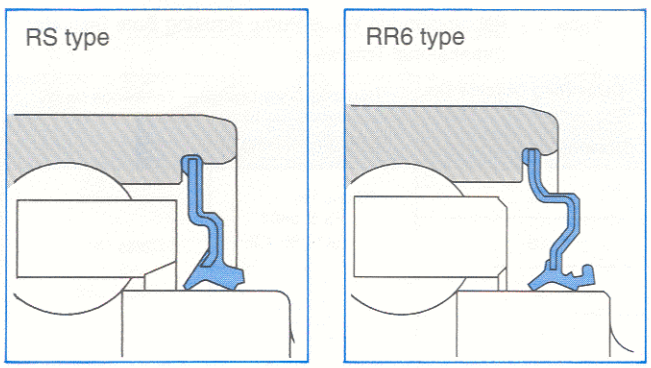


Fig. 4.4 Standard Seal Design

Highly watertight triple lip seal

Water from the engine cooling system is separated from the water pump bearing by a mechanical seal. However, in designs where there is a possibility that the bearing will be exposed to water, bearings with a triple lip seal (type RJ5 or RJ7) are highly recommended (Fig. 4.5).

These seals are provided with a slinger and axial lip which are in contact with each other, ensuring excellent waterproofing performance (Fig. 4.6). In addition, the rotating friction is similar to that of the standard seals.

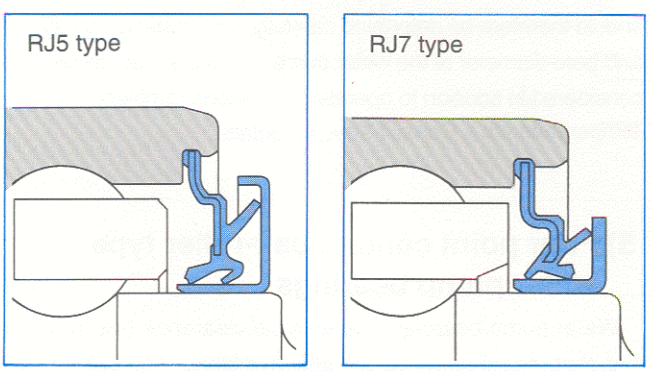


Fig. 4.5 Highly Watertight Triple Lip Seal Design

3) Grease durability

Grease can be chosen from among two types: standard grease and long-life grease W191 (Table 4.1).

Grease W191 is urea-based, and known to help lengthen rolling bearing life and improve performance at high speeds. It retains high durability even when mixed with water, extending water pump bearing life considerably (Fig. 4.6).

Table 4.1 Water Pump Bearing Grease Properties

Type		Standerd	Long-life (W191)
Thickening agent		Lithium soap	Urea compound
Base oil		Mineral oil	Poly-α-olefin mineral oil
Basic oil viscosity mm^2/s	40℃	130	148
	100℃	10.3	16.8
Color		Yellowish light brown	Light yellow
Consistency		225	275
Dropping point, ℃		186	Over 250
Operating temperature range, ℃		-10 to +100	-30 to +130

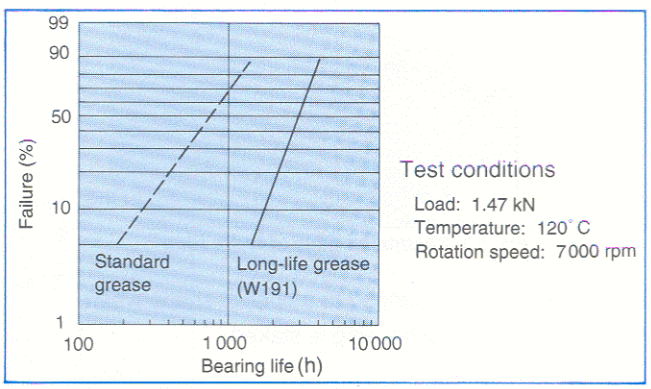


Fig. 4.6 Durability of Long-life Grease W191

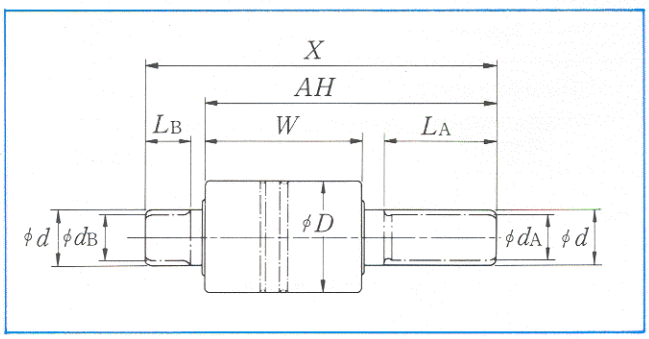
5. Bearing Specifications

1) Dimensional tolerances

Koyo water pump bearing standerd dimensional tolerances are as shown in Table 5.1 below:

Table 5.1 Water Pump Bearing Dimensional Tolerances

	D	W	AH	d, d_A, d_B	X, L_A, L_B
Tolerance (mm)	$^{0}_{-0.013}$	$^{0}_{-0.178}$	±0.15	$^{0}_{-0.013}$	±0.25



2) Chamfer dimensions

Water pump bearing outer ring and shaft are chamfered as shown in Fig. 5.1 and Fig. 5.2, respectively:

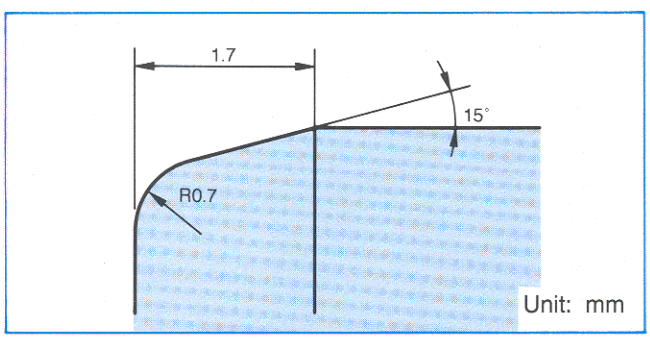


Fig. 5.1 Chamfered Edge of Outer Ring

The chamfer can be changed to a special shape when, for example, water pump housing is staked.

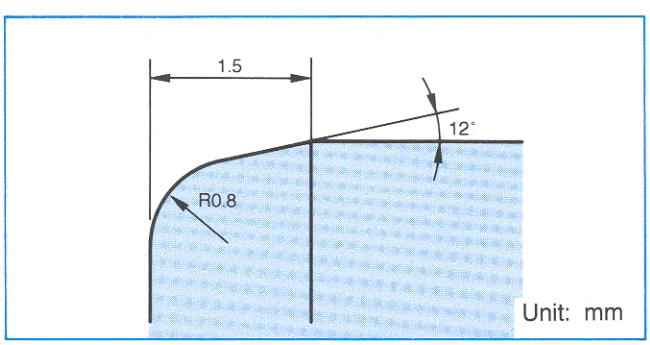


Fig. 5.2 Shape of Chamfer at End of Shaft

To prevent damage during assembly, shafts with ground slopes are also available.

3) Fitting

Table 5.2 lists recommended housing dimensions for correct fit between outer ring and housing.
Adequate interference is essential to ensure the water pump bearing and housing remain fastened to each other and prevent creeping.

If creeping occurs on the fitting surface, the bearing may be heated, abnormally vibrated or the fitting surface may be worn down.

Table 5.2 Recommended Water Pump Housing Bore Diameter Dimensional Tolerance

Outer Ring Outside Dia. (mm)	Housing Bore Diamater Tolerance (mm)	
(Housing bore diamater)	Cast iron housing	Aluminum alloy housing
26	Class R6 JIS B 0401 ISO 286-1,2	Class U6 JIS B 0401 ISO 286-1,2
28		
30	$^{-0.025}_{-0.038}$	
35		
38.1	$^{-0.033}_{-0.056}$	Class U7 JIS B 0401 ISO 286-1,2
42		
47.625	$^{-0.043}_{-0.076}$	

For bearings whose outer ring and housing are fastened at a level of fitting different from those shown above, consult Koyo.

4) Bearing internal clearance

Water pump bearings generally have a radial internal clearance of between 0.010 and 0.040 mm.
Internal clearance influences the bearing service life, and it should therefore be determind carefully. The material rigidity and bore diameter of the water pump housing should all be considered in addition to operating conditions (ambient temperature etc.). Consult Koyo for details.

5) Four point contact ball-roller type water pump bearings

Water pump bearings with an axial clearance one third that of standard bearings are also available. The ball row of these bearings is a four point contact design.

Water pump mechanical seal performance and reliability are improved considerably by the use of this type of bearing.

6) Special shaft design

Consult Koyo when special shaft designs are needed to attach the impeller, fan ,fan coupling or other parts.

Some examples of specially shaped shafts are given below:

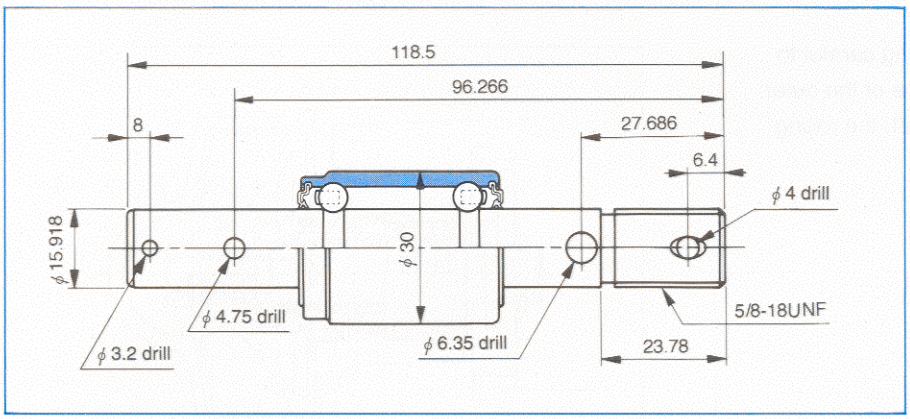


Fig. 5.3 Shaft Threading and Drilling

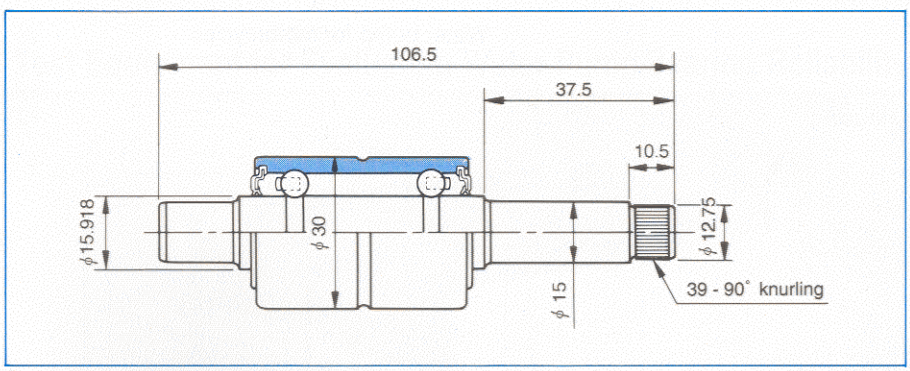


Fig. 5.4 Shaft Knurling

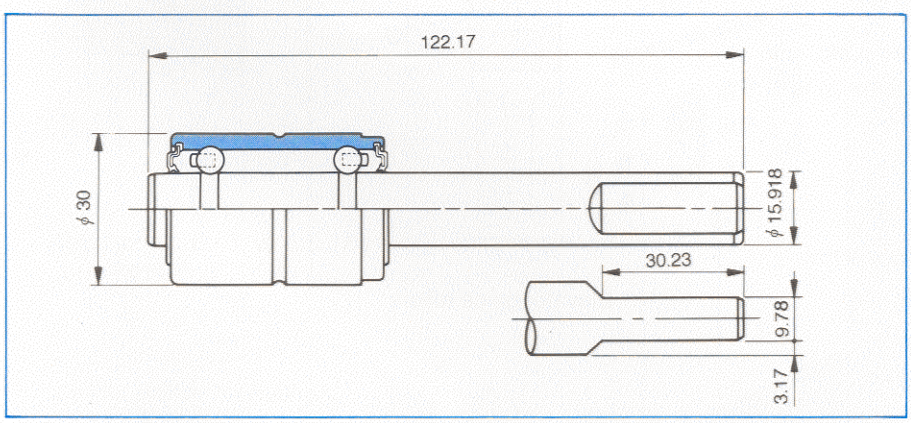


Fig. 5.5 Shaft Milling

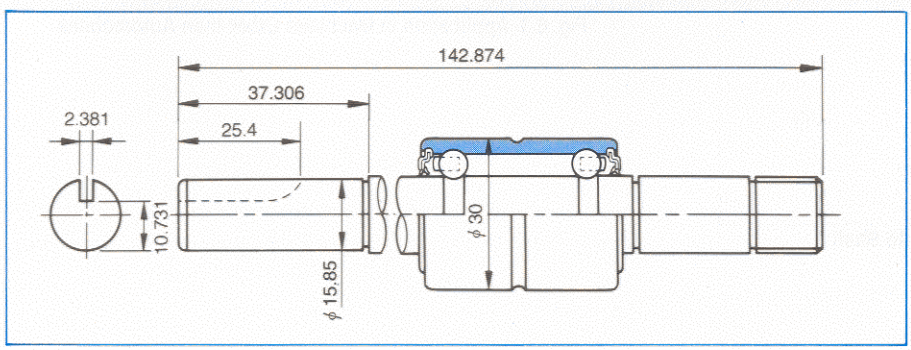


Fig. 5.6 Shaft Keyway Processing

6. Bearing Handling

Water pump bearings are as precise as standard bearings. To ensure the best possible performance, bearings and other components have to be handled carefully to prevent damage, corrosion or intrusion of dust.

Installation directions

Press-fit the bearing into the housing being careful to ensure the jig is in contact with the side face of the outer ring (Fig. 6.1). If force is applied to the shaft, the rolling elements and raceway may be damaged.

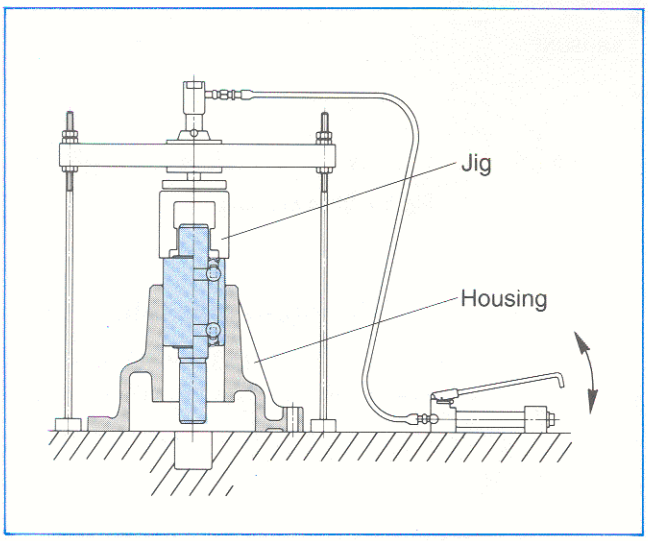


Fig. 6.1 Example of Pressing Bearing into Housing

Press-fit impeller, driving pulley, fan coupling, etc. onto shaft. The end of the shaft should be held in the jig to prevent any load being applied to the outer ring.

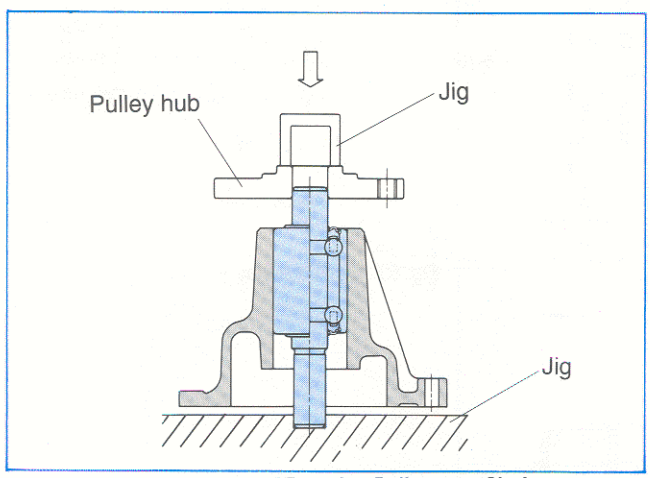


Fig. 6 Example of Pressing Pulley onto Shaft

7. Application in Machines Other than Automobiles

Specially designed water pump bearings are also available for use in other applications, as shown below:

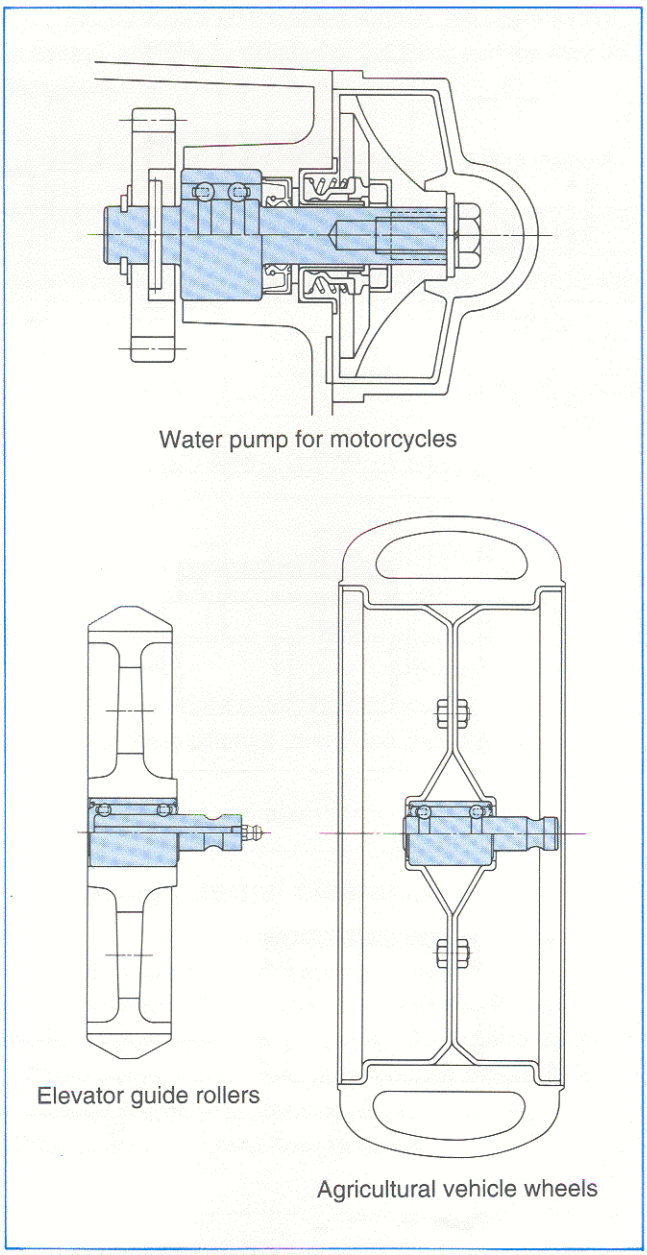
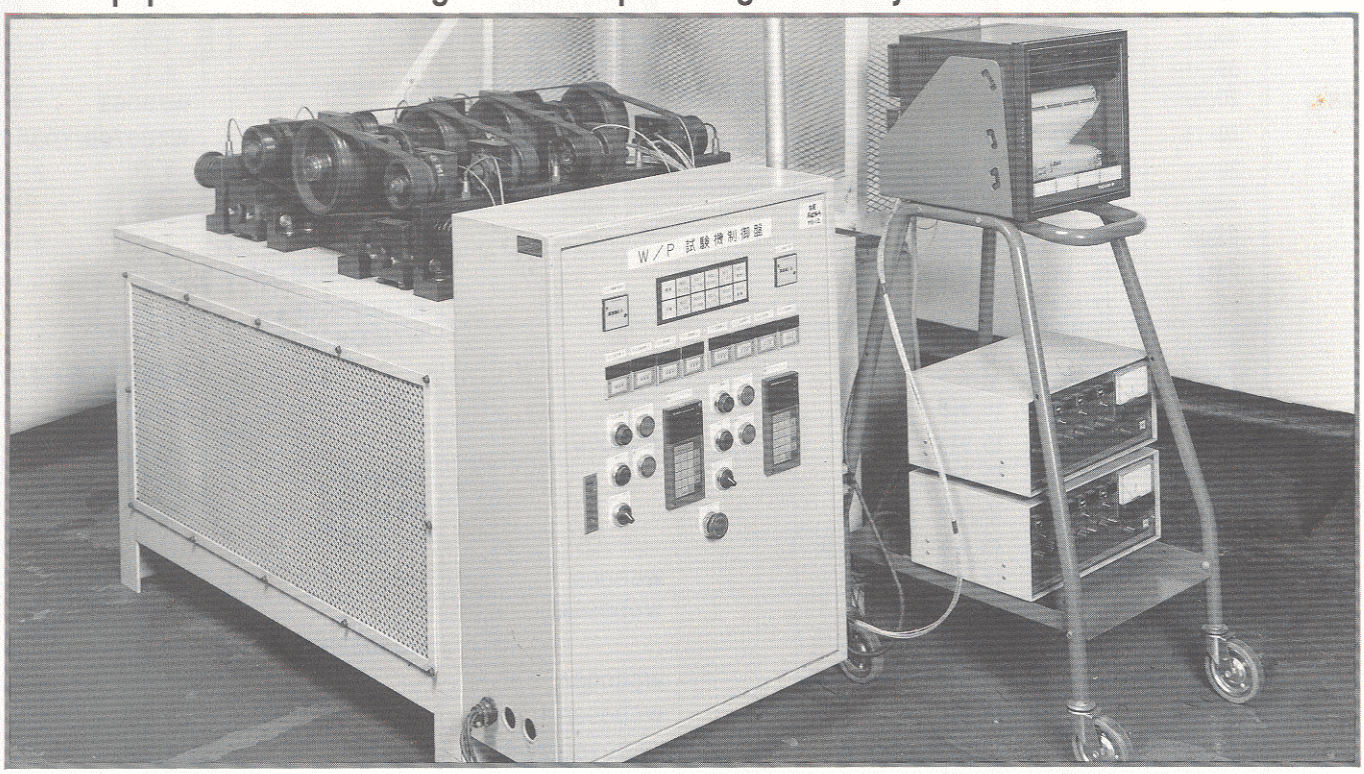


Fig. 6.3 Application in Machines Other than Automobiles

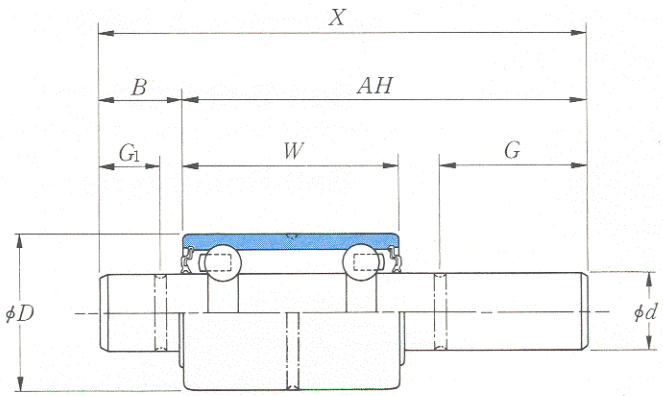
8. Bearing Dimension Tables

Test Equipment for Evaluating Water Pump Bearing Reliability



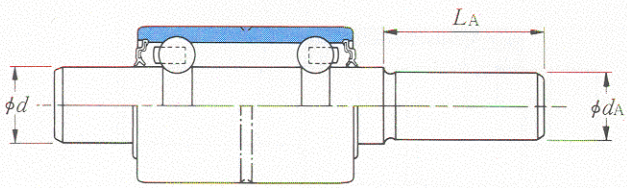
Ball-Ball type

D 26 – (30)mm

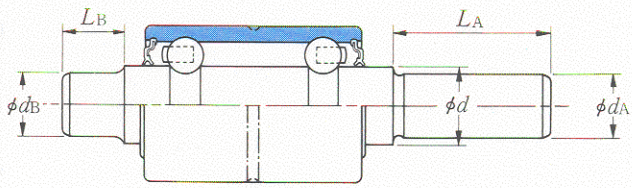


TYPE 1

Boundary Dimensions (mm)						Bearing No.			
0 −0.013 D	0 −0.178 W	±0.25 X	0 −0.013 d	0 −0.013 d_A	0 −0.013 d_B	TYPE 1	TYPE 2	TYPE 3	
26	39	90	12			W2B090ARR6			
	39	92	12			W2B092			
	39	92.5	12			W2B093ARR6			
	39	98	12			W2B098RR6L			
	39	103.5	12			W2B103RR6			
28	20	62.7	17.2	12	12			W7B063	
	20	70	17.2	12.038	13			W7B070B/YD3A	
	20	74.6	17.2	12			W7B075D		
30	23	75	17.2	12			W7B075B		
	23	75	17.2	12			W7B075G		
	23	75	17.2	12			W7B075GRJ7GF		
	23	77.8	17.2	12			W7B078CRR6		
	23	77.8	17.2	12			W7B078CRJ5F		
	23	81.5	17.2	12	15			W7B082DRJ5F/F	
	27	77	15.918	12	12			W6B077A	
	27	96	15.918			W6B096			
	30	86	15.918	12			W6B086		
	30	92.5	15.918	12			W6B093P		
	33.4	83.4	15.918	12.738			W6B084		
	36	88.75	16			W6B089			
	38.894	85.598	15.918			W6B086A			
	38.894	92.5	15.918	12			W6B093RR6		
	38.894	98	15.918			W6B098A			
	38.894	98	15.918			W6B098P			
	38.894	98	15.994			W6B098Q/YD6			
	38.894	98.17	15.918	12			W6B098G		
	38.894	98.5	15.918	12			W6B099ARR6		
	38.894	98.5	15.918	12	12			W6B099BRR6	
	38.894	99.5	15.918	12			W6B100B		
	38.894	100	15.918	12			W6B100ARR6		
	38.894	102.616	15.918	12.675			W6B102A		
	38.894	103.5	15.918	12	12			W6B104SRR6	
	38.894	103.5	15.918	12	12			W6B104SRJ5F	
	38.894	104.648	15.969			W6B105C/YD4L			
	38.894	105.5	15.918	12			W6B105DRR6		
	38.894	105.5	15.918	12			W6B105DRJ5F		



TYPE 2

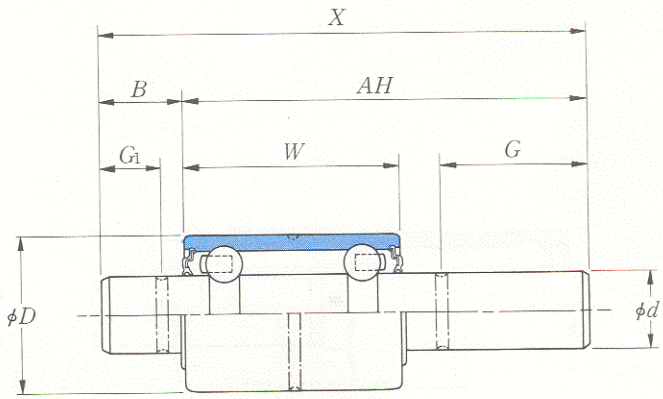


TYPE 3

Dimensions (mm)						Basic Load Ratings (kN) for one ball row		Mass (g)
±0.15 AH	B	±0.25 L_A	±0.25 L_B	G	G_1	Dyn. C_r	Stat. C_{0r}	
76	14					3.95	1.60	152
73	19					3.95	1.60	153
76	16.5					3.95	1.60	154
81.5	16.5					3.95	1.60	160
82	21.5					3.95	1.60	165
49.2	13.5	27.2	11.5			5.10	2.40	109
60.5	9.5	38.5	7.5			5.10	2.40	113
61.5	13.1	39.5				5.10	2.40	130
61	14	35.5				6.05	2.70	146
61.5	13.5	36.5				6.05	2.70	146
61.5	13.5	36.5				6.05	2.70	147
62.3	15.5	33.05				6.05	2.70	154
62.3	15.5	33.05				6.05	2.70	155
60.5	21	34.75	10.5			6.05	2.70	168
62	15	32	13			6.00	2.65	128
79	17					6.00	2.65	204
69.5	16.5	37				6.00	2.65	169
76	16.5	44				6.00	2.65	174
67.2	16.2	32				6.55	2.70	172
69.5	19.25					6.55	2.70	203
41.942	43.656					6.00	2.65	210
76	16.5	34.75				6.00	2.65	196
81.144	16.856					6.00	2.65	229
80.994	17.006					6.55	2.70	221
79.894	18.106			38		6.55	2.70	221
79.475	18.695	37.875				6.55	2.70	206
76	22.5	33.75				6.00	2.65	198
82	16.5	40.75	14.25			6.00	2.65	194
83	16.5	41.5				6.00	2.65	204
76	24	34.75				6.00	2.65	208
80.169	22.447	38.1				6.00	2.65	214
82	21.5	40.35	18.95			6.00	2.65	198
82	21.5	40.35	18.95			6.00	2.65	199
77.597	27.051			32.766		6.60	2.75	253
82	23.5	40.35				6.00	2.65	213
82	23.5	40.35				6.00	2.65	214

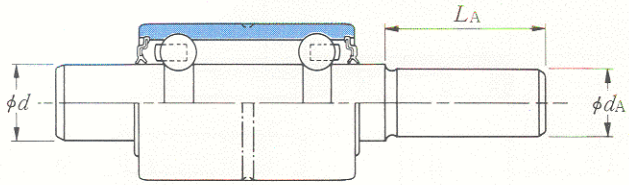
Ball-Ball type

D (30) – 47.625mm

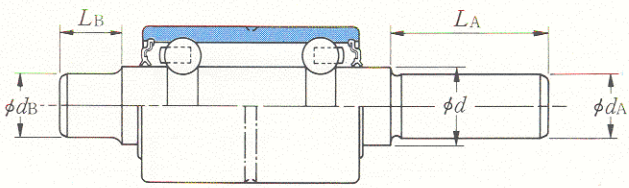


TYPE 1

Boundary Dimensions (mm)						Bearing No.		
0 −0.013 D	0 −0.178 W	±0.25 X	0 −0.013 d	0 −0.013 d_A	0 −0.013 d_B	TYPE 1	TYPE 2	TYPE 3
(30)	38.894	105.5	15.918	12	12			W6B106IRR6
	38.894	108.74	15.918	12.79			W6B109	
	38.894	109.5	15.918	12.038			W6B110	
	38.894	112	15.918	12			W6B112DRR6	
	38.894	116	15.918			W6B116B		
	38.894	118.278	15.918			W6B118RR6-F		
	38.894	124	15.918	12			W6B124BRR6	
	38.894	124	15.918	12			W6B124BRJ5F	
	38.894	136.398	15.918			W6B136AL		
	57.15	192.532	15.918			W6B193L		
35	30	79	17.5	12			W7B079ARJ5F	
	30	85.5	17.5	12			W7B086RR6	
	30	85.55	17.5	12			W7B086AHR2	
	30	100.05	17.5	12			W7B100G	
	38.894	91	17.5	12			W7B091CRJ5F	
	38.894	113.5	17.5	12	15.918			W7B114
38.1	41.275	112.67	18.961	15.918			W9B113L	
	53.975	140	18.961	12	15.918			W9B140CRJ5FL
47.625	69.95	124.63	25.4			W25B125		
	69.95	181.1	25.4	15.918			W25B181L	



TYPE 2

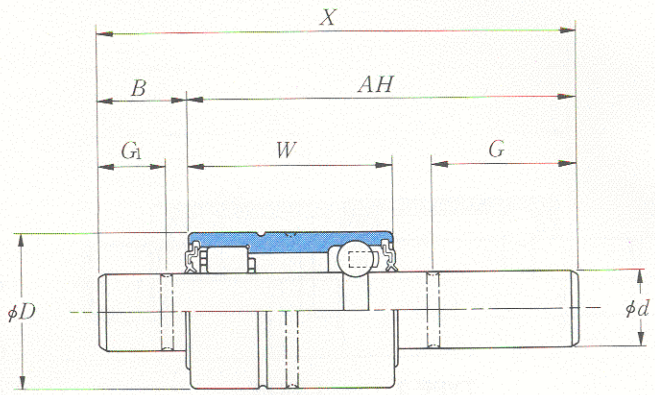


TYPE 3

Dimensions (mm)						Basic Load Ratings (kN) for one ball row		Mass (g)
±0.15 AH	B	±0.25 L_A	±0.25 L_B	G	G_1	Dyn. C_r	Stat. C_{0r}	
89	16.5	47.75	14.25			6.00	2.65	200
81.754	26.986	33.45				6.00	2.65	226
84.38	25.12	42.22				6.00	2.65	218
82	30	40.35				6.00	2.65	223
88.9	27.1					6.55	2.70	256
92.4	25.878					6.00	2.65	261
82	42	40.35				6.00	2.65	241
82	42	40.35				6.00	2.65	242
97.282	39.116			48.235		6.00	2.65	287
120.244	72.288					6.00	2.65	410
67	12	34.25				8.10	3.40	212
70	15.5	37.75				8.10	3.40	221
68.35	17.2	35.35				8.10	3.40	225
86.55	13.5	35.55				8.10	3.40	232
76	15	34.35				8.10	3.40	261
88.4	25.1	46.9	23.6			8.10	3.40	282
84.1	28.57	39.62				9.70	5.10	389
106	34	48.896	31.75			9.70	5.10	422
121.01	3.62					9.70	5.10	853
132.05	49.05	58.93				9.70	5.10	931

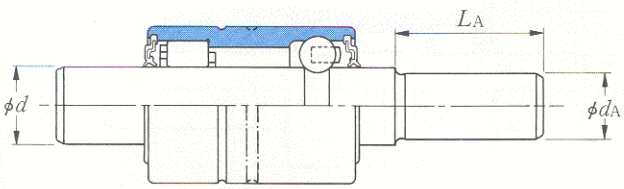
Ball-Roller type

***D* 26 – (35)mm**

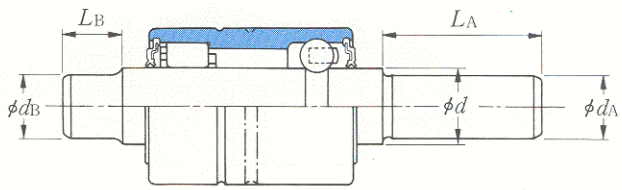


TYPE 1

Boundary Dimensions (mm)						Bearing No.		
0 −0.013 *D*	0 −0.178 *W*	±0.25 *X*	0 −0.013 *d*	0 −0.013 d_A	0 −0.013 d_B	TYPE 1	TYPE 2	TYPE 3
26	30	87.6	12			W2R088		
	39	92	12			W2R092		
	39	94.5	12			W2R095A		
30	30	78.7	17.2	12			W7R079B	
	30	80.5	17.2	12			W7R081	
	30	85.5	17.2	12			W7R086	
	30	85.5	15.918	12			W6R086B	
	30	94.2	15.918	12			W6R094B	
	36	87.5	15			W5R088		
	38.894	92.5	15.918	12.037			W6R093B	
	38.894	92.5	15.918	12			W6R093SRJ5F	
	38.894	94.6	15.918	12			W6R095G	
	38.894	95	15.918	12	12			W6R095RR6
	38.894	96.2	15.918	12			W6R096	
	38.894	98.5	15.918	12	12			W6R099G
	38.894	99	15.918	12			W6R099P	
	38.894	99	15.918	12			W6R099C	
	38.894	101	15.918	12			W6R101DRJ5F	
	38.894	103	15.918	12			W6R103A	
	38.894	105	15.918	12			W6R105	
	38.894	106	15.918	12			W6R106Q	
	38.894	106	15.918	12			W6R106DRJ5FL	
	38.894	106.17	15.918	12.738			W6R106B	
	38.894	106.2	15.918	12			W6R106	
	38.894	108.5	15.918	12			W6R109G	
	38.894	118.9	15.918	12			W6R119A	
	38.894	119	15.918	12			W6R119I	
	38.894	122.4	15.918			W6R122		
	46	123.3	15.918	12			W6R123	
	52	109.25	15			W5R110		
35	38.894	92.5	17.5	12	15.918			W7R093BRR6
	38.894	92.65	17.5	12			W7R093CHR2	
	38.894	100.4	17.5	12			W7R100CRJ5F	
	38.894	101	17.5	12	15.918			W7R101SRJ5F
	38.894	103.3	17.5		12		W7R103FHR2	
	38.894	106	17.5	12	15.918			W7R106BRJ5F



TYPE 2

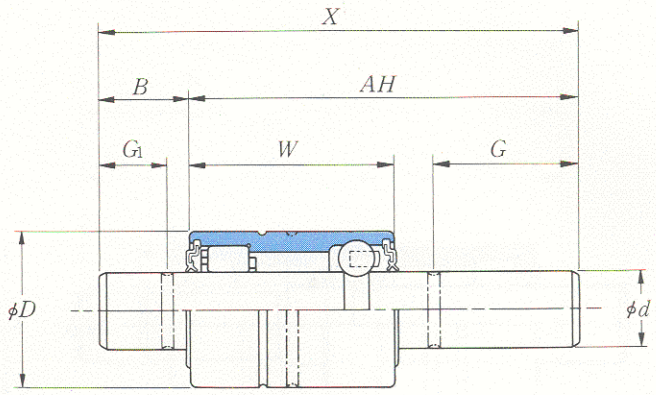


TYPE 3

Dimensions (mm)						Basic Load Ratings (kN)				Mass (g)
						for one ball row		for one roller row		
±0.15 AH	B	±0.25 L_A	±0.25 L_B	G	G_1	Dyn. C_r	Stat. C_{0r}	Dyn. C_r	Stat. C_{0r}	
70	17.6					3.95	1.60	11.5	9.45	134
73	19					3.95	1.60	11.5	9.45	155
73	21.5					3.95	1.60	11.5	9.45	157
65.6	13.1	33.6				6.05	2.70	15.9	12.8	186
67	13.5	35				6.05	2.70	15.9	12.8	188
72	13.5	35				6.05	2.70	15.9	12.8	197
68.5	17	36				6.60	2.75	14.1	12.7	185
77.7	16.5	45.2				6.60	2.75	14.1	12.7	185
71	16.5					6.55	2.70	14.1	12.5	200
67.37	25.13	25				6.60	2.75	14.1	12.7	224
76	16.5	34.35				6.60	2.75	14.1	12.7	212
75.4	19.2	33.5				6.60	2.75	18.8	18.1	220
78.5	16.5	37.25	14.25			6.60	2.75	14.1	12.7	203
77.9	18.3	36.4				6.60	2.75	18.8	18.1	221
81.594	16.906	40.094	14.5			6.60	2.75	14.1	12.7	210
81	18	39.606				6.60	2.75	14.1	12.7	220
85.5	13.5	44.106				6.60	2.75	14.1	12.7	213
76	25	34.35				6.60	2.75	14.1	12.7	225
86.5	16.5	43				6.60	2.75	14.1	12.7	223
74	31	32.6				6.60	2.75	14.1	12.7	234
90	16	47.5				6.60	2.75	14.1	12.7	227
76	30	34.35				6.60	2.75	14.1	12.7	234
81.164	25.006	38.81				6.60	2.75	18.8	18.1	235
87.7	18.5	41.25				6.60	2.75	18.8	18.1	233
81.594	26.906	39.3				6.60	2.75	18.8	18.1	233
98.9	20	53.15				6.60	2.75	18.8	18.1	243
101.5	17.5	45				6.60	2.75	14.1	12.7	247
88.9	33.5					6.60	2.75	18.8	18.1	281
102.8	20.5	53.8				6.60	2.75	18.8	18.1	257
91.5	17.75			36		6.55	2.70	14.1	12.5	281
76	16.5	34.75	15.25			8.10	3.40	22.5	21.0	268
72.65	20	31.26				8.10	3.40	22.5	21.0	282
85.4	15	43.75				8.10	3.40	22.5	21.0	286
76	25	34.35	23.75			8.10	3.40	22.5	21.0	288
63.494	39.806		37.3			8.10	3.40	22.5	21.0	289
76	30	34.35	28.75			8.10	3.40	22.5	21.0	290

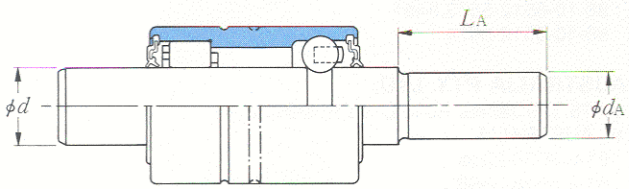
Ball-Roller type

***D* (35) – 42mm**

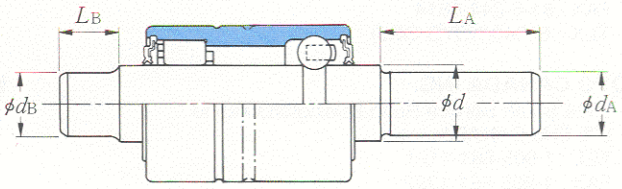


TYPE 1

Boundary Dimensions (mm)						Bearing No.		
0 −0.013 *D*	0 −0.178 *W*	±0.25 *X*	0 −0.013 *d*	0 −0.013 d_A	0 −0.013 d_B	TYPE 1	TYPE 2	TYPE 3
(35)	38.894	108	18	12			W8R108B	
	46	78.2	17.5		15.918		W7R078RR6	
	46	100.5	17.5	12	15.918			W7R101JRR6
	46	100.5	17.5	12	15.918			W7R101JRJ5F
	46	106.8	17.5	12			W7R107C	
	46	113	17.5	12			W7R113	
	46	113.8	18	12			W8R114A	
	46	114	17.5	12	15.918			W7R114BRR6
	46	114	17.5	12	15.918			W7R114BRJ5F
	46	119	17.5	12	15.918			W7R119KRJ5FL
	46	121.7	17.5	15.918	15.918			W7R122BRJ5FL
	56	125.5	17.5	12	15.918			W7R126CRJ5FHR2
38.1	53.975	80.6	18.961			W9R082L		
	53.975	127.5	18.961	15.918			W9R128BL	
	53.975	133.02	18.961	12			W9R133L	
	53.975	136	18.961	15.918			W9R136L	
	53.975	142.22	18.961	12			W9R142BL	
41	38.9	88.2	22	12	20			W22R088L
	38.9	93.3	22	12	20			W22R093L
	38.9	101.4	22	12	20			W22R101L
42	32	85.8	22	12			W22R085RR6L	
	32	95.35	22	12			W22R095L	
	46	107.2	22	12			W22R107AL	
	46	119	22	12	15.918			W22R119JRJ5FL
	48	109.55	22	12			W22R110L	
	48	115.7	22	12			W22R116L	
	48	116.7	22	12			W22R117L	
	56	127	22	12			W22R127ARJ5FHR	
	65	105	22			W22R105CL		
	75	156.68	22	12			W22R157L	



TYPE 2



TYPE 3

Dimensions (mm)						Basic Load Ratings (kN)				Mass (g)
						for one ball row		for one roller row		
±0.15 AH	B	±0.25 L_A	±0.25 L_B	G	G_1	Dyn. C_r	Stat. C_{0r}	Dyn. C_r	Stat. C_{0r}	
77.994	30.006	37				8.10	3.40	22.5	21.1	311
48.5	29.7		28.45			8.10	3.40	22.5	21.0	303
82.5	18	33.75	16.75			8.10	3.40	22.5	21.0	319
82.5	18	33.75	16.75			8.10	3.40	22.5	21.0	320
85.8	21	35.3				8.10	3.40	22.5	21.0	336
85.5	27.5	37				8.10	3.40	22.5	21.0	350
85.1	28.7	37				8.10	3.40	22.5	21.1	356
87	27	38.25	25.75			8.10	3.40	22.5	21.0	337
87	27	38.25	25.75			8.10	3.40	22.5	21.0	340
89	30	40.25	28.75			8.10	3.40	22.5	21.0	346
96.5	25.2	47.75	23.75			8.10	3.40	22.5	21.0	377
98	27.5	39.25	26.25			8.10	3.40	22.5	21.0	392
77.6	3					9.70	4.20	21.2	18.8	393
99.56	27.94	42.918				9.70	4.20	21.2	18.8	479
112.52	20.5	54.545				9.70	4.20	21.2	18.8	475
113.75	22.25	57.25				9.70	4.20	21.2	18.8	486
121.72	20.5	63.745				9.70	4.20	21.2	18.8	506
74.7	13.5	34.2	12.8			11.6	5.10	28.5	28.3	377
79.8	13.5	39.3	12.8			11.6	5.10	28.5	28.3	383
87.9	13.5	47.4	12.8			11.6	5.10	28.5	28.3	390
71.5	14.3	37				11.6	5.10	20.6	19.5	342
79.65	15.7	44.65				11.6	5.10	20.6	19.5	370
86.1	21.1	38				11.6	5.10	26.1	26.5	473
89	30	39.25	28.75			11.6	5.10	26.1	26.5	480
85.55	24	35.55				11.6	5.10	20.6	19.5	479
91	24.7	41				11.6	5.10	20.6	19.5	488
90.5	26.2	40.5				11.6	5.10	20.6	19.5	490
98	29	38.25				11.6	5.10	26.1	26.5	596
100	5					11.6	5.10	26.1	26.5	655
136.68	20	58.68				11.6	5.10	20.6	19.5	755

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