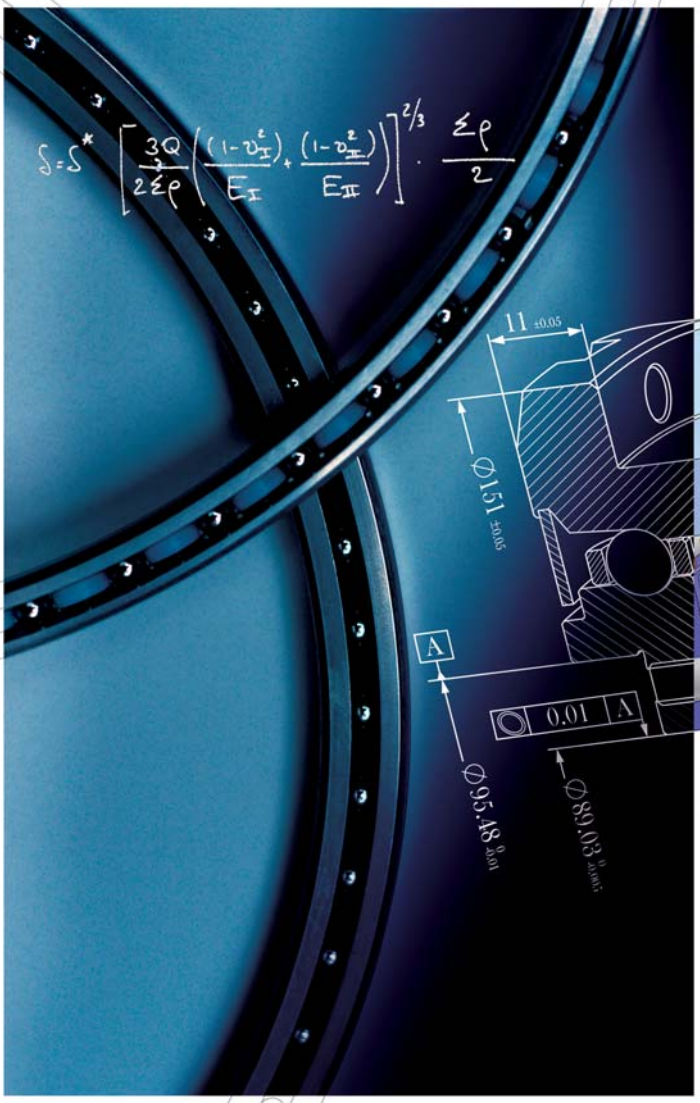
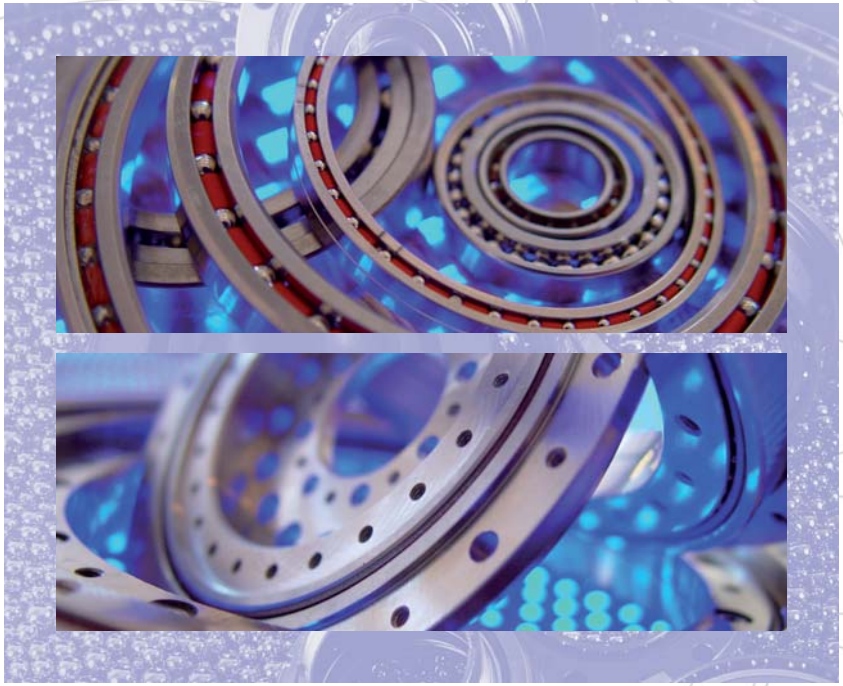
HIGH PRECISION BALL BEARINGS



LA TECHNOLOGIE EN MOUVEMENT
TECHNOLOGY IN MOTION

ADR GROUPE ALCEN



The data in this catalogue is based on our current production.
ADR reserves the right to make changes which are necessary by technological development. ADR also reserves the right to change without notice the technical characteristics of illustrated components.

ADR GROUPE ALCEN

Chemin des Prés
F-77810 THOMERY
FRANCE
Tel.: +33 (0) 1 64 70 59 50
Fax.: +33 (0) 1 60 96 43 46

Your sales contacts are available on:
our Internet site: www.adr-alcen.com
E-mail: mail@adr-alcen.com

NATO Manufacturer's code F0234

Contents

Directions ..... p 2

Chapter 1 . Foreword ..... p 3

Chapter 2 . Design ..... p 15

A . ADR bearing designations ..... p 16

B . Technical Definition of Products ..... p 18

Position 1 . Materials for rings and balls ..... p 18
Position 2 . Outer shape ..... p 22
Position 3 . Dimension reference ..... p 24
Position 4 . Inner shape ..... p 28
Position 5 . Shields/Seals ..... p 30
Position 6 . Cage/Retainer ..... p 32
Position 7 . Tolerances ..... p 36
Position 8 . Radial internal clearance and contact angle ..... p 44
Position 9 . Preload and duplex configurations ..... p 48
Position 10 . Vibration level ..... p 54
Position 11 . Surface treatment and coating ..... p 55
Position 12 . Torque ..... p 56
Position 13 . Calibration ..... p 59
Position 14 . Lubrication ..... p 62
Position 15 . Specification ..... p 66

Chapter 3 . Bearing characteristics ..... p 67

Chapter 4 . Mounting study ..... p 70

Chapter 5 . Bearing tables ..... p 75

A . Deep groove ball bearings ..... p 76

B . Angular contact ball bearings ..... p 92

C . Thin-section ball bearings ..... p 98

D . Special bearings ..... p 127

E . Integrated bearings ..... p 128

Memento ..... p 130

Notes ..... p 131

Product definition sheet ..... p 132

Directions

Address

12, chemin des Prés – F-77810 Thomery - FRANCE
(for GPS address, indicate n°12 as street number).

From the A6 motorway

- **Coming from Paris-Sud / Orly:** take the A6 motorway towards Lyon.
- **Coming from the Province:** take the A6 motorway towards Paris.

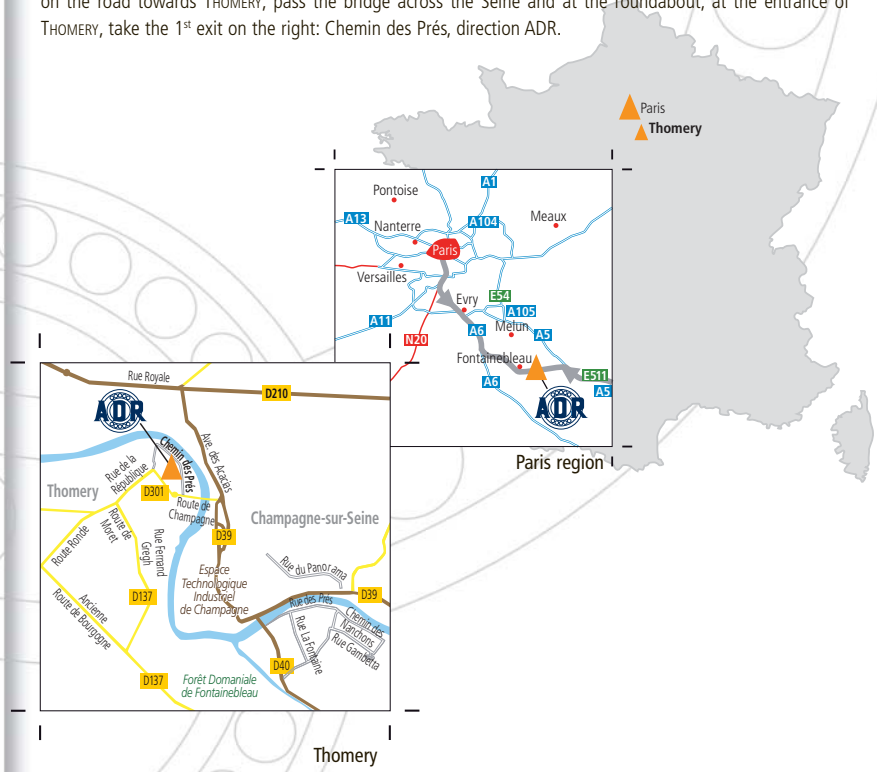
Take the exit Fontainebleau, continue to follow signs to Fontainebleau until the "Obélisque" roundabout, follow the D606 towards Sens / Moret-sur-Loing until the next roundabout, take the third exit, D301 towards Thomery.

Cross Thomery towards Champagne-sur-Seine until the roundabout, take the third exit: Chemin des Prés, towards ADR.

From the A5 motorway

- **Coming from Paris-Est / Roissy CDG:** take the A104/N104 road towards Evry / Lyon / Marne-la-Vallée then get on the A5 towards Troyes.
- **Coming from the Province:** get on the A5 towards Paris.

Take exit 17 Forges (only automatic toll), and follow towards Champagne-sur-Seine / Fontainebleau for 12 Km on the D210. At the roundabout, take the 3rd exit towards Champagne-sur-Seine, go through the town keeping on the road towards Thomery, pass the bridge across the Seine and at the roundabout, at the entrance of Thomery, take the 1st exit on the right: Chemin des Prés, direction ADR.



Founded in the 1930s, the ADR offices and factory are located 70 km south of Paris close to the forest of Fontainebleau.

In addition to the manufacture of high precision ball bearings, ADR designs and manufactures rotating systems based on bearing technology that meet the most demanding and special requirements of high technology applications.

The second part of this catalogue is devoted to the designation of our products and to a technical description of each of the components of our ball bearings. At the end of the catalogue, the main dimensions and the associated technical characteristics are listed.

This catalogue is designed to assist engineers in the selection of the correct ball bearings.

Our design and engineering department remains at your disposal to answer any questions you might have and to provide you with more detailed information on your particular requirements.

Methods and Means

ADR's strategy is to concentrate resources in key areas – engineering, grinding, metrology and assembly in ultra clean conditions. Carefully selected business partners are used for the preliminary work.

Grinding Workshop

Grinding

As a manufacturer of very high technology systems ADR has the latest machinery for grinding, super finishing and controlling. Our precision is measured in tolerances of one tenth of a micron.

Quality Control Area

Each operator performs controls at every stage of production. If required, certain parameters can be recorded and provided with each delivery.

3D Measurement

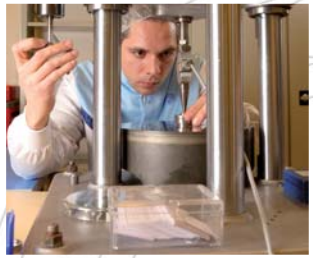
Assembly

At ADR, assembly consists mainly of dimensional and functional measuring operations, implementing stringent washing and lubricating techniques, and requiring an in-depth knowledge on how to assemble in a dust controlled environment.

All our bearings are mounted in our 1,200 m^2 of clean rooms (Class 100/ISO 5 to 100 000/ISO 8) and controlled both in terms of the dimensions and the performance required by our customer specifications.

Assembly workshop

Our designs satisfy the conflicting demands of minimum friction and maximum stiffness in the most demanding environments. Given the stringent controls we place on our manufacturing processes, these characteristics can be maximised and can guarantee consistent behaviour even over a large production run. The key to our success in this area is being able to supply with a 100% controlled and measured preload which gives us the flexibility to adjust the individual characteristics of each bearing, even by the smallest amount.



The lubrication operation, whether fluid or dry, adheres like the rest of our production to very strict quality rules. In addition we ensure that the shelf life of the many lubricants we use is respected.

Since our bearings are often designed for applications requiring minimum friction, the torque can be measured and the results supplied to our customers.

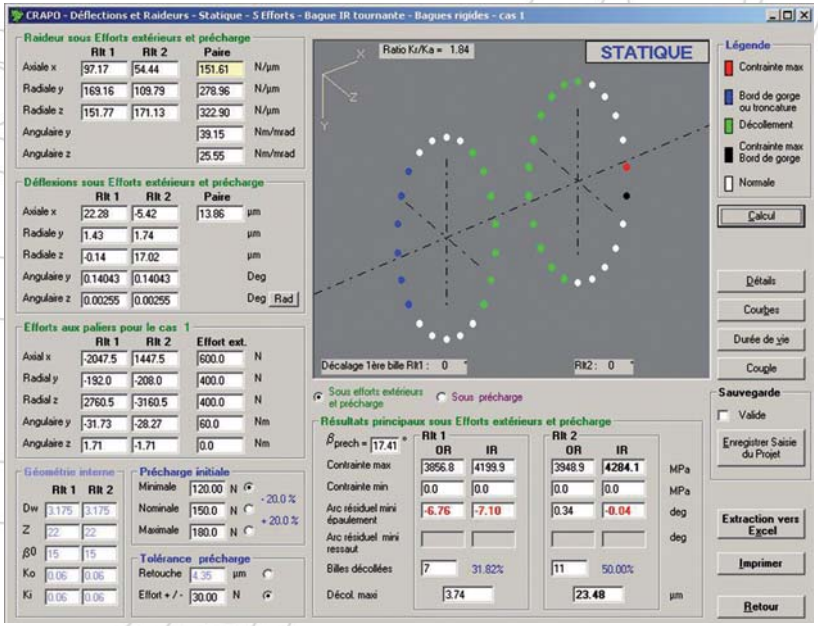
Marking and packaging are performed under optimum cleanliness and quality conditions. As standard, our bearings are individually vacuum packed, ready for use in the clean rooms of our customers.

Design - Service

The various ADR teams study, develop and market rotating systems based on high precision bearing technology. We scrupulously follow standard or customer specifications.

To best define the required solution in our customers' systems, we encourage direct contact between our Design & Engineering Department and those of our customers. We find that in this way we obtain the best possible solution for our customers.

Computer models, specifically developed at ADR and refined by long experience, provide outstanding predictive reliability of bearing behaviour.



We work closely with our customers, from first contact with our Sales Department focusing on your needs and continue throughout the life cycle of the products we supply.

From the first customer contact, our quality structure ensures that all stages, particularly those of design, meet the demanding standards which guarantee customer satisfaction.

Logistics – Purchase

Administrative

Computing

Process Planning

Production

Sales

Design & Engineering

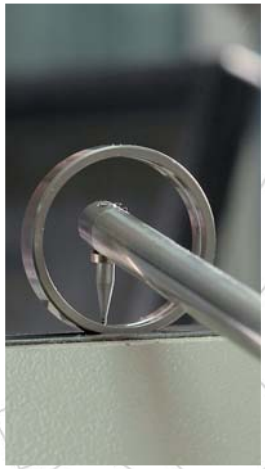
Quality

Assistance and expertise

This key competence is assured at ADR by our laboratory, whose principal objectives are:

- Customer assistance,
- Production assistance,
- Performance of specific operations, particularly chemical treatments,
- Metrological reference.

Controls at all levels



Our quality system

All stages, from design to manufacture and the final assembly of both bearings and rotating assemblies, are covered by our advanced traceability system.


BUREAU VERITAS
Certification

Certification

ADR
Chemin des Prés
77810 THOMERY
FRANCE

Standard

AS 9100 Revision B : 2004 / JIS Q 9100 : 2004
EN 9100 : 2003

Scope of supply

DESIGN, MANUFACTURING AND SALE OF TECHNICAL SOLUTIONS OF ROTATING SYSTEMS BASED ON BEARING TECHNOLOGY FOR AERONAUTICS.

CONCEPTION, FABRICATION ET VENTES DE SOLUTIONS DE SYSTEMES TOURNANTS, BASEES SUR LA TECHNOLOGIE DU ROULEMENT POUR LE MARCHE DE L'AERONAUTIQUE.


BUREAU VERITAS
Certification

Certification

ADR
Chemin des Prés
77810 THOMERY
FRANCE

Standard

NF EN ISO 9001 : 2008

Domaine d'activité

CONCEPTION, FABRICATION ET VENTES DE SOLUTIONS DE SYSTEMES TOURNANTS, BASEES SUR LA TECHNOLOGIE DU ROULEMENT POUR DES MARCHES DE HAUTES TECHNOLOGIE.

DESIGN, MANUFACTURING AND SALE OF TECHNICAL SOLUTIONS OF ROTATING SYSTEMS BASED ON BEARING TECHNOLOGY FOR HIGH TECHNOLOGY MARKET.

ADR is certified to ISO9001/EN9100

Since QUALITY is ADR's keyword, many technical resources, equipment and documentary systems are in place. Regular training programmes ensure that every employee is fully involved.

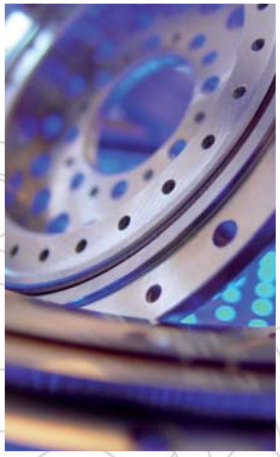
Our product range

Our main business is the manufacture of rotating systems and high precision ball bearings within a dimensional range extending from 1 mm to 330 mm.

These bearings are primarily used in:

- Optronic Systems,
- Inertial Systems,
- Actuators,
- Radar antenna supports,
- Solar panel and telescope deployment mechanisms,
- Navigation platforms,
- Encoders,
- Motors,
- Turbines,
- Turbomolecular vacuum pumps,
- Products operating in severe environments (nuclear, space, oil, vacuum, marine, high temperature,…)

Our work on small and medium orders (from one unit to 10,000 per year) is proof of our adaptability, flexibility and responsiveness. Where necessary, designs can be changed in order to optimise technical performance with cost.

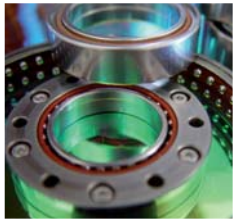


Integrated Designs

Thin Section Ball Bearings

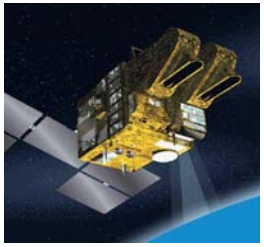
Miniature Ball Bearings

Custom Designs



Super Duplex Designs

Fields of application



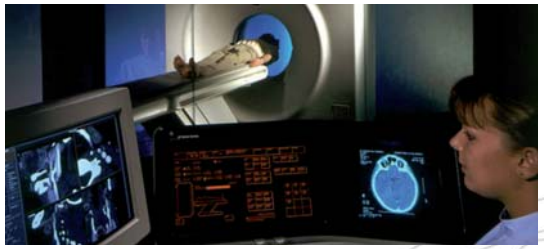
Space

Aeronautics

Defence

Motor sports

Optics



Medical

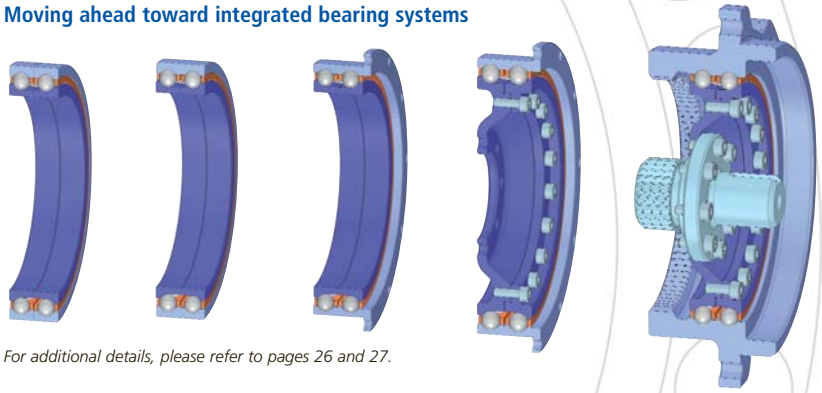
Participation to international exhibitions

Our strategy

The company's historical mission

ADR offers technical solutions for rotating systems, based on bearing technology, implementing a strategy centred on listening, reacting and searching for excellence in order to meet the special requirements of the high technology markets.

Moving ahead toward integrated bearing systems



For additional details, please refer to pages 26 and 27.

Current positioning as a system or subsystem supplier

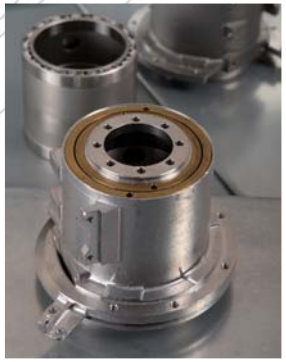
In addition to our ability to supply rotating systems, we are capable of integrating other equipment such as motors, gearboxes, encoders and optics, electronic control systems…

The market is now demanding more and more complex integrated systems. Our policy, initiated many years ago, meets these requirements. A further step was made in 2004 when ADR joined the ALCEN Group.

And, our abilities in:

- **design**, added to the Group's capabilities
- **grinding**, added to the Group's machining capabilities
- **assembly and industrialization** in a controlled dust free environment, on recently refurbished premises

make ADR a key partner in the design and manufacture of complete sub-assemblies and equipment.



The Alcen Group

- Created in 1988, ALCEN has focused its industrial growth in the defence, aeronautic, energy and medical equipments.
- ALCEN brings together unique and complementary areas of expertise, distinguished by exclusive technology know-how and/or by its customer-oriented services.
- ALCEN has established commercial and industrial dealings over the long term with its customers who are major groups positioned as global leaders in the market they operate in.
- In the organisational mode developed by ALCEN, the subsidiaries are used to work together with a proven synergy without any need of heavy central structure.

5 activities make up ALCEN group business. These activities provide mechanical, electronic and software services in their own field.

- Mechanical design, production, PLCM*
- Electronic design, production, PLCM*
- Optics and transmissions
- Fine sheet metal, refractory and composite materials
- Surface treatments

** PLCM: Product Life Cycle Management*

MECHANICAL, DESIGN, PRODUCTION, PLCM
Highly capable and reliable mechanical components and systems are designed, carried out and maintained in this activity, to which ADR belongs.
These systems play a critical role particularly in terms of performance, safety and security in the sets of which they are a part of.
Several know-how are controlled including assembly, machining, thermal analysis and ceramic production.

www.alcen.com

Please contact our Sales Department for information on other group companies that could be of assistance to you.

A . ADR bearing designations ..... p 16

B . Technical Definition of Products ..... p 18

Position 1 • Materials for rings and balls ..... p 18
Position 2 • Outer shape ..... p 22
Position 3 • Dimension reference ..... p 24
Position 4 • Inner shape ..... p 28
Position 5 • Shields/Seals ..... p 30
Position 6 • Cage/Retainer ..... p 32
Position 7 • Tolerances ..... p 36
Position 8 • Radial internal clearance and contact angle ..... p 44
Position 9 • Preload and duplex configurations ..... p 48
Position 10 • Vibration level ..... p 54
Position 11 • Surface treatment and coating ..... p 55
Position 12 • Torque ..... p 56
Position 13 • Calibration ..... p 59
Position 14 • Lubrication ..... p 62
Position 15 • Specification ..... p 66

Product definition sheet ..... p 132

ADR bearing designations

The designation of the ADR products is subdivided into 15 positions (filled in or not). The table below summarises the composition of the designation. Each position is detailed in the following chapters.

The ADR designation is a guideline to help understand the definition of a product by its designation.

The technical capabilities of our company go beyond this simple framework. Special dimensional references linked to a drawing (designation type SP...) and customer specifications linked to specific technical descriptions (designation type K.....) are frequently considered.

In this case, ADR will supply Technical Definitions of Products (so-called TDPs) as well as drawings on request from our Design & Engineering Department.

Position	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Definition	**Material**	**Outer shape**	**Dimension reference**	**Inner shape**	**Shields/ Seals**	**Cage/ Retainer**	**Tolerances**	**Radial internal clearance**	**Preload and duplex configuration**	**Vibration level**	**Passivation**	**Torque**	**Diameter calibration**	**Lubrication**	**Specification**
Codes currently used	— W Z	F L E	AX 6000 A412 AD8112 SP12987	H B X	Z ZZ F -2RS	— R E N	T4 TA4 T5 TA5	3 J1015	DO DX	W201	P	ML MR	C CL12	H47 G20 G68R	K1837
Pages	18 to 21	22 to 23	24 to 27	28 to 29	30 to 31	32 to 35	36 to 43	44 to 47	48 to 53	54	55	56 to 58	59 to 61	62 to 65	66
Designation examples															
WA725NTA4DOK2458	W	—	A725	—	—	N	TA4	—	DO	—	—	—	—	—	K2458
FR2BJ1830C42G68	—	F	R2	B	—	—	—	J1830	—	—	—	—	C42	G68	—
WSP11293TA4K2440	W	—	SP11293	—	—	—	TA4	—	—	—	—	—	—	—	K2440
W6201ZZT46W201PMLH77	W	—	6201	—	ZZ	—	T4	6	—	W201	P	ML	—	H77	—

"—": implies that there is no character in the designation.

Design help

Chapter 3 • Bearing characteristics: ..... p 67
Chapter 4 • Mounting study: ..... p 70

These chapters allow the reader to have a general understanding of the dimensions and mounting methods of our products. Our Design & Engineering Department (contact details on the back of the catalogue) is available to help you with definitions and to propose suitable technical solutions for bearings as well as designs for your rotating systems.

Position 1 • Materials for rings and balls

In any mechanical design, the choice of materials is of primary importance.
To respond to the needs of your applications, we propose various solutions to manufacture your rotating systems. The quality of our supply requirements guarantees the cleanliness and traceability of our materials. Here is an explanatory list of the most commonly encountered materials.

W Stainless steel

As standard

The steel designated **X105CrMo17** according to the EN standard (former denomination: Z100CD17) and **440C** according to the AISI standard is commonly used for the manufacture of bearings at ADR. This martensitic stainless steel presents a great hardness of 58 HRC minimum and an excellent resistance to abrasion. Its high chromium content makes it highly resistant to corrosion.
The core heat treatment processes include one or more cooling cycles depending on the expected characteristics. These ADR controlled processes provide the material with an excellent dimensional stability for a standard utilisation between -80°C and +150°C.

On specification (K...)

For applications in a wider temperature range, a special heat treatment of the stainless steel **X105CrMo17** allows using stainless steel between -260°C and +315°C.

For applications with greater constraints, we propose this same stainless steel **X105CrMo17** type **VAR** (Vacuum Arc Remelting) obtained by a remelting under vacuum **CEVM** (Consumable Electrode Vacuum Melt). This technology allows reducing the gas content and non-metallic inclusions in the material, and therefore increasing its breaking strength.

For applications with extreme constraints (very heavy loads, very high speed, very aggressive environment, ...), we use notably two nitrogen-doped steel grades:

- **X40CrMoVN16.2** according to the EN standard (former denomination: E-Z40CDV16.2+Az and commercial name: **XD15NW**).
  This remelted by a consumable electrode **ESR** steel (Electroslag Remelting) simultaneously presents an outstanding corrosion resistance and a great hardness of 58 HRC minimum. Its balanced composition yields a fine structure without coarse carbide, assuring excellent fatigue strength.
  A special high-temperature heat treatment allows the utilisation of **X40CrMoVN16.2** up to +450°C, while maintaining great hardnesses.
  A biocompatible grade can be proposed for medical applications.

- **X30CrMoN15.1** according to the EN standard (commercial name: **CRONIDUR® 30**).
  This second grade similarly elaborated under high pressure **PESR** (Pressurised Electroslag Remelting) allows obtaining performances equivalent to X40CrMoVN16.2.

— Chromium steel

As standard

The grade designated **100Cr6** according to the EN standard (former denomination 100C6) and **52100** according to the SAE standard presents a high hardness greater than 62 HRC and a high dimensional stability allowing it to resist heavy loads and to be usable up to +150°C. Thanks to its homogeneous structure at both macroscopic and microscopic levels, it is able to respond to requirements of small torques and high rotating velocities. This chromium steel is not recommended for corrosive environments.

On specification (K...)

For applications with high constraints, we propose this same steel **100Cr6** type **VAR** (Vacuum Arc Remelting) obtained by a remelting under vacuum **CEVM** (Consumable Electrode Vacuum Melt). This technology reduces the gas content and non-metallic inclusions in the material and therefore increases its breaking strength.

For applications with extreme constraints (very heavy loads, very high speed, ...), we recommend the steel **100Cr6** type **VIM-VAR** (Vacuum Induction Melting - Vacuum Arc Remelting) obtained by a double melting under vacuum. This allows increasing the breaking strength thanks to a more uniform microstructure.

Z High-speed steel

On specification (K...)

The high-speed tungsten steel designated **HS 18-0-1** according to the EN standard (former denomination: Z80WCV18.04.01) and **T1** according to the AISI standard is used for very high temperature applications up to +550°C. Its fine structure makes it particularly ideal for applications with a very low noise level.

High-speed steels elaborated from powder metallurgy with or without cobalt designated **HS 6-5-3-8** or **HS 6-5-3** according to the EN standard (commercial name: ASP®2023 or ASP®2030) possess a greater hardness due to a high concentration of carburised elements. The homogeneous distribution of the carburised elements and the absence of segregation increase the resiliency and fatigue strength of the steel.

The high-speed molybdenum steel designated **80MoCrV40** according to the EN standard (former denomination 80DCV40) and **M50** according to the AISI standard is generally used for applications combining strong mechanical stresses and high temperatures (up to +300°C). In order to increase its breaking strength, we recommend the steel **80MoCrV40** type **VIM-VAR** (Vacuum Induction Melting - Vacuum Arc Remelting) obtained by a double melting under vacuum.

Another high-speed steel grade designated **AMS 5749** (commercial name: **BG42®** VIM VAR) also accepts high-temperature utilisation with, in addition, a better resistance to corrosion.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

D Superalloy

On specification (K...)

We use mainly the **ALACRITE** or **STELLITE® alloys** which are cobalt based alloys with a high chromium and tungsten content. They are intended for utilisations:

- over a wide temperature range from -180°C to +800°C,
- for highly corrosive environments (thanks to an exceptional resistance to oxidation),
- for applications requiring non-magnetic materials (due to their very low steel content).

Cobalt confers good rubbing characteristics and an excellent resistance to abrasion and jamming. The additions of chromium and tungsten form very hard and stable carbides which allow obtaining a great hot and cold hardness for this type of alloy (more than 50 HRC). However, the dynamic load capacity of bearings (C) drops 50 % compared to the chromium steel 100Cr6. Other cobalt-free grades can be studied for applications in an irradiated environment.

T Light alloy

On specification (K...)

These alloys are generally used for structural parts in the designs of special bearings (**SP...**) due to their low density or their non-magnetism.

The titanium alloy type **Ti 6Al-4V** (former denomination **TA6-V)** offers an excellent combination of mechanical properties, with low density, good corrosion resistance and high temperatures (up to +400°C), in addition to being non-magnetic. For use in a bearing ring, please consult the Design & Engineering Department to find out what are the acceptable load capacities.

Ceramic – Hybrid bearings

On specification (K...)

We can propose so-called "hybrid" bearings with steel rings and ceramic balls (accordingly with a suitable design) mainly for utilisations:

- at high speed,
- in a corrosive environment,
- with limited lubrication,
- in a magnetic environment,
- etc...

Balls made of ceramic **Si_3N_4** (Silicon Nitride) have less than half the density of steel balls, which allows the limiting speed of the bearings to increase.

Using ceramic reduces the friction in contacts, limits jamming and lowers operational heating. The homogeneity and the hardness of balls made of new ceramic grades give an excellent breaking strength and provide a very good resistance to compression.

Other grades can be proposed, such as **ZrO_2** (Zirconium Oxide), whose expansion coefficient close to that of steel minimises impacts due to heat variations.

Basic data table of the main materials

Code	EN standard (Chemical composition)	AISI	Standards	Remarks	Density (g/cm³)	Coefficient of Thermal Expansion (K^{-1})	Hardness	Magnetism	Code
W	X105CrMo17	440 C	AMS 5630, 5880, 5618	Z100CD17	7.70	1.02 x10^{-5}	675 HV / 58 HRC	Yes	W
W	X40CrMoVN16.2	—	AMS 5925	XD15NW™	7.70	1.04 x10^{-5}	675 HV / 58 HRC	Yes	W
W	X30CrMoN15.1	—	AMS 5898	CRONIDUR® 30	7.72	9.90 x10^{-6}	690 HV / 59 HRC	Yes	W
—	100Cr6	SAE 52100	AMS 6440, 6444	100C6	7.80	1.14 x10^{-5}	765 HV / 62 HRC	Yes	—
Z	HS 18-0-1	T1	AMS 5626	High-speed steel	8.67	9.80 x10^{-6}	750 HV / 62 HRC	Yes	Z
Z	80MoCrV40	M50	AMS 6490, 6491	Semi high-speed steel	7.87	1.121 x10^{-5}	720 HV / 61 HRC	Yes	Z
Z	X115CrMoV14.4.1	—	AMS 5749	BG42®	7.76	1.013 x10^{-5}	720 HV / 61 HRC	Yes	Z
D	CoCr30W8	—	—	ALACRITE 554	8.40	1.24 x10^{-5}	530 HV / 51 HRC	No	D
D	CoCr32W13	—	—	ALACRITE 505	8.60	1.16 x10^{-5}	640 HV / 56 HRC	No	D
T	Ti 6Al-4V	—	AMS 4911, 4928, 4935, 4965, 4967	Titanium alloy TA6-V Grade 5	4.43	9.00 x10^{-6}	270 HV / 28 HRC to 350 HV / 36 HRC	No	T
	Si_3N_4	—	—	Silicon nitride (ceramic)	3.21	3.20 x10^{-6}	1400 to 1600 HV	No	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 2 • Outer shape

To increase the bearing's performances and to adapt to your configuration, we propose a design change by integrating a flange, larger rings or any other geometric specificity studied jointly with your Design & Engineering Department.

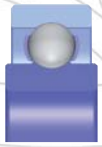
— Normal outer ring

Unless otherwise specified, the bearing's outer ring is standard and has normal overall dimensions as shown opposite.

F Flanged outer ring

By rigidifying the bearing, the flange limits deformations linked to its fitting in the system. This facilitates its mounting, simplifies the machining of its housing and increases its positioning precision.
ADR also proposes on request special flanges adaptable to your design. They may be circular or be obtained by milling and can be equipped with threaded fastening holes, smooth or have any other special shape.

L Extended inner ring with symmetrical extension



These bearings used as hubs facilitate stackings, particularly in gear trains. Their widths are modified according to the following data:

- Bearings in metric series – the inner ring is wider by an additional **0.800 mm**,
- Bearings in inch series – the inner ring is wider by an additional **0.794 mm (.0313 inch)**,
- Bearings in thin-section series – refer to the tables of dimensions of each series or please contact us.

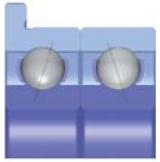
E Extended inner and outer rings

This version improves the bearing's seating in its housing. It also presents an increased inner volume, allowing in most of the cases, the mounting of a crown-type cage (type R) combined with two shields (type ZZ).
The widths of both rings are increased by the same value as in the version L presented above.

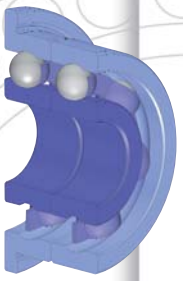
FL Flanged outer ring and extended inner ring

This solution can be used to simultaneously combine the advantages of the solutions F and L detailed above.

FN Flanged bearing + normal bearing assembly



This codification applies to a pair of bearings. The assembly consisting of a flanged bearing and a normal bearing facilitates the positioning of the pair in its housing.



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 3 • Dimension reference

Depending on their size, the bearings presented in this catalogue are part of a well defined referential series. However, since we work to order and on specification, any geometry is feasible. So please consult us directly when your designs require special dimensions. The reference series are listed below. The entire designations according to diameters are given in the dimension tables in part 5 of this catalogue.

— Rigid ball bearings (see pages 76 to 96)

The rigid ball bearing series differ by their cross section according to the following drawings.

AX X AY Y 600 620 630

61800 61900 6000 6200 6300

618 Thin-section ball bearings – metric series (see page 126)

The thin-section ball bearings in metric series are available with a cross section that increases with the diameter.

A Thin-section ball bearings (see pages 98 to 109)

The thin-section ball bearings are available in various series with the following constant cross sections.

A4 A6 A7 A8 A9 A10

A11 A12 A13 A16 A24

Super duplex thin-section ball bearings, 4 series: AA, AB, AD, AF.

These super duplex bearings improve the rotating precision and the friction torque compared to a conventional pair. Operation is improved, better performances are obtained and bearing life is longer. Super duplex ball bearings AA and AD are designed with a monobloc double-groove outer ring for a preloaded configuration in back-to-back DO. Super duplex ball bearings AB and AF are designed with a monobloc double-groove inner ring for a preloaded configuration in face-to-face DX. These solutions offer the following advantages to limit misalignment between the two bearing raceways at mounting and to increase angular stiffness by rigidifying the bearing (please see the next page).

Super duplex thin-section ball bearings with reduced width compared to an equivalent pair, 2 series: AD, AF.

AD Back-to-back (DO) preloaded super duplex (see pages 110 to 115)

Monobloc outer ring

This configuration of super duplex ball bearings AD has a reduced width compared to a pair of thin section ball bearings (so-called duplex) except for the AD4 series.

AD4 AD7 AD8 AD9 AD10 AD12

AF Face-to-face (DX) preloaded super duplex

Monobloc inner ring

This configuration is equivalent to the face-to-face preloaded configuration DX of the **AD** series. The inner ring here is a monobloc double-groove ring. The width of super duplex **AF** is reduced compared to a pair of thin section ball bearings (so-called duplex) except for the AF4 series.

Please refer to the dimension tables of each **AD** series which are equivalent in dimensions and load ratings; only the mass of the **AF** super duplex ball bearing differs slightly.

AF4 AF7 AF8 AF9 AF10 AF12

Super duplex thin-section ball bearings with similar width compared to an equivalent pair, 2 series: AA, AB.

AA Back-to-back (DO) preloaded super duplex (see pages 116 to 125)

Monobloc outer ring

This configuration of super duplex ball bearings is designed with a width and a ball diameter identical to those of a pair of thin-section ball bearings. These designations also exist in the dimension AA12, AA13, AA16 and AA24.

AA6 AA7 AA8 AA9 AA10 AA11

AB Face-to-face (DX) preloaded super duplex

Monobloc inner ring

This configuration is equivalent to the face-to-face preloaded configuration DX of the **AA** series. The inner ring is here a monobloc double-groove ring. Please refer to the dimension tables of each **AA** series which are equivalent in dimensions and load ratings.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Intermediate series can be made on request from our Design & Engineering Department.

KADV Integrated bearings

Integrated super duplex ball bearings with hard preload improve the overall rotating system behaviour. Its rotation precision is obtained thanks to its two grooves outer ring design which limits geometric defaults and reduces the running torque.
KADV bearings are proposed in back-to-back configuration with centred inner rings allowing a very good bending load capacity and increasing its angular stiffness.
Its hard preload applied with CHC screws allows to guarantee the repetitiveness of this parameter from one bearing to the other and a perfect control of the aimed stiffness performances.
KADV bearings avoid the user to deal with the preload set up on the system which is always a sensitive operation. This type of bearing with a flanged outer ring equipped with fixing holes on the flange limits mechanism interfaces. A precise positioning dimension may be requested between the bearing inner and outer ring in order to precisely position the housing in relation to the shaft (therefore facilitating coder integration, collector…).
The preload value is determined according to the loads that the bearing has to support. Preload screws are dimensioned for a limited preload and external loads. It is recommended to contact our Engineering Department to make sure that the bearing is well dimensioned with respect to the application and environment.

SP Special bearings

Special bearings are designed to respond precisely to the specific requirements of your application. Any bearing with a dimension that is not standard is named **SP…** followed by a digital increment. Bearings can be special from a dimensional point of view to respond to given load cases, stiffnesses or overall dimensions.
They can integrate your mechanism's functions to simplify the final mounting and reduce the geometric dispersion of the assembly by minimising the number of interfaces.
These solutions allow improving the rotating precision and the global friction torque of the system.
An axial positioning value between two mechanical parts can be assured by design and manufacture.

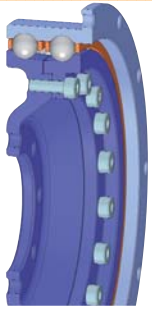
The right hand drawing represents an example of specific bearing, the illustrations below show another example of a specific design.

Example of integration

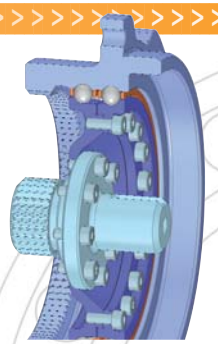
Controlled preload pair of bearings. Curve of preloads delivered with each pair.

Super duplex design with a single-piece outer ring. Gain in performance, rotating precision and bearing life.

Integration of a flange. Easy to mount and a time saving, enhanced system rigidity, less critical housing precision



Solid preloading. All the bearing's characteristics and performances are calculated, measured and under ADR's responsibility. Such a cartridge is very easy to mount with guaranteed performances.



Design and manufacture of complete complex integrated systems at ADR to guarantee the best performances with more compact and more reliable systems.

Intermediate series can be made on request from our Design & Engineering Department.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

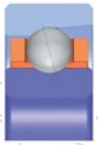
Position 4 • Inner shape

The axial and radial loads applied to ball bearings are mainly those which determine the internal geometry of the bearings. The best known ball bearing type, the "deep groove", can sustain radial and axial loads in both directions. High speed and a large axial load require using "angular contact" ball bearings.

— Deep groove ball bearings

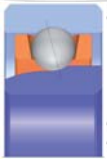
It is the most conventional bearing for multiple applications. Its grooves are complete tracks with symmetrical shoulders. These bearings can sustain mainly radial loads and support axial loads in both directions.
Deep groove ball bearings can be mounted in pairs, preloaded at ADR to meet application requirements and operate at a specified contact angle.

H Non separable angular contact ball bearings



This design allows integrating more balls than a deep groove ball bearing thus increasing the load ratings. These bearings can be constructed with large contact angles. This increases the bearing's axial rating within the limit of the groove depths and the ellipsoidal truncation.
These ball bearings are usually mounted in a preloaded pair to place them in angular contact and cancel axial and radial internal clearances. For utilisation as a single ball bearing, the axial clearance must be compensated.

B Separable angular contact ball bearings

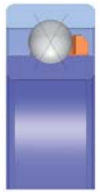


Separable angular contact ball bearings are delivered mounted, but their inner ring may be separated from the rest of the bearing to facilitate its mounting on the system. The balls remain held solidly in the cage with the outer ring.
They have the same properties as non separable angular contact ball bearings.

Q Full complement balls bearings with ball entry

They are deep groove ball bearings equipped with notches to allow a complete filling with balls. This particularity improves load ratings. Nonetheless, the friction torque becomes significantly higher than that of bearings equipped with a cage.

X Four point contact ball bearings



The bearing with four points of contact is defined by a ogival groove ring which allows having two points of contact on each of the rings. This means that higher ratings can be obtained than with a standard bearing. But, on the other hand, the inner geometry increases the friction torque.
It is possible to make this type of bearing with a negative clearance in order to preload it. However, this configuration cannot be comparable in any case to a preloaded pair. In fact, an X type bearing is preloaded by construction. This method induces major dispersions on the preload value. In addition, the hyperstatism of the four points of contact causes large variations in the friction torque.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 5 • Shields/Seals

Shields/seals are used on bearings mainly for two reasons:

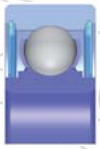
- The bearing can be subjected to a polluting environment. A bearing's shield/seal guarantees a longer life to the rotating system.
- The bearing can be a pollution generator in a critical environment. It might be necessary to prevent a possible migration of the lubricant, for instance.

— Open bearings

No symbol indicates an open bearing without shield/seal.

Z Bearings protected by one shield

ZZ Bearings protected by two shields



As standard

The bearing is protected by one or two separable stainless steel shields held by circlips or a retaining ring. This mounting prevents ring deformation due to crimping.

A small gap between the shield and the inner ring limits the size of dust particles liable to penetrate into the bearing. In addition, this protection limits the migration of lubricant into the system. The shield is not in contact with the inner ring. Therefore, the friction torque does not increase with respect to open bearings.

On specification (K...)

Unless otherwise specified, shields can be mounted by crimping, generally for low tolerance classes, type T0 or T6.

RS Bearings protected by one nitrile rubber seal

-2RS Bearings protected by two nitrile rubber seals

The bearing is rendered tight by one or two nitrile rubber seals reinforced by a metal reinforcement. The contact between the seal and the inner ring provides an excellent tightness. However, this leads to an increase in the friction torque.

The utilisation temperatures are between –20° and +100°C for nitrile rubber seals. Material variants are available (**RS2**: fluorinated elastomer: –30°C; 180°C) which offer a better resistance to higher temperatures. Please consult the Design & Engineering Department for more information about other materials.

F Bearings protected by one PTFE seal reinforced with fibreglass

FF Bearings protected by two PTFE seals reinforced with fibreglass

The bearing is protected by one or two PTFE seals reinforced with fibreglass and held by circlips. This type of seal offer a good tightness with lower friction torques than nitrile rubber seals.

These seals can be used for higher speed applications than rubber seals. The utilisation temperatures are between –60°C and +200°C.

Special shields/seals*

On specification (K...)

For special or complex rotating systems, special shields/seals can be considered.

- Special seal integrated on a bearing with low leak rate and low friction torque.
- Special shield and raceway with very small gap to limit to the maximum the intrusion of particles in the bearing.

Please consult the Design & Engineering Department for more information about these special shields/seals.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 6 . Cage/Retainer

Depending on the bearing's size and inner shape, the environment in which it will be forced to operate and the system's applications (speed, temperature, torque, the aggressivity of the environment) we propose many types of ball separators (different shapes and materials). You will find below a non exhaustive presentation of the various designs and examples of materials.

1 . Cage designs:

— Standard cages

Standard cages are defined according to the type of bearing, its size and its internal shape. Each type of cage listed below is detailed in its section.

- For rigid deep groove ball bearings (inner ring not filled in in position 4), the separators used are two-piece **pressed sheet-metal** cages.
- For non separable angular contact ball bearings, type H, the standard cage is a **one piece machined cage with cylindrical ball pockets** type.
- For separable angular contact ball bearings, type B, the standard cage is a **one piece machined cage with stepped ball pockets** type.

The cage type and the material used can be specified according to the application's requirements.

Pressed sheet-metal cage (ribbon type cage)

It is a two-piece cage made of pressed sheet-metal. In this design, the two constituent pieces are rendered solid by crimping. This cage type is particularly ideal for small-sized deep groove ball bearings used at slow to high speeds. The stainless steel X8Cr17 is commonly used, although the brass CuZ33 can be used as an alternative.

One piece machined cage, with cylindrical ball pockets

It is a machined, one-piece cage with cylindrical ball pockets. It is usually made of reinforced phenolic resin. This cage is particularly suitable for angular contact ball bearings used at moderate to very high speeds with a low friction torque.
Steels, bronzes, polymers or sintered materials can also be proposed depending on the application's requirements.

One piece machined cage, with stepped or conical ball pockets

This cage's shape is similar to that of the snap cage with the difference that the pockets contain ball retainers. This configuration allows holding the balls on the outer ring when the inner ring is dismounted. This cage is particularly suitable for angular contact ball bearings used at moderate to high speeds with a low friction torque.

V Floating sheet-metal cage

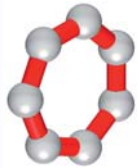
It is a two-piece pressed sheet-metal cage. In this design, the two constituent pieces are slightly floating. This cage type is perfect for small-sized deep groove ball bearings used at slow to high speeds with a low friction torque. The stainless steel X8Cr17 is commonly used.
A PTFE type coating can be proposed for moderate speeds and light loads. Its self lubricating characteristic is suitable for applications under vacuum and/or at low and high temperatures, or when a conventional lubricant is not recommended.

R Crown-type cage

It is a cage generally machined in the shape of a "comb" crown which clips onto the balls. This cage is particularly suitable for deep groove ball bearings used at moderate to high speeds with a low friction torque. It is usually made of reinforced phenolic resin. For some applications, an acetal resin, technical polymers, steels, bronzes, or PTFEs loaded with glass fibres can also be proposed and adapted.

E Separator tubes

These tubes are inserted between each ball of the bearing. These separators are used in deep groove ball bearing designs, notably in applications with slow rotating speeds or oscillating motions. The tubes are made of PTFE to guarantee a very low friction torque.



N Ring-shaped spacers

These spacers are set over every other ball for angular contact ball bearing designs. They are particularly suitable for applications with very low to moderate rotating speeds or oscillating motions. The ring-shaped spacers are made of PTFE to guarantee a very low friction torque.

Q Full complement ball bearings

In this case, the ball bearing has no ball separator. The bearing design can be a "ball entry" type as described in position 4, but may also be an angular contact type. This type of mounting is used only in cases where heavy loads are applied, and is often detrimental to the friction torque.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

2 . Materials for cages

If the chosen material differs from the defined standard, a two-digit codification is indicated after the cage shape symbol. For special requirements, our Design & Engineering Department is available to help you.

Phenolic resin

is used as standard for one piece machined cages or crown-type cages. This material is made up of a thermosetting synthetic resin matrix reinforced by a fabric or rolled paper frame. This material's porosity allows a lubricant to impregnate, guaranteeing a long, service-free bearing life. The utilisation limit temperature of phenolic resin is between -70°C and +120°C.

PTFE (polytetrafluoroethylene)

is used essentially for separator tubes and ring-shapped spacers. This material offers the advantages of a very low friction coefficient and of an inert chemical composition. PTFE can be used over a wide temperature range (-200°C to +250°C) and is ideal for cryogenic applications where fluid lubrication is impossible.

MELDIN®

notably type 9000, is a sintered polyimide with good mechanical properties and a high porosity which increases the cage's impregnation rate. It is generally used in applications where bearing life must be extremely long. MELDIN 9000 can be used over a wide temperature range between -204°C and +315°C.

VESPEL®

notably types SP1, SP22, SP3, are polyimides with exceptional mechanical properties and wear resistance. VESPEL® SP3 has a low friction coefficient thanks to the presence of MoS2 and is generally employed for space or cryogenic applications where temperatures can drop to 4°K. The two other references are essentially used for high-temperature applications up to +400°C.

ARMALON®

consists of a PTFE coated glass-fibre fabric frame. It has an exceptional mechanical resistance and a very low friction coefficient. It is essentially used for machined cages in high-speed applications or applications in a cryogenic environment. ARMALON is used over a wide temperature range from -253°C to +260°C.

PEEK

is a high-performance polymer (Polyetheretherketone) with high-temperature resistance properties (continuous utilisation up to +260°C) and a good wear resistance. In addition, wear resistance can be enhanced even more for grades loaded with carbon fibres. It is not subject to the hydrolysis phenomenon and can be used at a maximum temperature of +250°C in steam or water under high pressure, while preserving most of its mechanical properties. PEEK is particularly stable with respect to temperature and humidity, and resists chemical attacks or physical stresses. It is mainly employed in high-temperature or high-speed applications.

Graphite

is a self-lubricating material with a low friction coefficient. It is generally used for high-temperature applications or applications in an aqueous environment.

Steel

one piece machined or crown-type cages can be made of the steels 42CrMo4, 35NiCrMo16 or the stainless steels X105CrMo17 (440C) or X2CrNi19-11 to respond to either extreme mechanical stresses, very high speeds or high temperatures. These steels can accommodate a silver or MoS2 coating to reduce friction due to the sliding of balls with the cage's ball pockets and the guiding of the cage with bearing rings.

Copper alloy

machined cages are also proposed in various copper alloy grades to respond to specific environmental requirements (temperature, speed, non-magnetism, reduced lubrication, ...).

For more details, please contact our Design & Engineering Department.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 7 • Tolerances

The manufacturing precision of bearing rings complies with the rules derived from international standards. We determined the dimensional tolerance classes expressed in microns and detailed hereafter. This ADR choice made for the various classes allows meeting the most stringent standards.

Basic standards used and tolerance classes

- ISO 492 for normal ISO tolerance classes 5, 4, 2.
- ABMA STANDARD 12 for precision ball bearings for instruments, according to ABEC 5P, 7P, 9P and ABEC 5T, 7T.

ADR tolerance classes

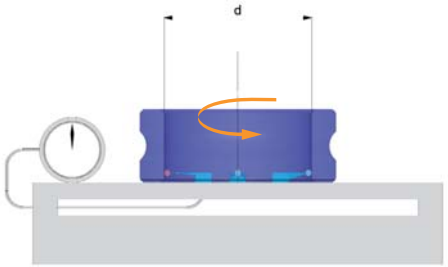
Comparison with reference Standards

ADR tolerance classes	Nominal bore d >	⩽	ISO	ABEC
T5	0	18	5	5P
	18	320	5	—
T4	0	18	—	7P
	18	250	4	—
	250	320	—	—
T2	0	18	—	9P
	18	250	2	—
	250	320	—	—
TA5	13	80	—	5T
	80	320	—	—
TA4	13	80	—	7T
	80	320	—	—

Definitions

Inner ring

- d nominal bore diameter
- d_s isolated bore diameter
- d_{mp} mean bore diameter in an isolated plane
- $d_{mp} = \frac{d_{s\,max} + d_{s\,min}}{2}$

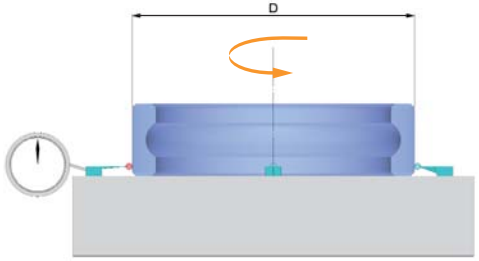


The bore is measured in two planes, and the smallest of the values (d_{mp}) is retained.

Measurements are taken on the ring on its own

Outer ring

- D nominal outer diameter
- D_s isolated outer diameter
- D_{mp} mean outer diameter in an isolated plane
- $D_{mp} = \frac{D_{s\,max} + D_{s\,min}}{2}$



The outer diameter is measured in two planes, and the largest of the values (D_{mp}) is retained.

Measurements are taken on the ring on its own

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Non thin-section ball bearings

Tolerance classes T5 - T4 - T2

Tolerances in µm
For 0 < d ⩽ 18 mm

Inner ring

Toleranced parameter	Tolerance class	Nominal bore diameter d in mm, from excluded to included 0 to 18	
		max	min
Isolated bore diameter	T5-T4	0	-5
	T2	0	-2,5
Bore out of round, taper	T5-T4	2,5	
	T2	1,3	
Radial runout	T5	3,5	
	T4	2,5	
	T2	1,3	
Bore runout with reference side	T5	7	
	T4	2,5	
	T2	1,3	
Raceway runout with reference side	T5	7	
	T4	2,5	
	T2	1,3	

Outer ring

Toleranced parameter	Tolerance class	Nominal outer diameter D in mm, from excluded to included 0 to 18		18 to 30		30 to50	
		max	min	max	min	max	min
Mean outer diameter	T5-T4	0	-5	0	-5	0	-5
Open bearing							
Isolated outer diameter	T5-T4	0	-5	0	-5	0	-5
	T2	0	-2,5	0	-3,75	0	-3,75
Outer diameter out of round	T5-T4	2,5		2,5		2,5	
	T2	1,3		2		2	
Shielded or sealed bearings							
Isolated outer diameter	T5-T4	+1	-6	+1	-6	+1	-6
Outer diameter out of round	T5-T4	5		5		5	
All bearing types							
Radial runout – max.	T5	5		5		5	
	T4	3,5		3,5		5	
	T2	1,3		2,5		2,5	
Outside cylindrical runout with reference side	T5	7		7		7	
	T4	3,5		3,5		3,5	
	T2	1,3		1,3		1,3	
Raceway runout with reference side	T5	7		7		7	
	T4[1]	5		5		5	
	T2	1,3		2,5		2,5	
Flange diameter	T5-T4	0	-25	0	-25	0	-25
Flange width	T5-T4	0	-50	0	-50	0	-50

Inner and outer rings for nominal bore diameter d, from 0 to 18 mm inclusive

Toleranced parameter	Tolerance class	0 to 18 max	0 to 18 min
Width of single bearing	T5-T4-T2	0	-25
Width of duplex pair[1]	T5-T4-T2	0	-380
Width variation[2]	T5	5	
	T4	2,5	
	T2	1,3	

[1] For an assembly comprising several bearings, the tolerance is equal to half this value multiplied by the number of bearings.
[2] For a flanged bearing, this variation applies to the flange width.
[3] For flanged bearing, apply value of tolerance class T5.
[4] Only for bearings with d > 18 mm, in ISO series 8 and 9.

Non thin-section ball bearings

Tolerance classes T5 - T4 - T2

Tolerances in µm
For 18 < d < 305 mm

Inner ring

Toleranced parameter	Tolerance class	Nominal bore diameter d, in mm, from excluded to included 18 to 30		30 to 50		50 to 80		80 to 120		120 to 150		150 to 180		180 to 250		250 to 305	
		max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
Isolated bore diameter	T5	0	-6	0	-8	0	-9	0	-10	0	-13	0	-13	0	-15	0	-18
	T4	0	-5	0	-6	0	-7	0	-8	0	-10	0	-10	0	-12	0	-15
	T2	0	-2,5	0	-2,5	0	-4	0	-5	0	-7	0	-7	0	-8	0	-10
Bore out of round[3]	T5	6		8		9		10		13		13		15		18	
	T4	5		6		7		8		10		10		12		15	
	T2	2,5		2,5		4		5		7		7		8		10	
Bore taper	T5	3		4		5		5		7		7		8		9	
	T4	2,5		3		3,5		4		5		5		6		7	
	T2	1,3		1,5		2		2,5		3,5		3,5		4		5	
Radial runout	T5	4		5		5		6		8		8		10		13	
	T4	3		4		4		5		6		6		8		10	
	T2	2,5		2,5		2,5		2,5		2,5		5		5		7	
Bore runout with reference side	T5	8		8		8		9		10		10		11		13	
	T4	4		4		5		5		6		6		7		9	
	T2	1,5		1,5		1,5		2,5		2,5		4		5		7	
Raceway run with reference side	T5	8		8		8		9		10		10		13		15	
	T4	4		4		5		5		7		7		8		10	
	T2	2,5		2,5		2,5		2,5		2,5		5		5		7	

Outer ring

Toleranced parameter	Tolerance class	Nominal outer diameter D, in mm, from excluded to included 30 to 50		50 to 80		80 to 120		120 to 150		150 to 180		180 to 250		250 to 315		315 to 330	
		max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
Mean outer diameter	T5	0	-7	0	-9	0	-10	0	-11	0	-13	0	-15	0	-18	0	-20
	T4	0	-6	0	-7	0	-8	0	-9	0	-10	0	-11	0	-13	0	-15
	T2	0	-4	0	-4	0	-5	0	-5	0	-7	0	-8	0	-8	0	-10
Isolated outer diameter	T5-T4	—		—		—		—		—		—		—		—	
	T2	0	-4	0	-4	0	-5	0	-5	0	-7	0	-8	0	-8	0	-10
Outer diameter out of round[4]	T5	7		9		10		11		13		15		18		20	
	T4	6		7		8		9		10		11		13		15	
	T2	4		4		5		5		7		8		8		10	
Outer diameter taper	T5	4		5		5		6		7		8		9		10	
	T4	3		3,5		4		5		5		6		7		8	
	T2	2		2		2,5		2,5		3,5		4		4		5	
Radial runout	T5	7		8		10		11		13		15		18		20	
	T4	5		5		6		7		8		10		11		13	
	T2	2,5		4		5		5		5		7		7		8	
Outside cylindrical surface runout with reference side	T5	8		8		9		10		10		11		13		13	
	T4	4		4		5		5		5		7		8		10	
	T2	1,5		1,5		2,5		2,5		2,5		4		5		7	
Raceway runout with reference side	T5	8		10		11		13		14		15		18		20	
	T4	5		5		6		7		8		10		10		13	
	T2	2,5		4		5		5		5		7		7		8	

Inner and outer rings

Toleranced parameter	Tolerance class	Nominal bore diameter d, in mm, from excluded to included 18 to 30		30 to 50		50 to 80		80 to 120		120 to 150		150 to 180		180 to 250		250 to 305	
		max	min	max	min	max	min	max	min	max	min	max	min	max	min	max	min
Width of single bearing	T5-T4-T2	0	-120	0	-120	0	-150	0	-200	0	-250	0	-250	0	-300	0	-350
Width of duplex pair[1]	T5-T4	0	-500	0	-500	0	-500	0	-750	0	-750	0	-750	0	-750	0	-750
Width variation	T5	5		5		6		7		8		8		10		13	
	T4	2,5		3		4		4		5		5		6		7	
	T2	1,3		1,5		1,5		2,5		2,5		4		5		6	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Thin-section ball bearings

Tolerance classes TA5 - TA4

Series A4 à A13

Tolerances in µm - For d 13 to 80 mm

Inner ring

Toleranced parameter	Tolerance class	Nominal bore diameter d in mm, from excluded to included									
		13 to 18		18 to 30		30 to 45		45 to 65		65 to 80	
		max	min	max	min	max	min	max	min	max	min
Mean bore diameter	TA5	0	-5	0	-5	0	-7,5	0	-10	0	-10
	TA4	0	-5	0	-5	0	-5	0	-7,5	0	-7,5
Series A, AD, AF 4											
Isolated bore diameter	TA5	+2,5	-7,5	+5	-10	+7,5	-15	+10	-20	+15	-25
	TA4	0	-5	+2,5	-7,5	+5	-10	+7,5	-15	+11	-19
Series A, AA, AD, AF 6-7-8-9-10-11-13											
Isolated bore diameter	TA5	+2,5	-7,5	+2,5	-7,5	+2,5	-10	+2,5	-12,5	+5	-15
	TA4	0	-5	+1	-6	+2,5	-7,5	+2,5	-10	+3	-11
All series A											
Radial runout	TA5	5		5		8		10		10	
	TA4	2,5		4		4		5		5	
Bore runout with reference side	TA5	7,5		7,5		7,5		7,5		7,5	
	TA4	2,5		4		4		5		5	
Raceway runout with reference side	TA5	7,5		7,5		7,5		10		10	
	TA4	2,5		4		4		5		5	

Outer ring

Toleranced parameter	Tolerance class	Nominal outer diameter D in mm, from excluded to included							
		18 to 28		28 to 50		50 to 80		80 to 120	
		max	min	max	min	max	min	max	min
Mean outer diameter	TA5	0	-5	0	-10	0	-10	0	-12
	TA4	0	-5	0	-5	0	-7,5	0	-10
Series A, AD, AF 4 open bearings									
Isolated outer diameter	TA5	+2,5	-7,5	+7	-17	+10	-20	+15	-27
	TA4	0	-5	+5	-10	+7	-15	+10	-20
Series A, AA, AD, AF 6-7-8-9-10-11-13 open bearings									
Isolated outer diameter	TA5	+2,5	-7,5	+2,5	-12,5	+2,5	-12,5	+5	-17
	TA4	0	-5	+2,5	-7,5	+2,5	-10	+2,5	-12,5
Series A, AD, A4 shielded or sealed bearings									
Isolated outer diameter	TA5	+5	-10	+10	-20	+12	-22	+18	-30
	TA4	+2,5	-7,5	+7	-12	+10	-17	+12	-22
Series A, AA, AD 6-7-9-11-13 shielded or sealed bearings									
Isolated outer diameter	TA5	+5	-10	+5	-15	+5	-15	+7	-20
	TA4	+2,5	-7,5	+5	-10	+5	-12	+5	-15
All series A									
Radial runout	TA5	5		8		8		10	
	TA4	4		5		5		8	
Outside cylindrical surface runout with reference side	TA5	8		8		8		8	
	TA4	4		4		4		5	
Raceway runout with reference side	TA5	8		8		10		12	
	TA4	5		5		8		8	

Inner and outer rings

Toleranced parameter	Tolerance class	Nominal bore diameter d, in mm, from excluded to included									
		13 to 18		18 to 30		30 to 45		45 to 65		65 to 80	
		max	min	max	min	max	min	max	min	max	min
Width of single bearing	TA5	0	-25	0	-25	0	-125	0	-125	0	-125
	TA4	0	-25	0	-25	0	-25	0	-25	0	-25
Width of duplex pair	TA5	0	-380	0	-380	0	-500	0	-500	0	-500
	TA4	0	-380	0	-380	0	-380	0	-380	0	-380
Width variation	TA5	5		5		5		5		8	
	TA4	2,5		2,5		2,5		4		4	

Thin-section ball bearings

Tolerance classes TA5 - TA4

Series A8 to A24

Tolerances in µm - For d 80 to 305 mm

Inner ring

Toleranced parameter	Tolerance class	Nominal bore diameter d, in mm, from excluded to included									
		80 to 120		120 to 150		150 to 180		180 to 254		254 to 305	
		max	min	max	min	max	min	max	min	max	min
Mean bore diameter	TA5	0	-12	0	-13	0	-15	0	-18	0	-20
	TA4	0	-9	0	-10	0	-12	0	-15	0	-18
Radial runout	TA5	6		6		8		10		13	
	TA4	5		5		6		8		10	
Raceway runout with reference side	TA5	9		9		10		13		13	
	TA4	5		5		7		8		10	

Outer ring

Toleranced parameter	Tolerance class	Nominal outer diameter D in mm, from excluded to included											
		80 to 120		120 to 150		150 to 180		180 to 254		254 to 305		305 to 330	
		max	min	max	min	max	min	max	min	max	min	max	min
Mean outer diameter	TA5	0	-12	0	-13	0	-15	0	-18	0	-20	0	-22
	TA4	0	-10	0	-10	0	-12	0	-15	0	-18	0	-20
Radial runout	TA5	10		10		13		15		18		20	
	TA4	5		6		8		10		11		13	
Raceway runout with reference side	TA5	11		13		14		15		18		18	
	TA4	5		7		8		10		10		13	

Inner and outer rings

Toleranced parameter	Tolerance class	Nominal bore diameter d, in mm, from excluded to included									
		80 to 120		120 to 150		150 to 180		180 to 254		254 to 305	
		max	min	max	min	max	min	max	min	max	min
Width of single bearing	TA5 - TA4	0	-125	0	-125	0	-125	0	-125	0	-250
Width of duplex pair	TA5 - TA4	0	-500	0	-500	0	-500	0	-500	0	-500
Width variation	TA5	7		7		8		10		12	
	TA4	4		4		5		6		8	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Non thin-section ball bearings — Only for information

Tolerance classes T0 - T6

Tolerances in µm
For 0 < d < 50 mm

Inner ring

Toleranced parameter	Tolerance class	Nominal bore diameter d, in mm, from excluded to included							
		0 to 10		10 to 18		18 to 30		30 to 50	
		max	min	max	min	max	min	max	min
Mean bore diameter	T0	0	-8	0	-8	0	-10	0	-12
	T6	0	-5	0	-5	0	-8	0	-10
Isolated bore diameter	T0	+2	-10	+2	-10	+3	-13	+3	-15
	T6	+2	-7	+2	-7	+2	-10	+2	-12
Radial runout	T0	8		10		13		15	
	T6	5		7		8		10	

Outer ring

Toleranced parameter	Tolerance class	Nominal outer diameter D, in mm, from excluded to included							
		0 to 18		18 to 30		30 to 50		50 to 80	
		max	min	max	min	max	min	max	min
Mean outer diameter	T0	0	-8	0	-9	0	-11	0	-13
	T6	0	-7	0	-8	0	-9	0	-11
Open bearings									
Isolated outer diameter	T0	+2	-10	+2	-11	+3	-14	+4	-17
	T6	+1	-8	+1	-9	+2	-11	+2	-13
Shielded or sealed bearings									
Isolated outer diameter	T0	+5	-13	+5	-14	+7	-18	+10	-23
	T6	+4	-11	+5	-13	+6	-15	+7	-18
All bearings types									
Radial runout	T0	15		15		20		25	
	T6	8		9		10		13	
Flange diameter	T0	—		—		—		—	
	T6			+125	-50				
Flange width	T0	—		—		—		—	
	T6			0	-50				

Inner and outer rings

Toleranced parameter	Tolerance class	Nominal bore diameter d, in mm, from excluded to included									
		0 to 2.5		2.5 to 10		10 to 18		18 to 30		30 to 50	
		max	min	max	min	max	min	max	min	max	min
Width of single bearing	T0, T6	0	-40	0	-120	0	-120	0	-120	0	-120
Width of duplex pair	T0, T6	—		0	-500	0	-500	0	-500	0	-500
Width variation	T0, T6	12		15		20		20		20	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 8 . Radial internal clearance or contact angle

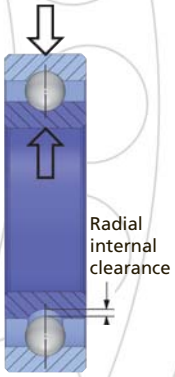
This terminology designates three types of parameters:
- Radial internal clearance,
- Contact angle,
- Axial internal clearance.

The definition of one of these parameters is sufficient to define the other two which are geometrically connected. The choice of these parameters is of primary importance to obtain the final mechanical performances of the bearing in terms of capacity, stiffness and friction torque.

1 . Radial internal clearance

The radial internal clearance in a ball bearing is the radial free space which exists between the raceways and the balls.
From a practical point of view, it is the radial relative and total displacement of a moving ring with respect to the other ring which is stationary.
Depending on the internal design (ball diameter, raceway radii), a variation in the radial internal clearance influences the contact angle and the axial clearance, and consequently load ratings, friction torque and stiffnesses. When properly chosen, all these parameters will improve the system's performances.

Particular attention must be paid to define the fits to avoid restricting the radial internal clearance during thermal stresses. In such cases, our Design & Engineering Department is available to help you calculate the effects and discuss the system's design to improve performances.



General remarks

- The definition of the radial internal clearance is generally applied to deep groove ball bearings. Angular contact ball bearings are generally defined by the contact angle's value.
- The radial internal clearance values are given under zero measuring loads.
- All deep groove ball bearings, as well as thin-section ball bearings in all versions, are supplied with the normal radial internal clearance unless otherwise specified.
- **The normal radial internal clearance** is never indicated in a bearing's reference. E.g.: **WAY5ZZT5, WA1056HTA4**
- **For a coded and therefore specific radial internal clearance**, the digit which determines the code follows the tolerance classes **T** or **TA**. Eg: **W623ZZT53, WA832RTA54** and is defined according to the tables below.
- **A radial internal clearance range which is not coded in the tables** must be fully expressed in µm after the letter **J**. This special range shall be determined by common agreement between the user and ADR ; it may fulfil a technical purpose. Eg: **W623ZZT4J310, WA12104RTA5J2040**.

Radial internal clearance codes and values

Table 1 - Deep groove ball bearings d ⩽ 18 mm

Not for thin-section ball bearings

Nominal bore diameter	Radial internal clearance codes, in µm											
	Small				Normal				Large			
d in mm	1		2		3		4		5		6	
from excluded to included	min	max	min	max	min	max	min	max	min	max	min	max
0 to 10	1	5	2	7	**5**	10	8	**13**	12	20	20	28
10 to 18	—	—	2	8	**5**	11	9	**15**	13	23	20	30

These values are adapted for instrument bearings. There are more radial internal clearance classes with narrower class ranges than those provided for in international standards in order to gain in behavioural repeatability. The radial internal clearance codes 1, 3 and 4 are not applicable to the tolerance classes T0 and T6.

Table 2 - Deep groove ball bearings, d 18 mm - 40 mm

Not for thin-section ball bearings

Nominal bore diameter	Radial internal clearance codes, in µm									
d in mm	2		Normal		3		4		5	
from excluded to included	min	max	min	max	min	max	min	max	min	max
18 to 24	0	10	5	20	13	28	20	36	28	46
24 to 30	0	11	5	20	13	28	23	41	31	51
30 to 40	0	11	6	20	15	33	28	46	40	62

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Radial internal clearance codes and values

Table 3 - Thin-section ball bearings

Series	Radial internal clearance codes, in µm									
	2		Normal		3		4		5	
	min	max	min	max	min	max	min	max	min	max
A4 / AD4 / AF4	2	8	7	15	12	22	20	30	28	40
A6 / AA6 / AB6 AD7. 8 .9 / AF7. 8. 9	3	12	10	22	18	33	30	45	42	60
A7. 8. 9. 11 .12 .13 AA7.8.9.11.12.13 AB7.8.9.11.12.13 AD10 / AF10	5	15	12	28	25	45	40	60	55	80
A10 / AA10 / AB10 AD12 / AF12	3	13	10	25	21	38	35	55	50	70
A16 / AA16 / AB16	5	20	15	40	35	60	55	90	80	120
A24 / AA24 / AB24	10	30	25	55	50	90	85	130	115	170

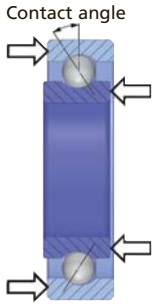
Table 4 - Thin-section ball bearings – metric series – Series 618

Basic bearing designation	Radial internal clearance codes, in µm									
	2		Normal		3		4		5	
	min	max	min	max	min	max	min	max	min	max
61805 à 61808	3	10	8	20	17	30	28	45	40	60
61809 à 61810	3	13	10	25	21	38	35	55	50	70
61811 à 61812	5	15	12	28	25	45	40	60	55	80
61813 à 61816	5	20	13	33	30	55	50	80	70	105
61817 à 61820	5	25	20	43	40	70	60	100	90	130
61822 à 61824	8	30	25	50	45	85	80	120	105	160
61826 à 61828	10	35	30	60	50	100	90	145	125	190
61830 à 61832	10	40	30	65	60	115	105	165	145	215
61834 à 61836	12	45	35	75	70	130	120	185	165	245
61838 à 61844	15	50	40	85	75	145	135	210	180	275

Tables 3 and 4: these values are specific for our products. Depending on the internal design, they correspond to a contact angle range with a mean value of:

- 10° for code 2,
- 15° for normal code,
- 20° for code 3,
- 25° for code 4,
- 30° for code 5.

2 . Contact angle



Under zero measuring load, the contact angle depends directly on the radial internal clearance for a given internal design. Angular contact ball bearings type B or H are delivered with a nominal contact angle with a tolerance assigned to it.

The normal contact angle values for angular contact ball bearings type **H** and **B** are: **15°± 2°**

For specific contact angles, the following codification is generally used: **A** + nominal angle followed by **N** + tolerance.

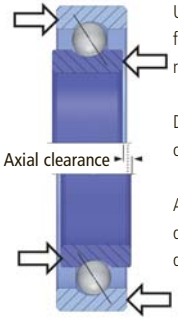
The nominal contact angle is expressed in degrees and its tolerance in (±) tenths of a degree. E.g.: **A20N25** (contact angle = 20° and tolerance ± 2.5°)

	Determination of contact angle according to codification			
	Nominal	Minimum	Maximum	Tolerance (±)
A20N25	20°	17,5°	22,5°	2,5°

Our Design & Engineering Department can supply you with the contact angle value for the radial internal clearances indicated in the previous tables.

Deep groove ball bearings may also be used to a certain extent like angular contact ball bearings to accommodate thrust loads. If a specific angle is requested, the codification is given by a radial internal clearance code. Our Design & Engineering Department can carry out the corresponding calculation.

3 . Axial clearance



Under zero measuring load, the axial clearance depends directly on the radial internal clearance for a given internal design. It is defined by the maximum axial displacement between the inner ring and the outer ring during alternate movements.

During assembly, the axial clearance is eliminated by the application of an axial load to the inner or outer rings depending on the mounting configuration.

Axial clearance is not directly codified. The radial internal clearance or contact angle code implicitly defines it. Our Design & Engineering Department can supply you with axial clearance values depending on the contact angle or the radial internal clearance.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 9 . Preload and duplex configurations

The main purpose of the preload is to eliminate the bearings internal clearances to guarantee a high operating precision. The preload value directly affects the stiffness of the rotating system guaranteeing the load ratings and the bearings service life.
The preload is rigid, measured and controlled during the manufacturing process. ADR then guarentee the exact preload value of each pair.

1 . General

In a system comprising at least two bearings, angular contact ball bearings like deep groove ball bearings can receive an initial internal axial stress called preload. It is applied by a construction called duplex configuration.

Preload is applied to:

- eliminate the axial clearance as well as the radial internal clearance,
- reduce rotational noise,
- control the displacements of a preloaded pair subjected to outside loads thanks to the axial and radial stiffness of the system,
- prevent the raceways and balls from getting damaged due to either vibrations or high rotational accelerations,
- obtain a better distribution of loads on balls to allow increasing the load rating.

Duplex configuration mounting:

The duplex configuration is an assembly and a design which guarantee a preload value. This value is obtained by creating a determined free space between the inside faces of the outer rings for face-to-face configurations (designated **DX**), and of the inner rings for back-to-back configurations (designated **DO**). During the mounting operation, the abutment of the inside faces which will be locked into that position will provide the desired preload.
Preloads are corrected until the target value is obtained by reworking faces or changing ball size. Preloads are measured at each intermediate step and in the end phase. Each duplex configuration is delivered with its individual preload curve.

Advantage of the duplex configuration controlled and measured:

The duplex configuration made by ADR offers the best technological means to **guarantee the precision** required to obtain the preload value.

This type of configuration allows guaranteeing a precisely determined preload value, that is, known and identical on all rotating systems, thereby assuring uniformity, repeatability and operation control.

Systematic control at ADR of the preload **by measurement** guarantees a real known value for the given performances of your rotating system.

The mechanical behaviour of the system can therefore be **controlled and adjusted**.

In addition, controlling this preload value allows making **realistic previsions** using our computational tools. By knowing and controlling this parameter, we can predict all characteristics, such as stiffness, friction torque, bearing life and behaviours in general.

2 . Main duplex configurations

DO "Back-to-Back"

The "opposed" duplex configuration is capable of accommodating combined and reversible radial internal and axial loads. The "**O**" arrangement of the bearings increases the angular stiffness of the assembly, as well as its resistance to moment loads.

DX "Face-to-face"

The "**X**" duplex configuration is differentiated from the DO configuration by its lower angular stiffness. This solution accommodates better the misalignments of housings, while guaranteeing good axial and radial stiffnesses.

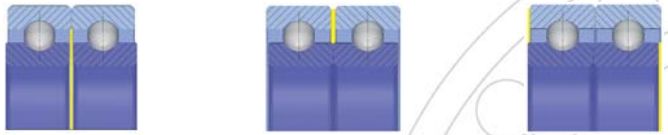
DT "Tandem"

The "Tandem" combination increases the resistance to thrust loads, but in only one direction. When radial loads are applied, the tandem assembly has to be axially preloaded.

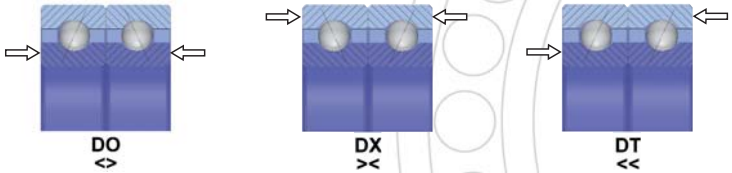
D "Universal Duplex Configuration"

The "Universal" duplex configuration is generally used to limit the number of duplex configurations for a pair of bearings. Both faces of each bearing are reworked in order to be able to obtain a **DO**, **DX** configuration according to the position of the chosen ball bearings.

Position of rings before preload



Position of rings after preloading



1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Preload value

As standard

The duplex configuration symbol is followed by a nominal preload value expressed in Newtons along with a tolerance on the nominal preload of +/- 20%.
E.g.: **DO1500** (Back-to-Back configuration with a preload of 1500 ± 300 N)
E.g.: **DX250** (Face-to-Face configuration with a preload of 250 ± 50 N)
The preload value must be consistent with the load ratings of the paired bearings.

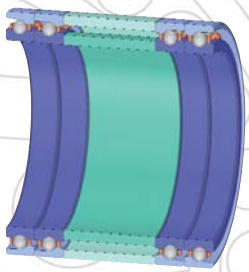
On specification (K...)

For applications which necessitate a high precision in stiffness or friction torque, a reduced preload tolerance can be determined in agreement with our Design & Engineering Department.
When the bearing reference includes a "**K**" specification for the various reasons explained on page 66, the preload value will not be fully indicated in the designation, but will be included in the "**K**". This value is reported in the technical definition of product (TDP) sheet, which will be supplied to you during the ball bearing's codification.

On design (SP...)

The configurations indicated above can be proposed with **spacers** either in the same material as the ball bearing to limit thermal impacts or in other materials depending on your applications.
The duplex or multiplex configurations can be associated with a **flanged** bearing to obtain an axial positioning of the bearings in the mounting.
A **screwed solid preload** is also proposed for super duplex ball bearings to facilitate the integration in the mounting, reduce overall dimensions, improve rigidity and positioning precision, reduce mounting times and gain in qualitative reliability.
Please contact our Design & Engineering Department to help you choose the best solution.

Multiplex of four bearings with spacers



Super duplex with flanged outer ring

Super duplex with screwed solid preload

3 . Generalities

Classification

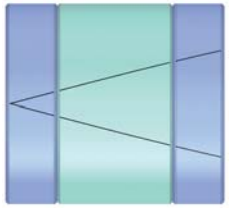
Any pairing requires a classification of bores and outer diameters of type C (see position 13 on page 59). Paired inner rings, as well as paired outer rings, will belong to the same class. This service is performed as standard on our pairs and is announced on our packages. This classification will allow you to increase fitting precision and minimise misalignments in your rotating systems, and therefore guarantee optimum performances.

Symbols indicating the position of the bearings

This marking is a visual aid to help you correctly and rapidly position the bearing assemblies during mounting phases.
The duplex configurations (**DO** and **DX**) and other multiplex configurations have a single 30° angle "V" symbol etched on the outer diameters of the bearings. This V symbol must be properly positioned when the set of bearings is mounted in the housing.
For tandem sets **DT**, the tip of the V shows the point where the thrust load is applied on the inner ring.

DO, DX, DT

DO, DX with Inner & Outer Spacers



DO Flanged bearing , Unflanged bearing

For the **universal duplex configuration** type **D**, each bearing is marked with a 30° angle V symbol. The tip of the V shows the point where the force is applied on the inner ring.
The mounted configuration's marking will represent an **O** (<>) for a **DO** pair and an **X** (><) for a **DX** pair.

Symbols indicating the high points of radial runout

The alignment of the rings radial runouts allows reducing to the maximum rotational eccentricities, which can generate angular positioning errors and vibrations.
These markings are aligned throughout all the pairing operations in the production process at ADR. The alignment of these markings during mounting guarantees the repeatability of the measured performances in our clean rooms.
The high points are symbolised by lines on the surfaces of the inner rings. The V symbol aligns the high points on the outer rings.

Preload measurement curves

All bearing pairs preloaded at ADR are systematically controlled to assure that the preload value conforms to the defined tolerance. For this control, we use devices equipped with high precision force and movement sensors. The curve of one in respect to the otherone allows identifying the preload point. You will find below an example of a preload control report.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Example of a preload measurement

ADR CP V3.0

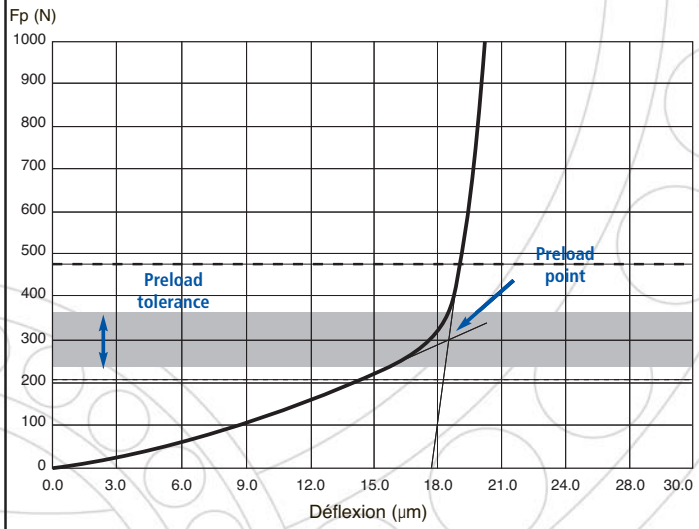
RAPPORT DE CONTROLE *(Control report)* — Date : 18-10-2008

MESURE DE PRECHARGE *(Preload measurement)* — Heure : 11:08:07

Visa : DLI

Observations *(Comments)*

REFERENCE **WA1145ETA45DX300H77**			Conditions du contrôle	
NUMERO OF : **404236**	CLASSE : **11**		N° capteur : (sensor number)	1370
NUMERO : **3**	Const1 : **1**	Const2 : **2**	Limite du capteur : (sensor limit)	10000
	Valeur mesurée	Tolérances	N° du Tesa : (Tesa number)	303031
PRECHARGE (N) *(preload)*	**298.8**	300 360	N° du pont : (amplificator number)	9101 N40
Déflexion (µm)	18.6	240	Masse d'outillage (N) : (tooling mass)	0
			N° palpeur : (transducer number)	PT091



Nom du fichier : c:\precharg\Wa1145ET\404236\3.adr

The first part of the curve represents the axial deflection of the bearing pair during axial loading before the pair's rings get in contact.

The graph shows a break in the curve at contact between the free rings (preload point).

The shaded area of the graph represents the preload tolerance to be respected where the preload point must appear.

4 . Possible duplex/multiplex configuration codifications

Code	Number of bearings	Usual designation	Symbols of contacts	Allowable outside loads	Moment of rigidity at switchover
D	2	Universal Duplex	<> ou ><		+ ou --
DO	2	Back-to-Back Duplex	<>		+
DX	2	Face-to-Face Duplex	><		- -
DT	2	Tandem Duplex	<<		- - -
TT	3	Triplex	<<<		- - -
TOT	3	Triplex	<>>		+
TXT	3	Triplex	>><		- -
QOT	4	Multiplex	<<>>		+ +
QXT	4	Multiplex	>>><		-
QOTT	4	Multiplex	<>>>		+
QXTT	4	Multiplex	>><<		- -
POTT	5	Multiplex	<<>>>		+ +
PXTT	5	Multiplex	>>><<		-
POQT	5	Multiplex	<>>>>		+ +
PXQT	5	Multiplex	>><<<		-
HOTT	6	Multiplex	<<<>>>		+ + +
HXTT	6	Multiplex	>>><<<		+
HOQT	6	Multiplex	<<>>>>		+ + +
HXQT	6	Multiplex	>>><<<		-

For any special requests, please contact our Design & Engineering Department for assistance.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 10 • Vibration level

The vibration level in a ball bearing is a measurable characteristic. The noise resulting from the rotation of a system of bearings depends as much on its usage context as on its intrinsic qualities. Our own standards guarantee for all qualities a low vibration level for a reference speed and a reference lubrication.

When the vibration level becomes a major characteristic, we can control each bearing according to various sensitivity criteria with the following codification.

As standard

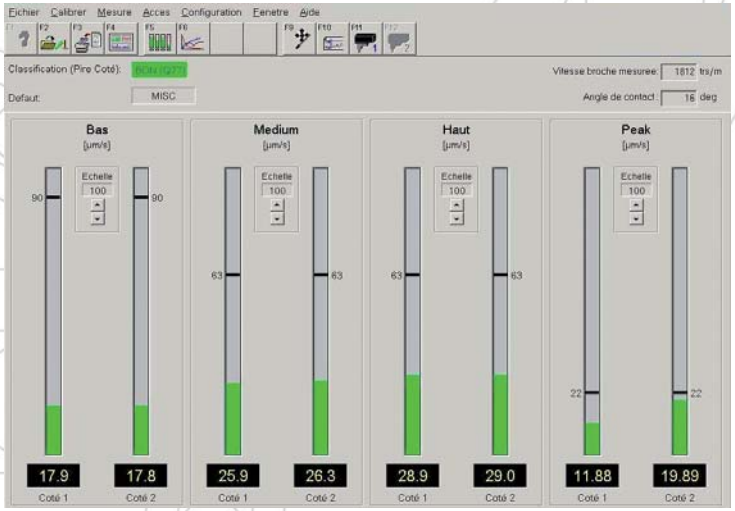
W	**+ "3 digits"**	Vibration level on oiled bearing
WG	**+ "3 digits"**	Vibration level on greased bearing

The "3 digits" following the vibration level code correspond to the vibration ranges controlled on assembled bearings. These ranges are given, respectively, for 3 frequency bands based on internal standards.
This type of control cannot be applied to large diameter bearings. Please consult us in such a case.

- W201 Allowable reference vibration level.
- W200 Reduced vibration level for bearings made of steel 100Cr6 only.
- W100 Very low vibration level for tolerance classes minimum T5 and steel 100Cr6 only.

On specification (K...)

When the vibration level becomes a critical characteristic, levels lower than those previously indicated may be supplied on a particular specification established in agreement with our Design & Engineering Department.
For the same intrinsic quality of the bearing's parts, the selected lubricant may significantly influence the vibration level. Please consult us for recommendations. You will find below an example of vibration measurements such as those taken at ADR.



Position 11 • Surface treatment and coating

We propose a wide choice of surface treatments and coatings to meet special requirements in specific environments. ADR will be able to help you make your choices according to your application.

P Passivation

As standard

The purpose of the passivation treatment is to improve the corrosion resistance of stainless steels. It may be proven useful when ball bearings are exposed directly to the exterior environment.
Passivation is a special process performed at ADR on rings and balls.

On specification (K...)

DLC (Diamond Like Carbon): the DLC coating comes in the form of a thin layer (a few microns) of amorphous carbon obtained by plasma deposit techniques type PVD or PECVD. DLC possesses a high hardness (1000 to 5000 Vickers) and a friction coefficient generally very low (0.1 to 0.2). These proprieties allow improving the wear resistance of metal surfaces, reducing the rubbing of contacts in motion and reinforcing the corrosion resistance.

BALINIT® C: the BALINIT® C coating consists of WC/C layers having a hardness of 1000 to 1500HV0.05 with a friction coefficient on steel (dry) of 0.1 – 0.2 and a maximum utilisation temperature of 300°C. BALINIT® C reduces adhesive wear (jamming, sticking) thanks to its low friction coefficient and its good sliding properties. It resists heavy loads with reduced or dry lubrication, and is bio-compatible.

Cadmium coating: cadmium coating is a surface treatment which consists of electrolytically depositing a cadmium layer. The cadmium does not alter when in contact with air and resists very well in a marine environment. This treatment is particularly used in the aeronautical field to protect the external surfaces of ball bearings.

Kolsterising®: the treatment consists of changing the surface of the structure of austenitic stainless steels type AISI 304 and 316. A large diffusion of carbon in the material realised in the gaseous phase and at low temperature confers major mechanical properties and a high hardness (1000HV0.05) on layers ranging from 20 to 30 µm. This coating significantly improves wear resistance and reduces the problems of jamming, while preserving the excellent corrosion resistance property of austenitic stainless steels.

Anti-migration coating: the anti-migration deposit is a fluorinated varnish which prevents the migration of oil outside the bearing. The anti-migration barrier is deposited on the adjacent faces of the bearing runway. The depositing areas of the treatment are to be defined with our Design & Engineering Department.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 12 • Torque

This term designates two concepts:
- starting torque, that is, the torque necessary to start the bearing rotation,
- running torque, that is, the torque necessary to keep the bearing rotating.

These two important criteria condition the definition of the bearing.

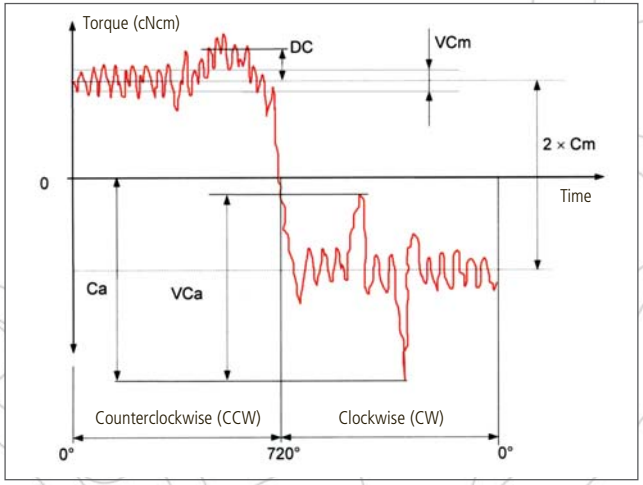
Friction torque characterises the efficiency and sensitivity of a bearing. It is a key parameter for precision ball bearings.

DEFINITIONS

Starting torque (CD): torque necessary to start one ring rotating with respect to the other.

Running torque (Cm) : torque necessary to keep a ring rotating at a specific speed and under a specific load. The measurement is taken at the vertical axis with an axial load for a single bearing or under a preload for paired bearings. The standard rotating speed is 2 revolutions per minute; the torque measurement is recorded in cN.cm over 4 revolutions, with 2 revolutions in each direction.

SCHEMATIC REPRESENTATION OF THE RUNNING TORQUE



Cm **Mean torque** during the entire measurement
Ca **Peak torque**: peak coupling point
VCa **Maximum hash width** of the running torque
VCm **Average hash width** of mean torque
DC **Torque derivation**: maximum deviation between the running mean over 600 points and the mean value (CR)

For information: the starting torque value can usually attain twice the running torque value.

As standard

— **reference running torque** guaranteed. The reference running torque values are indicated in the tables in part 3 of the catalogue for bearings with a bore (d) less than or equal to 10 mm. For a specific definition, the running torque can be indicated to you on the Technical Definition of Product (TDP) sheet.

ML maximum running torque guaranteed, less than 80 % of the reference torque.

MR maximum running torque guaranteed, less than 80 % of the reference torque supplied with its individual record sheet.

The reference torque satisfies the following measurement conditions:
- Runing torque: measurement unit cN.cm
- Speed: 2 rpm
- Vertical axis
- Thrust load: 0.75 N for D ⩽ 10 mm
  4.00 N for D > 10 mm
- Open or shielded bearings, made of 100Cr6 or X105CrMo17 (not valid for sealed ball bearings)
- With one- or two-piece pressed metal cage
- In tolerance class T5 or better
- Radial internal clearance code 5 only
- Lubrication with light-duty oil for instruments, viscosity between 20 and 30 cSt at 20°C
- Control room temperature: 20 to 24°C

On specification (K...)

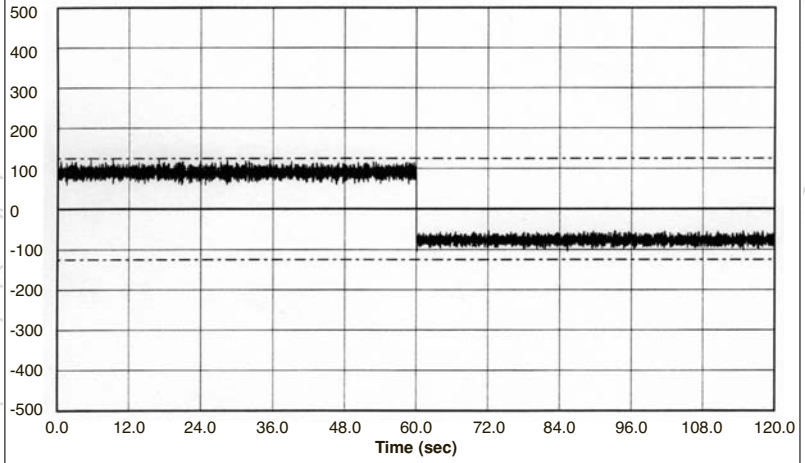
- For specific or non specific designs, **friction torque values can be guaranteed by ADR** for all assemblies where the reference friction torque is not defined. Our Design & Engineering Department remains at your disposal to perform predictive calculations necessary to design your rotating systems.
- Likewise, for all designs, **the measurements of these torques** can be individually supplied on request.
- **An individual starting torque measurement** may be made on specification and will be handed over in a summary table at delivery.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Example of a control report of recorded running torques

ADR	ADR BTT10 V3.6	
	CONTROL REPORT	Date: 19/02/2008
	BEARING FRICTION TROQUE TRACE	Time: 08/10/28
		Visa: CDU

Product order: 405098				
Bearing reference: WAY30RT4DO150W201MRC44			Experimental conditions	
Bearing number: 1			Load (N):	450.
Torque (cNcm)	Measured values	Tolerances	Speed (rpm):	2.
Mean torque (Cm)	83.32	125.00	Tool radius (cm):	3.2
Peak torque (Ca)	123.57	—	Tuning masse (g):	145.
Maximum hash width (VCa)	64.51	—	Sensor n°:	J008
Average hash width (VCm)	21.81	—	Temperature (°C):	20.
Torque derication (DC)	1.04	_	RHL (%):	—



Data file name: C:\BTT10\Data\405098\	Edition date: 19/02/2008

Position 13 . Calibration

To optimise rotating system performances, it is sometimes necessary to fit bearings very precisely with shafts and housings. The need to reduce geometric tolerances on bearings may then be expressed.
The calibration of bearing diameters is a possible response and this in order to define more precisely geometric tolerances.

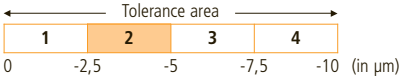
- A calibration may be **requested** by measurement and marking in order to know more precisely the bearing's dimension and be able to fit it better.
- A calibration may be **imposed** in order to deliver bearings with reduced dimensional tolerances.

For precision ball bearings, the scope of the tolerance on bore and outer diameter can lead to a division into "classes" and so better control the fitting clearances with respect to shafts or housings.

DEFINITION

Calibration: operation which consists of dividing the tolerance into classes and marking the position of the dimension considered in this system.

E.g.:



Our codification system is based on the following principles:

1 . Requested calibration

a - Upon the order

- the letter C designates the calibration in the bearing reference (designation),
- the first digit designates for bore d the number of desired classes,
- the second digit designates for outer diameter D the number of desired classes,
- if one of the dimensions (d or D) is not requested to be calibrated, it is designated by a zero,
- if d and D are requested in two classes, the letter C is sufficient, the two digits 2 (C22) being implicit,
- the scope of a class is the total tolerance of the considered diameter divided by the number of desired classes.

Example: For 4 classes with a bore tolerance of 5 µm, the scope of each class is 1,25 µm

Examples of codification for requested calibrations

Code	Number of classes
C	2 classes on d and D (understood to be C22)
C20	2 classes on d only
C40	4 classes on d only
C02	2 classes on D only
C04	4 classes on D only
C24	2 classes on d and 4 classes on D
C42	4 classes on d and 2 classes on D
C44	4 classes sur d and D

d: Bore diameter
D: Outer diameter

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

b - On delivery

On the packaging on the bearings, an anotation will be written accordingly as follow:

- the letters **CL** designate the calibration classes delivered.
- the **first digit** designates **the bore position** in the calibration system specified in the reference (designation).
- the **second digit** designates **the outer diameter position** in the calibration system specified in the reference (designation).
- the smallest digit always designates the class closest to the maximum bore or outer diameter.

Example: Requested calibration: **C**
Calibration into 2 classes
Tolerance scope: 5 µm for d and D

d \ D	0 -2.5 µm (1)	-2.5 -5 µm (2)
0 -2.5 µm (1)	CL11	CL12
-2.5 -5 µm (2)	**CL21**	CL22

Example: Delivered calibration: **CL21**
Bore diameter Code 2, i.e., d -2.5 to -5 µm
Outer diameter Code 1, i.e., D 0 to -2.5 µm

Example of designation

On the order: **WA714ETA42DO100C44H77**
Bore tolerance (d): 0 -5 µm
Outer diameter tolerance (D): 0 -5 µm
The production is run and measured at 100 %.
At delivery: **WA714ETA42DO100C44H77**

The bearings are announced in the class to which they belong.
The delivered calibration is marked on the package label.

E.g.: CL23
Bore (d) between: -1.25 to -2.5 µm
Outer diameter (D) between: -2.5 to -3.75 µm

E.g.: CL11
Bore (d) between: 0 to -2.5 µm
Outer diameter (D) between: 0 to -2.5 µm

Example of package labels

2 . Imposed calibration on request

In this case, the bearing designation directly comprises the CL code and the class choice attached to the C calibration request. This codification means that the tolerance interval is reduced. It is important to consult the Design & Engineering Department to confirm the feasibility of the selected imposed calibration.

Example of a designation

On the order: **WAY5T5C44CL31**
Bore (d) between: -2.5 to -3.75 µm
Outer diameter (D) between: 0 to -1.25 µm
Only the ball bearings made in CL31 will be delivered.

3 . Remarks related to calibration

- Only bearings in tolerance classes T5 or better can be requested calibrated on the order.
- A class scope less than the out of round or taper tolerances does not lead to any restriction on them, unless otherwise specified on the order and prior to manufacture.
- For bearings other than thin-section ball bearings, the calibration is based on the minimum measured bore value and the maximum measured outer diameter value.
- For thin-section ball bearing series, due to the large "out of round" values, the calibration is based on the mean measured bore value or the mean measured outer diameter value.
- For bearings requested calibrated without any special requirement, the delivered distribution may be of any value.
- For a number of classes other than 2 or 4, please consult our Design & Engineering Department.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 14 . Lubrication

Depending on the application, environment and system requirements, selecting the right lubricants is of primary importance. Knowledge about tribological phenomena is one of the key parameters of our know-how offered to you. We can propose appropriate solutions involving more than 300 lubricants (fluid or dry) which we use and whose limit dates we manage.

Generally, lubrication is aimed at avoiding contact between moving parts by using a lubricating substance which limits the deterioration of surfaces. For a bearing, the lubrication therefore reduces **the rolling friction** of the balls with rings and **the sliding friction** of the cages with balls and rings.
Selecting the right lubrication is therefore of primary importance to guarantee the proper operation of ball bearings. The lubrication method must take into consideration the operating and environmental conditions as viewed by the bearing (speed, temperature, loads, torque, …..). We can supply upon request detailed indications according to your application's requirements.
The lubrication of a ball bearing is divided into two main lubrication types:
Fluid lubrication, which is divided into two lubricant families: oils and greases. These lubricants are extensively used for operating temperatures between -70°C and +250°C.

Oils are composed of a mineral or synthetic viscous fluid and additives. They are generally dedicated to applications necessitating very low friction torques or high rotational speeds. An impregnation process under vacuum performed at ADR allows porous cages to sufficiently absorb oil to increase bearing life.

Greases are composed of a soap or a gel poured in a mineral or synthetic oil. Their texture varies according to the soap and oil used and its manufacturing process. A large number of applications with ball bearings use greases due to their easy implementation. They assure good lubrication at moderate running speeds and protect bearing raceways from oxidation, particles or foreign liquids.

A controlled utilisation of these two types of fluid lubrications can be proposed to optimise the bearing's operation and resistance.

Dry lubrication concerns the use of solid coatings or self-lubricating cages. Below -70 °C or above +250 °C, conventional lubricants are often unreliable. So ADR proposes various dry lubrications adapted to special contexts, such as high vacuum environments or high or low temperature applications. (Cf also position 11 – surface treatment and coating). For these extreme operating cases, please consult our Design & Engineering Department.

—

As standard

- **Shielded ball bearings and sealed ball bearings**: when no specific indication is mentioned in the designation, the ball bearings are lubricated with grease, ADR code **G20** (Esso Beacon 325), regardless of the tolerance class.
- **Open ball bearings**: when no specific indication is mentioned in the designation, the ball bearings are lubricated with oil, ADR code **H47** (Klüber Isoflex PDP 38), regardless of the tolerance class (**H47** oil viscosity at + 20 °C : 25 mmÇ/s = 25 cSt)

In codification

A wide range of lubricants is proposed to meet application requirements. Our Design & Engineering Department can help you choose the right lubrication and its codification.
For preloaded assemblies type "**DO**", "**DX**", "**AD**", etc…, the amount of lubricant in mg is given per ball row

1 . Oils

H--

H + "Digits" Designates the code of the oil used in the ball bearing **E.g.: H47**.

H + "Digits" + D Designates the code of the oil used which underwent a prior **degassing under vacuum** process, significantly reducing the evaporation of the oil from the ball bearing. This degassing also minimises lubricant migration and so the pollution of mechanical, electronic or optical units adjacent to the bearing. **E.g.:H47D**.

V + "Digits" Designates an **impregnation under vacuum of porous cage** process with the mentioned oil code. In this process, the cage is used as an oil reservoir to guarantee a continuous lubrication through the bearing's life. This lubrication method is necessary for a large number of space applications and mechanisms requiring extremely long bearing lives without any servicing **E.g.: V47**.

H + "Digits" + L Designates the code of the oil used with a specific amount for the application's requirements. **L** + lower and higher values in mg. **E.g.: H47L510**.

Table of oils mainly proposed

ADR Code	Origin	Designation	Recommended temperatures in C°		Standards		
			min	max	MIL	AIR	NATO
H20	Shell	Aeroshell Fluid 12	-60	+150	L6085D	3511	147
H23	BP	Turbo Oil 2389	-54	+175			
H46	Dupont de Nemours	Krytox 143AB	-43	+232			
H47	**Kluber**	**Isoflex PDP 38**	**-65**	**+100**	**L6085A**	**3511**	**147**
H50	Kluber	Isoflex PDP 65	-50	+120			
H55	BP	Extra Turbo Oil 274	-50	+150			149
H70	Mobil Oil	SHC 624	-40	+150			
H72	Dupont de Nemours	Krytox 143 AC	-35	+288			
H77	Anderol	Anderol 402	-53	+175	L6085C		
H78	Castrol	Brayco 815Z	-65	+204			
H81	NYE Lubricants	NYE Synthetic Oil 173	-35	+125			
H83	Solvay Solexis	Fomblin Z25	-75	+250			
H94	Mobil Oil	Spectrasyn 6	-45	+170			
H97	Dupont de Nemours	Krytox 143AA	-51	+177			
H100	Lubcon	Turmofluid H50	-60	+100			

The "digits" following the lubrication code correspond to the lubricants codified by ADR.
The data given in this table are an extract from our lubricant database.
The table next page indicates currently used oil codifications. This information is given as a guideline and may be subjected to change.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

2 . Greases

G..

G + "Digits" Designates the code of the grease used in the ball bearing. **E.g.: G20**.

GF + "Digits" Designates the code of the grease used and applied by **dilution – evaporation**. This method is used to spread the grease better in the bearing. **E.g.: GF20**.

G + "Digits" + P Designates the code of the grease used with a **full grease filling** (100% of the bearing's free volume). Completely filling a ball bearing with grease allows increasing the protection of the bearing against external pollutions.
Warning: this lubrication method may only be used for slow speeds. **E.g.: G20P**.

G + "Digits" + R Designates the code of the grease used with a reduced grease filling.
For high rotational speeds, it is recommended to use a reduced grease filling to avoid intensive heating of the grease in the bearing. **E.g.: G20R**.

G + "Digits" + L Designates the code of the grease used with a specific amount for the application's requirements.
L + lower and higher values in mg. **E.g.: G20L512**.

Table of greases mainly proposed

ADR Code	Origin	Designation	Recommended temperatures in C°		Standards		
			min	max	MIL	AIR	NATO
G20	**Esso**	**Beacon 325**	**-54**	**+121**	**G 3278A**	**4225A**	**G350**
G31	Shell	Alvania Grease RL2	-20	+120	G 18709		
G39	Kluber	Isoflex Super LDS 18	-50	+120	G 7118A	4210A	
G63	Kluber	Isoflex LDS 18 Special A	-50	+120	G 23827		
G66	Mobil Oil	Mobilux EP2	-15	+120			
G68	NYE Lubricants	Rheolube 374C	-40	+150			
G74	Shell	Aeroshell Grease 7	-73	+130	G23827B		
G81	Mobil Oil	Mobil Grease 28	-54	+176	G 81322	4205A	
G85	Kluber	PDB 38 CX1000	-70	+120			
G86	Dupont de Nemours	Krytox 240 AB	-40	+232	G 38220A		
G87	Dupont de Nemours	Krytox 240 AC	-34	+285	G 27617A		
G91	Dupont de Nemours	Krytox 240 AZ	-54	+150			
G105	Dupont de Nemours	Krytox 283 AB	-40	+232			
G112	NYE Lubricants	Rheotemp 500	-54	+175			
G121	Kluber	Asonic GLY 32	-50	+140			
G133	Kluber	Barrierta IL	-45	+200			
G148	Castrol	Braycote 601EF	-80	+204			
G149	Map	Maplub SH 051A	-40	+100			
G150	Dow Corning	Molykote M-77	-46	+400			
G151	Map	Maplub SH 050-A	-40	+100			
G154	Map	Maplub PF 101-A	-60	+250			
G159	Kluber	Kluberalfa HX83-302	-60	+240			
G160	Kluber	Kluberalfa YV 93-302	-60	+200			
G161	NYE Lubricants	Rheolube 2000	-45	+125			
G164	Shell	Aeroshell Grease 33MS	-73	+121	G21164D		
G166	Lubcon	Turmogrease Highspeed L252	-40	+120			
G167	Shell	Aeroshell Grease 22	-64	+204	PRF-81322F		G395

The "digits" following the lubrication code correspond to the lubricants codified by ADR.
The data given in this table are an extract from our lubricant database.
The table above indicates currently used grease codifications. This information is given as a guideline and may be subjected to change.

3 . Dry lubrication

LS2 ADR proposes a lubrication with a MoS_2 powder (molybdenum disulfide) deposited mechanically on the bearing balls and runways. This MoS_2 lubrication is generally used in high vacuum environments or high temperature applications.

On specification (K...)

MoS_2 The molybdenum disulfide coating (MoS_2) is deposited by PVD (Physical Vapor Deposition) on bearing runways. MoS_2 has a hexagonal laminar structure which is oriented parallel to the sliding direction under the effect of friction. It allows significantly improving tribological performances, such as the friction coefficient, and resisting high load stresses. The MoS_2 coating's performances allow improving bearing life in severe environments like in space.

Silver deposit Silver coatings are proposed for bearing cages or bearing runways. The silver deposit limits jamming phenomena and is particularly effective for very high temperature applications.

WS_2 The tungsten disulfide coating (DICRONITE® DL5) in laminar form with a thickness less than 0.5µm has a very low friction coefficient which limits friction, abrasive wear and heating of contact surfaces. It can also be specially used in wide temperature ranges between -188°C and +538°C and in an extremely high vacuum environment.

If a different oil or grease is necessary, please do not hesitate to contact us so that we can propose a suitable solution from among our 300 lubricant references. Otherwise, we can propose a custom choice specific to your needs.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

Position 15 • Specification

Since we work on order and on specifications which we develop in tight collaboration with our customers, some characteristics are not coded as standard in our catalogue and so must be specially codified.

K Specification

K + digits (2 to 4 digits)
The specification is added in the following cases:

- when the requested characteristics cannot be coded in the designation (regardless of the position).

  Example : materials other than those codified (see position 1 on page 18 to 21), controls requested at delivery, treatments and coatings other than passivation, dimensional and geometric tolerances different from the tolerance tables (see position 7 on page 36 to 42), internal designs different from the rules used, ….
  Z61802HQT5K4099 (in this example, the specification indicates, among others, the high speed steel grade used in the ball bearing).

- to simplify the designation when it exceeds 23 characters.
  Example : WA16104HTA54DO1200C20CL10G20R (29 characters)
  which is transformed into **WA16104HTA54DOK4330** (19 characters).

For any designation containing a specification number for one of the reasons described above, the positions 10 to 14 will be included in this specification to simplify the designation.

We will supply you on request a Technical Definition of Product (TDP) sheet; it summarises all this information.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
W		A725			N	TA4		DO						K2458
	F	R2	B				J1830					C42	G68	
W		SP11293				TA4								K2440
W		6201		ZZ		T4	6		W201	P	ML		H77	

LOAD RATING

The performance of instrument bearings is related not only to their precision, sensitivity (low torque) and silent operation, but also to their behaviour when sustaining loads of all types, whether radial, axial or combined, and applied dynamically or statically.

The load ratings are indicated in the bearing tables in chapter 5.

Basic dynamic radial load rating C: value of the radial load of constant strength and direction that can be theoretically sustained for a nominal bearing life of 1 million revolutions.

Basic static radial load rating Co: value of the static radial load which will cause a total permanent deformation (ball and raceway) on the most heavily stressed ball/raceway contact (4 200 MPa) of approximately 0.0001 of the ball diameter.

In the case of an angular contact ball bearing with a single ball row, these two definitions involve the radial load which causes a purely radial displacement of the rings with respect to one another.

The basic dynamic radial load rating C should be multiplied by 1.62 for DO, DX and DT duplex configurations and by 2.16 for TOT and TT triplex configurations.

The minimum static thrust load rating C_0 should be multiplied by 2 for DO, DX and DT duplex configurations and by 3 for TOT and TT triplex configurations.

The minimum static thrust load rating is also given in the thin-section ball bearing tables. It is calculated by reference for a contact angle of 15° and for the version with the minimum number of balls.
For instance, depending on the series, this value may be increased from 50% to 85% by increasing the contact angle and by changing the design within the limit of the groove depths.

BEARING LIFE

Bearing life depends on the appropriate definition of the bearing with respect to the application and the environment. It also depends on the attention given by the user to precision, geometry and cleanliness of the mating parts and the mounting conditions. If lubrication is made for life in small quantity without renewal, the lubricant becomes of major importance with respect to the material and can significantly change the bearing life resulting from the conventional calculation thereafter based on the fatigue of the materials used to make the balls and rings.

A few definitions regarding the bearing life

Life: for an individual bearing, the number of revolutions that one of its rings will make with respect to the other before the appearance of the first sign of fatigue of the material of one of the rings or one of the balls.

Reliability: for a group of bearings apparently identical and running under the same conditions, the percentage of these bearings expected to reach or exceed a given life. The reliability of an individual bearing is the probability of it reaching or exceeding a given life.

Nominal life (or basic rating life): for an individual bearing, or for a group of bearings apparently identical running under the same conditions, the life associated with a reliability of 90%. 50% of the bearings considered are expected to last five times longer.

Life formulas: the nominal life of a bearing, the basic dynamic radial load and the applied load are related by the formula:

Nominal life:

in millions of revolutions $L_{10} = \left(\frac{C}{P}\right)^3$

in number of operating hours $L_{10h} = \frac{10^6}{60n}\left(\frac{C}{P}\right)^3$

Symbols used in the formulas and table of this chapter

Symbols	Meaning
C	Basic dynamic radial load, in N
P	Equivalent dynamic radial load, in N
n	Rotational speed, in rpm
F_r	Radial component of the load, in N
F_a	Axial component of the load, in N
X	Radial coefficient of the bearing
Y	Axial coefficient of the bearing
P_o	Equivalent static radial load, in N
X_o	Radial coefficient of the bearing
Y_o	Axial coefficient of the bearing

EQUIVALENT LOAD RATINGS

Equivalent dynamic radial load:

A dynamic radial load that is constant in magnitude and direction under which the reached life would be the same as that with effectively applied loads. It is given by the formula:

$P = XF_r + YF_a$

Equivalent static radial load:

A static radial load that would cause the same total permanent deformation on the most loaded contact as that obtained under effectively applied loads. It is given by the formula:

$P_o = X_oF_r + Y_oF_a$ **(If $P_o < F_r$ take $P_o = F_r$)**

These equivalent load concepts allow making a first approximative calculation to validate a pre-sizing. For a more precise calculation, please contact our Design & Engineering Department.

Factors X and Y and Factors X_o and Y_o

In the table below, note that:

[1] • For the DO or DX pairs, take $2F_a$ and the value C_o of the pair.

[2] • For the DO or DX pairs, X0 and Y0 are to be multiplied by 2.

[3] • The values of X, Y and e to be retained for intermediate contact angles are obtained by linear interpolation.

Contact[3] angle	$\frac{F_a}{C_o}$[1]	e	Single bearing or DT pair						DO or DX pairs			
			$\frac{F_a}{F_r} \leqslant e$		$\frac{F_a}{F_r} > e$				$\frac{F_a}{F_r} \leqslant e$		$\frac{F_a}{F_r} > e$	
			X	Y	X	Y	X_o[2]	Y_o[2]	X	Y	X	Y
5°	0.014	0.23	1	0	0.56	2.30	0.6	0.5	1	2.78	0.78	3.74
	0.028	0.26				1.99				2.40		3.23
	0.056	0.30				1.71				2.07		2.78
	0.085	0.34				1.55				1.87		2.52
	0.110	0.36				1.45				1.75		2.36
	0.170	0.40				1.31				1.58		2.13
	0.280	0.45				1.15				1.39		1.87
	0.420	0.50				1.04				1.26		1.69
	0.560	0.52				1.00				1.21		1.63
10°	0.014	0.29	1	0	0.46	1.88	0.6	0.5	1	2.18	0.75	3.06
	0.029	0.32				1.71				1.98		2.78
	0.057	0.36				1.52				1.76		2.47
	0.086	0.38				1.41				1.63		2.29
	0.110	0.40				1.34				1.55		2.18
	0.170	0.44				1.23				1.42		2.00
	0.290	0.49				1.10				1.27		1.79
	0.430	0.54				1.01				1.17		1.64
	0.570	0.54				1.00				1.16		1.63
15°	0.015	0.38	1	0	0.44	1.47	0.5	0.46	1	1.65	0.72	2.39
	0.029	0.40				1.40				1.57		2.28
	0.058	0.43				1.30				1.46		2.11
	0.087	0.46				1.23				1.38		2.00
	0.120	0.47				1.19				1.34		1.93
	0.170	0.50				1.12				1.26		1.82
	0.290	0.55				1.02				1.14		1.66
	0.440	0.56				1.00				1.12		1.63
	0.580	0.56				1.00				1.12		1.63
20°	—	0.57	1	0	0.43	1.00	0.5	0.42	1	1.09	0.70	1.63
25°	—	0.68			0.41	0.87		0.38		0.92	0.67	1.41
30°	—	0.80			0.39	0.76		0.33		0.78	0.63	1.24
35°	—	0.95			0.37	0.66		0.29		0.66	0.60	1.07

LIMITING SPEED

The limiting rotational speed of a bearing depends especially on its type, dimensions and the load it supports. Other factors such as lubrication method, cage type, and internal clearance values must, however, be taken into consideration.
Warning: the values given in the bearing tables are approximative. They apply to relatively lightly loaded bearings and for rotating inner rings. For utilisation speeds higher than those indicated in the tables, please consult our Design & Engineering Department.

FITS

To define a correct fit, it is necessary to take into consideration:
- the quality of the selected bearing,
- the geometry of the shaft and housing, which must be matched to that of the bearing,
- the quality of surface finish of the shaft and housing seatings,
- the rotational speed of the moving part, the direction and the frequency of the applied loads,
- the materials from which the bearing's mating parts are made,
- the possible effects of temperature,
- the bearing's radial internal clearance, which can determine the fit or be determined by it.

Fitting recommendations

For light alloy housings, choose a tighter fit when thermal expansions are likely. When a sliding fit (clearance) is considered, it is advisable to insert a ground or broached steel liner between the housing and the bearing.

For these classes, the "fit" letter code is selected for both the shaft and the housing in the following order:
- Table 1: allows obtaining a code number for each main operating condition,
- Table 2: indicates the sets of codes corresponding to the most frequently used applications,
- Table 3: gives in conjunction with Table 2 the representative letter code for the recommended fit.

Table 1

Stationary shaft	**1**
Rotating shaft	**2**
Stationary housing	**3**
Rotating housing	**4**
Face-clamped inner ring	**5**
Unclamped inner ring	**6**
Tight ring (interference)	**7**
Sliding ring (clearance)	**8**
Slow speed	**9**
Moderate speed	**10**
High speed	**11**
Light load	**12**
Moderate load	**13**
Heavy load	**14**
Very low runout	**15**
High radial rigidity	**16**
Oscillations	**17**
Vibrations	**18**
Light-alloy housing	**19**

Table 2

Shaft	Housing
1.5.10.13	3.8.9.10.13
1.8.9.12	3.8.9.13.17
1.5.11.12.15.16	3.10.15.16
2.5.6.12	3.10.11.14
2.6.10.12.15.16	3.10.11.19
2.7.11.13.15.16	3.10.11.13
2.7.11.14.18	4.10.12.18
	4.10.13.19
	4.7.10.13.19

Table 3

	A	B	C	D	E
Shaft	●				
	●				
		●			
		●			
			●		
				●	
				●	
Housing	●				
	●				
		●			
			●		
			●		
				●	
				●	
				●	
					●

The following graphical representations show how to determine, according to the letter code obtained for the fit, the position of the tolerance to be allowed for the part associated with the bearing.

As a rule, the tolerance range of the associated part is:
- equal to the tolerance range of the corresponding ring for non-calibrated bearings,
- equal to the class range of the corresponding ring for calibrated bearings. The drawings refer to a calibration into two classes.

In each drawing the rectangle to the left symbolises the tolerance of the bearing ring, which can be read in the tables on pages 36 to 42, **Position 7**.

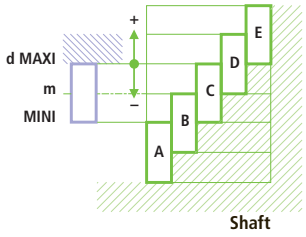
The letter "m" indicates the middle of this tolerance and the arrows + or – the direction of the variations with respect to the nominal dimension.

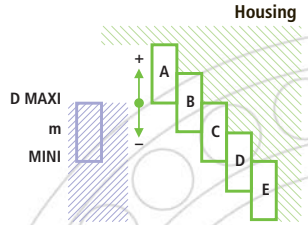
The stepped rectangles to the right symbolise the magnitude and position of the dimension variations corresponding to each fit letter code. A simple calculation allows deducting the nominal dimension and the tolerance of the associated part. Note that the alphabetical progression of the letter codes goes from a loose to tight fit in the resulting fit direction. For calibrated bearings, the resulting fit is estimated between light areas or shady areas depending on the type of calibration.

For tolerance classes TA5 – TA4, thin section series from A4 to A24,

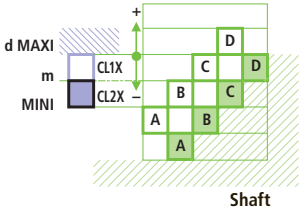
Considering the high flexibility of these series, fits should be studied for each specific case (particularly for preloaded bearing pairs). Please consult our Design & Engineering Department.

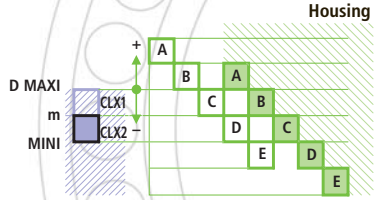
Non-calibrated bearings





Calibrated bearings





MOUNTING RECOMMENDATIONS

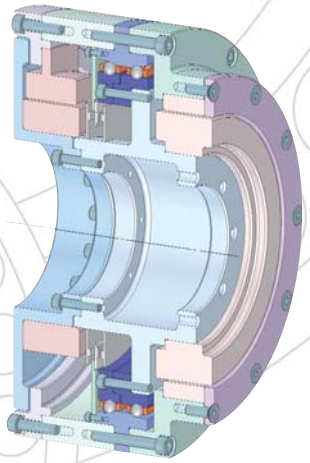
Study

The study of a system involving miniature or thin-section ball bearings should be carried out carefully.
In most cases, the rings are very thin and the faces are therefore very narrow, so are the faces to diameter corners.
The size and accuracy of the mating parts must be matched to those of the bearing.

The following precautions should be taken:

- the connecting radius of the shaft or housing shoulder fillet must be less than or equal to the value r given in all the bearing tables. This value must be complied with to assure a correct seating of bearing's ring face. If there is an undercut (where dimensions allow), care should be taken that its maximum dimension on the shoulder face ensures satisfactory seating.
- the maximum shaft shoulder diameter must be equal to or slightly less than bearing dimension d1 or d2.
- the minimum housing shoulder diameter must be equal to or slightly greater than bearing dimension D1.
- the shaft and housing seatings should be aligned in order to avoid any misalignment which might harm the sensitivity and vibration level.

The values d1, d2 and D1 are used to determine shaft or housing shoulders and are given in the bearing tables (chapter 5).



Example of mounting

Mounting

Mounting must be carried out carefully, with the following precautions to be taken:

- shaft and housing must be free of burrs and be carefully cleaned before mounting
- bearings should not be removed from their packages until the instant they are to be mounted
- In cases where interference fits are required, care should be taken to apply the force only to the ring involved; under no circumstances should the static mounting load be applied through the balls
- Whenever possible, bearings should be mounted under laminar flow or, at least, in clean areas exclusively reserved to this purpose
- magnetic fields should be avoided or neutralised in the areas reserved for mounting.

Mounting DO-DX duplex configurations.

Bringing the rings together and clamping them can be a delicate operation, because of the small cross sections of the ball bearings in this catalogue, particularly thin-section ball bearings.

The procedure used will decide whether the geometry, dimensions and low torque will be conserved or not.

Clamping order: the rings which are the farthest apart should be clamped first (inner rings for DO, outer rings for DX).

Clamping method: whenever clamping is accomplished by peripheral screws, a mounting fixture can be devised to bring the separated rings together, with their faces parallel.

For example, this can be obtained with a temporary device incorporating a central screw. After this screw is locked in position, the peripheral screws may then be adjusted in the correct order, with a minimum risk of distortion. The temporary device is then withdrawn. The contacting rings (outer if DO, inner if DX) may then be secured. If those rings are fixed by peripheral screws, the previous method may also be considered.

In any case, whether rings are secured by screws, bolts or threaded rings, it is expressly recommended to use a torque wrench or screwdriver.

When applying the preload, please take care to rotate the bearing all along the tightening process.

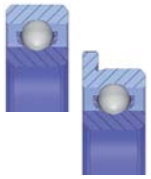
A • Deep groove ball bearings ..... p 76
- **1** • Metric series ..... p 76
- **2** • Inch series ..... p 82
- **3** • Metric series with flanged outer ring ..... p 86
- **4** • Inch series with flanged outer ring ..... p 90

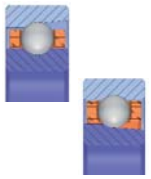
B • Angular contact ball bearings ..... p 92
- **1** • Metric series, type H ..... p 92
- **2** • Metric series, type B (separable) ..... p 94
- **3** • Inch series, type H ..... p 96
- **4** • Inch series, type B (separable) ..... p 96

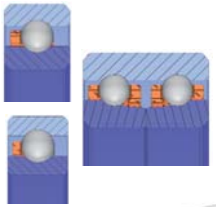
C • Thin-section ball bearings ..... p 98
- Description of the internal designs ..... p 98
- **1** • Inch series, A4 to A24 ..... p 99
- **2** • Inch series, super duplex: AD, AA ..... p 110
- **3** • Metric series, 618 ..... p 126

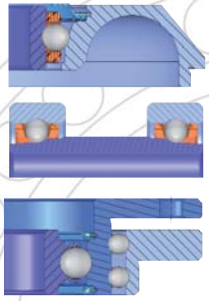
D • Specific ball bearings ..... p 127
- **1** • End-bell bearings for gyroscope rotors ..... p 127
- **2** • Shaft and outer ring assemblies ..... p 127
- **3** • Special bearings for gyroscope gimbal arrangements ..... p 127

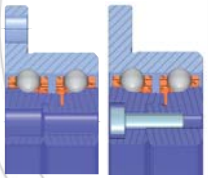
E • Integrated ball bearings ..... p 128
- Series KADV12 ..... p 128









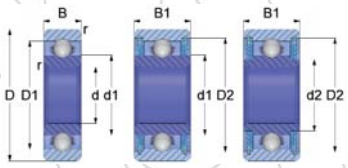


A • Deep groove ball bearings

Bore diameter d from 1 to 6 mm

1 • Metric series

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments

- The torque value and speed limit here under are only for opened or shielded (Z or ZZ) bearings.
- The axial load for running torque measurement is 0.75 N for D ⩽ 10 mm and is 4N for D > 10 mm.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection		Dimensions in mm									Basic load rating N				Running torque cN.cm		Speed limit Cage type:		Mean mass	Basic designation open bearing
													Radial			Axial			—	R		
													Dyn.		Stat.	static						
	—	Z or ZZ	RS or -2RS	d	D	B	B1	d1	d2[2]	D1	D2	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	0.75 N	4 N	+grease (rpm)		g	
AX1	✓			1	3	1	—	1,67	—	2,43	—	0,08	65	52	18	1,5	0,02	—	95 000	—	0,03	**AX1**
AX1.5	✓	✓		1,5	4	1,2	2	2,2	—	3,3	3,45	0,1	136	109	38	33	0,025	—	90 000	—	0,07	**AX1.5**
X1.5	✓	✓		1,5	5	1,7	2,6	2,5	—	4	4,2	0,15	181	145	48	27	0,025	—	78 000	—	0,16	**X1.5**
619/1.5	✓	✓		1,5	5	2	2	2,97	—	4,1	4,3	0,1	154	123	49	37	0,025	—	80 000	—	0,24	**619/1.5**
BX2	✓	✓		2	5	1,5	2,3	2,97	—	4,1	4,3	0,1	154	123	49	37	0,025	—	80 000	130 000	0,13	**BX2**
X2	✓			2	6	2	—	3,25	—	4,75	—	0,15	212	169	64	33	0,04	—	75 000	120 000	0,26	**X2**
619/2	✓	✓		2	6	2,3	2,3	3,25	—	4,75	5,05	0,15	212	169	64	33	0,04	—	75 000	120 000	0,3	**619/2**
AX2	✓	✓		2	6	2,3	3	3,25	—	4,75	5,05	0,15	212	169	64	33	0,04	—	75 000	120 000	0,3	**AX2**
AX2.5	✓	✓		2,5	6	1,8	2,6	3,5	—	5	5,2	0,15	236	188	77	39	0,04	—	70 000	110 000	0,21	**AX2.5**
X2.5	✓	✓		2,5	7	2,5	3	4	—	5,5	5,8	0,15	257	206	91	45	0,04	—	67 000	100 000	0,47	**X2.5**
60/2.5	✓	✓		2,5	8	2,8	2,8	4,6	—	6,4	6,7	0,15	325	260	113	58	0,04	—	63 000	95 000	0,7	**60/2.5**
AX3	✓	✓		3	7	2	3	4,25	—	5,75	6,05	0,15	256	205	93	45	0,04	—	67 000	100 000	0,34	**AX3**
X3	✓	✓		3	8	2,5	3	4,6	—	6,4	6,7	0,15	325	260	113	58	0,04	—	63 000	95 000	0,59	**X3**
619/3	✓			3	8	3	—	4,35	—	6,55	—	0,15	484	387	155	96	0,04	—	63 000	75 000	0,64	**619/3**
639/3		✓		3	8	—	4	4,35	—	6,55	7,05	0,15	484	387	155	96	0,04	—	63 000	75 000	0,84	**639/3**
623	✓	✓	✓	3	10	4	4	5,15	4,6	7,55	8,1	0,15	500	400	156	111	0,055	—	60 000	90 000	1,58	**623**
AX4	✓	✓		4	9	2,5	3,5	5,2	—	7,48	7,9	0,15	547	438	192	152	0,055	—	60 000	90 000	0,7	**AX4**
638/4		✓		4	9	—	4	5,2	—	7,48	7,9	0,15	547	438	192	152	0,055	—	60 000	90 000	0,81	**638/4**
X4	✓	✓		4	10	3	4	5,95	—	8,35	8,75	0,15	550	440	201	112	0,04	—	53 000	80 000	1,06	**X4**
AY4	✓	✓	✓	4	11	4	4	5,9	5,35	9	9,7	0,15	735	588	252	111	—	0,3	53 000	80 000	1,69	**AY4**
604	✓	✓		4	12	4	4	6,45	5,9	9,55	10,25	0,2	821	657	303	130	—	0,3	50 000	75 000	2,18	**604**
624	✓	✓	✓	4	13	5	5	6,6	5,9	10,4	11,25	0,2	921	737	289	151	—	0,3	48 000	70 000	3,11	**624**
634	✓	✓	✓	4	16	5	5	8,3	7,5	12,7	13,55	0,3	1150	921	414	243	—	0,37	43 000	63 000	5,4	**634**
X5	✓	✓		5	11	3	4	6,8	—	9,2	9,75	0,15	648	518	269	145	—	0,2	50 000	75 000	1,22	**X5**
638/5		✓		5	11	—	5	6,8	—	9,2	9,75	0,15	648	518	269	145	—	0,2	50 000	75 000	1,89	**638/5**
AY5	✓	✓	✓	5	13	4	4	7,65	6,95	10,75	11,45	0,2	902	712	365	149	—	0,3	48 000	70 000	2,47	**AY5**
625	✓	✓	✓	5	16	5	5	8,3	7,5	12,7	13,55	0,3	1150	921	414	243	—	0,37	43 000	63 000	4,99	**625**
635	✓	✓	✓	5	19	6	6	10	9,3	15	15,9	0,3	1920	1530	773	378	—	0,45	36 000	53 000	8,98	**635**
X6	✓	✓		6	12	3	4	7,8	—	10,2	10,75	0,15	640	512	278	146	—	0,21	48 000	70 000	1,36	**X6**
AX6	✓	✓		6	13	3,5	4,5	7,9	—	11,1	11,65	0,15	901	721	369	108	—	0,3	45 000	67 000	1,88	**AX6**
628/6		✓	✓	6	13	—	5	7,9	(7,22)	11,1	11,65	0,15	901	721	369	108	—	0,3	45 000	67 000	2,49	**628/6**
AY6	✓	✓	✓	6	15	5	5	8,6	7,9	12,4	13,25	0,2	1250	1000	518	204	—	0,37	43 000	63 000	3,89	**AY6**
626	✓	✓	✓	6	19	6	6	10	9,3	15	15,9	0,3	1920	1530	773	378	—	0,45	36 000	53 000	8,38	**626**

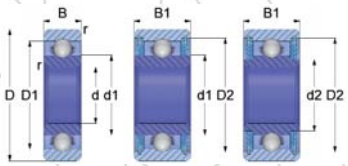
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 The values in brackets () are only valid for sealed version RS or –2RS.
If d2 is mentioned d1 only applies for opened bearings and d2 applies for protected bearings versions.
If d2 is in brackets, this values only applies for sealed version RS or -2RS; for shielded version Z or ZZ use d1 value.

A • Deep groove ball bearings

Bore diameter d from 7 to 17 mm

1 • Metric series

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments

- The torque value and speed limit here under are only for opened or shielded (Z or ZZ) bearings.
- The axial load for running torque measurement is 4N.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection		Dimensions in mm									Basic load rating N				Running torque	Speed limit Cage type:		Mean mass	Basic designation open bearing
													Radial			Axial					
													Dyn.		Stat.	static		—	R		
	—	Z or ZZ	RS or -2RS	d	D	B	B1	d1	d2 [2]	D1	D2	r [1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	4 N	+grease (rpm)		g	
AX7	✓	✓		7	14	3,5	5	8,9	—	12,1	12,55	0,15	968	774	428	122	0,37	43 000	63 000	2,04	AX7
X7	✓			7	14	4	—	8,9	—	12,1	—	0,15	968	774	428	122	0,37	43 000	63 000	2,32	X7
628/7	✓			7	14	5	—	8,9	—	12,1	—	0,15	968	774	428	122	0,37	43 000	63 000	2,77	628/7
AY7	✓	✓	✓	7	17	5	5	9,8	9,1	14,2	15,05	0,3	1510	1210	614	245	0,42	38 000	56 000	4,9	AY7
607	✓	✓		7	19	6	6	10,5	9,8	15,5	16,4	0,3	1920	1540	786	379	0,45	36 000	53 000	7,72	607
627	✓	✓	✓	7	22	7	7	11,5	10,5	17,9	19	0,3	2850	2280	1170	487	0,58	32 000	48 000	13	627
X8	✓	✓	✓	8	16	4	5	10,1	(9,45)	13,9	14,55	0,2	1350	1080	610	232	0,37	38 000	56 000	3,09	X8
638/8	✓	✓	✓	8	16	6	6	10,1	(9,45)	13,9	14,55	0,2	1350	1080	610	232	0,37	38 000	56 000	4,31	638/8
AY8	✓	✓	✓	8	19	6	6	11,1	10,4	16,1	17,1	0,3	1930	1540	800	380	0,45	34 000	50 000	7,05	AY8
608	✓	✓	✓	8	22	7	7	11,5	10,5	17,9	19	0,3	2850	2280	1170	487	0,58	32 000	48 000	12,1	608
X9	✓	✓		9	17	4	5	11,1	—	14,9	15,55	0,2	1440	1150	693	259	0,48	36 000	53 000	3,35	X9
638/9		✓		9	17	—	6	11,1	—	14,9	15,55	0,2	1440	1150	693	259	0,48	36 000	53 000	4,69	638/9
AY9	✓	✓	✓	9	20	6	6	12	11,3	17	18	0,3	2110	1690	937	436	0,45	32 000	48 000	7,63	AY9
609	✓	✓		9	24	7	7	13,7	12,4	19,9	21	0,3	2890	2310	1240	604	0,58	28 000	43 000	14,5	609
629	✓	✓	✓	9	26	8	8	14	(12,7)	21,1	22,4	0,6	3950	3160	1690	1380	0,6	28 000	43 000	18,8	629
X10	✓	✓	✓	10	19	5	5	12,6	(11,8)	16,4	17,25	0,3	1510	1210	784	286	0,5	32 000	48 000	5,4	X10
63800	✓	✓	✓	10	19	7	7	12,6	(11,8)	16,4	17,25	0,3	1510	1210	784	286	0,5	32 000	48 000	8,43	63800
AY10	✓	✓	✓	10	22	6	6	13,05	12,35	18,05	18,95	0,3	2110	1690	959	438	0,48	30 000	45 000	9,72	AY10
6000	✓	✓	✓	10	26	8	8	14	(12,7)	21,1	22,4	0,3	3950	3160	1690	1380	0,65	28 000	42 000	19	6000
6200	✓	✓	✓	10	30	9	9	17,15	(15,15)	22,85	24,05	0,6	5810	4640	3230	1820	—	25 000	37 000	33	6200
6300	✓			10	35	11	—	17,7	—	26,8	—	0,6	10300	8240	5380	2120	—	—	33 000	53	6300
61801	✓	✓	✓	12	21	5	5	15	14,1	18,2	18,95	0,3	1490	1190	716	818	—	30 000	45 000	6,15	61801
AY12	✓	✓	✓	12	24	6	6	15,5	14,8	20,5	21,4	0,3	2410	1930	1240	541	—	26 000	40 000	10,4	AY12
6001	✓	✓	✓	12	28	8	8	17,15	(15,15)	22,85	24,15	0,3	5800	4640	3220	1800	—	24 000	36 000	22	6001
6201	✓	✓	✓	12	32	10	10	18,26	17,2	25,7	27,34	0,6	7900	6320	4250	2090	—	22 000	34 000	37	6201
6301	✓			12	37	12	—	19,5	—	29,7	—	1	11500	9240	5860	3180	—	—	30 000	58	6301
61802	✓	✓		15	24	5	5	17,9	—	21,1	21,95	0,3	1610	1290	872	1330	—	24 000	36 000	7,26	61802
AY15	✓	✓	✓	15	28	7	7	18,4	17,4	24,6	25,7	0,3	3390	2710	1740	842	—	24 000	38 000	14,4	AY15
6002	✓	✓	✓	15	32	9	9	20,2	(18,2)	26,7	27,8	0,3	6200	4960	3490	1100	—	21 000	33 000	30	6002
6202	✓	✓		15	35	11	11	21,51	—	29	30,35	0,6	8040	6430	4530	3030	—	—	30 000	44	6202
6302	✓			15	42	13	—	23,7	21	33,65	—	1	13600	10800	7860	3480	—	—	26 000	83	6302
61803	✓	✓		17	26	5	5	20,2	—	23,2	23,95	0,3	1730	1390	1020	1080	—	24 000	35 000	8,03	61803
AY17	✓	✓	✓	17	30	7	7	20,4	19,4	26,6	27,7	0,3	3600	2880	1970	940	—	22 000	36 000	15,7	AY17
Y17	✓	✓	✓	17	32	8	8	20,4	19,4	26,6	27,7	0,3	3600	2880	1970	940	—	22 000	36 000	24	Y17
6003	✓	✓		17	35	10	10	22,8	21,5	29,2	30,1	0,3	6550	5240	3800	1430	—	—	28 000	40	6003
6203	✓			17	40	12	—	24,5	—	32,7	—	0,6	7200	5760	3100	4750	—	—	26 000	65	6203
6303	✓			17	47	14	—	26,5	—	37,6	—	1	15700	12600	9140	4570	—	—	23 000	115	6303

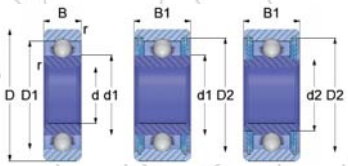
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 The values in brackets () are only valid for sealed version RS or –2RS.
If d2 is mentioned d1 only applies for opened bearings and d2 applies for protected bearings versions.
If d2 is in brackets, this values only applies for sealed version RS or -2RS; for shielded version Z or ZZ use d1 value.

A • Deep groove ball bearings

Bore diameter d from 20 to 40 mm

1 • Metric series

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments

- The torque value and speed limit here under are only for opened or shielded (Z or ZZ) bearings.
- The axial load for running torque measurement is 4N.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection		Dimensions in mm									Basic load rating N				Running torque cN.cm	Speed limit Cage type:		Mean mass	Basic designation open bearing
													Radial			Axial static		—	R		
													Dyn.		Stat.			+grease (rpm)			
	—	Z or ZZ	RS or -2RS	d	D	B	B1	d1	d2[2]	D1	D2	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	4 N			g	
61804	✔	✔		20	32	7	7	24	—	28,25	29,35	0,3	2720	2170	1550	1350	—	19 000	25 000	18	**61804**
AY20	✔	✔	✔	20	37	9	9	25,55	(24,3)	31,35	34,5	0,3	6750	5400	3910	2220	—	18 000	26 000	38	**AY20**
6004	✔	✔		20	42	12	12	27,2	—	34,8	35,8	0,6	10400	8340	6240	3650	—	—	24 000	68	**6004**
6204	✔			20	47	14	—	28,5	—	38,45	—	1	14900	11900	9010	3960	—	—	22 000	105	**6204**
6304	✔			20	52	15	—	30,3	—	42,1	—	1	18500	14800	11000	6490	—	—	20 000	145	**6304**
AY22	✔	✔	✔	22	39	9	9	27,3	26	34	35,6	0,3	7170	5730	4500	526	—	16 000	24 000	40	**AY22**
Y22	✔	✔	✔	22	40	9	9	27,3	26	34	35,6	0,3	7170	5730	4500	526	—	16 000	24 000	45	**Y22**
AY25	✔	✔	✔	25	42	9	9	30,3	28,2	36,7	38	0,3	6990	5590	4330	1620	—	15 000	22 000	45	**AY25**
6005	✔			25	47	12	—	32	—	40,3	—	0,6	11600	9310	7400	3730	—	—	20 000	77	**6005**
6205	✔			25	52	15	—	34,04	—	43,95	—	1	15200	12100	9410	4940	—	—	19 000	130	**6205**
6305	✔			25	62	17	—	36,6	—	50,9	—	1	24500	19600	15200	7850	—	—	17 000	225	**6305**
AY28	✔	✔		28	45	9	9	33,35	32	40	41,6	0,3	7830	6260	5910	782	—	13 000	20 000	48	**AY28**
AY30	✔	✔		30	47	9	9	35,3	34	42	43,6	0,3	8140	6510	6420	825	—	12 000	17 000	50	**AY30**
6006	✔			30	55	13	—	38,2	—	46,8	—	1	9250	7400	4680	7630	—	—	17 000	115	**6006**
6206	✔			30	62	16	—	40,36	—	51,55	—	1	15400	12300	7840	13600	—	—	16 000	200	**6206**
6306	✔			30	72	19	—	43,2	—	59,5	—	1	31200	24900	20200	10700	—	—	14 000	335	**6306**
AY32	✔			32	52	10	—	38	—	46	—	0,6	9360	7480	6820	1970	—	11 000	17 000	70	**AY32**
AY35	✔	✔		35	55	10	10	41	—	49	50	0,6	9720	7780	7440	2130	—	10 000	16 000	75	**AY35**
6007	✔			35	62	14	—	43,75	—	53,25	—	1	13200	10500	7980	12900	—	—	15 000	150	**6007**
6207	✔			35	72	17	—	46,9	—	60,6	—	1	27100	21700	17800	9650	—	—	14 000	275	**6207**
6307	✔			35	80	21	—	49,5	—	66,1	—	1,5	28700	23000	16600	28300	—	—	13 000	450	**6307**
AY40	✔	✔		40	62	12	12	47,7	44,6	54,5	58	0,6	14500	11600	12400	4620	—	—	14 000	112	**AY40**
6008	✔			40	68	15	—	49,25	—	58,75	—	1	13900	11100	9470	17000	—	—	13 000	190	**6008**
6208	✔			40	80	18	—	52,6	—	67,9	—	1	32600	26000	21900	9410	—	—	12 000	350	**6208**
6308	✔			40	90	23	—	55,2	—	75,5	—	1,5	46700	37400	31900	16600	—	—	11 000	600	**6308**

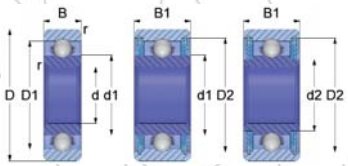
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 The values in brackets () are only valid for sealed version RS or –2RS.
If d2 is mentioned d1 only applies for opened bearings and d2 applies for protected bearings versions.
If d2 is in brackets, this values only applies for sealed version RS or -2RS; for shielded version Z or ZZ use d1 value.

A • Deep groove ball bearings

Bore diameter d from .04 inch (d 1,016 mm) to .125 inch (d 3,175 mm)

2 • Inch series

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments

- The torque value and speed limit here under are only for opened or shielded (Z or ZZ) bearings.
- The axial load for running torque measurement is 0.75 N for D ⩽ 10 mm and is 4N for D > 10 mm.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection		Dimensions *in inches* in mm									Basic load rating N				Running torque cN.cm		Speed limit Cage type:		Mean mass	Basic designation open bearing
													Radial			Axial			—	R		
													Dyn.		Stat.	static			+grease (rpm)			
	—	Z or ZZ	RS or -2RS	d	D	B	B1	d1	d2 [2]	D1	D2	r [1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	0,75 N	4 N			g	
R09	✓			.04 1,016	.125 3,175	.0469 1,191	— —	.0657 1,67	— —	.0957 2,43	— —	.003 0,075	49	39	10	8	0,02	—	95 000	—	0,04	**R09**
X3/64	✓	✓		.0469 1,191	.1562 3,9675	.0625 1,588	.0937 2,38	.0764 1,94	— —	.122 3,1	.128 3,25	.004 0,1	97	77	21	35	0,025	—	90 000	—	0,12	**X3/64**
R1	✓	✓		.055 1,397	.1875 4,7625	.0781 1,984	.1094 2,779	.0925 2,35	— —	.1496 3,8	.1575 4	.005 0,125	145	116	33	51	0,04	—	85 000	—	0,23	**R1**
X5/64	✓	✓		.0781 1,984	.25 6,35	.0937 2,38	.1406 3,571	.128 3,25	— —	.187 4,75	.1988 5,05	.005 0,125	156	125	37	59	0,04	—	75 000	—	0,54	**X5/64**
AX3/32	✓	✓		.0937 2,38	.1875 4,7625	.0625 1,588	.0937 2,38	.1169 2,97	— —	.1614 4,1	.1673 4,25	.004 0,1	115	92	28	48	0,025	—	80 000	—	0,13	**AX3/32**
SP4622		✓		.0937 2,38	.2883 7,323	— —	.0625 1,588	.1169 2,97	— —	.1614 4,1	.189 4,8	.004 0,1	115	92	28	48	0,025	—	80 000	—	0,4	**SP4622**
X3/32	✓	✓		.0937 2,38	.3125 7,9375	.1094 2,779	.1406 3,571	.1713 4,35	— —	.2579 6,55	.2776 7,05	.005 0,125	351	281	89	127	0,055	—	60 000	90 000	0,8	**X3/32**
AX1/8SP7		✓		.125 3,175	.25 6,35	— —	.0937 2,38	.1575 4	— —	.2165 5,5	.2244 5,7	.004 0,1	192	154	53	86	0,04	—	67 000	100 000	0,32	**AX1/8SP7**
AX1/8	✓	✓		.125 3,175	.25 6,35	.0937 2,38	.1094 2,779	.1575 4	— —	.2165 5,5	.2244 5,7	.004 0,1	192	154	53	86	0,04	—	67 000	100 000	0,3	**AX1/8**
SP4962		✓		.125 3,175	.3125 7,9375	— —	.1094 2,779	.1575 4	— —	.2165 5,5	.2244 5,7	.005 0,125	192	154	53	86	0,04	—	67 000	100 000	0,7	**SP4962**
X1/8	✓	✓		.125 3,175	.3125 7,9375	.1094 2,779	.1406 3,571	.1713 4,35	— —	.2579 6,55	.2776 7,05	.005 0,125	351	281	89	127	0,055	—	63 000	95 000	0,68	**X1/8**
SP3621		✓		.125 3,175	.375 9,525	— —	.1094 2,779	.1575 4	— —	.2165 5,5	.2244 5,7	.005 0,125	192	154	53	86	0,04	—	67 000	100 000	0,97	**SP3621**
R2	✓	✓	✓	.125 3,175	.375 9,525	.1562 3,967	.1562 3,967	.2028 5,15	.1811 4,6	.2972 7,55	.3189 8,1	.012 0,3	401	321	111	160	0,055	—	60 000	90 000	1,16	**R2**
SP3630		✓		.125 3,175	.41 10,414	— —	.0937 2,38	.1575 4	— —	.2165 5,5	.2244 5,7	.005 0,125	192	154	53	86	—	0,155	67 000	100 000	1,25	**SP3630**
SP3557		✓		.125 3,175	.41 10,414	— —	.1094 2,779	.1811 4,6	— —	.252 6,4	.2638 6,7	.005 0,125	242	193	66	101	—	0,155	63 000	95 000	1,37	**SP3557**
AX1/8SP5		✓		.125 3,175	.425 10,795	— —	.1094 2,779	.1575 4	— —	.2165 5,5	.2244 5,7	.004 0,1	192	154	53	86	—	0,155	67 000	100 000	1,6	**AX1/8SP5**
SP5239		✓		.125 3,175	.5 12,7	— —	.1094 2,779	.1575 4	— —	.2165 5,5	.2244 5,7	.004 0,1	192	154	53	86	—	0,155	67 000	100 000	2,36	**SP5239**
R2A	✓	✓		.125 3,175	.5 12,7	.1719 4,366	.1719 4,366	.2028 5,15	.1811 4,6	.2972 7,55	.3189 8,1	.012 0,3	401	321	111	160	—	0,2	60 000	90 000	3,15	**R2A**

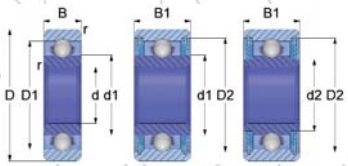
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 The values in brackets () are only valid for sealed version RS or –2RS.
If d2 is mentioned d1 only applies for opened bearings and d2 applies for protected bearings versions.
If d2 is in brackets, this values only applies for sealed version RS or -2RS; for shielded version Z or ZZ use d1 value.

A • Deep groove ball bearings

Bore diameter d from (d 3,967 mm) to .5 inch (d 12,7mm)

2 • Inch series

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments

- The torque value and speed limit here under are only for opened or shielded (Z or ZZ) bearings.
- The axial load for running torque measurement is 0.75 N for D ⩽ 10 mm and is 4N for D > 10 mm.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection		Dimensions *in inches* in mm									Basic load rating N				Running torque cN.cm		Speed limit Cage type:		Mean mass	Basic designation open bearing
													Radial			Axial			—	R		
													Dyn.		Stat.	static						
	—	Z or ZZ	RS or -2RS	d	D	B	B1	d1	d2 [2]	D1	D2	r [1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	0,75 N	4 N	+grease (rpm)		g	
X5/32	✓	✓		.1562 3,9675	.3125 7,9375	.1094 2,779	.125 3,175	.2197 5,58	— —	.2795 7,1	.2874 7,3	.004 0,1	206	165	65	106	0,04	—	60 000	90 000	0,63	**X5/32**
AX3/16	✓	✓		.1875 4,7625	.3125 7,9375	.1094 2,779	.125 3,175	.2197 5,58	— —	.2795 7,1	.2874 7,3	.004 0,1	206	165	65	106	0,04	—	60 000	90 000	0,47	**AX3/16**
X3/16	✓	✓		.1875 4,7625	.375 9,525	.125 3,175	.125 3,175	.2343 5,95	— —	.3287 8,35	.3366 8,55	.005 0,125	445	356	133	193	0,055	—	53 000	80 000	0,78	**X3/16**
X3/16SP5		✓		.1875 4,7625	.425 10,795	— —	.125 3,175	.2343 5,95	— —	.3287 8,35	.3366 8,55	.005 0,125	445	356	133	193	0,055	—	53 000	80 000	1,28	**X3/16SP5**
SP5154		✓		.1875 4,7625	.5 12,7	— —	.1094 2,779	.2197 5,58	— —	.2795 7,1	.3031 7,7	.004 0,1	206	165	65	106	—	0,155	60 000	90 000	2,06	**SP5154**
SP2824		✓		.1875 4,7625	.5 12,7	— —	.1562 3,967	.2677 6,8	.2343 5,95	.3622 9,2	.3839 9,75	.005 0,125	484	387	155	228	—	0,205	50 000	75 000	2,33	**SP2824**
Y3/16	✓	✓	✓	.1875 4,7625	.5 12,7	.1562 3,967	.196 4,978	.2697 6,85	.2539 6,45	.4154 10,55	.435 11,05	.012 0,3	821	657	242	323	—	0,3	48 000	70 000	2,69	**Y3/16**
R3	✓	✓		.1875 4,7625	.5 12,7	.1562 3,967	.196 4,978	.2717 6,9	.2539 6,45	.4075 10,35	.435 11,05	.012 0,3	821	657	242	323	—	0,3	48 000	70 000	2,69	**R3**
SP4041		✓		.1875 4,7625	.875 22,225	— —	.196 4,978	.2697 6,85	.2539 6,45	.4154 10,55	.435 11,05	.012 0,3	821	657	242	323	—	0,3	48 000	70 000	12,3	**SP4041**
X1/4	✓	✓		.25 6,35	.375 9,525	.125 3,175	.125 3,175	.2835 7,2	— —	.3425 8,7	.3504 8,9	.005 0,125	229	183	83	136	0,055	—	50 000	75 000	0,58	**X1/4**
R188	✓	✓		.25 6,35	.5 12,7	.125 3,175	.1875 4,762	.311 7,9	— —	.437 11,1	.4528 11,5	.005 0,125	669	535	213	297	—	0,3	45 000	67 000	2,08	**R188**
Y1/4	✓	✓	✓	.25 6,35	.625 15,875	.196 4,978	.196 4,978	.3622 9,2	.3346 8,5	.5118 13	.5453 13,85	.012 0,3	929	743	305	416	—	0,365	40 000	60 000	4,43	**Y1/4**
R4	✓	✓		.25 6,35	.625 15,875	.196 4,978	.196 4,978	.374 9,5	.3346 8,5	.5 12,7	.5453 13,85	.012 0,3	1270	1020	527	592	—	0,365	40 000	60 000	4,43	**R4**
R4A	✓	✓	✓	.25 6,35	.75 19,05	.2188 5,558	.2812 7,142	.3937 10	.3661 9,3	.5906 15	.626 15,9	.016 0,4	1400	1120	445	578	—	0,45	36 000	53 000	9,58	**R4A**
SP5407	✓	✓		.3125 7,937	.5 12,7	.1562 3,967	.1562 3,967	.3622 9,2	— —	.4429 11,25	.4618 11,73	.005 0,125	547	438	203	302	—	0,35	45 000	67 000	1,7	**SP5407**
Y3/8	✓	✓	✓	.375 9,525	.875 22,225	.2188 5,557	.2812 7,142	.5 12,7	.4685 11,9	.748 19	.7835 19,9	.016 0,4	2100	1680	701	892	—	0,58	28 000	43 000	9,36	**Y3/8**
R8	✓	✓	✓	.5 12,7	1.125 28,575	.25 6,35	.3125 7,937	.6752 17,15	.5965 (15,15)	.8996 22,85	.9508 24,15	.016 0,4	6320	5050	3220	1350	—	0,7	24 000	38 000	22,5	**R8**

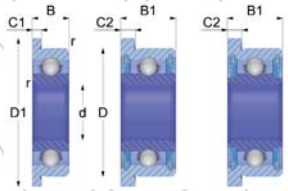
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 The values in brackets () are only valid for sealed version RS or –2RS.
If d2 is mentioned d1 only applies for opened bearings and d2 applies for protected bearings versions.
If d2 is in brackets, this values only applies for sealed version RS or -2RS; for shielded version Z or ZZ use d1 value.

A • Deep groove ball bearings

Bore diameter d from 1,5 to 6 mm

3 • Metric series with flanged outer ring

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments

- The torque value and speed limit here under are only for opened or shielded (Z or ZZ) bearings.
- The axial load for running torque measurement is 0.75 N for D ⩽ 10 mm and is 4N for D > 10 mm.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection	Dimensions in mm								Basic load rating N				Running torque cN.cm		Speed limit Cage type:		Mean mass	Basic designation open bearing
											Radial			Axial			—	R		
											Dyn.		Stat.	static						
	—	Z or ZZ	d	D	D1	B	C1	B1	C2	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	0,75 N	4 N	+grease (rpm)		g	
FAX1.5	✔	✔	1,5	4	5	1,2	0,4	2	0,6	0,1	136	109	38	33	0,025	—	90 000	—	0,09	**FAX1.5**
F619/1.5	✔		1,5	5	6,5	2	0,6	—	—	0,1	154	123	49	37	0,025	—	80 000	—	0,31	**F619/1.5**
FX1.5	✔	✔	1,5	5	6,5	1,7	0,6	2,6	0,8	0,15	181	145	48	27	0,025	—	78 000	—	0,22	**FX1.5**
FBX2	✔	✔	2	5	6,1	1,5	0,5	2,3	0,6	0,1	154	123	49	37	0,025	—	80 000	130 000	0,16	**FBX2**
F619/2		✔	2	6	7,5	—	—	2,3	0,6	0,15	212	169	64	33	0,04	—	75 000	120 000	0,38	**F619/2**
FAX2	✔	✔	2	6	7,5	2,3	0,6	3	0,8	0,15	212	169	64	33	0,04	—	75 000	120 000	0,38	**FAX2**
FAX2.5	✔	✔	2,5	6	7,1	1,8	0,5	2,6	0,8	0,15	236	188	77	39	0,04	—	70 000	110 000	0,26	**FAX2.5**
FX2.5	✔	✔	2,5	7	8,5	2,5	0,7	3,5	0,9	0,15	257	206	91	45	0,04	—	67 000	100 000	0,57	**FX2.5**
FAX3	✔	✔	3	7	8,1	2	0,5	3	0,8	0,15	256	205	93	45	0,04	—	67 000	100 000	0,39	**FAX3**
FX3	✔	✔	3	8	9,5	3	0,7	4	0,9	0,15	325	260	113	58	0,04	—	63 000	95 000	0,7	**FX3**
F623	✔	✔	3	10	11,5	4	1	4	1	0,15	500	400	156	111	0,055	—	60 000	90 000	1,77	**F623**
FAX4	✔	✔	4	9	10,3	2,5	0,6	3,5	1	0,15	547	438	192	152	0,055	—	60 000	90 000	0,79	**FAX4**
F638/4		✔	4	9	10,3	—	—	4	1	0,15	547	438	192	152	0,055	—	60 000	90 000	1,13	**F638/4**
FX4	✔	✔	4	10	11,5	3	0,8	4	1	0,15	550	440	201	112	0,04	—	53 000	80 000	1,17	**FX4**
FAY4	✔	✔	4	11	12,5	4	1	4	1	0,15	735	588	252	111	—	0,3	53 000	80 000	1,91	**FAY4**
F604		✔	4	12	14	—	—	4	1	0,2	821	657	303	130	—	0,3	50 000	75 000	2,5	**F604**
F624	✔	✔	4	13	15	5	1	5	1	0,2	921	737	289	151	—	0,3	48 000	70 000	3,45	**F624**
F634	✔	✔	4	16	18	5	1	5	1	0,3	1150	921	414	243	—	0,37	43 000	63 000	5,77	**F634**
FX5	✔		5	11	12,5	3	0,8	—	—	0,15	648	518	269	145	—	0,2	50 000	75 000	1,35	**FX5**
FBX5		✔	5	11	12,5	—	—	4	1	0,15	648	518	269	145	—	0,2	50 000	75 000	1,76	**FBX5**
F638/5		✔	5	11	12,5	—	—	5	1	0,15	648	518	269	145	—	0,2	50 000	75 000	2,11	**F638/5**
FAY5	✔	✔	5	13	15	4	1	4	1	0,2	902	712	365	149	—	0,3	48 000	70 000	2,81	**FAY5**
F625	✔	✔	5	16	18	5	1	5	1	0,3	1150	921	414	243	—	0,37	43 000	63 000	5,24	**F625**
F635	✔	✔	5	19	22	6	1,5	6	1,5	0,3	1920	1530	773	378	—	0,45	36 000	53 000	10,2	**F635**
FAX6	✔		6	13	15	3,5	1	—	—	0,15	901	721	369	108	—	0,3	45 000	67 000	2,22	**FAX6**
FBX6		✔	6	13	15	—	—	4,5	1	0,15	901	721	369	108	—	0,3	45 000	67 000	2,64	**FBX6**
F628/6		✔	6	13	15	—	—	5	1,1	0,15	901	721	369	108	—	0,3	45 000	67 000	2,87	**F628/6**
FAY6	✔	✔	6	15	17	5	1,2	5	1,2	0,2	1250	1000	518	204	—	0,37	43 000	63 000	4,36	**FAY6**
F626	✔	✔	6	19	22	6	1,5	6	1,5	0,3	1920	1530	773	378	—	0,45	36 000	53 000	9,51	**F626**

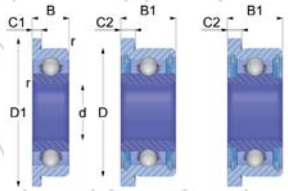
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

A • Deep groove ball bearings

Bore diameter d from 7 to 10 mm

3 • Metric series with flanged outer ring

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments
- The axial load for running torque measurement is 4N.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection	Dimensions in mm								Basic load rating N				Running torque cN.cm	Speed limit Cage type:		Mean mass	Basic designation open bearing
											Radial			Axial					
											Dyn.		Stat.	static		—	R		
	—	Z or ZZ	d	D	D1	B	C1	B1	C2	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	4 N	+grease (rpm)		g	
FAX7	✔	✔	7	14	16	3,5	1	5	1,1	0,15	968	774	428	122	0,37	43 000	63 000	2,41	**FAX7**
FAY7	✔	✔	7	17	19	5	1,2	5	1,2	0,3	1510	1210	614	245	0,42	38 000	56 000	5,43	**FAY7**
F607	✔	✔	7	19	22	6	1,5	6	1,5	0,3	1920	1540	786	379	0,45	36 000	53 000	8,85	**F607**
F627	✔	✔	7	22	25	7	1,5	7	1,5	0,3	2850	2280	1170	487	0,58	32 000	48 000	14,3	**F627**
FX8	✔		8	16	18	4	1	—	—	0,2	1350	1080	610	232	0,37	38 000	56 000	3,36	**FX8**
F638/8		✔	8	16	18	—	—	6	1,3	0,2	1350	1080	610	232	0,37	38 000	56 000	4,85	**F638/8**
FAY8	✔	✔	8	19	22	6	1,5	6	1,5	0,3	1930	1540	800	380	0,45	34 000	50 000	8,18	**FAY8**
F608	✔	✔	8	22	25	7	1,5	7	1,5	0,3	2850	2280	1170	487	0,58	32 000	48 000	13,4	**F608**
FX9	✔		9	17	19	4	1	—	—	0,2	1440	1150	693	259	0,48	36 000	53 000	3,79	**FX9**
F638/9		✔	9	17	19	—	—	6	1,3	0,2	1440	1150	693	259	0,48	36 000	53 000	5,94	**F638/9**
FAY9	✔	✔	9	20	23	6	1,5	6	1,5	0,3	2110	1690	937	436	0,45	32 000	48 000	8,82	**FAY9**
F609	✔	✔	9	24	27	7	1,5	7	1,5	0,3	2890	2310	1240	604	0,58	28 000	43 000	15,9	**F609**
F629	✔	✔	9	26	28	8	2	8	2	0,6	3950	3160	1690	1380	0,6	28 000	43 000	20,2	**F629**
FX10	✔		10	19	21	5	1	—	—	0,3	1510	1210	784	286	0,5	32 000	48 000	5,89	**FX10**
F63800		✔	10	19	21	—	—	7	1,5	0,3	1510	1210	784	286	0,5	32 000	48 000	7,86	**F63800**

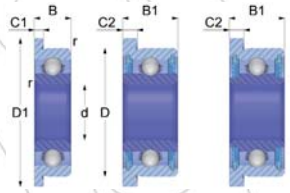
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

A • Deep groove ball bearings

Bore diameter d from .04 inch (d 1,016 mm) to .5 inch (d 12,7 mm)

4 • Inch series with flanged outer ring

Versions: Pressed sheet-metal cage: —
Crown-type cage: **R**
Tolerances: T5, T4, T2



Comments

- The axial load for running torque measurement is 0.75 N for D ⩽ 10 mm and is 4N for D > 10 mm.
- The mean mass corresponds to opened beating mass or shielded bearings if the opened version does not exist.

Basic designation open bearing	open	Protection	Dimensions *in inches* in mm								Basic load rating N				Running torque cN.cm		Speed limit Cage type:		Mean mass	Basic designation open bearing
											Radial			Axial			—	R		
											Dyn.		Stat.	static						
	—	Z or ZZ	d	D	D1	B	C1	B1	C2	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	0,75 N	4 N	+grease (rpm)		g	
FR09	✔		*.04* 1,016	*.125* 3,175	*.171* 4,343	*.0469* 1,191	*.013* 0,33	— —	— —	*.003* 0,075	49	39	10	8	0,02	—	95 000	—	0,06	**FR09**
FX3/64	✔	✔	*.0469* 1,191	*.1562* 3,9675	*.203* 5,156	*.0625* 1,588	*.013* 0,33	*.0937* 2,38	*.031* 0,787	*.004* 0,1	97	77	21	35	0,025	—	90 000	—	0,14	**FX3/64**
FR1	✔	✔	*.055* 1,397	*.1875* 4,7625	*.234* 5,944	*.0781* 1,984	*.023* 0,584	*.1094* 2,779	*.031* 0,787	*.005* 0,125	145	116	33	51	0,04	—	85 000	—	0,28	**FR1**
FX5/64	✔	✔	*.0781* 1,984	*.25* 6,35	*.296* 7,518	*.0937* 2,38	*.023* 0,584	*.1406* 3,571	*.031* 0,787	*.005* 0,125	156	125	37	59	0,04	—	75 000	—	0,6	**FX5/64**
FAX3/32	✔	✔	*.0937* 2,38	*.1875* 4,7625	*.234* 5,944	*.0625* 1,588	*.018* 0,457	*.0937* 2,38	*.031* 0,787	*.004* 0,1	115	92	28	48	0,025	—	80 000	—	0,17	**FAX3/32**
FX3/32	✔	✔	*.0937* 2,38	*.3125* 7,9375	*.359* 9,119	*.1094* 2,779	*.023* 0,584	*.1406* 3,571	*.031* 0,787	*.005* 0,125	351	281	89	127	0,055	—	60 000	90 000	0,87	**FX3/32**
FAX1/8	✔	✔	*.125* 3,175	*.25* 6,35	*.296* 7,518	*.0937* 2,38	*.023* 0,584	*.1094* 2,779	*.031* 0,787	*.004* 0,1	192	154	53	86	0,04	—	67 000	100 000	0,36	**FAX1/8**
FX1/8	✔	✔	*.125* 3,175	*.3125* 7,9375	*.359* 9,119	*.1094* 2,779	*.023* 0,584	*.1406* 3,571	*.031* 0,787	*.005* 0,125	351	281	89	127	0,055	—	63 000	95 000	0,75	**FX1/8**
FR2	✔	✔	*.125* 3,175	*.375* 9,525	*.44* 11,176	*.1562* 3,967	*.03* 0,762	*.1562* 3,967	*.03* 0,762	*.012* 0,3	401	321	111	160	0,055	—	60 000	90 000	1,32	**FR2**
FX5/32	✔	✔	*.1562* 3,9675	*.3125* 7,9375	*.359* 9,119	*.1094* 2,779	*.023* 0,584	*.125* 3,175	*.036* 0,914	*.004* 0,1	206	165	65	106	0,04	—	60 000	90 000	0,7	**FX5/32**
FAX3/16	✔	✔	*.1875* 4,7625	*.3125* 7,9375	*.359* 9,119	*.1094* 2,779	*.023* 0,584	*.125* 3,175	*.036* 0,914	*.004* 0,1	206	165	65	106	0,04	—	60 000	90 000	0,54	**FAX3/16**
FX3/16	✔	✔	*.1875* 4,7625	*.375* 9,525	*.422* 10,719	*.125* 3,175	*.023* 0,584	*.125* 3,175	*.031* 0,787	*.005* 0,125	445	356	133	193	0,055	—	53 000	80 000	0,87	**FX3/16**
FY3/16	✔	✔	*.1875* 4,7625	*.5* 12,7	*.565* 14,351	*.196* 4,978	*.042* 1,067	*.196* 4,978	*.042* 1,067	*.012* 0,3	821	657	242	323	—	0,3	48 000	70 000	2,96	**FY3/16**
FR3		✔	*.1875* 4,7625	*.5* 12,7	*.565* 14,351	— —	— —	*.196* 4,978	*.042* 1,067	*.012* 0,3	821	657	242	323	—	0,3	48 000	70 000	3,04	**FR3**
FX1/4	✔	✔	*.25* 6,35	*.375* 9,525	*.422* 10,719	*.125* 3,175	*.023* 0,584	*.125* 3,175	*.036* 0,914	*.005* 0,125	229	183	83	136	0,055	—	50 000	75 000	0,65	**FX1/4**
FR188	✔	✔	*.25* 6,35	*.5* 12,7	*.547* 13,894	*.125* 3,175	*.023* 0,584	*.1875* 4,762	*.045* 1,143	*.005* 0,125	669	535	213	297	—	0,3	45 000	67 000	2,19	**FR188**
FY1/4	✔	✔	*.25* 6,35	*.625* 15,875	*.69* 17,526	*.196* 4,978	*.042* 1,067	*.196* 4,978	*.042* 1,067	*.012* 0,3	929	743	305	416	—	0,365	40 000	60 000	4,79	**FY1/4**
FR4		✔	*.25* 6,35	*.625* 15,875	*.69* 17,526	— —	— —	*.196* 4,978	*.042* 1,067	*.012* 0,3	1270	1020	527	592	—	0,365	40 000	60 000	4,82	**FR4**
FSP5407	✔	✔	*.3125* 7,937	*.5* 12,7	*.547* 13,894	*.1562* 3,967	*.031* 0,787	*.1562* 3,967	*.031* 0,787	*.005* 0,125	547	438	203	302	—	0,35	45 000	67 000	1,85	**FSP5407**
FY3/8	✔	✔	*.3750* 9,525	*.875* 22,225	*.969* 24,612	*.2812* 7,142	*.062* 1,575	*.2812* 7,142	*.062* 1,575	*.016* 0,4	2100	1680	701	892	—	0,58	28 000	43 000	11,7	**FY3/8**
FR8	✔	✔	*.5* 12,7	*1.125* 28,575	*1.225* 31,115	*.25* 6,35	*.062* 1,575	*.3125* 7,937	*.062* 1,575	*.016* 0,4	6320	5050	3220	1350	—	0,7	24 000	38 000	24	**FR8**

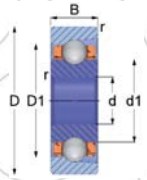
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

B • Angular contact ball bearings

Bore diameter d from 5 to 65 mm

1 • Metric series, type H

Versions: Type H with one piece machined cage, with cylindrical ball pockets
Tolerance: T5, T4, T2



Comments
- Nominal contact angle: 15° ± 2°.
- Other nominal values or tolerances may be given upon request.

Basic designation	Dimensions in mm						Basic load rating N				Speed limit in rpm (revolution per minute)		Mean mass	Basic designation
							Radial			Axial				
							Dyn.		Stat.	static	with	with		
	d	D	B	d1	D1	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	grease	oil	g	
635H	5	19	6	11,1	15,05	0,3	1960	1570	752	1390	69 000	100 000	8,79	**635H**
626H	6	19	6	10,6	14,55	0,3	1890	1510	764	1510	72 000	104 000	8,37	**626H**
607H	7	19	6	11,1	15,05	0,3	1960	1570	752	1390	69 000	100 000	7,9	**607H**
638/8H	8	16	6	10,1	13,9	0,2	1430	1150	671	217	75 000	108 000	4	**638/8H**
608H	8	22	7	12,45	17,65	0,3	2900	2320	1130	2080	60 000	86 000	12,3	**608H**
609H	9	24	7	13,95	19,15	0,3	3150	2520	1310	2440	54 000	78 000	15	**609H**
61900H	10	22	6	14	18	0,3	2260	1810	1010	1910	56 000	81 000	9,77	**61900H**
6000H	10	26	8	14,85	21,15	0,3	4030	3220	1620	2990	50 000	72 000	18,8	**6000H**
6200H	10	30	9	16,8	23,6	0,6	5280	4220	2170	3980	44 000	64 000	30,5	**6200H**
61901H	12	24	6	15,9	20,6	0,3	2510	2010	1250	1410	49 000	71 000	10,7	**61901H**
6001H	12	28	8	16,85	23,15	0,3	4380	3500	1900	3530	45 000	65 000	21	**6001H**
6201H	12	32	10	18,3	26,4	0,6	7500	6000	3780	2750	40 000	58 000	35,1	**6201H**
61902H	15	28	7	18,95	24,07	0,3	3580	2860	1780	3380	41 000	60 000	15,5	**61902H**
6002H	15	32	9	20,6	26,8	0,3	4700	3760	2260	4260	38 000	55 000	29,5	**6002H**
6202H	15	35	11	21,51	29	0,6	7310	5850	3290	6090	35 000	51 000	44	**6202H**
61903H	17	30	7	21	26	0,3	3550	2840	1830	3490	38 000	55 000	16,8	**61903H**
6203H	17	40	12	24,23	32,7	0,6	8210	6570	3830	7110	31 000	45 000	64,1	**6203H**
61904H	20	37	9	25,55	31,35	0,3	5460	4370	3080	5880	31 000	45 000	36,4	**61904H**
6004H	20	42	12	27,2	34,8	0,6	8370	6690	4360	8220	29 000	41 000	67,6	**6004H**
61905H	25	42	9	30,3	36,7	0,3	6090	4870	3890	7490	26 000	38 000	42,7	**61905H**
6205H	25	52	15	33,52	43,64	0,6	14600	11700	9120	8890	23 000	33 000	126	**6205H**
61906H	30	47	9	35,3	42	0,3	6170	4930	4240	5500	23 000	33 000	48	**61906H**
61907H	35	55	10	41,1	48,9	0,6	9370	7490	7310	5500	20 000	28 000	74,7	**61907H**
6007H	35	62	14	43,75	53,25	0,6	14900	11900	9840	18800	18 000	26 000	154	**6007H**
61908H	40	62	12	46,7	55,3	0,6	12300	9850	9570	10500	17 000	25 000	111	**61908H**
6008H	40	68	15	49,25	59,1	1	16400	13100	12200	22300	16 000	24 000	187	**6008H**
6009H	45	75	16	54,2	65,8	1	21500	17200	15100	29000	15 000	21 000	236	**6009H**
61910H	50	72	12	57,1	64,9	0,6	12400	9940	10700	20900	14 000	21 000	135	**61910H**
6010H	50	80	16	59,2	70,8	1	22100	17700	16300	31400	13 000	20 000	252	**6010H**
6210H	50	90	20	62,3	77,7	0,6	33600	26900	22900	43600	12 000	18 000	465	**6210H**
61911H	55	80	13	62,7	72,3	0,6	18000	14400	15200	29400	13 000	19 000	180	**61911H**
6012H	60	95	18	70,8	84,2	1,1	29100	23300	22400	43000	11 000	16 000	399	**6012H**
6212H	60	110	22	75,4	94,6	0,6	—	40300	37600	72600	10 000	15 000	797	**6212H**
61913H	65	90	13	73	82,1	1	18500	14800	16900	32800	11 000	16 000	207	**61913H**

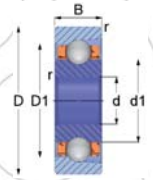
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

B • Angular contact ball bearings

Bore diameter d from 85 to 140 mm

1 • Metric series, type H

Versions: Type H with one piece machined cage, with cylindrical ball pockets
Tolerances: T5, T4, T2



Comments
- Nominal contact angle: 15° ± 2°.
- Other nominal values or tolerances may be given upon request.

Basic designation	Dimensions in mm						Basic load rating N				Speed limit in rpm (revolution per minute)		Mean mass	Basic designation
							Radial			Axial				
							Dyn.		Stat.	static	with	with		
	d	D	B	d1	D1	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	grease	oil	g	
6017H	85	130	22	99,4	115,6	1,1	—	38400	44000	93000	8 000	12 000	897	**6017H**
61920H	100	140	20	112	128	1	—	34700	45600	90100	7 000	10 000	796	**61920H**
61928H	140	190	24	155	175	1	—	66100	101000	109000	5 000	7 000	1670	**61928H**

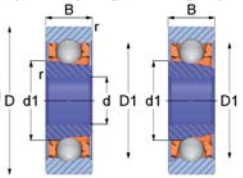
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

B • Angular contact ball bearings

Bore diameter d from 1,5 to 50 mm

2 • Metric series, type B (separable)

Versions: Type B with one piece machined cage, with stepped ball pockets
Tolerances: T5, T4, T2



Comments
- Nominal contact angle: 15° ± 2°.
- Other nominal values or tolerances may be given upon request.
- Type B bearings d ⩽ 8 mm may be supplied with a flange on the outer ring by indicating F symbol in position 2 of the designation.

Basic designation	Dimensions in mm						Basic load rating N				Speed limit in rpm (revolution per minute)		Mean mass	Basic designation
							Radial			Axial				
							Dyn.		Stat.	static	with	with		
	d	D	B	d1	D1	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	grease	oil	g	
619/1.5B	1,5	5	2	2,58	3,92	0,15	131	105	28	45	276 000	400 000	0,18	**619/1.5B**
AX2B	2	6	2,3	3,33	4,67	0,15	156	125	37	61	225 000	325 000	0,3	**AX2B**
60/2.5B	2,5	8	2,8	4,4	6,65	0,15	349	279	89	145	162 000	234 000	0,62	**60/2.5B**
623B	3	10	4	5,2	7,45	0,15	398	318	110	181	141 000	204 000	1,53	**623B**
604B	4	12	4	6,6	9,4	0,2	595	476	173	284	112 000	162 000	2,15	**604B**
624B	4	13	5	6,75	10,2	0,2	728	582	202	330	105 000	152 000	3,04	**624B**
634B	4	16	5	7,65	12,35	0,3	1170	942	337	545	90 000	130 000	5,01	**634B**
625B	5	16	5	7,65	12,35	0,3	1170	942	337	545	90 000	130 000	4,7	**625B**
626B	6	19	6	10,15	14,85	0,3	1380	1100	439	721	150 000	216 000	8,12	**626B**
607B	7	19	6	10,65	15,35	0,3	1390	1110	446	735	69 000	100 000	7,59	**607B**
608B	8	22	7	12,15	17,85	0,3	2050	1640	674	1100	60 000	86 000	11,5	**608B**
6000B	10	26	8	14,2	20,85	0,3	2830	2260	959	1560	51 000	74 000	18,8	**6000B**
6001B	12	28	8	16,7	23,35	0,3	3420	2730	1300	2140	45 000	65 000	20	**6001B**
6002B	15	32	9	20,6	26,8	0,3	4700	3760	2260	4260	38 000	55 000	29,2	**6002B**
6003B	17	35	10	22,8	29,2	0,3	3950	3160	1730	2890	34 000	50 000	38,2	**6003B**
6006B	30	55	13	38,2	47,1	0,6	12700	10200	8850	15300	21 000	30 000	115	**6006B**
6007B	35	62	14	43,75	53,25	0,6	16700	13400	12400	22100	18 000	26 000	156	**6007B**
6210B	50	90	20	62	78,6	0,6	37500	30000	27400	33400	12 000	18 000	439	**6210B**

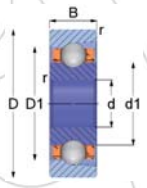
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

B • Angular contact ball bearings

Bore diameter d from (d 3,175 mm) to .5 inch (d 12,7 mm)

3 • Inch series, type H

Versions: Type H with one piece machined cage, with cylindrical ball pockets
Tolerances: T5, T4, T2



Comments
- Nominal contact angle: 15° ± 2°.
- Other nominal values or tolerances may be given upon request.

Basic designation	Dimensions *in inches* / in mm						Basic load rating N				Speed limit in rpm (revolution per minute)		Mean mass	Basic designation
							Radial			Axial				
							Dyn.		Stat.	static	with	with		
	d	D	B	d1	D1	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	grease	oil	g	
R4H	.25 6,350	.625 15,875	.196 4,978	.374 9,5	.5 12,7	.012 0,3	991	792	338	560	81 000	117 000	4,4	R4H
R8H	.5 12,7	1.125 28,575	.3125 7,937	.7283 18,5	.8976 22,8	.016 0,4	2410	1930	1170	1960	43 000	62 000	19,4	R8H

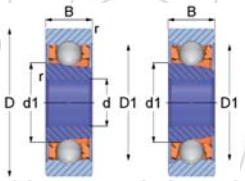
1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

B • Angular contact ball bearings

Bore diameter d from .0781 inch (d 1,984 mm) to .25 inch (d 6,35 mm)

4 • Inch series, type B (separable)

Versions: Type B with one piece machined cage, with stepped ball pockets
Tolerances: T5, T4, T2



Comments
- Nominal contact angle: 15° ± 2°.
- Other nominal values or tolerances may be given upon request.
- Type B bearings d ⩽ 8 mm may be supplied with a flange on the outer ring by indicating F symbol in position 2 of the designation.

Basic designation	Dimensions *in inches* / in mm						Basic load rating N				Speed limit in rpm (revolution per minute)		Mean mass	Basic designation
							Radial			Axial				
							Dyn.		Stat.	static	with	with		
	d	D	B	d1	D1	r[1]	$C_{(100C6)}$	$C_{(Z100CD17)}$	Co	Cax	grease	oil	g	
X5/64B	.0781 1,984	.25 6,35	.0937 2,38	.1311 3,33	.1839 4,67	.005 0,125	156	125	37	61	225 000	325 000	0,37	X5/64B
X3/32B	.0937 2,380	.3125 7,9375	.1094 2,779	.1732 4,4	.2618 6,65	.005 0,125	349	279	89	145	162 000	234 000	0,61	X3/32B
X1/8B	.125 3,175	.3125 7,9375	.1094 2,779	.1732 4,4	.2618 6,65	.005 0,125	349	279	89	145	162 000	234 000	0,54	X1/8B
R2B	.125 3,175	.375 9,525	.1562 3,967	.2047 5,2	.2933 7,45	.012 0,3	398	318	110	181	141 000	204 000	1,31	R2B
Y3/16B	.1875 4,7625	.5 12,7	.1562 3,967	.2756 7	.4114 10,45	.012 0,3	812	650	239	391	102 000	148 000	2,14	Y3/16B
Y1/4B	.25 6,350	.625 15,875	.196 4,978	.3681 9,35	.5039 12,8	.012 0,3	916	733	300	498	81 000	117 000	4,4	Y1/4B

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

C • Thin-section ball bearings

The variations available are listed on the tabular data for each series.
Z100CD17 (X105CrMo17) steel for all series. Tolerances TA5-TA4, see Position 7 pages 40-41.

Description of the internal designs

1 • DESIGN E
Deep groove ball bearings for slow or oscillating motions with PTFE tube separators.

2 • DESIGN R
Deep groove ball bearings for moderate or high speeds, depending on dimensions: with crown-type cage, machined from phenolic resin. (Design shown in tables for series A and 618).

3 • DESIGN H
Angular contact bearings with a maximum load carrying capacity with crown-type cage, machined from phenolic resin, for all speeds.

4 • DESIGN N
Angular contact bearings with a maximum load carrying capacity with ring-shaped spacers, for slow speeds and low torque applications.

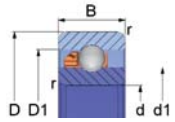
Variants

Variant LA: extended inner ring for all designs.

Variant EA: extended inner and outer rings for E and R designs in ZZ only.

For these two variants, the extended width(s) is (are) mentioned in each table for the series involved.

C • Thin-section ball bearings



Bore diameter d from .375 inch (d 9,525 mm) to 1.625 inch (d 41,275 mm)

1 • Series A4

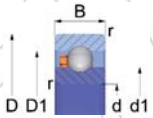
Constant ball diameter: 1/16 inch (1,588 mm)
Constant section
Versions E, R, H and N
Open bearing for all versions
Bearing with shields on versions E and R[4]
Width variant LA and EA : .1960"(4,978 mm)
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA406[3]	*.375*	*.625*	*.1562*	*.4583*	*.5417*	*.01*	630	440	470	2,7
	9,525	15,875	3,967	11,64	13,76	0,25				
WA408[3]	*.5*	*.75*	*.1562*	*.5835*	*.6669*	*.01*	680	520	580	3,4
	12,7	19,05	3,967	14,82	16,94	0,25				
WA410	*.625*	*.875*	*.1562*	*.7083*	*.7917*	*.01*	720	600	690	4
	15,875	22,225	3,967	17,99	20,11	0,25				
WA412	*.75*	*1*	*.1562*	*.8335*	*.9169*	*.01*	750	680	790	4,7
	19,05	25,4	3,967	21,17	23,29	0,25				
WA414	*.875*	*1.125*	*.1562*	*.9583*	*1.0417*	*.01*	810	790	940	5,4
	22,225	28,575	3,967	24,34	26,46	0,25				
WA417	*1.0625*	*1.3125*	*.1562*	*1.1461*	*1.2295*	*.01*	850	930	1110	6,4
	26,9875	33,3375	3,967	29,11	31,23	0,25				
WA420	*1.25*	*1.5*	*.1562*	*1.3335*	*1.4169*	*.01*	880	1030	1250	7,4
	31,75	38,1	3,967	33,87	35,99	0,25				
WA422	*1.375*	*1.625*	*.1562*	*1.4583*	*1.5417*	*.01*	920	1140	1400	8
	34,925	41,275	3,967	37,04	39,16	0,25				
WA424	*1.5*	*1.75*	*.1562*	*1.5835*	*1.6669*	*.01*	960	1260	1540	8,7
	38,1	44,45	3,967	40,22	42,34	0,25				
WA426	*1.625*	*1.875*	*.1562*	*1.7083*	*1.7917*	*.01*	990	1370	1680	9,4
	41,275	47,625	3,967	43,39	45,51	0,25				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.
3 The tolerances applicable to WA406 and WA408 are those of classes T5, T4 and T2, pages 38 and 39.
4 Please consult our Design & Engineering Department for feasibility for shielded bearings.

C • Thin-section ball bearings

Bore diameter d from .875 inch (d 22,225 mm) to 2.5 inch (d 63,5 mm)



1 • Series A6

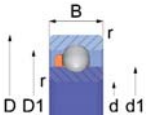
Constant ball diameter: 3/32 inch (2,381 mm)
Constant section
Versions E, R, H and N
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA614	*.875*	*1.25*	*.1875*	*1.0043*	*1.1205*	*.01*	1470	1290	2080	11
	22,225	31,75	4,762	25,51	28,46	0,25				
WA616	*1*	*1.375*	*.1875*	*1.1291*	*1.2453*	*.01*	1570	1480	2380	12
	25,4	34,925	4,762	28,68	31,63	0,25				
WA618	*1.125*	*1.5*	*.1875*	*1.2543*	*1.3705*	*.01*	1620	1600	2640	14
	28,575	38,1	4,762	31,86	34,81	0,25				
WA620	*1.25*	*1.625*	*.1875*	*1.3791*	*1.4953*	*.01*	1660	1720	2830	15
	31,75	41,275	4,762	35,03	37,98	0,25				
WA622	*1.375*	*1.75*	*.1875*	*1.5043*	*1.6205*	*.01*	1700	1850	3090	16
	34,925	44,45	4,762	38,21	41,16	0,25				
WA624	*1.5*	*1.875*	*.1875*	*1.6291*	*1.7453*	*.01*	1730	1970	3270	17
	38,1	47,625	4,762	41,38	44,33	0,25				
WA628	*1.75*	*2.125*	*.1875*	*1.8791*	*1.9953*	*.01*	1840	2280	3830	20
	44,45	53,975	4,762	47,73	50,68	0,25				
WA632	*2*	*2.375*	*.1875*	*2.1291*	*2.2453*	*.01*	1900	2520	4270	22
	50,8	60,325	4,762	54,08	57,03	0,25				
WA640	*2.5*	*2.875*	*.1875*	*2.6291*	*2.7453*	*.01*	2050	3080	5270	27
	63,5	73,025	4,762	66,78	69,73	0,25				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.

C • Thin-section ball bearings

Bore diameter d from .625 inch (d 15,875 mm) to 2.5625 inch (d 65,0875 mm)



1 • Series A7

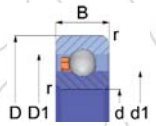
Constant ball diameter: 1/8 inch (3,175 mm)
Constant section
Versions E, R, H and N
Open bearing for all versions
Bearing with shields on versions E and R[3]
Width variant LA and EA: .2812"(7,142 mm)
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA710	*.625*	*1.0625*	*.25*	*.7661*	*.9217*	*.015*	2090	1550	2290	12
	15,875	26,9875	6,35	19,46	23,41	0,38				
WA712	*.75*	*1.1875*	*.25*	*.8909*	*1.0465*	*.015*	2240	1780	2690	14
	19,05	30,1625	6,35	22,63	26,58	0,38				
WA713	*.8125*	*1.25*	*.25*	*.9535*	*1.1091*	*.015*	2310	1890	2890	15
	20,6375	31,75	6,35	24,22	28,17	0,38				
WA714	*.875*	*1.3125*	*.25*	*1.0161*	*1.1717*	*.015*	2280	1870	2900	16
	22,225	33,3375	6,35	25,81	29,76	0,38				
WA717	*1.0625*	*1.5*	*.25*	*1.2035*	*1.3591*	*.015*	2470	2210	3500	19
	26,9875	38,1	6,35	30,57	34,52	0,38				
WA721	*1.3125*	*1.75*	*.25*	*1.4535*	*1.6091*	*.015*	2590	2530	4100	22
	33,3375	44,45	6,35	36,92	40,87	0,38				
WA725	*1.5625*	*2*	*.25*	*1.7035*	*1.8591*	*.015*	2710	2860	4710	26
	39,6875	50,8	6,35	43,27	47,22	0,38				
WA729	*1.8125*	*2.25*	*.25*	*1.9535*	*2.1091*	*.015*	2880	3300	5510	30
	46,0375	57,15	6,35	49,62	53,57	0,38				
WA733	*2.0625*	*2.5*	*.25*	*2.2035*	*2.3591*	*.015*	2970	3630	6110	34
	52,3875	63,5	6,35	55,97	59,92	0,38				
WA737	*2.3125*	*2.75*	*.25*	*2.4535*	*2.6091*	*.015*	3060	3950	6710	37
	58,7375	69,85	6,35	62,32	66,27	0,38				
WA741	*2.5625*	*3*	*.25*	*2.7035*	*2.8591*	*.015*	3200	4400	7520	41
	65,0875	76,2	6,35	68,67	72,62	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.
3 Please consult our Design & Engineering Department for feasibility for shielded bearings.

C • Thin-section ball bearings

Bore diameter d from 2 inch (d 50,8 mm) to 7 inch (d 177,8 mm)



1 • Series A8

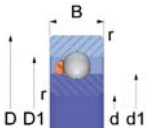
Constant ball diameter: 1/8 inch (3,175 mm)
Constant section
Versions E, R, H and N
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
	d	D	B	d1	D1	r[1]	Dyn. C	Stat. Co	static Cax	g
WA832	*2*	*2.5*	*.25*	*2.172*	*2.3275*	*.025*	2990	3630	6110	40
	50,8	63,5	6,35	55,17	59,12	0,635				
WA840	*2.5*	*3*	*.25*	*2.672*	*2.8275*	*.025*	3150	4280	7320	48
	63,5	76,2	6,35	67,87	71,82	0,635				
WA848	*3*	*3.5*	*.25*	*3.172*	*3.3275*	*.025*	3360	5050	8720	57
	76,2	88,9	6,35	80,57	84,52	0,635				
WA856	*3.5*	*4*	*.25*	*3.672*	*3.8275*	*.025*	3450	5590	9730	66
	88,9	101,6	6,35	93,27	97,22	0,635				
WA864	*4*	*4.5*	*.25*	*4.172*	*4.3275*	*.025*	3710	6590	11500	75
	101,6	114,3	6,35	105,97	109,92	0,635				
WA868	*4.25*	*4.75*	*.25*	*4.422*	*4.5775*	*.025*	3770	6920	12100	79
	107,95	120,65	6,35	112,32	116,27	0,635				
WA872	*4.5*	*5*	*.25*	*4.672*	*4.8275*	*.025*	3830	7250	12700	83
	114,3	127	6,35	118,67	122,62	0,635				
WA876	*4.75*	*5.25*	*.25*	*4.922*	*5.0775*	*.025*	3920	7690	13500	88
	120,65	133,35	6,35	125,02	128,97	0,635				
WA880	*5*	*5.5*	*.25*	*5.172*	*5.3275*	*.025*	3970	8010	14100	92
	127	139,7	6,35	131,37	135,32	0,635				
WA888	*5.5*	*6*	*.25*	*5.672*	*5.8275*	*.025*	4080	8670	15300	101
	139,7	152,4	6,35	144,07	148,02	0,635				
WA896	*6*	*6.5*	*.25*	*6.172*	*6.3275*	*.025*	4210	9440	16700	109
	152,4	165,1	6,35	156,77	160,72	0,635				
WA8104	*6.5*	*7*	*.25*	*6.672*	*6.8275*	*.025*	4340	10200	18100	118
	165,1	177,8	6,35	169,47	173,42	0,635				
WA8112	*7*	*7.5*	*.25*	*7.172*	*7.3275*	*.025*	4420	10800	19300	127
	177,8	190,5	6,35	182,17	186,12	0,635				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.

C • Thin-section ball bearings

Bore diameter d from 2.0625 inch (d 52,3875 mm) to 7 inch (d 177,8 mm)



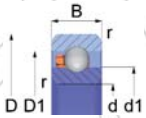
1 • Series A9

Constant ball diameter: 1/8 inch (3,175 mm)
Constant section
Versions E, R, H and N
Open bearing for all versions
Bearing with shields on versions E and R[3]
Width variant LA and EA: .2812"(7,142 mm)
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
	d	D	B	d1	D1	r[1]	Dyn. C	Stat. Co	static Cax	g
WA933	*2.0625*	*2.625*	*.25*	*2.2657*	*2.4212*	*.015*	3010	3740	6310	49
	52,3875	66,675	6,35	57,55	61,5	0,38				
WA937	*2.3125*	*2.875*	*.25*	*2.5157*	*2.6712*	*.015*	3160	4180	7110	54
	58,7375	73,025	6,35	63,9	67,85	0,38				
WA940	*2.5*	*3.0625*	*.25*	*2.7031*	*2.8587*	*.015*	3200	4400	7520	58
	63,5	77,7875	6,35	68,66	72,61	0,38				
WA948	*3*	*3.5625*	*.25*	*3.2031*	*3.3587*	*.015*	3350	5050	8720	68
	76,2	90,4875	6,35	81,36	85,31	0,38				
WA956	*3.5*	*4.0625*	*.25*	*3.7031*	*3.8587*	*.015*	3490	5710	9930	79
	88,9	103,1875	6,35	94,06	98,01	0,38				
WA964	*4*	*4.5625*	*.25*	*4.2031*	*4.3587*	*.015*	3660	6470	11300	89
	101,6	115,8875	6,35	106,76	110,71	0,38				
WA972	*4.5*	*5.0625*	*.25*	*4.7031*	*4.8587*	*.015*	3820	7240	12700	100
	114,3	128,5875	6,35	119,46	123,41	0,38				
WA980	*5*	*5.5625*	*.25*	*5.2031*	*5.3587*	*.015*	3930	7900	13900	110
	127	141,2875	6,35	132,16	136,11	0,38				
WA988	*5.5*	*6.0625*	*.25*	*5.7031*	*5.8587*	*.015*	4070	8670	15300	120
	139,7	153,9875	6,35	144,86	148,81	0,38				
WA996	*6*	*6.5625*	*.25*	*6.2031*	*6.3587*	*.015*	4170	9330	16500	130
	152,4	166,6875	6,35	157,56	161,51	0,38				
WA9104	*6.5*	*7.0625*	*.25*	*6.7031*	*6.8587*	*.015*	4300	10100	17900	141
	165,1	179,3875	6,35	170,26	174,21	0,38				
WA9112	*7*	*7.5625*	*.25*	*7.2031*	*7.3587*	*.015*	4390	10700	19100	151
	177,8	192,0875	6,35	182,96	186,91	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.
3 Please consult our Design & Engineering Department for feasibility for shielded bearings.

C • Thin-section ball bearings



Bore diameter d from 2 inch (d 50,8 mm) to 8 inch (d 203,2 mm)

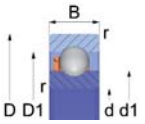
1 • Series A10

Constant ball diameter: 5/32 inch (3,969 mm)
Constant section
Versions E, R, H and N
Open bearings only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA1032	*2*	*2.625*	*.3125*	*2.2154*	*2.4094*	*.04*	4630	5870	6350	63
	50,8	66,675	7,937	56,27	61,2	1,015				
WA1040	*2.5*	*3.125*	*.3125*	*2.7154*	*2.9094*	*.04*	5070	7390	7900	76
	63,5	79,375	7,937	68,97	73,9	1,015				
WA1048	*3*	*3.625*	*.3125*	*3.2154*	*3.4094*	*.04*	5250	8430	8940	89
	76,2	92,075	7,937	81,67	86,6	1,015				
WA1056	*3.5*	*4.125*	*.3125*	*3.7154*	*3.9094*	*.04*	5600	9940	10400	103
	88,9	104,775	7,937	94,37	99,3	1,015				
WA1064	*4*	*4.625*	*.3125*	*4.2154*	*4.4094*	*.04*	5920	11400	12000	116
	101,6	117,475	7,937	107,07	112	1,015				
WA1068	*4.25*	*4.875*	*.3125*	*4.4654*	*4.6594*	*.04*	5990	11900	12500	123
	107,95	123,825	7,937	113,42	118,35	1,015				
WA1072	*4.5*	*5.125*	*.3125*	*4.7154*	*4.9094*	*.04*	6140	12700	13300	130
	114,3	130,175	7,937	119,77	124,7	1,015				
WA1076	*4.75*	*5.375*	*.3125*	*4.9654*	*5.1594*	*.04*	6280	13500	14100	137
	120,65	136,525	7,937	126,12	131,05	1,015				
WA1080	*5*	*5.625*	*.3125*	*5.2154*	*5.4094*	*.04*	6410	14200	14800	143
	127	142,875	7,937	132,47	137,4	1,015				
WA1088	*5.5*	*6.125*	*.3125*	*5.7154*	*5.9094*	*.04*	6600	15500	16100	157
	139,7	155,575	7,937	145,17	150,1	1,015				
WA1096	*6*	*6.625*	*.3125*	*6.2154*	*6.4094*	*.04*	6770	16800	17400	170
	152,4	168,275	7,937	157,87	162,8	1,015				
WA10104	*6.5*	*7.125*	*.3125*	*6.7154*	*6.9094*	*.04*	7010	18300	19000	184
	165,1	180,975	7,937	170,57	175,5	1,015				
WA10112	*7*	*7.625*	*.3125*	*7.2154*	*7.4094*	*.04*	7230	19800	20500	197
	177,8	193,675	7,937	183,27	188,2	1,015				
WA10120	*7.5*	*8.125*	*.3125*	*7.7154*	*7.9094*	*.04*	7320	20800	21600	210
	190,5	206,375	7,937	195,97	200,9	1,015				
WA10128	*8*	*8.625*	*.3125*	*8.2154*	*8.4094*	*.04*	7470	22100	22900	224
	203,2	219,075	7,937	208,67	213,6	1,015				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.

C • Thin-section ball bearings



Bore diameter d from 2.5625 inch (d 65,0875 mm) to 6.8125 inch (d 173,0375 mm)

1 • Series A11

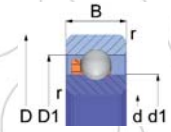
Constant ball diameter: 3/16 inch (4,762 mm)
Constant section
Versions E, R, H and N
Open bearing for all versions
Bearing with shields on versions E and R[3]
Width variant LA and EA: .3750"(9,525 mm)
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA1141	*2.5625*	*3.25*	*.3125*	*2.7896*	*3.0228*	*.015*	6520	8840	9650	87
	65,0875	82,55	7,937	70,856	76,78	0,38				
WA1145	*2.8125*	*3.5*	*.3125*	*3.0396*	*3.2728*	*.015*	6860	9920	10700	94
	71,4375	88,9	7,937	77,206	83,13	0,38				
WA1149	*3.0625*	*3.75*	*.3125*	*3.2896*	*3.5228*	*.015*	7030	10600	11500	102
	77,7875	95,25	7,937	83,556	89,48	0,38				
WA1153	*3.3125*	*4*	*.3125*	*3.5396*	*3.7728*	*.015*	7180	11400	12200	109
	84,1375	101,6	7,937	89,906	95,83	0,38				
WA1161	*3.8125*	*4.5*	*.3125*	*4.0396*	*4.2728*	*.015*	7480	12800	13700	123
	96,8375	114,3	7,937	102,606	108,53	0,38				
WA1169	*4.3125*	*5*	*.3125*	*4.5396*	*4.7728*	*.015*	7880	14700	15500	138
	109,5375	127	7,937	115,306	121,23	0,38				
WA1177	*4.8125*	*5.5*	*.3125*	*5.0396*	*5.2728*	*.015*	8130	16100	17000	153
	122,2375	139,7	7,937	128,006	133,93	0,38				
WA1185	*5.3125*	*6*	*.3125*	*5.5396*	*5.7728*	*.015*	8360	17600	18500	168
	134,9375	152,4	7,937	140,706	146,63	0,38				
WA1193	*5.8125*	*6.5*	*.3125*	*6.0396*	*6.2728*	*.015*	8690	19400	20300	183
	147,6375	165,1	7,937	153,406	159,33	0,38				
WA11101	*6.3125*	*7*	*.3125*	*6.5396*	*6.7728*	*.015*	8900	20900	21800	197
	160,3375	177,8	7,937	166,106	172,03	0,38				
WA11109	*6.8125*	*7.5*	*.3125*	*7.0396*	*7.2728*	*.015*	9110	22400	23300	212
	173,0375	190,5	7,937	178,806	184,73	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.
3 Please consult our Design & Engineering Department for feasibility for shielded bearings.

C • Thin-section ball bearings

Bore diameter d from 4 inch (d 101,6 mm) to 10 inch (d 254 mm)



1 • Series A12

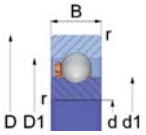
Constant ball diameter: 3/16 inch (4,762 mm)
Constant section
Versions E, R, H and N
Open bearings only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA1264	*4*	*4.75*	*.375*	*4.2583*	*4.4917*	*.04*	7760	13900	14800	172
	101,6	120,65	9,525	108,16	114,09	1,015				
WA1268	*4.25*	*5*	*.375*	*4.5083*	*4.7417*	*.04*	7890	14700	15500	181
	107,95	127	9,525	114,51	120,44	1,015				
WA1272	*4.5*	*5.25*	*.375*	*4.7583*	*4.9917*	*.04*	8020	15400	16300	191
	114,3	133,35	9,525	120,86	126,79	1,015				
WA1276	*4.75*	*5.5*	*.375*	*5.0083*	*5.2417*	*.04*	8140	16100	17000	204
	120,65	139,7	9,525	127,21	133,14	1,015				
WA1280	*5*	*5.75*	*.375*	*5.2583*	*5.4917*	*.04*	8380	17200	18100	211
	127	146,05	9,525	133,56	139,49	1,015				
WA1288	*5.5*	*6.25*	*.375*	*5.7583*	*5.9917*	*.04*	8600	18700	19600	230
	139,7	158,75	9,525	146,26	152,19	1,015				
WA1296	*6*	*6.75*	*.375*	*6.2583*	*6.4917*	*.04*	8920	20500	21400	250
	152,4	171,45	9,525	158,96	164,89	1,015				
WA12104	*6.5*	*7.25*	*.375*	*6.7583*	*6.9917*	*.04*	9120	22000	22900	269
	165,1	184,15	9,525	171,66	177,59	1,015				
WA12112	*7*	*7.75*	*.375*	*7.2583*	*7.4917*	*.04*	9400	23800	24800	289
	177,8	196,85	9,525	184,36	190,29	1,015				
WA12120	*7.5*	*8.25*	*.375*	*7.7583*	*7.9917*	*.04*	9580	25300	26200	309
	190,5	209,55	9,525	197,06	202,99	1,015				
WA12128	*8*	*8.75*	*.375*	*8.2583*	*8.4917*	*.04*	9850	27100	28100	328
	203,2	222,25	9,525	209,76	215,69	1,015				
WA12144	*9*	*9.75*	*.375*	*9.2583*	*9.4917*	*.04*	10100	30100	31000	366
	228,6	247,65	9,525	235,16	241,09	1,015				
WA12160	*10*	*10.75*	*.375*	*10.2583*	*10.4917*	*.04*	10600	33700	34700	406
	254	273,05	9,525	260,56	266,49	1,015				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.

C • Thin-section ball bearings

Bore diameter d from 3.0625 inch (d 77.7875 mm) to 10 inch (d 254 mm)



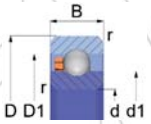
1 • Series A13

Constant ball diameter: 3/16 inch (4,762 mm)
Constant section
Versions E, R, H and N
Open bearing for all versions
Bearing with shields on versions E and R[3]
Width variant LA and EA: .3750"(9,525 mm)
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA1349	*3.0625*	*3.875*	*.3125*	*3.3521*	*3.5854*	*.015*	7140	11000	11800	130
	77,7875	98,425	7,937	85,144	91,07	0,38				
WA1356	*3.5*	*4.3125*	*.3125*	*3.7895*	*4.0228*	*.015*	7470	12400	13300	147
	88,9	109,5375	7,937	96,254	102,18	0,38				
WA1364	*4*	*4.8125*	*.3125*	*4.2895*	*4.5228*	*.015*	7750	13900	14800	165
	101,6	122,2375	7,937	108,954	114,88	0,38				
WA1372	*4.5*	*5.3125*	*.3125*	*4.7895*	*5.0228*	*.015*	8000	15400	16300	184
	114,3	134,9375	7,937	121,654	127,58	0,38				
WA1380	*5*	*5.8125*	*.3125*	*5.2895*	*5.5228*	*.015*	8250	16900	17800	202
	127	147,6375	7,937	134,354	140,28	0,38				
WA1388	*5.5*	*6.3125*	*.3125*	*5.7895*	*6.0228*	*.015*	8480	18300	19200	221
	139,7	160,3375	7,937	147,054	152,98	0,38				
WA1396	*6*	*6.8125*	*.3125*	*6.2895*	*6.5228*	*.015*	8700	19800	20700	239
	152,4	173,0375	7,937	159,754	165,68	0,38				
WA13104	*6.5*	*7.3125*	*.3125*	*6.7895*	*7.0228*	*.015*	8910	21300	22200	258
	165,1	185,7375	7,937	172,454	178,38	0,38				
WA13112	*7*	*7.8125*	*.3125*	*7.2895*	*7.5228*	*.015*	9110	22800	23600	276
	177,8	198,4375	7,937	185,154	191,08	0,38				
WA13120	*7.5*	*8.3125*	*.3125*	*7.7895*	*8.0228*	*.015*	9300	24200	25100	295
	190,5	211,1375	7,937	197,854	203,78	0,38				
WA13128	*8*	*8.8125*	*.3125*	*8.2895*	*8.5228*	*.015*	9490	25700	26600	313
	203,2	223,8375	7,937	210,554	216,48	0,38				
WA13144	*9*	*9.8125*	*.3125*	*9.2895*	*9.5228*	*.015*	9840	28600	29500	350
	228,6	249,2375	7,937	235,954	241,88	0,38				
WA13160	*10*	*10.8125*	*.3125*	*10.2895*	*10.5228*	*.015*	10100	31600	32500	387
	254	274,6375	7,937	261,354	267,28	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.
3 Please consult our Design & Engineering Department for feasibility for shielded bearings.

C • Thin-section ball bearings



Bore diameter d from 4 inch (d 101,6 mm) to 12 inch (d 304,8 mm)

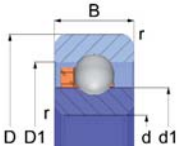
1 • Series A16

Constant ball diameter: 1/4 inch (6,35 mm)
Constant section
Versions R, H and N
Open bearings only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA1664	*4* 101,6	*5* 127	*.5* 12,7	*4.3445* 110,35	*4.6555* 118,25	*.06* 1,525	11800	18900	18300	312
WA1668	*4.25* 107,95	*5.25* 133,35	*.5* 12,7	*4.5945* 116,7	*4.9055* 124,6	*.06* 1,525	11850	19600	21000	329
WA1672	*4.5* 114,3	*5.5* 139,7	*.5* 12,7	*4.8445* 123,05	*5.1555* 130,95	*.06* 1,525	12200	20900	22300	346
WA1676	*4.75* 120,65	*5.75* 146,05	*.5* 12,7	*5.0945* 129,4	*5.4055* 137,3	*.06* 1,525	12500	22200	23600	364
WA1680	*5* 127	*6* 152,4	*.5* 12,7	*5.3445* 135,75	*5.6555* 143,65	*.06* 1,525	12550	22800	24200	380
WA1688	*5.5* 139,7	*6.5* 165,1	*.5* 12,7	*5.8445* 148,45	*6.1555* 156,35	*.06* 1,525	13100	25400	26800	415
WA1696	*6* 152,4	*7* 177,8	*.5* 12,7	*6.3445* 161,15	*6.6555* 169,05	*.06* 1,525	13400	27400	28800	450
WA16104	*6.5* 165,1	*7.5* 190,5	*.5* 12,7	*6.8445* 173,85	*7.1555* 181,75	*.06* 1,525	13700	29300	30700	484
WA16112	*7* 177,8	*8* 203,2	*.5* 12,7	*7.3445* 186,55	*7.6555* 194,45	*.06* 1,525	14200	31900	33300	519
WA16120	*7.5* 190,5	*8.5* 215,9	*.5* 12,7	*7.8445* 199,25	*8.1555* 207,15	*.06* 1,525	14500	33900	35300	553
WA16128	*8* 203,2	*9* 228,6	*.5* 12,7	*8.3445* 211,95	*8.6555* 219,85	*.06* 1,525	14700	35900	37200	587
WA16144	*9* 228,6	*10* 254	*.5* 12,7	*9.3445* 237,35	*9.6555* 245,25	*.06* 1,525	15400	40400	41800	657
WA16160	*10* 254	*11* 279,4	*.5* 12,7	*10.3445* 262,75	*10.6555* 270,65	*.06* 1,525	16000	45000	46300	726
WA16176	*11* 279,4	*12* 304,8	*.5* 12,7	*11.3445* 288,15	*11.6555* 296,05	*.06* 1,525	16500	48900	50200	794
WA16192	*12* 304,8	*13* 330,2	*.5* 12,7	*12.3445* 313,55	*12.6555* 321,45	*.06* 1,525	16900	52800	54100	863

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.

C • Thin-section ball bearings



Bore diameter d from 4 inch (d 101,6 mm) to 11 inch (d 279,4 mm)

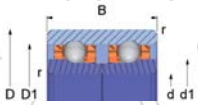
1 • Series A24

Constant ball diameter: 3/8 inch (9,525 mm)
Constant section
Versions R, H and N
Open bearings only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WA2464	*4* 101,6	*5.5* 139,7	*.75* 19,05	*4.5169* 114,73	*4.9831* 126,57	*.075* 1,905	21400	29400	32600	746
WA2468	*4.25* 107,95	*5.75* 146,05	*.75* 19,05	*4.7669* 121,08	*5.2331* 132,92	*.075* 1,905	21700	30900	34100	784
WA2472	*4.5* 114,3	*6* 152,4	*.75* 19,05	*5.0169* 127,43	*5.4831* 139,27	*.075* 1,905	22700	33700	37100	826
WA2476	*4.75* 120,65	*6.25* 158,75	*.75* 19,05	*5.2669* 133,78	*5.7331* 145,62	*.075* 1,905	23000	35200	38600	865
WA2480	*5* 127	*6.5* 165,1	*.75* 19,05	*5.5169* 140,13	*5.9831* 151,97	*.075* 1,905	23300	36700	40200	904
WA2488	*5.5* 139,7	*7* 177,8	*.75* 19,05	*6.0169* 152,83	*6.4831* 164,67	*.075* 1,905	23900	39600	43200	981
WA2496	*6* 152,4	*7.5* 190,5	*.75* 19,05	*6.5169* 165,53	*6.9831* 177,37	*.075* 1,905	25000	44000	47800	1070
WA24104	*6.5* 165,1	*8* 203,2	*.75* 19,05	*7.0169* 178,23	*7.4831* 190,07	*.075* 1,905	25600	46900	50700	1140
WA24112	*7* 177,8	*8.5* 215,9	*.75* 19,05	*7.5169* 190,93	*7.9831* 202,77	*.075* 1,905	26100	49900	53700	1220
WA24120	*7.5* 190,5	*9* 228,6	*.75* 19,05	*8.0169* 203,63	*8.4831* 215,47	*.075* 1,905	27000	54300	58100	1300
WA24128	*8* 203,2	*9.5* 241,3	*.75* 19,05	*8.5169* 216,33	*8.9831* 228,17	*.075* 1,905	27500	57200	61100	1380
WA24144	*9* 228,6	*10.5* 266,7	*.75* 19,05	*9.5169* 241,73	*9.9831* 253,57	*.075* 1,905	28700	64500	68500	1540
WA24160	*10* 254	*11.5* 292,1	*.75* 19,05	*10.5169* 267,13	*10.9831* 278,97	*.075* 1,905	29500	70400	74400	1690
WA24176	*11* 279,4	*12.5* 317,5	*.75* 19,05	*11.5169* 292,53	*11.9831* 304,37	*.075* 1,905	30700	77800	81800	1850

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.

C • Thin-section ball bearings



Bore diameter d from .5 inch (d 12,7 mm) to 1.625 inch (d 41,275 mm)

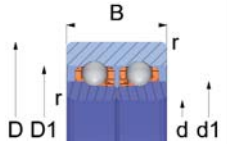
2 • Series AD4, super duplex

Constant ball diameter: 1/16 inch (1,588 mm)
Constant section
Version H
Duplex configuration back-to-back
Preload value upon request
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAD408[3]	.5	.75	.3125	.5835	.6669	.01	1280	1290	740	6,7
	12,7	19,05	7,937	14,82	16,94	0,25				
WAD412	.75	1	.3125	.8335	.9169	.01	1470	1780	1040	9,4
	19,05	25,4	7,937	21,17	23,29	0,25				
WAD420	1.25	1.5	.3125	1.3335	1.4169	.01	1640	2540	1530	15
	31,75	38,1	7,937	33,87	35,99	0,25				
WAD424	1.5	1.75	.3125	1.5835	1.6669	.01	1740	2970	1820	18
	38,1	44,45	7,937	40,22	42,34	0,25				
WAD426	1.625	1.875	.3125	1.7083	1.7917	.01	1790	3190	1960	19
	41,275	47,625	7,937	43,39	45,51	0,25				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.
3 The tolerances applicable to WAD408 are those of classes T5, T4 and T2, pages 38 and 39.

C • Thin-section ball bearings



Bore diameter d from .6250 inch (d 15,875 mm) to 2.5625 inch (d 65,0875 mm)

2 • Series AD7, super duplex

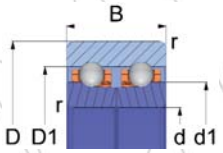
Constant ball diameter: 3/32 inch (2,381 mm)
Constant section
Versions H, N and B
Duplex configuration back-to-back
Preload value upon request
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAD710	.625	1.0625	.375	.7661	.8827	.015	2200	2100	1620	21
	15,875	26,9875	9,525	19,46	22,42	0,38				
WAD712	.75	1.1875	.375	.8909	1.0075	.015	2300	2340	1840	24
	19,05	30,1625	9,525	22,63	25,59	0,38				
WAD713	.8125	1.25	.375	.9535	1.0701	.015	2340	2460	1950	25
	20,6375	31,75	9,525	24,22	27,18	0,38				
WAD714	.875	1.3125	.375	1.0161	1.1327	.015	2390	2590	2070	27
	22,225	33,3375	9,525	25,81	28,77	0,38				
WAD717	1.0625	1.5	.375	1.2035	1.3201	.015	2510	2950	2400	31
	26,9875	38,1	9,525	30,57	33,53	0,38				
WAD721	1.3125	1.75	.375	1.4535	1.5701	.015	2720	3570	2960	37
	33,3375	44,45	9,525	36,92	39,88	0,38				
WAD725	1.5625	2	.375	1.7035	1.8201	.015	2840	4060	3410	43
	39,6875	50,8	9,525	43,27	46,23	0,38				
WAD729	1.8125	2.25	.375	1.9535	2.0701	.015	3010	4680	3970	49
	46,0375	57,15	9,525	49,62	52,58	0,38				
WAD733	2.0625	2.5	.375	2.2035	2.3201	.015	3850	7110	6080	57
	52,3875	63,5	9,525	55,97	58,93	0,38				
WAD737	2.3125	2.75	.375	2.4535	2.5701	.015	3990	7850	6750	63
	58,7375	69,85	9,525	62,32	65,28	0,38				
WAD741	2.5625	3	.375	2.7035	2.8201	.015	4130	8590	7420	69
	65,0875	76,2	9,525	68,67	71,63	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 2 inch (d 50,8 mm) to 7 inch (d 177,8 mm)



2 • Series AD8, super duplex

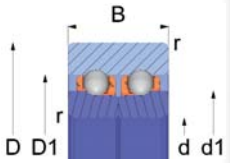
Constant ball diameter: 3/32 inch (2,381 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAD832	*2*	*2.5*	*.375*	*2.1913*	*2.3083*	*.015*	3810	6980	5790	66
	50,8	63,5	9,525	55,66	58,63	0,38				
WAD840	*2.5*	*3*	*.375*	*2.6913*	*2.8083*	*.015*	4090	8460	7090	80
	63,5	76,2	9,525	68,36	71,33	0,38				
WAD848	*3*	*3.5*	*.375*	*3.1913*	*3.3083*	*.015*	4340	9940	8400	95
	76,2	88,9	9,525	81,06	84,03	0,38				
WAD856	*3.5*	*4*	*.375*	*3.6913*	*3.8083*	*.015*	4560	11400	9700	110
	88,9	101,6	9,525	93,76	96,73	0,38				
WAD864	*4*	*4.5*	*.375*	*4.1913*	*4.3083*	*.015*	4740	12700	10800	124
	101,6	114,3	9,525	106,46	109,43	0,38				
WAD868	*4.25*	*4.75*	*.375*	*4.4413*	*4.5583*	*.015*	4840	13500	11500	131
	107,95	120,65	9,525	112,81	115,78	0,38				
WAD872	*4.5*	*5*	*.375*	*4.6913*	*4.8083*	*.015*	4930	14200	12200	139
	114,3	127	9,525	119,16	122,13	0,38				
WAD876	*4.75*	*5.25*	*.375*	*4.9413*	*5.0583*	*.015*	5020	14900	12800	146
	120,65	133,35	9,525	125,51	128,48	0,38				
WAD880	*5*	*5.5*	*.375*	*5.1913*	*5.3083*	*.015*	5110	15700	13500	153
	127	139,7	9,525	131,86	134,83	0,38				
WAD888	*5.5*	*6*	*.375*	*5.6913*	*5.8083*	*.015*	5280	17200	14800	168
	139,7	152,4	9,525	144,56	147,53	0,38				
WAD896	*6*	*6.5*	*.375*	*6.1913*	*6.3083*	*.015*	5450	18600	16100	183
	152,4	165,1	9,525	157,26	160,23	0,38				
WAD8104	*6.5*	*7*	*.375*	*6.6913*	*6.8083*	*.015*	5600	20100	17400	197
	165,1	177,8	9,525	169,96	172,93	0,38				
WAD8112	*7*	*7.5*	*.375*	*7.1913*	*7.3083*	*.015*	5720	21500	18600	212
	177,8	190,5	9,525	182,66	185,63	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 2.0625 inch (d 52,3875 mm) to 7 inch (d 177,8 mm)



2 • Series AD9, super duplex

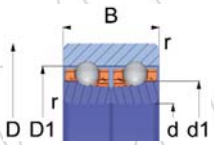
Constant ball diameter: 3/32 inch (2,381 mm)
Constant section
Versions H, N and B
Duplex configuration back-to-back
Preload value upon request
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAD933	*2.0625*	*2.625*	*.375*	*2.2657*	*2.3823*	*.015*	3140	5290	4530	79
	52,3875	66,675	9,525	57,55	60,51	0,38				
WAD937	*2.3125*	*2.875*	*.375*	*2.5157*	*2.6323*	*.015*	3280	5910	5090	87
	58,7375	73,025	9,525	63,9	66,86	0,38				
WAD940	*2.5*	*3.0625*	*.375*	*2.7031*	*2.8197*	*.015*	4130	8590	7420	95
	63,5	77,7875	9,525	68,66	71,62	0,38				
WAD948	*3*	*3.5625*	*.375*	*3.2031*	*3.3197*	*.015*	4370	10000	8760	112
	76,2	90,4875	9,525	81,36	84,32	0,38				
WAD956	*3.5*	*4.0625*	*.375*	*3.7031*	*3.8197*	*.015*	4560	11400	10000	129
	88,9	103,1875	9,525	94,06	97,02	0,38				
WAD964	*4*	*4.5625*	*.375*	*4.2031*	*4.3197*	*.015*	4770	12800	11300	146
	101,6	115,8875	9,525	106,76	109,72	0,38				
WAD972	*4.5*	*5.0625*	*.375*	*4.7031*	*4.8197*	*.015*	4960	14300	12600	163
	114,3	128,5875	9,525	119,46	122,42	0,38				
WAD980	*5*	*5.5625*	*.375*	*5.2031*	*5.3197*	*.015*	5140	15800	14000	180
	127	141,2875	9,525	132,16	135,12	0,38				
WAD988	*5.5*	*6.0625*	*.375*	*5.7031*	*5.8197*	*.015*	5310	17300	15300	197
	139,7	153,9875	9,525	144,86	147,82	0,38				
WAD996	*6*	*6.5625*	*.375*	*6.2031*	*6.3197*	*.015*	5470	18800	16700	214
	152,4	166,6875	9,525	157,56	160,52	0,38				
WAD9104	*6.5*	*7.0625*	*.375*	*6.7031*	*6.8197*	*.015*	5600	20100	17900	230
	165,1	179,3875	9,525	170,26	173,22	0,38				
WAD9112	*7*	*7.5625*	*.375*	*7.2031*	*7.3197*	*.015*	5740	21600	19200	247
	177,8	192,0875	9,525	182,96	185,92	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 2 inch (d 50,8 mm) to 8 inch (d 203,2 mm)



2 • Series AD10, super duplex

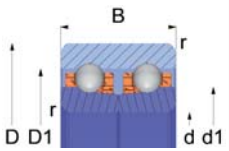
Constant ball diameter: 1/8 inch (3,175 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAD1032	*2* 50,8	*2.625* 66,675	*.5* 12,7	*2.2346* 56,76	*2.3906* 60,72	*.025* 0,635	5890	9830	8230	110
WAD1040	*2.5* 63,5	*3.125* 79,375	*.5* 12,7	*2.7346* 69,46	*2.8906* 73,42	*.025* 0,635	6310	11800	10000	134
WAD1048	*3* 76,2	*3.625* 92,075	*.5* 12,7	*3.2346* 82,16	*3.3906* 86,12	*.025* 0,635	6670	13700	11800	157
WAD1056	*3.5* 88,9	*4.125* 104,775	*.5* 12,7	*3.7346* 94,86	*3.8906* 98,82	*.025* 0,635	7010	15700	13600	181
WAD1064	*4* 101,6	*4.625* 117,475	*.5* 12,7	*4.2346* 107,56	*4.3906* 111,52	*.025* 0,635	7250	17500	15200	205
WAD1068	*4.25* 107,95	*4.875* 123,825	*.5* 12,7	*4.4846* 113,91	*4.6406* 117,87	*.025* 0,635	7430	18600	16200	217
WAD1072	*4.5* 114,3	*5.125* 130,175	*.5* 12,7	*4.7346* 120,26	*4.8906* 124,22	*.025* 0,635	7540	19400	17000	229
WAD1076	*4.75* 120,65	*5.375* 136,525	*.5* 12,7	*4.9846* 126,61	*5.1406* 130,57	*.025* 0,635	7710	20500	18000	241
WAD1080	*5* 127	*5.625* 142,875	*.5* 12,7	*5.2346* 132,96	*5.3906* 136,92	*.025* 0,635	7810	21400	18800	252
WAD1088	*5.5* 139,7	*6.125* 155,575	*.5* 12,7	*5.7346* 145,66	*5.8906* 149,62	*.025* 0,635	8070	23400	20600	276
WAD1096	*6* 152,4	*6.625* 168,275	*.5* 12,7	*6.2346* 158,36	*6.3906* 162,32	*.025* 0,635	8310	25400	22300	300
WAD10104	*6.5* 165,1	*7.125* 180,975	*.5* 12,7	*6.7346* 171,06	*6.8906* 175,02	*.025* 0,635	8540	27300	24100	324
WAD10112	*7* 177,8	*7.625* 193,675	*.5* 12,7	*7.2346* 183,76	*7.3906* 187,72	*.025* 0,635	8760	29300	25900	348
WAD10120	*7.5* 190,5	*8.125* 206,375	*.5* 12,7	*7.7346* 196,46	*7.8906* 200,42	*.025* 0,635	8970	31330	27770	372
WAD10128	*8* 203,2	*8.625* 219,075	*.5* 12,7	*8.2346* 209,16	*8.3906* 213,12	*.025* 0,635	9140	33080	29370	395

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 4 inch (d 101,6 mm) to 10 inch (d 254 mm)



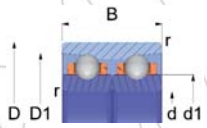
2 • Series AD12, super duplex

Constant ball diameter: 5/32 inch (3,969 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAD1264	*4* 101,6	*4.75* 120,65	*.625* 15,875	*4.278* 108,66	*4.472* 113,59	*.04* 1,015	11600	30700	16100	305
WAD1268	*4.25* 107,95	*5* 127	*.625* 15,875	*4.528* 115,01	*4.722* 119,94	*.04* 1,015	11900	32700	17100	323
WAD1272	*4.5* 114,3	*5.25* 133,35	*.625* 15,875	*4.778* 121,36	*4.972* 126,29	*.04* 1,015	12100	34300	17900	340
WAD1276	*4.75* 120,65	*5.5* 139,7	*.625* 15,875	*5.028* 127,71	*5.222* 132,64	*.04* 1,015	12300	36300	18900	358
WAD1280	*5* 127	*5.75* 146,05	*.625* 15,875	*5.278* 134,06	*5.472* 138,99	*.04* 1,015	12500	37800	19700	375
WAD1288	*5.5* 139,7	*6.25* 158,75	*.625* 15,875	*5.778* 146,76	*5.972* 151,69	*.04* 1,015	12900	41400	21400	410
WAD1296	*6* 152,4	*6.75* 171,45	*.625* 15,875	*6.278* 159,46	*6.472* 164,39	*.04* 1,015	13300	45000	23200	445
WAD12104	*6.5* 165,1	*7.25* 184,15	*.625* 15,875	*6.778* 172,16	*6.972* 177,09	*.04* 1,015	13700	49000	25200	480
WAD12112	*7* 177,8	*7.75* 196,85	*.625* 15,875	*7.278* 184,86	*7.472* 189,79	*.04* 1,015	14100	52600	27000	515
WAD12120	*7.5* 190,5	*8.25* 209,55	*.625* 15,875	*7.778* 197,56	*7.972* 202,49	*.04* 1,015	14400	56100	28800	550
WAD12128	*8* 203,2	*8.75* 222,25	*.625* 15,875	*8.278* 210,26	*8.472* 215,19	*.04* 1,015	14700	59700	30600	585
WAD12144	*9* 228,6	*9.75* 247,65	*.625* 15,875	*9.278* 235,66	*9.472* 240,59	*.04* 1,015	15300	66800	34100	655
WAD12160	*10* 254	*10.75* 273,05	*.625* 15,875	*10.278* 261,06	*10.472* 265,99	*.04* 1,015	15900	74000	37700	725

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings



Bore diameter d from .875 inch (d 22,225 mm) to 2.5 inch (d 63,5 mm)

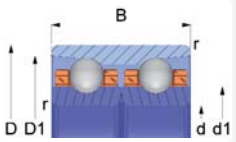
2 • Series AA6, super duplex

Constant ball diameter: 3/32 inch (2,381 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N Radial		Axial	Mean[2] mass
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA614	*.875*	*1.25*	*.375*	*1.0043*	*1.1665*	*.01*	3030	3680	2950	21
	22,225	31,75	9,525	25,51	29,63	0,25				
WAA616	*1*	*1.375*	*.375*	*1.1291*	*1.2913*	*.01*	3150	4050	3250	24
	25,4	34,925	9,525	28,68	32,8	0,25				
WAA618	*1.125*	*1.5*	*.375*	*1.2543*	*1.4161*	*.01*	3250	4420	3630	26
	28,575	38,1	9,525	31,86	35,97	0,25				
WAA620	*1.25*	*1.625*	*.375*	*1.3791*	*1.5409*	*.01*	3290	4650	3810	29
	31,75	41,275	9,525	35,03	39,14	0,25				
WAA622	*1.375*	*1.75*	*.375*	*1.5043*	*1.6657*	*.01*	3380	5020	4190	31
	34,925	44,45	9,525	38,21	42,31	0,25				
WAA624	*1.5*	*1.875*	*.375*	*1.6291*	*1.7906*	*.01*	3470	5390	4470	33
	38,1	47,625	9,525	41,38	45,48	0,25				
WAA628	*1.75*	*2.125*	*.375*	*1.8791*	*2.0402*	*.01*	3590	6000	5030	38
	44,45	53,975	9,525	47,73	51,82	0,25				
WAA632	*2*	*2.375*	*.375*	*2.1291*	*2.2898*	*.01*	3800	6860	5800	44
	50,8	60,325	9,525	54,08	58,16	0,25				
WAA640	*2.5*	*2.875*	*.375*	*2.6291*	*2.789*	*.01*	4080	8340	7140	53
	63,5	73,025	9,525	66,78	70,84	0,25				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings



Bore diameter d from .625 inch (d 15,875 mm) to 2.5625 inch (d 65,0875 mm)

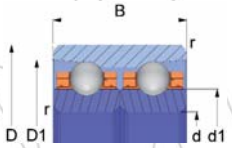
2 • Series AA7, super duplex

Constant ball diameter: 1/8 inch (3,175 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* in mm						Basic load rating[2] N Radial		Axial	Mean[2] mass
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA710	*.625*	*1.0625*	*.5*	*.7661*	*.9843*	*.015*	3940	3890	2870	25
	15,875	26,9875	12,7	19,46	25	0,38				
WAA712	*.75*	*1.1875*	*.5*	*.8909*	*1.1091*	*.015*	4310	4580	3460	28
	19,05	30,1625	12,7	22,63	28,17	0,38				
WAA713	*.8125*	*1.25*	*.5*	*.9535*	*1.1713*	*.015*	4410	4790	3670	30
	20,6375	31,75	12,7	24,22	29,75	0,38				
WAA714	*.875*	*1.3125*	*.5*	*1.0161*	*1.2339*	*.015*	4490	5010	3870	32
	22,225	33,3375	12,7	25,81	31,34	0,38				
WAA717	*1.0625*	*1.5*	*.5*	*1.2035*	*1.4209*	*.015*	4860	5900	4670	37
	26,9875	38,1	12,7	30,57	36,09	0,38				
WAA721	*1.3125*	*1.75*	*.5*	*1.4535*	*1.6705*	*.015*	5110	6760	5470	45
	33,3375	44,45	12,7	36,92	42,43	0,38				
WAA725	*1.5625*	*2*	*.5*	*1.7035*	*1.9201*	*.015*	5550	8100	6670	52
	39,6875	50,8	12,7	43,27	48,77	0,38				
WAA729	*1.8125*	*2.25*	*.5*	*1.9535*	*2.1697*	*.015*	5740	8970	7480	60
	46,0375	57,15	12,7	49,62	55,11	0,38				
WAA733	*2.0625*	*2.5*	*.5*	*2.2035*	*2.4193*	*.015*	5920	9840	8280	67
	52,3875	63,5	12,7	55,97	61,45	0,38				
WAA737	*2.3125*	*2.75*	*.5*	*2.4535*	*2.6689*	*.015*	6090	10700	9090	74
	58,7375	69,85	12,7	62,32	67,79	0,38				
WAA741	*2.5625*	*3*	*.5*	*2.7035*	*2.9185*	*.015*	6330	11800	10000	81
	65,0875	76,2	12,7	68,67	74,13	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings



Bore diameter d from 2 inch (d 50,8 mm) to 7 inch (d 177,8 mm)

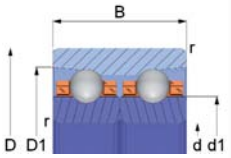
2 • Series AA8, super duplex

Constant ball diameter: 1/8 inch (3,175 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA832	*2*	*2.5*	*.5*	*2.172*	*2.3878*	*.025*	5950	9840	8280	79
	50,8	63,5	12,7	55,17	60,65	0,635				
WAA840	*2.5*	*3*	*.5*	*2.672*	*2.8866*	*.025*	6270	11500	9890	96
	63,5	76,2	12,7	67,87	73,32	0,635				
WAA848	*3*	*3.5*	*.5*	*3.172*	*3.3858*	*.025*	6640	13500	11600	114
	76,2	88,9	12,7	80,57	86	0,635				
WAA856	*3.5*	*4*	*.5*	*3.672*	*3.885*	*.025*	6980	15500	13500	132
	88,9	101,6	12,7	93,27	98,68	0,635				
WAA864	*4*	*4.5*	*.5*	*4.172*	*4.3843*	*.025*	7290	17500	15300	149
	101,6	114,3	12,7	105,97	111,36	0,635				
WAA868	*4.25*	*4.75*	*.5*	*4.422*	*4.6339*	*.025*	7400	18300	16100	158
	107,95	120,65	12,7	112,32	117,7	0,635				
WAA872	*4.5*	*5*	*.5*	*4.672*	*4.8835*	*.025*	7510	19200	16900	167
	114,3	127	12,7	118,67	124,04	0,635				
WAA876	*4.75*	*5.25*	*.5*	*4.922*	*5.1331*	*.025*	7680	20300	17900	176
	120,65	133,35	12,7	125,02	130,38	0,635				
WAA880	*5*	*5.5*	*.5*	*5.172*	*5.3827*	*.025*	7790	21200	18700	184
	127	139,7	12,7	131,37	136,72	0,635				
WAA888	*5.5*	*6*	*.5*	*5.672*	*5.8819*	*.025*	8050	23200	20500	202
	139,7	152,4	12,7	144,07	149,4	0,635				
WAA896	*6*	*6.5*	*.5*	*6.172*	*6.3811*	*.025*	8290	25100	22300	220
	152,4	165,1	12,7	156,77	162,08	0,635				
WAA8104	*6.5*	*7*	*.5*	*6.672*	*6.8799*	*.025*	8520	27100	24100	238
	165,1	177,8	12,7	169,47	174,75	0,635				
WAA8112	*7*	*7.5*	*.5*	*7.172*	*7.3791*	*.025*	8740	29100	25900	255
	177,8	190,5	12,7	182,17	187,43	0,635				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings



Bore diameter d from 2.0625 inch (d 52,3875 mm) to 7 inch (d 177,8 mm)

2 • Series AA9, super duplex

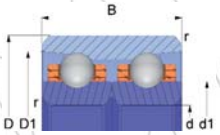
Constant ball diameter: 1/8 inch (3,175 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA933	*2.0625*	*2.625*	*.5*	*2.2657*	*2.4811*	*.015*	6050	10200	8680	98
	52,3875	66,675	12,7	57,55	63,02	0,38				
WAA937	*2.3125*	*2.875*	*.5*	*2.5157*	*2.7307*	*.015*	6210	11100	9480	108
	58,7375	73,025	12,7	63,9	69,36	0,38				
WAA940	*2.5*	*3.0625*	*.5*	*2.7031*	*2.9181*	*.015*	6330	11800	10000	116
	63,5	77,7875	12,7	68,66	74,12	0,38				
WAA948	*3*	*3.5625*	*.5*	*3.2031*	*3.4173*	*.015*	6690	13700	11800	137
	76,2	90,4875	12,7	81,36	86,8	0,38				
WAA956	*3.5*	*4.0625*	*.5*	*3.7031*	*3.9165*	*.015*	7030	15700	13700	157
	88,9	103,1875	12,7	94,06	99,48	0,38				
WAA964	*4*	*4.5625*	*.5*	*4.2031*	*4.4154*	*.015*	7270	17500	15300	178
	101,6	115,8875	12,7	106,76	112,15	0,38				
WAA972	*4.5*	*5.0625*	*.5*	*4.7031*	*4.9146*	*.015*	7560	19400	17100	199
	114,3	128,5875	12,7	119,46	124,83	0,38				
WAA980	*5*	*5.5625*	*.5*	*5.2031*	*5.4138*	*.015*	7830	21400	18900	220
	127	141,2875	12,7	132,16	137,51	0,38				
WAA988	*5.5*	*6.0625*	*.5*	*5.7031*	*5.913*	*.015*	8080	23400	20700	241
	139,7	153,9875	12,7	144,86	150,19	0,38				
WAA996	*6*	*6.5625*	*.5*	*6.2031*	*6.4122*	*.015*	8330	25400	22500	262
	152,4	166,6875	12,7	157,56	162,87	0,38				
WAA9104	*6.5*	*7.0625*	*.5*	*6.7031*	*6.9114*	*.015*	8560	27300	24300	283
	165,1	179,3875	12,7	170,26	175,55	0,38				
WAA9112	*7*	*7.5625*	*.5*	*7.2031*	*7.4106*	*.015*	8770	29300	26100	304
	177,8	192,0875	12,7	182,96	188,23	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 2 inch (d 50,8 mm) to 8 inch (d 203,2 mm)



2 • Series AA10, super duplex

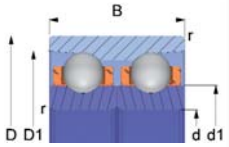
Constant ball diameter: 5/32 inch (3,969 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA1032	*2*	*2.625*	*.625*	*2.2154*	*2.4819*	*.04*	9050	15500	8380	124
	50,8	66,675	15,875	56,27	63,04	1,015				
WAA1040	*2.5*	*3.125*	*.625*	*2.7154*	*2.9811*	*.04*	9760	19000	10100	151
	63,5	79,375	15,875	68,97	75,72	1,015				
WAA1048	*3*	*3.625*	*.625*	*3.2154*	*3.4799*	*.04*	10500	23100	12200	179
	76,2	92,075	15,875	81,67	88,39	1,015				
WAA1056	*3.5*	*4.125*	*.625*	*3.7154*	*3.9791*	*.04*	11000	26600	14000	206
	88,9	104,775	15,875	94,37	101,07	1,015				
WAA1064	*4*	*4.625*	*.625*	*4.2154*	*4.4783*	*.04*	11500	30200	15800	233
	101,6	117,475	15,875	107,07	113,75	1,015				
WAA1068	*4.25*	*4.875*	*.625*	*4.4654*	*4.728*	*.04*	11800	32200	16900	247
	107,95	123,825	15,875	113,42	120,09	1,015				
WAA1072	*4.5*	*5.125*	*.625*	*4.7154*	*4.9776*	*.04*	12100	34300	17900	260
	114,3	130,175	15,875	119,77	126,43	1,015				
WAA1076	*4.75*	*5.375*	*.625*	*4.9654*	*5.2272*	*.04*	12300	35800	18700	274
	120,65	136,525	15,875	126,12	132,77	1,015				
WAA1080	*5*	*5.625*	*.625*	*5.2154*	*5.4701*	*.04*	12500	37800	19700	288
	127	142,875	15,875	132,47	138,94	1,015				
WAA1088	*5.5*	*6.125*	*.625*	*5.7154*	*5.9756*	*.04*	12900	41400	21500	315
	139,7	155,575	15,875	145,17	151,78	1,015				
WAA1096	*6*	*6.625*	*.625*	*6.2154*	*6.4748*	*.04*	13300	44900	23400	342
	152,4	168,275	15,875	157,87	164,46	1,015				
WAA10104	*6.5*	*7.125*	*.625*	*6.7154*	*6.974*	*.04*	13700	48500	25200	369
	165,1	180,975	15,875	170,57	177,14	1,015				
WAA10112	*7*	*7.625*	*.625*	*7.2154*	*7.4732*	*.04*	14100	52600	27200	397
	177,8	193,675	15,875	183,27	189,82	1,015				
WAA10120	*7.5*	*8.125*	*.625*	*7.7154*	*7.9724*	*.04*	14500	56100	29100	424
	190,5	206,375	15,875	195,97	202,5	1,015				
WAA10128	*8*	*8.625*	*.625*	*8.2154*	*8.4717*	*.04*	14800	59700	30900	452
	203,2	219,075	15,875	208,67	215,18	1,015				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 2.5625 inch (d 65,0875 mm) to 6.8125 inch (d 173,0375 mm)



2 • Series AA11, super duplex

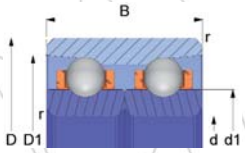
Constant ball diameter: 3/16 inch (4,762 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA1141	*2.5625*	*3.25*	*.625*	*2.7896*	*3.1102*	*.015*	13100	24500	13300	173
	65,0875	82,55	15,875	70,856	79	0,38				
WAA1145	*2.8125*	*3.5*	*.625*	*3.0396*	*3.3598*	*.015*	13500	26700	14500	188
	71,4375	88,9	15,875	77,206	85,34	0,38				
WAA1149	*3.0625*	*3.75*	*.625*	*3.2896*	*3.6094*	*.015*	13900	28900	15600	203
	77,7875	95,25	15,875	83,556	91,68	0,38				
WAA1153	*3.3125*	*4*	*.625*	*3.5396*	*3.8591*	*.015*	14300	31100	16700	217
	84,1375	101,6	15,875	89,906	98,02	0,38				
WAA1161	*3.8125*	*4.5*	*.625*	*4.0396*	*4.3583*	*.015*	15000	35500	18900	248
	96,8375	114,3	15,875	102,606	110,7	0,38				
WAA1169	*4.3125*	*5*	*.625*	*4.5396*	*4.8575*	*.015*	15600	39900	21100	277
	109,5375	127	15,875	115,306	123,38	0,38				
WAA1177	*4.8125*	*5.5*	*.625*	*5.0396*	*5.3563*	*.015*	16100	43600	23000	307
	122,2375	139,7	15,875	128,006	136,05	0,38				
WAA1185	*5.3125*	*6*	*.625*	*5.5396*	*5.8555*	*.015*	16600	48000	25200	337
	134,9375	152,4	15,875	140,706	148,73	0,38				
WAA1193	*5.8125*	*6.5*	*.625*	*6.0396*	*6.3465*	*.015*	17200	52400	27400	368
	147,6375	165,1	15,875	153,406	161,2	0,38				
WAA11101	*6.3125*	*7*	*.625*	*6.5396*	*6.8539*	*.015*	17700	56800	29600	397
	160,3375	177,8	15,875	166,106	174,09	0,38				
WAA11109	*6.8125*	*7.5*	*.625*	*7.0396*	*7.3531*	*.015*	18200	61200	31800	427
	173,0375	190,5	15,875	178,806	186,77	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 4 inch (d 101,6 mm) to 10 inch (d 254 mm)



2 • Series AA12, super duplex

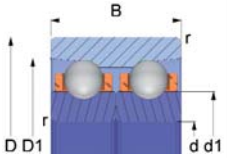
Constant ball diameter: 3/16 inch (4,762 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA1264	*4*	*4.75*	*.75*	*4.2583*	*4.5819*	*.04*	15000	36300	19200	338
	101,6	120,65	19,05	108,16	116,38	1,015				
WAA1268	*4.25*	*5*	*.75*	*4.5083*	*4.8315*	*.04*	15300	38500	20300	358
	107,95	127	19,05	114,51	122,72	1,015				
WAA1272	*4.5*	*5.25*	*.75*	*4.7583*	*5.0811*	*.04*	15600	40700	21500	377
	114,3	133,35	19,05	120,86	129,06	1,015				
WAA1276	*4.75*	*5.5*	*.75*	*5.0083*	*5.3307*	*.04*	15900	42900	22600	397
	120,65	139,7	19,05	127,21	135,4	1,015				
WAA1280	*5*	*5.75*	*.75*	*5.2583*	*5.5803*	*.04*	16200	45100	23700	417
	127	146,05	19,05	133,56	141,74	1,015				
WAA1288	*5.5*	*6.25*	*.75*	*5.7583*	*6.0795*	*.04*	16800	49500	25900	456
	139,7	158,75	19,05	146,26	154,42	1,015				
WAA1296	*6*	*6.75*	*.75*	*6.2583*	*6.5783*	*.04*	17300	53900	28100	495
	152,4	171,45	19,05	158,96	167,09	1,015				
WAA12104	*6.5*	*7.25*	*.75*	*6.7583*	*7.078*	*.04*	17800	58300	30300	534
	165,1	184,15	19,05	171,66	179,78	1,015				
WAA12112	*7*	*7.75*	*.75*	*7.2583*	*7.5669*	*.04*	18300	62700	32500	575
	177,8	196,85	19,05	184,36	192,2	1,015				
WAA12120	*7.5*	*8.25*	*.75*	*7.7583*	*8.076*	*.04*	18700	67100	34700	613
	190,5	209,55	19,05	197,06	205,13	1,015				
WAA12128	*8*	*8.75*	*.75*	*8.2583*	*8.5752*	*.04*	19200	71500	36900	652
	203,2	222,25	19,05	209,76	217,81	1,015				
WAA12144	*9*	*9.75*	*.75*	*9.2583*	*9.5736*	*.04*	20000	80300	41400	730
	228,6	247,65	19,05	235,16	243,17	1,015				
WAA12160	*10*	*10.75*	*.75*	*10.2583*	*10.572*	*.04*	20800	89100	45800	810
	254	273,05	19,05	260,56	268,53	1,015				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 3.0625 inch (d 77,7875 mm) to 10 inch (d 254 mm)



2 • Series AA13, super duplex

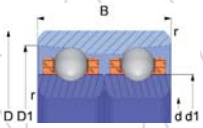
Constant ball diameter: 3/16 inch (4,762 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] moass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA1349	*3.0625*	*3.875*	*.625*	*3.3521*	*3.672*	*.015*	13900	28000	15500	260
	77,7875	98,425	15,875	85,144	93,27	0,38				
WAA1356	*3.5*	*4.3125*	*.625*	*3.7895*	*4.1087*	*.015*	14700	33300	17800	293
	88,9	109,5375	15,875	96,254	104,36	0,38				
WAA1364	*4*	*4.8125*	*.625*	*4.2895*	*4.6079*	*.015*	15300	37700	20000	331
	101,6	122,2375	15,875	108,954	117,04	0,38				
WAA1372	*4.5*	*5.3125*	*.625*	*4.7895*	*5.1067*	*.015*	15800	41400	21900	369
	114,3	134,9375	15,875	121,654	129,71	0,38				
WAA1380	*5*	*5.8125*	*.625*	*5.2895*	*5.6059*	*.015*	16400	45800	24100	405
	127	147,6375	15,875	134,354	142,39	0,38				
WAA1388	*5.5*	*6.3125*	*.625*	*5.7895*	*6.1051*	*.015*	16900	50200	26300	443
	139,7	160,3375	15,875	147,054	155,07	0,38				
WAA1396	*6*	*6.8125*	*.625*	*6.2895*	*6.6043*	*.015*	17400	54600	28500	481
	152,4	173,0375	15,875	159,754	167,75	0,38				
WAA13104	*6.5*	*7.3125*	*.625*	*6.7895*	*7.1035*	*.015*	17900	59000	30700	519
	165,1	185,7375	15,875	172,454	180,43	0,38				
WAA13112	*7*	*7.8125*	*.625*	*7.2895*	*7.6028*	*.015*	18400	63400	32900	556
	177,8	198,4375	15,875	185,154	193,11	0,38				
WAA13120	*7.5*	*8.3125*	*.625*	*7.7895*	*8.102*	*.015*	18800	67800	35100	594
	190,5	211,1375	15,875	197,854	205,79	0,38				
WAA13128	*8*	*8.8125*	*.625*	*8.2895*	*8.6012*	*.015*	19300	72200	37300	632
	203,2	223,8375	15,875	210,554	218,47	0,38				
WAA13144	*9*	*9.8125*	*.625*	*9.2895*	*9.5992*	*.015*	20100	81000	41700	708
	228,6	249,2375	15,875	235,954	243,82	0,38				
WAA13160	*10*	*10.8125*	*.625*	*10.2895*	*10.5976*	*.015*	20900	89800	46100	784
	254	274,6375	15,875	261,354	269,18	0,38				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 4 inch (d 101,6 mm) to 12 inch (d 304,8 mm)



2 • Series AA16, super duplex

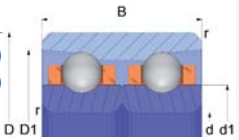
Constant ball diameter: 1/4 inch (6,35 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA1664	*4*	*5*	*1*	*4.3445*	*4.7787*	*.06*	23100	50000	26900	620
	101,6	127	25,4	110,35	121,38	1,525				
WAA1668	*4.25*	*5.25*	*1*	*4.5945*	*5.0283*	*.06*	23500	52700	28200	654
	107,95	133,35	25,4	116,7	127,72	1,525				
WAA1672	*4.5*	*5.5*	*1*	*4.8445*	*5.278*	*.06*	24200	56500	30100	690
	114,3	139,7	25,4	123,05	134,06	1,525				
WAA1676	*4.75*	*5.75*	*1*	*5.0945*	*5.5276*	*.06*	24600	59200	31400	724
	120,65	146,05	25,4	129,4	140,4	1,525				
WAA1680	*5*	*6*	*1*	*5.3445*	*5.7772*	*.06*	24900	61800	32700	758
	127	152,4	25,4	135,75	146,74	1,525				
WAA1688	*5.5*	*6.5*	*1*	*5.8445*	*6.2764*	*.06*	25900	68300	36000	828
	139,7	165,1	25,4	148,45	159,42	1,525				
WAA1696	*6*	*7*	*1*	*6.3445*	*6.7752*	*.06*	26500	73500	38600	897
	152,4	177,8	25,4	161,15	172,09	1,525				
WAA16104	*6.5*	*7.5*	*1*	*6.8445*	*7.2744*	*.06*	27100	78700	41200	965
	165,1	190,5	25,4	173,85	184,77	1,525				
WAA16112	*7*	*8*	*1*	*7.3445*	*7.7736*	*.06*	27700	84000	43800	1040
	177,8	203,2	25,4	186,55	197,45	1,525				
WAA16120	*7.5*	*8.5*	*1*	*7.8445*	*8.2728*	*.06*	28500	90500	47000	1110
	190,5	215,9	25,4	199,25	210,13	1,525				
WAA16128	*8*	*9*	*1*	*8.3445*	*8.772*	*.06*	29000	95700	49600	1180
	203,2	228,6	25,4	211,95	222,81	1,525				
WAA16144	*9*	*10*	*1*	*9.3445*	*9.7701*	*.06*	30300	107400	55500	1320
	228,6	254	25,4	237,35	248,16	1,525				
WAA16160	*10*	*11*	*1*	*10.3445*	*10.7685*	*.06*	31400	119100	61300	1460
	254	279,4	25,4	262,75	273,52	1,525				
WAA16176	*11*	*12*	*1*	*11.3445*	*11.7669*	*.06*	32300	129600	66500	1600
	279,4	304,8	25,4	288,15	298,88	1,525				
WAA16192	*12*	*13*	*1*	*12.3445*	*12.7654*	*.06*	33400	141300	72400	1740
	304,8	330,2	25,4	313,55	324,24	1,525				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 4 inch (d 101,6 mm) to 11 inch (d 279,4 mm)



2 • Series AA24, super duplex

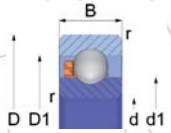
Constant ball diameter: 3/8 inch (9,525 mm)
Constant section
Versions H and N
Duplex configuration back-to-back
Preload value upon request
Open bearing only
Tolerances: TA5, TA4

Basic designation	Dimensions *in inches* / in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
WAA2464	*4*	*5.5*	*1.5*	*4.5169*	*5.1728*	*.075*	42700	80200	44500	1490
	101,6	139,7	38,1	114,73	131,39	1,905				
WAA2468	*4.25*	*5.75*	*1.5*	*4.7669*	*5.4224*	*.075*	44100	86000	47500	1570
	107,95	146,05	38,1	121,08	137,73	1,905				
WAA2472	*4.5*	*6*	*1.5*	*5.0169*	*5.672*	*.075*	44400	89100	49000	1640
	114,3	152,4	38,1	127,43	144,07	1,905				
WAA2476	*4.75*	*6.25*	*1.5*	*5.2669*	*5.9217*	*.075*	45600	94800	52000	1720
	120,65	158,75	38,1	133,78	150,41	1,905				
WAA2480	*5*	*6.5*	*1.5*	*5.5169*	*6.1709*	*.075*	46000	97900	53600	1800
	127	165,1	38,1	140,13	156,74	1,905				
WAA2488	*5.5*	*7*	*1.5*	*6.0169*	*6.6701*	*.075*	47400	106700	58100	1960
	139,7	177,8	38,1	152,83	169,42	1,905				
WAA2496	*6*	*7.5*	*1.5*	*6.5169*	*7.1693*	*.075*	48800	115500	62700	2110
	152,4	190,5	38,1	165,53	182,1	1,905				
WAA24104	*6.5*	*8*	*1.5*	*7.0169*	*7.6681*	*.075*	50100	124400	67200	2270
	165,1	203,2	38,1	178,23	194,77	1,905				
WAA24112	*7*	*8.5*	*1.5*	*7.5169*	*8.1673*	*.075*	51300	133200	71600	2430
	177,8	215,9	38,1	190,93	207,45	1,905				
WAA24120	*7.5*	*9*	*1.5*	*8.0169*	*8.6665*	*.075*	52500	142000	76100	2580
	190,5	228,6	38,1	203,63	220,13	1,905				
WAA24128	*8*	*9.5*	*1.5*	*8.5169*	*9.1657*	*.075*	53600	150800	80500	2740
	203,2	241,3	38,1	216,33	232,81	1,905				
WAA24144	*9*	*10.5*	*1.5*	*9.5169*	*10.1638*	*.075*	55800	168400	89400	3050
	228,6	266,7	38,1	241,73	258,16	1,905				
WAA24160	*10*	*11.5*	*1.5*	*10.5169*	*11.1622*	*.075*	58400	188900	99700	3370
	254	292,1	38,1	267,13	283,52	1,905				
WAA24176	*11*	*12.5*	*1.5*	*11.5169*	*12.1606*	*.075*	60200	206500	108600	3690
	279,4	317,5	38,1	292,53	308,88	1,905				

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 H version values.

C • Thin-section ball bearings

Bore diameter d from 25 to 220 mm



3 • Series 618, metric series

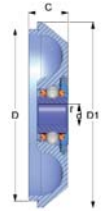
Versions: Deep grooves with crown-type cage: **R**
Angular contact with one piece machined cage, with cylindrical ball pockets: **H**
Tolerances: T5, T4, T2
Variable sections and balls ∅

Basic designation	Dimensions in mm						Basic load rating[2] N			Mean[2] mass
							Radial		Axial	
							Dyn.	Stat.	static	
	d	D	B	d1	D1	r[1]	C	Co	Cax	g
W61805	25	37	7	29	33	0,3	2540	2300	2450	22
W61806	30	42	7	34	38	0,3	2750	2780	2920	26
W61807	35	47	7	39	43	0,3	2850	3120	3240	29
W61808	40	52	7	44	48	0,3	3030	3600	3710	33
W61809	45	58	7	49	54	0,3	4390	5110	5300	38
W61810	50	65	7	55	60	0,3	4530	5630	5800	52
W61811	55	72	9	60,5	66,5	0,3	6070	7390	7720	80
W61812	60	78	10	66	72	0,3	6300	8120	8440	105
W61813	65	85	10	71,6	78,4	0,6	7990	10000	11800	124
W61814	70	90	10	76,6	83,4	0,6	8330	11000	12900	133
W61815	75	95	10	81,6	88,4	0,6	8420	11500	13500	140
W61816	80	100	10	86,6	93,4	0,6	8730	12500	14600	149
W61817	85	110	13	93,1	101,9	1,1	12800	17400	19700	257
W61818	90	115	13	98,1	106,9	1,1	13000	18200	20600	270
W61820	100	125	13	108,1	116,9	1,1	13400	19900	22300	296
W61822	110	140	16	119,7	130,3	1,1	18800	27200	32700	490
W61824	120	150	16	129,7	140,3	1,1	19400	29700	35500	530
W61826	130	165	18	141,2	153,8	1,1	25300	38000	44600	760
W61828	140	175	18	151,2	163,8	1,1	25600	39800	46500	800
W61830	150	190	20	162,7	177,3	1,1	32900	50700	59400	1100
W61832	160	200	20	172,7	187,3	1,1	34200	55200	64400	1170
W61834	170	215	22	184,2	200,8	1,1	40100	62400	71900	1530
W61836	180	225	22	194,2	210,8	1,1	41800	68200	78300	1620
W61838	190	240	24	206	224	1,5	49000	78000	100300	2070
W61840	200	250	24	216	234	1,5	51100	85100	109200	2180
W61844	220	270	24	236	254	1,5	52600	92500	118100	2370

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.
2 R version values.

D • Specific ball bearings

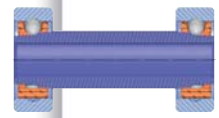
1 • End-bell bearings for gyroscope rotors



These bearings form the extremities of a gyroscope rotor. They are generally supplied with a precisely controlled contact angle, and may also be supplied in pairs.

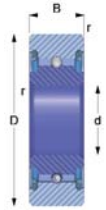
Designation	Dimensions in mm				
	d	D	C	D1	r
SP3181	1,984	15,9	3,86	17,145	0,2
SP1690	2,38	15,9	3,86	17,145	0,2
SP5090	4	23	4,8	26	0,2

2 • Shaft and outer ring assemblies



They are mainly used in gyroscope rotors with high performance levels and comprise a shaft having ground raceways, and two outer-ring assemblies type E. This principle increases the rigidity and the accuracy of the unit. Please consult our Design & Engineering Department for new designs based on this principle.

3 • Special bearings for gyroscope gimbal arrangements

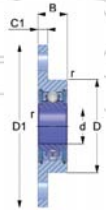


a • Bearings with spring ball separators

Low torque and small size.

Designation	Dimensions in mm			
	d	D	C	r
SP4619ZZ	4,762	12,7	3,967	0,3
SP4620ZZ	6,35	15,875	4,978	0,3
SP6125ZZ	7,937	15,875	4,978	0,3

b • Bearings with extra-large drilled flange



A low torque bearings may be supplied with this type of flange. Details regarding mounting are available on request.

Designation	Dimensions in mm					
	d	D	B	D1	C1	r
KSP2824ZZ	4,762	12,7	3,967	22,225	1,321	0,13
SP5007ZZ	5	12	4	22	1,2	0,15
SP4040ZZ	6,35	15,875	4,978	25,4	1,651	0,3

c • Three-ring assemblies

They are used in gyroscope gimbal arrangements. The torque of the sensitive inner bearing may be greatly reduced by keeping the intermediate ring in rotation. The double row of balls of the outer bearing provides an accurate axial positioning. Please consult our Design & Engineering Department for details.

Designation	Fig.	Dimensions in mm					
		d	D	B	D1	C1	r
SP4441	3	3,175	13	5,5	20	4	0,3
SP5258	1	3,175	15,875	5,944	22,098	3,967	0,13
SP5255	1	4,762	15,875	5,944	22,098	3,967	0,13
SP5264	2	6,35	20,635	7,34	30,162	4,978	0,3

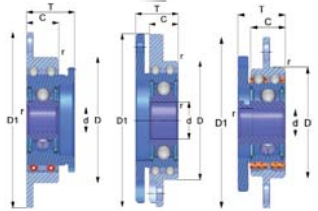


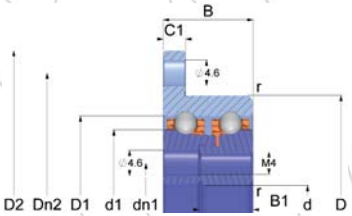
Fig. 1 Fig. 2 Fig. 3

E • Integrated ball bearings

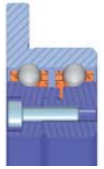
Bore diameter d from 3.5 inch (d 88,9 mm) to 9.5 inch (d 241,3 mm)

Series KADV12

Constant ball diameter: 5/32 inch (3,969 mm)
Constant section, versions H and N
K versions (Flange on outer ring with n-1 holes)
Inner rings with n2 threaded holes
Back-to-back duplex configuration maintained by screws
Preload value upon request
Open bearing only
Tolerances: TA5, TA4



Comments
• Centring diameter d is only for B1 width.



Basic designation	Dimensions *in inches* in mm													Basic load rating[2] N			Mean[2] mass	Basic designation
														Radial		Axial static		
														Dyn.	Stat.			
	d	D	B	B1	C1	D2	d1	D1	r[1]	dn1	n1	Dn2	n2	C	Co	Cax	g	
WKADV1264	*3.5*	*4.75*	*.625*	*.375*	*.1563*	*5.375*	*4.278*	*4.472*	*.04*	*3,813*	8	*5,063*	8	11600	30700	16100	610	WKADV1264
	88,9	120,65	15,875	9,525	3,969	136,525	108,66	113,59	1,015	96,85		128,6						
WKADV1268	*3.75*	*5*	*.625*	*.375*	*.1563*	*5.625*	*4.528*	*4.722*	*.04*	*4,063*	8	*5,313*	8	11900	32700	17100	648	WKADV1268
	95,25	127	15,875	9,525	3,969	142,875	115,01	119,94	1,015	103,2		134,95						
WKADV1272	*4*	*5.25*	*.625*	*.375*	*.1563*	*5.875*	*4.778*	*4.972*	*.04*	*4,313*	10	*5,563*	10	12100	34300	17900	680	WKADV1272
	101,6	133,35	15,875	9,525	3,969	149,225	121,36	126,29	1,015	109,55		141,3						
WKADV1276	*4.25*	*5.5*	*.625*	*.375*	*.1563*	*6.125*	*5.028*	*5.222*	*.04*	*4,563*	10	*5,813*	10	12300	36300	18900	718	WKADV1276
	107,95	139,7	15,875	9,525	3,969	155,575	127,71	132,64	1,015	115,9		147,65						
WKADV1280	*4.5*	*5.75*	*.625*	*.375*	*.1563*	*6.375*	*5.278*	*5.472*	*.04*	*4,813*	12	*6,063*	12	12500	37800	19700	750	WKADV1280
	114,3	146,05	15,875	9,525	3,969	161,925	134,06	138,99	1,015	122,25		154						
WKADV1288	*5*	*6.25*	*.625*	*.375*	*.1563*	*6.875*	*5.778*	*5.972*	*.04*	*5,313*	12	*6,563*	12	12900	41400	21400	825	WKADV1288
	127	158,75	15,875	9,525	3,969	174,625	146,76	151,69	1,015	134,95		166,7						
WKADV1296	*5.5*	*6.75*	*.625*	*.375*	*.1563*	*7.375*	*6.278*	*6.472*	*.04*	*5,813*	12	*7,063*	12	13300	45000	23200	899	WKADV1296
	139,7	171,45	15,875	9,525	3,969	187,325	159,46	164,39	1,015	147,65		179,4						
WKADV12104	*6*	*7.25*	*.625*	*.375*	*.1563*	*7.875*	*6.778*	*6.972*	*.04*	*6,313*	16	*7,563*	16	13700	49000	25200	965	WKADV12104
	152,4	184,15	15,875	9,525	3,969	200,025	172,16	177,09	1,015	160,35		192,1						
WKADV12112	*6.5*	*7.75*	*.625*	*.375*	*.1563*	*8.375*	*7.278*	*7.472*	*.04*	*6,813*	16	*8,063*	16	14100	52600	27000	1040	WKADV12112
	165,1	196,85	15,875	9,525	3,969	212,725	184,86	189,79	1,015	173,05		204,8						
WKADV12120	*7*	*8.25*	*.625*	*.375*	*.1563*	*8.875*	*7.778*	*7.972*	*.04*	*7,313*	16	*8,563*	16	14400	56100	28800	1120	WKADV12120
	177,8	209,55	15,875	9,525	3,969	225,425	197,56	202,49	1,015	185,75		217,5						
WKADV12128	*7.5*	*8.75*	*.625*	*.375*	*.1563*	*9.375*	*8.278*	*8.472*	*.04*	*7,813*	16	*9,063*	16	14700	59700	30600	1190	WKADV12128
	190,5	222,25	15,875	9,525	3,969	238,125	210,26	215,19	1,015	198,45		230,2						
WKADV12144	*8.5*	*9.75*	*.625*	*.375*	*.1563*	*10.375*	*9.278*	*9.472*	*.04*	*8,813*	20	*10,063*	20	15300	66800	34100	1330	WKADV12144
	215,9	247,65	15,875	9,525	3,969	263,525	235,66	240,59	1,015	223,85		255,6						
WKADV12160	*9.5*	*10.75*	*.625*	*.375*	*.1563*	*11.375*	*10.278*	*10.472*	*.04*	*9,813*	20	*11,063*	20	15900	74000	37700	1480	WKADV12160
	241,3	273,05	15,875	9,525	3,969	288,925	261,06	265,99	1,015	249,25		281						

1 Minimum bearing corner radius and maximum shaft or housing fillet radius.

2 H version values.

The most common units of measurement

Measurement	Unit	Symbol
Dimension	Millimetre	mm
Surface, Area	Square millimetre	mm^2
Volume	Cubic millimetre	mm^3
Rotational angular speed	Radian per second	rad/s
Volumic mass	Kilogramme per cubic metre	Kg/m^3
Load	Newton	N
Moment load	Newton - metre	N.m
Pressure, stress	Mega Pascal	MPa
Kinematics viscosity	Square millimetre per second	mm^2/s
Power	Watt	W
Coefficient of thermal expansion	Inverse Kelvin	K^{-1}
Thermal conductivity	Watt per Kelvin metre	W/(m.K)

Length conversion table

	mm	cm	m	inches	feet
1 mm =	**1**	10^{-1}	10^{-3}	$3.93701\ 10^{-2}$	$3.28084\ 10^{-3}$
1 cm =	10	**1**	10^{-2}	$3.93701\ 10^{-1}$	$3.28084\ 10^{-2}$
1 m =	10^3	10^2	**1**	39.3701	3.28084
1 inch =	25.4	2.54	$2.54\ 10^{-2}$	**1**	$8.3333\ 10^{-2}$
1 foot =	304.8	30.48	$3.048\ 10^{-1}$	12	**1**

Mass conversion table

	g	Kg	Oz	Pound (lb)
1 g =	**1**	10^{-3}	$3.5274\ 10^{-2}$	$2.20462\ 10^{-3}$
1 Kg =	10^3	**1**	35.274	2.20462
1 Oz =	28.3495	$2.83495\ 10^{-2}$	**1**	$6.25\ 10^{-2}$
1 Pound =	453.592	0.4536	16	**1**

Pressure conversion table

	MPa	Pa	N/mm^2	Bar	millibar	Torr
1 MPa =	**1**	10^6	1	10	10^4	$7.5\ 10^3$
1 Pa =	10^{-6}	**1**	10^{-6}	10^{-5}	10^{-2}	$7.5\ 10^{-3}$
1 N/mm^2 =	1	10^6	**1**	10	10^4	$7.5\ 10^3$
1 Bar =	10^{-1}	10^5	10^{-1}	**1**	10^3	$7.5\ 10^2$
1 millibar =	10^{-4}	10^2	10^{-4}	10^3	**1**	$7.5\ 10^{-1}$
1 Torr =	$1.33\ 10^{-4}$	133	$1.33\ 10^{-4}$	$1.33\ 10^{-3}$	1.33	**1**

PRODUCT DEFINITION SHEET	FDPA N°:	Ind. DOC:
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Commercial and Technical Data

Company: ..... Technical contact: .....
Adresse: ..... Purchasing contact: .....
Other people: .....
Phone: ..... Extention: .....
Fax.: ..... Email: .....

Bearing size: ..... inner dia: ..... outer dia: ..... Width B: .....
ADR reference: .....
Equivalences: .....
Specification or customer drawings: .....
Quantity for tests: ..... Lead time: .....
Potential for industrialisation: ..... Schedule: ..... Lead time: .....

Application environment

- Equipment: .....
- Speed: .....
- Rotating ring: .....
- Axial load: .....
- Radial load: .....
- Axial play: .....
- Position of axis: .....
- Temperature: .....
- Environment: .....
- Acceleration: .....
- Vibrations: .....
- Life time: .....

Magnetism ☐ Salt fog ☐
Humidity ☐ Vacuum ☐ Space ☐ Etc...

Main criteria

Without ☐ Noise ☐ Sensivity ☐
Speed ☐ Other ☐

Bearing definition

Material: ..... Preload: .....
Form and size : ..... Vibration level: .....
Protection: ..... Torque: .....
Cage: ..... Classement: .....
Precision: ..... Lubrication: .....
Contact angle: ..... SPECIFICATION : .....

DIAGRAM

Special demands .....

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