

**MATERIAL AND EQUIPMENT STANDARD**  
**FOR**  
**ROLLING BEARINGS**

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## 1. SCOPE AND FIELD OF APPLICATION

This Standard specification gives the minimum requirements for selection, quality control and testing of general purpose steel rolling bearings to be used in Iranian Oil/Gas and Petrochemical Industries.

This Standard shall be used for the selection of the rolling bearings and also for the preparation of requisition or purchase orders.

## 2. REFERENCES

Throughout this Standard the following standards are referred to. The editions of these standards that are in effect at the time of publication of this Standard shall to the extent specified herein, form a part of this Standard. The applicability of changes in standards that occur after the date of this Standard shall be mutually agreed upon by the Company and the Vendor/Consultant.

ISO 199-1979 (BS 5989-2)	"Rolling Bearings-Thrust Ball Bearings-Tolerances"
ISO 492-1986 (BS 6107-2)	"Rolling Bearing-Radial Bearings-Tolerances"
ISO 582-1979 (BS 5988)	"Rolling Bearings-Metric Series-Chamfer Dimension Limits"
ISO 1132-1980 (BS 6107-1)	"Rolling Bearings-Tolerances-Definitions"
ISO 1160-1976	"Rolling Bearings for Railway Axle Boxes-Acceptance-Inspection"
ISO 5593-1984 (BS 6560)	"Rolling Bearings-Vocabulary"
ISO 6507-1-1982 (BS 5600-4)	"Metallic Materials-Hardness Test Vickers Test-pt. 1 HV5 to HV 100"
ISO 6507-2-1983 (BS 5600-4)	"Metallic Materials-Hardness Test Vickers Test-pt. 2 HV 0-2 to Less Than HV5"
ISO 6508-1986 (BS 891)	"Metallic Materials-Hardness Test Rockwell Test (Scales A, B, C, D, E, F, G, H, K)"

## 3. DEFINITIONS

For the purpose of this Standard the definitions mentioned in ISO 5593 shall apply.

## 4. UNITS

This Standard is based on International System of Units (SI), except where otherwise specified.

## 5. SPECIFIC REQUIREMENTS

### 5.1 Appearance

All essential portions of the rolling bearings shall be clean and free from visible defects such as porosity, burrs, cracks, grinding marks, indentations, rusk marks, etc. The finishing of all the surfaces shall be smooth.

### 5.2 Types of Steels to be Used and Their Chemical Compositions

#### 5.2.1 Type of steels to be used

Rolling bearings shall be manufactured from four groups of wrought rolling bearing steels as listed in Table 1 namely:

- a) Steels with about 1%C and 1 to 2%Cr which are referred to in this Standard as through hardening bearing steels. For bearing components having large cross sections steel alloyed with manganese and molybdenum are used because of their superior through hardening properties;

**b) case hardening steels:**

Chromium-nickel and manganese chromium steels with a carbon content of approximately 0.15% are those case-hardening steels most commonly used for rolling bearings;

**c) stainless steels:**

For bearings which come into contact with corrosive media during operation, chromium or chromium/-molybdenum stainless steels are used. Because of the reduced hardness of these steels, the bearings do not have the same high load carrying capacity as bearings made of conventional steels;

**d) high temperature bearings steels.**

In order to obtain more information when selecting the required type of steel refer to Appendix A.

## 5.2.2 Chemical composition of different types

Unless otherwise specified in data sheet or purchase order the chemical composition of the type of steel used in the manufacture of the rolling bearings shall fall in one of the categories listed in Table 1.

Permissible deviations from the ranges given in Table 1 shall be according to Table 2.

Other chemical compositions superior to this Standard are acceptable if the supplier obtains the written approval of the Company beforehand.

**TABLE 1 - TYPES OF STEEL AND THEIR CHEMICAL COMPOSITION**

Type of Steel & ASTM Gr.	C%	Si%	Mn%	P% max.	S% Max.	Cr%	Mo%	Ni%	V%	W%
Through hardening bearing steels										
1 (A 295)	0.95/1.10	0.15/0.35	0.25/0.45	0.030	0.025	1.35/1.65	—	—	—	—
2 (A 295)	0.95/1.10	0.45/0.75	0.95/1.25	0.030	0.025	0.90/1.20	—	—	—	—
3 (A485)	0.95/1.10	0.45/0.75	0.95/1.25	0.030	0.025	1.40/1.65	—	—	—	—
4	0.95/1.10	0.20/0.40	0.25/0.45	0.030	0.025	1.65/1.95	0.20/0.40	—	—	—
5 (A485)	0.95/1.10	0.20/0.40	0.60/0.90	0.030	0.025	1.65/1.95	0.20/0.40	—	—	—
Case hardening bearing steels										
10	0.13/0.19	0.15/0.40	1.00/1.30	0.035	0.035	0.80/1.10	—	—	—	—
11 (A 534)	0.17/0.23	0.15/0.40	0.40/0.70	0.035	0.035	—	0.20/0.30	1.60/2.00	—	—
12 (A 534)	0.17/0.23	0.15/0.40	0.60/0.90	0.035	0.035	0.35/0.65	0.15/0.25	0.40/0.70	—	—
13	0.17/0.23	0.15/0.40	0.40/0.70	0.035	0.035	0.35/0.65	0.15/0.25	0.90/1.20	—	—
14 (A 535)	0.17/0.23	0.15/0.40	0.40/0.70	0.035	0.035	0.35/0.65	0.20/0.30	1.60/2.00	—	—
15	0.14/0.20	0.15/0.40	0.60/0.90	0.035	0.035	0.80/1.10	0.15/0.25	1.20/1.60	—	—
16 (A535)	0.14/0.20	0.15/0.40	0.40/0.70	0.035	0.035	1.30/1.60	0.15/0.25	3.25/3.75	—	—
Stainless bearing steels										
20	0.42/0.50	1.00 Max.	1.00 Max.	0.040	0.030	12.5/14.5	—	1.00 Max.	—	—
21 (A 756)	0.95/1.20	1.00 Max.	1.00 Max.	0.040	0.030	16.0/18.0	0.35/0.75	0.50 Max.	—	—
High temperature bearing steels										
30	0.77/0.85	0.25 Max.	0.35 Max.	0.025	0.020	3.75/4.25	4.00/4.50	—	0.09/1.10	—
31	0.78/0.86	0.40 Max.	0.40 Max.	0.030	0.030	3.80/4.50	4.70/5.20	—	1.70/2.00	6.00/6.70
32	0.70/0.80	0.40 Max.	0.40 Max.	0.030	0.030	3.75/4.50	0.60 Max.	—	1.00/1.25	17.8/19.0

**Note:**

Table 1 has been selected from ISO 683/XVII, Table 4 (BS 970/4).

**TABLE 2 - PERMISSIBLE DEVIATIONS OF CHEMICAL COMPOSITIONS**

Reference shall be made to ISO 683/XVII-1976 Table 5 (BS 970-4).

### **5.3 Hardness**

The hardness of steel used in the manufacture of rolling bearings shall be according to Tables 3 and 4.

For numbers referred to the type of steel refer to Table 2.

**TABLE 3 - HARDNESS LIMIT OF THE CASE HARDENING STEELS**

Refer to ISO 683/Part 17: 1976, Table 6 (BS 970/4).

**TABLE 4 - HARDNESS OF THE THROUGH HARDENING, THE STAINLESS AND HIGH TEMPERATURE BEARING STEELS**

Refer to ISO 683, Table XVII-1976, Table 7 (BS 970/4).

### **5.4 Dimensions and Tolerances**

In this Standard in order to categorize the bearings dimension-wise they have been grouped according to the direction of supported load as follows:

#### **a) Radial rolling bearings**

This group comprises the following bearings:

- Deep groove ball bearings.
- Angular contact ball bearings.
- Self aligning ball bearings.
- Cylindrical roller bearings.
- Tapered roller bearings.
- Needle roller bearings.

#### **b) Thrust rolling bearings**

This group comprises the following bearings:

- Thrust ball bearings.
- Cylindrical roller thrust bearings.
- Needle roller thrust bearings.
- Spherical roller thrust bearings.

Dimensions and tolerances of the rolling bearings for different type and series shall be as follows:

Diameter series 0 as per ISO 15:1981, Table 4 (BS 6267).  
Diameter series 1 as per ISO 15:1981, Table 5 (BS 6267).  
Diameter series 2 as per ISO 15:1981, Table 6 (BS 6267).  
Diameter series 3 as per ISO 15:1981, Table 7 (BS 6267).  
Diameter series 4 as per ISO 15:1981, Table 8 (BS 6267).  
Diameter series 7 as per ISO 15:1981, Table 1 (BS 6267).  
Diameter series 8 as per ISO 15:1981, Table 2 (BS 6267).  
Diameter series 9 as per ISO 15:1981, Table 3 (BS 6267).

#### **5.4.1 Dimensions of needle roller bearings, light and medium series**

Reference shall be made to ISO 1206: 1982, Clause 4- Symbols (BS 5773/1).

**a) Light series:**

Refer to ISO 1206: 1982, Clause 5, Table 1 (BS 5773/1).

**b) Medium series:**

Refer to ISO 1206: 1982, Clause 5, Table 2 (BS 5773/1).

##### **5.4.1.1 Tolerances of dimensions of needle roller bearings-light and medium series:**

**a) Inner ring:**

Refer to ISO 1206: 1982, Clause 6, Table 3 (BS 5773/1).

**b) Outer ring:**

Refer to ISO 1206: 1982, Clause 6, Table 4 (BS 5773/2).

**c) Needle roller complement bore diameter for bearings without inner ring:**

Refer to ISO 1206: 1982, Clause 6, Table 5 (BS 5773/1).

##### **5.4.1.2 Dimensions and tolerances of needle roller bearings-heavy series:**

Reference shall be made to ISO 6979, Clause 4- Symbols (BS 5773/9).

**a) Complete bearings inner rings and bearings without inner ring:**

Refer to ISO 6979: 1982, Clause 5, Table 1 (BS 5773/9).

**b) Tolerances of needle roller bearings-heavy series inner ring:**

Refer to ISO 6979: 1982, Clause 6, Table 2 (BS 5773/9).

**c) Tolerances of needle roller bearings-heavy series outer ring:**

Refer to ISO 6979: 1982 Clause 6, Table 3 (BS 5773/9).

**d) Separate inner rings and needle roller bearings without inner ring:**

Refer to ISO 6979:1982, Clause 6, Table 4 (BS 5773/9).

##### **5.4.1.3 Dimensions of metric tapered roller bearings**

###### **5.4.1.3.1 Dimensions of single row metric tapered roller bearings**

Reference shall be made to ISO 355:1977, Clause 2, Symbols and Clause 3 Table 1 (BS 3134-1979).

**a) Contact angle series 2**

Refer to ISO 355, 1977, Clause 4, Table 2 (BS 3134-1979).

**b) Contact angle series 3**

Refer to ISO 355:1977 Clause 4, Table 3 (BS 3134-1979).

**c) Contact angle series 4**

Refer to ISO 355:1977, Clause 4, Table 4 (BS 3134-1979).

**d) Contact angle series 5**

Refer to ISO 355:1977, Clause 4, Table 5 (BS 3134-1979).

**e) Contact angle series 7**

Refer to ISO 355:1977, Clause 4, Table 6 (BS 3134-1979).

#### **5.4.1.3.2 Dimensions of double row metric tapered roller bearings**

Reference shall be made to ISO 355:1977/Addendum 1/ Clause 3, Symbols (BS 3134/2).

**a) Contact angle series 2**

Refer to ISO 355:1977/Addendum 1/ Clause 4, Table 1 (BS 3134/2)

**b) Contact angle series 3**

Refer to ISO 355:1977/Addendum 1/ Clause 4, Table 2 (BS 3134/2).

**c) Contact angle series 4**

Refer to ISO 355:1977/Addendum 1/ Clause 4, Table 3 (BS 3134/2).

**d) Contact angle series 7**

Refer to ISO 355:1977/Addendum 1/ Clause 4, Table 4 (BS 3134/2).

#### **5.4.2 Dimensions of thrust rolling bearings**

For boundary dimensions of this type of bearings, with flat back faces reference shall be made to ISO 104:1979, Clauses 1 and 2 (BS 5989/1).

##### **5.4.2.1 Single direction thrust rolling bearings:**

**a) Diameter series 0**

Refer to ISO 104:1979, Table 1 (BS 5989/1).

**b) Diameter series 1**

Refer to ISO 104:1979, Table 2 (BS 5989/1).

**c) Diameter series 2**

Refer to ISO 104:1979, Table 3 (BS 5989/1).

**d) Diameter series 3**

Refer to ISO 104:1979, Table 4 (BS 5989/1).

**e) Diameter series 4**

Refer to ISO 104:1979, Table 5 (BS 5989/1).

**f) Diameter series 5**

Refer to ISO 104:1979, Table 6 (BS 5989/1).

#### 5.4.2.2 Double direction thrust rolling bearings:

**a)** Dimension series 22

Refer to ISO 104:1979, Table 7 (BS 5989/1).

**b)** Dimension series 23

Refer to ISO 104:1979, Table 8 (BS 5989/1).

**c)** Dimension series 24

Refer to ISO 104:1979, Table 9 (BS 5989/1).

### 5.5 Radial Internal Clearance (Gr.)

Relates to bearing capable of taking purely radial load's non-preloaded.

Described as the arithmetical mean of the radial distances through which one of the rings or washers may be displaced relative to the other (for further details reference may be made to ISO 5593, Sub-clause 05.08.01 and ISO 1132 Clause 6.1.1).

The values of radial internal clearance for the following types of rolling bearings shall comply with the requirement of ISO 5753:1981 (or BS 6107/3) as mentioned below:

**5.5.1** For radial contact groove ball bearings with cylindrical bore, refer to Sub-clause 4.1, Table 1 of ISO 5753.

**5.5.2** For double row self-aligning ball bearings with cylindrical bore, refer to Sub-clause 4.2, Table 2 of ISO 5753.

**5.5.3** For double row self-aligning ball bearings with tapered bore, refer to Sub-clause 4.2, Table 3 of ISO 5753.

**5.5.4** For cylindrical roller bearings with cylindrical bore, refer to Sub-clause 4.3, Table 4 of ISO 5753.

**5.5.5** For double row self-aligning roller bearings with cylindrical bore, refer to Sub-clause 4.5, Table 5 of ISO 5753.

**5.5.6** For double row self-aligning roller bearings with tapered bore, refer to Sub-clause 4.5, Table 6 of ISO 5753.

## 6. BEARING LUBRICANTS

### 6.1 Grease Type Lubricant

#### 6.1.1 Factors expected from grease lubricants

- a)** Easily retained in the bearing housing.
- b)** Reduces the housing sealing requirements.
- c)** Helps prevent corrosive/abrasive media from entering the housing.
- d)** Convenient to handle and install.
- e)** Adheres to the bearing surfaces and provides some corrosion protection.
- f)** The grease type and consistency method to the required duty.

#### 6.1.2 Selection of grease lubricant

Selection of grease lubricant shall be made with due consideration to operating temperature as given hereunder:

- a)** Operating temperature -30°C to + 120°C Lithium base grease of No. 2 to 3 consistency.
- b)** Operating temperature over 100°C Silicon base grease of medium consistency.



## 6.2 Oil type Lubricant

### 6.2.1 Factors expected from oil lubricants

- a) Low frictional resistance if minimal quantity of low viscosity oil is used.
- b) Greater lubrication reliability achievable specially at the higher operating temperatures.
- c) Serves as a coolant for controlling bearing temperatures under combined conditions of heavy load and high speed.

### 6.2.2 Selection of oil lubricant

- a) Mineral oil fortified against foaming and oxidation or synthetic oil for high speed or high temperature.
- b) Oils with EP additive for heavy load working condition.

## 7. DOCUMENTS

If specified, the supplier shall submit the following documents at quotation stage for general purpose bearings:

- Report of experience and annual sale for similar bearing(s).
- Drawings and/or documents defining the technical data of the required bearing(s).
- List of the tests executed on his product(s).
- Guaranty policies.
- Complaint and compensation policies.
- Declaration of any certificate from any impartial laboratory if any.

## 8. TESTS

### 8.1 General

**8.1.1** All measurements shall be carried out at reference temperature<sup>1)</sup>. The gages, measuring instruments and the parts to be tested shall be stabilized at this temperature before any test is carried out.

**8.1.2** Unless otherwise specified by the Company all tests shall be carried out at the supplier's premises.

**8.1.3** The Company may ask the Supplier to carry out the tests in the presence of his nominated representative who shall be informed at least three weeks prior to the date of the tests.

### 8.2 Required Tests

#### 8.2.1 Hardness test

The hardness test shall be carried out according to the Pertinent ISO Standard(s). These standards are ISO 6507: Parts 1 and 2 (BS 5600) and also ISO 6508 (BS 891).

##### 8.2.1.1 Rings

The hardness test on rings shall be done on both rings of each bearing. The Rockwell hardness shall be measured on one of the side faces of the ring at both ends of two diameters perpendicular to each other. In each of the four checked areas two measurements giving compatible results shall be made.

**1) The bearings shall however operate perfectly at the ambient temperature mentioned in data sheet.**

### 8.2.1.2 Rollers

The hardness test on rollers shall be made on three rollers of each bearing. The Rockwell hardness shall be measured at one point on the surface of one end of the roller. In each checked area two measurements giving compatible results shall be made.

### 8.2.2 Chemical analysis

The chemical analysis shall be made in accordance with requirements of ISO 1160:1976, Para. 5.2.9.

### 8.2.3 Examination of the appearance

The examination of the appearance shall be carried out visually i.e., without magnification.

### 8.2.4 Radial internal clearance

The radial internal clearance of the bearings (other than tapered roller bearings) shall be measured according to Clause 5.2.3.7 of ISO 1160-1976 or any other method agreed between the Company and the Supplier. Depending on bearing design and measuring method some scatter of the results of repeated measurements may be experienced. Suppliers are expected to take such scatter into consideration by applying correspondingly reduced manufacturing tolerances.

## 9. CONFLICTING REQUIREMENTS

In case of conflict between the documents relating to the enquiry or purchase order the following priority of documents shall apply:

- **First priority :** Purchase order (including attachments) and variations thereof.
- **Second priority :** Data sheets.
- **Third priority :** This Standard specification.

## 10. GUARANTY

The Supplier shall guarantee his bearings during commissioning and for one year operation against the following defects:

**10.1** All operational defects.

**10.2** All material defects.

**10.3** All design defects.

## 11. PACKAGING

Unless otherwise specified by the Company the bearings shall be delivered greased or oiled and packaged to prevent corrosion or damage due to any reason. Packages shall carry the markings defined in Clause 11.2.

## 12. MARKING

### 12.1 Marking of the Bearings

Refer to ISO 1160:1976 Paragraph 6.1.

## **12.2 Marking of the Packages**

Each package shall be legibly and permanently marked to show the following information:

- Manufacturer's name, address and trade-mark,
- specification,
- type of bearings,
- MESC number.,
- purchase order No.,
- quantity of bearings in container,
- information and warning, if required.

## **13. SHIPMENT**

If the bearings are shipped, they shall be accompanied by the relevant documents stating the detailed description of the bearings for custom release.

## **14. INSPECTION**

Refer to ISO 1160:1976 Section 5.

## APPENDICES

### APPENDIX A

#### A GUIDE TO ROLLING BEARINGS DESIGNATIONS

In order to have enough information about bearings' designation when filling out data sheets the following material is provided.

The majority of bearing designations consist of five figures. Each of these figures is a code number providing certain information about the bearing.

#### Bearing Designation 5 Figures x x x x x

As a rule for bearings with bore diameter ranging from 20 to 490 mm, the first figure indicates the type of bearing involved. The second and third figures indicate the dimension series to which the bearing belongs. Thus the second figure represents the width or height series and the third figure the diameter series. The first three figures form the designation of the bearing series. Each bearing accordingly belongs to a particular bearing series. Finally the last two figures indicate the bore diameter divided by five. Consequently the bore diameter of each bearing expressed in mm is obtained by multiplying the last two figures by five.

For bearings of 10 to 20 mm bore size however the last two digits in the designation always indicate the bore diameter as follows:

<b>00</b>	<b>= 10 mm</b>
<b>01</b>	<b>= 12 mm</b>
<b>02</b>	<b>= 15 mm</b>
<b>03</b>	<b>= 17 mm</b>
<b>04</b>	<b>= 20 mm</b>

Bearings of bore diameter under 10 mm usually have designations consisting of three digits but sometimes there may be a 4th digit preceded by an oblique stroke. In each case the last digit shows the nominal bore diameter in mm.

To begin with bearing type 0, "Double Row Angular Contact Ball Bearings", the bearing series numbers are found to be 32 and 33. This means that the Fig. 0 indicating the type of bearing, has been dispensed with. The Figs. 32 and 33 then indicate the bearing series and the dimension series.

Self-aligning ball bearings have the Fig. 1 as their type number and are available in bearing series 12, 13, 22 and 23, which all have four-figure bearing numbers, and series 104 with five-figure bearing numbers. The type number 2 applies to all bearings with spherical rollers, i.e., single and double row spherical roller radial bearings and spherical roller thrust bearings.

Taper roller bearings, type number 3 have five-figure numbers which comply with the rules.

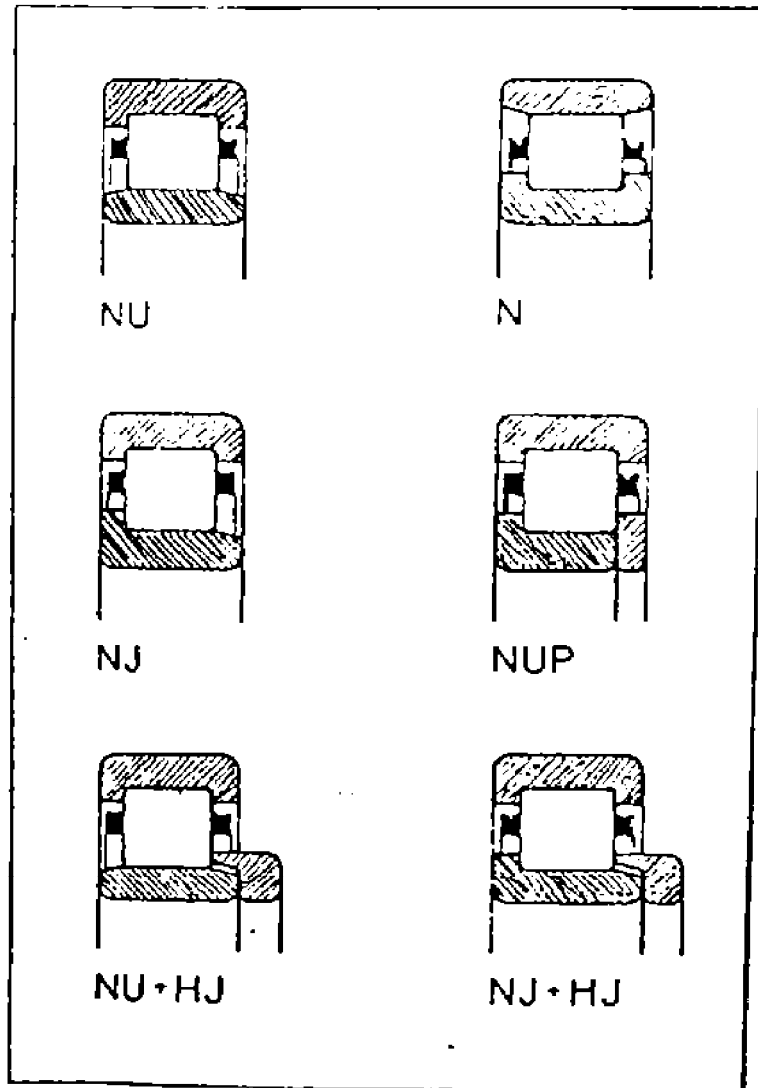
Double row deep groove ball bearings have the type number 4 and their Series designations 42 and 43 according to the rules, must be 422 and 423.

All single row thrust ball bearings have five-figure numbers, the type number being 5 and the series designations 511, 512, etc.

The type number 6 applies to single row deep groove ball bearings. The most common series are designated 60, 62, 63 and 64 and have four-figure bearing numbers. The width series Fig. 0, is omitted from these designations. There are, in addition, Series 618 and 619 with five-figure bearing numbers. Deep groove ball bearings for small diameter shafting have three-figure numbers, the last figure of which represents the bore diameter.

Single row angular contact ball bearings have the type number 7. In common with deep groove ball bearings, they have three-four-and five-figure numbers. The most common series are designated 72 and 73.

The designations of cylindrical roller bearings commence with one or more letters. These letters indicate the design of the bearing and are followed by three or four figures. Examples of these signs are shown opposite.



### Supplementary designations

The complete designations of rolling bearings consist of the basic designation and may include one or more supplementary designations. Generally, the basic designation consists of an identification of the type of bearing (figure, letter or combination of letters), the series designation and the bore diameter identification, e.g., 23216 or NU 212. The supplementary designations are placed either in front of the basic designation (prefix) or after the basic designation (suffix). Prefixes serve to identify bearing components. Suffixes are used to identify designs (variants) which differ in some way from the original design or which differ from the design which is the current production standard. The more commonly used supplementary designations are listed in the following and their meaning explained.

## Prefixes

<b>GS</b>	Housing washer of a cylindrical roller thrust bearing.
<b>Example:</b>	GS 81107-housing washer of cylindrical roller thrust bearing 81107.
<b>K</b>	Roller and cage assembly of a cylindrical roller thrust bearing .
<b>K-</b>	Inner ring with roller and cage assembly (cone) or outer ring (cup) of a taper roller bearing belonging to an AFBMA standard series and generally having inch dimensions.
<b>Example:</b>	K-09067-cone of taper roller bearing of series 09000 K-09195- cup of taper roller bearing of series 09000 K-09067/K-09195-complete taper roller bearing comprising cone K-09067 and cup K-091967
<b>L</b>	Removable inner or outer ring of a separable bearing.
<b>Example:</b>	LNU 207-inner ring of cylindrical roller bearing NU 207. L 30207-outer ring of taper roller bearing 30207.
<b>R</b>	Separable bearing without removable inner or outer ring.
<b>Example:</b>	RNU 207-outer ring with roller and cage assembly of cylindrical roller bearing NU 207. R 30207-inner ring with roller and cage assembly of taper roller bearing 30207.
<b>WS</b>	Shaft washer of a cylindrical roller thrust bearing.

## Bearing Data-General

### Suffixes

Where several suffixes are included in a product designation they are written in the order dictated by the following groupings (internal design, external design, cage, other bearing features). The suffixes of the fourth group (other bearing features) are always preceded by an oblique stroke which separates them from the basic designation or the preceding suffix.

### Internal Design

<b>A</b>	Deviating or modified internal.
<b>B</b>	Design, specific feature.
<b>Example:</b>	7205 B-single row identifies angular contact ball with modified internal design.
<b>C</b>	Increased axial load capacity.
<b>Example:</b>	NU 205 EC-single row cylindrical roller bearing with reinforced roller and cage assembly and increased axial load carrying capacity.
<b>D</b>	Bearing with a contact angle of 40° and a reinforced ball and cage assembly.

## External Design

<b>CA</b>	Single row angular contact ball.
<b>CB</b>	Bearing for paired mounting in.
<b>CC</b>	Random order (tandem, back-to-back or face-to-face). When arranged back-to-back or face-to-face, the bearings will have a small (CA), normal (CB) or larger than normal (CC) axial internal clearance before mounting.
<b>-2F</b>	Flingers at both sides of the bearing (Y-bearings).
<b>-2FF</b>	Flocked flingers at both sides of the bearing (Y-bearings).
<b>G</b>	Single row angular contact ball bearings for paired mounting in random order (tandem, back-to-back or face-to-face). When arranged back-to-back or face-to-face, the bearings will have a certain axial internal clearance before mounting.
<b>GA</b>	Single row angular contact ball.
<b>GB</b>	Bearings for paired mounting in.
<b>GC</b>	Random order (tandem, back-to-back or face-to-face). When arranged back-to-back or face-to-face, the bearings will have a light (GA), medium (GB) or heavy preload (GC) before mounting .
<b>K</b>	Tapered bore, taper 1:12 on diameter.
<b>K30</b>	Tapered bore, taper 1:30 on diameter.
<b>-LS</b>	Land riding seal (rubbing seal) at one side of the bearing, inner ring without seal recess.
<b>-2LS</b>	LS seals at both sides of bearing.
<b>N</b>	Snap ring groove in outside cylindrical surface of outer ring.
<b>NR</b>	As N, but with snap ring.
<b>N2</b>	Two locating slots (at 180°) in outer ring.
<b>PP</b>	Rubbing seals at both sides of bearing (support rollers, cam followers).
<b>RS</b>	Rubbing seal of synthetic rubber or polyurethane at one side of the bearing (needle roller bearings).
<b>-RS1</b>	Rubbing seal of synthetic rubber with sheet steel reinforcement at one side of the bearing.
<b>-2RS1</b>	RS1 seals at both sides of bearing .
<b>-2RS</b>	RS seal at both sides of bearing (needle roller bearings).
<b>-RZ</b>	Low-friction seal of synthetic rubber with sheet steel reinforcement at one side of bearing.
<b>-2RZ</b>	RZ seals at both sides of bearing.
<b>X</b>	1. Boundary dimensions altered to conform to ISO Standards. 2. Cylindrical runner surface (support rollers, cam followers).
<b>-Z</b>	Shield (non-rubbing seal) at one side of bearing.
<b>-2Z</b>	Z shields at both sides of bearing .
<b>-ZN</b>	Z shield at one side of bearing and snap ring groove in outer ring of bearing at opposite side.

<b>-2ZN</b>	Z shields at both sides of bearing and snap ring groove in outer ring.
<b>-ZNR</b>	As-ZN, but with snap ring.
<b>-2ZNR</b>	As-2ZN, but with snap ring.

### Cage

<b>F</b>	Machined cage of steel or special cast iron.
<b>J</b>	Pressed cage of sheet steel.
<b>L</b>	Machined cage of light alloy.
<b>M</b>	Machined cage of brass.
<b>MP</b>	Machined cage of brass, window type.
<b>P</b>	Moulded cage of glass fiber reinforced polyamide 6, 6.
<b>TN</b>	Moulded cage of plastic.
<b>Y</b>	Pressed cage of sheet brass.

To indicate how the cage is guided in the bearing, the suffix identifying the cage may be followed by letters A or B. A indicates that the cage is centered in the outer ring, B: that it is centered on the innerring. The absence of an additional letter indicates that the cage is centered on the rolling elements.

**Example:** MA-machined cage of brass, outer ring centered

The cage suffixes may also be followed by figures indicating different designs or materials.

**Example:** TN9-moulded cage of glass fiber reinforced polyamide 6,6.

<b>V</b>	Full complement bearing (without cage).
<b>VH</b>	Full complement bearing with non-separable roller complement (cylindrical roller bearings).

### Other Bearing Features

The oblique stroke which must precede the suffixes of this group is not shown in the following:

### Accuracy

<b>CLN</b>	Corresponds to ISO tolerance class 6X for taper roller bearings (metric), (reduced width tolerances)
<b>CLO</b>	Corresponds to ISO tolerance class O (inch-size taper roller bearings).
<b>CL3</b>	Corresponds to ISO tolerance class 3 (inch-size taper roller bearings).
<b>CL7A</b>	Standard taper roller bearing quality for pinion bearing arrangements.
<b>CL7C</b>	Special taper roller bearing quality for pinion bearing arrangements.
<b>P4</b>	Dimensional and running accuracy to ISO tolerance class 4 (more accurate than P5).
<b>P4A</b>	Dimensional accuracy to ISO tolerance class 4 and running accuracy to AFBMA class ABEC 9*.
<b>P5</b>	Dimensional and running accuracy to ISO tolerance class 5 (more accurate than P6).
<b>P6</b>	Dimensional and running accuracy to ISO tolerance class 6.
<b>PA9A</b>	Dimensional and running accuracy to AFBMA class ABEC 9.
<b>PA9B</b>	Dimensional accuracy to AFBMA class ABEC9, running accuracy better than PA9A.
<b>SP</b>	Dimensional accuracy approximately to P5, running accuracy approximately to P4.
<b>UP</b>	Dimensional accuracy approximately to P4, running accuracy better than P4.
<b>*</b>	See ANSI B 3.14-1972 Sub-clause 4.3.



## Bearing Data-General

### Internal Clearance

<b>C1</b>	Clearance less than C2.
<b>C2</b>	Clearance less than normal.
<b>C3</b>	Clearance greater than normal.
<b>C4</b>	Clearance greater than C3.
<b>C5</b>	Clearance greater than C4.

When in combination with suffixes P4, P5 or P6 (for accuracy), the letter C is omitted from the clearance suffix.

**Example:** P6 + C2 = P62

### Quality

<b>Q</b>	Optimized internal geometry and surface finish (taper roller bearings).
<b>Q66</b>	Vibration level lower than normal, vibration peaks lower than normal.
<b>QE5</b>	Special electric motor quality, dimensional and running accuracy to P6, exceptionally quiet running.
<b>QE6</b>	Standard electric motor quality, quiet running .

## Bearing Sets

**DB** Two matched single row deep groove ball bearings, single row angular contact ball bearings or single row taper roller bearings for arranging back-to-back. The letter(s) following immediately after DB indicate the magnitude of the axial internal clearance or the preload of the bearing before mounting:

<b>A</b>	light preload (angular contact ball bearings).
<b>B</b>	preload greater than A (angular contact ball bearings).
<b>C</b>	preload greater than B (angular contact ball bearings).
<b>CA</b>	small axial internal clearance (deep groove and angular contact ball bearings).
<b>CB</b>	axial internal clearance larger than CA (deep groove and angular contact ball bearings).
<b>CC</b>	axial internal clearance larger than CB (deep groove and angular contact ball bearings).
<b>CG</b>	"zero" clearance (taper roller bearings).
<b>C...</b>	special axial internal clearance (the figures following C give the magnitude of the axial clearance in $\mu\text{m}$ ).
<b>GA</b>	light preload (deep groove ball bearings).
<b>GB</b>	preload greater than GA (deep groove ball bearings).
<b>G...</b>	special preload (the figures following G give the magnitude of the preload in daN).

**Example:** 6208/DBGGA-two matched deep groove ball bearings 6208 arranged back-to-back with light preload.

**DF** Two matched single row deep groove ball bearings, single row angular contact ball bearings or single row taper roller bearings for arranging face-to-face. DF can be followed by the same letters as DB.

**DT** Two matched single row deep groove ball bearings, single row angular contact ball bearings or single row taper roller bearings for arranging in tandem.

## Heat Treatment

The bearing rings (or washers) are dimensionally stabilized for use at the following operating temperatures:

<b>S0</b>	up to 150°C
<b>S1</b>	up to 200°C
<b>S2</b>	up to 250°C
<b>S3</b>	up to 300°C
<b>S4</b>	up to 350°C

## Relubrication

<b>W</b>	No relubrication facility.
<b>W20</b>	Three lubrication holes in outer ring.
<b>W33</b>	Lubrication groove and three holes in outer ring.
<b>W33X</b>	Lubrication groove and six holes in outer ring.

## Lubricants

The suffixes used to identify the grease with which a bearing is filled comprise a letter combination signifying the temperature range followed by a two-figure number which identifies the actual grease. The following letter combinations are used:

<b>HT</b>	Grease for high temperatures (-20 to +130°C)
<b>LHT</b>	Grease for low and high temperatures (-40 to +140°C)
<b>LT</b>	Grease for low temperatures (-50 to +80°C)
<b>MT</b>	Grease for medium temperatures (-30 to +110°C).

An MT suffix is used only if the grease is not the Standard grease for a particular bearing. Grease quantities which differ from the Standard fill (25 to 35% of the free space in the bearing) are identified by an additional letter:

<b>A</b>	grease quantity less than standard.
<b>B</b>	grease quantity greater than standard.
<b>C</b>	grease quantity greater than B.

**Example:** 6210-2Z/HT51B-deep groove ball bearing 6210 with two shields having a larger quantity than standard fill of a grease suitable for high temperatures.

## Other Features

Combinations of the letter V with another letter (e.g., VA) and a three-figure combination identify differences from the Standard design which are not covered by other established suffixes.

<b>VA201</b>	Bearings for kiln trucks
<b>VA301</b>	Cylindrical roller bearings for traction motors