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**JIS B 0163-2** : 2007

(JSME/JSA)

**Plain bearings—Symbols—  
Part 2: Applications**

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**Reference number : JIS B 0163-2 : 2007 (E)**

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## Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for establishment of Japanese Industrial Standard submitted by The Japan Society of Mechanical Engineers (JSME)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

This Standard has been prepared based on **ISO 7904-2:1995** *Plain bearings—Symbols—Part 2: Applications* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

**JIS B 0163** consists of following 2 parts under the general title “*Plain bearings—Symbols*”:

*Part 1: Basic symbols*

*Part 2: Applications*

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In the event of any doubts arising as to the contents,  
the original JIS is to be the final authority.

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## Plain bearings—Symbols— Part 2: Applications

**Introduction** This Japanese Industrial Standard has been prepared based on the first edition of **ISO 7904-2:1995** *Plain bearings—Symbols—Part 2: Applications* published in 1995 with some modifications of the technical contents.

The portions underlined with dots in this Standard are the matters in which the contents of the original International Standard have been modified. A list of modifications with explanations is given in Annex (informative).

**1 Scope** This part of **JIS B 0163** specifies practical applications of the general symbols laid down in **JIS B 0163-1** with regard to the calculations, design and testing of plain bearings.

**NOTE :** The International Standard corresponding to this part of **JIS B 0163** is as follows:

In addition, symbols which denote the degree of correspondence in the contents between **JIS** and the relevant International Standard are IDT (identical), MOD (modified) and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

ISO 7904-2:1995 *Plain bearings—Symbols—Part 2: Applications* (MOD)

**2 Normative reference** The following standard contains provisions which, through reference in this text, constitute provisions of this part of **JIS B 0163**. The most recent edition of the standard (including amendments) indicated below shall be applied.

JIS B 0163-1 *Plain bearings—Symbols—Part 1: Basic symbols*

**NOTE :** **ISO 7904-1:1995** *Plain bearings—Symbols—Part 1: Basic symbols* is equivalent to the said standard.

### 3 Symbols and terms

#### 3.1 Symbols (Roman alphabet)

| Symbol             | Term (Japanese)                              | Reading                                                                                                         | English equivalent (informative)                                                                                             |
|--------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| $A$                | 面積<br>破断時の伸び<br>放熱表面積                        | MENSEKI<br>HADAN ZI NO NOBI<br>HÔNETU HYÔMENSEKI                                                                | area<br>elongation at fracture<br>area of heat-emitting surface                                                              |
| $A_{\text{lan}}$   | ランド面積                                        | RANDO MENSEKI                                                                                                   | land area                                                                                                                    |
| $A_{\text{lan}}^*$ | 相対ランド面積                                      | SÔTAI RANDO MENSEKI                                                                                             | relative land area                                                                                                           |
| $A_{\text{p}}$     | オイルポケット面積                                    | OIRU POKETTO MENSEKI                                                                                            | oil pocket area                                                                                                              |
| $A_{\text{s}}$     | 断面積                                          | DANMENSEKI                                                                                                      | area of cross-section                                                                                                        |
| $a$                | 距離<br>加速度<br>熱拡散率                            | KYORI<br>KASOKU DO<br>NETU KAKUSANRITU                                                                          | distance<br>acceleration<br>thermal diffusivity                                                                              |
| $a_F$              | ギャップの入口とピボットポイントの位置<br>との間の距離                | GYAPPU NO IRIGUTI TO PIBOTTO<br>POINTO NO ITI TONO AIDA NO<br>KYORI                                             | distance between entrance of the gap and the<br>location of the pivot point                                                  |
| $a_F^*$            | ギャップの入口とピボットポイントの位置<br>との間の相対的な距離            | GYAPPU NO IRIGUTI TO PIBOTTO<br>POINTO NO ITI TONO AIDA NO<br>SÔTAI TEKI NA KYORI                               | relative distance between entrance of the gap and<br>the location of the pivot point                                         |
| $a_M$              | 軸受支持のオフセット                                   | ZIKUKE SIZI NO OHUSETTO                                                                                         | off-set of bearing support                                                                                                   |
| $B$                | 軸受幅<br>滑り方向に対し直角方向の有効軸受幅<br>円形テイルデルイングパッドの直径 | ZIKUKE HABA<br>SUBERI HÔKÔ NI TAISI TYOKKAKU<br>HÔKÔ NO YÛKÔ ZIKUKE HABA<br>ENKEI TIRUTINGU PADDO NO<br>TYOKKEI | bearing width<br>effective bearing width at right angles to the<br>direction of motion<br>diameter of a circular tilting pad |
| $B^*$              | 相対幅<br>幅比                                    | SÔTAI HABA<br>HABA HI                                                                                           | relative width<br>width ratio                                                                                                |

| Symbol       | Term (Japanese)                                            | Reading                                                                                                                                   | English equivalent (informative)                                                                                    |
|--------------|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| $B_H$        | 軸方向における軸受ハウジングの外幅                                          | ZIKU HÔKÔ NI OKERU ZIKUUEKE<br>HAUZINGU NO SOTOHABA                                                                                       | external width of bearing housing in axial direction                                                                |
| $B_{tot}$    | 滑り方向に対し直角方向の総軸受幅                                           | SUBERI HÔKÔ NI TAISI TYOKKAKU<br>HÔKÔ NO SÔ ZIKUUEKE HABA                                                                                 | total bearing width at right angles to the direction of motion                                                      |
| $b_{ax}$     | 軸方向出口の幅                                                    | ZIKU HÔKÔ DEGUTI NO HABA                                                                                                                  | width of axial outlet                                                                                               |
| $b_c$        | 円周方向出口の幅                                                   | ENSYÛ HÔKÔ DEGUTI NO HABA                                                                                                                 | width of circumferential outlet                                                                                     |
| $b_G$        | 油溝幅<br>流出溝の幅                                               | YUKÔ HABA<br>RYÛSYUTU KÔ NO HABA                                                                                                          | width of oil groove<br>width of bleed groove                                                                        |
| $b_P$        | オイルポケットの幅                                                  | OIRU POCKETTO NO HABA                                                                                                                     | width of oil pocket                                                                                                 |
| $C$          | すき間<br>濃度<br>面取り                                           | SUKIMA<br>NÔDO<br>MENTORI                                                                                                                 | clearance<br>concentration<br>chamfer                                                                               |
| $C^*$        | 相対軸受すき間<br>( $\psi$ とも書く。)                                 | SÔTAI ZIKUUEKE SUKIMA<br>(also represented by " $\psi$ ")                                                                                 | relative bearing clearance<br>(also $\psi$ )                                                                        |
| $C_B$        | 多円弧ジャーナル軸受及びテイルインゲ<br>パッドジョヤールナル軸受の円弧半径又はパ<br>ッド内半径と軸半径との差 | TAENKO ZYÂNARU ZIKUUEKE OYOBI<br>TIRUTINNGU PADDÔ ZYÂNARU<br>ZIKUUEKE NO ENKO HANKEI<br>MATAHA PADDÔ NAI HANKEI TO<br>ZIKU HANKEI TONO SA | difference between lobe or pad bore radius and<br>shaft radius of a multi-lobed and tilting pad<br>journal bearing  |
| $C_D$        | 軸受すき間<br>軸受直径すき間<br>(ジャーナル軸受内径と軸の直径との差)                    | ZIKUUEKE SUKIMA<br>ZIKUUEKE TYOKKEI SUKIMA<br>(ZYÂNARU ZIKUUEKE NAIKEI TO<br>ZIKU NO TYOKKEI TONO SA)                                     | bearing clearance<br>bearing diametral clearance<br>(difference between journal bearing bore and<br>shaft diameter) |
| $\bar{C}_D$  | $C_D$ の平均値                                                 | $C_D$ NO HEIKIN TI                                                                                                                        | mean value of $C_D$                                                                                                 |
| $C_{D, eff}$ | 有効軸受直径のすき間                                                 | YÛKÔ ZIKUUEKE TYOKKEI SUKIMA                                                                                                              | effective bearing diametral clearance                                                                               |
| $C_{D, max}$ | $C_D$ の最大値                                                 | $C_D$ NO SAIDAI TI                                                                                                                        | maximum value of $C_D$                                                                                              |
| $C_{D, min}$ | $C_D$ の最小値                                                 | $C_D$ NO SAISYÔ TI                                                                                                                        | minimum value of $C_D$                                                                                              |

| Symbol             | Term (Japanese)                               | Reading                                                                                                  | English equivalent (informative)                                                                          |
|--------------------|-----------------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| $C_{\text{man}}$   | 多円弧ジャーナル軸受の加工公差によるすき間範囲                       | TAENKO ZYÂNARU ZIKUUE NO KAKÔ KÔSA NI YORU SUKIMA HAN'I                                                  | clearance range due to machining tolerances of a multi-lobed journal bearing                              |
| $C_{\text{max}}$   | 多円弧軸受の最大すき間                                   | TAENKO ZIKUUE NO SAIDAI SUKIMA                                                                           | maximum clearance of multi-lobed bearing                                                                  |
| $C_{\text{min}}$   | 多円弧軸受の最小すき間                                   | TAENKO ZIKUUE NO SAISYÔ SUKIMA                                                                           | minimum clearance of multi-lobed bearing                                                                  |
| $C_R$              | 軸受半径すき間<br>(ジャーナル軸受半径と軸半径との差)                 | ZIKUUE HANKEI SUKIMA<br>(ZYÂNARU ZIKUUE HANKEI TO ZIKU HANKEI TONO SA)                                   | bearing radial clearance<br>(difference between journal bearing radius and shaft radius)                  |
| $\bar{C}_R$        | $C_R$ の平均値                                    | $C_R$ NO HEIKIN TI                                                                                       | mean value of $C_R$                                                                                       |
| $C_{R,\text{eff}}$ | 有効軸受半径すき間                                     | YÛKÔ ZIKUUE HANKEI SUKIMA                                                                                | effective bearing radical clearance                                                                       |
| $C_{R,\text{max}}$ | $C_R$ の最大値                                    | $C_R$ NO SAIDAI TI                                                                                       | maximum value of $C_R$                                                                                    |
| $C_{R,\text{min}}$ | $C_R$ の最小値                                    | $C_R$ NO SAISYÔ TI                                                                                       | minimum value of $C_R$                                                                                    |
| $C_{\text{wed}}$   | マルチテーパランド軸受のくさび深さ<br>(スラスト軸受すき間)              | MARUTI TÊPA RANDO ZIKUUE NO KUSABI HUKASA<br>(SURASUTO ZIKUUE SUKIMA)                                    | wedge depth of a multi-taper land bearing<br>(“thrust bearing clearance”)                                 |
| $c$                | 比熱<br>剛性係数                                    | HINETU<br>GÔSEI KEISÛ                                                                                    | specific heat<br>stiffness coefficient                                                                    |
| $c_J$              | 軸の曲げ剛性                                        | ZIKUNO MAGE GÔSEI                                                                                        | flexural stiffness of shaft                                                                               |
| $c_p$              | 比熱 (圧力一定下)                                    | HINETU (ATURYOKU ITTEIKA)                                                                                | specific heat capacity (with $p$ constant)                                                                |
| $D$                | 軸受直径<br>(ジャーナル軸受の内径, スラスト軸受<br>キャリヤリングの平均の直径) | ZIKUUE TYOKKEI<br>(ZYÂNARU ZIKUUE NO NAIKEI,<br>SURASUTO ZIKUUE<br>KYARIYÂRINGU NO HEIKIN NO<br>TYOKKEI) | bearing diameter<br>(inside diameter of journal bearing, mean<br>diameter of thrust bearing carrier ring) |

| Symbol        | Term (Japanese)                             | Reading                                                                                            | English equivalent (informative)                                                 |
|---------------|---------------------------------------------|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| $D_B$         | 多円弧ジャーナル軸受及びティルティングパッドジャーナル軸受の円弧又はパッド半径の2倍値 | TAENKO ZYÂNARU ZIKUKE OYOBI TIRUTINGU PADDO ZYÂNARU ZIKUKE NO ENKO MATAHA PADDO HANKEI NO NIBAI TI | twice the radius of lobe or pad in a multi-lobed and tilting pad journal bearing |
| $D_{B, \max}$ | $D_B$ の最大値                                  | $D_B$ NO SAIDAI TI                                                                                 | maximum value of $D_B$                                                           |
| $D_{B, \min}$ | $D_B$ の最小値                                  | $D_B$ NO SAISYÔ TI                                                                                 | minimum value of $D_B$                                                           |
| $D_H$         | 軸受ハウジングの直径                                  | ZIKUKE HAUZINGU NO TYOKKEI                                                                         | diameter of bearing housing                                                      |
| $D_i$         | スラスト軸受キャリヤリングの内径                            | SURASUTO ZIKUKE KYARIYÂRINGU NO NAIKEI                                                             | inside diameter of thrust-bearing carrier ring                                   |
| $D_J$         | 軸径                                          | ZIKUKEI                                                                                            | shaft diameter                                                                   |
| $D_{J, \max}$ | $D_J$ の最大値                                  | $D_J$ NO SAIDAI TI                                                                                 | maximum value of $D_J$                                                           |
| $D_{J, \min}$ | $D_J$ の最小値                                  | $D_J$ NO SAISYÔ TI                                                                                 | minimum value of $D_J$                                                           |
| $D_o$         | スラスト軸受キャリヤリングの外径                            | SURASUTO ZIKUKE KYARIYÂRINGU NO GAIKEI                                                             | outside diameter of thrust-bearing carrier ring                                  |
| $d$           | 直径<br>減衰係数                                  | TYOKKEI<br>GENSUI KEISÛ                                                                            | diameter<br>damping coefficient                                                  |
| $d_{cp}$      | 毛細管 (孔) の直径                                 | MÔSAI KAN (KO) NO TYOKKEI                                                                          | diameter of capillaries                                                          |
| $d_L$         | 油穴の直径                                       | YUKETU NO TYOKKEI                                                                                  | oil hole diameter                                                                |
| $E$           | 縦弾性係数                                       | ZYÛDANSEI KEISÛ                                                                                    | modulus of elasticity                                                            |
| $E^*$         | 弾性のパラメータ                                    | DANSEI NO PARAMÊTA                                                                                 | parameter of elasticity                                                          |
| $E_B$         | 軸受材料の縦弾性係数                                  | ZIKUKE ZAIRYÔ NO ZYUDANSEI KEISU                                                                   | modulus of elasticity of bearing material                                        |
| $E_J$         | 回転体材料の縦弾性係数<br>(滑り表面)                       | KAITENTAI ZAIRYO NO ZYÛDANSEI KEISÛ<br>(SUBERI HYÔMEN)                                             | modulus of elasticity of rotor material<br>(sliding surface)                     |
| $E_{rs1}$     | 合成縦弾性係数                                     | GÔSEI ZYÛDANSEI KEISÛ                                                                              | resultant modulus of elasticity                                                  |

| Symbol        | Term (Japanese)                     | Reading                                                                              | English equivalent (informative)                                                                |
|---------------|-------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------|
| $e$           | 偏心率<br>(軸受と軸の中心軸との距離)               | HENSIN RYÔ<br>(ZIKUUE TO ZIKU NO TYÛSIN<br>ZIKU TONO KYORI)                          | absolute eccentricity<br>(distance between the axis of the shaft and the<br>bearing axis)       |
| $e^*$         | 偏心率, 相対偏心率<br>( $\epsilon$ とも書く。)   | HENSIN RITU, SÔTAI HENSIN RYÔ<br>(also represented by “ $\epsilon$ ”)                | relative eccentricity<br>(also $\epsilon$ )                                                     |
| $e_B$         | 多円弧及びテイルテリングパッドジャーナル軸受の滑り面の偏心率      | TAENKO OYOBI TIRUTINGU PADDO<br>ZYÂNARU ZIKUUE NO SUBERI<br>MEN NO HENSIN RYÔ        | eccentricity of sliding surfaces (segments) of a<br>multi-lobed and tilting pad journal bearing |
| $e_F$         | 多円弧ジャーナル軸受の荷重方向における軸の偏心率            | TAENKO ZYÂNARU ZIKUUE NO<br>KAZYÛ HÔKÔ NI OKERU ZIKU NO<br>HENSIN RYÔ                | eccentricity of shaft in direction of load of a multi-<br>lobed journal bearing                 |
| $F$           | 軸受荷重<br>力<br>油膜力                    | ZIKUUE KAZYÛ<br>TIKARA<br>YUMAKU RYOKU                                               | bearing force (load)<br>force<br>oil film force                                                 |
| $F^*$         | 軸受荷重パラメータ                           | ZIKUUE KAZYÛ PARAMÊTA                                                                | bearing force parameter                                                                         |
| $F_E$         | 軸受荷重<br>(EHD 影響下での)                 | ZIKUUE KAZYÛ<br>(EHD EIKYÔKA DENO)                                                   | bearing force<br>(with EHD influence)                                                           |
| $F^*_E$       | 軸受荷重パラメータ<br>(EHD 影響下での)            | ZIKUUE KAZYÛ PARAMÊTA<br>(EHD EIKYÔKA DENO)                                          | bearing force parameter<br>(with EHD influence)                                                 |
| $F_{E, tr}$   | 境界潤滑の限界における軸受荷重<br>(EHD 影響下での)      | KYÔKAI ZYUNKATU NO GENKAI NI<br>OKERU ZIKUUE KAZYÛ<br>(EHD EIKYÔKA DENO)             | bearing force (with EHD influence) at the limit of<br>boundary lubrication                      |
| $F^*_{E, tr}$ | 境界潤滑の限界における軸受荷重パラメータ<br>(EHD 影響下での) | KYÔKAI ZYUNKATU NO GENKAI NI<br>OKERU ZIKUUE KAZYÛ<br>PARAMÊTA<br>(EHD EIKYÔKA DENO) | bearing force parameter (with EHD influence) at<br>the limit of boundary lubrication            |
| $F^*_{eff}$   | 有効軸受荷重パラメータ                         | YÛKÔ ZIKUUE KAZYÛ PARAMÊTA                                                           | effective bearing force parameter                                                               |
| $F_f$         | 摩擦力                                 | MASATU RYOKU                                                                         | friction force                                                                                  |

| Symbol     | Term (Japanese)                                         | Reading                                                                                                                                                                | English equivalent (informative)                                                        |
|------------|---------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| $F_f^*$    | 摩擦パラメータ                                                 | MASATU RYOKU PARAMÊTA                                                                                                                                                  | friction force parameter                                                                |
| $F_n$      | 垂直荷重<br>(滑り面に垂直方向)                                      | SUITYOKU KAZYÛ<br>(SUBERI MEN NI SUITYOKU<br>HÔKÔ)                                                                                                                     | normal force<br>(normal to sliding surface)                                             |
| $F_{wed}$  | 流体潤滑下における油膜力のくさび作用によって生じる成分<br>(油膜力：油膜圧力によって軸受荷重を支える力)  | RYÛTAI ZYUNKATUKA NI OKERU<br>YUMAKU RYOKU NO KUSABI<br>SAYÔ NI YOTTE SYÔZIRU SEIBUN<br>(YUMAKU RYOKU: YUMAKU<br>ATURYOKU NI YOTTE ZIKUUE<br>KAZYÛ WO SASAERU TIKARA)  | component of oil film force due to wedge action<br>under hydrodynamic lubrication       |
| $F_{sc}$   | 静荷重                                                     | SEI KAZYÛ                                                                                                                                                              | static load                                                                             |
| $F_{sq}$   | 流体潤滑下における油膜力のスクイズ作用によって生じる成分<br>(油膜力：油膜圧力によって軸受荷重を支える力) | RYÛTAI ZYUNKATUKA NI OKERU<br>YUMAKU RYOKU NO SUKUÛZU<br>SAYÔ NI YOTTE SYÔZIRU SEIBUN<br>(YUMAKU RYOKU: YUMAKU<br>ATURYOKU NI YOTTE ZIKUUE<br>KAZYÛ WO SASAERU TIKARA) | component of oil film force due to squeeze action<br>under hydrodynamic lubrication     |
| $F_{st}$   | 始動時における軸受荷重                                             | SIDÔ ZI NI OKERU ZIKUUE KAZYÛ                                                                                                                                          | bearing force at start (N = 0)                                                          |
| $F_{stop}$ | 停止時における軸受荷重                                             | TEISI ZI NI OKERU ZIKUUE KAZYÛ                                                                                                                                         | bearing force at stop (N = 0)                                                           |
| $F_{tr}$   | 境界潤滑の限界における軸受荷重<br>(EHDの影響なしで)                          | KYÔKAI ZYUNKATU NO GENKAI NI<br>OKERU ZIKUUE KAZYÛ<br>(EHD NO EIKYÔ NASI DE)                                                                                           | bearing force (without EHD influence) at the limit<br>of boundary lubrication           |
| $F_{tr}^*$ | 境界潤滑の限界における軸受荷重パラメータ<br>(EHDの影響なしで)                     | KYÔKAI ZYUNKATU NO GENKAI NI<br>OKERU ZIKUUE KAZYÛ<br>PARAMÊTA<br>(EHD NO EIKYÔ NASI DE)                                                                               | bearing force parameter (without EHD influence) at<br>the limit of boundary lubrication |
| $f$        | 摩擦係数<br>関数                                              | MASATU KEISÛ<br>KANSÛ                                                                                                                                                  | coefficient of friction<br>function                                                     |