For further information, please ask for technical catalogue, also available on line: www.isb-bearing.com

Per ulteriori informazioni, potete richiedere il catalogo tecnico, disponibile anche on line: www.isb-bearing.com
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PRODUZIONE

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PRODUCTION

All products ISB® are manufactured exclusively by companies with UNI EN ISO 9001:2015 certified Quality System.
Tutti i prodotti ISB® sono costruiti esclusivamente da aziende con Sistema Qualità certificato secondo le norme UNI EN ISO 9001:2015.

All products ISB® are manufactured exclusively by companies with UNI EN ISO 9001:2015 certified Quality System.
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... centro di controllo per la qualità nella nostra sede in ITALIA.
... uno staff di Ingegneri tecnici della Qualità, al vostro servizio.

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... a quality control centre is located in our ITALY headquarters.
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CONTROLLO QUALITÀ ASIA
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... un’ulteriore serie di controlli vengono eseguiti da Laboratori esterni specializzati, attrezzati con moderni strumenti. Laboratorio Controllo Qualità.

ISB BEARING CHINA
ASIA QUALITY CONTROL
... an additional series of tests are conducted by specialised third party Laboratories using the latest instruments Quality Control Laboratory.
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**Certificazione finale - Inspection certificate**

**Data: 19/09/2013**

**Esito:** OK
La gamma prodotti ISB® è in continuo sviluppo, a breve è previsto l’ampliamento con ulteriori prodotti.

*The ISB® range is continuously in evolution and shortly will be widened by the addition of new items.*
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SETTORI DI APPLICAZIONE DEI CUSCINETTI DI BASE

SLEWING BEARING APPLICATION FIELDS

Il cuscinetto di base (comunemente definito con il nome di ralla) si rende necessario quando, all’interno di un macchinario o di un impianto, una parte strutturale deve ruotare rispetto ad un’altra secondo un asse univoco, assicurando il vincolo tra le parti.

Il cuscinetto di base, con la massima rigidità possibile offerta del suo disegno, deve sopportare e trasmettere i carichi operativi della struttura a cui è collegato e deve inoltre garantire il grado di precisione richiesto dall’applicazione, il rispetto dei parametri di funzionamento e il ciclo di vita richiesto. È evidente come il cuscinetto sia un componente fondamentale e la sua scelta deve rispondere ad attenti studi tecnici. Lo staff tecnico di ISB-BEARINGS è a disposizione per assistervi nella scelta del cuscinetto ideale per la vostra applicazione.

The slewing bearing has to be adopted when, in a machinery or in mechanical plant, a structural part must rotate opposed to another part, along a fixed axis, ensuring the axial and radial link between the two parts. The slew bearing, with the maximum stiffness offered by its design, must bear and transmit the operative loads of the structure it is linked to, and also it must guarantee the required motion precision, the respect of operational parameters, and the required lifetime.

It is evident how the slewing bearing is a fundamental component and its choice must be done according to specific technical studies. ISB-BEARINGS technical staff can assist your Company in the choice of the suitable bearing.

Le applicazioni più comuni sono:
- escavatori
- pompe per calcestruzzo
- veicoli sollevatori
- autogru
- gru edili e portuali
- compattatori
- turbine eoliche
- radar
- manipolatori, posizionatori
- caroselli di imbottigliamento
- tavole girevoli

Common application are:
- excavators
- concrete pumps
- boomer, manlift
- crane truck
- civil and harbour crane
- compactors
- wind turbines
- radar
- manipulators
- filling carousels
- rotary tables

Le applicazioni più comuni sono:

Manipolatore / Manipulator

Radar
**Pinze demolitrici / Demolitions shears**

**Macchine avvolgitrici**
*Wrapping machines*

**Macchine per il legname**
*Forest machines*

**Gru edili / Civil cranes**

**Autogru / Crane truck**
**ESCAVATORI / EXCAVATORS**

In this type of application, according to the typology of load and environmental conditions, the slew bearing must have high stiffness features, for counteracting fast load variations, good rotational features, for easy rotation of the superstructure, resistance to impact stresses in raceways and gear, in order to preserve its lifetime. The correct choice of suitable ISB slew bearings is an added value to the general quality of your project.

**REFERENCE SERIES**

**ER1/ZR1**
One row crossed roller bearing

**EB1/ZB1**
One row 4 contact point ball bearing
Il cuscinetto di base nelle pompe da calcestruzzo sorregge l’elongazione del braccio, consentendone la rotazione, e pertanto è soggetto ad un forte momento ribaltante. Deve anche possedere una struttura compatta per poter essere montato sui veicoli stradali. La sua scelta ricade solitamente su cuscinetti a due giri di sfere a otto punto di contatto, altrimenti può ricadere sul singolo giro di sfere, dove le sollecitazioni lo consentono.

The slew bearing in concrete pumps supports the boom elongation also allowing its rotation, and for this reason it is subject to a huge tilting moment. It must also have a compact structure in order to be mounted on road vehicles. A common choice is a double row ball bearings, 8-contact points, otherwise if loads are much lower, it could be one-row ball bearing.

REFERENCE SERIES

EB1/ZB1
4 contact point one row ball bearing

EB2/ZB2
8-point contact double row ball bearing
CAROSELLI DI IMBOTTIGLIAMENTO - FILLING CAROUSELS

Nei caroselli di imbottigliamento il cuscinetto di base può variare dal piccolo al grande diametro, ma le caratteristiche fondamentali devono essere l’elevata precisione costruttiva unita all’elevata velocità di rotazione che essi devono garantire in modo continuativo.

In filling carousels, slew bearing dimensions could vary from small to large diameter, but common characteristics are high precision construction and high continuous rotational speed.

COMPATTATORI - COMPACTORS

Nei compattatori, vista la bassa velocità di rotazione del rullo e l’elevato grado di sollecitazione in presenza di vibrazioni, l’utilizzo di due cuscinetti di base che sostengono il rullo è la soluzione ideale.

In compactor rollers, due to low rotation speed of the roller and to the relevant stress condition in presence of vibrations, the use of a pair of slew bearings supporting the roller is an ideal solution.
VEICOLI SOLLEVATORI - BOOMLIFT, MANLIFT

Applicazione tipica del cuscinetto di base. La ralla sostiene tutto il carico a sbalzo della piattaforma aerea.

This is a typical application of the slewing bearing. The whole overhang load of the aerial platform is entirely supported by the bearing.

PINZE DI SOLLEVAMENTO ROTANTI - ROTATING CLAMP

Sui muletti è spesso necessario avere delle pinze di sollevamento in grado di ruotare l’oggetto sollevato, per scopi come il versamento del suo contenuto o per permettere la sua movimentazione all’interno dei cicli di produzione e di stoccaggio.

On the forklifts it is often necessary to have a lifting clamp to rotate the lifted object, with the possibility to pour its content or to allow its handling in the production and storage cycles.
POSIZIONATORI DI SALDATURA - WELDING POSITIONERS

Un cuscinetto viene montato alla base del braccio dei robot di saldatura per sorreggere la struttura a sbalzo e consentirne l’azione rotativa; in aggiunta è richiesta una elevata rigidità per assicurare la necessaria precisione sul posizionamento.

A slew bearing is applied to the base of the arm of welding robots, in order to support the overhang structure and allow its rotational motion; moreover, high stiffness is required to ensure precision in positioning.

TAVOLE GIREvoli - ROTARY TABLES

Su macchine utensili, dove è necessario un controllo micrometrico sulla posizione del pezzo, alla base della tavole girevoli viene montato un cuscinetto YRT. Questo cuscinetto risponde ai massimi requisiti di precisione, costruiti senza gioco e completamente rettificati, internamente ed esternamente. La fornitura standard è completa di certificati di controllo dimensionali.

In machining centers, where a micrometric control is required, a YRT type bearing is installed on the turntable base. YRT is produced according to the highest precision requirements, completely grinded internally and externally, and assembled without any radial and axial clearance. The standard supply of this product also provides dimensional check certificates.
Le gru portuali e navali rappresentano uno dei campi fondamentali per l’impiego dei cuscinetti di base: il loro impiego è imprescindibile per supportare la struttura soggetta a gravose condizioni di carico, caratteristiche nella movimentazione dei materiali dei container. Il centro tecnico ISB è in grado di eseguire uno studio tecnico di progettazione o verifica del cuscinetto in tutte le sue parti, e inoltre di fornire tutti i certificati di conformità/materiali che accompagnano questo tipo di forniture.

Harbour and deck cranes represent one of the most important application fields for slew bearings: their use is fundamental to support the structure subject to extreme load conditions, such as the handling of containers. The ISB technical center is able to design or to verify the selected slew bearing in each part it is composed, and also to provide the compliance/material certificate usually required for this type of applications.
In questo tipo di applicazione i cuscinetti di base sono componenti funzionali fondamentali e il loro design varia in base alla funzione svolta sulla torre eolica. Il primo tipo di cuscinetto si chiama Blade Bearing “B” ed è fissato alla base di ogni pala e ne consente l’orientamento. Il secondo tipo si chiama Yaw Bearing “Y” ed è fissato alla base della navicella consentendo l’orientamento dell’intera turbina. Il terzo tipo si chiama Main Bearing “M” e consente il trasferimento del moto rotatorio dalla turbina all’alternatore.

For this type of application the slew bearings are extremely important functional component and their design changes according to their position in the wind turbine. The first is called Blade Bearing “B”, it is fixed in the base of each blade allowing its orientation. The second is the Yaw Bearing “Y”, it is fixed on the base of the nacelle and it allows the orientation of the whole turbine. The third type is called Main Bearing “M” and it allows the motion transfer from the turbine to the generator.
Componenti del cuscinetto di base - Slew bearings components

Il cuscinetto di base è costituito normalmente da due anelli di acciaio ad alta resistenza il cui movimento rotatorio relativo viene permesso tramite la creazione di piste di rotolamento ospitanti gli elementi volventi, che possono essere sfere o rulli cilindrici. Le piste di rotolamento sono il cuore della struttura del cuscinetto e su di esse si rivolge la maggiore attenzione durante il ciclo di produzione. Esse dovranno essere trattate termicamente per aumentarne la durezza, non solo in superficie, ma anche in profondità e permettere al cuscinetto di sopportare i gravosi carichi a cui è normalmente soggetto conferendogli integrità nel tempo.

The slew bearing is normally composed of two rings made of high resistance steel, and their relative rotating motion is allowed by the creation of raceways hosting the rolling elements, which can be balls or cylindrical rollers. The roller raceways are the structural heart of the bearing and require the major attention during the production cycle. An induction hardening treatment must be applied on raceways in order to increase their hardness both on the surface and in depth. This allows the bearing to endure the huge loads it is usually subject to, ensuring structural integrity over time.
Componenti standard di un cuscinetto di base
Standard components of a slewing bearing

Sfere DIN 5401 vengono usate per cuscinetti a quattro punti di contatto mentre rulli cilindrici DIN 5402 per cuscinetti a rulli: entrambi i componenti sono prodotti con materiale 100 Cr6.
La dimensione delle sfere o dei rulli può essere facilmente rintracciabile nella sigla stessa del cuscinetto (vedi pag. 56).

DIN5401 balls are used for four point contact bearings while DIN5402 cylindrical rollers are used for crossed roller bearings: both types of rolling elements are made of 100 Cr6 material.
Rolling element diameter can be taken from the code of the slew bearing as per the designation (see pag. 56).
**Distanziali**

*Spacers*

Distanziali in Nylon vengono usati per mantenere i componenti per la rotazione (sfere, rulli) separati tra loro evitando qualsiasi contatto.

*Nylon spacers are used to guide the rolling elements, to hold them at an equal distance from each other and to prevent them from coming into contact with each other.*

**Guarnizioni**

*Sealing*

Il materiale utilizzato per la guarnizione è gomma NBR. La guarnizione chiude il vuoto che si crea tra un anello e l’altro evitando l’ingresso di sporczia, polvere e umidità. Una corretta lubrificazione incrementa l’efficacia della guarnizione (vedi Lubrificazione delle piste pag. 145)

*Seals made from NBR rubber protect the gap in the bearing on both sides from the ingress of dirt, dust and moisture. Please note that a correct lubrication increases the effectiveness of the seals (see Raceway Lubrication page 145)*

**Grasso**

*Grease*

I nostri cuscinetti vengono forniti con una iniziale lubrificazione di piste e dentatura con grassi specifici elencati nelle sezione Lubrificazione, parte 4 Installazione e Manutenzione. Seguire attentamente le istruzioni fornite per preservare la vita del cuscinetto.

*Our bearings are delivered with an initial lubrication of raceways and gear, using grease listed in the lubrication section, part 4 Installation and Maintenance. Strictly follow the instructions supplied in order to preserve the lifecycle of the bearing.*

**Ingrassatori**

*Greasers*

Sono posti sul diametro dell’anello senza dentatura (per i cuscinetti senza dentatura sono posti sull’anello esterno) e servono per ingrassare la sede di rotolamento degli elementi volventi.

*They are located on the diameter of the ungeared ring (for the bearings without gear teeth they are located on the outer ring) and they are used to grease the raceway.*
MATERIALI PER GLI ANELLI - RINGS MATERIAL

The materials used to produce slew bearings can be carbon steel, as C45, or alloy steel, as 42CrMo4. The choice between these two types of steel is related to the required mechanical performances, like core-tenacity and hardness, but also to other technological factors, as hardenability. The 42CrMo4 allows a deeper thickness of the hardened layer than C45, ensuring higher load capacity. The C45 (or equivalent) is the material used for the production of the major part of standard medium-low diameter bearing, the 42CrMo4 is used for medium-high diameters, and for many different special applications.

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<thead>
<tr>
<th>UNI Italia</th>
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<tr>
<td>Acciaio legato</td>
<td>42CrMo4</td>
<td>42CrMo4</td>
<td>42CrMo4</td>
<td>4140</td>
<td>42CrMo</td>
<td>En19A</td>
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</tbody>
</table>

Tabella 1 - corrispondenza nelle varie unificazioni delle denominazioni degli acciai per cuscinetti di base
Form 1 - correspondance of steel used for slewing bearing production, in various normative
Dopo forgiatura e laminazione, un trattamento termico, che può essere di bonifica o di normalizzazione, viene effettuato per incrementare tutte le caratteristiche meccaniche del materiale fra cui resistenza a trazione, tenacità, durezza, temprabilità. Il ciclo di bonifica, che prevede la successione di un trattamento di tempra più uno di rinvenimento, conferisce al materiale una durezza e una resistenza a cuore maggiore di quella della normalizzazione, caratteristiche necessarie per dentature soggette alle massime sollecitazioni meccaniche e ambientali.

*After forging and ring mill, a heat treatment, either core-hardening or normalization, must be applied in order to increase all mechanical proprieties of the material, such as tensile strength, tenacity, hardness. The core-hardening process, composed by a succession of quenching and tempering heat treatments, confers to the material higher hardness and higher core-resistance values than normalization, proprieties required in case of heavy stress conditions on the gear.*
Il trattamento di tempra delle piste di rotolamento, innalzando il loro valore di durezza in superficie e in profondità fino ad un valore compreso fra 55 e 62 HRC, serve ad aumentare la capacità di carico del cuscinetto e a preservare le piste da fenomeni di plasticizzazione dovuto alle pressioni di contatto con gli elementi volventi. Questo trattamento consiste nell’avvicinare alla pista un induttore di rame percorso da corrente alternata di forte amperaggio. La vicinanza del campo magnetico variabile alla pista metallica induce correnti parassite locali che per effetto joule riscaldano immediatamente la zona interessata oltre la temperatura di austenizzazione, che viene quindi raffreddata in uscita per permettere la formazione di martensite e carburi. La scelta di un acciaio al carbonio come il C45 o legato come il 42CrMo4 è legata proprio all’ottenimento dei migliori risultati metallurgici durante questo procedimento.

The heat treatment of rollerways, increasing the hardness value on surface and in depth up to a value range of 55 ÷ 62 HRC, involves a higher load capacity of the bearing and avoid plastic deformation along rollers contact points. This heat treatment consists in bringing a copper made inductor crossed by high amperage alternate current nearer to the rollerways. The proximity of magnetic field to the metallic rollerway inducts parasite currents and Joule effect that produces an instantaneous heating of interested regions leading to the austenite temperature field. The following quick cooling produces the formation of martensite and carbides.

The choice of a carbon steel, as C45, as well as an alloy steel, as 42CrMo4, allows to obtaining best metallurgical results during this process.

Il soft spot (punto morbido) è un punto delle piste di ambedue gli anelli che non è temprato ad induzione in quanto al termine del processo di tempra non è possibile sovrapporre gli stacchi di tempra, rischio cricca o addirittura rottura del pezzo. Per l’anello non dentato è buona norma far coincidere il soft spot con il punto di inserimento delle sfere, ovvero con il tappo, che viene lavorato insieme alla pista.

Per l’anello dentato si rende invece necessaria l’indicazione con una lettera “S” stampigliata sulla faccia superiore dell’anello, in corrispondenza del soft spot.

The soft spot is a raceway point that has not been induction hardened, due the fact at the end of hardening process it isn’t possible to overlay the hardening ends, the risk is to generate cracks or directly to produce the breaking of the piece. For the untoothed ring is a common rule to make the soft spot coincident with the filling plug, the inserting point of roller elements, machined together to the raceways. In order to identify the soft spot on the geared ring it is necessary to stamp a “S” letter on the upper surface of the bearing, in corresponding position.
La durezza superficiale standard del materiale bonificato utilizzato arriva ad un massimo di 30 HRC (42CrMo4). Questo valore di durezza non sempre può essere accettabile per preservare la vita della dentatura in alcune applicazioni. Una coppia di rotazione elevata che produce un elevato sforzo (e attrito) sul dente, alte velocità di rotazione, condizioni ambientali sfavorevoli con presenza di polvere o elementi abrasivi, oppure la necessità di portare il ciclo di vita della ralla al suo massimo ottenibile, fa sì che il trattamento di tempra ad induzione venga effettuato anche sulla dentatura. Il trattamento può essere solo sul fianco oppure su fianco e fondo del dente, a seconda dei carichi e del tipo di applicazione, e porta il valore di durezza superficiale fino ad un massimo di circa 60 HRC.

The standard surface hardness of core-hardened steel used for bearing could be 30 HRC at maximum (42CrMo4). This value of hardness could not be enough to preserve the lifetime of the gear in some applications. A high rotational torque producing a high load (and friction) on the tooth, high rotational speed, heavy duty environmental condition including dust and abrasive elements, or the necessity to extend the lifecycle of the bearing to the maximum, any of those aspects may require a gear induction hardening. The heat treatment could be only flank or flank & root of the teeth, according to loads and application type, and it leads the surface hardness value to a maximum value of about 60 HRC.
Il gioco di una ralla è la misura del movimento libero dell’anello esterno rispetto a quello interno (e viceversa), valutato in due direzioni: in senso assiale, cioè nella direzione definita dall’asse di rotazione, e radiale, ovvero in qualsiasi direzione perpendicolare all’asse stesso. Il gioco ralla è determinato dall’accoppiamento degli elementi volventi con le piste di rotolamento degli anelli componenti, ciascuno con la sua tolleranza. Il cuscinetto di base si può presentare con quattro tipologie di giochi differenti, siano gli elementi volventi sfere oppure rulli. La scelta dei giochi viene fatta contemporaneamente alla scelta del tipo di ralla e dipende dal campo di applicazione della ralla stessa.

Clearance of a slew bearing is the measure of the motion freedom of the outer ring compared to the inner ring (and vice versa), evaluated in two directions: along the axial direction, defined by the revolution axis of the bearing, and along radial direction, any direction perpendicular to the first one. When assembling, the plays of the bearing is determined by matching rings raceways with rollers, each component having its tolerance. The slew bearing can show four different types of clearances, both ball and crossed roller bearing. The type choice is done simultaneously to bearing type selection, and mainly depends on the application field.

Di seguito la descrizione dei vari casi in modo tale che possiate prevedere la scelta migliore per la vostra applicazione. È comunque sempre disponibile la consulenza dell’ufficio Tecnico ISB.

On the following page you can find the description of the different cases so that you can make the best choice for your application. ISB technical center is always available to support you.
### Giochi standard / Standard Clearance

Normally in a slew bearing axial and radial clearance can vary from 0.1 to 0.3 mm. Pilots are function of application and/or type of bearings: on standard balls series, for example, pilots are optional, in standard roller series pilots are for standard construction.

### Giochi ridotti / Reduced Clearance

When the application requires the maximum precision during operation, with high values of rotational speed, the slew bearing design changes in favor of a reduction of axial and radial plays. Clearance can vary from null value to few hundreds of millimeter, in positive value. Precision series adopt general dimensions of standard series and show pilots on both rings.

### Leggero precarico / Slight preload

When the application requires the absence of any plays, radial and axial, in order for example to avoid any positional error or because the bearing works in vertical position, the clearance is eliminated and the construction is called "with preload". When the condition is slight preload the design interference between rollers and raceways can vary from zero to few hundreds of millimeter: the slew bearing shows anyway an adequate rotational speed, even on intense operational cycles, with a limited friction torque. This type of construction is not standard and must be specifically requested.

### Precarico / Preload

When load conditions includes relevant tilting moments that may quickly invert their direction and the eventual presence of vibration which involves rollerways, the slew bearing construction must be strongly preloaded. Interference range shows only negative values and its calculation is performed to guarantee the functionality of the bearing and, at the same time, to observe design limit values of static and dynamic friction torque. This type of construction is not standard and must be specifically requested.
SISTEMI DI PROTEZIONE SUPERFICIALE - SURFACE PROTECTION SYSTEM

Il trattamento di protezione superficiale preserva le superfici metalliche esterne dall’ ossidazione per effetto di agenti atmosferici o chimici, durante l’arco di funzionamento del cuscinetto o semplicemente durante il loro periodo di stoccaggio. Siamo in grado di effettuare i seguenti trattamenti di protezione superficiale, a seconda delle vostre necessità.

The external surface protection treatment protects metallic surfaces from their oxidation caused by atmospherical or chemical agents, during operational lifetime or simply during the storage period. We can apply the here different surface protection treatments, according to your needs.

Olio protettivo - Protective Oil
Standard

Tutti i cuscinetti di base ISB vengono protetti da olio protettivo applicato su superfici, guarnizioni e dentatura. Consente una protezione costante durante il trasporto e lo stoccaggio per circa 2 anni.

All ISB slew bearings are protected with applying oil to surfaces, seals and gear. It allows a constant protection for about 2 years.

Verniciatura - Painting
Su richiesta / On request

Su specifica richiesta del cliente può essere effettato un trattamento di verniciatura protettiva su superfici esposte.

Exposed surfaces can be protected by painting, on customer request.
SISTEMI DI PROTEZIONE SUPERFICIALE - SURFACE PROTECTION SYSTEM

Fosfatazione nera - Black phosphating
Su richiesta / On request

In caso di agenti atmosferici e chimici aggressivi può essere applicato un riporto chimico a base di fosfati. Lo strato è di pochi centesimi ma rappresenta una protezione resistente consentendo anche una possibile ulteriore verniciatura spray.

In case of atmospheric or chemical agents a layer of phosphates can be applied. The thickness is just few hundreds of mm but it allows a durable protection and the possibility to spray a layer of paint over it.

Zincatura spray a caldo - Hot flame spray zinc coating
Su richiesta / On request

Zincatura spray a caldo: lo strato protettivo può arrivare fino a qualche decimo di spessore ed è l’ideale per contrastare qualsiasi tipo di agente atmosferico essendo resistente ad azioni di abrasione e urto sulle superfici.

This treatment can apply a protective layer up to 0,3 mm thickness that resists to the abrasive action of atmospheric agents.
Introduzione - Introduction

La scelta del cuscinetto per una determinata applicazione non può naturalmente prescindere, oltre da considerazioni di tipo generale sulla tipologia e sulle caratteristiche macrogeometriche, dalle seguenti verifiche:

- capacità statica e dinamica del sistema di rotolamento (A)
- tenuta del sistema di fissaggio alla struttura (B)
- resistenza dell’accoppiamento con un eventuale pignone (C)

L’analisi di queste tematiche può essere affrontata da un punto di vista teorico sulla base delle proprietà meccaniche del cuscinetto e delle sollecitazioni (sforzi e deformazioni) che si vengono a creare in seguito all’applicazione dei carichi.

The choice of the bearing for each application depends not only on its macro-geometric specifications but also on the evaluation of the following elements:

- the static and dynamic capacity of the rolling system (A)
- the resistance of the fixing system to the structure (B)
- the resistance of the gear coupling with a pinion (C)

From a theoretical point of view these topics could be analyzed considering the mechanical features of the bearing and the stress and strain due to the application of loads.
CAPACITÀ STATICA - STATIC CAPACITY

Un cuscinetto è normalmente sottoposto ad una situazione di carico composta da un carico assiale uniformemente distribuito \( (F_a) \), un momento flettente di ribaltamento \( (M_t) \) e un carico radiale \( (F_r) \).

Usually, a bearing is subject to a load case which includes an axial load uniformly distributed \( (F_a) \), a tilting moment \( (M_t) \) and a radial load \( (F_r) \).

La verifica statica viene effettuata attraverso il confronto del massimo carico equivalente agente sul singolo corpo volvente con il carico massimo ammissibile ed il calcolo viene eseguito sulla base delle specifiche contenute nello standard internazionale ISO 76.

The static capacity is based on the comparison between the maximum equivalent load on the single rolling element and the maximum allowable load. The calculation is done according to the specifications listed in the international standard ISO 76.

Il carico equivalente \( (Q_{eq}) \), ovvero il massimo carico agente sul corpo volvente in direzione normale alla superficie di contatto, è funzione dei carichi agenti sul cuscinetto attraverso dei coefficienti \( C_1, C_2 \) e \( C_3 \) che dipendono dalla tipologia (sfere o rulli), dalle dimensioni e geometria del cuscinetto stesso e dalle caratteristiche meccaniche:

The equivalent load \( (Q_{eq}) \), the maximum load applied to the single rolling element along the perpendicular direction to the contact surface, is a function of the loads applied to the bearing through some coefficients \( C_1, C_2 \) and \( C_3 \) which depend on the type and dimension of the bearing itself:

\[
Q_{eq} = C_1 \frac{F_a}{z} + C_2 \frac{M_t}{D_L z} + C_3 \frac{F_r}{z}
\]

\[ z \text{ = numero di sfere-rulli} \]
\[ \text{number of balls-rollers} \]
\[ D_L \text{ = Diametro di rotolamento} \]
\[ \text{rolling diameter} \]
Il calcolo del carico ammissibile presuppone invece uno studio accurato dello stato di sollecitazioni della zona di contatto tra corpo volvente e pista di rotolamento. L’analisi degli sforzi e delle deformazioni viene eseguita ricorrendo alla teoria elastica del contatto Hertziano. Nella zona di contatto, al centro dell’area interessata dallo stato di deformazione, si crea uno stato di sforzo che ha un andamento analogo al seguente:

For the estimation of the allowable load, it’s necessary a deep study of the state of stress in the contact area between the rolling element and the raceway. The analysis of stresses and strain is based on the elastic theory of the Hertzian contact. In the contact area, in the middle of the area subject to the state of deformation, a stress distribution is produced, which has a trend similar to the one reported in the following:

Il carico ammissibile viene quindi valutato imponendo che la deformazione plastica della zona di contatto tra corpo volvente e pista di rotolamento non superi lo 0,01% del diametro della sfera o del rullo\(^1\). Tale situazione limite garantisce infatti la funzionalità del cuscinetto in termini di rumorosità e di durata a fatica teorica:

The allowable load is calculated considering that the plastic deformation of the contact area between the rolling element and the raceway is less than 0,01% of the ball/roller diameter\(^1\). It guarantees the functionality of the bearing both in terms of noise and life rating:

\[
Q_0 = kD_w^2
\]

Il fattore \(k\) dipende dalla curvatura di corpo volvente e pista di rotolamento oltre che dalle caratteristiche meccaniche dei materiali in gioco.

Factor \(k\) depends on the radius of curvature of both the rolling element and the raceway and on the mechanical characteristics of the materials.

\(^1\) Condizione valida per anelli temprati a cuore. / Condition valid for through hardened bearings.
Poiché i materiali utilizzati per la maggior parte delle applicazioni meccaniche non sono temprati a cuore, per migliorare le caratteristiche meccaniche della pista di rotolamento ed aumentare così la capacità statica e dinamica del cuscinetto viene realizzato un trattamento termico di tempra ad induzione in grado di garantire una durezza del materiale pari a quella dei corpi volventi (circa 60 HRC) fino ad una certa distanza dalla superficie di contatto:

Since the materials used for most of the mechanical applications aren’t usually core-hardened, an induction hardening heat treatment is applied in order to improve the mechanical proprieties of the raceways and, in that way, to increase the static and dynamic capacity of the bearing. This treatment guarantees a material hardness equivalent to the value of the rolling elements (about 60 HRC), up to a certain depth of the contact surface.

La profondità di tempra viene definita di volta in volta in base alla verifica a “core-crashing” del cuscinetto. La norma di riferimento è la ASME 77-DE-39.

Sotto la superficie di contatto della pista di rotolamento si crea uno stato di sforzo composto il cui andamento è ricavabile in base alla teoria elastica di Hertz o ai più moderni metodi di calcolo ad elementi finiti.

In corrispondenza della transizione tra la zona temprata e il “cuore” dell’anello si ha una repentina diminuzione delle proprietà meccaniche del materiale. È proprio in questa zona che si possono creare delle microfratture dovute alla deformazione plasticà del materiale che, salendo in superficie, portano a visibili fratture perpendicolari alla superficie di contatto.

The hardening depth is defined in each bearing according to the “core-crashing” verification of the bearing. The reference normative is ASME 77-DE-39.

Under the contact surface of the raceway it appears a composite stress condition, and its distribution can be calculated by using the Elastic Theory of Hertz or the modern finite element simulation. In correspondence of the transition of the hardened zone and the “heart” of the bearing there is a quick decrease of mechanical proprieties of the material. In that zone, due to the plastic deformation of the material, micro fractures can appear rising up to the surface showing perpendicular fracture lines on contact surface.
To avoid this phenomenon it is necessary to extend the hardened layer of the material up to a depth which is enough to prevent plastic deformation which would compromise the resistance of the bearing itself.

The choice of the material is therefore important both to ensure the hardenability of the raceways to the desired depth and to ensure the strength characteristics required in the core of the ring:

$$\tau_{h_c}(z = RHT) < \tau_{c, all}.$$
FATTORE DI SICUREZZA STADIOCO - Static safety factor

Il rapporto tra carico limite e carico massimo equivalente viene definito coefficiente di sicurezza statico:

The ratio between the maximum load and the maximum equivalent load is defined as static safety coefficient:

\[ S_f = \frac{Q_0}{Q_{eq}} > 1 \]

In base all'ambito di utilizzo del cuscinetto, vengono quindi applicati i seguenti valori di sicurezza, con i quali è possibile effettuare una prima selezione:

Considering the application context it’s possible to do a first selection applying the following safety values:

**APPLICAZIONE - APPLICATION**

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<td>Tavola girevole - Turntable</td>
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<td>Radar (rotazione lenta) - Radar (slow rotation)</td>
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<tr>
<td>Carrello elevatore - Fork lift truck</td>
</tr>
<tr>
<td>Gru a bandiera - Slewing crane</td>
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</table>

\[ S_f = 1,35 \]

| Gru a benna - Grab crane                    |
| Gru a gancio - Heavy handling crane         |
| Gru da camion - Truck crane                 |
| Gru di bordo - Ship crane                   |
| Gru ferroviaria - Railway crane             |

\[ S_f = 1,5 \]

| Pompe calcestruzzo - Concrete pump          |
| Autogru telescopica - Telescopic mobile crane |
| Trivella - Bucket                            |
| Escavatore a funi - Cable shovel            |
| Escavatore a benna - Grab shovel            |
| Robotica - Robotic                          |
| Gru a torre (braccio girevole) - Tower crane (slewing jib) |
| Gru portuale - Dock crane                   |

\[ S_f = 1,65 \]

| Compattatore - Compactor                    |
| Gru offshore - Offshore crane               |
| Gru a torre (torre girevole) - Tower crane (slewing tower) |

\[ S_f = 1,8 \]

| Escavatore idraulico - Hydraulic shovel     |
| Impastatrice calcestruzzo - Concrete mixer  |
| Generatore eolico - Windturbine            |
| Radar (rotazione rapida) - Radar (rapid rotation) |
| Escavatore da miniera - Mine digging machine |

\[ S_f = 2 \]

QUESTI SONO VALORI LIMITE PER APPLICAZIONI QUASI STATICHE.
PER UNA VALUTAZIONE PRELIMINARE SU APPLICAZIONI DINAMICHE È CONSIGLIABILE AUMENTARE QUESTI COEFFICIENTI DAL 50% AL 100% ED AVVALERSI DEL CNETRO TECNICO ISB.

THESE ARE LIMIT VALUES ARE FOR ALMOST STATIC APPLICATIONS.
REFERRING TO A PRELIMINARY VERIFICATION FOR DYNAMIC APPLICATIONS IT IS RECOMMENDED TO INCREASE THESE COEFFICIENTS FROM 50 % TO 100% AND TO BE SUPPORTED FROM ISB TECHNICAL CENTER.
**CALCULO DI RESISTENZA DEI BULLONI DI FISSAGGIO**

**FIXING BOLTS RESISTANCE CALCULATION**

Poiché la funzione del cuscinetto è quella di permettere il movimento relativo degli elementi della struttura sulla quale viene installato ed alla quale è collegato attraverso una serie di elementi di fissaggio, la tenuta del sistema non può prescindere dalla verifica della bullonatura stessa nelle reali condizioni di lavoro.

Since the function of the bearing is to permit the relative rotation of the elements of the structure on which it has been installed and to which is linked through fixing elements, the capacity of the system depends on the verification of the bolts in real working conditions.

La verifica dei bulloni viene eseguita sulle base delle specifiche della norma tedesca VDI2230 che, in funzione dello stato di carico del cuscinetto e prendendo in considerazione il comportamento statico e dinamico dei bulloni, arriva a definire i massimi carichi di trazione sui singoli bulloni. In particolare viene verificato che il precarico del bullone sia sufficiente a garantire la tenuta del sistema di fissaggio sotto carico e che il bullone stesso sia in grado di sopportare il carico complessivo applicato.

The bolts verification is done according to the German standard VDI2230 which, in function of the load case of the bearing and considering the static and dynamic behavior of the bolts, leads to define the maximum tensile loads on the single bolt. In particular, it's verified that the preload on the single bolt is greater than the value required to ensure the integrity of the whole tightening system under loads, and it is also verified that the single bolt is able to resist to the total applied load.
Il precarico e la coppia di serraggio del bullone vengono calcolati come segue:

The preload and tightening torque of bolts are calculated as follows:

\[ F_M > F_{\text{tolleranza}} = \alpha_s \left[ F_{\text{Korf}} + F_{\text{PA}} + F_Z \right] \]

\[ F_M < 0.1 \cdot R_{\text{PO2}} \cdot A_s \]

- \( F_M \) = Precarico del bullone - Bolt preload
- \( F_{\text{tolleranza}} \) = Massimo precarico richiesto - Maximum preload required
- \( \alpha_s \) = Fattore di serraggio - Tightening factor
- \( F_{\text{Korf}} \) = Minimo precarico per garantire la tenuta del bullone
  Minimum bolt preload required
- \( F_{\text{PA}} + F_Z \) = Riduzione del precarico in servizio
  Loss of preload in service
- \( F_M \) = Forza risultante dall’applicazione del carico \( F_A \)
  Resulting load from application force \( F_A \)
- \( R_{\text{PO2}} \) = Carico di snervamento del bullone
  Bolt Yield strength
- \( A_s \) = Area resistente del bullone
  Cross section area under stress

\[ F_M = \sigma_M \cdot A_s \]

\[ \sigma_M = \frac{\nu \cdot R_{\text{PO2}}}{\sqrt{1 + \frac{4}{1 + d_s / d_2} \left( \frac{P}{\pi \cdot d_2} + 1.15 \mu_0 \right)^2}} \]

- \( \sigma_M \) = Sforzo medio di trazione sul bullone
  Mean tensile stress of the bolt
- \( \nu \) = Percentuale di snervamento di precarico
  Degree of exploitation of the yield load during tightening
- \( d_s \) = Diametro primitivo del bullone
  Pitch diameter of the bolt
- \( d_2 \) = Diametro di nocciole del filletto
  Minor diameter of bolt thread
- \( \mu_0 \) = Coefficiente d’attrito del filletto
  Coefficient of friction in thread

\[ M_a = F_M \left[ 0.16 P + 0.58 d_s \mu_0 + \frac{D_m}{2} \mu_k \right] \]

\[ D_{}\text{m}/2 = (d_s + d_h)/4 \]

- \( M_a \) = Coppia di serraggio
  Tightening torque
- \( d_s \) = Diametro esterno di contatto della testa del bullone
  Outer diameter of the plane head bearing surface
- \( d_h \) = Diametro di foratura degli elementi imbullonati
  Bore diameter of the clamped parts
- \( \mu_k \) = Coefficiente di attrito della testa del bullone - superficie di contatto
  Coefficient of friction for bolt head - contact surface

Consultare la parte 4 “Installazione e manutenzione” per i valori della coppia di serraggio della bulloneria e per le istruzioni di montaggio.

Please consult part 4 “Installation & Maintenance” for bolts tightening torque values and installation instructions.
Se si trascura la componente radiale dello stato di carico del cuscinetto è possibile riportare su un diagramma cartesiano, sul cui asse X è riportato il valore del carico assiale $F_a$ e sull’asse Y il momento di ribaltamento, le condizioni limite di funzionamento, espressa dalla curva limite del cuscinetto.
La curva di carico massimo ammissibile per una specifica applicazione è ottenibile traslando la curva limite di una quantità proporzionale al suo fattore di sicurezza $S_f$ (pag. 43).

According to the load equations, without considering the radial component of the load case of the bearing, it’s possible to represent in a Cartesian diagram where X and Y axes represent respectively the axial load $F_a$ and the tilting moment, the working limit conditions, expressed by the survival curve.

The allowable load curve for a specific application is obtained from the translation of the survival load curve of a quantity proportional to its safety factor $S_f$ (page 43).

Quanto detto è equivalente a considerare una maggiorazione sui carichi agenti sul cuscinetto esattamente pari al \textbf{FATTORE DI SICUREZZA $S_f$}, in modo da poter utilizzare agevolmente i grafici.

This is equivalent to consider an increase of the loads exactly equal to \textbf{SAFETY FACTOR $S_f$}, in order to simplify the use of load diagrams.
Un grafico analogo può essere fatto per la bullonatura: anche in questo caso, riportando sullo stesso diagramma cartesiano le condizioni limite di funzionamento del sistema di fissaggio, si ottiene una curva che ha un andamento come segue.

**Il diagramma ha validità per forze assiali $F_a$ di sola compressione.**

Per condizioni di carico differenti è necessario contattare il nostro ufficio tecnico.

The same graph could be done for the bolts: also in this case, tracing the limit working conditions of the fixing system on the same Cartesian diagram, we obtain a curve similar to the following.

The diagram has validity only for compressive axial forces $F_a$.

For different load cases contact our technical office.

L’area sottesa dalle due curve limite rappresenta la zona di funzionamento del cuscinetto.

The area defined by the limit curves is the working area of the bearing.
SCELTA DEL CUSCINETTO DI BASE - SLEWING BEARING SELECTION

VERIFICA IN PRESENZA DI CARICO RADIALE

VERIFICATION IN PRESENCE OF RADIAL LOAD

Nel caso in cui fosse presente un carico radiale $F_r$, è possibile tenerne conto applicando le seguenti correzioni:

It's also possible to consider a radial load $F_r$ just applying the following corrections:

For ball bearings:

\[ \begin{align*}
    F'_a &= (F_a + 5.046 \cdot F_r) \cdot S_f \\
    M'_{fr} &= M_f \cdot S_f
\end{align*} \]

\[ \begin{align*}
    F''_a &= (1.225 \cdot F_a + 2.676 \cdot F_r) \cdot S_f \\
    M''_{fr} &= 1.225 \cdot M_f \cdot S_f
\end{align*} \]

Per cuscinetti a sfere, almeno una delle due condizioni di carico equivalente deve essere al di sotto della curva limite.

For ball bearings, at least one of the two equivalent loads cases has to be under the limit curve.

Cuscinetti a sfere / Ball bearings:

\[ \begin{align*}
    F'_a &= (F_a + 5.046 \cdot F_r) \cdot S_f \\
    M'_{fr} &= M_f \cdot S_f
\end{align*} \]

\[ \begin{align*}
    F''_a &= (1.225 \cdot F_a + 2.676 \cdot F_r) \cdot S_f \\
    M''_{fr} &= 1.225 \cdot M_f \cdot S_f
\end{align*} \]

Cuscinetti a rulli incrociati / Cross roller bearings:

\[ \begin{align*}
    F'_a &= (F_a + 2.05 \cdot F_r) \cdot S_f \\
    M'_{fr} &= M_f \cdot S_f
\end{align*} \]
CALCOLO DELLA VITA A FATICA - RATING LIFE CALCULATION

L’analisi della vita a fatica di un cuscinetto prende spunto dalla norma ISO 281.
Un cuscinetto in rotazione sottoposto ad un carico può presentare, se male dimensionato, microdifetti sottoforma di piccole cricche al di sotto della superficie della pista di rotolamento che a lungo andare si ingrandiscono e portano ad una sfociatura del materiale (chiamato con il termine di “pitting”).

La durata a fatica viene quindi definita come il numero di rotazioni (o di ore di funzionamento) che viene raggiunto dal 90% dei cuscinetti (di un gruppo di cuscinetti identici tra loro) prima che si manifestino segni di affaticamento.

\[ L_{10}[10^6 \text{ rev.}] = \left( \frac{C}{P} \right)^p \]
\[ L_{100}[\text{hours}] = \frac{L_{10}}{60 \cdot n} \]

- C è il coefficiente di carico dinamico del cuscinetto definito come coefficiente di carico di base dipendente dalla geometria del cuscinetto, a cui vengono applicati dei coefficienti di correzioni che contemplano le caratteristiche del materiale ed le condizioni di lavoro.

- P è il carico dinamico equivalente, funzione dei carichi agenti sul cuscinetto \( F_a \) e \( F_r \).

- p è un esponente pari a 3 per cuscinetti a sfera e 10/3 per cuscinetti a rulli.

- C is the dynamic working load coefficient of the bearing defined as the basic dynamic load coefficient depending on the bearing geometry, to which some adjustments are applied in order to consider the material features and the working conditions.

- P, the dynamic equivalent load, is a function of the loads applied to the bearing \( F_a \) and \( F_r \).

- p is a coefficient equal to 3 for balls bearings or to 10/3 for roller bearings.
Considerato uno spettro di carico con un numero K di condizioni di carico, la vita del cuscinetto è calcolabile come segue:

\[
\frac{1}{L_{0h} \times 10^{6 \text{ rev.}}} = \sum_{i=1}^{K} \frac{f_{aii}}{L_{0h_i}}
\]

\( f_{aii} \) = Frequenza di applicazione del carico i (%)

\( L_{0h} \) = Vita a fatica (10^6 rev.) nella condizione di carico i

In funzione dei carichi agenti, della loro frequenza di applicazione e della velocità di rotazione \( n \) del cuscinetto è quindi possibile stimare la vita a fatica in termini di numero di rotazioni (\( N_{\text{rev}} \)) o, analogamente, in numero di ore di funzionamento (\( N_{\text{h}} \)).

Allo stesso modo, definita una durata di base richiesta al cuscinetto, è possibile riportare sul diagramma -\( F_a \) la curva limite per un determinato numero di giri di vita a fatica (\( N_{\text{rev}} \)).

Depending on the load agents, their application frequency and the rotation speed \( n \) of the bearing, it is possible to estimate the fatigue life in terms of number of rotations (\( N_{\text{rev}} \)) or, similarly, in terms of number of operating hours (\( N_{\text{h}} \)).

In the same way, by defining a basic lifetime of the bearing, it is possible to trace on the diagram -\( F_a \) the limit curve for a given number of turns of fatigue life (\( N_{\text{rev}} \)).
SCELTA DEL CUSCINETTO DI BASE - SLEWING BEARING SELECTION

La trasmissione del moto tra le due parti della struttura sulla quale viene applicato il cuscinetto, può essere effettuata direttamente dal cuscinetto stesso attraverso l’ingranamento di uno degli anelli dentati con un pignone solida e al secondo anello.
Il pignone può essere solida sia alla parte rotante che a quella fissa e la dentatura del cuscinetto può essere sia esterna che interna e viene opportunamente dimensionata per sopportare le sollecitazioni agenti.
La geometria e le proprietà meccaniche dell’accoppiamento pignone-cuscinetto vengono calcolate sulla base alle norme DIN vigenti.

The motion transmission between two parts of a structure could be done directly by the bearing through a toothed ring that engages a pinion moving together with the other ring. The pinion could be assembled to the fixed or to the mobile part of the structure, and the gear of the bearing could be external or internal, designed to resist to the load applied.
The geometry and the mechanical proprieties of the coupling pinion-bearing must be calculated basing on current DIN norms.

Nelle tabelle sono riportati due valori di sollecitazione tangenziale sul dente, uno ammissibile \( f_z \text{ norm} \) e l’altro limite \( f_z \text{ max} \). Il calcolo del carico sul dente effettuato nelle condizioni di normale esercizio non deve superare il valore di \( f_z \text{ norm} \), invece il calcolo eseguito a seguito di condizioni eccezionali, come sovraccarico o bloccaggio della struttura, non deve superare \( f_z \text{ max} \).

In the tables, two values of tangential load on the teeth are listed: the first is the admissible value called \( f_z \text{ norm} \), the second is the limit value called \( f_z \text{ max} \). The calculation of the tooth load performed on normal working conditions must not be over the value of \( f_z \text{ norm} \), instead the calculation performed considering exceptional working conditions, such as overload or the locking of the structure, must not be over \( f_z \text{ max} \) value.
La geometria della dentatura, e in particolare le seguenti grandezze:
- modulo m;
- numero di denti Z;
- angolo di pressione \(\alpha_p\);
- coefficiente di correzione \(x\);
- coefficiente di troncatura \(k\);
da cui derivano tutte le caratteristiche geometriche del dente, vengono determinate accuratamente utilizzando un software di calcolo dedicato, che in funzione dei carichi a cui è sottoposta, è in grado non solo di verificare dal punto di vista statico la resistenza a flessione del dente secondo le metodologie sopracitate, ma anche di calcolare la vita a fatica teorica dell’accoppiamento con il pignone in modo da fornire una durata stimata del cuscinetto in tutte le sue componenti.

The gear geometry, specifically the following parameters
- module \(m\);
- number of teeth \(Z\);
- pressure angle \(\alpha_p\);
- addendum modification coefficient \(x\);
- truncation coefficient \(k\);
from which all the other gear features come, are precisely determined using a dedicated calculation software. According to the loads applied, we are able to verify both the bending resistance of the tooth in static and dynamic conditions and the predicted lifetime of the gear subject to a fatigue stress when engaged to the pinion, for a global resistance check of the bearing in all its components.

Il controllo geometrico viene effettuato con la misura delle due quote di riferimento principali:
1. La quota Wildhaber tra \(n\) denti \(W_n\) ovvero la distanza di due superfici di misura parallele tra loro, che si appoggiano a due fianchi contrapposti, cioè al fianco destro e a quello sinistro, e sono tangenti all’involvere.
2. La quota tra sfere (o rulli) \(M_{Dk}\).

The geometric check is done by measuring the two main reference measures:
1. The Wildhaber measure between \(n\) teeth \(W_n\) that means the distance between two parallel surfaces corresponding to opposed tooth flank, right and left side, and tangent to the involute profile.
2. The measure between balls (or rollers) \(M_{Dk}\).
La resistenza che un cuscinetto oppone alla rotazione della struttura è fondamentalmente causata dall’attrito volvente tra sfere o rulli e la pista di rotolamento degli anelli oltre ad una piccola quota di attrito radente tra corpi volventi e distanziali.

Il momento d’attrito di un cuscinetto sotto carico è ben approssimabile dalla seguente relazione:

The resistance a bearing shows during the structure rotation is determined by the friction between rollers and raceway, plus a small amount of friction between rollers and spacers.

The friction torque of a loaded bearing is well approximated by the following equation:

\[ M_f = \frac{\mu}{2} \left( k \cdot M + |F_a| \cdot D_t + \frac{k \cdot F_t \cdot D_a \cdot f}{2} \right) \]

\( k = 4.37 \) (ball bearing) - 4.1 (roller bearing)
\( f = 1.73 \) (ball bearing) - 1 (roller bearing)
\( \mu = 0.006 \) (single row balls bearing)
\( \mu = 0.009 \) (double row balls bearing)
\( \mu = 0.004 \) (roller bearing)

La relazione semiempirica riportata è valida per un cuscinetto ben lubrificato. Una lubrificazione continua e completa della pista di rotolamento è infatti un punto fondamentale per garantire la necessaria durata del cuscinetto.

Il lubrificante agisce idealmente in due modi, creando un film sottile che evita il contatto diretto e l’adesione delle superfici a contatto e diminuendo l’attrito attraverso una corrispondente diminuzione della sollecitazione tangenziale nella zona di contatto.

Tale comportamento, valido per cuscinetti in rotazione continua, è detto lubrificazione idrodinamica e dipende sostanzialmente dalla geometria dei solidi a contatto e dalla viscosità dell’ lubricante, e dalla velocità di rotazione.

The semi empirical relation above is valid for a well-lubricated bearing. A continuous and complete lubrication is in fact a fundamental factor that guarantees the required lifetime of the bearing. The lubricant operates in two ways: it creates a thin film that prevents direct contact and adhesion of surfaces, and it reduces the roller friction through a corresponding decrease in the tangential stress in the contact area.

This behavior, valid for bearings in continuous rotation, is called hydrodynamic lubrication and largely depends on the geometry of contact elements, the lubricant viscosity, and the rotation speed.
La viscosità di base del lubrificante viene calcolata in funzione del diametro di rotolamento del cuscinetto e della sua velocità di rotazione in base al diagramma seguente:

The viscosity of the lubricant base is then calculated according to the rolling diameter of the bearing and its rotational speed according to the following diagram:

Nota la temperatura di lavoro del cuscinetto $T_L$ è possibile risalire attraverso il diagramma $v$-$T$ alla viscosità effettiva del lubrificante:

Note the temperature of $T_L$ from the diagram $v$-$T$ is possible to set the effective viscosity of the lubricant:
TIPOLOGIE / SERIES OVERVIEW

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 TURNTABLES FOR AGRICULTURE

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- **EBL SERIES** pag. 68
  Dentata esterna / Ext. toothed
  - EBL.20 S
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  - ZBL.20 S
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  - NBL.20 S
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 ONE ROW BALL STANDARD SERIES

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  Dentata interna / Int. toothed
  - ZB1.20 S
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  - ZB1.50 S
  - ZB1 STOCK

- **NB1 SERIES** pag. 112
  Non dentata / Untoothed
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 DOUBLE ROW BALL STANDARD SERIES

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- ER1.30/50

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- ZR1.14 S
- ZR1.14 PR
- ZR1.20 S
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- ZR1.30/50

#### NR1 SERIES
- NR1.14 S
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#### ER3 SERIES
- ER3.20/25
- ER3.32/40

#### ZR3 SERIES
- ZR3.20/25
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**CODIFICA / DESIGNATION**

(Esempio su codice EBL.30.1155.200-1STPN)  
(Example on code EBL.30.1155.200-1STPN)

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* l’incremento dell’indice è utilizzato per differenziare codici simili.  
/ Index increment is used to differentiate slewing bearings with similar features.

**LEGGENDA DELLA CODIFICA / DESIGNATION LEGEND**

**TIPO DI DENTATURA (PREFISSO) / GEAR TYPE (PREFIX)**

- **E** Esterna / External
- **Z** Interna / Internal
- **N** Nessuna / None

**TIPO DI COSTRUZIONE / TYPE OF CONSTRUCTION**

- **K** Leggera un giro di sfere  
  Light profile, one row of balls
- **BL** Flangiata, un giro di sfere  
  Flanged one row of balls
- **B** A Sfere  
  With balls
- **R** A Rulli  
  With rollers

**N GIRI ELEMENTI VOLVENTI / ROLLING ROWS NUMBER**

- **1** Un giro / One row
- **2** Due giri / Double row
- **3** Tre giri / Triple row

**GIOCHI CLEARANCES / CLEARANCES**

- **1** Standard
- **2** Precisi / Precision
- **3** Leggero precario / Light preload
- **4** Precarico / Preload

**MATERIALE ANELLI / RINGS MATERIAL**

- **1** C45 / 50 Mn  
  Normalizzato/Normalized
- **2** C45 / 50 Mn  
  Bonificato/Quenched & Tempered
- **3** 42CrMo4 / 42CrMo  
  Normalizzato/Normalized
- **4** 42CrMo4 / 42CrMo  
  Bonificato/Quenched & Tempered
- **5** 100cr6  
  Temprato a cuore / Through hardened
- **6** AISI 420  
  Acciaio inox / Stainless steel

**TEMPI INDUZIONE DEI DENTI / INDUCTION TEETH HARDENING**

- **S** Nessuna / None
- **F** Solo fianco / Only flank
- **R** Fianco e fondo  
  Flank and root

**FORATURA EST-INT / FIXING HOLES EXT-INT**

- **P** Fori passanti standard  
  Through passing holes
- **T** Fori filettati  
  Threaded holes

**PROTEZIONE SUPERFICIALE / SURFACES PROTECTION**

- **N** Oleatura / Oil coating
- **V** Verniciatura / Painting
- **F** Fosfatazione nera  
  / Black phosphating
- **Z** Zinca spray a caldo  
  Hot flame Zinc Coating

**CARATTERISTICHE SPECIALI / SPECIAL FEATURES**

- **FG** Grasso alimentare  
  Food grease
- **SC** Gabbia in acciaio  
  Steel cage
- **FC** Pieno riempimento  
  Full complement
- **GG** Dentatura rettificata  
  Gear ground
- **VT** Tenute in Viton  
  Viton sealing
- **LT** Tenute NBR per basse T°  
  Low temp. NBR sealing

AG, ZK, NK, precision series,  
SG series  
harono la loro designazione dedicata  
have their own designation
Ralle agricole

Turntables for agriculture

AG SERIES
### AGRICULTURAL SLEWING BEARINGS

**RALLE AGRICOLE**

**AG.0300.55**  
ØA: 300 [mm]  
ØB: 300 [mm]  
ØC: 225 [mm]  
ØD: 200 [mm]  
H: 55 [mm]  
G: 5 [mm]  
Portata assiale: 12,5 [Kgf]  
Peso: 500 [Kg]

**AG.0400.55**  
ØA: 400 [mm]  
ØB: 400 [mm]  
ØC: 321 [mm]  
ØD: 300 [mm]  
H: 55 [mm]  
G: 5 [mm]  
Portata assiale: 12,5 [Kgf]  
Peso: 750 [Kg]

**AG.0500.55**  
ØA: 500 [mm]  
ØB: 500 [mm]  
ØC: 421 [mm]  
ØD: 400 [mm]  
H: 55 [mm]  
G: 5 [mm]  
Portata assiale: 12,5 [Kgf]  
Peso: 1000 [Kg]

**AG.0500.65**  
ØA: 500 [mm]  
ØB: 500 [mm]  
ØC: 410 [mm]  
ØD: 388 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 12,5 [Kgf]  
Peso: 1000 [Kg]

**AG.0600.65**  
ØA: 600 [mm]  
ØB: 600 [mm]  
ØC: 510 [mm]  
ØD: 486 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 12,5 [Kgf]  
Peso: 1500 [Kg]

**AG.0650.65**  
ØA: 650 [mm]  
ØB: 650 [mm]  
ØC: 560 [mm]  
ØD: 536 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 12,5 [Kgf]  
Peso: 1600 [Kg]

**AG.0700.65**  
ØA: 700 [mm]  
ØB: 700 [mm]  
ØC: 610 [mm]  
ØD: 587 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 2000 [Kg]

**AG.0750.65**  
ØA: 750 [mm]  
ØB: 750 [mm]  
ØC: 660 [mm]  
ØD: 636 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 2100 [Kg]

**AG.0800.65**  
ØA: 800 [mm]  
ØB: 800 [mm]  
ØC: 710 [mm]  
ØD: 688 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 2500 [Kg]

**AG.0850.65**  
ØA: 850 [mm]  
ØB: 850 [mm]  
ØC: 760 [mm]  
ØD: 728 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 3000 [Kg]

**AG.0900.65**  
ØA: 900 [mm]  
ØB: 900 [mm]  
ØC: 810 [mm]  
ØD: 786 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 3500 [Kg]

**AG.0950.65**  
ØA: 950 [mm]  
ØB: 950 [mm]  
ØC: 860 [mm]  
ØD: 837 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 3500 [Kg]

**AG.1000.65**  
ØA: 1000 [mm]  
ØB: 1000 [mm]  
ØC: 910 [mm]  
ØD: 888 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 4000 [Kg]

**AG.1050.65**  
ØA: 1050 [mm]  
ØB: 1050 [mm]  
ØC: 960 [mm]  
ØD: 938 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 4500 [Kg]

**AG.1100.65**  
ØA: 1100 [mm]  
ØB: 1100 [mm]  
ØC: 1010 [mm]  
ØD: 988 [mm]  
H: 65 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 4500 [Kg]

**AG.1000.70**  
ØA: 1000 [mm]  
ØB: 1000 [mm]  
ØC: 905 [mm]  
ØD: 875 [mm]  
H: 70 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 4500 [Kg]

**AG.1100.70**  
ØA: 1100 [mm]  
ØB: 1100 [mm]  
ØC: 1000 [mm]  
ØD: 975 [mm]  
H: 70 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 6000 [Kg]

**AG.1200.70**  
ØA: 1200 [mm]  
ØB: 1190 [mm]  
ØC: 1095 [mm]  
ØD: 1075 [mm]  
H: 70 [mm]  
G: 8 [mm]  
Portata assiale: 14 [Kgf]  
Peso: 10000 [Kg]

**AG.0900.80**  
ØA: 890 [mm]  
ØB: 895 [mm]  
ØC: 795 [mm]  
ØD: 766 [mm]  
H: 80 [mm]  
G: 8 [mm]  
Portata assiale: 16 [Kgf]  
Peso: 5000 [Kg]

**AG.1000.80**  
ØA: 1010 [mm]  
ØB: 1015 [mm]  
ØC: 916 [mm]  
ØD: 888 [mm]  
H: 80 [mm]  
G: 8 [mm]  
Portata assiale: 16 [Kgf]  
Peso: 6000 [Kg]

**AG.1100.80**  
ØA: 1100 [mm]  
ØB: 1105 [mm]  
ØC: 1005 [mm]  
ØD: 976 [mm]  
H: 80 [mm]  
G: 8 [mm]  
Portata assiale: 16 [Kgf]  
Peso: 6500 [Kg]

**AG.1000.90**  
ØA: 1000 [mm]  
ØB: 1008 [mm]  
ØC: 889 [mm]  
ØD: 856 [mm]  
H: 90 [mm]  
G: 9 [mm]  
Portata assiale: 20 [Kgf]  
Peso: 8000 [Kg]

**AG.1100.90**  
ØA: 1100 [mm]  
ØB: 1100 [mm]  
ØC: 980 [mm]  
ØD: 948 [mm]  
H: 90 [mm]  
G: 9 [mm]  
Portata assiale: 20 [Kgf]  
Peso: 10000 [Kg]

---

ATTENZIONE: LE RALLE AGRICOLE NON SONO ADATTE PER APPLICAZIONI AD UTILIZZO INDUSTRIALE DOVE SI NECESSITA DI PRECISIONE E MASSIMA SCORREVOLEZZA.

**ATTENTION:** TURNTABLES ARE NOT SUITABLE FOR INDUSTRIAL APPLICATION INVOLVING PRECISION AND MAXIMUM ROTATIVE SMOOTHNESS.
Cuscinetti di base serie leggera a un giro di sfere

Light series one row ball bearings

ZK/NK SERIES
**ZK**

**SERIE LEGGERA DENTATA, CON O SENZA FORATURA**

**TOOTHED LIGHT SERIES, WITH OR WITHOUT FIXING HOLES**

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<td>SENZA FORATURA WITHOUT FIXING HOLES</td>
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- Materiale: C45 nor
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

**NOTA:** controllare se carico radiale applicato e consultare parte 2 del catalogo

**Diagramma:**

Diagamma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

*Suspended load: specific bolts calculation required*
SERIE LEGGERA, PISTE TEMPRATE - LIGHT SERIES, HARDENED RACEWAYS

SERIE LEGGERA NON DENTATA, CON O SENZA FORATURA
UNTOOTHED LIGHT SERIES, WITH OR WITHOUT FIXING HOLES

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- Materiale: C45 nor
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Mf
Momente ribilante equivalente [KnNm]
Equivalent tilting moment [KnNm]

Fa
Carico assiale equivalente [KN]
Equivalent axial load [Kn]
Cuscinetti di base flangiati ad un giro di sfere, dentatura esterna

One row ball flanged bearing, external toothed

EBL SERIES
**EBL.20 S**

**SERIE FLANGIATA STANDARD**

**FLANGED STANDARD SERIES**

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<th>Dimensioni</th>
<th>Fori di fissaggio</th>
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- Materiale: C45O+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Material: C45 O+T
- Axial/radial clearances are on the technical drawing
- Full of grease, protected by oil and wrapped in resistant plastic film

**Note:** controllo se carico radiale presente e consultare parte 2 del catalogo.

**Static load charts valid for compressive loads**

**Suspended load:** specific bolts calculation required
**SERIE FLANGIATA DI PRECISIONE**

**FLANGED PRECISION SERIES**

### Codice Code

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**- Materiale: C45Q+T**

**- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico**

**- Disponibili anche con denti temprati 55 HRC (suffisso -2RTPN)**

**- Material C45 Q+T**

**- Full of grease, protected by oil and wrapped in resistant plastic film**

**- Also available with hardened gear 55 HRC (suffix - 2RTPN)**

**Diagramma di carico statico valido per sforzi compressivi**

**Static load charts valid for compressive loads**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**
**EBL.30 S**

**SERIE FLANGIATA STANDARD**

**FLANGED STANDARD SERIES**

---

**Dimensioni**

- **De**: Diametro esterno [mm]
- **de**: Diametro esterno [mm]
- **di**: Diametro interno [mm]
- **V**: Profondità [mm]
- **Dh**: Diametro di uscita [mm]

**Fori di fissaggio**

- **Fe**: Foro esterno [mm]
- **Ne**: Foro interno [mm]
- **Fi**: Foro interno [mm]
- **Ni**: Foro interno [mm]
- **m**: Tipo di filettatura
- **Z**: Tipo di dentatura
- **Dg**: Diametro di gomito [mm]
- **fz norm**: Profilo radicale [mm]
- **fz max**: Profilo radicale massimo [mm]
- **Peso**: Peso [kg]

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<th>di</th>
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- Materiale: C45Q+T
- Gioco assiale riportato sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

### Diagramma

- **Mf**: Momento ribaltante equivalente [KNm]
- **Fa**: Carico assiale equivalente [kN]

---

**NOTE:**

- Controllare se carico radiale presente e consultare parte 2 del catalogo.
- Check radial load applied and consult part 2 of the catalogue.

---

**Diagramma di carico statico valido per sforzi compressivi**

**Carico sospeso:** occorre verificare specifica della bulloneria

**Static load charts valid for compressive loads**

**Suspended load:** specific bolts calculation required
### SERIE FLANGIATA DI PRECISIONE

**FLANGED PRECISION SERIES**

#### Codice Code | Giorno Date | Fori di fissaggio Fixing Holes | Dentatura Gear data | Gioco assiale Axial and Radial Clearance | Peso Weight |
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- Materiale: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Disponibili anche con denti temprati 55 HRC (suffisso -2RTPN)

> P=tappo inserimento sfere / filling plug

### Diagramma di carico statico valido per sforzi compressivi

### Carico sospeso: occorre verifica specifica della bulloneria

### Static load charts valid for compressive loads

### Suspected load: specific bolts calculation required
Cuscinetti di base flangiati ad un giro di sfere, dentatura interna

One row ball flanged bearing, internal toothed

ZBL SERIES
### SERIE FLANGIATA STANDARD

**FLANGED STANDARD SERIES**

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- Materiale: C45Q + T
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Materiale C45Q + T
- Axial/radial clearances are on the technical drawing
- Full of grease, protected by oil and wrapped in resistant plastic film

**Mf**

Momento ribilante equivalente [Knm]

**Fa**

Carico assiale equivalente [kN]

**NOTA**: controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE**: check if radial load applied and consult part 2 of the catalogue.
### ZBL.20 P

**SERIE FLANGIATA DI PRECISIONE**

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- Materiale: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Disponibili anche con denti temprati 55 HRC (suffisso -2RPTN)
- Material: C45Q+T
- Full of grease, protected by oil and wrapped in resistant plastic film
- Also available with hardened gear 55 HRC (suffix -2RPTN)

**Mf**

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

**Fa**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria

Suspended load: specific bolts calculation required

NOTE: check if radial load applied and consult part 2 of the catalogue
## ZBL.30 S

**SERIE FLANGIATA STANDARD**

**FLANGED STANDARD SERIES**

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- Materiale: C45Q+T
- Gioco assiale riportato sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

### Diagramma di carico statico

**Diagramma di carico statico valido per sforzi compressivi**

**Static load charts valid for compressive loads**

### Carico sospeso

**Suspended load:**

**Specific bolts calculation required**

---

**Mf**

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

### Fa

**Carico assiale equivalente [kN]**

**Equivalent axial load [kN]**

---

**Nota:** controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE:** check if radial load applied and consult part 2 of the catalogue.
## ZBL.30 P

### SERIE FLANGIATA DI PRECISIONE

**FLANGED PRECISION SERIES**

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- **Materiale:** C45Q+T
- **Pieni di grasso, protetti da olio, e avvolti in resistente film plastico**
- **Disponibili anche con denti temprati 55 HRC (suffisso -2RPTN)**

⇒ P=tappo inserimento sfere / filling plug  
⇒ G=n.6 ingrassatori M8X1 / n.6 greasers M8X1

---

### Diagramma di carico statico valido per sforzi compressivi

**Static load charts valid for compressive loads**

### Carico sospeso:

**Suspended load:** specific bolts calculation required

---

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo.  
NOTE: check if radial load applied and consult part 2 of the catalogue
Cuscinetti di base flangiati ad un giro di sfere, senza dentatura

One row ball flanged bearing, untoothed

NBL SERIES
SERIE FLANGIATA STANDARD

**NBL.20 S**

**FLANGED STANDARD SERIES**

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- Materiale: C45Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

**UN GIRO DI SFERE, SENZA DENTATURA**

**ONE ROW OF BALLS, UNTOOTHED**

**Diagramma di carico statico valido per sforzi compressivi**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Static load charts valid for compressive loads**

**Suspended load: specific bolts calculation required**

**Mf**

**Equivalent tilting moment [KNm]**

**Fa**

**Equivalent axial load [kN]**

**Nota:** controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE:** check if radial load applied and consult part 2 of the catalogue.
SERIE FLANGIATA DI PRECISIONE
FLANGED PRECISION SERIES

NBL.20 P

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- Materiale: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Full of grease, protected by oil and wrapped in resistant plastic film
- \( \phi \) P=tappo inserimento sfere / filling plug
- \( G \) n.4 ingrassatori M8X1 / n.4 greaseers M8X1

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads
Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo.
NOTE: check if radial load applied and consult part 2 of the catalogue.

Mf
Momento ribaltante equivalente [KNm]
Equivalent tilting moment [KNm]

Fa
Carico assiale equivalente [KN]
Equivalent axial load [KN]
**NBL.30 S**  
**SERIE FLANGIATA STANDARD**  
**FLANGED STANDARD SERIES**

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- Materiale: C45Q+T  
- Gioco assiale riportato sul disegno tecnico  
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico  

D = tappo inserimento sfere / filling plug  
G = n.6 ingrassatori M8X1 / n.6 greasers M8X1

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo.  
**NOTE:** check if radial load applied and consult part 2 of the catalogue

**Momento ribaltante equivalente [KNm]**  
**Equivalent tilting moment [KNm]**

**Carico assiale equivalente [KN]**  
**Equivalent axial load [KN]**
**NBL.30 P**

**SERIE FLANGIATA DI PRECISIONE**

**FLANGED PRECISION SERIES**

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- Materiale: C45Q+T
- Pieni di grasso, protetti da olio e avvolti in resistente film plastico

**Diagramma**

**Carico sospeso:** occorre verifica specifica della bulloneria.

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

**Carico assiale equivalente [kN]**

**Equivalent axial load [kN]**

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE:** check if radial load applied and consult part 2 of the catalogue.
Cuscinetti di base ad un giro di sfere, dentatura esterna

One row ball bearing, external toothed

EB1 SERIES
## SERIE STANDARD

### STANDARD SERIES

### Codice Code | Curva Curve | Dimensioni Dimensions | Forti di fissaggio Fixing Holes | Dentatura Gear data | Peso Weight
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- Materiale: C45Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads
Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

### UN GIRO DI SFERE, DENTATURA ESTERNA - ONE ROW BALL, EXTERNAL TOOTHED

- Materiale: C45Q+T
- Axial/radial clearances are on the technical drawing
- Full of grease, protected by oil and wrapped in resistant plastic film

- P=tappo inserimento sfere / filling plug
- G=n.4 ingrassatori M8X1 / n.4 greasers M8X1
## SERIE DI PRECISIONE

### PRECISION SERIES

### EB1.20 P

### Dimensioni (Dimensions)

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<th>Dentatura (Gear data)</th>
<th>Gioco assiale e radiale (Axial and Radial Clearance)</th>
<th>Peso (Weight)</th>
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- Materiale: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Disponibili anche con denti temprati 55 HRC (suffisso -2RTPN)
- Carico sospeso: occorre verifica specifica della bulloneria

Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

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<th>Codice Codice Code</th>
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<th>Gear data</th>
<th>Axial and Radial Clearance</th>
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Diagramma di carico statico valido per sforzi compriessivi

Static load charts valid for compressive loads

**Fa**

Carico assiale equivalente [KN] Equivalent axial load [KN]

**Mf**

Momento ribaltante equivalente [Kn.m] Equivalent tilting moment [Knm]

**Diagrams**

- Material C45Q+T
- Full of grease, protected by oil and wrapped in resistant plastic film
- Also available with hardened gear 55 HRC (suffix -2RTPN)

P=tappo inserimento sfere / filling plug

- Carico sospeso: occorre verifica specifica della bulloneria

**Fa**

Carico assiale equivalente [KN] Equivalent axial load [KN]
**EB1.25 S**

**SERIE STANDARD**

**STANDARD SERIES**

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### Codice Code

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<th>Dimensioni Dimensions</th>
<th>Fori di fissaggio Fixing Holes</th>
<th>Dentatura Gear data</th>
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- Materiale: C45Q+T
- Gioco assiale riportato sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

**Diagramma**

- Carico assiale equivalente [KN]
  - Equivalent axial load [KN]

- Carico statico valido per sforzi compressivi
  - Static load charts valid for compressive loads

- Materiale C45 Q+T
- Axial/radial clearances are on the technical drawing
- Full of grease, protected by oil and wrapped in resistant plastic film

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo

**Carico sospeso:** occorre verifica specifica della bulloneria

**Suspended load:** specific bolts calculation required

**Mf**

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

**Fa**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**
### SERIE DI PRECISIONE

#### PRECISION SERIES

---|---|---|---|---
EB1.25.0455.201-2STPN  |  1  |  590,4  |  455 +0,10  |  456  |  357 +0,09  |  355  |  516  |  18  |  395  |  18  |  8  |  72  |  576  |  38,6  |  77,2  |  0 ÷ 0,03  |  74  
EB1.25.0555.201-2STPN  |  2  |  694,4  |  555 +0,11  |  556  |  457 +0,10  |  455  |  616  |  20  |  495  |  20  |  8  |  85  |  680  |  38,6  |  77,2  |  0 ÷ 0,03  |  93  
EB1.25.0655.201-2STPN  |  3  |  798,4  |  655 +0,13  |  656  |  557 +0,11  |  555  |  716  |  24  |  595  |  24  |  8  |  98  |  784  |  38,6  |  77,2  |  0 ÷ 0,03  |  111  
EB1.25.0755.201-2STPN  |  4  |  898  |  755 +0,14  |  756  |  657 +0,13  |  655  |  816  |  28  |  695  |  28  |  8  |  98  |  882  |  43,4  |  86,8  |  0 ÷ 0,04  |  125  
EB1.25.0855.201-2STPN  |  5  |  997  |  855 +0,14  |  856  |  757 +0,14  |  755  |  916  |  32  |  795  |  32  |  9  |  109  |  981  |  43,4  |  86,8  |  0 ÷ 0,04  |  145  
EB1.25.0955.201-2STPN  |  6  |  1096  |  955 +0,14  |  956  |  857 +0,14  |  855  |  1016  |  35  |  895  |  35  |  9  |  120  |  1080  |  43,4  |  86,8  |  0 ÷ 0,05  |  155  
EB1.25.1055.201-2STPN  |  7  |  1198  |  1055 +0,17  |  1056  |  957 +0,14  |  955  |  1116  |  40  |  995  |  40  |  10  |  118  |  1180  |  43,4  |  86,8  |  0 ÷ 0,05  |  171  
EB1.25.1155.201-2STPN  |  8  |  1298  |  1155 +0,17  |  1156  |  1057 +0,17  |  1055  |  1216  |  45  |  1095  |  45  |  10  |  128  |  1280  |  43,4  |  86,8  |  0 ÷ 0,06  |  186  
EB1.25.1255.201-2STPN  |  9  |  1398  |  1255 +0,17  |  1256  |  1157 +0,17  |  1155  |  1316  |  50  |  1195  |  50  |  10  |  138  |  1380  |  43,4  |  86,8  |  0 ÷ 0,07  |  201  
EB1.25.1355.201-2STPN  |  10  |  1498  |  1355 +0,20  |  1356  |  1257 +0,17  |  1255  |  1416  |  55  |  1295  |  55  |  10  |  148  |  1480  |  43,4  |  86,8  |  0 ÷ 0,07  |  218  
EB1.25.1455.201-2STPN  |  11  |  1598  |  1455 +0,20  |  1456  |  1357 +0,20  |  1355  |  1516  |  60  |  1395  |  60  |  10  |  158  |  1580  |  43,4  |  86,8  |  0 ÷ 0,07  |  233  

- Materiale: C45Q+T  
- Pienu di grasso, protetti da olio, e avvolti in resistente film plastico  
- Disponibili anche con denti temprati 55 HRC (sufficiente -2RTPN)  

**NOTA:** controlare se carico radiale presente e consultare parte 2 del catalogo.  
**NOTE:** check if radial load applied and consult part 2 of the catalogue.

---

**Diagramma di carico statico valido per sforzi compressivi**  
*Static load charts valid for compressive loads*  
*Carico sospeso: occorre verifica specifica della bulloneria*  
*Suspended load: specific bolts calculation required*

---

**Mf**  
*Momento ribaltante equivalente [KNm]*  
*Equivalent tilting moment [KNm]*  

**Fa**  
*Carico assiale equivalente [KN]*  
*Equivalent axial load [KN]*
**EB1.25 R**

**SERIE STANDARD**

**STANDARD SERIES**

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- Materiale: 42CrMo4 Q+T
- Gioco assiale riportato sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

**Diagramma di carico statico valido per sforzi compressivi**

**Carico sospeso: occorre verificare specifica della bulloneria**

**Fa**

**Carico assiale equivalente [kN]**

**Equivalent axial load [kN]**

**Mf**

**Momento ribaltante equivalente [kNm]**

**Equivalent tilting moment [kNm]**

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE:** check if radial load applied and consult part 2 of the catalogue.
**SERIE STANDARD**

**EB1.50 S**

### Codice

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- Materiale: C45Q+T
- Gioco assiale riportato sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- P: tappo inserimento sfere / filling plug
- G: ingrassatori / greasers

### Diagramma

**Momento ribalzante equivalente [KNm]**

![](image)

**Carico assiale equivalente [KN]**

![](image)

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE:** check if radial load applied and consult part 2 of the catalogue.
## EB1 STOCK SERIE STANDARD

### EB1.14.0179.400-2SPPN

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### EB1.14.0188.200-3RTTN

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### Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

### Carico sospeso: occorre verifica specifica della bulloneria

Suspended load: specific bolts calculation required

### NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo

NOTE: check if radial load applied and consult part 2 of the catalogue
EB1 STOCK
SERIE STANDARD
STANDARD SERIES

EB1.16.0234.200-2SPPN

- Ø232.5
- Ø195 N.12 fori holes
- Ø171.5*2

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

<table>
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EB1.16.0235.200-2RPPN

- Ø236
- Ø199 N.12 fori holes
- Ø173*2

EB1.14.0259.200-2RPTN

- Ø295.5*2
- Ø210 N.12 fori holes
- Ø186*2

EB1.22.0228.200-2RPPN

- Ø326*2
- Ø181 N.20 fori holes
- Ø162*2

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

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**EB1 STOCK**

**SERIE STANDARD**

**STANDARD SERIES**

**EB1.22.0308.200-1SPPN**

- **Diagramma di carico statico valido per sforzi compressivi**
- **Static load charts valid for compressive loads**

**EB1.22.0308.203-1STPN**

- **Carico sospeso: occorre verifica specifica della bulloneria**
- **Suspended load: specific bolts calculation required**

**EB1.22.0308.205-1RPTN**

- **NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo**
- **NOTE: check if radial load applied and consult part 2 of the catalogue**

**EB1.25.0309.200-2RPPN**

- **Mf [KNm]**
- **Fa [KN]**

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Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue
EB1 STOCK
SERIE STANDARD
STANDARD SERIES

EB1.25.0475.202-1S(R)PPN
EB1.28.0572.200-1RPPN
EB1.20.0662.200-1STTN
EB1.22.0758.201-1SPPN

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads
Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue

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<th>Materiale Material</th>
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<th>fz max [kN]</th>
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**EB1 STOCK**

**SERIE STANDARD**

**STANDARD SERIES**

---

**EB1.25.0854.200-1SPPN**

- **Dentatura**
- **Peso**
- **Codice**
- **Curva**
- **Materiale**
- **fz nor**
- **fz max**

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<th>fz max</th>
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<td>54,4</td>
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**Diagramma di carico statico valido per sforzi compressivi**

*Static load charts valid for compressive loads*

**Carico sospeso: occorre verifica specifica della bulloneria**

*Suspended load: specific bolts calculation required*

---

**NOTA:** controllare se carico radiale applicato e consultare parte 2 del catalogo

*NOTE:* check if radial load applied and consult part 2 of the catalogue.
## EB1 STOCK

### SERIE STANDARD

#### EB1.25.1076.202-1STPN

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### Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

### Carico sospeso: occorre verifica specifica della bulloneria

Suspended load: specific bolts calculation required

### NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo

NOTE: check if radial load applied and consult part 2 of the catalogue
Cuscinetti di base ad un giro di sfere, dentatura interna

One row ball bearing, internal toothed

ZB1 SERIES
**ZB1.20 S**

**SERIE STANDARD**

**STANDARD SERIES**

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<th>Dp</th>
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<th>Peso</th>
<th>Codice</th>
<th>Gioco assiale e radiale riportati sul disegno tecnico</th>
<th>Pieni di grasso, protetti da olio, e avvolti in resistente film plastico</th>
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<td>Gioco assiale e radiale riportati sul disegno tecnico</td>
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<td>Gioco assiale e radiale riportati sul disegno tecnico</td>
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</table>

**Diagramma di carico statico valido per sforzi compressivi**

**Static load charts valid for compressive loads**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**

**NOTA: consultare carico radiale presente e consultare parte 2 del catalogo**

**NOTE: consult radial load applied and consult part 2 of the catalogue**
### ZB1.20 P

#### SERIE DI PRECISIONE

#### PRECISION SERIES

---

**Diagramma di carico statico valido per sforzi compressivi**

Static load charts valid for compressive loads

---

**Carico sospeso: occorre verifica specifica della bulloneria**

Suspended load: specific bolts calculation required

---

**Carica assiale equivalente [KN]**

Equivalent axial load [KN]

---

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<th>DcE</th>
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<th>del</th>
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</table>

- Materiale: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Disponibili anche con denti temprati 55 HRC (suffisso -2RPTN)

D = tappo inserimento sfere / filling plug

NOTA: carico radiale presente e consultare parte 2 del catalogo

NOTE: check if radial load applied and consult part 2 of the catalogue

---

**Diagramma**

**Mf**

Momento ribaltante equivalente [KNm]

Equivalent tilting moment [KNm]

---

**Fa**

Carica assiale equivalente [KN]

Equivalent axial load [KN]

---

**Diagramma di carico statico valido per sforzi compressivi**

Static load charts valid for compressive loads

---

**Carico sospeso: occorre verifica specifica della bulloneria**

Suspended load: specific bolts calculation required

---

**Carica assiale equivalente [KN]**

Equivalent axial load [KN]

---

**Diagramma**

**Mf**

Momento ribaltante equivalente [KNm]

Equivalent tilting moment [KNm]

---

**Fa**

Carica assiale equivalente [KN]

Equivalent axial load [KN]
**UN GIRO DI SFERE, DENTATURA INTERNA - ONE ROW BALL, INTERNAL TOOTHED**

## SERIE STANDARD

**STANDARD SERIES**

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<th>Serie Code</th>
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<th>de</th>
<th>di</th>
<th>Fe</th>
<th>Ne</th>
<th>Fi</th>
<th>Ni</th>
<th>m</th>
<th>Z</th>
<th>Dp</th>
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<th>fz max</th>
<th>Peso Weight</th>
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- **Materiale**: C45Q+T
- **Gioco assiale e radiale riportati sul disegno tecnico**
- **Pieni di grasso, protetti da olio, e avvolti in resistente film plastico**

### Diagramma di carico statico valido per sforzi compressivi

- **Main load charts valid for compressive loads**
- **Carico sospeso: occorre verifica specifica della bulloneria**
- **Suspension load: specific bolts calculation required**

### Nota:
- Controllare se carico radiale presente e consultare parte 1 del catalogo.
- **NOTA**: check if radial load applied and consult part 2 of the catalogue.
**UN GIRO DI SFERE, DENTATURA INTERNA**  
**ONE ROW BALL, INTERNAL TOOTHED**

**SERIE DI PRECISIONE**  
**PRECISION SERIES**

---

### ZB1.25 P

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**Dimensions**

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- Materiale: C45Q+T  
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico  
- Disponibili anche con denti temprati 55 HRC (suffisso -2RPTN)

**Diagramma di carico statico valido per sforzi compressivi**

**Carico sospeso: occorre verifica specifica della bulloneria**

---

**NOTE:** controllare se carico radiale presente e consultare parte 2 del catalogo.

---

**Mf**  
**Momento ribaltante equivalente [KNm]**

**Fa**  
**Carico assiale equivalente [KN]**
## ZB1.25 R

**SERIE STANDARD**  
**STANDARD SERIES**

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**Code**

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- Materiale: 42CrMo4 Q+T  
- Gioco assiale e radiale riportati sul disegno tecnico  
- Piemi di grasso, protetti da olio, e avvolti in resistente film plastico

\(D=\) tappo inserimento sfere / filling plug  
\(G=\) n.4 ingrassatori M10X1 / n.4 greasers M10X1

### Diagrammi

- Momento ribaltante equivalente [KNm]  
  **Equivalent tilting moment [KNm]**

- Carico assiale equivalente [KN]  
  **Equivalent axial load [kN]**

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo

**NOTE:** check if radial load applied and consult part 2 of the catalogue

**Diagramma di carico statico valido per sforzi compressivi**

**Static load charts valid for compressive loads**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**
## ZB1.50 S

**SERIE STANDARD**

**STANDARD SERIES**

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<th>Codice Code</th>
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<th>Dentatura Gear data</th>
<th>Peso Weight</th>
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- Material: 42CrMoA Q+T
- Axial/radial clearances are on the technical drawing
- Full of grease, protected by oil and wrapped in resistant plastic film

**Diagramma di carico statico valido per sforzi compressivi**

**Static load charts valid for compressive loads**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**

**Diagramma di carico statico valido per sforzi compressivi**

**Static load charts valid for compressive loads**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE:** check if radial load applied and consult part 2 of the catalogue.
### ZB1 STOCK

#### SERIE STANDARD

#### ZB1.16.0260.400-1SPPN
- **Dentatura (Gear data):**
  - \( \phi_{30} \) N. 16 for holes
  - \( \phi_{28} \) N. 16 for holes

#### ZB1.16.0288.200-2RPPN
- **Dentatura (Gear data):**
  - \( \phi_{30} \) N. 20 for holes

#### ZB1.16.0400.200-1RPTN
- **Dentatura (Gear data):**
  - \( \phi_{38} \) N. 16 for holes

#### ZB1.20.0465.200-1RPTN
- **Dentatura (Gear data):**
  - \( \phi_{46} \) N. 16 for holes

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**Diagramma di carico statico valido per sforzi compressivi**
Static load charts valid for compressive loads

**Carico sospeso: occorre verifica specifica della bulloneria**
Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue
UN GIRO DI SFERE, DENTATURA INTERNA - ONE ROW BALL, INTERNAL TOOTHED

ZB1 STOCK
SERIE STANDARD
STANDARD SERIES

ZB1.25.0488.200-2RPPN

ZB1.20.0568.200-2RPPN

ZB1.20.0605.200-1RTTN

ZB1.25.0663.200-1SPPN

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue
ZB1 STOCK
SERIE STANDARD
STANDARD SERIES

ZB1.25.0663.201-1SPPN

Dentatura
Gear data
Peso
Weight
Codice
Code
Curva
Curve
Materiale
Material
fz nor
[kN]
fz max
[kN]
fz max
[kg]
ZB1.25.0663.201-1SPPN
9
C45 Q+T
19,5
39,0
76

Carico sospeso: occorre verificare specifica della bulloneria
Suspended load: specific bolts calculation required

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue
ZB1 STOCK
SERIE STANDARD
STANDARD SERIES

ZB1.25.0860.200-1SPPN

ZB1.25.0862.200-1SPPN

ZB1.25.0862.201-1SPTN

ZB1.28.1103.200-1STPN

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue
Carico sospeso: occorre verifica specifica della bulloneria

Suspended load: specific bolts calculation required

Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

NOTA: controllo se carico radiale applicato e consultare parte 2 del catalogo

NOTE: check if radial load applied and consult part 2 of the catalogue
Cuscinetti di base ad un giro di sfere, senza dentatura

One row ball bearing, untoothed

NB1 SERIES
UN GIRO DI SFERE, SENZA DENTATURA - ONE ROW BALL, UNTOOTHED

SERIE STANDARD
STANDARD SERIES

NB1.20 S

Certificato
Certification

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale presente e consultare part 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue

Momento ribaltante equivalente [KNm]
Equivalent tilting moment [KNm]

Fa
Carico assiale equivalente [KN]
Equivalent axial load [KN]
# NB1.20 P

**SERIE DI PRECISIONE**

**PRECISION SERIES**

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- Materiale: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

**Diagramma di carico statico valido per sforzi compressivi**

Static load charts valid for compressive loads

**Carico sospeso: occorre verifica specifica della bulloneria**

Suspended load: specific bolts calculation required

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo

**NOTE:** check if radial load applied and consult part 2 of the catalogue
**UN GIRO DI SFERE, SENZA DENTATURA - ONE ROW BALL, UNTOOTHED**

### SERIE STANDARD

**NB1.25 S**

**STANDARD SERIES**

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- Materiale: C45Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Piemi di grasso, protetti da olio, e avvolti in resistente film plastico

**Diagramma di carico statico valido per sforzi compressivi**

**Diagramma**

**Static load charts valid for compressive loads**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

**NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo**

**NOTE: check if radial load applied and consult part 2 of the catalogue**
### UN GIRO DI SFERE, SENZA DENTATURA - ONE ROW BALL, UNTOOTHED

**SERIE DI PRECISIONE**

**PRECISION SERIES**

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- Materiale: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo.

NOTE: check if radial load applied and consult part 2 of the catalogue.

### NOTA
- Codice di riferimento: C45Q+T
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria

Suspended load: specific bolts calculation required
**NB1.25 R**  
**SERIE STANDARD**  
**STANDARD SERIES**

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- Materiale: 42CrMo4 Q+T  
- Gioco assiale e radiale riportati sul disegno tecnico  
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

Diagramma di carico statico valido per sforzi compressivi

Carico sospeso: occorre verifica specifica della bulloneria  
Suspended load: specific bolts calculation required

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo  
**NOTE:** check if radial load applied and consult part 2 of the catalogue
NB1 STOCK
SERIE STANDARD
STANDARD SERIES

NB1.14.0179.200-1PPN

- Ø180
- Ø144,5 N.12 fori/holes
- Ø126,5 ±0,15
- Ø124,5 ±0,3

30 ±0,2
35 ±0,5

ø axial-radial ≤ 0,03 mm

NB1.14.0179.201-1PPN

- Ø177,5
- Ø144,5 N.20 fori/holes
- Ø124 ±0,2

30 ±0,2
35 ±0,5

ø axial-radial ≤ 0,03 mm

NB1.20.0220.200-1PPN

- Ø221
- Ø170 N. 10 fori/holes
- Ø140 ±0,15
- Ø138 ±0,3

41 ±0,2
48 ±0,5

ø axial-radial ≤ 0,03 mm

NB1.20.0260.200-1PPN

- Ø328 ±0,3
- Ø325 ±0,3
- Ø315 N. 16 fori/holes
- Ø305 ±0,15
- Ø29 ±0,4

12
48 ±0,5

ø axial-radial ≤ 0,03 mm

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Codice
NB1.14.0179.200-1PPN
NB1.14.0179.201-1PPN
NB1.20.0220.200-1PPN
NB1.20.0260.200-1PPN

Girante
1-a
1
2
3

Materiale
C45 Q+T
C45 Q+T
C45 Q+T
C45 Q+T

Kg
7
7
16
18

Mf [KNm]

Fa [KN]

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue
**SERIE STANDARD**

**NB1 STOCK**

**NB1.20.0260.201-1PPN**

Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

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Carico sospeso: occorre verifica specifica della bulloneria

Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo

NOTE: check if radial load applied and consult part 2 of the catalogue
NB1 STOCK
SERIE STANDARD
STANDARD SERIES

NB1.14.0325.200-2PPN

NB1.20.0405.200-2PPN

NB1.25.0433.200-2PPN

NB1.25.0475.200-1PPN

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Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

NOTA: controllare se carico radiale applicato e consultare parte 2 del catalogo
NOTE: check if radial load applied and consult part 2 of the catalogue
### NB1 STOCK

**SERIE STANDARD**

**STANDARD SERIES**

#### NB1.25.0523.400-3PPV

- **Diametro:** Ø38<sub>3</sub> (3)
- **Fori:** N. 38, Ø9<sub>3</sub><sup>0.3</sup>
- **Diametro:** Ø21<sub>0</sub>, Ø2<sup>0</sup>

#### NB1.28.0574.200-2PPN

- **Diametro:** Ø58<sup>0.3</sup>
- **Fori:** N. 20, Ø7<sup>0.3</sup>
- **Diametro:** Ø7<sup>0.3</sup>

#### NB1.25.0763.201-2PPN

- **Diametro:** Ø2<sup>0</sup>
- **Fori:** N. 24, Ø6<sup>0.3</sup>

#### NB1.30.0780.200-1PTV

- **Diametro:** Ø30<sup>0.5</sup>
- **Fori:** N. 12, Ø6<sup>0.3</sup>

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**Diagramma di carico statico valido per sforzi compressivi**

**Static load charts valid for compressive loads**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**

**Nota:** controllare se carico radiale applicato e consultare parte 2 del catalogo.

**NOTE:** check if radial load applied and consult part 2 of the catalogue.
Cuscinetti di base a due giri di sfere, dentatura esterna

Double row ball bearing, external toothed

EB2 SERIES
**EB2**

**SERIE STANDARD**

**STANDARD SERIES**

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- Materiale: .400/401: = 42CrMo4 Q+T / .200 = C45 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico

> P1, P2 = tappo inserimento sfere / filling plug
> G1, G2 = n.2+2 ingrassatori / n.2+2 greasers

**Diagramma di carico statico valido per sforzi compressivi**

**Curves 1–6**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Suspended load: specific bolts calculation required**

**Curves 7–9**

*NOTA:* controllare se carico radiale presente e consultare parte 2 del catalogo - NOTE: check if radial load applied and consult part 2 of the catalogue
### EB2 Serie Standard

#### Standard Dimensions

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- Materiale: 42CrMo4 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Possibilità di dentatura temprata (-1RPPN)

*Material: 42CrMo4 Q+T
Axial/radial clearances are on the technical drawing
Induction gear hardening available on request (-1RPPN)

> P1, P2 = tappo inserimento sfere / filling plug
> G1, G2 = n.2+2 ingrassatori / n.2+2 greasers

### Diagramma di carico statico valido per sforzi compressivi

**Curves 1~3**

### Carico sospeso: occorre verifica specifica della bulloneria

**Curves 4~7**

**Suspected load: specific bolts calculation required**

---

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo - NOTE: check if radial load applied and consult part 2 of the catalogue
## EB2 SERIES STANDARD

### STANDARD SERIES

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- Materiale: 42CrMo4 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Possibilità di dentatura temprata (-1RPPN)

\[ P1, P2 = \text{tappo inserimento sfere} / \text{filling plug} \]
\[ G1, G2 = n.2+2 ingrassatori / n.2+2 greasers \]

**Diagramma di carico statico valido per sforzi compressivi**

Static load charts valid for compressive loads

**Carico sospeso: occorre verifica specifica della bulloneria**

Suspended load: specific bolts calculation required

---

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo - NOTE: check if radial load applied and consult part 2 of the catalogue

---

**124**
Cuscinetti di base a due giri di sfere, dentatura interna

Double row ball bearing, internal toothed

ZB2 SERIES
## ZB2 SERIE STANDARD

**Standard Series**

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<th>Curva</th>
<th>Dimensioni</th>
<th>Fori di fissaggio</th>
<th>Dentatura</th>
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- Materiale: .400:=42CrMo4 Q+T / .200=C45 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Possibilità di dentatura temperata (-1RPPN)
- Induction gear hardening available on request (-1RPPN)

**Diagramma di carico statico valido per sforzi compressivi**

Carico sospeso: occorre verifica specifica della bulloneria

**Diagramma di carico statico valido per sforzi compressivi**

**Curves 1-5**

**Curves 6,7 (holes a or b)**

**NOTE:** controllare se carico radiale presente e consultare parte 2 del catalogo - NOTE: check if radial load applied and consult part 2 of the catalogue

---

*Diagramma di carico statico valido per sforzi compressivi*

Static load charts valid for compressive loads

*Carico sospeso: occorre verifica specifica della bulloneria*

Suspended load: specific bolts calculation required
**DUE Giri di sfere, dentatura interna - Double row ball, internal toothed**

**SERIE STANDARD**

**STANDARD SERIES**

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- Materiale: 42CrMo4 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Possibilità di dentatura temprata (-1RPPN)

> P1, P2 = tappo inserimento sfere / filling plug

- Material: 42CrMo4 Q+T
- Axial/radial clearances are on the technical drawing
- Induction gear hardening available on request (-1RPPN)

Diagramma di carico statico valido per sforzi compressivi

Carico sospeso: occorre verificare specifica della bulloneria

---

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo - NOTE: check if radial load applied and consult part 2 of the catalogue
**ZB2**

**SERIE STANDARD**

**STANDARD SERIES**

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- **Material**: 42CrMo4 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Possibilità di dentatura temprata (-1RPPN)

**Diagramma di carico statico valido per sforzi compressivi**

**Carico sospeso: occorre verificare specifica della bulloneria**

---

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo - NOTE: check if radial load applied and consult part 2 of the catalogue

---

128
One row crossed roller bearing, external toothed

ER1 SERIES
## SERIE STANDARD

### UN GIRO DI RULLI, DENTATURA ESTERNA - ONE ROW ROLLER, EXTERNAL TOOTHED

#### STANDARD SERIES

![Diagramma di carico statico valido per sforzi compressivi](image)

*Carico sospeso: occorre verifica specifica della bulloneria*

**Momento ribaltante equivalente [KNm]**

<table>
<thead>
<tr>
<th>Codice Code</th>
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<th>Dimensioni</th>
<th>Fori di fissaggio</th>
<th>Dentatura</th>
<th>Peso</th>
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<td>De</td>
<td>dce±IT7</td>
<td>di</td>
<td>Dc1±IT7</td>
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<td>1093-0,7</td>
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</table>

- Materiale: C45 Q+T
- Costruite con gioco stretto
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

\[ P = \text{tappo inserimento sfere / filling plug} \]

\[ G = \text{ingrassatori M8X1 / greasers M8X1} \]

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo

**NOTA:** check if radial load applied and consult part 2 of the catalogue
SERIE PRECARICATA DI PRECISIONE
PRELOADED PRECISION SERIES

Codice Code | Codice Codice | Codice Codice | Codice Codice | Codice Codice | Codice Codice
-------------|-------------|-------------|-------------|-------------|-------------
ER1.14.0414.201-3RTPN 1 | 503,3 | 417 | 413,5 | 344 | 455 | 20 | 368 | 24 | 5 | 99 | 495 | 15,9 | 23,6 | -0,01÷-0,03 | 32
ER1.14.0544.201-3RTPN 2 | 640,3 | 547 | 543,5 | 474 | 585 | 28 | 498 | 32 | 6 | 105 | 630 | 21,3 | 31,5 | -0,01÷-0,03 | 44
ER1.14.0644.201-3RTPN 3 | 742,3 | 647 | 643,6 | 574 | 685 | 32 | 598 | 36 | 6 | 122 | 732 | 21,3 | 31,5 | -0,01÷-0,04 | 52
ER1.14.0744.201-3RTPN 4 | 838,1 | 747 | 743,6 | 674 | 785 | 36 | 698 | 40 | 6 | 138 | 828 | 21,3 | 31,5 | -0,01÷-0,04 | 59
ER1.14.0844.201-3RTPN 5 | 950,1 | 847 | 843,6 | 774 | 885 | 36 | 798 | 40 | 8 | 117 | 936 | 28,3 | 42 | -0,01÷-0,04 | 71
ER1.14.0944.201-3RTPN 6 | 1046,1 | 947 | 943,7 | 874 | 985 | 40 | 898 | 44 | 8 | 129 | 1032 | 28,3 | 42 | -0,01÷-0,05 | 77
ER1.14.1094.201-3RTPN 7 | 1198,1 | 1097 | 1093,7 | 1024 | 1135 | 44 | 1048 | 48 | 8 | 148 | 1184 | 28,3 | 42 | -0,01÷-0,06 | 91

- Materiale: C45Q+T
- Costruite con leggero precarico e dentatura temprata 55HRC
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

- Material C45 Q+T
- Assembled with slight preload and gear hardened 55HRC
- Full of grease, protected by oil and wrapped in resistant plastic film

D'Ptappo inserimento sfere / filling plug
G = n.4 ingrassatori MBX1 / n.4 greasers MBX1

STESSO DIAGRAMMA DI CARICO SERIE ER1.14 S
SAME LOAD CHART OF ER1.14 S SERIES
**SERIE STANDARD**

**ER1.20 S**

**UN GIRO DI RULLI, DENTATURA ESTERNA - ONE ROW ROLLER, EXTERNAL TOOTHED**

**Serie Standard**

**ER1.20 S**

**Dimensioni**

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<th>m</th>
<th>Z</th>
<th>zm</th>
<th>Dp</th>
<th>pz</th>
<th>Peso</th>
<th>Pieni di grasso, protetti da olio, e avvolti in resistente film plastico</th>
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- **Materialie: 42CrMo4 Q+T**
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

D = tappo inserimento sfere / filling plug  
G = 4 ingrassatori M10X1 / 4 greasers M10X1

**NOTE: check if radial load applied and consult part 2 of the catalogue**

**Diagramma**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

**Mf**

**Fa**
## ER1.20/25
### SERIES STANDARD

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- Materiale: 42CrMo4 Q+T
- Costruite con gioco centesimale e denti temprati 55 HRC
- Plen di grasso, protetti da olio, e avvolti in resistente film plastico

\[ D = \text{filling plug} \quad G = \text{greasers} \]

### Diagramma di carico statico valido per sforzi compressivi

**Static load charts valid for compressive loads**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

---

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo.

**NOTE:** check for radial load applied and consult part 2 of the catalogue.
| Codice Code | De | Dce | Dre | he | Hi | Ht | hd | De | Fz | Norm | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight | Peso Weight |
|-------------|----|-----|-----|----|----|----|----|----|----|------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| ER1.30.1116.400-2RPPN | A | 1289,5 | 1240 | -0,17 | 985 | +0,14 | 90 | 94 | 114 | 78 | 1198 | 40 | 22 | 1035 | 40 | 22 | 10 | 125 | +10,5 | 1271 | 75,4 | 335 |
| ER1.36.1250.400-2RPPN | A | 1476 | 1415 | -0,20 | 1080 | +0,14 | 91 | 100 | 110 | 79 | 1350 | 40 | 26 | 1150 | 40 | 26 | 10 | 144 | +8,6 | 1457,2 | 75,4 | 505 |
| ER1.45.1390.400-2RPPN | A | 1604 | 1551 | -0,20 | 1285 | +0,17 | 112 | 116 | 130 | 90 | 1500 | 48 | 30 | 1280 | 48 | 30 | 10 | 157 | +7,5 | 1585 | 87,0 | 620 |
| ER1.45.1595.400-2RPPN | C | 1836 | 1608 | +0,20 | 1437 | +0,20 | 120 | 115 | 135 | - | 1700 | 45 | 30 | 1485 | 45 | 30 | 16 | 112 | +8 | 1808 | 185,5 | 791 |
| ER1.45.1790.400-2RPPN | C | 2027 | 1808 | +0,25 | 1617 | +0,20 | 130 | 128 | 150 | - | 1905 | 45 | 30 | 1280 | 48 | 30 | 14 | 142 | +7 | 2002 | 175,8 | 1004 |
| ER1.50.2002.400-2RPPN | C | 2267 | 2013 | +0,30 | 1822 | +0,25 | 129 | 119 | 140 | - | 2124 | 72 | 30 | 1880 | 72 | 30 | 16 | 139 | +8 | 2240 | 199,4 | 1174 |
| ER1.50.2242.400-2RPPN | C | 2534 | 2260 | +0,20 | 2049 | +0,30 | 132 | 122 | 144 | - | 2373 | 60 | 33 | 2112 | 60 | 33 | 18 | 138 | +9 | 2502 | 229,6 | 1482 |
| ER1.50.2500.400-2RPPN | C | 2790 | 2508 | +0,30 | 2297 | +0,30 | 148 | 142 | 164 | - | 2640 | 72 | 33 | 2360 | 72 | 33 | 18 | 151 | +19,8 | 2757,6 | 257,4 | 1895 |
| ER1.50.2810.400-2RPPN | C | 3116 | 2818 | +0,35 | 2607 | +0,35 | 148 | 142 | 164 | - | 2950 | 80 | 33 | 2670 | 80 | 33 | 20 | 152 | +20 | 3080 | 286,0 | 2200 |

- Materiale: 42CrMo4 Q+T
- Costruite con gioco centesimale e denti temprati 55 HRC
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

- Material: 42CrMo4 Q+T
- Assembled with precision clearance and gear hardened 55 HRC
- Full of grease, protected by oil and wrapped in resistant plastic film

D = tappo inserimento sfere / filling plug  G = ingrassatori M8X1 / greasers M8X1
Cuscinetti di base ad un giro di rulli incrociati, dentatura interna

One row crossed roller bearing, internal toothed

ZR1 SERIES
## ZR1.14 S

**SERIE STANDARD**  
**STANDARD SERIES**

<table>
<thead>
<tr>
<th>Codice Code</th>
<th>Curva Curve</th>
<th>Dimensioni Dimensions</th>
<th>Fori di fissaggio Fixing Holes</th>
<th>Dentatura Gear data</th>
<th>Peso Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZR1.14.014.200-1SPTN</td>
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<td>914</td>
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<tr>
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<td>1166</td>
<td>1164</td>
<td>1095+0,7</td>
<td>1091</td>
</tr>
</tbody>
</table>

- Materiale: C45 Q+T  
- Costruite con gioco stretto  
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

\[ P = \text{tappo inserimento sfere / filling plug} \quad G = \text{ingrassatori / greasers} \]

**Diagramma**  
**di carico statico valido per sforzi compressivi**  
**Static load charts valid for compressive loads**

**Carico sospeso:** occorre verifica specifica della bulloneria  
**Suspended load:** specific bolts calculation required

---

**Mf**  
**Momento ribaltante equivalente [KNm]**  
**Equivalent tilting moment [KNm]**

**Fa**  
**Carico assiale equivalente [KN]**  
**Equivalent axial load [KN]**

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo.  
NOTE: check if radial load applied and consult part 2 of the catalogue.
## SERIE PRECARICATA DI PRECISIONE

### PRELOADED PRECISION SERIES

<table>
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<th>Curva Code</th>
<th>Dimensioni Dimensions</th>
<th>Fori di fissaggio Fixing Holes</th>
<th>Dentatura Gear data</th>
<th>Precarico Preload</th>
<th>Peso Weight</th>
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- Codice: Material C45 Q+T  
- Costruite con leggero precarico e dentatura temprata 55HRC  
- Pieni di grasso, protetti da olio, e avvolti in resistente pellicola plastica  
- Materia: C45Q-T  
- Assembled with slight preload and gear hardened 55HRC  
- Full of grease, protected by oil and wrapped in resistant plastic film  

- Valori di oscillazione Run-out values

<table>
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<tr>
<th>n.</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
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**STESSO DIAGRAMMA DI CARICO SERIE ZR1.14 S**

SAME LOAD CHART OF ZR1.14 S SERIES
UN GIRO DI RULLI, DENTATURA INTERNA - ONE ROW ROLLER, INTERNAL TOOTHED

SERIE STANDARD

STANDARD SERIES

<table>
<thead>
<tr>
<th>Codice Code</th>
<th>Curva Code</th>
<th>Dimensioni Dimensions</th>
<th>Fori di fissaggio Fixing Holes</th>
<th>Dentatura Gear data</th>
<th>Peso Weight</th>
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- Materiale: 42CrMo4 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

\[ D = \text{tappo inserimento sfere / filling plug} \quad \bullet G = 4 \text{ ingrassatori M10X1 / 4 greasers M10X1} \]

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo

NOTE: check if radial load applied and consult part 2 of the catalogue

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

**Mf**
Momento ribaltante equivalente [KNm]
Equivalent tilting moment [KNm]

**Fa**
Carico assiale equivalente [KN]
Equivalent axial load [KN]
## ZR1.16/25 SERIE STANDARD

**Standard Series**

### Codice / Code

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<th>Me</th>
<th>Hi</th>
<th>Mt</th>
<th>Df</th>
<th>Ne</th>
<th>Fe</th>
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<tr>
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<td>1170</td>
<td>1165</td>
<td>-0,17</td>
<td>1040</td>
<td>+0,17</td>
<td>982</td>
<td>40</td>
<td>40</td>
<td>55</td>
<td>60</td>
<td>1125</td>
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<td>22</td>
<td>975</td>
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<td>10</td>
<td>89</td>
<td>-803,04</td>
</tr>
</tbody>
</table>

- **Material**: 42CrMo4 Q+T
- **Costruite con gioco centesimale e denti temprati 55 HRC**
- **Pieni di grasso, protetti da olio, e avvolti in resistente film plastico**
- **P** = tappo / filling plug
- **G** = ingrassatori / greasers

**Diagramma di carico statico valido per sforzi compressivi**

**Carico sospeso: occorre verifica specifica della bulloneria**

**Static load charts valid for compressive loads**

**Suspended load: specific bolts calculation required**

NOTA: controllare se carico radiale presente e consultare parte 2 del catalogo

NOTE: check if radial load applied and consult part 2 of the catalogue
### ZR1.30/50 
**SERIE STANDARD**  
**STANDARD SERIES**

#### Dimensioni  
**Dimensions**

<table>
<thead>
<tr>
<th>Codice Code</th>
<th>Curve</th>
<th>De</th>
<th>Dce</th>
<th>Dei</th>
<th>Dp</th>
<th>He</th>
<th>Hi</th>
<th>Fp</th>
<th>Ne</th>
<th>Fp</th>
<th>Ne</th>
<th>Z</th>
<th>df</th>
<th>m</th>
<th>Zxm</th>
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<td>1430</td>
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</table>

- **Materiale: 42CrMo4 Q+T**  
- **Costruite con gioco centesimale e denti temprati a 55 HRC**  
- **Pieni di grasso, protetti da olio, e avvolti in resistente film plastico**  

\( P = \text{tappo inserimento sfere} = \text{filling plug} \)  
\( G = \text{ingrassatori} = \text{greasers} \)

#### Forni di fissaggio  
**Fixing Holes**

#### Dentatura  
**Gear data**

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<th>Curve</th>
<th>Fp</th>
<th>Ne</th>
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<th>df</th>
<th>m</th>
<th>Zxm</th>
<th>Dp (xm)</th>
<th>fz (mm)</th>
<th>Peso (kg)</th>
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<td>22</td>
<td>10</td>
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<td>72</td>
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</tbody>
</table>

- **Carico sospeso: occorre verifica specifica della bulloneria**  
- **Static load charts valid for compressive loads**

\( Mf = \text{Momento ribaltante equivalente} = \text{Equivalent tilting moment} \)  
\( Fa = \text{Carico assiale equivalente} = \text{Equivalent axial load} \)

**Diagramma di carico statico valido per sforzi compressivi**  
**Carica assiale**
Cuscinetti di base ad un giro di rulli incrociati, senza dentatura

One row crossed roller bearing, untoothed

NR1 SERIES
**SERIE STANDARD**

**NR1.14 S**

- Materiale: C45 Q+T
- Costruite con gioco stretto
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

**Diagramma di carico statico valido per sforzi compressivi**

**Carico sospeso: occorre verifica specifica della bulloneria**

### Codice | Curva | De | Dce-IT7 | de | di | Dci-IT7 | Fi | Ni | Peso
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
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<th></th>
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<tbody>
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<td>484</td>
<td>415+0,5</td>
<td>413-0,5</td>
<td>344</td>
<td>342</td>
<td>460</td>
<td>24</td>
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<tr>
<td>NR1.14.0544.200-1PPN</td>
<td>2</td>
<td>616</td>
<td>614</td>
<td>545+0,5</td>
<td>543-0,5</td>
<td>474</td>
<td>472</td>
<td>590</td>
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<td>3</td>
<td>716</td>
<td>714</td>
<td>645+0,6</td>
<td>643-0,6</td>
<td>574</td>
<td>572</td>
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<td>814</td>
<td>745+0,6</td>
<td>743-0,6</td>
<td>674</td>
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<td>914</td>
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<td>843-0,6</td>
<td>774</td>
<td>772</td>
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<td>40</td>
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<td>1014</td>
<td>945+0,7</td>
<td>943-0,7</td>
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<td>1164</td>
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<td>1093-0,7</td>
<td>1024</td>
<td>1022</td>
<td>1140</td>
<td>48</td>
</tr>
</tbody>
</table>

- Materiali: C45 Q+T  - Materiali: C45 Q+T
- Assembled with reduced clearances
- Full of grease, protected by oil and wrapped in resistant plastic film

**NOTA:** controllare se carico radiale presente e consultare parte 2 del catalogo
**NOTE:** check if radial load applied and consult part 2 of the catalogue
NR1.14 PR
SERIE PRECARICATA DI PRECISIONE
PRELOADED PRECISION SERIES

<table>
<thead>
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<th>Fori di fissaggio</th>
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<th>Peso</th>
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<td>de</td>
<td>di</td>
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<tr>
<td>NR1.14.0544.201-3PPN</td>
<td>2</td>
<td>614</td>
<td>545+0,5</td>
<td>543-0,5</td>
<td>474</td>
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<tr>
<td>NR1.14.0644.201-3PPN</td>
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<td>714</td>
<td>645+0,6</td>
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<tr>
<td>NR1.14.0744.201-3PPN</td>
<td>4</td>
<td>814</td>
<td>745+0,6</td>
<td>743-0,6</td>
<td>674</td>
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<td>1164</td>
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<td>1093-0,7</td>
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</table>

- Materiale: C45Q+T
- Costruite con leggero precarico
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico
- Material C45 Q+T
- Assembled with slight preload
- Full of grease, protected by oil and wrapped in resistant plastic film

Ptappo inserimento sfere / filling plug  G = n.4 ingrassatori MBX1 / n.4 greasers MBX1

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<th>n.</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
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STESSO DIAGRAMMA DI CARICO SERIE NR1.14 S
SAME LOAD CHART OF THE NR1.14 S SERIES
## NR1.20 S

**SERIE STANDARD**

**STANDARD SERIES**

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<th>de [mm]</th>
<th>di [mm]</th>
<th>Di [mm]</th>
<th>Fe [mm]</th>
<th>Ne [mm]</th>
<th>he [mm]</th>
<th>Fi [mm]</th>
<th>Ni [mm]</th>
<th>hi [mm]</th>
<th>Peso [kg]</th>
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- Materia: 42CrMo4 Q+T
- Gioco assiale e radiale riportati sul disegno tecnico
- Pieni di grasso protetti da olio, e avvolti in resistente film plastico

**Diagramma di carico statico valido per sforzi compressivi**

**Fa**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

**NOTA:** contrassegnato se carico radiale presente e consultare parte 2 del catalogo.

**NOTA:** check if radial load applied and consult part 2 of the catalogue.

**Diagramma**

**Carico sospeso:** occorre verifica specifica della bulloneria.

**Carico sospeso:** specific bolts calculation required.

**Mf**

**Momento ribaltante equivalente [KNm]**

**Equivalent tilting moment [KNm]**

**Bolts 10.9**

**Fa**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**
UN GIRO DI RULLI, SENZA DENTATURA - ONE ROW ROLLER, UNTOOTHED

NR1.14/25 SERIE STANDARD
STANDARD SERIES

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Curves 1 ~ 4

Carico sospeso: occorre verificare specifica della bulloneria
Suspended load: specific bolts calculation required
Cuscinetti di base a tre giri di rulli, dentatura esterna

Triple row roller bearing, external toothed

ER3 SERIES
<table>
<thead>
<tr>
<th>Codice Code</th>
<th>Curva Code</th>
<th>Dim. Dimensions</th>
<th>Fissaggio Fixing Holes</th>
<th>Dent. Gear data</th>
<th>Peso Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>[mm] [mm]</td>
<td>[mm] [mm] [mm] [mm]</td>
<td>[mm] [mm] [mm]</td>
<td>[mm] [kg]</td>
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<td>1 1461,6 1282 1280 1103 106 123 132 1355 1155 36 26</td>
<td>12 119</td>
<td>+0.50 1428 107 187 542</td>
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<td></td>
</tr>
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<td>14 128</td>
<td>+0.50 1792 136 236 731</td>
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<tr>
<td>ER3.20.1800.400-1SPPN</td>
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<td>+0.50 2192 163 285 912</td>
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- Materiale: 42CrMo4 Q+T
- Costruite con gioco positivo
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

- Material 42CrMo4 Q+T
- Assembled with positive clearances
- Full of grease, protected by oil and wrapped in resistant plastic film

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required
## SERIE STANDARD

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- Materiale: 42CrMo4 Q+T
- Costruite con gioco positivo
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

Diagramma di carico statico valido per sforzi compressivi

Curves 1-6

Carico sospeso: occorre verifica specifica della bulloneria

Suspended load: specific bolts calculation required

### Nota

- Materiale: 42CrMo4 Q+T
- Assembled with positive clearances
- Full of grease, protected by oil and wrapped in resistant plastic film

NOTA: necessario sempre comunicare i carichi per una corretta selezione - NOTE: always communicate load cases for an appropriate selection
Cuscinetti di base a tre giri di rulli, dentatura interna

Triple row roller bearing, internal toothed

ZR3 SERIES
**TRE GIRI DI RULLI, DENTATURA INTERNA - TRIPLE ROW ROLLER, INTERNAL TOOTHED**

**SERIE STANDARD**

**ZR3.20/25**

**STANDARD SERIES**

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- Materiale: 42CrMo4 Q+T
- Costruite con gioco positivo
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verificare specifica della bulloneria
Suspended load: specific bolts calculation required

**NOTA: necessario sempre comunicare i carichi per una corretta selezione**
**NOTE: always communicate load cases for an appropriate selection**
# ZR3.32/40 Standard Series

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- Material: 42CrMo4 Q+T
- Costruite con gioco positivo
- Pieni di grasso, protetti da olio, e avvolti in resistente film plastico

**Diagramma di carico statico valido per sforzi compressivi**

Static load charts valid for compressive loads

**Carico sospeso: occorre verifica specifica della bulloneria**

Suspended load: specific bolts calculation required
Serie a rulli incrociati per rotazione di precisione

Crossed roller series for precision rotation

RB/RE/RU/CRBC
CRBH/SX
NR1-XU/XSU SERIES
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**Esempio di designazione completa valida per serie RB / Designation example valid for RB series**

**RB 12025 - UU - CC0 - P5**

1. Codice in tabella / Code on table
2. Simbolo per la tenuta / Sealing symbol
   - Senza simbolo: nessuna tenuta / No symbol: without sealing
   - U: tenuta su un lato / sealing on one side only
   - UU: tenuta su entrambi i lati / sealing on both sides
3. Simbolo per i giochi / Clearances symbol
   - CC0: gioco negativo (precarico) / negative clearances (preload)
   - C0: gioco positivo / positive clearances
   - C1: gioco positivo (maggiore di C0) / positive clearances (more than C0)
4. Simbolo per la classe di precisione / Precision class symbol
   - Senza simbolo: classe standard P0 / no symbol: standard precision class P0
   - P2: oscillazione radiale e assiale e tolleranze classe 2 / radial and axial run-out and tolerances class 2
   - P4: oscillazione radiale e assiale e tolleranze classe 4 / radial and axial run-out and tolerances class 4
   - P5: oscillazione radiale e assiale e tolleranze classe 5 / radial and axial run-out and tolerances class 5
   - USP: oscillazione radiale e assiale USP / radial and axial run-out class USP

**INOLTRARE RICHIESTA CON DESIGNAZIONE COMPLETA PER I DETTAGLI COSTRUTTIVI E DI PRECISIONE.**
**SUBMIT THE REQUEST WITH COMPLETE DESIGNATION TO RECEIVE CONSTRUCTION AND PRECISION DETAILS.**
# RE Series of Precision Crossed Roller Bearings

**CON ANELLO INTERNO COMPOSTO**

**WITH COMPOSED INNER RING**

**SERIE DI PRECISIONE A RULLI INCROCIATI**

**CROSSED ROLLER PRECISION SERIES**

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**Notes:**
- Dimensions (mm)
- Greasing holes
- Housing diameter
- Basic load rating (Kg)
- Weight (Kg)
### Desingnation example valid for RE and RU series

<table>
<thead>
<tr>
<th>Codice in tabella / Code on table</th>
<th>Simbolo per la tenuta / Sealing symbol</th>
<th>Simbolo per i giochi / Clearances symbol</th>
<th>Simbolo per la classe di precisione / Precision class symbol</th>
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<tr>
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<td>UU</td>
<td>CC0</td>
<td>P5</td>
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**Codice in tabella / Code on table**

1. RE 14025 - UU - CC0 - P5

**Simbolo per la tenuta / Sealing symbol**

- UU: tenuta su entrambi i lati / sealing on both sides
- U: tenuta su un lato / sealing on one side only

**Simbolo per i giochi / Clearances symbol**

- CC0: gioco negativo (precarico) / negative clearances (preload)
- C0: gioco positivo / positive clearances
- C1: gioco positivo (maggiore di C0) / positive clearances (more than C0)

**Simbolo per la classe di precisione / Precision class symbol**

- P2: oscillazione radiale e assiale e tolleranze classe 2 / radial and axial run-out and tolerances class 2
- P4: oscillazione radiale e assiale e tolleranze classe 4 / radial and axial run-out and tolerances class 4
- P5: oscillazione radiale e assiale e tolleranze classe 5 / radial and axial run-out and tolerances class 5
- P6: oscillazione radiale e assiale e tolleranze classe 6 / radial and axial run-out and tolerances class 6
- USP: oscillazione radiale e assiale USP / radial and axial run-out class USP

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**Esempio di designazione completa valida per serie RE e RU / Designation example valid for RE and RU series**

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<th>Codice / Code</th>
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**INOLTRARE RICHIESTA CON DESIGNAZIONE COMPLETA PER I DETTAGLI COSTRUTTIVI E DI PRECISIONE. \**
**SUBMIT THE REQUEST WITH COMPLETE DESIGNATION TO RECEIVE CONSTRUCTION AND PRECISION DETAILS.**
### Serie di precisione a rulli incrociati

**Crossed Roller Precision Series**

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<th>B (mm)</th>
<th>Dp (mm)</th>
<th>r (mm)</th>
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<th>Ne</th>
<th>Ve</th>
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#### Codice in Tabella / Code on Table

1 Codice in tabella / Code on table
2 Simbolo per la tenuta / Sealing symbol
3 Simbolo per le tensioni / Clearances symbol
4 Simbolo per la classe di precisione / Precision class symbol

#### Esempio di designazione

**RU 124G - UU - CC0 - P5 - B**

1 USP: oscillazione radiale e assiale USP / radial and axial run-out class USP
2 5 Simbolo per la classe di precisione di oscillazione relativa all’anello rotante / Symbol for ring precision reference
3 Senza simbolo: anello interno in rotazione / No symbol: inner ring rotating
4 Anello esterno in rotazione / Outer ring rotating
5 Anello esterno e interno con possibilità di rotazione / Outer and inner ring both rotating
## SERIE DI PRECISIONE A RULLI INCROCIATI

### CROSSED ROLLER PRECISION SERIES

**Esempio di designazione completa valida per serie CRBH / Designation example valid for CRBH series**

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<th>Dimensioni Dimensions</th>
<th>Diametro appoggio Housing diameter</th>
<th>Coeff. di carico Basic load rating</th>
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**ESEMPIO DI DESIGNAZIONE COMPLETA VALIDA PER I DETTAGLI COSTRUTTIVI E DI PRECISIONE.**

**SUBMIT THE REQUEST WITH COMPLETE DESIGNATION TO RECEIVE CONSTRUCTION AND PRECISION DETAILS.**
# CRBC - CRB

**SERIE DI PRECISIONE A RULLI INCROCIATI**

**CROSSED ROLLER PRECISION SERIES**

### Dimensions

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### Esempio di designazione completa valida per serie CRB(C) / Designation example valid for CRB(C) series

**CRBC 12025 - UU - T1 - P5**

1. Codice in tabella / Code on table
2. Simbolo per la tenuta / Sealing symbol
   - Senza simbolo: nessuna tenuta / No symbol: without sealing
   - UU: tenuta su entrambi i lati / sealing on both sides
   - U: tenuta su un lato / sealing on one side only
3. Simbolo per i giochi / Clearances symbol
   - T1: gioco negativo (precarico) / negative clearances (preload)
   - C1: gioco positivo / positive clearances
   - C2: gioco positivo (maggiore di C0) / positive clearances (more than C0)
4. Simbolo per la classe di precisione / Precision class symbol
   - P2: oscillazione radiale e assiale e tolleranze classe 2 / radial and axial run-out and tolerances class 2
   - P4: oscillazione radiale e assiale e tolleranze classe 4 / radial and axial run-out and tolerances class 4
   - P5: oscillazione radiale e assiale e tolleranze classe 5 / radial and axial run-out and tolerances class 5
   - P6: oscillazione radiale e assiale e tolleranze classe 6 / radial and axial run-out and tolerances class 6
### SX Series of Crossed Roller Precision Series

**SX**

**SERIE DI PRECISIONE A RULLI INCROCIATI**

**CROSSED ROLLER PRECISION SERIES**

**Con Anello Esterno Composto**  
**With Composed Outer Ring**

---

**Diagram**

- **SX 011814** - RLO

- **SX 011818**

- **SX 011820**

- **SX 011824**

- **SX 011828**

- **SX 011832**

- **SX 011836**

- **SX 011840**

- **SX 011848**

- **SX 011860**

- **SX 011868**

- **SX 011880**

- **SX 0118/500**

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**Esempio di designazione completa valida per serie SX / Designation example valid for SX series**

1. SX 011814 - RLO

   1. Codice in tabella / Code on table
   2. Simbolo per i giochi / Clearances symbol
   4. RLO: gioco positivo / positive clearances
   5. VSP: gioco negativo (precarico) / negative clearances (preload)

---

**INOLTRARE RICHIESTA CON DESIGNAZIONE COMPLETA PER I DETTAGLI COSTRUTTIVI E DI PRECISIONE.**  
**SUBMIT THE REQUEST WITH COMPLETE DESIGNATION TO RECEIVE CONSTRUCTION AND PRECISION DETAILS.**
NR1-XSU
SERIE DI PRECISIONE A RULLI INCROCIATI
CROSSED ROLLER PRECISION SERIES

INOLTRARE RICHIESTA CON DESIGNAZIONE COMPLETA PER I DETTAGLI COSTRUTTIVI E DI PRECISIONE.
SUBMIT THE REQUEST WITH COMPLETE DESIGNATION TO RECEIVE CONSTRUCTION AND PRECISION DETAILS.
NR1-XU
SERIE DI PRECISIONE
PRECISION SERIES

NR1.05.0077.500-3PTN
SERIE DI PRECISIONE
PRECISION SERIES

NR1.06.0094.500-3PTN
SERIE DI PRECISIONE
PRECISION SERIES

NR1.06.0111.500-3PPN
SERIE DI PRECISIONE
PRECISION SERIES

NR1.08.0120.500-3PTN
SERIE DI PRECISIONE
PRECISION SERIES

NR1.08.0149.500-3PPN
SERIE DI PRECISIONE
PRECISION SERIES

NR1.12.0179.200-3PPN
SERIE DI PRECISIONE
PRECISION SERIES
NR1-XU
SERIE DI PRECISIONE
PRECISION SERIES

NR1.12.0222.500-2TPN

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

NR1.16.0260.200-3PPN

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

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Cuscinetti di precisione YRT, per tavole girevoli

Turntable precision bearing YRT

YRT/YRTS/ZKLDF SERIES
CUSCINETTO DI PRECISIONE PER TAVOLE GIREVOLI - PRECISION TURNTABLE BEARING

SERIE PER VELOCITÀ DI ROTAZIONE STANDARD

STANDARD ROTATING SPEED SERIES

- Cuscinetto leggermente pre caricato
- Il cuscinetto richiede una elevata qualità delle superfici di contatto al fine di funzionare perfettamente
- Il momento di attrito dinamico è testato alla di velocità 5 giri/min. Il momento di attrito statico deve essere di 2-2,5 volte il momento di attrito dinamico
- La coppia di serraggio deve essere applicata in 3 passaggi, al 40-70-100% del dato in tabella, secondo una sequenza di serraggio a croce

- Slightly preloaded bearing
- The bearing requires an high quality of companion surfaces in order to work perfectly
- Dynamic frictional torque is tested at speed 5 r/min. Static frictional torque should be 2 - 2,5 times of dynamic frictional torque
- Tightening torque must be applied on 3 stages, at 40-70-100% of listed data, according crosswise tightening sequence
CUSCINETTO DI PRECISIONE PER TAVOLE GIREVOLI - PRECISION TURN TABLE BEARING

<table>
<thead>
<tr>
<th>Codice Code</th>
<th>Velocità limite / Limiting speed</th>
<th>Momento di attrito dinamico / Dynamic friction torque</th>
<th>Coefficiente di carico assiale/axial / Radiale/radial / Retenendo/screws in &amp; R</th>
<th>N. viti di assemblaggio / Screws tightening</th>
<th>Fori di estrazione / Extraction holes</th>
<th>Peso / Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRT 50</td>
<td>440</td>
<td>2,5</td>
<td>38</td>
<td>158</td>
<td>28,5</td>
<td>49,5</td>
</tr>
<tr>
<td>YRT 80</td>
<td>530</td>
<td>3</td>
<td>56</td>
<td>255</td>
<td>42,5</td>
<td>100</td>
</tr>
<tr>
<td>YRT 100</td>
<td>430</td>
<td>3</td>
<td>75,5</td>
<td>415</td>
<td>47,5</td>
<td>120</td>
</tr>
<tr>
<td>YRT 120</td>
<td>340</td>
<td>7</td>
<td>102</td>
<td>540</td>
<td>52</td>
<td>143</td>
</tr>
<tr>
<td>YRT 150</td>
<td>320</td>
<td>10</td>
<td>112</td>
<td>630</td>
<td>56</td>
<td>170</td>
</tr>
<tr>
<td>YRT 180</td>
<td>280</td>
<td>12</td>
<td>118</td>
<td>710</td>
<td>69,5</td>
<td>200</td>
</tr>
<tr>
<td>YRT 200</td>
<td>260</td>
<td>14</td>
<td>120</td>
<td>765</td>
<td>81,5</td>
<td>220</td>
</tr>
<tr>
<td>YRT 260</td>
<td>200</td>
<td>20</td>
<td>160</td>
<td>1060</td>
<td>93</td>
<td>290</td>
</tr>
<tr>
<td>YRT 325</td>
<td>170</td>
<td>40</td>
<td>275</td>
<td>1930</td>
<td>120</td>
<td>345</td>
</tr>
<tr>
<td>YRT 395</td>
<td>140</td>
<td>55</td>
<td>300</td>
<td>2280</td>
<td>186</td>
<td>655</td>
</tr>
<tr>
<td>YRT 460</td>
<td>120</td>
<td>70</td>
<td>355</td>
<td>2800</td>
<td>200</td>
<td>765</td>
</tr>
<tr>
<td>YRT 580</td>
<td>80</td>
<td>140</td>
<td>490</td>
<td>4250</td>
<td>228</td>
<td>965</td>
</tr>
<tr>
<td>YRT 650</td>
<td>65</td>
<td>200</td>
<td>1040</td>
<td>8000</td>
<td>490</td>
<td>18000</td>
</tr>
<tr>
<td>YRT 850</td>
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<td>300</td>
<td>1000</td>
<td>8650</td>
<td>455</td>
<td>1730</td>
</tr>
<tr>
<td>YRT 950</td>
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<td>600</td>
<td>1290</td>
<td>11400</td>
<td>530</td>
<td>2040</td>
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<td>35</td>
<td>800</td>
<td>1380</td>
<td>12000</td>
<td>620</td>
<td>2650</td>
</tr>
</tbody>
</table>

Esempio di designazione completa valida per serie SX / Designation example valid for SX series

YRT 260 - P4

1 Codice in tabella / Code on table
2 Simbolo per la classe di precisione / Precision class symbol
P4: oscillazione radiale e assiale e tolleranze classe 4 STANDARD (senza simbolo)
radial and axial run-out and tolerances class 4 STANDARD (no symbol)
P2: oscillazione radiale e assiale e tolleranze classe 2 / radial and axial run-out and tolerances class 2

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## YRTS

### SERIE PER ALTA VELOCITÀ DI ROTAZIONE

**HIGH ROTATION SPEED SERIES**

### Dimensions/Dimensions

<table>
<thead>
<tr>
<th>Codice Code</th>
<th>De</th>
<th>D1</th>
<th>Di</th>
<th>C</th>
<th>H1</th>
<th>H2</th>
<th>Fe</th>
<th>Ne</th>
<th>he</th>
<th>fi</th>
<th>Ni</th>
<th>hi</th>
<th>L</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRTS 200</td>
<td>300 -0,018</td>
<td>274</td>
<td>200 -0,015</td>
<td>15</td>
<td>30</td>
<td>±0,175</td>
<td>45</td>
<td>285</td>
<td>45</td>
<td>7</td>
<td>215</td>
<td>46</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>YRTS 260</td>
<td>385 -0,020</td>
<td>345</td>
<td>260 -0,018</td>
<td>18</td>
<td>36,5</td>
<td>±0,20</td>
<td>55</td>
<td>365</td>
<td>33</td>
<td>9,3</td>
<td>280</td>
<td>34</td>
<td>9,3</td>
<td>15</td>
</tr>
<tr>
<td>YRTS 325</td>
<td>450 -0,023</td>
<td>415</td>
<td>325 -0,023</td>
<td>20</td>
<td>40</td>
<td>±0,20</td>
<td>60</td>
<td>430</td>
<td>33</td>
<td>9,3</td>
<td>342</td>
<td>34</td>
<td>9,3</td>
<td>15</td>
</tr>
<tr>
<td>YRTS 395</td>
<td>525 -0,028</td>
<td>486</td>
<td>395 -0,023</td>
<td>20</td>
<td>42,5</td>
<td>±0,20</td>
<td>65</td>
<td>505</td>
<td>45</td>
<td>9,3</td>
<td>415</td>
<td>46</td>
<td>9,3</td>
<td>15</td>
</tr>
<tr>
<td>YRTS 460</td>
<td>600 -0,028</td>
<td>560</td>
<td>460 -0,023</td>
<td>22</td>
<td>46</td>
<td>±0,225</td>
<td>70</td>
<td>580</td>
<td>45</td>
<td>9,3</td>
<td>482</td>
<td>46</td>
<td>9,3</td>
<td>15</td>
</tr>
</tbody>
</table>

### Velocità limite

**Limiting speed**

<table>
<thead>
<tr>
<th>Codice Code</th>
<th>Velocità limite (rpm)</th>
<th>Momento di attrito dinamico (Nm)</th>
<th>Coefficiente di carico assiale/assiale (Ca/Cc)</th>
<th>Coefficiente di carico radiale/radiale (Cr/Cor)</th>
<th>N. viti di assemblaggio (n R)</th>
<th>Fori di estrazione (holes pitch)</th>
<th>Assiale/Assiale (nXα°)</th>
<th>Axial/Radial (nXα°)</th>
<th>Type</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRTS 200</td>
<td>1160</td>
<td>-</td>
<td>155</td>
<td>840</td>
<td>94</td>
<td>226</td>
<td>2x180°</td>
<td>3x180°</td>
<td>M8</td>
<td>3</td>
</tr>
<tr>
<td>YRTS 260</td>
<td>910</td>
<td>-</td>
<td>173</td>
<td>1050</td>
<td>110</td>
<td>305</td>
<td>2x180°</td>
<td>3x180°</td>
<td>M12</td>
<td>3</td>
</tr>
<tr>
<td>YRTS 325</td>
<td>760</td>
<td>-</td>
<td>191</td>
<td>1260</td>
<td>109</td>
<td>320</td>
<td>2x180°</td>
<td>3x180°</td>
<td>M12</td>
<td>3</td>
</tr>
<tr>
<td>YRTS 395</td>
<td>650</td>
<td>-</td>
<td>214</td>
<td>1540</td>
<td>121</td>
<td>390</td>
<td>2x180°</td>
<td>3x180°</td>
<td>M12</td>
<td>3</td>
</tr>
<tr>
<td>YRTS 460</td>
<td>560</td>
<td>-</td>
<td>221</td>
<td>1690</td>
<td>168</td>
<td>570</td>
<td>2x180°</td>
<td>3x180°</td>
<td>M12</td>
<td>3</td>
</tr>
</tbody>
</table>

### Esempio di designazione completa valida per serie SX / Designation example valid for SX series

1. **YRTS 260** - **P4**

   1. Codice in tabella / Code on table
   2. Simbolo per la classe di precisione / Precision class symbol
   3. P4: oscillazione radiale e assiale e tolleranze classe 4 STANDARD (senza simbolo)
   4. radial and axial run-out and tolerances class 4 STANDARD (no symbol)
   5. P2: oscillazione radiale e assiale e tolleranze classe 2 / radial and axial run-out and tolerances class 2

---

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# Tolleranze di lavorazione per alloggiamento degli YRT

**YRT Housing and Shaft Machining Tolerances**

<table>
<thead>
<tr>
<th>Codice</th>
<th>Albero</th>
<th>Alloggiamento</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Ds</td>
<td>t1</td>
</tr>
<tr>
<td>--------</td>
<td>--------</td>
<td>-----</td>
</tr>
<tr>
<td>YRT 50</td>
<td>50-0,011</td>
<td>4</td>
</tr>
<tr>
<td>YRT 80</td>
<td>80-0,013</td>
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<tr>
<td>YRT 100</td>
<td>100-0,015</td>
<td>6</td>
</tr>
<tr>
<td>YRT 120</td>
<td>120-0,015</td>
<td>6</td>
</tr>
<tr>
<td>YRT 150</td>
<td>150-0,015</td>
<td>8</td>
</tr>
<tr>
<td>YRT 180</td>
<td>180-0,018</td>
<td>8</td>
</tr>
<tr>
<td>YRT/S 200</td>
<td>200-0,020</td>
<td>10</td>
</tr>
<tr>
<td>YRT/S 260</td>
<td>260-0,023</td>
<td>12</td>
</tr>
<tr>
<td>YRT/S 325</td>
<td>325-0,025</td>
<td>13</td>
</tr>
<tr>
<td>YRT/S 395</td>
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<td>13</td>
</tr>
<tr>
<td>YRT/S 460</td>
<td>460-0,027</td>
<td>15</td>
</tr>
<tr>
<td>YRT 580</td>
<td>580-0,028</td>
<td>16</td>
</tr>
<tr>
<td>YRT 650</td>
<td>650-0,032</td>
<td>18</td>
</tr>
<tr>
<td>YRT 850</td>
<td>850-0,036</td>
<td>20</td>
</tr>
<tr>
<td>YRT 950</td>
<td>950-0,036</td>
<td>20</td>
</tr>
<tr>
<td>YRT 1030</td>
<td>1030-0,045</td>
<td>25</td>
</tr>
</tbody>
</table>

Tabella delle tolleranze per albero e alloggiamento (1µm = 0,001 mm)

Tolerance table for shaft and housing (1µm = 0,001 mm)
### CUSCINETTO DI PRECISIONE PER TAVOLE GIREVOLI - PRECISION TURNTABLE BEARING

---

**ZKLDF SERIES STANDARD**

| ZKLDF100 | 185 -0,015 | 160 | 158 | 136 | 100 -0,010 | 25 | 38 | 170 | 15 | 5,6 | 112 | 16 | 5,6 | 10 | 5,4 | ≤ 4
| ZKLDF120 | 210 -0,015 | 184 | 181 | 159 | 120 -0,010 | 26 | 40 | 195 | 21 | 7 | 135 | 22 | 7 | 11 | 6,2 | ≤ 6
| ZKLDF150 | 240 -0,015 | 214 | 211 | 188 | 150 -0,013 | 26 | 40 | 225 | 33 | 7 | 165 | 34 | 7 | 11 | 6,2 | ≤ 6
| ZKLDF200 | 300 -0,018 | 274 | 271 | 243 | 200 -0,015 | 30 | 45 | 285 | 45 | 7 | 215 | 46 | 7 | 11 | 6,2 | ≤ 6
| ZKLDF260 | 385 -0,020 | 345 | 348 | 313 | 260 -0,018 | 36,5 | 55 | 365 | 33 | 9,3 | 280 | 34 | 9,3 | 15 | 8,2 | ≤ 6
| ZKLDF325 | 450 -0,023 | 415 | 413 | 380 | 325 -0,023 | 40 | 60 | 430 | 33 | 9,3 | 342 | 34 | 9,3 | 15 | 8,2 | ≤ 6
| ZKLDF395 | 525 -0,028 | 486 | 488 | 450 | 395 -0,023 | 42,5 | 65 | 505 | 45 | 9,3 | 415 | 46 | 9,3 | 15 | 8,2 | ≤ 6
| ZKLDF460 | 600 -0,028 | 560 | 563 | 520 | 460 -0,023 | 46 | 70 | 580 | 45 | 9,3 | 482 | 46 | 9,3 | 15 | 8,2 | ≤ 6

---

**Diagram:**

- **De:** Diameter of external raceway
- **D1:** Diameter of the first hole
- **D2:** Diameter of the second hole
- **D3:** Diameter of the third hole
- **Di:** Diameter of the fourth hole
- **H1:** Height of external raceway
- **H2:** Height of the internal raceway
- **Fi:** Diameter of the first hole
- **Ni:** Diameter of the second hole
- **he:** Height of the internal raceway
- **Fe:** Diameter of the external raceway
- **Ne:** Diameter of the internal raceway
- **R:** Radius of the raceway
- **L:** Length of the raceway

---

**Table: Dimensions and Fixing holes**

<table>
<thead>
<tr>
<th>Code</th>
<th>De</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
<th>Di</th>
<th>H1</th>
<th>H2</th>
<th>Fe</th>
<th>Ne</th>
<th>he</th>
<th>Fi</th>
<th>Ni</th>
<th>hi</th>
<th>W</th>
</tr>
</thead>
<tbody>
<tr>
<td>ZKLDF100</td>
<td>185</td>
<td>160</td>
<td>158</td>
<td>136</td>
<td>100</td>
<td>25</td>
<td>38</td>
<td>170</td>
<td>15</td>
<td>5,6</td>
<td>112</td>
<td>16</td>
<td>5,6</td>
<td>10</td>
</tr>
<tr>
<td>ZKLDF120</td>
<td>210</td>
<td>184</td>
<td>181</td>
<td>159</td>
<td>120</td>
<td>26</td>
<td>40</td>
<td>195</td>
<td>21</td>
<td>7</td>
<td>135</td>
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<td>40</td>
<td>225</td>
<td>33</td>
<td>7</td>
<td>165</td>
<td>34</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>ZKLDF200</td>
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<td>271</td>
<td>243</td>
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<td>285</td>
<td>45</td>
<td>7</td>
<td>215</td>
<td>46</td>
<td>7</td>
<td>11</td>
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<tr>
<td>ZKLDF260</td>
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<td>345</td>
<td>348</td>
<td>313</td>
<td>260</td>
<td>36,5</td>
<td>55</td>
<td>365</td>
<td>33</td>
<td>9,3</td>
<td>280</td>
<td>34</td>
<td>9,3</td>
<td>15</td>
</tr>
<tr>
<td>ZKLDF325</td>
<td>450</td>
<td>415</td>
<td>413</td>
<td>380</td>
<td>325</td>
<td>40</td>
<td>60</td>
<td>430</td>
<td>33</td>
<td>9,3</td>
<td>342</td>
<td>34</td>
<td>9,3</td>
<td>15</td>
</tr>
<tr>
<td>ZKLDF395</td>
<td>525</td>
<td>486</td>
<td>488</td>
<td>450</td>
<td>395</td>
<td>42,5</td>
<td>65</td>
<td>505</td>
<td>45</td>
<td>9,3</td>
<td>415</td>
<td>46</td>
<td>9,3</td>
<td>15</td>
</tr>
<tr>
<td>ZKLDF460</td>
<td>600</td>
<td>560</td>
<td>563</td>
<td>520</td>
<td>460</td>
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<td>45</td>
<td>9,3</td>
<td>482</td>
<td>46</td>
<td>9,3</td>
<td>15</td>
</tr>
</tbody>
</table>

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**Table: Limiting Speed and Dynamic Friction Torque**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ZKLDF100</td>
<td>700</td>
<td>1,6</td>
<td>67</td>
<td>251</td>
<td>2x180°</td>
<td></td>
<td>M5</td>
<td>3</td>
<td>18,0 x 2°</td>
<td>50</td>
<td>35,5 x 2°</td>
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<td>680</td>
<td>2</td>
<td>72</td>
<td>315</td>
<td>2x180°</td>
<td></td>
<td>M8</td>
<td>3</td>
<td>24,0 x 1,5°</td>
<td>14</td>
<td>6</td>
</tr>
<tr>
<td>ZKLDF150</td>
<td>650</td>
<td>3</td>
<td>76</td>
<td>365</td>
<td>2x180°</td>
<td></td>
<td>M8</td>
<td>3</td>
<td>36,0 x 1°</td>
<td>14</td>
<td>7,5</td>
</tr>
<tr>
<td>ZKLDF200</td>
<td>600</td>
<td>4,5</td>
<td>112</td>
<td>550</td>
<td>2x180°</td>
<td></td>
<td>M8</td>
<td>3</td>
<td>48,0 x 1,5°</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>ZKLDF260</td>
<td>500</td>
<td>7,5</td>
<td>155</td>
<td>920</td>
<td>2x180°</td>
<td></td>
<td>M12</td>
<td>3</td>
<td>36,0 x 1°</td>
<td>34</td>
<td>22</td>
</tr>
<tr>
<td>ZKLDF325</td>
<td>450</td>
<td>11</td>
<td>165</td>
<td>1110</td>
<td>2x180°</td>
<td></td>
<td>M12</td>
<td>3</td>
<td>36,0 x 1°</td>
<td>34</td>
<td>28</td>
</tr>
<tr>
<td>ZKLDF395</td>
<td>400</td>
<td>16</td>
<td>214</td>
<td>1470</td>
<td>2x180°</td>
<td></td>
<td>M12</td>
<td>3</td>
<td>48,0 x 1,5°</td>
<td>34</td>
<td>39</td>
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<tr>
<td>ZKLDF460</td>
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<td>255</td>
<td>1860</td>
<td>2x180°</td>
<td></td>
<td>M12</td>
<td>3</td>
<td>48,0 x 1,5°</td>
<td>34</td>
<td>50</td>
</tr>
</tbody>
</table>

---

- La coppia di serraggio deve essere applicata in 3 passaggi, al 40-70-100% del dato in tabella, secondo una sequenza di serraggio a croce.
- Il cuscinetto richiede una elevata qualità delle superfici di contatto al fine di funzionare perfettamente.

- Tightening torque must be applied on 3 stages, at 40-70-100% of listed data, according crosswise tightening sequence.
- The bearing requires a high quality of companion surfaces in order to work perfectly.
PARTI DI ASSIEME

ASSEMBLY PARTS

1. Carcassa fusione ghisa
2. Cuscinetto di base
3. Pista di rotolamento
4. Guarnizione a librimento
5. Flangia di attacco esterna
6. Motore (idraulico, servo motore, motoriduttore)
7. Flangia di attacco motore
8. O-ring
9. Foro di ingresso albero motore
10. Albero opposto (per encoder o prosecuzione)
11. Flangia chiusura
12. Copri copertura
13. Encoder (opzionale)

1. Cast iron housing
2. Slewing Ring
3. Raceway
4. Labyrinth monolithic seal
5. External Companion flange
6. Drive (hydraulic motor / electric motor)
7. Motor Adapter
8. O-ring
9. Input Hole
10. Shaft Opposite to Motor
11. End Cap
12. Cover
13. Encoder (optional)

PRESTAZIONI

PERFORMANCES

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Max coppa in uscita (KNm)</strong></td>
<td>3,5</td>
<td>8</td>
<td>9,5</td>
<td>10,8</td>
<td>13</td>
<td>18,5</td>
<td>28,7</td>
<td>34,2</td>
</tr>
<tr>
<td><strong>Efficienza/potenza residua (%)</strong></td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Max coppa in ingresso (Nm)</strong></td>
<td>180</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>300</td>
<td>800</td>
<td>800</td>
<td>800</td>
</tr>
<tr>
<td><strong>Max velocità rotazione tavola (RPM)</strong></td>
<td>1 ~ 2,5</td>
<td>1 ~ 2,5</td>
<td>1 ~ 2,5</td>
<td>1 ~ 2,5</td>
<td>1 ~ 2,5</td>
<td>1 ~ 2,5</td>
<td>1 ~ 2,5</td>
<td>1 ~ 2,5</td>
</tr>
<tr>
<td><strong>Rapporto di trasmissione</strong></td>
<td>47:1</td>
<td>62:1</td>
<td>79:1</td>
<td>86:1</td>
<td>104:1</td>
<td>94:1</td>
<td>90:1</td>
<td>104:1</td>
</tr>
<tr>
<td><strong>Max velocità in ingresso (RPM)</strong></td>
<td>47</td>
<td>62</td>
<td>79</td>
<td>86</td>
<td>104</td>
<td>94</td>
<td>90</td>
<td>104</td>
</tr>
<tr>
<td><strong>Max velocità in ingresso (RPM) (continua)</strong></td>
<td>117,5</td>
<td>155</td>
<td>197,5</td>
<td>215</td>
<td>260</td>
<td>235</td>
<td>225</td>
<td>260</td>
</tr>
</tbody>
</table>

* la velocità massima dipende anche dalla coppia resistente e dai carichi applicati / the maximum speed also depends on the resistant torque and loads applied
**SPECIFICHE DI LUBRIFICAZIONE**

**LUBRICATION SPECIFICATION**

---

**PARTI DA LUBRIFICARE**

**PARTS TO BE LUBRICATED**

<table>
<thead>
<tr>
<th>PART</th>
<th>DESCRIPTION</th>
<th>MAXIMUM GREASE QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Pista di rotolamento / Ring raceway</td>
<td>15-20 g, 30-35 g, 45-50 g, 55-60 g, 70-75 g, 90-95 g, 120-130 g, 140-150 g</td>
</tr>
<tr>
<td>B</td>
<td>Vite senza file / Worm Gear Thread</td>
<td>55-65 g, 90-100 g, 100-110 g, 110-120 g, 120-130 g, 130-140 g, 130-140 g</td>
</tr>
<tr>
<td>C</td>
<td>Cuscinetti conici / Tapered Bearing</td>
<td>7±0.5 g, 10±0.5 g, 10±0.5 g, 10±0.5 g, 10±0.5 g, 10±0.6 g, 10±0.5 g, 10±0.5 g</td>
</tr>
</tbody>
</table>

---

**SPECIFICHE TECNICHE GRASSO / GREASE TECHNICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>GRASSI PER TUTTE LE PARTI / ALL PARTS DEFAULT GREASE</th>
<th>SPECIFICHE DI LUBRIFICAZIONE / LUBRICATION SPECIFICATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOBILTEMP SHC 32 / Recommanded</td>
<td>Range di utilizzo TAVOLA / Operating Temperature: -30 °C → 60 °C</td>
</tr>
<tr>
<td>MOBILTEMP SHC 100 / Recommanded</td>
<td>Range di temperatura grasso / Grease applicable temp. range: -40 °C → 200 °C</td>
</tr>
<tr>
<td>ISOFLEX NBU15 / -</td>
<td>Test delle 4 sfere / Four-ball test: 350 Kg carico di saldatura</td>
</tr>
<tr>
<td>DOW CORRING-44 / -</td>
<td>Viscosità (-40 °C, 10 s⁻¹) / Viscosity (-40 °C, 10 s⁻¹): 653 Pas</td>
</tr>
<tr>
<td>MOBILITEMP SHC 100 / Recommanded</td>
<td>Punto di goccia / Dropping Point: 316 °C</td>
</tr>
</tbody>
</table>

---

**ALTRE RACCOMANDAZIONI**

**OTHER RECOMMENDATIONS**

- La causa più frequente del mancato funzionamento è una lubrificazione insufficiente. *The most frequent cause of failure of slewing drives is insufficient lubrication.*

- Ri-lubrificazione completa e con nuovo grasso raccomandata ogni 3 anni. *Recommended re-lubrication every 3 years by filling each cavity completely with new grease.*

- Le indicazioni di ingrassaggio non possono sostituire i valori stabiliti attraverso l’esperienza. *Greasing indications cannot never replace values established by true experience.*

- Non è ammessa la pulizia del componente attraverso getto d’acqua in pressione o getto di calore. *Cleaning a slewing drive with steam jet or high-pressure cleaner is not allowed.*
Le tavole motorizzate possono essere azionate in due diversi modi, o con un motore idraulico, per cui è previsto l’attacco standard su tutti i modelli, oppure con un motoriduttore elettrico per cui è necessario applicare una flangia di adattamento nel caso di un collegamento rigido.

SELEZIONE DEL MODELLO CORRETTO

La selezione del modello di tavola motorizzata deve soddisfare i seguenti requisiti:

- Resistenza alle Condizioni di carico (vedi parte 2 e curve di carico sotto tabelle) - Fig. 1
- Idoneità della coppia torcente da trasmettere C output - Fig. 2
- Idoneità della coppia torcente applicata alla vite C input - Fig. 2
- Idoneità alle velocità di rotazione massime consentite in ingresso e in uscita - Fig. 2

CALCOLO DELLA COPPIA TORCENTE IN USCITA

C output [Nm] è determinato dalla somma di:

1. **Coppia di attrito o Coppia di frizione [C friction]**, dovuto all’attrito sfere/distanziali/tenute che è funzione dei carichi applicati secondo la formula sotto riportata (tiene conto dell’avvio):

   \[ C_{\text{friction}} [Nm] = 0,006 \times (4370 \times M_f + |F_a| \times \text{CODE}* + 3,78 \times \text{CODE}* \times Fr) \]

   ATTENZIONE alle unità: \( F_a [KN] \) / \( Fr [KN] \) / \( M_f [KNm] \) / \( \text{CODE} [mm] \)*

   *esempio SG 175 - > CODE = 175

2. **Coppia resistente operativa [C op]**, cioè dovuta a resistenze esterne, normalmente costituite da una Forza resistente \( F_\text{op} \) parallela al tavola applicata ad una distanza \( [b] \) dall’asse di rotazione o direttamente da un Coppia resistente.

   \[ C_{\text{op}} [Nm] = F_\text{op} \times b \] unità: \( F_\text{op} [N] \), \( b [m] \)

   \[ C_{\text{output}} [Nm] = C_{\text{friction}} [Nm] + C_{\text{op}} [Nm] < \text{Massima coppia trasmettibile in uscita} \]
CALCULO DELLA COPPIA TORCENTE IN INGRESSO (SELEZIONE DEL MOTORE)

Una volta calcolata la coppia totale da trasmettere \( C_{output} \) si passa al calcolo della coppia torcente minima da applicare alla vite per assicurare l'inizio del movimento \( C_{start} \) passando per:

1. Il rapporto di riduzione della tavola \( i \) espresso nelle tabelle SG.
2. Il rendimento della trasmissione \( \mu \) del 40%, ovvero la corrispondente perdita di potenza.

\[
C_{start} [Nm] = \frac{C_{output} \times \mu}{i}
\]

LA COPPIA DI PROGETTO \( C_{input} [Nm] \) CON CUI SELEZIONARE IL MOTORE DOVRÀ ESSERE MAGGIORATA DEL 40 AL 100% A SECONDA DELLA NECESSITÀ OPERATIVE.

\[ C_{input} [Nm] = C_{start} [Nm] + 40\% - 100\% \]
\(< \text{Massima coppia trasmettibile in ingresso} \]

Le tavole motorizzate possono risultare di utilizzo molto versatile risolvendo esigenze di compattezza, precisione, rigidità e resistenza agli agenti atmosferici.
Slewing gear can be driven using two different ways, or with a hydraulic motor, in which the standard attachment is provided on all SG models, or with electric motor and gearbox, for which it is necessary to apply an adapter flange in case is a rigid connection needed.

**SIZE SELECTION**

The selection of the right size of Slewing gears model must comply the following requirements:
- Resistance to Load conditions (see part 2 for Equivalent Load calculation and load curves under tables) - Fig. 1
- Suitable to transmit the required output Torque C output - Fig. 2
- Suitable to accept the required Input Torque applied to the worm screw C input - Fig. 2
- Suitable to accept the maximum permitted rotation speed, output and input - Fig. 2

\[ C_{output} [Nm] = C_{friction} [Nm] + C_{op} [Nm] \]

**CALCULATION OF THE OUTPUT TORQUE**

\[ C_{friction} [Nm] = 0.006 \times [4370 \times Mf + |Fa| \times CODE^* + 3.78 \times CODE^* \times Fr] \]

ATTENTION to units: Fa[kN] / Fr[kN] / Mf[kNm] / CODE [mm]^*  *example SG 175 - > CODE = 175

\[ C_{op} [Nm] = F_{op} \times b \]

units: F_{op}[N], b[m]

\[ C_{output} [Nm] = C_{friction} [Nm] + C_{op} [Nm] \] < Maximum transmittable torque
CALCULATION OF THE INPUT TORQUE (MOTOR DESIGN)

Once $C_{\text{output}}$ has been calculated, it is necessary to pass to the calculation of the minimum torque applicable to the screw in order to start rotation $C_{\text{start}}$. Calculation factors are:

1. the reduction ratio of the table $[i]$ expressed in all the the SG tables.
2. The transmission efficiency $\mu$ corresponding to the residual power (40%)

$C_{\text{start}} [\text{Nm}] = \frac{C_{\text{output}} \cdot \mu}{i}$

THE DESIGN TORQUE $C_{\text{input}} [\text{Nm}]$ MUST BE INCREASED FROM 40% UP TO 100%, ACCORDING THE OPERATIONAL NEEDS, IN ORDER TO SELECT THE SUITABLE MOTOR UNIT:

$C_{\text{input}} [\text{Nm}] = C_{\text{start}} [\text{Nm}] + 40\% - 100\%$

$< \text{Maximum transmittable Input Torque}$

Slewing drives can be very useful to comply both compactness and performance needs, ensuring high stiffness and superior protection to atmospheric agents.
SG 175

TAVOLA GIREVOLE CON VITE SENZA FINE
SLEWING GEARS WITH WORM DRIVE

<table>
<thead>
<tr>
<th>Massima coppia in uscita sulla tavola Max Output Torque</th>
<th>Massima Coppia in ingresso Max Input Torque</th>
<th>Rendimento vite-madre-vite Worm gear Efficiency</th>
<th>Massima velocità in uscita Max output Speed</th>
<th>Massima velocità in ingresso Max input Speed</th>
<th>Coppia di irreversibilità Holding Torque</th>
<th>Rapporto di riduzione Ratio of Worm Gear</th>
<th>Precisione sul posizionamento Tracking precision</th>
<th>Peso Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>[KNm]</td>
<td>[Nm]</td>
<td>[μ]</td>
<td>[RPM]</td>
<td>[RPM]</td>
<td>[KNm]</td>
<td>[i]</td>
<td>[degrees°]</td>
<td>[kg]</td>
</tr>
<tr>
<td>3,5</td>
<td>180</td>
<td>40%</td>
<td>1,0 continuous</td>
<td>2,5 NOT continuous</td>
<td>47 continuous</td>
<td>94 NOT continuous</td>
<td>20</td>
<td>47:1</td>
</tr>
</tbody>
</table>

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Esempio di designazione completa valida per serie SG / Designation example valid for SG series

1 2 3 Option 1 Option 2
SG 175 - 25 - RH - ENC - RAL

1 Codice tavola girevole / slewing gears code
2 Tipo albero di ingresso / input shaft type
3 Verso di entrata / input side
   RH Ingresso destro / Right side input (Standard, as the image on top)
   LH Ingresso sinistro / Left side input (opposite side)
   RL Ingresso sui due lati / Both sides input
Option 1 Con Encoder / with Encoder
Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
SG 175

Ω12  Ω14  Ω16  Ω10  Ω25

- STANDARD IN STOCK

6B SPLINE
**SG 222**  
**TAVOLA GIREVOLE CON VITE SENZA FINE**  
**SLEWING GEARS WITH WORM DRIVE**

<table>
<thead>
<tr>
<th>Massima coppia in uscita sulla tavola (Max Output Torque)</th>
<th>Massima coppia in ingresso (Max Input Torque)</th>
<th>Rendimento vite-madrevite (Efficiency)</th>
<th>Massima velocità in uscita (Max Output Speed)</th>
<th>Massima velocità in ingresso (Max Input Speed)</th>
<th>Coppia di irreversibilità (Holding Torque)</th>
<th>Rapporto di riduzione (_ratio of Worm Gear)</th>
<th>Precisione sul posizionamento (Tracking precision)</th>
<th>Peso (Weight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>[KNm]</td>
<td>[Nm]</td>
<td>[-]</td>
<td>[RPM]</td>
<td>[RPM]</td>
<td>[KNm]</td>
<td>[-]</td>
<td>[degrees°]</td>
<td>[kg]</td>
</tr>
<tr>
<td>8,0</td>
<td>300</td>
<td>40%</td>
<td>1,0 continuous</td>
<td>2,5 NOT continuous</td>
<td>62 continuous</td>
<td>155 NOT continuous</td>
<td>38.7</td>
<td>≤ 0.15 *</td>
</tr>
</tbody>
</table>

Diagramma di carico statico valido per sforzi compressivi  
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria  
Suspended load: specific bolts calculation required

### Momento ribaltante equivalente [KNm]  
*Equivalent tilting moment [KNm]*

Carico ultimo/Survival load  
Limite statico/Static limit  
Limite dinamico/Dynamic limit

### Fa  
*Carico assiale equivalente [KN]  
*Equivalenl axial load [KN]*

Esempio di designazione completa valida per serie SG / Designation example valid for SG series

1  
2  
3  
Option 1  
Option 2

**SG 222** - **25** - RH - ENC - RAL  
1 Codice tavola girevole / g/ sowing gears code  
2 Tipo albero di ingresso / input shaft type  
3 Verso di entrata / input side  
   RH Ingresso destro / Right side input (Standard, as the image on top)  
   LH Ingresso sinistro / Left side input (opposite side)  
   RL Ingresso sui due lati / Both sides input  
   Option 1 Con Encoder / with Encoder  
   Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
SG 222

Input RH (standard)

Ø12  Ø14  Ø16  Ø10  Ø25

■ STANDARD IN STOCK

6B SPLINE
SG 310

TAVOLA GIREVOLE CON VITE SENZA FINE
SLEWING GEARS WITH WORM DRIVE

<table>
<thead>
<tr>
<th>Momento ribaltante equivalente [KNm]</th>
<th>Equivalent tilting moment [KNm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massima coppia in uscita sulla tavola</td>
<td>Max Output Torque</td>
</tr>
<tr>
<td>Massima coppia in ingresso</td>
<td>Max Input Torque</td>
</tr>
<tr>
<td>Rendimento vite-madre-vite</td>
<td>Efficiency</td>
</tr>
<tr>
<td>Massima velocità in uscita</td>
<td>Max Output Speed</td>
</tr>
<tr>
<td>Massima velocità in ingresso</td>
<td>Max Input Speed</td>
</tr>
<tr>
<td>Coppia di ineribilità</td>
<td>Holding Torque</td>
</tr>
<tr>
<td>Rapporto di riduzione</td>
<td>Ratio of Worm Gear</td>
</tr>
<tr>
<td>Precisione sul posizionamento</td>
<td>Tracking precision</td>
</tr>
<tr>
<td>Peso</td>
<td>Weight</td>
</tr>
<tr>
<td>[KNNm]</td>
<td>[Nm]</td>
</tr>
<tr>
<td>9,5</td>
<td>300</td>
</tr>
</tbody>
</table>

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Esempio di designazione completa valida per serie SG / Designation example valid for SG series

1 2 3  Option 1  Option 2
SG 310 - 25 - RH - ENC - RAL

1 Codice tavola girevole / slewing gears code
2 Tipo albero di ingresso / input shaft type
3 Verso di entrata / input side
   RH Ingresso destro / Right side input (Standard, as the image on top)
   LH Ingresso sinistro / Left side input (opposite side)
   RL Ingresso sui due lati / Both sides input
Option 1 Con Encoder / with Encoder
Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
TAVOLA GIREVOLE CON VITE SENZA FINE
SLEWING GEARS WITH WORM DRIVE

SG 342

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Momente ribaltante equivalente [KNm]
Equivalent tilting moment [KNm]

Carico ultimo/Survival load
Limite statico/Static limit
Limite dinamico/Dynamic limit

Fa
Carico assiale equivalente [KN]
Equivalent axial load [KN]

Esempio di designazione completa valida per serie SG / Designation example valid for SG series

1 2 3  Option 1  Option 2
SG 342 - 25 - RH - ENC - RAL

1 Codice tavola girevole / slewing gears code
2 Tipo albero di ingresso / input shaft type
3 Verso di entrata / input side
   RH Ingresso destro / Right side input (Standard, as the image on top)
   LH Ingresso sinistro / Left side input (opposite side)
   RL Ingresso sui due lati / Both sides input
Option 1 Con Encoder / with Encoder
Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
SG 342

TAVOLE GIREVOLI - SLEWING GEARS

Input RH (standard)

Input LH

Ø12    Ø14    Ø16    Ø10    Ø25

■ STANDARD IN STOCK

6B SPLINE
SG 430

TAVOLA GIREVOLE CON VITE SENZA FINE
SLEWING GEARS WITH WORM DRIVE

<table>
<thead>
<tr>
<th>Massima coppia in uscita sulla tavola</th>
<th>Massima coppia in ingresso</th>
<th>Rendimento vite-madrevite</th>
<th>Massima velocità in uscita</th>
<th>Massima velocità in ingresso</th>
<th>Coppia di ineribilità</th>
<th>Rapporto di riduzione</th>
<th>Precisione sul posizionamento</th>
<th>Peso</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Output Torque</td>
<td>Max input Torque</td>
<td>Warm gear Efficiency</td>
<td>Max output Speed</td>
<td>Max input Speed</td>
<td>Holding Torque</td>
<td>Worm Gear</td>
<td>Tracking precision</td>
<td>Weight</td>
</tr>
<tr>
<td>(KNm)</td>
<td>(Nm)</td>
<td>[-]</td>
<td>(RPM)</td>
<td>(RPM)</td>
<td>(KNm)</td>
<td>[-]</td>
<td>[-]</td>
<td>(Kg)</td>
</tr>
<tr>
<td>13,0</td>
<td>300</td>
<td>40%</td>
<td>1,0 continuous</td>
<td>2,5 NOT continuous</td>
<td>104</td>
<td>continuous</td>
<td>104:1</td>
<td>96</td>
</tr>
</tbody>
</table>

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

<table>
<thead>
<tr>
<th>Carico ultimo/Survival load</th>
<th>Limite statico/Static limit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Diagrama de momento de giro
Equivalent tilting moment

Massimo carico assiale equivalente [KN]
Equivalent axial load [KN]

Esempio di designazione completa valida per serie SG / Designation example valid for SG series

1 2 3  Option 1  Option 2
SG 430 - 25 - RH - ENC - RAL

1 Codice tavola girevole / slewing gears code
2 Tipo albero di ingresso / input shaft type
3 Verso di entrata / input side
   RH Ingresso destro / Right side input (Standard, as the image on top)
   LH Ingresso sinistro / Left side input (opposite side)
   RL Ingresso sui due lati / Both sides input
Option 1 Con Encoder / with Encoder
Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
**SG 430**

**TAVOLE GIREVOLI - SLEWING GEARS**

**Input RH**
(standard)

**Input LH**

- **Ø12**  Ø14  Ø16  Ø10  Ø25
- **6B SPLINE**
- **STANDARD IN STOCK**
**SG 480**

**TAVOLA GIREVOLE CON VITE SENZA FINE**

**SLEWING GEARS WITH WORM DRIVE**

<table>
<thead>
<tr>
<th>Massima coppia in uscita sulla tavola</th>
<th>Massima Coppia in ingresso</th>
<th>Rendimento vite-madrevite</th>
<th>Massima velocità in uscita</th>
<th>Massima velocità in ingresso</th>
<th>Coppia di ineribilità Holding Torque</th>
<th>Rapporto di riduzione Ratio of Worm Gear</th>
<th>Precisione sul posizionamento Tracking precision</th>
<th>Peso Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Output Torque</td>
<td>Max Input Torque</td>
<td>Worm gear Efficiency</td>
<td>Max Output Speed</td>
<td>Max Input Speed</td>
<td>Torque</td>
<td>Efficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>[KNm]</td>
<td>[Nm]</td>
<td>[°]</td>
<td>[RPM]</td>
<td>[RPM]</td>
<td>[KNm]</td>
<td>[°]</td>
<td>[kg]</td>
<td></td>
</tr>
<tr>
<td>18,5</td>
<td>300</td>
<td>40%</td>
<td>1.0 continuous</td>
<td>94 continuous</td>
<td>2,5 NOT continuous</td>
<td>80,1</td>
<td>94:1</td>
<td>≤ 0.1 °</td>
</tr>
</tbody>
</table>

Diagramma di carico statico valido per sforzi compressivi

Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloniera
Suspended load: specific bolts calculation required

**Diagramma di carico statico valido per sforzi compressivi**

**Carico ultimo/Survival load**

**Carico assiale equivalente [KN]**

**Equivalent axial load [KN]**

**Esempio di designazione completa valida per serie SG / Designation example valid for SG series**

1 Codice tavola girevole / slewing gears code
2 Tipo albero di ingresso / input shaft type
3 Verso di entrata / input side
   RH Ingresso destro / Right side input (Standard, as the image on top)
   LH Ingresso sinistro / Left side input (opposite side)
   RL Ingresso sui due lati / Both sides input
Option 1 Con Encoder / with Encoder
Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
SG 480

Input RH (standard)

Input LH

Cover for protecting the worm

312.5

377.5

R312.5 x 2

31-M16 x 2 Tap32 Equally Spaced

32-M16 x 2 Tap32 Equally Spaced

6B Spline

Standard in stock

Ø12 Ø14 Ø16 Ø10 Ø25

193
Esempio di designazione completa valida per serie SG / Designation example valid for SG series

1  SG 540  2 25  3  RH  Option 1  Option 2

1 Codice tavola girevole / slewing gears code
2 Tipo albero di ingresso / input shaft type
3 Verso di entrata / input side
   RH Ingresso destro / Right side input (Standard, as the image on top)
   LH Ingresso sinistro / Left side input (opposite side)
   RL Ingresso sui due lati / Both sides input

Option 1 Con Encoder / with Encoder
Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
TAVOLE GIREVOLI - SLEWING GEARS

SG 540

Input RH (standard)

Input LH

Ø12    Ø14    Ø16    Ø10    Ø25

■ STANDARD IN STOCK

6B SPLINE
### SG 630

**TAVOLA GIREVOLI CON VITE SENZA FINE**

**SLEWING GEARS WITH WORM DRIVE**

<table>
<thead>
<tr>
<th>Momento ribaltante equivalente [KNm]</th>
<th>Equivalent tilting moment [KNm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Output Torque</td>
<td>Max input Torque</td>
</tr>
<tr>
<td>(KNm)</td>
<td>(Nm)</td>
</tr>
<tr>
<td>34,2</td>
<td>800</td>
</tr>
</tbody>
</table>

Diagramma di carico statico valido per sforzi compressivi
Static load charts valid for compressive loads

Carico sospeso: occorre verifica specifica della bulloneria
Suspended load: specific bolts calculation required

Esempio di designazione completa valida per serie SG

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>Option 1</th>
<th>Option 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SG 630</td>
<td>25</td>
<td>RH</td>
<td>ENC</td>
<td>RAL</td>
</tr>
</tbody>
</table>

1 Codice tavola girevole / slewing gears code
2 Tipo albero di ingresso / input shaft type
3 Verso di entrata / input side
   - RH Ingresso destro / Right side input (Standard, as the image on top)
   - LH Ingresso sinistro / Left side input (opposite side)
   - RL Ingresso sui due lati / Both sides input
Option 1 Con Encoder / with Encoder
Option 2 RAL a scelta / Customized RAL (Standard RAL 6029)
TAVOLE GIREVOLI - SLEWING GEARS

SG 630

Input RH (standard)

- Ø650
- Ø565
- Ø525
- Ø630
- Ø675
- Ø725

2-1/8"-27NPT Grease Nipple

36- M20 Tap40 Equally Spaced

35-M20 Tap40 Based On 36 Equally Spaced

R396.5±3

Ø12 Ø14 Ø16 Ø10 Ø25

■ STANDARD IN STOCK

6B SPLINE
CUSCINETTI DI BASE RICAMBIO PER ESCAVATORI

SLEWING BEARING SPARE PART FOR EXCAVATOR
LISTA DI RALLE PER ESCAVATORI - LIST OF SLEWING BEARINGS FOR EXCAVATORS

1 - Komatsu PC40-10
2 - Komatsu PW60-5
3 - Komatsu PC80-5(1)
4 - Komatsu PC60-5(2)
5 - Komatsu PC60-4(1-76)
6 - Komatsu PC60-6(2-80)
7 - Komatsu PC60-7(2-76)
8 - Komatsu PC60-7(2-80)
9 - Komatsu PC90-6
10 - Komatsu PC100-5
11 - Komatsu PC120-5
12 - Komatsu PC120-6(4D95)
13 - Komatsu PC120-6(4D102)
14 - Komatsu PC130-7
15 - Komatsu PC150-7
16 - Komatsu PC20HT
17 - Komatsu PC200-1
18 - Komatsu PC200-2
19 - Komatsu PC200-3
20 - Komatsu PC200-5
21 - Komatsu PC200-6(1)
22 - Komatsu PC200-6(2)
23 - Komatsu PC200-6(New)
24 - Komatsu PC200-6(ED95)
25 - Komatsu PC200-7
26 - Komatsu PC200-8
27 - Komatsu PC220-3
28 - Komatsu PC220-5
29 - Komatsu PC220-7
30 - Komatsu PC220-8
31 - Komatsu PC228
32 - Komatsu PC240-8
33 - Komatsu PC300-2
34 - Komatsu PC300-3
35 - Komatsu PC300-5
36 - Komatsu PC300-6
37 - Komatsu PC350-6
38 - Komatsu PC360-7
39 - Komatsu PC400-1
40 - Komatsu PC400-3
41 - Komatsu PC400-5
42 - Komatsu PC400-6
43 - Komatsu PC450-5
44 - Komatsu PC450-6
45 - Komatsu PC450-7
46 - Komatsu PC650
47 - Hitachi EX60-1
48 - Hitachi EX60-2,3
49 - Hitachi EX60-5
50 - Hitachi EX90
51 - Hitachi EX100-5
52 - Hitachi EX120-2
53 - Hitachi EX120-3
54 - Hitachi EX120-3
55 - Hitachi EX120-1
56 - Hitachi EX120-5
57 - Hitachi EX130
58 - Hitachi EX160WD-1
59 - Hitachi EX200-1
60 - Hitachi EX200-2,3,5
61 - Hitachi ZX200
62 - Hitachi ZX210-5
63 - Hitachi ZX210
64 - Hitachi ZX220-5
65 - Hitachi ZX225U (1)
66 - Hitachi ZX225U (2)
67 - Hitachi ZX230
68 - Hitachi ZX240
69 - Hitachi ZX270
70 - Hitachi EX300-1
71 - Hitachi EX300-2
72 - Hitachi EX300-3
73 - Hitachi EX300-5
74 - Hitachi ZX330
75 - Hitachi ZX350-5
76 - Hitachi ZX450H
77 - Kato HD220-7
78 - Kato HD450-5
79 - Kato HD450-7
80 - Kato HD450
81 - Kato HD512
82 - Kato HD516
83 - Kato HD770SE
84 - Kato HD770-1
85 - Kato HD770-2
86 - Kato HD700-2
87 - Kato HD700-5
88 - Kato HD700-7
89 - Kato HD800-5
90 - Kato HD800-7
91 - Kato HD820-1
92 - Kato HD820-3
93 - Kato HD1250/1430
94 - Kobelco SK120-5
95 - Kobelco SK130-7
96 - Kobelco SK07-1
97 - Kobelco SK07-1-N2
98 - Kobelco SK07-N2 (1)
99 - Kobelco SK07-N2 (2)
100 - Kobelco SK07-2
101 - Kobelco SK090B
102 - Kobelco SK09
103 - Kobelco SK03
104 - Kobelco SK04
105 - Kobelco SK60-5
106 - Kobelco SK60-6
107 - Kobelco SK200-3/5
108 - Kobelco SK200-6
109 - Kobelco SK210-6E
110 - Kobelco SK200-8
111 - Kobelco SK235
112 - Kobelco SK330-3
113 - Kobelco SK350
114 - Kobelco SK450-6E
115 - Sumitomo SH60-1
116 - Sumitomo SH120-1
117 - Sumitomo SH120-2
118 - Sumitomo SH120-3
119 - Sumitomo SH120
120 - Sumitomo SH140
121 - Sumitomo SH145
122 - Sumitomo SH200A1
123 - Sumitomo SH200A2
124 - Sumitomo SH200A3
125 - Sumitomo SH20002
126 - Sumitomo SH20003
127 - Sumitomo SH220-2
128 - Sumitomo SH220-3
129 - Sumitomo SH225
130 - Sumitomo SH260
131 - Sumitomo SH265
132 - Sumitomo SH280
133 - Sumitomo SH300-2
134 - Sumitomo SH300-3
135 - Sumitomo SH330
136 - Sumitomo SH340
137 - Sumitomo SH350
138 - Sumitomo SH40T
139 - Sumitomo SH430
140 - Daewoo DH55-3
141 - Daewoo DH55-5
142 - Daewoo DH200-3
143 - Daewoo DH220-2
144 - Daewoo DH220-3
145 - Daewoo DH220-5
146 - Daewoo DH220-7LC
147 - Daewoo DH225-7
148 - Daewoo DH280
149 - Daewoo DH295-5
150 - Daewoo DH300-5
151 - Daewoo DH300-7
152 - Daewoo DH10L
153 - Daewoo DH320
154 - Daewoo DH330-3
155 - Caterpillar CAT110
156 - Caterpillar CAT215
157 - Caterpillar CAT215B
158 - Caterpillar CAT225
159 - Caterpillar CAT280
160 - Caterpillar CAT2008
161 - Caterpillar CAT305S
162 - Caterpillar CAT320B
163 - Caterpillar CAT320C
164 - Caterpillar CAT320D
165 - Caterpillar CAT320L
166 - Caterpillar CAT325
167 - Caterpillar CAT325B
168 - Caterpillar CAT325C
169 - Caterpillar CAT330C
170 - Hyundai R55-7
171 - Hyundai R60-5
172 - Hyundai R60-7(1)
173 - Hyundai R60-7(2)
174 - Hyundai R110-7
175 - Hyundai R130-5
176 - Hyundai R130-7
177 - Hyundai R170-5
178 - Hyundai R200-5
179 - Hyundai R200-7
180 - Hyundai R210-3
181 - Hyundai R215-7
182 - Hyundai R220-5
183 - Hyundai R225-7
184 - Hyundai R260LC-7
185 - Hyundai R290
186 - Hyundai R305LC-7
187 - Hyundai R300
188 - Hyundai R290
189 - Hyundai R210-7
190 - Hyundai R210-9
191 - Volvo EC210B
192 - Volvo EC210C
193 - Volvo EC280C
194 - Volvo EC280D
195 - Volvo EC300C
196 - Volvo EC300D
197 - Liebherr 934
198 - Liebherr 924
199 - Liebherr 914
200 - Mitsubishi 230
201 - Atlas 3306
CONTROLLO DELLA PLANARITÀ - Flatness Check

Il cuscinetto di base, seppur progettato per resistere alle massime sollecitazioni compressive e flessionali, conserva una intrinseca elasticità strutturale dovuta alla sua geometria, ovvero sezione ridotta confrontata al grande diametro. Questa elasticità strutturale, con il fissaggio tramite bulloneria del cuscinetto alla struttura di supporto, produce un “adattamento” della ralla stessa agli errori di planarità della superficie che, se non contenuti entro certi limiti, possono provocare problemi alla fase di rotazione. Di seguito i valori massimi degli scostamenti sulla planarità $\partial_r$ e $\partial_p$, in direzione circonferenziale e radiale, per cuscinetti con giochi standard.

The slewing ring, even though designed to resist to the maximum compressive and tilting loads, shows an intrinsic structural elasticity due to its own geometry, that is a reduced section compared to a large diameter. This structural elasticity, when the bearing is fixed by bolts to the companion structure, involves an “adaptation” of the bearing itself to the flatness deviation of the mounting surface. These deviations, if not contained into the limits, may generate rotational problems. Below, the permissible flatness deviations $\partial_p$ e $\partial_r$, measured along the circumferential and radial directions, valid for standard clearance bearings.

<table>
<thead>
<tr>
<th>TIPO DI CUSCINETTO</th>
<th>BEARING TYPE</th>
<th>DIAMETRO DI ROTOLAMENTO / RACEWAY DIAMETER</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFERE / BALL</td>
<td></td>
<td>$&lt;500$ $&lt;750$ $&lt;1000$ $&lt;1200$ $&lt;1500$ $&lt;2000$ $&lt;2500$ $&lt;3000$ $&lt;3500$ $&lt;4000$ $&lt;4500$</td>
</tr>
<tr>
<td>RULLI / ROLLER</td>
<td></td>
<td>$0.07$ $0.09$ $0.11$ $0.13$ $0.15$ $0.17$ $0.19$ $0.25$ $0.30$ $0.35$ $0.40$ $0.50$</td>
</tr>
</tbody>
</table>

Tabella degli scostamenti circonferenziali massimi $\partial_p_{\text{max}}$ in funzione del diametro di rotolamento.
Per cuscinetti con gioco ridotto o precaricati contattare il nostro Ufficio Tecnico.

Table of values of maximum circumferential deviations $\partial_p_{\text{max}}$ depending on raceway diameter.
For reduced clearance or preloaded bearings please contact our Technical Office.
SERRAGGIO DELLA BULLONERIA - BOLTS TIGHTENING

Rispettare le seguenti regole:

1. utilizzare chiavi dinamometriche o un tensionatore idraulico
2. utilizzare preferibilmente viti a gambo parzialmente filettato
3. utilizzare viti, dadi e rondelle piane classe 10.9, con cui sono calcolati i grafici di resistenza
4. non riutilizzare la bulloneria
5. controllare il serraggio ogni 600 ore di lavoro

Strictly follow these rules:

1. use dynamometric wrench or a hydraulic preloading tool
2. use only bolts partial threaded bolts
3. use bolts, nuts and plane washers class 10.9, the same of resistance catalogue graph
4. do not reuse bolts, nuts and washers
5. check tightening every 600 working hours

Sequenza di serraggio:

si raccomanda di serrare in tre passaggi al 30-70-100% del valore di coppia tabellato. Controllare la rotazione durante il serraggio.

Tightening sequence:

we recommend to tight on three steps at 30-70-100% of below torque values. Check rotation during tightening.
OPERAZIONI PRELIMINARI - PRELIMINARY OPERATIONS

Le operazioni preliminari al posizionamento del cuscinetto sulla struttura di collegamento sono le seguenti (prego rispettare tale successione):

1. pulitura con solventi chimici e controllo visivo delle superfici di collegamento delle strutture. Le superfici dovranno risultare esenti da bave o difetti di lavorazione, ad esempio in prossimità dei fori, oppure residui di saldatura o verniciatura.
2. controllo con comparatore o con l’utilizzo di misuratori laser del massimo errore di planarità delle superfici di collegamento secondo i valori limite indicati a pagina 140.
3. rimozione del rivestimento oleoso protettivo delle superfici della ralla e della dentatura attraverso l’utilizzo di solventi. Si raccomanda di evitare assolutamente il contatto del solvente con le guarnizioni a labbro del cuscinetto in modo tale da impedire possibili deterioramenti o infiltrazioni.

The preliminary operations to be performed before positioning the slew bearing on companion structures are (please follow the succession):

1. clean with chemical solvents and perform a visual check of the mounting surfaces of companion structures. Surfaces must be free from burrs or machining defects, for example in proximity of holes, or else welding or painting residues.
2. check, with a gauge device or a laser measuring device, the flatness values of companion structures observing limit values listed on page 140.
3. remove the protective oil from the bearing surfaces and gear surfaces, using a chemical solvent. In order to avoid any sealing damages, do not put in contact the solvent with the sealing.

L’operazione di montaggio deve essere preceduta dal controllo e della preparazione delle superfici.

The checking and preparation of the mounting surfaces must come before the mounting operation.
Le successive operazioni riguardano il fissaggio del cuscinetto sulla struttura di collegamento. Si faccia riferimento all’esempio applicativo in basso.

4. Per fissare il cuscinetto alla struttura di collegamento è necessario in primis collocare il suo soft spot nella giusta posizione: sull’anello interno esso risulta essere in coincidenza del tappo e pertanto l’anello verrà orientato con il tappo a formare un angolo di circa 90° con la direzione di massimo sforzo operativo (flessione e compressione) in modo da sollecitare al minimo la pista in tal punto (gap di durezza).

5. Prima di serrare la bulloneria dell’anello interno controllare attraverso rotazioni complete che il cuscinetto non presenti punti duri: quindi fissare la bulloneria dell’anello. Controllare nuovamente che il cuscinetto ruoti uniformemente.

Following operations concern the fastening of the bearing to the companion structure. Please refer to the image below.

4. In order to fasten the bearing to the companion structure it is firstly necessary to set the soft spot in the right position. On the inner ring the soft spot coincides with the filling plug, so the ring must be oriented with the filling plug at about 90° from the maximum operative load direction in order to minimize the stress in that raceway point (hardness gap).

5. Before fastening the bearing with bolts check the free rotation of the bearing: it must be without any tight spot. Then tighten the bolts and finally check rotation again.
6. Fissare l’anello dentato sulla seconda struttura e se opportuno porre il soft spot, definito dalla lettera “S” stampigliata, a 90° circa dalla posizione di massimo carico. Procedere quindi al serraggio della bulloneria.

7. Occorre ora posizionare il motoriduttore che determina la rotazione della struttura. La sua registrazione viene definita regolando il gioco δf del pignone nel punto di massima eccentricità della dentatura (o minima, per le ralle dentate interne) definito da tre denti verniciati in verde (immagine in basso). In questo punto viene evidenziato il massimo valore di run-out della dentatura al di fuori della circonferenza primitiva, pertanto registrando il gioco ralla-pignone al valore di 0,03 ÷ 0,04 volte il valore del modulo in tutti gli altri punti la rotazione avverrà senza interferenze.

6. Fasten the geared ring to the second companion structure and, if suitable, set the soft spot defined by the stamped letter “S” at 90° from the maximum load direction. Then fasten the bolts.

7. Now it is necessary to assemble the gearbox to the structure. The fine position is determined by checking the backlash δf of the pinion teeth in the point of maximum eccentricity of the bearing gear, defined by three green painted teeth (see image below). This point represents the maximum run-out value of the gear outside the pitch diameter so, adjusting in this point the clearance pinion-bearing between 0,03 and 0,04 the module value, the rotation in all the other points will be ensured.

<table>
<thead>
<tr>
<th>MODULO</th>
<th>MIN δf</th>
<th>MAX δf</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0,12</td>
<td>0,16</td>
</tr>
<tr>
<td>4,5</td>
<td>0,13</td>
<td>0,18</td>
</tr>
<tr>
<td>5</td>
<td>0,15</td>
<td>0,2</td>
</tr>
<tr>
<td>6</td>
<td>0,18</td>
<td>0,24</td>
</tr>
<tr>
<td>8</td>
<td>0,24</td>
<td>0,32</td>
</tr>
<tr>
<td>10</td>
<td>0,3</td>
<td>0,4</td>
</tr>
<tr>
<td>12</td>
<td>0,36</td>
<td>0,48</td>
</tr>
<tr>
<td>14</td>
<td>0,42</td>
<td>0,56</td>
</tr>
<tr>
<td>16</td>
<td>0,48</td>
<td>0,64</td>
</tr>
<tr>
<td>18</td>
<td>0,54</td>
<td>0,72</td>
</tr>
<tr>
<td>20</td>
<td>0,6</td>
<td>0,8</td>
</tr>
<tr>
<td>22</td>
<td>0,66</td>
<td>0,88</td>
</tr>
<tr>
<td>24</td>
<td>0,72</td>
<td>0,96</td>
</tr>
<tr>
<td>25</td>
<td>0,75</td>
<td>1</td>
</tr>
<tr>
<td>28</td>
<td>0,84</td>
<td>1,12</td>
</tr>
<tr>
<td>30</td>
<td>0,9</td>
<td>1,2</td>
</tr>
</tbody>
</table>

Per controllare il gioco di ingranamento utilizzare uno spessimetro
To check the setting of the pinion backlash use a thickness gauge.
LUBRIFICAZIONE DELLE PISTE - RACEWAY LUBRICATION

La lubrificazione delle piste di rotolamento viene eseguita subito dopo il montaggio o in fasi intermedie nel momento in cui l’operazione risulti più agevole. In tutti casi va effettuata una attenta rilubrificazione del cuscinetto prima della messa in opera della macchina o dopo un lungo periodo di fermo. È buona norma che durante il funzionamento vi sia sempre un film di grasso sempre fresco sul bordo della guarnizione, che impedisce la contaminazione da agenti esterni. L’operazione di re-ingrasaggio è da effettuare:

✔ ogni 100 ore di attività della macchina su cui è montato (non solo di rotazione)
✔ con la ralla in rotazione
✔ utilizzando tutti gli ingrassatori

Il buon esito si raggiunge quando compare un film di grasso fresco sullo spessore della guarnizione.

Il re-ingrazzaggio serve anche per evacuare le piste da eventuale sporcizia interna accumulata. Se non è possibile ruotare la ralla durante il re-ingrasaggio bisogna prevedere un maggior numero di ingrassatori.

Si faccia riferimento alla lista dei grassi sottostanti, che all’occorrenza possono essere anche mischiati essendo compatibili (attenzione a ΔT).

The raceway lubrication may be conducted just after the installation of the bearing or in a intermediate phase. In any case an accurate re-greasing of the bearing must be performed before the machine start-up or before a long standstill time. It is an optimum condition that, during machine activity, the sealing shall be always protected by a layer of fresh grease coming out from the raceway, in order to avoid external contamination.

The re-greasing operation must be performed:

✔ every 100 hours of machine activity (not only rotation time)
✔ with the bearing in continuous rotation
✔ using whole greases

The operation is completed when a collar of fresh grease appears along the sealing of the bearing.

The re-greasing is also useful to evacuate the raceway from eventual internal moisture. If the bearing cannot rotate during this operation, the bearing design must include a major number of greasers. If necessary, lubricants can be mixed (check ΔT).

<table>
<thead>
<tr>
<th>PRODUTTORE</th>
<th>NOME DEL GRASSO (ΔT)</th>
<th>GREASE NAME (ΔT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agip</td>
<td>GR MU EP 2</td>
<td>-20° to +110°C</td>
</tr>
<tr>
<td>Aral</td>
<td>ARALUB HLP 2</td>
<td>-20° to +130°C</td>
</tr>
<tr>
<td>BP</td>
<td>ENERGREASE LS-EP 2</td>
<td>-20° to +130°C</td>
</tr>
<tr>
<td>Castrol</td>
<td>SPHEEROL EPL 2</td>
<td>-20°C to +120°C</td>
</tr>
<tr>
<td>Lagermeister</td>
<td>LAGERMEISTER EP 2</td>
<td>-20°C to +130°C</td>
</tr>
<tr>
<td>Esso</td>
<td>BEACON EP 2</td>
<td>-20°C to +120°C</td>
</tr>
<tr>
<td>Mobil</td>
<td>MOBILUX EP 2</td>
<td>-20°C to +120°C</td>
</tr>
<tr>
<td>Shell</td>
<td>ALVANIA EP 2</td>
<td>-20° to +130°C</td>
</tr>
<tr>
<td>Total</td>
<td>MULTIS EP 2</td>
<td>-25° to +120°C</td>
</tr>
<tr>
<td>Klober</td>
<td>CENTOPLEX EP 2</td>
<td>-25° to +130°C</td>
</tr>
</tbody>
</table>

Lubrificanti per le piste di rotolamento / Lubricant for raceways
LUBRIFICAZIONE DELLA DENTATURA - GEAR LUBRICATION

La lubrificazione della dentatura deve essere pensata in funzione dell’utilizzo e dell’ambiente in cui è installato il cuscinetto. Si consiglia di installare un sistema di lubrificazione automatica della dentatura, ad esempio in prossimità del pignone, in modo da ridistribuire il grasso sulle zone più interessate. In tutti i casi una completa lubrificazione su tutta la dentatura va eseguita manualmente prima della messa in opera della macchina, con un pennello pulito o un sistema spray, rimuovendo il grasso in eccesso.

The gear lubrication may be planned in function of the working characteristics and the environment conditions in which the bearing has been installed. We suggest to design an automatic lubrication gear system, for example in proximity of the pinion, in order to redistribute the grease on the most used part of the bearing gear. In any case, a complete gear lubrication must be manually performed just before the machine start-up, using a clean brush or a spray system, and then removing exceeded grease.

<table>
<thead>
<tr>
<th>PRODUTTORE</th>
<th>NOME DEL GRASSO (ΔT)</th>
<th>GREASE NAME (ΔT)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agip</strong></td>
<td>GR MU EP 2</td>
<td>-20° to +110 °C</td>
</tr>
<tr>
<td><strong>ARAL</strong></td>
<td>ARALUB MKA-Z-1</td>
<td>-25° to +180 °C</td>
</tr>
<tr>
<td><strong>bp</strong></td>
<td>ENERGREASE LC2</td>
<td>-30° to +140 °C</td>
</tr>
<tr>
<td><strong>Castrol</strong></td>
<td>LMX</td>
<td>-20°C to +120°C</td>
</tr>
<tr>
<td><strong>CEPLATTYN</strong></td>
<td>KG 10 H</td>
<td>-10°C to +140°C</td>
</tr>
<tr>
<td><strong>Esso</strong></td>
<td>Multi purpose grease (Molly)</td>
<td>-20°C to +130°C</td>
</tr>
<tr>
<td><strong>Mobil</strong></td>
<td>MOBILGEAR OGL 461</td>
<td>-20°C to +120°C</td>
</tr>
<tr>
<td><strong>MALLEUS</strong></td>
<td>OGH</td>
<td>-10°C to +200 °C</td>
</tr>
<tr>
<td><strong>GARDREXA</strong></td>
<td>GR 1 AL</td>
<td>-20° to + 200 °C</td>
</tr>
<tr>
<td><strong>GRAFLOSCON C-SG D ultra</strong></td>
<td></td>
<td>-30° to +200 °C</td>
</tr>
</tbody>
</table>

Lubrificanti per la dentatura di rally e pignone / Lubricant for pinion and bearing gear
MOVIMENTAZIONE E STOCCAGGIO - HANDLING & STORAGE

MOVIMENTAZIONE / HANDLING
Per una movimentazione ottimale del cuscinetto utilizzare almeno 3 golfari imbullonati ai fori ralla e distribuiti in modo uniforme lungo la circonferenza. Non aprire l’angolo delle catene sopra i 120°.

For an optimal handling of the bearing, use at least 3 eyebolts fixed to the bearings holes, equally spaced along the circumference. Do not exceed the chain angle over 120°.

Nel caso si debbano impilare i cuscinetti, per evitare danni alle superfici di contatto interporre fra cuscinetti impilati dei distanziali in legno fra anelli combacianti.

If the bearings must be piled, interpose wooden spacers between matching rings, in order to avoid damages on bearing surfaces.

STOCCAGGIO / STORAGE
Tenere i cuscinetti stoccati orizzontalmente chiusi nella loro cassa di legno oppure sul loro pallet protetti da cellophane evitando il contatto diretto con il suolo.

Storage the bearings horizontally in their own wooden crate or else on their pallet protected with cellophane, avoiding direct contact with the ground.

Stoccare preferibilmente al chiuso e comunque al riparo da agenti atmosferici, in zone a temperatura costante e lontano da zone umide. Controllare lo stato dell’olio protettivo ogni 6-12 mesi in funzione del tipo di ambiente di stoccaggio.

Stock the bearings preferably in indoor dry areas at constant temperature, in any case repaired from weather agents and humidity. Check the protective oil coating every 6-12 months basing on stock conditions.
CONDIZIONI GENERALI DI VENDITA - GENERAL SALES CONDITIONS

Introduzione
Le forniture dei prodotti, presenti in questo documento, sono regolate dalle seguenti condizioni generali di vendita. Sarà necessario un preventivo accordo scritto con il Fornitore per ulteriori ed eventuali clausole e/o condizioni particolari richieste dai Clienti.

Sono da ritenersi inaccettabili, tutte le clausole e/o condizioni contrattuali in contrasto con quanto sopra riportato.

1) Offerte ed ordini
Le offerte mantengono una validità di 30 giorni dalla data di comunicazione al Cliente. Decorso questo termine senza avere ricevuto l’ordine, il Fornitore avrà la facoltà di accettare o non accettare l’ordinazione tardiva. Tutti gli ordini dovranno indicare sempre la tipologia del prodotto, la quantità e la data di consegna richiesta. Il Fornitore si riserva il diritto di fornire eventualmente altri prodotti aventi le stesse caratteristiche merceologiche di quelli ordinati.

Gli ordini sono da intendersi impegnativi per il Cliente, anche senza la forma scritta. Il Fornitore avrà il medesimo obbligo al momento dell’invio della conferma d’ordine (escluse le eccezioni ai punti due e cinque).

2) Prezzi
I prezzi validi di riferimento sono quelli indicati nell’offerta e/o nell’accettazione dell’ordine e sono riferiti solo a prodotti standard. I prezzi relativi a tipologie speciali di prodotto e/o non standard ovvero a richiesta specifica del Cliente, saranno concordati per ogni singolo ordine di volta in volta tra le parti. Il Fornitore si riserva il diritto, per esigenze produttive e/o d’approvvigionamento, di fornire una quantità di prodotto con variazione pari a ± 15% rispetto alla quantità concordata con il Cliente. Nel corso delle diverse forniture qualora dovessero verificarsi degli aumenti causati da variazioni quali: aumento delle materie prime, del costo della mano d’opera del costo dei trasporti, delle imposte e dazi, ed anche altri aumenti che comportino aumenti del prodotto per il Fornitore, questo potrà a proprio insindacabile giudizio adeguare i prezzi, comunicando l’entità di tale aumento al Cliente. Le quotazioni dei prodotti, sono da intendersi franco sede del Fornitore, escluso imballo ed IVA.

3) Consegnna
La consegna, è da intendersi terminata ed eseguita nel momento in cui i prodotti sono messi a disposizione del Cliente al banco, presso la sede del Fornitore o con la consegna al vettore/spedizioniere. Se il Cliente non ha dato precise istruzioni sulle modalità di spedizione dei prodotti o non ha provveduto in modo celere al loro ritiro, il Fornitore potrà conservarli presso i propri locali; a rischio e pericolo ed a spese del Cliente, senza alcuna responsabilità per la loro conservazione o spedirli con mezzi propri o corrieri di propria scelta.

4) Termini di consegna
I termini di consegna indicati dal Fornitore, sono indicativi e non hanno carattere essenziale e perentorio. La loro inosservanza non costituirà in alcun caso motivo di risoluzione del contratto e/o risarcimento d’altun danno di qualsiasi natura. I termini saranno rispettati per quanto possibile, poiché la consegna dipende da soggetti terzi rispetto al Fornitore. Il Fornitore potrà risolvere il contratto e/o modificare i termini di consegna, senza che ciò possa costituire in alcun modo motivo di risarcimento e/o pagamento d’indennità per eventuali danni subiti dai Clienti, nei seguenti casi:

I. Inadempienza dei pagamenti e/o pendenze debitorie da parte del Cliente.
II. Difficoltà in fase d’approvvigionamento dei prodotti.
III. Modifiche alle condizioni contrattuali dopo il ricevimento dell’ordine.
IV. Eventi di causa e/o forza maggiore, non imputabili alla volontà del Fornitore, quali a titolo di esempio scioperi di vario genere, calamità naturali, epidemie, sommossa, tumulti, guerre, blocchi doganali che pos- sono gravare sul Fornitore stesso o sulle sue fonti d’approvvigionamento.
V. Inaspettate o ritardi da parte del Cliente nella conferma dell’ordine.

Per i fatti riportati ai punti I-III-V il Fornitore potrà chiedere il risarcimento dei danni al Cliente.

Introduction
The supply of the products covered by this document is governed by the following general conditions of sale. Any additional clauses and/or special conditions requested by Customers shall only be valid in case of prior written agreement with the Supplier.

All contract clauses and/or conditions in conflict with the terms set out below shall be considered unacceptable.

1) Offers and orders
Offers are valid for 30 days from the date of communication to the Customer. If no order is received within this period, the Supplier shall have the option of accepting or rejecting late orders, at its own discretion. All orders must always state the type of product, the quantity and the delivery date required.

The Supplier reserves the right to supply different products with the same characteristics as those ordered.

Orders are binding on the Customer even if not in writing. Orders shall also be binding on the Supplier once the confirmation of order has been dispatched (with the exceptions in points two and five below).

2) Prices

The valid reference prices are those stated in the offer and/or the order acceptance, and refer to standard products only. The prices relating to special and/or nonstandard product types, or to specific requests from the Customer, shall be agreed between the parties for each order on a one-off basis. Depending on production and/or procurement requirements, the Supplier reserves the right to supply a quantity of product with variation of +/-10% from the quantity agreed with the Customer. Over a series of shipments, if increases occur due to variations such as increases in raw material costs, in the cost of labour, freight costs, taxes and duties, or any other increases which lead to increases in the cost of the product for the Supplier, the latter may adjust the prices accordingly, at its own absolute discretion, informing the Customer of the amount of any such increase. Quotations for products are ex-works Supplier’s factory, not including packaging or VAT.

3) Delivery

Delivery is considered to have taken place when the products are placed on the Customer’s disposal on the counter on the Supplier’s premises, or on consignment to the carrier/forwarding agent. If the Customer has not given clear instructions concerning the procedures for shipment of the products, or has not arranged for their prompt collection, the Supplier may store them on its own premises, at the Customer’s risk and expense, without any responsibility for their conservation, or may ship them using its own vehicles or carriers of its choice.

4) Delivery terms

The delivery terms stated by the Supplier are guideline and not binding. In no case shall failure to meet them constitute grounds for termination of the contract and/or for compensation for any damage of any kind. Delivery terms shall be complied with as far as possible, since delivery depends on third parties over which the Supplier has no control. The Supplier may terminate the contract and/or modify the delivery terms, without this constituting grounds for compensation and/or payment of damages for any costs or losses incurred by the Customer, in the following cases:

I. Failure to meet payment terms and/or outstanding debts on the part of the Customer.
II. Difficulty in procurement of the products.
III. Modifications of the contract conditions after receipt of the order.
IV. Circumstances of force majeure, beyond the Supplier’s control, such as, for example, strikes of various kinds, natural disasters, epidemics, uprisings, riots, wars or customs blockades which may affect the Supplier itself or its sources of supply.
V. Inaccuracies or delays on the part of the Customer in confirming the order.

In the circumstances listed in points I-III-V, the Supplier may request compensation from the Customer.
CONDIZIONI GENERALI DI VENDITA - GENERAL SALES CONDITIONS

5) Spedizioni
Le spedizioni sono sempre eseguite per conto dei Clienti, pertanto a loro rischio e pericolo, anche nei casi di trasporti “franco destino”. Nel caso d’eventuali manomissioni o ammanichi imputabili espressamente al vettore/spedizioniere, sarà obbligo del Cliente stesso di presentare reclamo direttamente al vettore/spedizioniere. Il Fornitore, potrà accettare reclami per eventuali differenze, qualitative e quantitative dei prodotti, solamente se comunicate da parte del Cliente, in forma scritta entro otto giorni dalla data di ricevimento dei prodotti, a pena di decadenza da ogni e qualsiasi reclamo. In mancanza d’istanze dettagliate da parte del Cliente, il Fornitore non sarà responsabile, sia per la scelta dei mezzi di trasporto, sia per le tariffe applicate dai vettori/spedizioniieri. Inoltre qualora non si sussista accordo tra le parti, le spese di spedizione sono da intendersi a cura ed a carico del Cliente. Nei casi in cui anche solo una parte delle spese di trasporto sia a carico del Fornitore, quest’ultimo potrà servirsi dei mezzi più economici a propria insindacabile scelta. Gli ulteriori aggrevi e oneri aggiuntivi nei costi di trasporto saranno ad esclusivo carico del Cliente. Per errori di consegna causati dal Cliente, con conseguente reso dei prodotti, il Fornitore avrà il diritto di addebitare al Cliente le spese di spedizione se dovute, ed il 15% del prezzo dei prodotti.

6) Pagamenti
Il Cliente non potrà sospendere ovvero ritardare i pagamenti della merce per nessun motivo e dovranno essere eseguiti al domicilio del Fornitore, come indicato nei documenti che accompagnano la spedizione dei prodotti. Non saranno considerati validi i Pagamenti effettuati in luoghi diversi, salvo che non siano stati concordati preventivamente con il Fornitore. Decorso i termini indicati, il Fornitore avrà diritto al pagamento, oltre alla somma capitale dovuta per il prezzo della merce, anche agli interessi di mora pari all’Euribor aumentato del 3%, avvalendosi del diritto di agire anche giudizialmente nei confronti del Cliente moroso. Il Fornitore ha la facoltà di sospendere temporaneamente la fabbricazione o la fornitura dei prodotti ancora in ordine, inoltre potrà annullare il residuo dell’ordine stesso, comunicandolo al Cliente, che non avrà diritto ad indennizzi d’alcun genere. Il Fornitore avrà il diritto di ottenere il pagamento delle somme dovutegli per le consegne già eseguite. Per ogni contestazione inerente a prodotti in corso di fabbricazione, pronti per essere spediti o già in possesso del Cliente, quest’ultimo non è liberato dai propri obblighi e dovrà provvedere al pagamento, alla data stabilita, di quanto dovuto al Fornitore.

7) Garanzia
La garanzia s’estende per un anno dalla data di consegna dei prodotti; è limitata esclusivamente alla riparazione o alla sostituzione gratuita dei pezzi riconosciuti non conformi rispetto alle specifiche che riportate sui cataloghi tecnici. La responsabilità della garanzia del Fornitore decade per tutti i prodotti che hanno subito manomissioni, sovraccarichi d’esercizio, lubrificazioni, riparazioni errate o errori in fase di montaggio, quindi per problemi causati da un utilizzo improprio del Cliente e pertanto non più restituibili al Fornitore. Il Cliente inoltre è tenuto ad avvertire il Fornitore per eventuali difetti, vizi o non conformità dei prodotti entro otto giorni dal ricevimento degli stessi (in forma scritta), pena la decadenza della garanzia. Non saranno accettati reclami trascorsi i termini sopra citati. I reclami non possono causare l’annullamento o la riduzione degli ordini da parte del Cliente, né la corresponsione d’indennizzi e/o risarcimenti da parte del Fornitore. Non si accettano ritorni di forniture, per prodotti resi non integri o manomessi o espressamente costruiti, lavorati e/o modificati per il Cliente. Il materiale non conforme dovrà essere reso previa autorizzazione del Fornitore, esente da ogni spesa (franco destino). Sul documento di reso dovranno essere riportati gli estremi del DDT o fattura di vendita relativa (Data e n° - obbligatorio per legge). Il Fornitore non assume alcuna responsabilità per incidenti che possano avvenire nell’utilizzo dei propri prodotti.

5) Shipments
Shipments are always made on the Customer’s behalf and therefore at its risk, even in case of delivery “freight prepaid”. In case of tampering or missing items for which the carrier/forwarding agent is specifically to blame, the Customer shall be responsible for placing a claim directly with the carrier/forwarding agent. The Supplier will only be able to accept claims for any differences in the quality or quantity of the products if submitted by the Customer, in writing within eight days after the date of receipt of the products; otherwise, all claims shall become null and void. In the absence of detailed instructions from the Customer, the Supplier shall not be responsible for the choice of means of transport or for the rates charged by the carriers/forwarding agents. Moreover, in the absence of agreement between the parties, the shipment expenses shall be payable by the Customer. If even just a part of the freight costs is to be met by the Supplier, the latter shall be permitted to make use of the most economical means of transport, at its own absolute discretion. Any additional freight costs and/or charges shall be solely for the Customer’s account. For errors in delivery caused by the Customer which result in return of the products, the Supplier shall be entitled to charge the Customer the shipment expenses, if due, plus 15% of the price of the products.

6) Payment
The Customer shall not be permitted to suspend or delay payments for goods for any reason, and payments must be made to the Supplier’s domicile, as stated in the documents that accompany the shipment of the products. Payments made to other places shall not be considered valid unless agreed in advance with the Supplier. Once the specified payment terms have passed, the Supplier shall be entitled to payment, not only of the capital sum due for the price of the goods, but also of interest at the Euribor rate increased by 3%, and retains the right to take legal action against any Customer late with payments. The Supplier shall be entitled to temporarily suspend the manufacture or supply of any products still on order; it may also cancel the remainder of the order, informing the Customer, which shall not be entitled to compensation of any kind. The Supplier shall be entitled to obtain payment of the sums due to it for the deliveries already made. In case of any disputes concerning products being manufactured, ready for shipment or already in the Customer’s possession, the latter shall not be released from its obligations and must pay the amounts due to the Supplier at the date set.

7) Warranty
The warranty is valid for one year from the date of delivery of the products; it is limited solely to the repair or replacement, free of charge, of pieces acknowledged not to comply with the specifications stated in the technical catalogues. The Supplier’s warranty ceases to apply to all products which have been tampered with, operated with overloads, improperly lubricated or repaired, or incorrectly assembled; in other words, for all problems caused by improper use by the Customer, for which the Supplier is not responsible. The Customer is also obliged to inform the Supplier about any defects, faults or nonconformity of the products within eight days after the date of receipt of the same (in writing); otherwise, the warranty shall become null and void. No claims shall be accepted once the above terms have expired. Claims shall not constitute grounds for the cancellation or reduction of orders on the part of the Customer, or the payment of damages and/or compensation on the part of the Supplier. No returns of products are accepted unless authorised in advance. No returns are accepted of products which are not intact, have been tampered with, or have been specifically built, processed and/or modified for the Customer. Nonconforming material must be returned, further to the Supplier’s authorisation, with all expenses paid (freight prepaid). The return document must contain the details of the original transport document or invoice (date and number – compulsory by law). The Supplier does not accept any responsibility for accidents occurring during the use of its products.
8) Offerte ed ordini
Il Fornitore qualora accetti commesse di prodotti speciali o su particolari specifiche tecniche del Cliente, dovrà sempre ricevere un disegno tecnico dettagliato prima di procedere alla produzione. Dopo aver accettato l’ordine e previa consegna del disegno tecnico, il Fornitore invierà al Cliente una campionatura del prodotto. Il Cliente, dopo averne preso visione, dovrà inviare conferma scritta al Fornitore per l’esecuzione dell’intera fornitura. Nel caso in cui il Cliente per motivi non imputabili al Fornitore rifiutasse in modo parziale o completo la fornitura, il Fornitore avvalersi del diritto di addebitare le spese per l’esecuzione della campionatura, oltre al mancato guadagno e per gli eventuali danni subiti, trattandosi di prodotti non commercializzabili. Il Fornitore provvederà al ritiro ed alla sostituzione del materiale non conforme, nel caso in cui il Cliente dimostrasse palesemente che le caratteristiche del prodotto fornito non corrispondono a quelle dei campioni consegnati, senza alcuna responsabilità da parte del Fornitore e con rinuncia del Cliente ad ogni richiesta di risarcimento a qualsiasi titolo richiesto.

9) Materiali
I materiali utilizzati per la costruzione dei prodotti contenuti nel presente catalogo possono essere soggetti ad aggiornamenti solo ed esclusivamente migliorativi all’interno della loro categoria di appartenenza. Il Cliente non potrà perciò avvalersi di questa caratteristica per eventuali reclami al Fornitore.

10) Validità e deroghe delle Condizioni Generali di Vendita
Ogni e qualsiasi deroga o modifica alle sopra indicate condizioni generali di vendita, dovrà essere convenuta in forma scritta tra le parti.

11) Domicilio del Cliente
Il domicilio del Cliente è da intendersi quello ove il Cliente ha la propria sede legale, salvo diversa comunicazione scritta. Il Fornitore pertanto indirizzerà tutte le comunicazioni e le spedizioni dei prodotti in quella sede.

12) Foro competente
Per ogni e qualsiasi controversia sarà competente il foro dove si trova la sede legale del Fornitore.

8) Special and/or custom-made products
If the Supplier accepts orders for special products or those made to the Customer’s own technical specifications, it must always receive a detailed technical drawing before proceeding with production. After accepting the order and further to consignment of the technical drawing, the Supplier shall send the Customer a sample lot of the product. After viewing the sample lot, the Customer shall send the Supplier written confirmation for production of the entire ordered amount. If, due to circumstances beyond the Supplier’s control, the Customer refuses delivery of all or part of the goods, the Supplier shall be entitled to reimbursement of the expenses for production of the sample lot, and for compensation for loss of earnings and for any damages incurred, since these products are not marketable.

The Supplier shall collect and replace non-conforming material if the Customer clearly demonstrates that the characteristics of the product supplied differ from those of the samples consigned, without any liability on the part of the Supplier and with waiver on the part of the Customer of any request for compensation on any grounds.

9) Materials
The materials used to manufacture the products featured in this catalogue may be updated exclusively for improvement purposes within their range, therefore the Customer is not entitled to have recourse to these upgrades to lodge any claim with the Supplier.

10) Validity and waivers of the General Conditions of Sale
Any waivers or modifications of the aforesaid general conditions of sale must be agreed between the parties in writing.

11) Customer’s Domicile
The Customer shall be domiciled in the place where it has its registered office, unless otherwise notified in writing. The Supplier shall therefore send all communications and shipments of products to the relevant address.

12) Legal jurisdiction
The law court of the Supplier’s registered office shall have jurisdiction over all disputes of any kind.
**MODULO DI RICHIESTA CLIENTE - CUSTOMER REQUEST MODULE**

### INFO CONTATTO / CONTACT INFO

<table>
<thead>
<tr>
<th>Nome Azienda / Company Name</th>
<th>Nome contatto / Contact Name</th>
<th>E-Mail e telefono / E-Mail and phone</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### APPLICAZIONE E SPETTRO DI CARICO / APPLICATION AND LOAD SPECTRUM

<table>
<thead>
<tr>
<th>Codice ralla selezionata / Selected bearing code</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Breve descrizione dell’applicazione o disegno applicativo / Brief application description or application drawing**

### Grado di precisione sul posizionamento / Positioning accuracy grade

<table>
<thead>
<tr>
<th>Grado di precisione sul posizionamento / Positioning accuracy grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ex. 0 - 0,05mm - 0,2mm - non richiesto / not required)</td>
</tr>
</tbody>
</table>

### Vibrazioni / Vibrations

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
</table>

### Asse di rotazione del cuscinetto / Rotation axis of the bearing

| Verticale / Vertical | Orizzontale / Horizontal | Obliquo / Oblique |

### Carico sospeso* / Suspended load

| YES | NO |

*In caso di carico a trazione indicare il valore di Fa con segno (-). In case of tensile load please indicate Fa with sign (-)

### Load case 1 | Load case 2 | Load case 3

<table>
<thead>
<tr>
<th>Fa* (assiale/axial)</th>
<th>N</th>
<th>Fa* (assiale/axial)</th>
<th>N</th>
<th>Fa* (assiale/axial)</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fr (radiale/radial)</td>
<td>N</td>
<td>Fr (radiale/radial)</td>
<td>N</td>
<td>Fr (radiale/radial)</td>
<td>N</td>
</tr>
<tr>
<td>Mf (ribaltante/tilting)</td>
<td>Nm</td>
<td>Mf (ribaltante/tilting)</td>
<td>Nm</td>
<td>Mf (ribaltante/tilting)</td>
<td>Nm</td>
</tr>
<tr>
<td>% funzionamento % lifecycle</td>
<td>%</td>
<td>% funzionamento % lifecycle</td>
<td>%</td>
<td>% funzionamento % lifecycle</td>
<td>%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fa* (assiale/axial)</th>
<th>Fr (radiale/radial)</th>
<th>Mf (ribaltante/tilting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Nm</td>
<td>Nm</td>
</tr>
</tbody>
</table>

### TRANSMISSION / TRASMISSIONE

<table>
<thead>
<tr>
<th>Coppia richiesta in uscita / Output required torque</th>
<th>Nm</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Coppia sul pignone / Drive gear torque</td>
<td>Nm</td>
</tr>
<tr>
<td>* Numero di denti del pignone / Drive gear teeth number</td>
<td></td>
</tr>
<tr>
<td>Tipo di funzionamento / Working type</td>
<td>Continuo/continuous</td>
</tr>
<tr>
<td>Presegnatura + Fa, Fr, Mf / Shock presence</td>
<td>YES, NO</td>
</tr>
<tr>
<td>N. ore funzionamento giornaliero / Daily required working hours</td>
<td></td>
</tr>
</tbody>
</table>

* se già fissati / if already fixed

### Ambiente / Environment

<table>
<thead>
<tr>
<th>Pulito/Clean</th>
<th>Polvere/Dust</th>
<th>Sabbia/Sand</th>
<th>Fango/Mud</th>
</tr>
</thead>
</table>

### Tipo di Dentatura / Preferred gear type

<table>
<thead>
<tr>
<th>Esterna External</th>
<th>Interna Internal</th>
<th>Non dentata No gear</th>
</tr>
</thead>
</table>

### Costruzioni preferite / Preferred constructions

<table>
<thead>
<tr>
<th>1 giro sfere 1 row balls</th>
<th>2 giri sfere 2 rows of balls</th>
<th>Rulli incrociati Crossed roller</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tavola motorizzata Slewing gears</td>
<td>Ralla di precisione Precision slew ring</td>
<td></td>
</tr>
</tbody>
</table>