SCHAUBLIN

Unibal

Fabrique de machines **SCHAUBLIN S.A.**, CH-2800 Delémont/Suisse
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Personal notes

Introduction

This is the latest edition of the UNIBAL catalogue detailing our ranges of rod ends and spherical bearings. In addition, it contains all the technical data and information required to help you to select the component best suited to your application.

We listen to our customers

The content of this catalogue is the result of more than 35 years experience in the design development and manufacture of high quality components. The validity of our technical data and dynamic calculations derives from extensive testing of our products, and our success in resolving numerous application problems for our customers, with whom we maintain close contact.

We believe that the UNIBAL products, as described in this catalogue, accurately reflect the needs of our customers.

Our reputation has been built on the reliability of our products which are produced to exacting standards, closely monitored by our Quality Assurance procedure.

Please inform us if for any reason you experience problems or difficulties with our products. Your comments and observations will always be important to us.

This catalogue relates to standard UNIBAL products in our current production programme. In addition to our standard range we manufacture many special versions to customer specifications, and welcome your enquiries for such requirements. (See the examples on page 62).

Our technical support and test facilities are available to assist you in the design, development and testing of components to suit special needs.

The questionnaire on page 64 details the factors which should be considered when selecting a rod end or spherical bearing. If assistance is required with selection, please complete the questionnaire and return it to us. On receipt, our engineers will be able to determine, by calculation, the type and size of component to provide optimum performance in your particular application.

Our new catalogue in summary :

- To respond to ever increasing and diversifying demands, the **standard series** has been extended to include sizes 2 and 4 (dimension B).

- The **high performance series** (series 50, 51 and 52) are suitable for applications involving high loads and rigorous operating conditions.
  This series feature :
  - crack detection by magnaflux inspection;
  - minimum bearing clearances for high stress applications;
  - standard or self lubricating options.

- **UNIFLON® lined series** - featuring UNIFLON® E or VV for maintenance free operation; high quality anti-friction linings also permit higher running speeds.

- **Stainless steel series** (series 45) - for use in corrosive environments; standard and self lubricating - UNIFLON® E - versions now available.

Our rod ends and spherical bearings are manufactured to the following standards :
- DIN 648 K
- ISO 6126 JK

N.B.

In this catalogue we make frequent reference to **stress** when describing the performance characteristics of a rod end or spherical bearing.

Stress in this context refers to factors such as dynamic load, vibration, shock loading, frequency of oscillations, etc. Individually or combined, these are the factors which impose stress on the bearing and determine its life expectancy.

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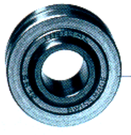

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Product summary

Table 1

Series	Rod ends	Sphericals	Type reference	Characteristics	Bearing surfaces	Table 2 Reference
Standard series	*	*	SMG, SFG SS	Simple mechanical applications with no special demands.	Steel / Bronze	1
Series ..10	* *	*	SMG..10 SFG..10 SS..10	As standard but with chrome plated ball for reduced wear, corrosion resistance and higher operating speeds	Steel / Bronze	2
Series ..20	* *		SMG..20 SFG..20	As standard but offering a range of alternative threads including CETOP.	Steel / Bronze	3
Series ..40	* *		SMG..40 SFG..40	High tensile steel housing to withstand high static loads.	Steel / Bronze	4
Series ..45	* *	*	SMG..45 SFG..45 SS..45	Stainless steel housing and ball for use in corrosive environments.	St. steel / Bronze	5
Series ..50/51/52	*		SMGM..50 /51/52	High performance series, for high resistance to static loads and vibration. Not suitable for high speeds.	Steel / Steel	6
Series ..50/51/52 + UNIFLON® E	*		SMEM..50 /51/52	High performance series with UNIFLON® E lining. Self lubricating.	Steel / UNIFLON® E	7
UNIFLON® VV	*	*	SMVV, SFVV SSVV	UNIFLON® VV lining with polished ball for high operating speeds (8m/min). Self lubricating	Steel / UNIFLON® VV	8
UNIFLON® E	*	*	SME, SFE SSE	UNIFLON® E lining with polished ball. Rated higher for loads and speeds (6m/min). Self lubricating.	Steel / UNIFLON® E	9
Series ..40 + UNIFLON® E	* *		SME..40 SFE..40	High tensile steel, UNIFLON® E lined for high static & high dynamic loads. Self lubricating.	Steel / UNIFLON® E	10
Series ..45 + UNIFLON® E	* *	*	SME..45 SFE..45 SSE..45	Stainless steel, UNIFLON® E lined for higher loads/speeds in corrosive environments.	St. steel / UNIFLON® E	11
Steel sphericals		*	SSA	Standard steel/steel bearings good resistance to shockloads, static loads, vibrations.	Steel / Steel	12
Steel sphericals - series ..10		*	SSA..10	As SSA but with chrome plated ball for rduced wear, corrosion resistance and higher operating speeds.	Steel / Steel	13
St. steel spherical - series ..45		*	SSA..45	Stainless steel bearing with good resistance to static loads.	St. steel / St. steel	14
Steel spherical - series ..50		*	SSA..50	High performance series, high resistance to static loads and improved dynamic performance.	Steel / Steel	15
Steel spherical Series 50 + UNIFLON® E		*	SSE..50	High strength, UNIFLON® E lined for exceptional load resistance; speed 2,5 m/min. Self lubricating.	Steel / UNIFLON® E	16

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Performance Characteristics

This table is indicative. It establishes comparisons between the various types of rod ends and spherical bearings, under different operating conditions.

An initial choice can be made by reference to this table, taking account of the conditions which will be encountered in practice.

The suitability and life expectancy of the chosen component can then be checked more closely by calculation or reference to the load/frequency graph (pages 21-59).

Table 2

		Continuous dynamic load	Alternating / pulsating dynamic load	Shocks loads / vibrations	Axial load Axial shock loads	High running speed	Frequent lubrication	No lubrication or maintenance necessary	Temperature -25 - 125°C	Corrosive environment	Neoprene protection size 6-22	Table 2 Reference	
SMG..	SMG, SFG	●	●	◐	●	◐	●	○	●	○	●	1	20
	SMG..10, SFG..10	◐	●	◐	●	◐	●	○	●	◐	●	2	20
	SMG..20, SFG..20	◐	●	◐	●	◐	●	○	●	○	●	3	22
	SMG..40, SFG..40	◐	●	●	●	○	●	○	●	○	●	4	24
	SMG..45, SFG..45	◐	●	◐	●	◐	●	○	●	●	●	5	26
	SMGM..50/51/52	●	●	●	●	○	●	○	●	○	●	6	28
SFG..	SMEM..50/51/52	●	●	●	○	○	*	●	○	○	●	7	30
	SMVV, SFVV	●	◐	◐	○	●	*	●	○	○	●	8	32
	SME, SFE	●	◐	◐	○	●	*	●	○	○	●	9	34
	SME..40, SFE..40	●	◐	●	○	○	*	●	○	○	●	10	36
	SME..45, SFE..45	●	◐	◐	○	●	*	●	○	●	●	11	38
SS..	SS	◐	●	◐	●	◐	●	○	●	○	○	1	42
	SS..10	◐	●	◐	●	●	●	○	●	◐	○	2	42
	SS..45	◐	●	◐	●	◐	●	○	●	●	○	5	44
	SSA	●	●	●	●	◐	●	○	●	○	○	12	46
	SSA..10	●	●	●	●	◐	●	○	●	○	○	13	46
	SSA..45	●	●	●	●	◐	●	○	●	●	○	14	48
	SSA..50	●	●	●	●	○	●	○	●	○	○	15	50
	SSVV	●	◐	◐	●	●	*	●	○	○	○	8	52
	SSE	●	◐	◐	●	●	*	●	○	○	○	9	54
	SSE..45	●	◐	◐	●	●	*	●	○	●	○	11	56
	SSE..50	●	●	●	●	○	*	●	○	○	○	16	58

Key

- ● Excellent, perfect for this application
- ◐ Average, life expectancy should be calculated for each application
- ○ Not suitable, not advised for this application
- * Lubrication not necessary, self-lubricating

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Technical data

This section contains technical information and details of dynamic calculations, together with worked examples, to help guide you in the selection and installation of Unibal products.

Static loads (p.7)

Static loads : loads which are applied to a rod end or spherical bearing whilst the ball is stationary.

Dynamic loads (p. 8-13)

Dynamic loads: a combination of load and movement (oscillation or rotation of the ball) which must be taken into account when considering the operational life of a bearing or rod end.

Empirical formulae have been developed, and these contain the various factors which relate to the affects of dynamic loads. The application of these formulae enable the theoretical life of our rod and spherical bearings to be determined - see pages 8-11. Examples of the application of the formulae follow on pages 12-13.

The graphs on pages 21 to 59 show dynamic loads in simple form and enable you to check loads and allowable frequencies quickly and simply. The life expectancy guaranteed by these graphs is a minimum of 3000 hours.

Note :
Axial dynamic loads are referred to in the formula for PV on page 8. For rod ends, dynamic axial loads must be carefully considered; the limiting condition will be determined by the resistance of the shank to bending.

Please refer to us for advice.

Misalignment angles (p. 15)

The relationship between mounting methods and misalignment angles are illustrated; angles specific to common mounting methods are provided (table 6) and formulae for general application are given.

Lubrication and maintenance (p. 16)

The self lubricating and non-self lubricating types are defined, and details of recommended lubricants are provided.

Details of special lubricants are also given.

Neoprene protective covers (p. 17)

For the protection of rod ends from the ingress of dust, grit, chemical agents, damp and foreign matter.

Details of material specification, use, mounting, spacers and effect on misalignment angle.

Dimensions, tolerances, clearances (play) (p. 18)

Details of standards and tolerances applicable to Unibal products.

Maximum clearances for each size are also given.

Sliding moment (torque) - (p. 19)

Rotation and misalignment sliding moments are defined and rotation sliding moments values are given for the full range of rod ends and spherical bearings.

It is important to relate the sliding moment to the application requirements.

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Static Loads

The radial and axial static loads given in the tables which follow have been derived from our own tests.

The static loads indicated are the maximum allowable loads.

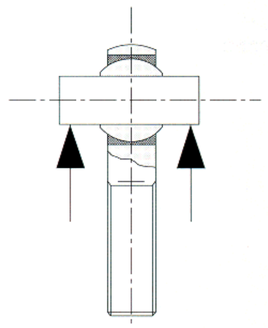
The base unit is: daN (1 daN = 10N).

Safety factor :

The allowable static loads given in our tables have been determined by dividing the static load at failure by 2,5.

$$\text{Maximum allowable load} = \frac{\text{load at failure}}{2{,}5}$$

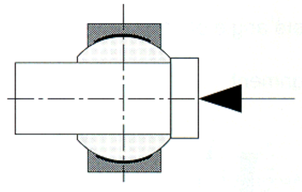
Radial static loads



Radial static locads are determined by the strength of the housing material.

The maximum allowable radial static loads are given in the tables describing each component (p. 20 – 58).

Axial static loads



The allowable axial loads for our rod ends are not given as in most circumstances the limiting condition will be determined not by the strength of the head, but by the resistance of the shank to bending. Where significant, axial loads should be determined and referred to us for advice.

Axial static loads for spherical bearings are given on pages 42-58.

Combined static loads : axial & radial

Where critical to the application, we recommend that the actual radial and axial loads be determined in tests. On request, we will carry out further tests to determine a factor of safety appropriate to the particular application.

Note :
The sliding moments (see p. 19) may be modified where combined static loads are encountered.

Life expectancy

Static loads within the limits specified will not adversely affect life expectancy.

Load coefficients on the following pages are calculated using the load at 80 % of the elastic limit thus avoiding long term deterioration due to static loads.

Resistance to stress

Pulsating alternating shock loads can cause failure of a rod end housing at load levels below the static loads given in the tables on pages 20 to 58.

Premature failure of rod ends can result from a combination of factors including the nature of applied loads, thermal cycling, environmental conditions, etc., all of which impose stress on the component.

The stress factors most likely to be encountered in practice are detailed on the Application Profile (p. 64). Complete information is required in order to determine the most suitable component for a particular application. It is also advisable to carry out life performance tests on the selected component in critical applications.

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Calculation of dynamic radial loads

To calculate the life expectancy of a rod end or a spherical bearing :

1) Calculate and then check whether the pressure falls within the limits allowed by table 3
2) Calculate and check whether the speed falls within the limits allowed by table 3.
3) Multiply the speed by the pressure to obtain the factor PV, which must fall within the limits set out in table 3.
4) It is important to take all factors and available data into account. Only known data should be used. An invalid result is likely if estimated values are used.

Calculation of pressure

To check the average pressure on the ball as a function of the force exerted on the friction surface :

Formula:

$$P = \frac{F}{E \cdot H}$$

$F = Fr + (2{,}5 \cdot Fa)$
normal case $F = Fr$

Worked examples in this catalogue assume that radial loads are zero, thus F = Fr.
(see illustration of axial and radial loads on p. 7).

P : pressure (daN/mm²)
F : total dynamic load (daN)
Fr : dynamic radial load
Fa : dynamic axial load
E : diameter of the ball (p. 20 – 58)
H : width of the housing (p. 20 – 58)

Calculation of speed

To check the maximum speed at the friction surface, between the ball and the race :

Formula :

$$V = \frac{E \cdot \beta \cdot f}{114600}$$

V : speed (m/min)
E : diameter of the ball (mm) (p. 20-58)
ß : complete angle of oscillation (°), one complete rotation = 360°, see table 4
f : frequency of oscillations (min $^{-1}$)

Calculation of PV

To verify the factor PV :

Formula : $PV = P \cdot V$

P : pressure (daN/mm²)
V : speed (m/min)

Table 3

Type	Maximum pressure daN/mm²	Maximum speed m/min	Allowable maximum PV
Rod ends			
SMG, SFG	5	5	3
SMG..10, SFG..10	5	6	3,5
SMG..20, SFG..20	5	5	3
SMG..40, SFG..40	5	2,5	3
SMG..45, SFG..45	5	4,5	3
SMGM..50/51/52	10	2,5	4,5
SMEM..50/51/52	10	2,5	5
SMVV, SFVV	10	8	3
SME, SFE	10	6	5
SME..40, SFE..40	10	2,5	5
SME..45, SFE..45	10	5	4
Spherical bearings			
SS	5	5,5	3
SS..10	5	6	3,5
SS..45	5	4,5	3
SSA	10	4	3,5
SSA..10	10	4,5	4
SSA..45	10	4	3,5
SSA..50	10	2,5	4,5
SSVV	10	8	3
SSE	10	6	5
SSE..45	10	5	4
SSE..50	10	2,5	6

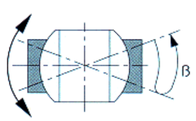
If the above values are not adhered to, we cannot guarantee the life of a component. Practical tests must be carried out.

Table 4

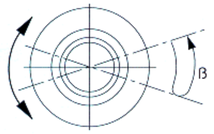
Angle of oscillation

ß: complete angle of oscillation

misalignment



rotation



Examples of the calculation :
± 5° = 5 + 5 + 5 + 5 = ß = 20°
± 12° = 12 + 12 + 12 + 12 = ß = 48°

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To calculate the life of a component

The formulae shown below determine the life expectancy of our rod ends and bearings.

These formulae are derived from the results of thousands of hours of tests; moreover our experience with practical applications has confirmed their validity. The results of calculations using these formulae can be applied with confidence.

In the majority of cases, the actual life exceeds that determined by calculation.

It is often difficult to precisely determine the actual loads encountered in practice, but it is essential to do so if consistent and reliable results are to be obtained.

There are, however, limits to where the calculations may be used; if the following conditions apply our formulae are likely to produce erroneous results :

- If play cannot be tolerated at any time during the life of the component.
- Where there are shock loads, vibration, corrosive or abrasive environments, etc...

These special conditions should be dealt with in consultation with us.

In practice, and under test conditions, different life expectancies are found for apparently identical applications.

Formulae :

$$Dh = \frac{c1 \cdot c2 \cdot c3 \cdot c4 \cdot c5 \cdot c6 \cdot c7 \cdot c8 \cdot X \cdot H \cdot C \cdot 10^7}{F \cdot \beta \cdot f}$$

$$D = \frac{c1 \cdot c2 \cdot c3 \cdot c4 \cdot c5 \cdot c6 \cdot c7 \cdot c8 \cdot X \cdot H \cdot C \cdot 10^7}{F \cdot \beta \cdot 0{,}0167}$$

Dh : life expectancy in hours (h)
D : life expectancy (in number of oscillations or complete turns)
C : constant, given in table 5
H : width of the housing (p. 20 - 58)
F : dynamic radial load (daN)
ß : complete angle of oscillation (°), one complete rotation = 360°, see table 4
f : frequency of oscillations (osc/min)
c1 : coefficient of pressure (p. 10)
c2 : coefficient of speed (p. 10)
c3 : coefficient of the angle (p. 10)
c4 : coefficient of stress (p. 11)
c5 : coefficient of alternating loads (p. 11)
c6 : coefficient of maintenance (p. 11)
c7 : coefficient of temperature (p. 11)
c8 : coefficient of vibrations
= 1 where osc/min < 60
= 0,8 where osc/min > 60
X : coefficient of failure (min = 0,7 ; max = 1)
To take account of extraneous factors likely to affect the life of the bearing e.g. corrosive environment, abrasive particles, shock loads, etc. Select an X coefficient between 0,7 and 1 dependant on severity.

Where the sliding moment is matched to the application requirement use **constant C + 5** (refer to p. 19).

Where Neoprene protective covers are used with lubricant use **constant C + 5** (refer to p. 17).

Table 5

Type	Constant **C**
SMG, SFG	80
SMG..10, SFG..10	85
SMG..20, SFG..20	80
SMG..40, SFG..40	80
SMG..45, SFG..45	70
SMGM..50/51/52	70
SMEM..50/51/52	110
SMVV, SFVV	90
SME, SFE	105
SME..40, SFE..40	105
SME..45/, SFE..45	100
SS	80
SS..10	85
SS..45	70
SSA	70
SSA..10	75
SSA..45	70
SSA..50	75
SSVV	90
SSE	105
SSE..45	100
SSE..50	110

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Coefficient Tables

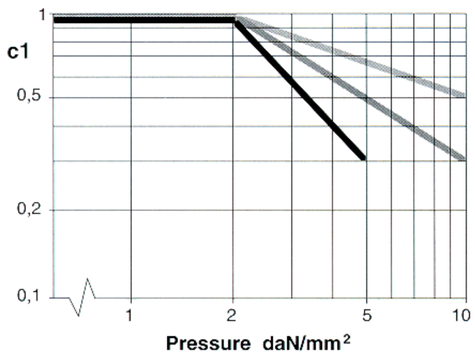
The graphs below illustrate all the coefficients which should be used in calculations to determine the life expectancy of a component.

For extraneous factors such as shock loads, abrasive particles, corrosive environments, etc. a suitable value is assigned to the coefficient of failure: X (see page 9). If the operational requirements fall outside the values given on the following tables, please consult us.

Notes :
The graphs refer to all types of rod ends and spherical bearings.

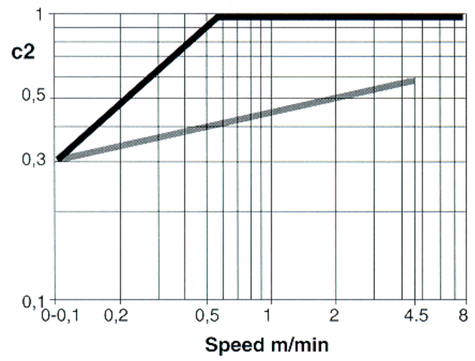
The shading of the frames of the columns on the right corresponds to the curve of the same shading on the graph.

Coefficient of pressure c1



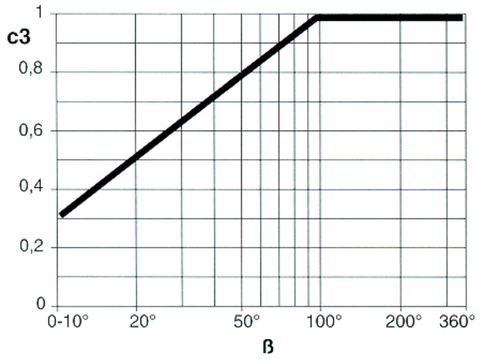
Bearing surfaces Steel / bronze	Bearing surfaces Steel / UNIFLON®	Bearing surfaces Steel / steel
SMG, SFG SMG..10, SFG..10 SMG..20, SFG..20 SMG..40, SFG..40 SMG..45, SFG..45 SS SS..10 SS..45	SMEM..50 / 51 / 52 SMVV, SFVV SME, SFE SME..40, SFE..40 SME..45, SFE..45 SSVV SSE SSE..45 SSE..50	SMGM..50 SMGM..51 SMGM..52 SSA SSA..10 SSA..45 SSA..50

Coefficient of speed c2



Bearing surfaces Steel / bronze	Bearing surfaces Steel / steel	Coeff. c2 = 1 Bearing surfaces Steel / UNIFLON®
SMG, SFG SMG..10, SFG..10 SMG..20, SFG..20 SMG..40, SFG..40 SMG..45, SFG..45 SS SS..10 SS..45	SMGM..50 SMGM..51 SMGM..52 SSA SSA..10 SSA..45 SSA..50	SMEM..50 / 51 / 52 SMVV, SFVV SME, SFE SME..40, SFE..40 SME..45, SFE..45 SSVV SSE SSE..45, SSE..50

Coefficient of the angle c3



Bearing surfaces Steel / bronze	Bearing surfaces Steel / steel	Coeff. c3 = 1 Bearing surfaces Steel / UNIFLON®
SMG, SFG SMG..10, SFG..10 SMG..20, SFG..20 SMG..40, SFG..40 SMG..45, SFG..45 SS SS..10 SS..45	SMGM..50 SMGM..51 SMGM..52 SSA SSA..10 SSA..45 SSA..50	SMEM..50 / 51 / 52 SMVV, SFVV SME, SFE SME..40, SFE..40 SME..45, SFE..45 SSVV SSE SSE..45, SSE..50

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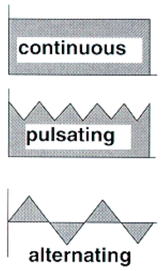
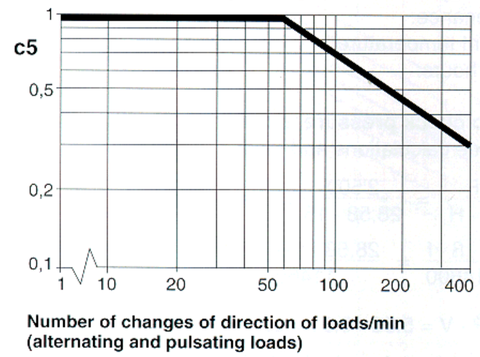
Coefficient of load c4



c4	c4
0,65	1
0,8	0,75
1	0,5

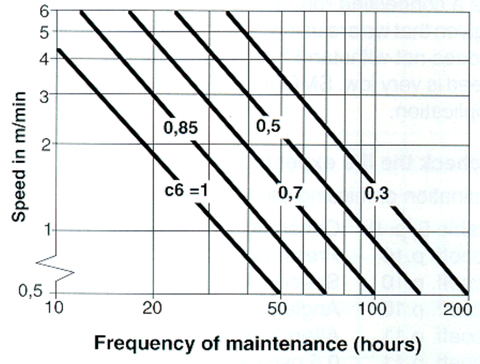
Bearing surfaces Steel / bronze	Bearing surfaces Steel / steel	Bearing surfaces Steel / UNIFLON®
SMG, SFG SMG..10, SFG..10 SMG..20, SFG..20 SMG..40, SFG..40 SMG..45, SFG..45 SS SS..10 SS..45	SMGM..50 SMGM..51 SMGM..52 SSA SSA..10 SSA..45 SSA..50	SMEM..50 / 51 / 52 SMVV, SFVV SME, SFE SME..40, SFE..40 SME..45, SFE..45 SSVV SSE SSE..45, SSE..50

Coefficient of frequency (alternating and pulsating loads) c5



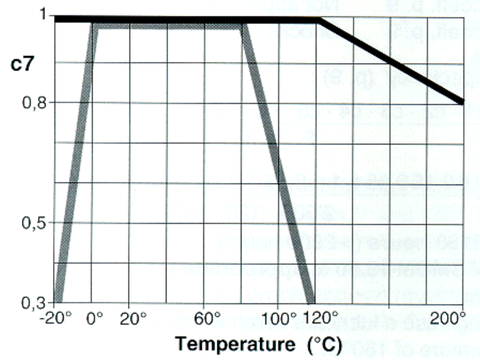
Bearing surfaces Steel / bronze	Bearing surfaces Steel / UNIFLON®	Coeff. c5 = 1 Bearing surfaces Steel / steel
SMG, SFG SMG..10, SFG..10 SMG..20, SFG..20 SMG..40, SFG..40 SMG..45, SFG..45 SS SS..10 SS..45	SMEM..50 / 51 / 52 SMVV, SFVV SME, SFE SME..40, SFE..40 SME..45, SFE..45 SSVV SSE SSE..45, SSE..50	SMGM..50 SMGM..51 SMGM..52 SSA SSA..10 SSA..45 SSA..50

Coefficient of maintenance c6



Bearing surfaces Steel / bronze	Bearing surfaces Steel / Steel	Coeff. c6 = 1 Bearing surfaces Steel / UNIFLON®
SMG, SFG SMG..10, SFG..10 SMG..20, SFG..20 SMG..40, SFG..40 SMG..45, SFG..45 SS SS..10 SS..45	SMGM..50 SMGM..51 SMGM..52 SSA SSA..10 SSA..45 SSA..50	SMEM..50 / 51 / 52 SMVV, SFVV SME, SFE SME..40, SFE..40 SME..45, SFE..45 SSVV SSE SSE..45, SSE..50

Coefficient of temperature c7



Bearing surfaces Steel / bronze	Bearing surfaces Steel / Steel	Bearing surfaces Steel / UNIFLON®
SMG, SFG SMG..10, SFG..10 SMG..20, SFG..20 SMG..40, SFG..40 SMG..45, SFG..45 SS SS..10 SS..45	SMGM..50 SMGM..51 SMGM..52 SSA SSA..10 SSA..45 SSA..50	SMEM..50 / 51 / 52 SMVV, SFVV SME, SFE SME..40, SFE..40 SME..45, SFE..45 SSVV SSE SSE..45 SSE..50

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Note concerning UNIFLON®

UNIFLON® liners used on our Unibal self lubricating rod ends and spherical bearings

Introduction

To meet the high performance demands which self-lubricating bearings are increasingly required to withstand, HEIM, USA (Schaublin SA is its licensee) has developed UNIFLON® type E, a new and improved liner material. UNIFLON® type E is qualified to procurement specification MIL-B-81820.

This new liner material has properties which differ from the well established type "VV", and broadens the range of products and applications for which self-lubricating - maintenance free - components can be used.

UNIFLON® type E is unique in the family of teflon-type bearing materials. Type E is a low coefficient of friction composite of three materials. Most composite bearing materials consist of one layer of low coefficient of friction material usually teflon fibre, layered or interwoven with either a highly abrasive fabric such as fibreglass, or a low-load bearing fabric such as dacron, coated with resin. Type E combines a low coefficient of friction, high tensile, high compressive strength fabric with chemically bonded teflon fibre to form the type E matrix.

Why UNIFLON® type E ?

UNIFLON® type E liner is recommended over other bearing materials for the following reasons :

1. High teflon-fibre content. Teflon has the lowest coefficient of friction of known materials today.
2. The backing or basic high strength fabric in type E has an inherent coefficient of friction only slightly higher than teflon (0,19)

Where UNIFLON® type E bearings are used

UNIFLON® bearings are best suited to applications involving low speeds (6m/min) and high pressures, where metal to metal contact is undesirable. Type E bearings suitable for static loads up to 41 daN/mm² are available.

UNIFLON® type E is suitable for use in combination with hardened steel, aluminium, titanium and plated surfaces. It will operate equally well in normal or adverse environments and can tolerate temperatures between –70°C and +175°C.

The coefficient of friction of type E on ungreased steel is **0,13**.

Our technical department will always be pleased to advise regarding operating conditions, loads, speeds and pressures, etc. Please consult us.

Type VV UNIFLON® liner

The type VV UNIFLON liner is designed for higher operating speeds 8m/min or up to 10m/min if lightly loaded.

The coefficient of friction of type VV on ungreased steel is **0,16**.

Figure 1 Coefficient of friction vs. temperature

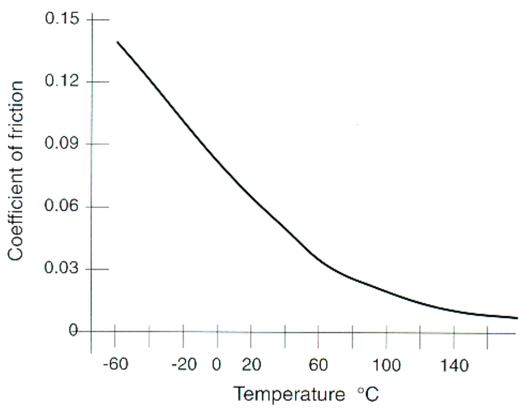

Figure 1 shows the coefficient of friction of UNIFLON® type E liner and how this low-friction fabric dramatically improves with increasing temperature.

Figure 2 Wear vs. oscillations

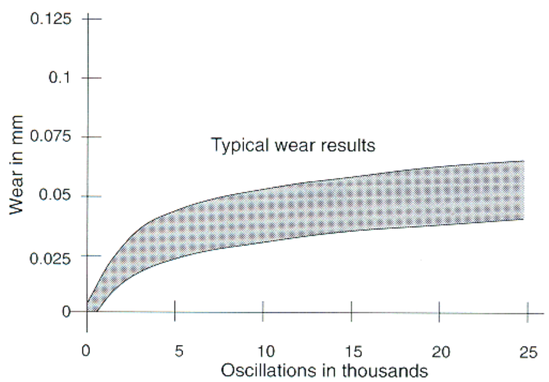

Figure 2 shows a typical wear pattern of UNIFLON® type E liner and how it varies with number of oscillations.

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Calculation No 3 : Steel/UNIFLON® E

An SF rod end will be used on a fairground roundabout. It must be able to function without maintenance. Which model should be used ?

1) Research data

Preferred type and size :	**size 30, Model SF..**
(according to technical characteristics p. 5)	
Dynamic radial load :	**5000 daN**
Stress (load):	**alternating**
Angle of oscillation :	**±1.5° = β : 6°**
Frequency :	**80 osc/min**
Maintenance :	**self lubricating**
Ambient temperature :	**0 to 45°C, dust**
Life in hours :	**1500 hours**

2) To check pressure, speed and the factor PV
(see calculations and table 3, p. 8)

$$P = \frac{F}{E \cdot H} = \frac{5'000}{50{,}8 \cdot 25} = \mathbf{3{,}94} \quad \mathbf{daN/mm^2}$$

$$V = \frac{E \cdot \beta \cdot f}{114600} = \frac{50{,}8 \cdot 6 \cdot 80}{114600} = \mathbf{0{,}21} \quad \mathbf{m/min}$$

$$\mathbf{PV} = P \cdot V = 3{,}94 \cdot 0{,}21 = \mathbf{0{,}83}$$

After checking with table 3, the pressure, speed and factor PV are found to be below the maximum allowable values. The static load of SFE 30 (p. 34) is then checked and found to be 5130 daN, above the given load, so SFE 30 is thus chosen, for the following reasons : no problems as far as the load is concerned, and it is self lubricating.

3) To check the life expectancy

Determination of missing data :

C	: table 5, p. 9	Constant SFE 30 :	**105**
c1	: coeff. p.10	Pressure = 3.94 :	**0.6**
c2	: coeff. p.10	Speed = 0.21 :	**1**
c3	: coeff. p.10	Angle β = 6° :	**1**
c4	: coeff. p.11	Alternating load :	**0.5**
c5	: coeff. p.11	80 osc/min :	**0.8**
c6	: coeff. p.11	Self lubricating :	**1**
c7	: coeff. p.11	0 to 45°C :	**1**
c8	: coeff. p. 9	Not applicable :	**1**
X	: coeff. p. 9	Dusty :	**0.8**

Life expectancy (p. 9) :

$$Dh = \frac{c1 \cdot c2 \cdot c3 \cdot c4 \cdot c5 \cdot c6 \cdot c7 \cdot c8 \cdot X \cdot H \cdot C \cdot 10^7}{F \cdot \beta \cdot f}$$

$$Dh = \frac{0{,}6 \cdot 1 \cdot 1 \cdot 1 \cdot 0{,}5 \cdot 0{,}8 \cdot 1 \cdot 1 \cdot 0{,}8 \cdot 25 \cdot 105 \cdot 10'000'000}{5'000 \cdot 6 \cdot 80}$$

Dh = 2100 hours (> 1500)
Unibal SFE 30 would ensure the smooth running of the roundabout.

Calculation No 4 : Stainless Steel/Stainless Steel

Several SSA 3.45 spherical bearings are fitted on a scale model (a model of a boat). Despite the corrosive environment and stresses, these components must withstand 150'000 oscillations.

1) Research data :

Preferred model and size :	**SSA 3.45**
(according to technical characteristics p. 5)	
Dynamic radial load :	**190 daN**
Stresses(load) :	**continuous**
Complete turns :	**β : 360°**
Frequency :	**20 min⁻¹**
Maintenance :	**generous lubrication**
Ambient temperature :	**5 to 30°C**
Life expectancy in number of oscillations :	**150'000 osc**

2) To check pressure, speed and factor PV
(see calculations and table 3, p. 8)

$$P = \frac{F}{E \cdot H} = \frac{400}{15{,}88 \cdot 9} = \mathbf{2{,}8} \quad \mathbf{daN/mm^2}$$

$$V = \frac{E \cdot \beta \cdot f}{114600} = \frac{15{,}88 \cdot 8 \cdot 60}{114600} = \mathbf{0{,}07} \quad \mathbf{m/min}$$

$$\mathbf{PV} = P \cdot V = 5{,}32 \cdot 0{,}5 = \mathbf{2{,}66}$$

According to table 3, the speed and factor PV are acceptable. As far as the pressure is concerned, SSA 3.45 would be suitable, as it withstands pressures of 10 daN/mm². In a corrosive environment it is imperative to select SSA 3.45. The allowable static load (p. 48) of 610 daN is also acceptable. It only remains to forecast the number of oscillations.

3) To check life expectancy

Determination of missing data :

C	: table 5, p. 9	Constant SSA 3.45 :	**70**
c1	: coeff. p.10	Pressure = 5.32 :	**0.62**
c2	: coeff. p.10	Speed = 0.5 :	**0.25**
c3	: coeff. p.10	Angle β = 360° :	**1**
c4	: coeff. p.11	Continuous load :	**0.65**
c5	: coeff. p.11	Not applicable :	**1**
c6	: coeff. p.11	Generous lubrication :	**1**
c7	: coeff. p.11	5 to 30°C :	**1**
c8	: coeff. p. 9	Not applicable :	**1**
X	: coeff. p. 9	OK :	**1**

Life expectancy (p. 9) :

$$Dh = \frac{c1 \cdot c2 \cdot c3 \cdot c4 \cdot c5 \cdot c6 \cdot c7 \cdot c8 \cdot X \cdot H \cdot C \cdot 10^7}{F \cdot \beta \cdot f}$$

$$Dh = \frac{0{,}63 \cdot 1 \cdot 1 \cdot 0{,}75 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 1 \cdot 9 \cdot 40 \cdot 10'000'000}{400 \cdot 8 \cdot 60}$$

D = 277'800 osc. (>150'000 osc)
According to the calculations, SSA 3.45 spherical bearings are suitable for this application.

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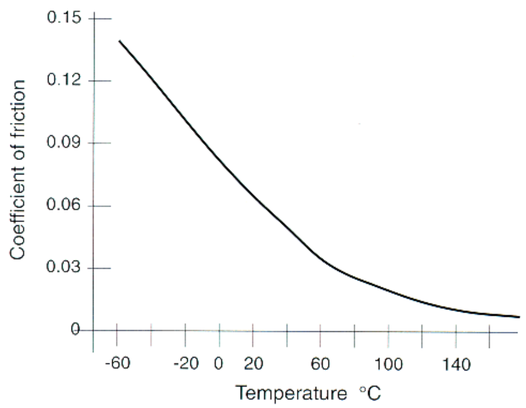

Figure 1 shows the coefficient of friction of UNIFLON® type E liner and how this low-friction fabric dramatically improves with increasing temperature.

Figure 2 Wear vs. oscillations

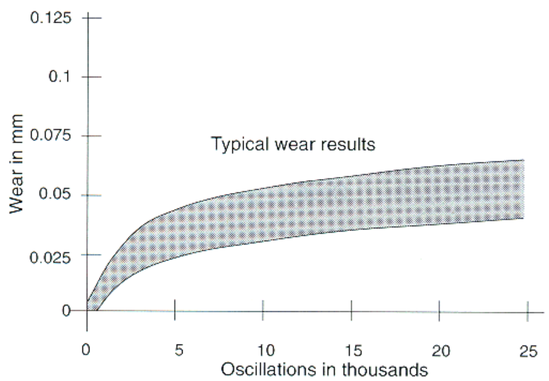

Figure 2 shows a typical wear pattern of UNIFLON® type E liner and how it varies with number of oscillations.

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Misalignment Angles

The angles of misalignment (α) shown below are the same for all types of rod ends and spherical bearings.

The angle (α) varies dependant on the mounting method.

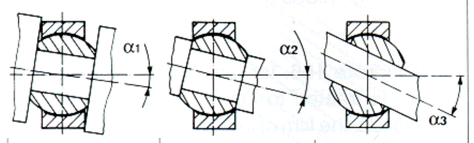
Table 6 shows the maximum possible misalignment with the three most common methods of mounting.

The formulae on table 7 show the way in which these angles are calculated. They will produce an exact result, whereas the angles in table 6 are rounded values.

These formulae may be used as a basis for calculating the angles obtained with alternative methods of mounting.

Table 5

Value of the angle α

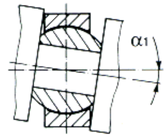


Size of rod end or spherical bearing	α1	α2	α3
2	8°	16°	33°
3	8°	15°	33°
4	8°	14°	31°
5	8°	13°	30°
6	8°	13°	30°
8	8°	14°	25°
10	8°	14°	25°
12	8°	13°	25°
14	10°	16°	24°
16	9°	15°	24°
18	9°	15°	24°
20	9°	15°	24°
22	10°	15°	23°
25	10°	15°	23°
30	11°	17°	24°
35	8°	14°	23°
40	8°	14°	22°
45	7°	12°	22°
50	7°	12°	22°

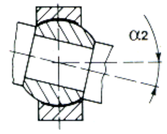
Table 6

Calculation formulas

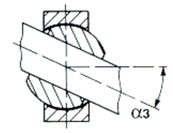
$$\alpha 1 = tg^{-1}\left(\frac{W-H}{D}\right)$$



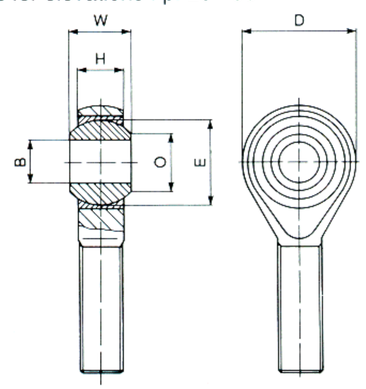
$$\alpha 2 = \cos^{-1}\left(\frac{H}{E}\right) - tg^{-1}\left(\frac{O}{W}\right)$$



$$\alpha 3 = \cos^{-1}\left(\frac{H}{E}\right) - \sin^{-1}\left(\frac{B}{E}\right)$$



Values for elevations : p. 20 - 58



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Lubrication and maintenance

As far as lubrication and maintenance are concerned, our products fall into two distinct groups :

- Rod ends and spherical bearings requiring lubrication, whose life expectancy is directly related to lubrication and maintenance.
- Rod ends and spherical bearings, which need no maintenance and no lubrication.

Rod ends and spherical bearings requiring lubrication

The following rod ends and spherical bearings all need regular maintenance :

Bearing surfaces Steel/Bronze	Bearing surfaces Steel/Steel
SMG, SFG	SMGM..50
SMG..10, SFG..10	SMGM..51
SMG..20, SFG..20	SMGM..52
SMG..40, SFG..40	SSA
SMG..45, SFG..45	SSA..10
SS	SSA..45
SS..10	SSA..50
SS..45	

The models listed above have an internal channel designed to ensure perfect lubrication of the sliding surface. The rod ends incorporate a lubrication nipple; the spherical bearings do not. Under certain operating conditions e.g. high operating speeds, continuous duty, equipment should be designed with a built in supply of lubricant to the bearing surfaces.

Regular lubrication should be carried out for two reasons :

- To ensure a maximum life expectancy.
- To prevent corrosion, mainly in steel/steel applications.

The following lubricants meet our requirements and we recommend their use.

Standard lubricant

Mobilplex 47 lubricant (ISO 3498 XM2) is used in the assembly of all our products where a supply of lubricant is necessary. Its availability all over the world makes it an ideal standard lubricant :

- Base : calcium compound
- Drop point : 260°C
- Working temperature : –25° to 125°C
- Excellent anti-wear properties
- Good resistance to breakdown
- Recommended for packing Neoprene covers to prevent seizure. (see p.17)

Special lubricant

On request, two types of lubrication may be applied :

1) **Molykote BR2**, a very high quality lubricant, whose principal characteristics we list here :
   - Base : soap, lithium, mineral oil
   - Drop point : 190°C
   - Working temperature : –30° to 130°C
   - Multifunction lubricant containing solid grease
   - Excellent properties in situations of extreme pressure and perfectly suited to high speeds
   - A permanent film of lubricant ensures safety and extends the intervals between lubrication.

   This lubricant is recommended for applications involving high loads and high speeds.

2) **Molykote 106**, for use before assembly, when the ball is treated to ensure durable lubrication. Once applied, the film of lubricant does not break down and thus reduces wear, and guarantees safe working, even after long static periods.

Our products thus treated are distinguished by the suffix "11".
Examples : SMG 20.11, SFG 8.11

Self lubricating rod ends and spherical bearings (maintenance free)

Certain of our products need no maintenance at all, notably :

Bearing surfaces Steel/UNIFLON®
SMEM..50/51/52
SMVV, SFVV
SME, SFE
SME..40, SFE..40
SME..45, SFE..45
SSVV
SSE
SSE..50

Note :
Lubrication will greatly reduce the friction in self lubricating rod ends and spherical bearings, and increase their life expectancy by up to 25 %. The rotational sliding moment will alter slightly as a result of applying lubricant.

Self lubricating products are not treated with any form of lubricant during assembly.

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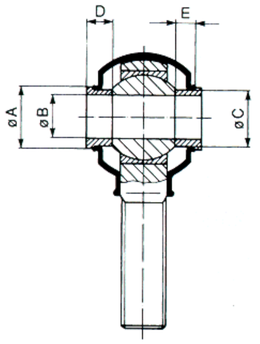
Neoprene Protective Covers

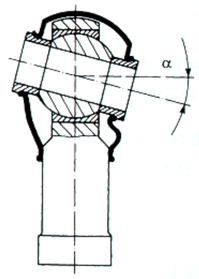
Neoprene protective covers are used to protect rod ends and spherical bearings from the ingress of : dust, abrasive particles, chemical agents, damp and foreign matter.

Packed with grease, they ensure permanent lubrication of the bearing surfaces to provide optimum efficiency and service life.

Material :	Neoprene, to NFT 46-018 standard
Colour :	Black
max/min Temperatures :	–30° to 120°C
Good resistance to :	oil grease chemical agents sea water tropical climate
Not advised for :	permanent contact with oxidising agents. Applications where the ball is completely rotated or where there are high running speeds.

Advice for assembly
Use external circlips pliers to fit covers.





Neoprene protective covers

N°	PR1	PR2	PR3	PR4
Size of rod ends	6 - 8	10 - 12	14 - 16	18 - 25

Spacing rings

N° or size	Ø A	Ø B	Ø C $^{+0.5}_{0}$	D	E	α
BD 6 *	11	6	8.7	6	4	13°
BD 8	12	8	10.3	6	4	14°
BD 10	14	10	12.5	6	4	14°
BD 12	17	12	15	8	6	13°
BD 14	19	14	16.8	8	6	16°
BD 16	21	16	19	8	6	15°
BD 18 *	25	18	21	8	6	15°
BD 20 *	28	20	24	10	8	15°
BD 22 *	29	22	25	10	8	15°
BD 25 *	33	25	29	10	8	15°

* These are not kept in stock

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Dimensions

Our rod ends and spherical bearings are sold ready to be fitted. Their distinguishing features include compact proportions, high load resistance and ease of fitting.

The dimensions of rod ends and spherical bearings featured in this catalogue conform to the following standards : **DIN 648 K** and **ISO 6126 JK**.

Components with special dimensions (e.g. larger head diameter, longer shank, etc.) can be manufactured to order, given economic batch quantities.

Tolerances

To ensure ease of fitting and replacement, our rod ends and spherical bearings are manufactured in accordance with the dimensions indicated (see data and sketches, p. 20-58), which conform to the normal H7 basic hole system for the ball, and to the normal h6 shaft system for the spherical bearings.

For special components, the tolerances will be as requested by the customer.

The housing tolerances for spherical bearings are shown in table 10 (p. 41).

Free movement (play)

Our rod ends and spherical bearings have initial play and a sliding moment (torque), which is peculiar to each series and size.

Tables 8 and 9 show the maximum play and sliding moments (torques) respectively.

Table 8

Size	2-6	8-12	14-18	20-22	25-30	35-50
Max. radial play (mm)	0,03	0,04	0,05	0,06	0,08	0,09

Table 8 does not apply to the series references listed below, these types are produced with minimum clearances producing a tight fit - without play.

Steel/Bronze

SMG..40, SFG..40

Steel/Steel

SMGM..50
SMGM..51
SMGM..52
SSA..50

Steel/UNIFLON®

SMEM..50/51/52
SME, SFE
SMVV, SFVV
SME..40, SFE..40
SSVV
SSE
SSE..45
SSE.50

The sliding moments for these types are given in table 9 (p. 19).

The values for maximum play given in table 8 result from measurement of a representative series of components.

In addition to our standard range, we can produce components with customer specified play or sliding moment, subject to minimum order quantities.

Please consult us for advice regarding the play and sliding moment best suited to your application.

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Unibal

Sliding moment (Torque)

The ball in a rod end or spherical bearing can rotate about the bore axis or axes at right angles to the bore. The torques required to rotate the ball are referred to as the sliding rotation moment and the sliding misalignment moment respectively, and these are depicted in the diagrams below.

The relationship between rotation moment and misalignment moment is as follows :

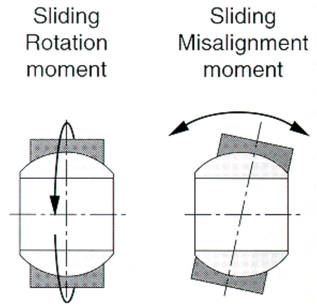
$$\text{Misalignment moment} = \frac{\text{Rotation moment}}{1.37}$$

The following rules apply in the majority of cases :

- For high running speeds (low load) the sliding moment must be as low as possible.
- To withstand alternating loads or shock loads (low speeds) the sliding moment must be high.

The rotation moments for the full range of Unibal products are given in table 9.

The operational life of a component will be shortened substantially if the sliding moment is not properly matched to the application



If the chosen component does not comply with the above rules, it is advisable to either

a) allow a braking-in period

b) use rod ends or spherical bearings with the sliding moment as calculated (in daNcm) and which corresponds exactly with your requirement

The sliding rotation moments given in table 9 relate to our standard production. On request, we are able to provide components with a sliding moment to meet specific customer requirements, within an agreed tolerance band.

Table 9

Type	Rotation moment (daNcm) size 2 - 5 min - max	size 6 - 10 min - max	size 12 - 18 min - max	size 20 - 50 min - max	
SMG, SFG	< 0.4	< 0.6	< 1	< 1.7	20
SMG..10, SFG..10	< 0.4	< 0.6	< 1	< 1.7	20
SMG..20, SFG..20	-	< 0.6	< 1	< 1.7	22
SMG..40, SFG..40	0.6 - 3.4	1 - 5.9	1.6 - 9.8	2.5 - 16	24
SMG..45, SFG..45	< 0.4	< 0.6	< 1	< 1.7	26
SMGM..50/51/52	-	5 - 19	8.5 - 32	-	28
SMEM..50/51/52	-	5 - 19	8.5 - 32	-	30
SMVV, SFVV	< 0.4	< 0.6	< 1	< 1.7	32
SME, SFE	0.1 - 0.7	0.2 - 1.3	0.3 - 2.1	0.5 - 3.4	34
SME..40, SFE..40	0.6 - 3.4	1 - 6	1.6 - 10	2.5 - 16	36
SME..45, SFE..45	0.1 - 0.7	0.2 - 1.3	0.3 - 2.1	0.5 - 3.4	38
SS	< 0.4	< 0.6	< 1	< 1.7	42
SS..10	< 0.4	< 0.6	< 1	< 1.7	42
SS..45	< 0.4	< 0.6	< 1	< 1.7	44
SSA	< 0.4	< 0.6	< 1	< 2.7	46
SSA..10	< 0.4	< 0.6	< 1	< 2.7	46
SSA..45	< 0.4	< 0.6	< 1	< 1.7	48
SSA..50	1.1 - 11	5 - 19	8.5 - 32	13 - 38	50
SSVV	< 0.4	< 0.6	< 1	< 1.7	52
SSE	0.1 - 0.7	0.2 - 1.3	0.3 - 2.1	0.5 - 3.4	54
SSE..45	0.1 - 0.7	0.2 - 1.3	0.3 - 2.1	0.5 - 3.4	56
SSE..50	1.1 - 11	5 - 19	8.5 - 32	13 - 51	58

Note : Under high load conditions, fluctuations in the sliding moment may be evident as a result of static friction (stiction); such fluctuations are quite normal.

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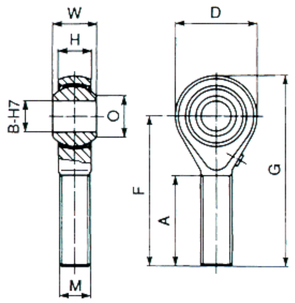
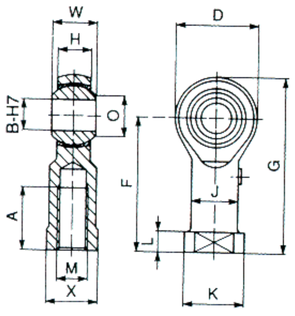
SM and SMG

Characteristic : standard



Type		A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SM	2	9	2	9	18	22.5	3.6	M 2 x 0,4	3.60	4.8	6.00	40	2
SM	3	15	3	12	27	33	4.5	M 3 x 0,5	5.18	6	7.93	120	5
SM	4	18	4	14	30	37	5.25	M 4 x 0,7	6.46	7	9.52	200	9
SM	5	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	340	12
SM	6	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	490	18
SM	8	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	830	35
SMG	10	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	1,270	57
SMG	12	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	1,670	87
SMG	14	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	2,060	120
SMG	16	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	2,500	170
SMG	18	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	2,940	240
SMG	20	47	20	46	78	101	18	M 20 x 1,5	24.38	25	34.92	3,430	320
SMG	22	51	22	50	84	109	20	M 22 x 1,5	25.84	28	38.10	4,120	420
SMG	25	57	25	56	94	122	22	M 24 x 2	29.60	31	42.85	5,000	580
SMG	30	66	30	66	110	143	25	M 30 x 2	34.80	37	50.80	6,670	980
SMC	35	85	35	80	140	180	30	M 36 x 2	40.30	43	59.00	9,500	1,600
SMC	40	90	40	90	150	195	35	M 42 x 2	44.20	49	66.00	13,000	2,300
SMC	50	105	50	116	185	243	45	M 48 x 2	55.80	60	82.00	23,500	4,800

SF and SFG



Type		A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SF	2	7	2	9	16	20.5	3.6	3.8	4.5	2.5	M 2 x 0,4	3.60	4.8	4.5	6.00	190	3
SF	3	10	3	12	21	27	4.5	5	6.5	3	M 3 x 0,5	5.18	6	5.5	7.93	360	7
SF	4	12	4	14	24	31	5.25	6.5	8.5	3.5	M 4 x 0,7	6.46	7	7	9.52	450	11
SF	5	14	5	16	27	35	6	7.5	9.5	4	M 5 x 0,8	7.71	8	8	11.11	560	14
SF	6	14	6	18	30	39	6.75	9.5	12	5	M 6 x 1	8.96	9	10	12.70	690	22
SF	8	17	8	22	36	47	9	12.5	16	5	M 8 x 1,25	10.40	12	13	15.88	980	38
SFG	10	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,5	12.92	14	16	19.05	1,320	70
SFG	12	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,75	15.43	16	18	22.23	1,670	110
SFG	14	27	14	34	57	74	13.5	20	25	8	M 14 x 2	16.86	19	21	25.40	2,060	150
SFG	16	33	16	38	64	83	15	22	27	8	M 16 x 2	19.39	21	24	28.58	2,500	200
SFG	18	36	18	42	71	92	16.5	25	31	10	M 18 x 1,5	21.89	23	27	31.75	2,940	280
SFG	20	40	20	46	77	100	18	27.5	34	10	M 20 x 1,5	24.38	25	30	34.92	3,430	370
SFG	22	43	22	50	84	109	20	30	37	12	M 22 x 1,5	25.84	28	34	38.10	4,120	480
SFG	25	48	25	56	94	122	22	33.5	42	12	M 24 x 2	29.60	31	36	42.85	5,000	670
SFG	30	56	30	66	110	143	25	40	50	15	M 30 x 2	34.80	37	46	50.80	6,670	1,080
SFC	35	56	35	80	125	165	30	49	60	20	M 36 x 2	40.30	43	50	59.00	9,500	1,600
SFC	40	60	40	90	142	187	35	57	69	25	M 42 x 2	44.20	49	60	66.00	13,000	2,400
SFC	50	65	50	116	160	218	45	65	78	25	M 48 x 2	55.80	60	65	82.00	23,500	5,000

SM..10 and SMG..10
SF..10 and SFG..10

Characteristic : as standard, with hard chrome plated ball
The type ..10 gives a better resistance to wear, as well as a higher allowable running speed (6 m/min.) Available in sizes 3 to 30.

Specific uses :
Our standard rod ends are suitable for many simple applications, where the loads, frequencies etc... are within the recommended limits. They need regular lubrication.

Applications : general mechanical linkages, multiple applications.

Materials used

Housing :
Sizes 2 to 12 : C 22 or C 35 Pb steel, zinc plated and passivated
Sizes 14 to 30 : C 35 steel, zinc plated and passivated.
Sizes 35 to 50 : C 22 steel, zinc plated and passivated

Ball :
SM, SF : hardened, ground, polished, 100 Cr 6 ball bearing steel.
SM..10, SF..10 : h ardened, ground, hard chrome plated, 100 Cr 6 ball bearing steel.

Inserts :
Sizes 2 to 16 : Cu Zn 40 Mn Pb bronze
Sizes 18 to 30 : GC- Cu Sn 7 Zn Pb bronze
Sizes 35 t o 50 : Cu Sn8 / Cu Zn40 AL2 F60 bronze

Notes :
- To designate a left handed thread, add the suffix L in the identification code. For example : SML 6, SFLG 12.
- The letter G indicates that the component is equipped with lubricator. Housings for sizes 8 to 30 are provided with a lubricator.
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- Magnaflux control (suffix M)
- Original lubrication with Molykote BR2

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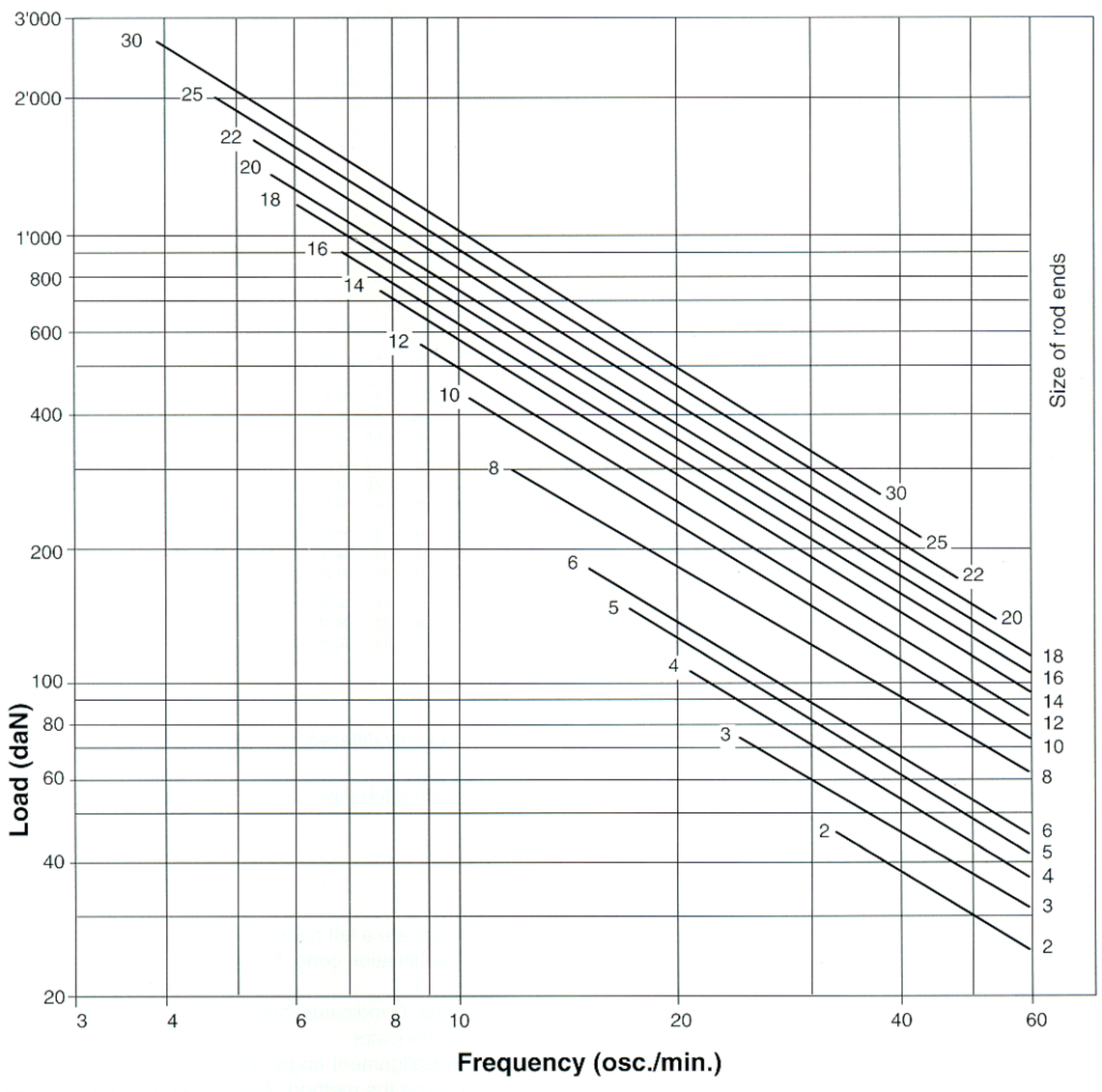
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SM, SMG and SF, SFG.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (β)between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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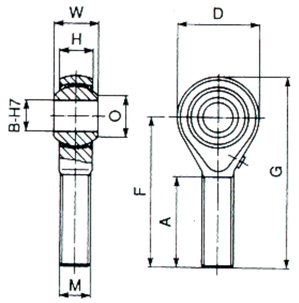
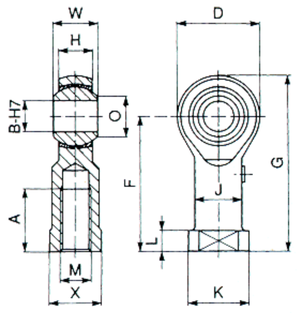
SMG..20

Characteristics : As standard - with alternative threads (M & MF)



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SMG 8.20	25	8	22	42	53	9	M 8 x 1	10.40	12	15.88	830	35
SMG 10.20	29	10	26	48	61	10.5	M 10 x 1	12.92	14	19.05	1,270	57
SMG 10.22	29	10	26	48	61	10.5	M 10 x 1,25	12.92	14	19.05	1,270	57
SMG 12.20	33	12	30	54	69	12	M 12 x 1,5	15.43	16	22.23	1,670	87
SMG 12.22	33	12	30	54	69	12	M 12 x 1,25	15.43	16	22.23	1,670	87
SMG 14.20	36	14	34	60	77	13.5	M 14 x 1,5	16.86	19	25.40	2,060	120
SMG 16.20	40	16	38	66	85	15	M 16 x 1,5	19.39	21	28.58	2,500	170
SMG 18.20	44	18	42	72	93	16.5	M 18 x 2,5	21.89	23	31.75	2,940	240
SMG 20.20	47	20	46	78	101	18	M 20 x 2,5	24.38	25	34.92	3,430	320
SMG 22.20	51	22	50	84	109	20	M 22 x 2,5	25.84	28	38.10	4,120	420
SMG 25.20	57	25	56	94	122	22	M 24 x 3	29.60	31	42.85	5,000	580
SMG 30.20	66	30	66	110	143	25	M 30 x 3,5	34.80	37	50.80	6,670	980

SFG..20



Type	A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SFG *8.20	17	8	22	36	47	9	12.5	16	5	M 8 x 1	10.40	12	13	15.88	980	38
SFG 10.20	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1	12.92	14	16	19.05	1,320	70
SFG *10.22	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,25	12.92	14	16	19.05	1,320	70
SFG 12.20	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,5	15.43	16	18	22.23	1,670	110
SFG *12.22	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,25	15.43	16	18	22.23	1,670	110
SFG 14.20	27	14	34	57	74	13.5	20	25	8	M 14 x 1,5	16.86	19	21	25.40	2,060	150
SFG *16.20	33	16	38	64	83	15	22	27	8	M 16 x 1,5	19.39	21	24	28.58	2,500	200
SFG 18.20	36	18	42	71	92	16.5	25	31	10	M 18 x 2,5	21.89	23	27	31.75	2,940	280
SFG 20.20	40	20	46	77	100	18	27.5	34	10	M 20 x 2,5	24.38	25	30	34.92	3,430	370
SFG 22.20	43	22	50	84	109	20	30	37	12	M 22 x 2,5	25.84	28	34	38.10	4,120	480
SFG 25.20	48	25	56	94	122	22	33.5	42	12	M 24 x 3	29.60	31	36	42.85	5,000	670
SFG 30.20	56	30	66	110	143	25	40	50	15	M 30 x 3,5	34.80	37	46	50.80	6,670	1,080

* Thread CETOP

Specific uses :
In technical terms it is identical to the standard series (SMG, SFG), the only difference being the pitch of the threads in this range.

Applications : general mechanical applications which necessitate an MF pitch (fine metric) or an M pitch (metric).

Materials used :

Housing :
Sizes 8 to 12 : C22 or C 35 Pb steel, zinc plated and passivated.
Sizes 14 to 30 : C 35 steel, zinc plated and passivated.

Ball:
Hardened, ground, polished, 100 Cr 6 ball bearing steel.

Inserts :
Sizes 8 to 16 : Cu Zn 40 Mn Pb bronze
Sizes 18 to 30 : GC-Cu Sn 7 Zn Pb bronze

Notes :
- To designate a left handed thread, add the suffix L to the identification code. For example : SMLG 8, SFLG 16.
- The letter G indicates that the component is provided with a lubricator.
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- Magnaflux control (suffix M)
- Original lubricating with Molykote BR2

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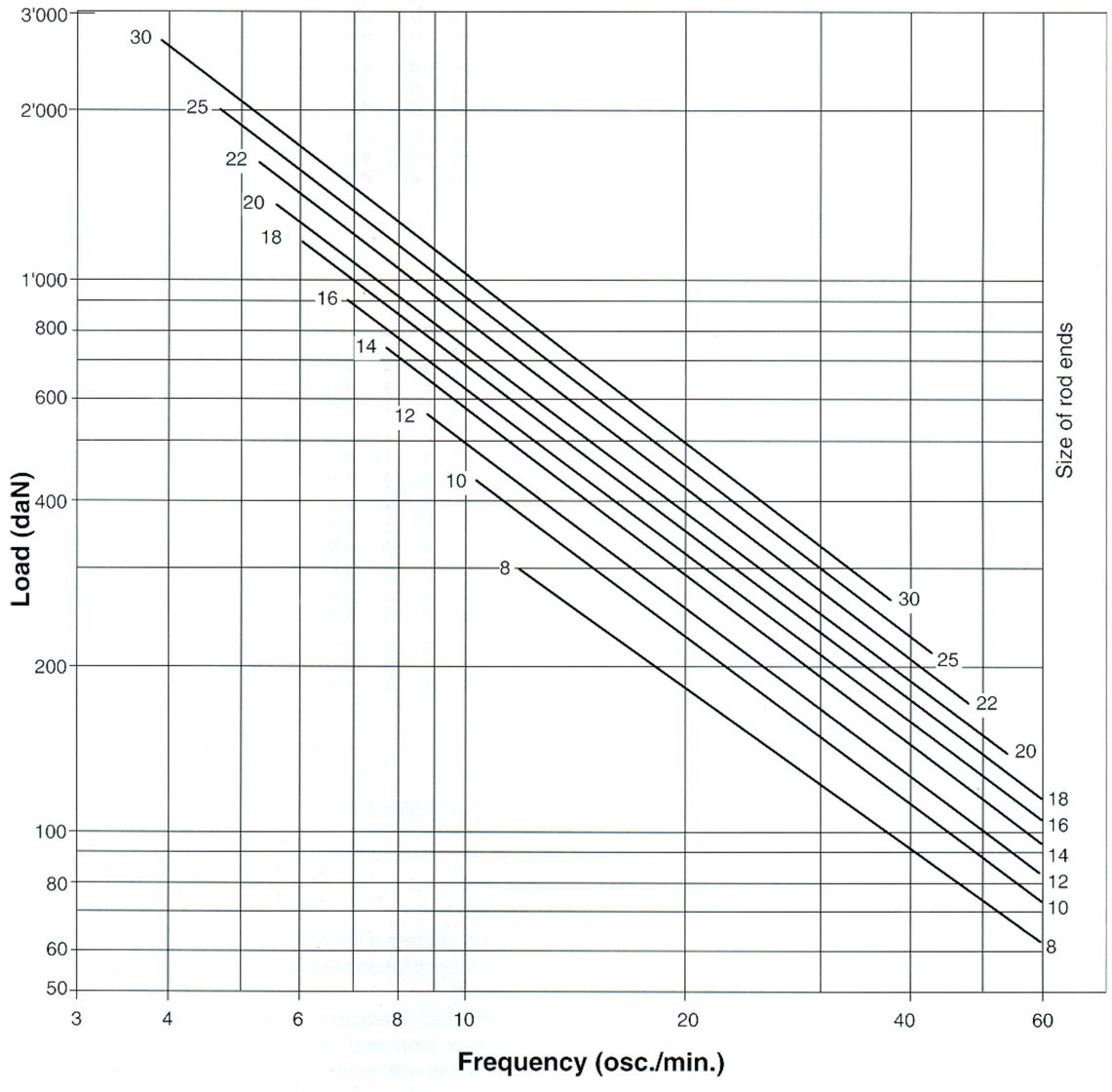
Unibal

Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SM..20, SMG..20 and SF..20, SFG..20.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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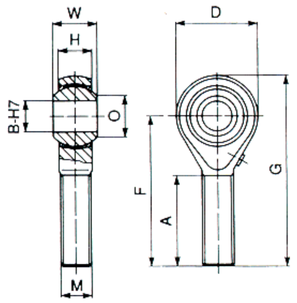
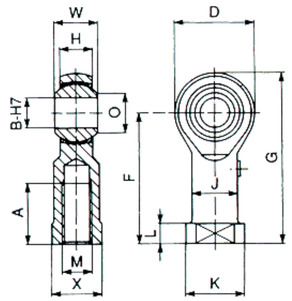
SM..40 and SMG..40

Characteristics : high performance



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SM 5.40	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	690	12
SM 6.40	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	980	18
SMG 8.40	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	1,670	35
SMG 10.40	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	2,550	57
SMG 12.40	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	3,330	87
SMG 14.40	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	4,120	120
SMG 16.40	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	5,000	170
SMG 18.40	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	5,890	240
SMG 20.40	47	20	46	78	101	18	M 20 x 1,5	24.38	25	34.92	6,870	320
SMG 22.40	51	22	50	84	109	20	M 22 x 1,5	25.84	28	38.10	8,240	420
SMG 25.40	57	25	56	94	122	22	M 24 x 2	29.60	31	42.85	10,010	580
SMG 30.40	66	30	66	110	143	25	M 30 x 2	34.80	37	50.80	13,340	980
SMXC 35	85	35	80	140	180	30	M 36 x 2	40.30	43	59.00	17,000	1,600
SMXC 40	90	40	90	150	195	35	M 42 x 2	44.20	49	66.00	23,500	2,300
SMXC 50	105	50	116	185	243	45	M 48 x 2	55.80	60	82.00	44,000	4,800

SF..40 and SFG..40



Type	A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SF 5.40	14	5	16	27	35	6	7.5	9.5	4	M 5 x 0,8	7.71	8	8	11.11	1,120	14
SF 6.40	14	6	18	30	39	6.75	9.5	12	5	M 6 x 1	8.96	9	10	12.70	1,370	22
SFG 8.40	17	8	22	36	47	9	12.5	16	5	M 8 x 1,25	10.40	12	13	15.88	1,960	38
SFG 10.40	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,5	12.92	14	16	19.05	2,650	70
SFG 12.40	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,75	15.43	16	18	22.23	3,330	110
SFG 14.40	27	14	34	57	74	13.5	20	25	8	M 14 x 2	16.86	19	21	25.40	4,120	150
SFG 16.40	33	16	38	64	83	15	22	27	8	M 16 x 2	19.39	21	24	28.58	5,000	200
SFG 18.40	36	18	42	71	92	16.5	25	31	10	M 18 x 1,5	21.89	23	27	31.75	5,890	280
SFG 20.40	40	20	46	77	100	18	27.5	34	10	M 20 x 1,5	24.38	25	30	34.92	6,870	370
SFG 22.40	43	22	50	84	109	20	30	37	12	M 22 x 1,5	25.84	28	34	38.10	8,240	480
SFG 25.40	48	25	56	94	122	22	33.5	42	12	M 24 x 2	29.60	31	36	42.85	10,010	670
SFG 30.40	56	30	66	110	143	25	40	50	15	M 30 x 2	34.80	37	46	50.80	13,340	1,080
SFXC 35	56	35	80	125	165	30	49	60	20	M 36 x 2	40.30	43	50	59.00	17,000	1,600
SFXC 40	60	40	90	142	187	35	57	69	25	M 42 x 2	44.20	49	60	66.00	23,500	2,400
SFXC 50	65	50	116	160	218	45	65	78	25	M 48 x 2	55.80	60	65	82.00	44,000	5,000

Specific uses:
The housing of this rod end is made from a high tensile steel, which enables it to withstand high static loads. Regular lubrication is necessary.

Applications : where static loads are high.

Materials used

Housing:
Sizes 5 to 30 : C 45 treated (or similar) steel, zinc plated and yellow passivated
Sizes 35 to 50 : 25 Cr Mo4 (or similar), zinc plated and passivated.

Ball :
Hardened, ground, polished 100 Cr 6 ball bearing steel.

Inserts :
Sizes 5 to 30 : GC-Cu SN 7 Zn Pb bronze.
Sizes 35 to 50 : Cu Sn8 / Cu Zn40 AL2 F60 bronze

Notes :
- To designate a left handed thread, add the suffix L to the identification code. For example, SML 6.40, SFLG 12.40.
- The letter G indicates that the component is equipped with a lubricator. Housings for sizes 8 to 30 are provided with a lubricator.
- The misalignment angle which can be achieved will depend on the method of mounting (p. 15).

Available on request :
- Magnaflux control (suffix M)
- Original lubricating with Molykote BR2
- Hard chrome plated ball
- Quality 20 or manufactured to your own specifications

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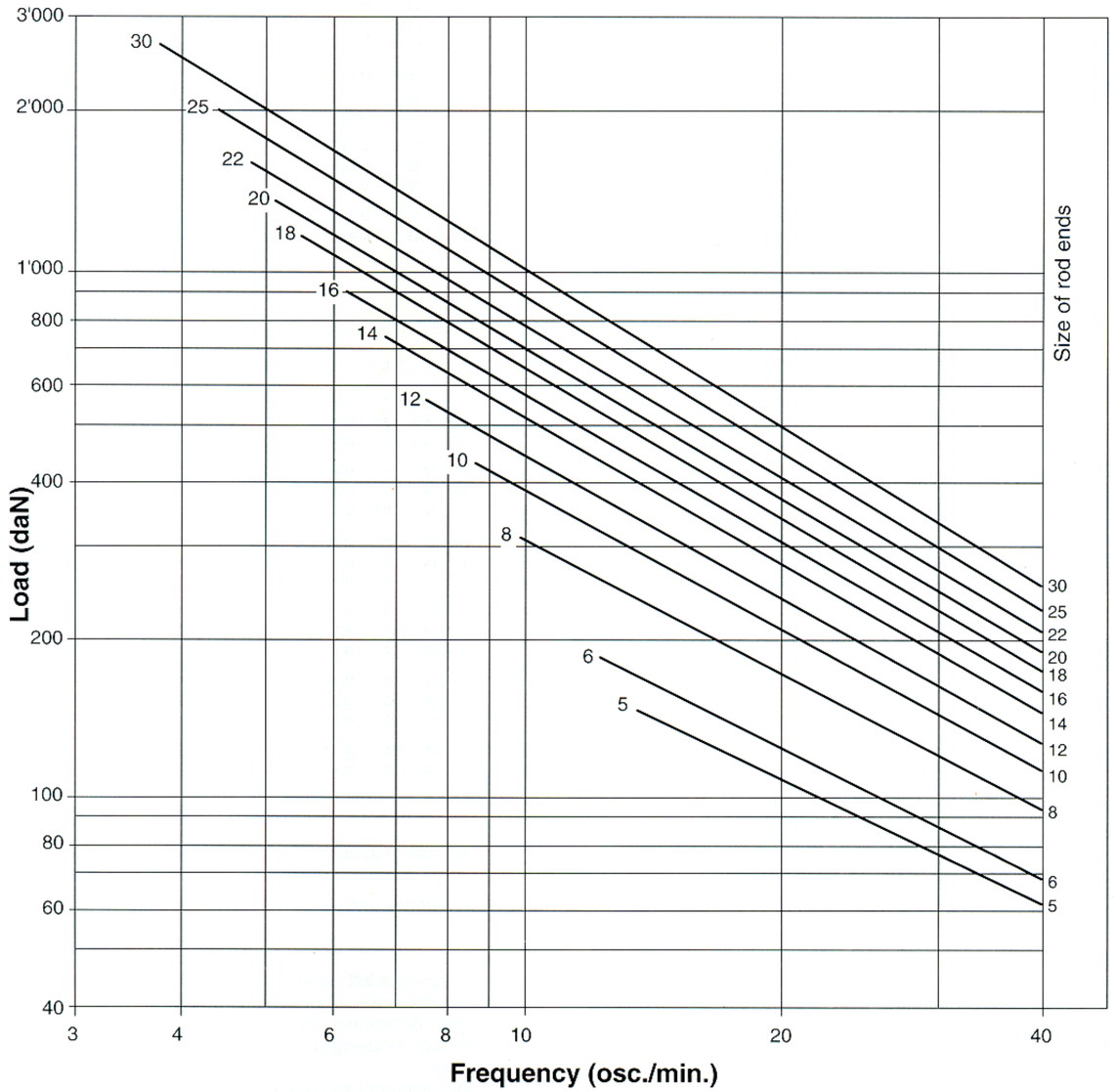
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SM..40, SMG..40 and SF..40, SFG..40.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 60°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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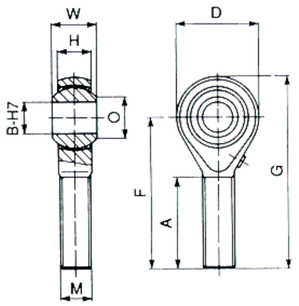
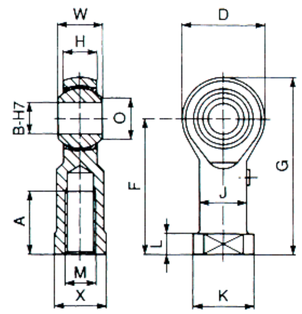
SM..45 and SMG..45

Characteristics : stainless steel



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SM 3.45	15	3	12	27	33	4.5	M 3 x 0,5	5.18	6	7.93	70	5
SM 4.45	18	4	14	30	27	5.25	M 4 x 0,7	6.46	7	9.52	120	9
SM 5.45	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	200	13
SM 6.45	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	280	19
SMG 8.45	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	520	35
SMG 10.45	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	780	57
SMG 12.45	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	1,000	87
SMG 14.45	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	1,230	120
SMG 16.45	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	1,490	170
SMG 18.45	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	1,780	240
SMG 20.45	47	20	46	78	101	18	M 20 x 1,5	24.38	25	34.92	2,090	320
SMG 22.45	51	22	50	84	109	20	M 22 x 1,5	25.84	28	38.10	2,460	420
SMG 25.45	57	25	56	94	122	22	M 24 x 2	29.60	31	42.85	3,000	580
SMG 30.45	66	30	66	110	143	25	M 30 x 2	34.80	37	50.80	3,970	980
SMRC 35	85	35	80	140	180	30	M 36 x 2	40.30	43	59.00	9,500	1,600
SMRC 40	90	40	90	150	195	35	M 42 x 2	44.20	49	66.00	13,000	2,300
SMRC 50	105	50	116	185	243	45	M 48 x 2	55.80	60	82.00	23,500	4,800

SF..45 and SFG..45



Type	A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SF 3.45	10	3	12	21	27	4.5	5	6.5	3	M 3 x 0,5	5.18	6	5.5	7.93	220	7
SF 4.45	12	4	14	24	31	5.25	6.5	8.5	3.5	M 4 x 0,7	6.46	7	7	9.50	270	11
SF 5.45	14	5	16	27	35	6	7.5	9.5	4	M 5 x 0,8	7.71	8	8	11.11	330	14
SFG 6.45	14	6	18	30	39	6.75	9.5	12	5	M 6 x 1	8.96	9	10	12.70	400	22
SFG 8.45	17	8	22	36	47	9	12.5	16	5	M 8 x 1,25	10.40	12	13	15.88	590	38
SFG 10.45	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,5	12.92	14	16	19.05	780	70
SFG 12.45	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,75	15.43	16	18	22.23	1,000	110
SFG 14.45	27	14	34	57	74	13.5	20	25	8	M 14 x 2	16.86	19	21	25.40	1,230	150
SFG 16.45	33	16	38	64	83	15	22	27	8	M 16 x 2	19.39	21	24	28.58	1,490	200
SFG 18.45	36	18	42	71	92	16.5	25	31	10	M 18 x 1,5	21.89	23	27	31.75	1,780	280
SFG 20.45	40	20	46	77	100	18	27.5	34	10	M 20 x 1,5	24.38	25	30	34.92	2,090	370
SFG 22.45	43	22	50	84	109	20	30	37	12	M 22 x 1,5	25.84	28	34	38.10	2,460	480
SFG 25.45	48	25	56	94	122	22	33.5	42	12	M 24 x 2	29.60	31	36	42.85	3,000	670
SFG 30.45	56	30	66	110	143	25	40	50	15	M 30 x 2	34.80	37	46	50.80	3,970	1,080
SFRC 35	56	35	80	125	165	30	49	60	20	M 36 x 2	40.30	43	50	59.00	9,500	1,600
SFRC 40	60	40	90	142	187	35	57	69	25	M 42 x 2	44.20	49	60	66.00	13,000	2,400
SFRC 50	65	50	116	160	218	45	65	78	25	M 48 x 2	55.80	60	65	82.00	23,500	5,000

Specific uses :
This stainless steel series is suitable for use in corrosive environments (water, salt, humidity, etc...). However, regular lubrication is necessary.

Applications : rod ends exposed to atmospheric conditions or oxidising environments, and used in clean areas, laboratories, etc...

Materials used

Housing :
Sizes 3 to 30 : X 10 Cr Ni S18 9 (AISI 303) stainless steel.
Sizes 35 to 50 : X 10 Cr Ni S18 9 (AISI 303) stainless steel, forged.

Ball :
Sizes 3 to 30 : hard, ground, polished X Cr 13 (AISI 420) stainless steel.
Sizes 35 to 50 : 100 Cr6, chrome plated, stainless steel on request.

Inserts :
Sizes 3 to 30 : GC-Cu Sn 7 Zn Pb bronze.
Sizes 35 to 50 : Cu Sn8 / Cu Zn40 AL2 F60 bronze.

Notes :
- To designate a left handed thread, add the suffix L to the identification code. For example, SML6,.45, SFLG 12.45.
- The letter G indicates that the component is equipped with a lubricator. Housings for sizes 8 to 30 are provided with a lubricator.
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- Original lubricating with Molykote BR2
- Quality 20 thread, or manufactured to your own specifications
- Hard chrome plated ball
- Other grades of stainless steels
- Components may be manufactured entirely from stainless steel.

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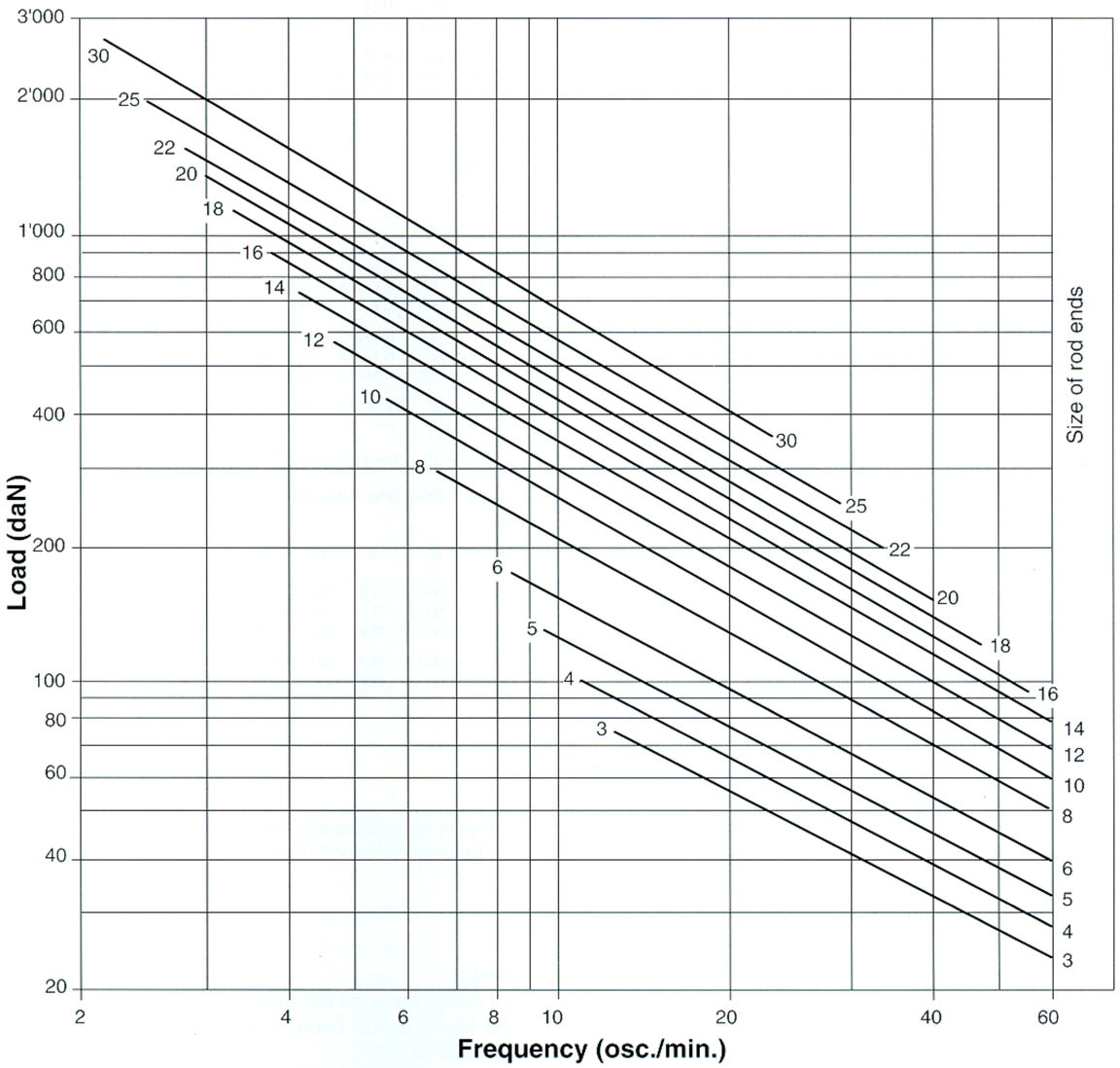
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SM..45, SMG..45 and SF..45, SFG..45.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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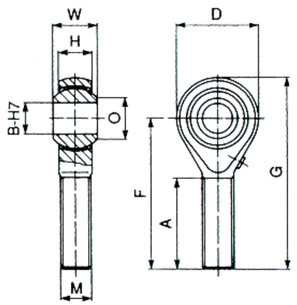
Characteristics : **High performance, Magnaflux control**

SMGM..50



Distinctive feature : standard high performance model

Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SMGM 5.50	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	810	12
SMGM 6.50	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	1120	18
SMGM 8.50	25	8	22	42	53	9	M 8 x 1,25	10.4	12	15.88	2'060	35
SMGM 10.50	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	3,140	57
SMGM 12.50	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	3,920	87
SMGM 14.50	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	4,810	120
SMGM 16.50	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	5,890	170
SMGM 18.50	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	7,060	240

SMGM..51

Distinctive feature : fine thread

Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SMGM 5.51	20	5	16	33	41	6	M 5 x 0,5	7.71	8	11.11	810	12
SMGM 6.51	22	6	18	36	45	6.75	M 6 x 0,75	8.96	9	12.70	1120	18
SMGM 8.51	25	8	22	42	53	9	M 8 x 1	10.40	12	15.88	2,060	35
SMGM 10.51	29	10	26	48	61	10.5	M 10 x 1	12.92	14	19.05	3,140	57
SMGM 12.51	33	12	30	54	69	12	M 12 x 1,5	15.43	16	22.23	3,920	87
SMGM 14.51	36	14	34	60	77	13.5	M 14 x 1,5	16.86	19	25.40	4,810	120
SMGM 16.51	40	16	38	66	85	15	M 16 x 1,5	19.39	21	28.58	5,890	170

SMGM..52

Distinctive feature : bore of the ball : 2mm less than the diameter of the thread – and fine threads.

Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Angle	Weight g
SMGM 10.52	29	8	26	48	61	10.5	M 10 x 1	12.92	14	19.05	3,140	31°30'	62
SMGM 12.52	33	10	30	54	69	12	M 12 x 1,5	15.43	16	22.23	3,920	30°30'	90
SMGM 14.52	36	12	34	60	77	13.5	M 14 x 1,5	16.86	19	25.40	4,810	29°30'	130
SMGM 16.52	40	14	38	66	85	15	M 16 x 1,5	19.39	21	28.58	5,890	29°	185
SMGM 18.52	44	16	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	7,060	28°	250

Specific uses :
The high performance series are specifically designed to withstand very high stresses (loads, frequencies, etc.) They have exceptionally high resistance to shock loads and vibrations, however the lack of play gives rise to high sliding moments (torque) making them unsuitable for high speeds.

Applications : motor bikes, competition cars, etc...

Materials used

Housing :
High performance 34 Cr Ni Mo 6 steel, carbonised and oiled.

Ball :
Hardened, ground, polished, hard chrome plated, 100 Cr 6 ball bearing steel.

Inserts :
Stainless steel X 10 Cr Ni S 18 9.
Manufactured with reduced play and Magnaflux control (suffix M).

Notes :
- To designate a left handed thread, add the suffix L to the identification code. For example, SMLGM8.50, SMLGM 16.52.
- The letter G indicates that the component is equipped with a lubricator. Housings for sizes 8 to 30 are provided with a lubricator.
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Original lubricating with Molykote BR2

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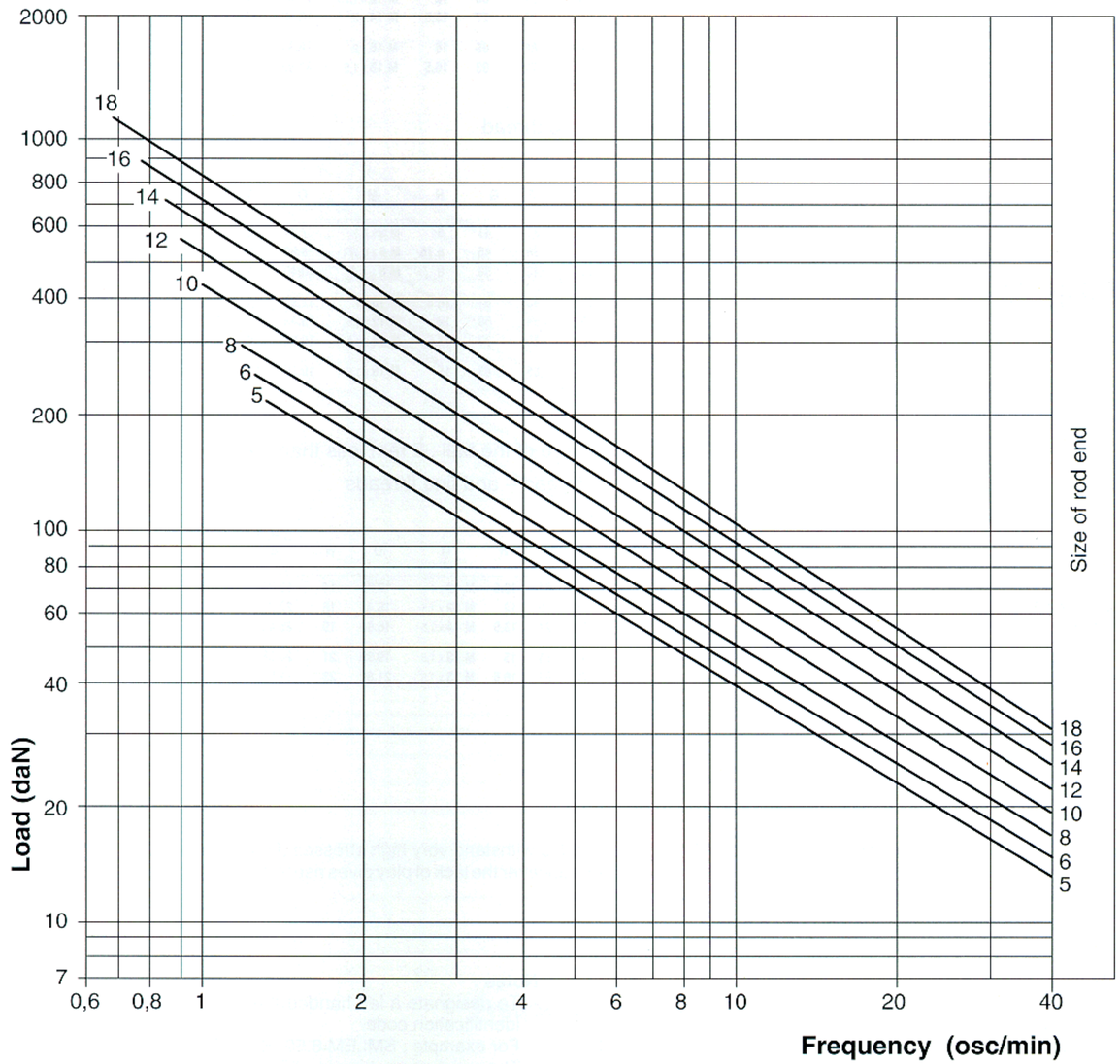
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SMGM..50, SMGM..51, SMGM..52.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 60°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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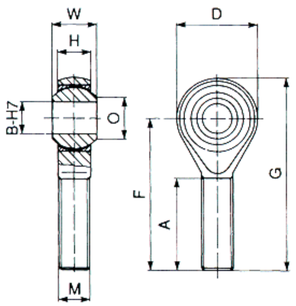
Characteristics : **High performance, UNIFLON® E, maintenance free, Magnaflux control**

SMEM..50

Distinctive feature : standard high performance



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SMEM 5.50	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	610	12
SMEM 6.50	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	860	18
SMEM 8.50	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	1,520	35
SMEM 10.50	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	2,320	57
SMEM 12.50	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	2,900	87
SMEM 14.50	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	3,550	120
SMEM 16.50	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	4,350	170
SMEM 18.50	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	5,220	240

SMEM..51

Distinctive feature : fine thread

Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SMEM 5.51	20	5	16	33	41	6	M 5 x 0,5	7.71	8	11.11	610	12
SMEM 6.51	22	6	18	36	45	6.75	M 6 x 0,75	8.96	9	12.70	860	18
SMEM 8.51	25	8	22	42	53	9	M 8 x 1	10.40	12	15.88	1,520	35
SMEM 10.51	29	10	26	48	61	10.5	M 10 x 1	12.92	14	19.05	2,320	57
SMEM 12.51	33	12	30	54	69	12	M 12 x 1,5	15.43	16	22.23	2,900	87
SMEM 14.51	36	14	34	60	77	13.5	M 14 x 1,5	16.86	19	25.40	3,550	120
SMEM 16.51	40	16	38	66	85	15	M 16 x 1,5	19.39	21	28.58	4,350	170

SMEM..52

Distinctive feature : bore of the ball : 2 mm less than the diameter of the thread – and fine threads

Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Angle	Weight g
SMEM 10.52	29	8	26	48	61	10.5	M 10 x 1	12.92	14	19.05	2,320	31°30'	62
SMEM 12.52	33	10	30	54	69	12	M 12 x 1,5	15.43	16	22.23	2,900	30°30'	90
SMEM 14.52	36	12	34	60	77	13.5	M 14 x 1,5	16.86	19	25.40	3,550	29°30'	130
SMEM 16.52	40	14	38	66	85	15	M 16 x 1,5	19.39	21	28.58	4,350	29°	185
SMEM 18.52	44	16	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	5,220	28°	250

Specific uses :

High performance series with UNIFLON® E, specifically designed to withstand very high stresses (loads, frequencies, etc.). They have exceptionally high resistance to shock loads and vibrations, however the lack of play gives rise to high sliding moments (torque) making them unsuitable for high speeds. Self lubricating.

Applications : motor bikes, competition cars, etc.

Material used

Housing :
High performance 34Cr Ni Mo 6 (or similar) steel, carbonised and oiled, or zinc plated and yellow passivated

Ball :
Hardened, ground, polished, hard chrome plated, 100 Cr6 ball bearing steel.

Race :
Stainless steel X 10 Cr Ni S 18 9
Manufactured with reduced play and Magnaflux control (suffix M).
UNIFLON® E

Notes :
- To designate a left handed thread, add the suffix L to the identification code.
  For example : SMLEM 8.50, SMLEM 16.52
- The misalignment angle which can be achieved will depend on the method of mounting (p. 15)

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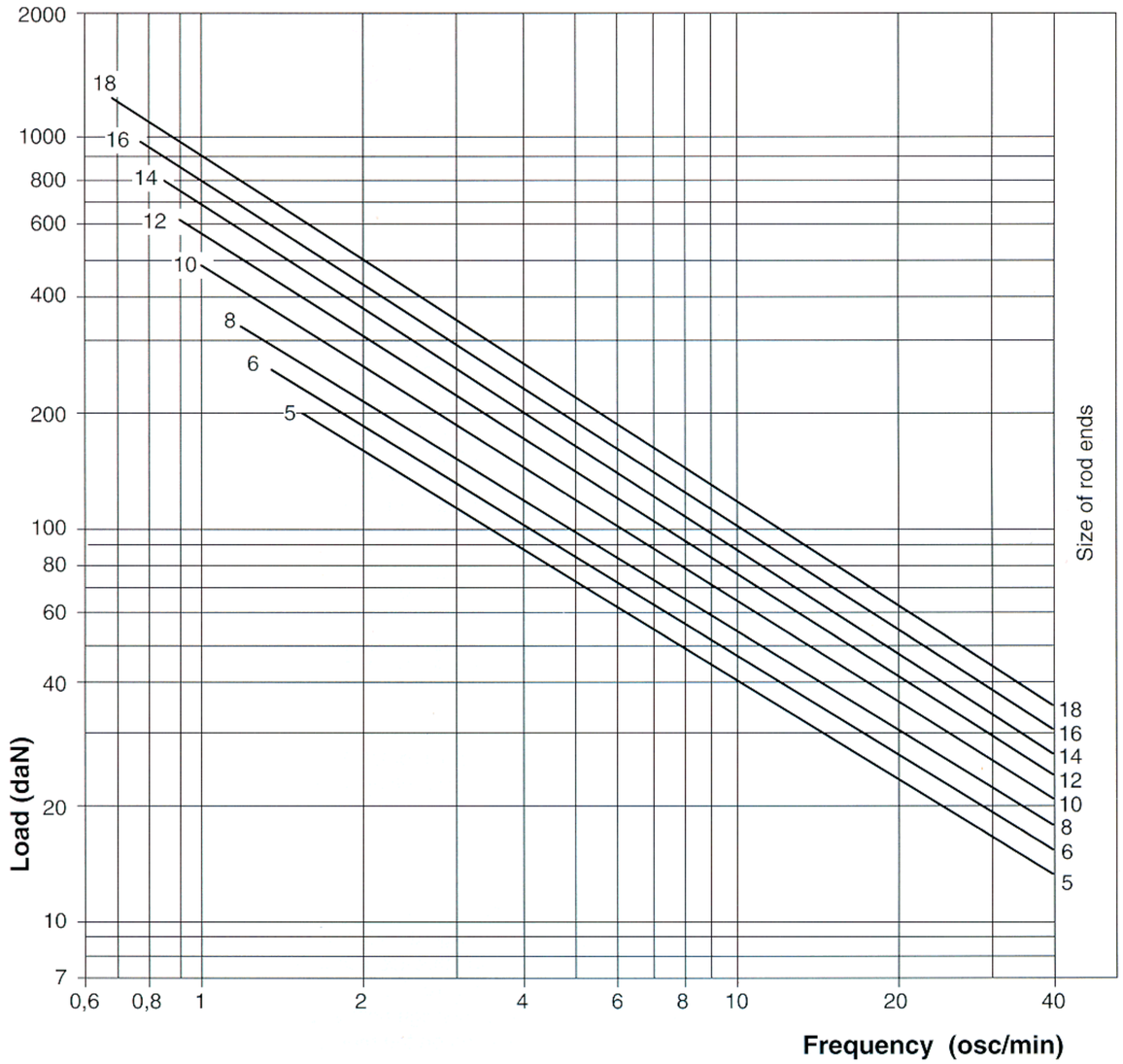
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SMEM..50, SMEM..51, SMEM..52.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 60°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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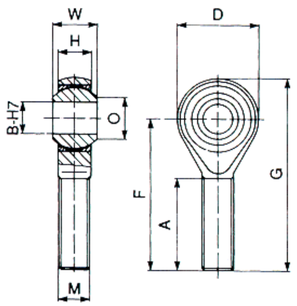
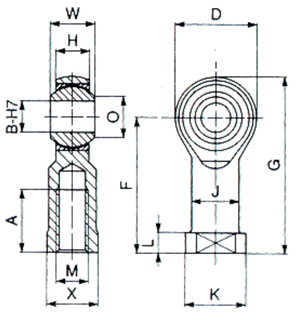
SMVV

Characteristic : UNIFLON® VV



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SMVV 3	15	3	12	27	33	4.5	M 3 x 0,5	5.18	6	7.93	90	5
SMVV 4	18	4	14	30	37	5.25	M 4 x 0,7	6.46	7	9.52	150	9
SMVV 5	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	260	12
SMVV 6	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	370	18
SMVV 8	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	640	35
SMVV 10	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	970	57
SMVV 12	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	1,280	87
SMVV 14	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	1,580	120
SMVV 16	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	1,920	170
SMVV 18	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	2,260	240
SMVV 20	47	20	46	78	101	18	M 20 x 1,5	24.38	25	34.92	2,640	320
SMVV 22	51	22	50	84	109	20	M 22 x 1,5	25.84	28	38.10	3,170	420
SMVV 25	57	25	56	94	122	22	M 24 x 2	29.60	31	42.85	3,850	580
SMVV 30	66	30	66	110	143	25	M 30 x 2	34.80	37	50.80	5,130	980

SFVV



Type	A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SFVV 3	10	3	12	21	27	4.5	5	6.5	3	M 3 x 0,5	5.18	6	5.5	7.93	270	7
SFVV 4	12	4	14	24	31	5.25	6.5	8.5	3.5	M 4 x 0,7	6.46	7	7	9.52	350	11
SFVV 5	14	5	16	27	35	6	7.5	9.5	4	M 5 x 0,8	7.71	8	8	11.11	430	14
SFVV 6	14	6	18	30	39	6.75	9.5	12	5	M 6 x 1	8.96	9	10	12.70	530	22
SFVV 8	17	8	22	36	47	9	12.5	16	5	M 8 x 1,25	10.40	12	13	15.88	750	38
SFVV 10	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,5	12.92	14	16	19.05	1,010	70
SFVV 12	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,75	15.43	16	18	22.23	1,280	110
SFVV 14	27	14	34	57	74	13.5	20	25	8	M 14 x 2	16.86	19	21	25.40	1,580	150
SFVV 16	33	16	38	64	83	15	22	27	8	M 16 x 2	19.39	21	24	28.58	1,920	200
SFVV 18	36	18	42	71	92	16.5	25	31	10	M 18 x 1,5	21.89	23	27	31.75	2,260	280
SFVV 20	40	20	46	77	100	18	27.5	34	10	M 20 x 1,5	24.38	25	30	34.92	3,430	370
SFVV 22	43	22	50	84	109	20	30	37	12	M 22 x 1,5	25.84	28	34	38.10	3,170	480
SFVV 25	48	25	56	94	122	22	33.5	42	12	M 24 x 2	29.60	31	36	42.85	3,850	670
SFVV 30	56	30	66	110	143	25	40	50	15	M 30 x 2	34.80	37	46	50.80	5,130	1,080

Specific uses:
There is a liner of UNIFLON® VV between the ball and the race. The use of UNIFLON® VV eliminates the need for maintenance (lubrication) and the rod end is able to operate at a higher running speed (8m/min).
Applications : high speeds without the need for maintenance.

Materials used

Housing:
Sizes 3 to 12 : C 35 Pb steel, zinc plated and passivated
Sizes 14 to 30 : C 35 steel, zinc plated and passivated

Ball :
Hardened, ground, polished 100 Cr 6 ball bearing steel.

Race :
Sizes 3 to 12 : Cu Zn 40 Mn Pb bronze.
Sizes 14 to 30 : Cu Zn 40 Mn Pb3 bronze.
UNIFLON® VV

Notes :
- To designate a left handed thread, add the suffix L to the identification code. For example, SMLVV 6, SFLVV 12.
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- Magnaflux control (suffix M)
- Hard chrome plated ball
- Quality 20 thread or manufactured according to your specifications.

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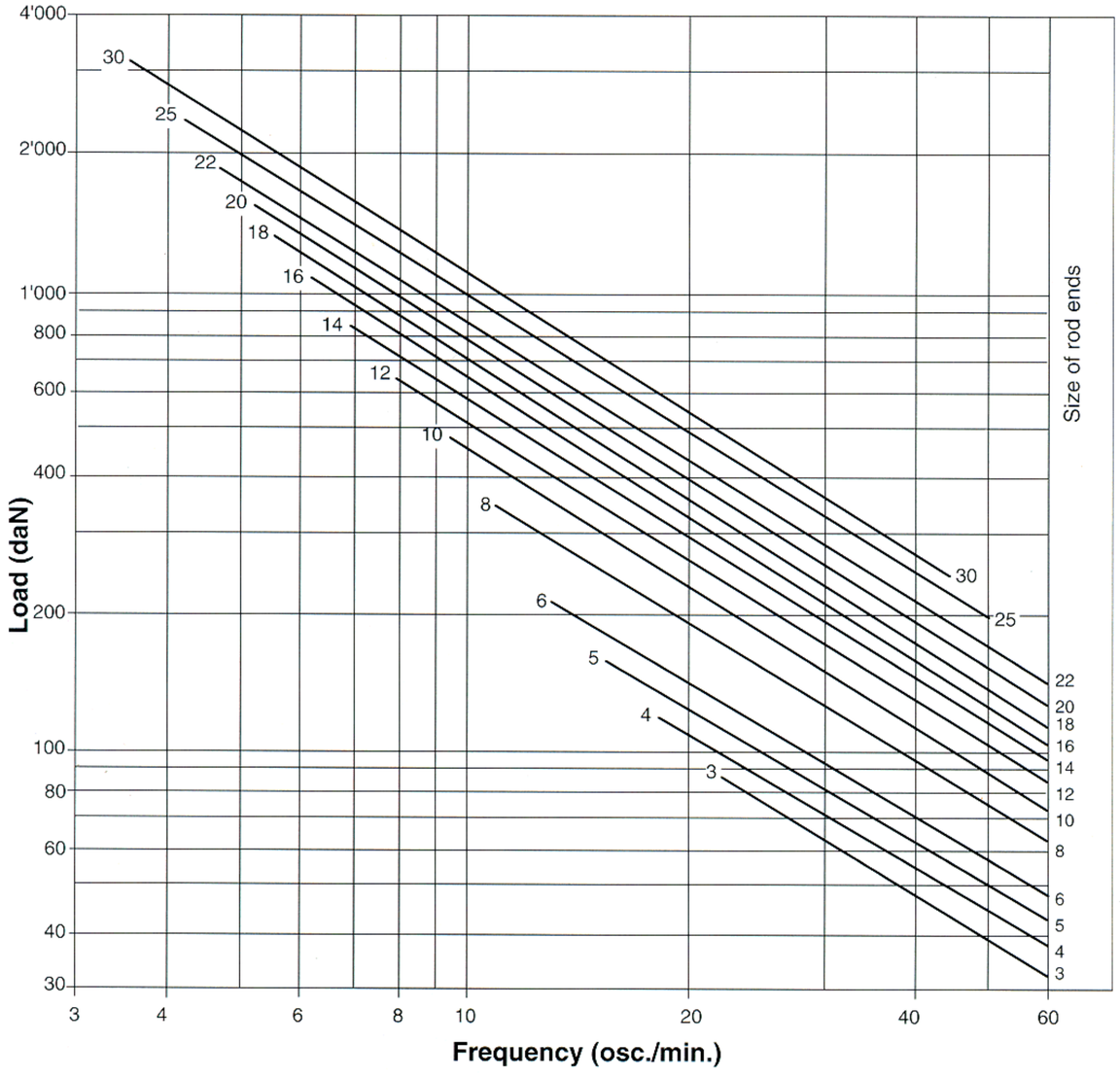
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SMVV and SFVV.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures(0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

Fabrique de machines **SCHAUBLIN S.A.** CH-2800 Delémont/Suisse
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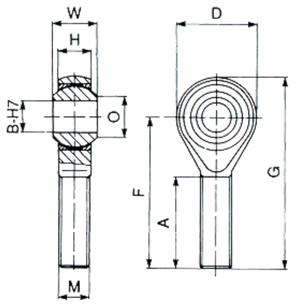
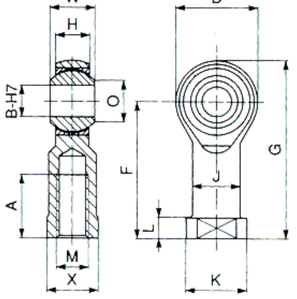
SME

Characteristic : UNIFLON® E



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SME 3	15	3	12	27	33	4.5	M 3 x 0,5	5.18	6	7.93	90	5
SME 4	18	4	14	30	37	5.25	M 4 x 0,7	6.46	7	9.52	150	9
SME 5	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	260	12
SME 6	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	370	18
SME 8	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	640	35
SME 10	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	970	57
SME 12	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	1,280	87
SME 14	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	1,580	120
SME 16	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	1,920	170
SME 18	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	2,260	240
SME 20	47	20	46	78	101	18	M 20 x 1,5	24.38	25	34.92	2,640	320
SME 22	51	22	50	84	109	20	M 22 x 1,5	25.84	28	38.10	3,170	420
SME 25	57	25	56	94	122	22	M 24 x 2	29.60	31	42.85	3,850	580
SME 30	66	30	66	110	143	25	M 30 x 2	34.80	37	50.80	5,130	980
SMCP 35	85	35	80	140	180	30	M 36 x 2	40.30	43	59.00	9,500	1,600
SMCP 40	90	40	90	150	195	35	M 42 x 2	44.20	49	66.00	12,000	2,300
SMCP 50	105	50	116	185	243	45	M 48 x 2	55.80	60	82.00	23,500	4,800

SFE



Type	A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SFE 3	10	3	12	21	27	4.5	5	6.5	3	M 3 x 0,5	5.18	6	5.5	7.93	270	7
SFE 4	12	4	14	24	31	5.25	6.5	8.5	3.5	M 4 x 0,7	6.46	7	7	9.52	350	11
SFE 5	14	5	16	27	35	6	7.5	9.5	4	M 5 x 0,8	7.71	8	8	11.11	430	14
SFE 6	14	6	18	30	39	6.75	9.5	12	5	M 6 x 1	8.96	9	10	12.70	530	22
SFE 8	17	8	22	36	47	9	12.5	16	5	M 8 x 1,25	10.40	12	13	15.88	750	38
SFE 10	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,5	12.92	14	16	19.05	1,010	70
SFE 12	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,75	15.43	16	18	22.23	1,280	110
SFE 14	27	14	34	57	74	13.5	20	25	8	M 14 x 2	16.86	19	21	25.40	1,580	150
SFE 16	33	16	38	64	83	15	22	27	8	M 16 x 2	19.39	21	24	28.58	1,920	200
SFE 18	36	18	42	71	92	16.5	25	31	10	M 18 x 1,5	21.89	23	27	31.75	2,260	280
SFE 20	40	20	46	77	100	18	27.5	34	10	M 20 x 1,5	24.38	25	30	34.92	2,640	370
SFE 22	43	22	50	84	109	20	30	37	12	M 22 x 1,5	25.84	28	34	38.10	3,170	480
SFE 25	48	25	56	94	122	22	33.5	42	12	M 24 x 2	29.60	31	36	42.85	3,850	670
SFE 30	56	30	66	110	143	25	40	50	15	M 30 x 2	34.80	37	46	50.80	5,130	1,080
SFCP 35	56	35	80	125	165	30	49	60	20	M 36 x 2	40.30	43	50	59.00	9,500	1,600
SFCP 40	60	40	90	142	187	35	57	69	25	M 42 x 2	44.20	49	60	66.00	13,000	2,400
SFCP 50	65	50	116	160	218	45	65	78	25	M 48 x 2	58.80	60	65	82.00	23,500	5,000

Specific uses:
There is a liner of UNIFLON® E between the ball and the race. UNIFLON® E is capable of heavier duty than UNIFLON® VV (life, dynamic loads, speed : 6m/min).

Applications : high loads/frequencies etc ... without the need for maintenance.

Materials used

Housing :
Sizes 3 to 12 : C 35 Pb steel, zinc plated and passivated
Sizes 14 to 30 : C 35 steel, zinc plated and passivated
Sizes 35 to 50 : C 22 steel, zinc plated and passivated

Ball :
Hardened, ground, polished 100 Cr 6 ball bearing steel.

Race :
Sizes 3 to 12 : Cu Zn 40 Mn Pb bronze, UNIFLON® E
Sizes 14 to 30 : Cu Zn 40 Pb 3 bronze, UNIFLON® E
Sizes 35 to 50 : Cu Zn 40 AL2, zinc plated, PTFE

Notes :
- To designate a left handed thread, add the suffix L to the identification code. For example, SMLE 6, SFLE 12.
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- Magnaflux control (suffix M)
- Hard chrome plated ring
- Quality 20 thread or as specified by the client.

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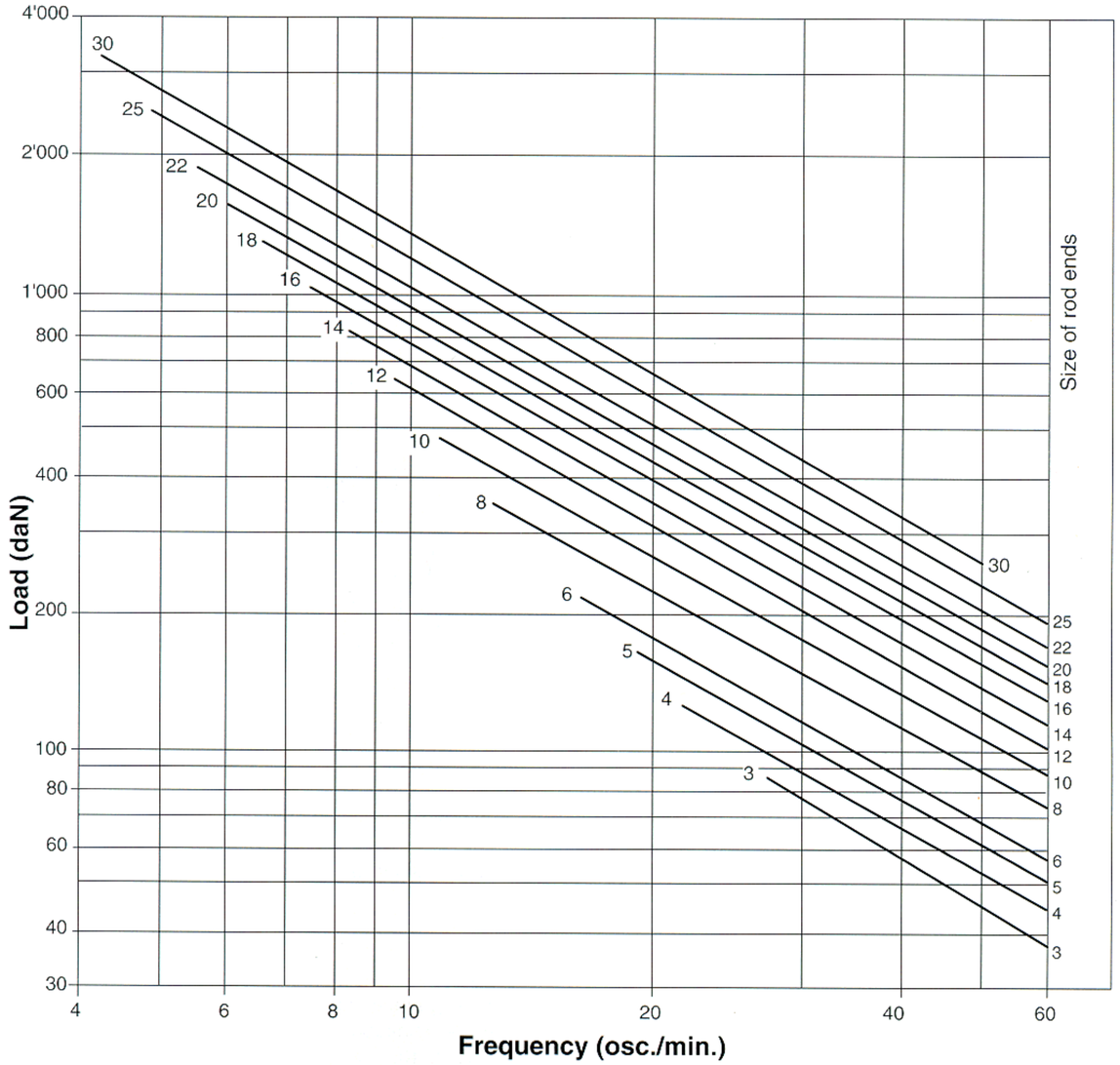
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SME and SFE.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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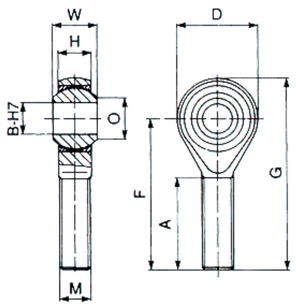
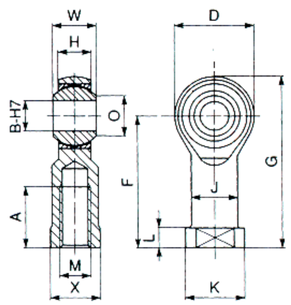
SME..40

Characteristics : UNIFLON® E, high performance



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SME 5.40	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	530	12
SME 6.40	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	750	18
SME 8.40	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	1,030	35
SME 10.40	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	1,960	57
SME 12.40	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	2,560	87
SME 14.40	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	3,170	120
SME 16.40	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	3,850	170
SME 18.40	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	4,530	240
SME 20.40	47	20	46	78	101	18	M 20 x 1,5	24.38	25	34.92	5,280	320
SME 22.40	51	22	50	84	109	20	M 22 x 1,5	25.84	28	38.10	6,340	420
SME 25.40	57	25	56	94	122	22	M 24 x 2	29.60	31	42.85	7,700	580
SME 30.40	66	30	66	110	143	25	M 30 x 2	34.80	37	50.80	10,270	980

SFE..40



Type	A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SFE 5.40	14	5	16	27	35	6	7.5	9.5	4	M 5 x 0,8	7.71	8	8	15.88	780	14
SFE 6.40	14	6	18	30	39	6.75	9.5	12	5	M 6 x 1	8.96	9	10	19.05	930	22
SFE 8.40	17	8	22	36	47	9	12.5	16	5	M 8 x 1,25	10.40	12	13	19.05	1,030	38
SFE 10.40	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,5	12.92	14	16	22.23	2,010	70
SFE 12.40	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,75	15.43	16	18	22.23	2,560	110
SFE 14.40	27	14	34	57	74	13.5	20	25	8	M 14 x 2	16.86	19	21	25.40	3,170	150
SFE 16.40	33	16	38	64	83	15	22	27	8	M 16 x 2	19.39	21	24	28.58	3,850	200
SFE 18.40	36	18	42	71	92	16.5	25	31	10	M 18 x 1,5	21.89	23	27	31.75	4,530	280
SFE 20.40	40	20	46	77	100	18	27.5	34	10	M 20 x 1,5	24.38	25	30	34.92	5,280	370
SFE 22.40	43	22	50	84	109	20	30	37	12	M 22 x 1,5	25.84	28	34	38.10	6,340	480
SFE 25.40	48	25	56	94	122	22	33.5	42	12	M 24 x 2	29.60	31	36	42.85	7,700	670
SFE 30.40	56	30	66	110	143	25	40	50	15	M 30 x 2	34.80	37	46	50.80	10,270	1,080

Specific uses :
There is a liner of UNIFLON® E between the ball and the race. The housing is manufactured from high tensile steel, which gives this series excellent resistance to static loads.

Applications : high static and dynamic loads/frequencies etc ... without the need for maintenance.

Materials used

Housing :
C 45 treated (or similar) steel, zinc plated and yellow passivated.

Ball :
Hardened, ground, polished, 100 Cr 6 ball bearing steel.

Race :
C 35 Pb steel, cadmium-plated
UNIFLON® E.

Notes :
- To designate a left handed thread, add the suffix L to the identification code. For example, SMLE 6.40, SFLE 12.40.
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Magnaflux control (suffix M)
- Hard chrome plated ball
- Quality 20 thread or according to your specifications.

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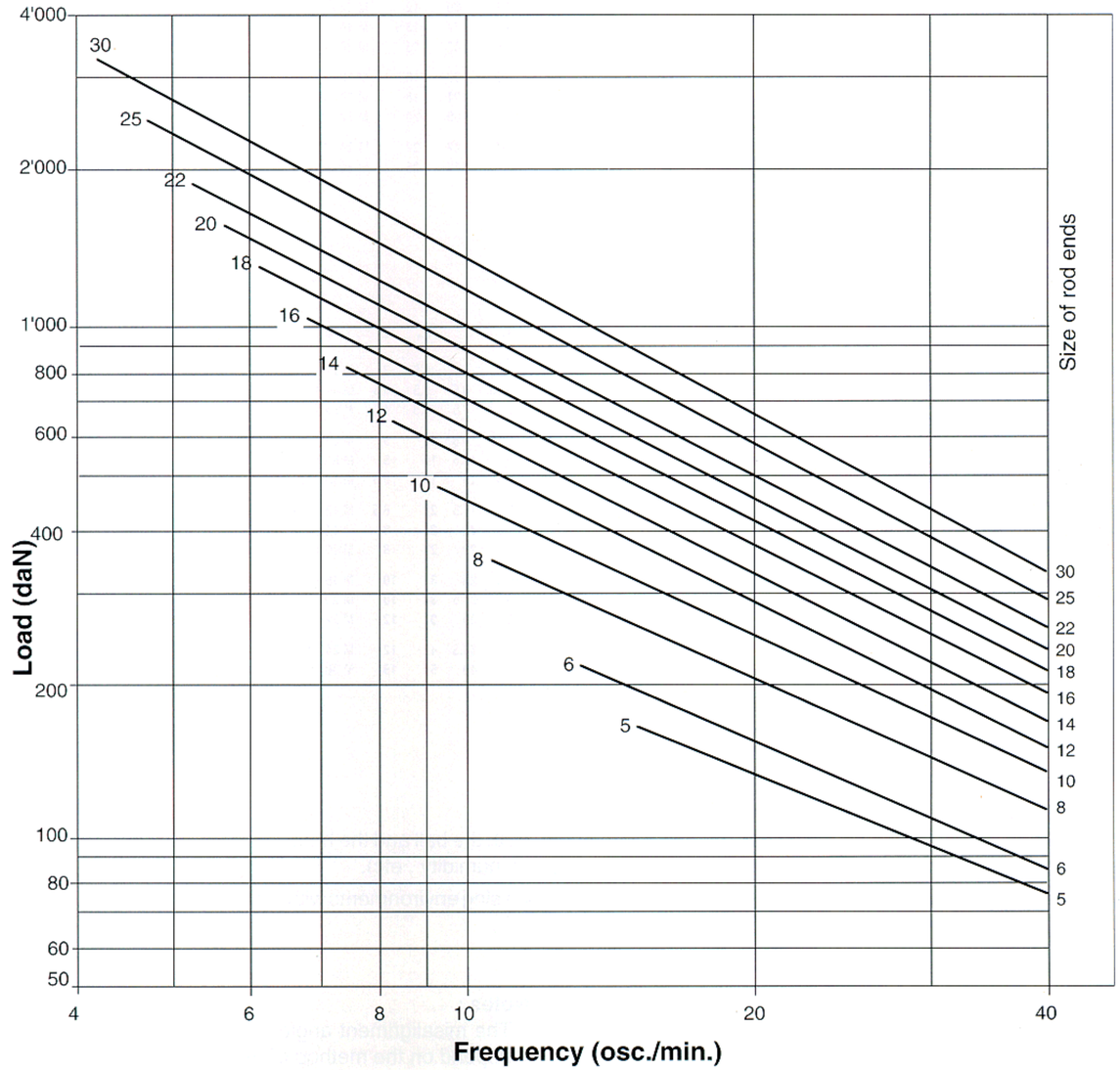
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SME..40 and SFE..40.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 60°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc...

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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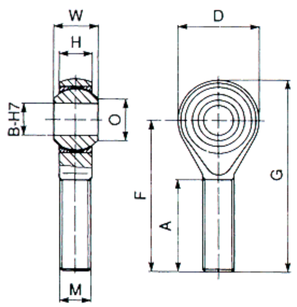
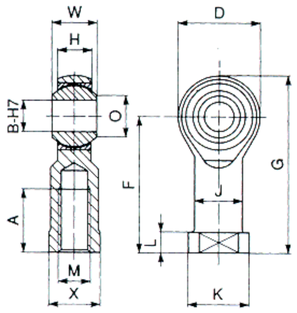
SME..45

Characteristics : UNIFLON® E, stainless steel



Type	A	B	D	F	G	H	M	O	W	Ø Ball E	Static loads daN	Weight g
SME 3.45	15	3	12	27	33	4.5	M 3 x 0,5	5.18	6	7.93	50	5
SME 4.45	18	4	14	30	37	5.25	M 4 x 0,7	6.46	7	9.52	90	9
SME 5.45	20	5	16	33	41	6	M 5 x 0,8	7.71	8	11.11	150	13
SME 6.45	22	6	18	36	45	6.75	M 6 x 1	8.96	9	12.70	210	19
SME 8.45	25	8	22	42	53	9	M 8 x 1,25	10.40	12	15.88	400	35
SME 10.45	29	10	26	48	61	10.5	M 10 x 1,5	12.92	14	19.05	600	57
SME 12.45	33	12	30	54	69	12	M 12 x 1,75	15.43	16	22.23	770	87
SME 14.45	36	14	34	60	77	13.5	M 14 x 2	16.86	19	25.40	940	120
SME 16.45	40	16	38	66	85	15	M 16 x 2	19.39	21	28.58	1,140	170
SME 18.45	44	18	42	72	93	16.5	M 18 x 1,5	21.89	23	31.75	1,370	240
SME 20.45	47	20	46	78	101	18	M 20 x 1,5	24.38	25	34.92	1,600	320
SME 22.45	51	22	50	84	109	20	M 22 x 1,5	25.84	28	38.10	1,890	420
SME 25.45	57	25	56	94	122	22	M 24 x 2	29.60	31	42.85	2,310	580
SME 30.45	66	30	66	110	143	25	M 30 x 2	34.80	37	50.80	3,050	980

SFE..45



Type	A	B	D	F	G	H	J	K	L	M	O	W	X	Ø Ball E	Static loads daN	Weight g
SFE 3.45	10	3	12	21	27	4.5	5	6.5	3	M 3 x 0,5	5.18	6	5.5	7.93	160	7
SFE 4.45	12	4	14	24	31	5.25	6.5	8.5	3.5	M 4 x 0,7	6.46	7	7	9.52	200	11
SFE 5.45	14	5	16	27	35	6	7.5	9.5	4	M 5 x 0,8	7.71	8	8	11.11	250	14
SFE 6.45	14	6	18	30	39	6.75	9.5	12	5	M 6 x 1	8.96	9	10	12.70	300	22
SFE 8.45	17	8	22	36	47	9	12.5	16	5	M 8 x 1,25	10.40	12	13	15.88	450	38
SFE 10.45	20	10	26	43	56	10.5	15	19	6.5	M 10 x 1,5	12.92	14	16	19.05	600	70
SFE 12.45	22	12	30	50	65	12	17.5	22	6.5	M 12 x 1,75	15.43	16	18	22.23	770	110
SFE 14.45	27	14	34	57	74	13.5	20	25	8	M 14 x 2	16.86	19	21	25.40	940	150
SFE 16.45	33	16	38	64	83	15	22	27	8	M 16 x 2	19.39	21	24	28.58	1,140	200
SFE 18.45	36	18	42	71	92	16.5	25	31	10	M 18 x 1,5	21.89	23	27	31.75	1,370	280
SFE 20.45	40	20	46	77	100	18	27.5	34	10	M 20 x 1,5	24.38	25	30	34.92	1,600	370
SFE 22.45	43	22	50	84	109	20	30	37	12	M 22 x 1,5	25.84	28	34	38.10	1,890	480
SFE 25.45	48	25	56	94	122	22	33.5	42	12	M 24 x 2	29.60	31	36	42.85	2,310	670
SFE 30.45	56	30	66	110	143	25	40	50	15	M 30 x 2	34.80	37	46	50.80	3,050	1,080

Specific uses :
There is a liner of UNIFLON® E between the ball and the race. Both the ball and the housing are in stainless steel. This series is suitable for use in corrosive environments (water, salt, humidity , etc).

Applications : rod ends exposed to atmospheric conditions or oxidising environments without the need for maintenance.

Materials used

Housing :
Stainless steel X 10 CrNiS18 9 (AISI 303).

Ball :
Stainless steel X 46 Cr 13 (AISI 420)

Race :
Stainless steel X 10 CrNiS18 9 (AISI 303).
UNIFLON® E

Notes :
- The misalignment angle which can be achieved will depend on the method of mounting.

Available on request :
- Special sliding moment
- Hard chrome plated ball
- Other grades of stainless steel
- Components may be manufactured entirely from stainless steels

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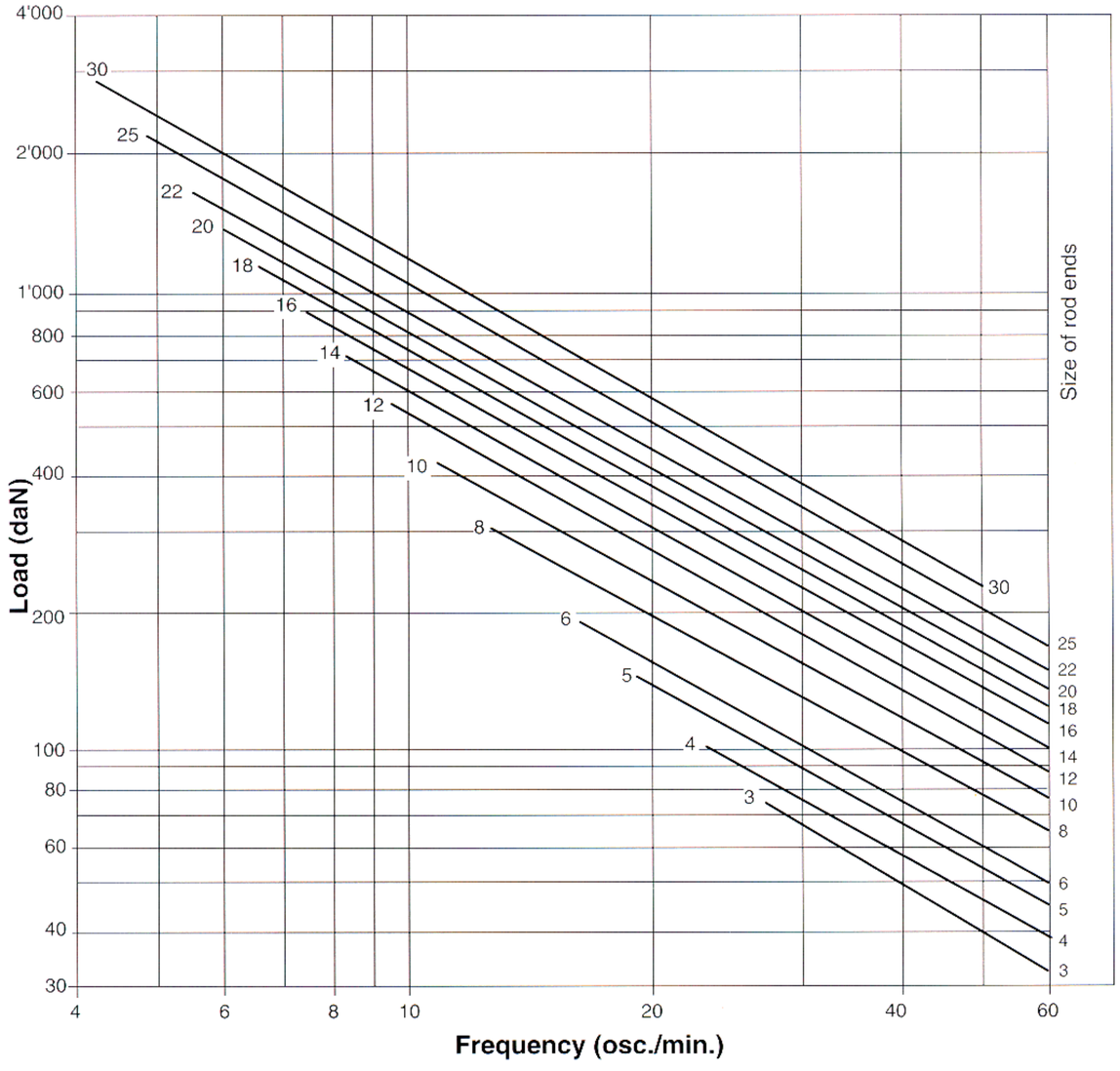
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for models SME..45 and SFE..45.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc ...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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Spherical bearings

The constructional characteristics of spherical bearings are similar to those of (the head of) the rod ends described previously.

Spherical bearings differ by being contained in a cylindrical housing enabling them to be mounted in the conventional manner for journal support. Please see below, and refer to the installation recommendations on page 60.

It is important to ensure that the bore into which a bearing is fitted is sized correctly. An undersized bore may considerably increase the rotational resistance of the ball within its housing, with obvious detrimental affects on the performance of the bearing. To ensure correct operation of the bearing, we recommend that bores be provided toleranced in accordance with the following table :

Table 10

Size of the bearing	Tolerance P7 (mm)
2	- 0,009 - 0,024
3 - 4 - 5 - 6	- 0,011 - 0,029
8 - 10 - 12	- 0,014 - 0,035
14 - 16 - 18 - 20 - 22	- 0,017 - 0,042
25 - 30 - 35	- 0,021 - 0,051
40 - 45 - 50	- 0,024 - 0,059

Axial loads :

Spherical bearings will only support axial loads if properly installed in a bore which provides adequate support for its housing. A simple seating will not be adequate. See installation methods described on page 60.

Radial and axial loads are given for spherical bearings, but axial loads are not specified for end rods.

The factor of safety for axial loads in the tables which follow is as given previously for radial loads (page 7)

$$\text{Maximum allowable load} = \frac{\text{Load at failure}}{2{,}5}$$

We do not advise application of maximum possible radial and axial loads to spherical bearings.

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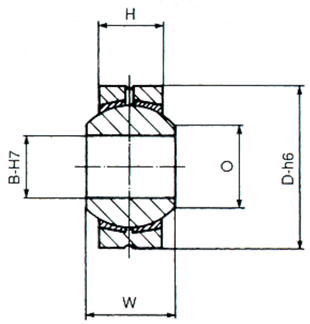
SS

Characteristic : standard, available in sizes 2 to 50



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SS 2	2	9	3.6	3.60	4.8	6.00	240	50	3
SS 3	3	12	4.5	5.18	6	7.93	420	100	4
SS 4	4	14	5.25	6.46	7	9.52	590	140	6
SS 5	5	16	6	7.71	8	11.11	780	190	9
SS 6	6	18	6.75	8.96	9	12.70	980	240	12
SS 8	8	22	9	10.40	12	15.88	1,670	400	24
SS 10	10	26	10.5	12.92	14	19.05	2,350	570	38
SS 12	12	30	12	15.43	16	22.23	3,140	750	57
SS 14	14	34	13.5	16.86	19	25.40	4,020	970	83
SS 16	16	38	15	19.39	21	28.58	5,000	1,220	110
SS 18	18	42	16.5	21.89	23	31.75	6,180	1,480	150
SS 20	20	46	18	24.38	25	34.92	7,360	1,780	200
SS 22	22	50	20	25.84	28	38.10	8,830	2,160	250
SS 25	25	56	22	29.60	31	42.85	11,080	2,670	360
SS 30	30	66	25	34.80	37	50.80	14,710	3,590	570
SSC 35	35	78	30	40.30	43	59.00	51,000	-	850
SSC 40	40	87	35	44.20	49	66.00	67,500	-	1,420
SSC 50	50	108	45	55.80	60	82.00	110,000	-	2,630

SS..10

Characteristic : as standard, with hard chrome plated ball

Available in sizes 2 to 30.

Specific Uses :

Type SS is suitable for many simple applications, where the loads/frequencies etc. are within the recommended limits. It needs regular lubrication.

Type SS..10 provides improved performance where the application involves high operating speeds (6 m/min.).

Applications : machine tools, mounting in machine supports, etc ...

Materials used

Housing :

Sizes 2 to 16 : C 35 steel, zinc plated and passivated.
Sizes 18 to 30 : 100 Cr 6, ball bearing steel, carbonised.
Sizes 35 to 50 : 9S Mn28 steel, carbonised.

Ball :

SS : hardened, ground, polished, 100 Cr 6 ball bearing steel
SS..10 : hardened, ground, polished, hard chrome plated, 100 Cr 6 ball bearing steel

Inserts :

Sizes 2 to 16 : Cu Zn 40 Mn Pb bronze
Sizes 18 to 30 : GC-Cu Sn 7 Zn Pb bronze
Sizes 35 to 50 : Cu Sn8 / Cu Sn40 AL2 F60 bronze

Notes :

- The misalignment angle which can be achieved will depend on the method of mounting (p.15)

Available on request :

- Reduced play
- Magnaflux control (suffix M)
- Original lubricating with Molykote BR2

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Graph showing dynamic radial loads

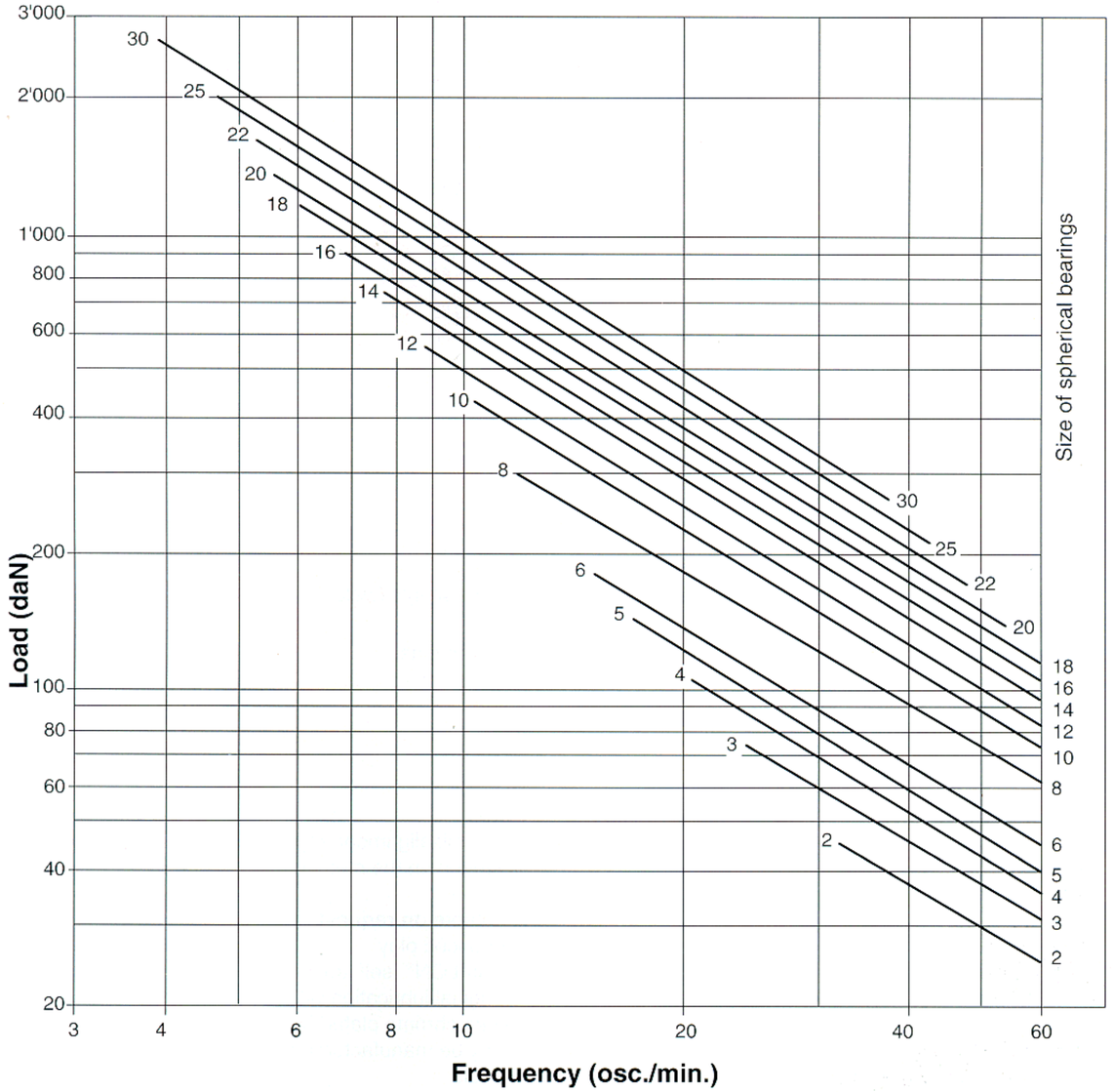
This graph allows you to check quickly and simply the allowable loads or frequencies for model SS.

The information on this graph is based on a working life of 3000 hours.

Notes :

For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).

Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :

- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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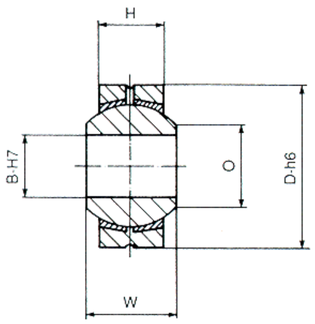
SS..45

Characteristic : stainless steel



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SS 3.45	3	12	4.5	5.18	6	7.93	420	100	4
SS 4.45	4	14	5.25	6.46	7	9.52	590	140	6
SS 5.45	5	16	6	7.71	8	11.11	780	190	9
SS 6.45	6	18	6.75	8.96	9	12.70	980	240	12
SS 8.45	8	22	9	10.40	12	15.88	1,670	400	24
SS 10.45	10	26	10.5	12.92	14	19.05	2,350	570	38
SS 12.45	12	30	12	15.43	16	22.23	3,140	750	57
SS 14.45	14	34	13.5	16.86	19	25.40	4,020	970	83
SS 16.45	16	38	15	19.39	21	28.58	5,000	1,220	110
SS 18.45	18	42	16.5	21.89	23	31.75	6,180	1,480	150
SS 20.45	20	46	18	24.38	25	34.92	7,360	1,780	200
SS 22.45	22	50	20	25.84	28	38.10	8,830	2,160	250
SS 25.45	25	56	22	29.60	31	42.85	11,080	2,670	360
SS 30.45	30	66	25	34.80	37	50.80	14,710	3,590	570

Specific uses :
This stainless steel series is suited to applications in corrosive environments (water, salt, humidity etc ...). Lubrication is necessary.
Applications : for use in the open or in unprotected oxidising environments.

Materials used

Housing :
X 10 Cr Ni S 18 9 (AISI 303) stainless steel

Ball :
Hardened, ground, polished, X 46 Cr 13 (AISI 420) stainless steel

Inserts :
GC-Cu Sn 7 Zn Pb bronze

Notes :
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- UNIFLON® (self lubricating)
- Original lubrication with Molykote BR2
- Hard chrome plated ball
- May be manufactured from different quality stainless steels

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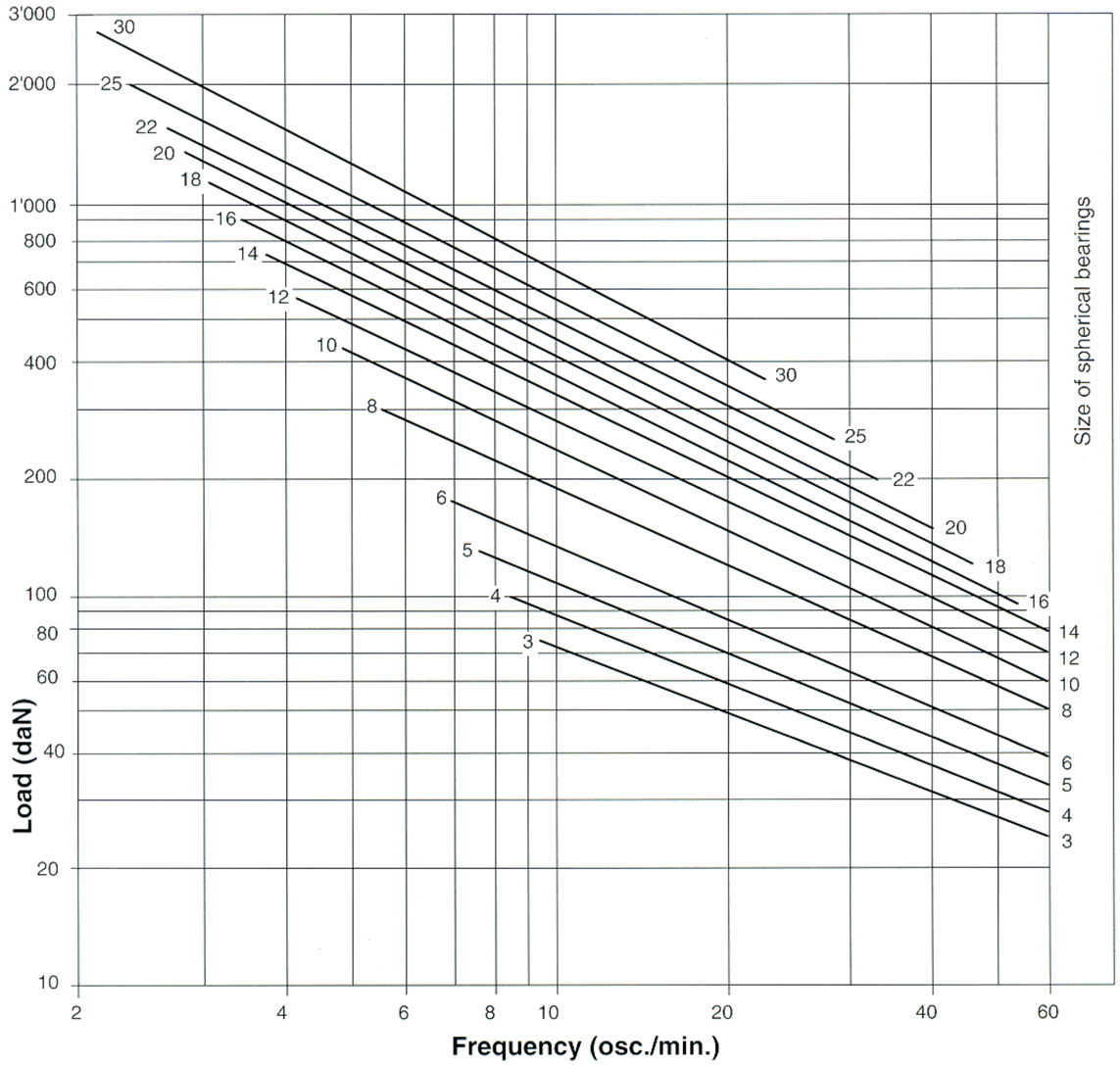
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SS..45.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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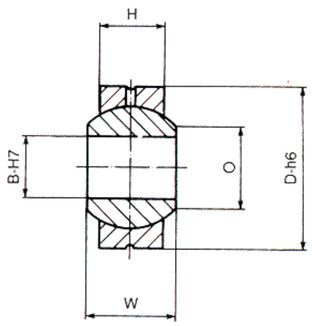
SSA

Characteristics : standard, steel on steel
available in sizes 2 to 50.



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SSA 2	2	9	3.6	3.60	4.8	6.00	600	130	3
SSA 3	3	12	4.5	5.18	6	7.93	1,030	240	4
SSA 4	4	14	5.25	6.46	7	9.52	1,470	340	6
SSA 5	5	16	6	7.71	8	11.11	1,960	460	9
SSA 6	6	18	6.75	8.96	9	12.70	2,550	610	12
SSA 8	8	22	9	10.40	12	15.88	4,120	1,000	24
SSA 10	10	26	10.5	12.92	14	19.05	5,890	1,420	38
SSA 12	12	30	12	15.43	16	22.23	7,850	1,880	57
SSA 14	14	34	13.5	16.86	19	25.40	9,810	2,420	83
SSA 16	16	38	15	19.39	21	28.58	12,260	3,040	110
SSA 18	18	42	16.5	21.89	23	31.75	15,300	3,700	150
SSA 20	20	46	18	24.38	25	34.92	18,340	4,460	200
SSA 22	22	50	20	25.84	28	38.10	22,070	5,400	250
SSA 25	25	56	22	29.60	31	42.85	27,470	6,670	360
SSA 30	30	66	25	34.80	37	50.80	36,300	8,980	570
SSA 35	35	80	30	41.44	42	59.00	51,010	12,510	1,020
SSA 40	40	90	34	47.75	47	67.00	65,730	15,940	1,440
SSA 45	45	100	38	54.99	51	75.00	83,380	20,110	1,940
SSA 50	50	110	42	61.26	56	83.00	98,100	24,520	2,630

SSA..10

Characteristics : as standard, but hard chrome plated ball

Specific uses :
Type SSA comprises a steel housing and a steel ball, without linings or inserts, the housing being press formed onto the ball. This assembly method produces a bearing with good resistance to static loads, shock loads and vibrations. Requires generous lubrication.
Type SSA..10 : its hard chrome plated ball withstands higher speeds than model SSA.
Applications : high static radial and axial loads.

Materials used

Housing :
Sizes 2 to 16 : C 35 Pb steel, cadmium plated
Sizes 18 to 50 : Ck 35 steel, cadmium plated

Ball :
SSA : hardened, ground, polished 100Cr 6 ball bearing steel
SSA..10 : hardened, ground, polished, hard chrome plated, 100Cr 6 ball bearing steel

Notes :
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- Magnaflux control (suffix M)
- Original lubrication with Molykote BR2

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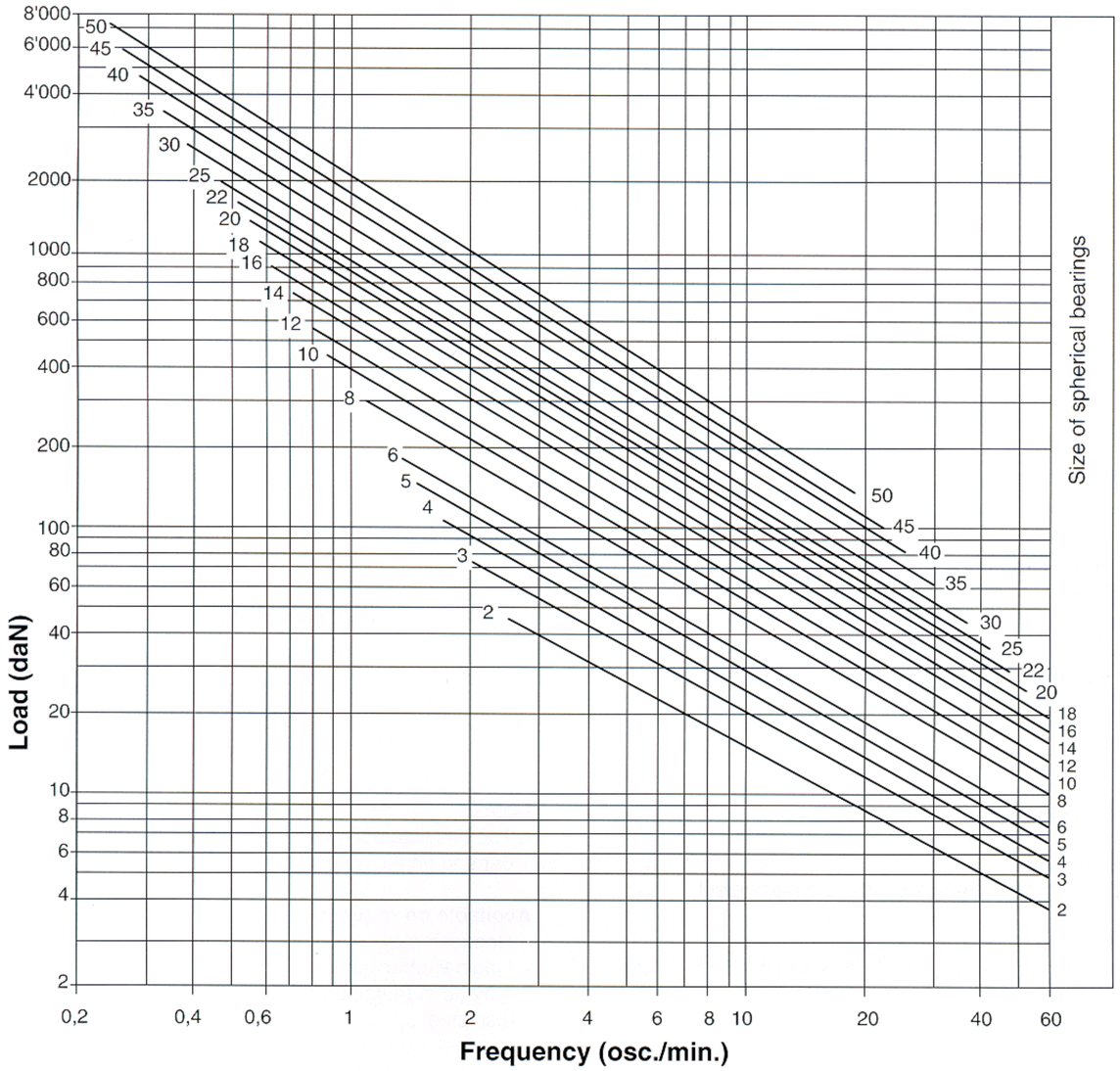
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SSA.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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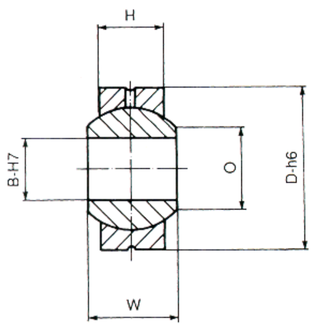
SSA..45

Characteristic : stainless steel on stainless steel



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SSA 3.45	3	12	4.5	5.18	6	7.93	610	170	4
SSA 4.45	4	14	5.25	6.46	7	9.52	730	190	6
SSA 5.45	5	16	6	7.71	8	11.11	1,080	230	9
SSA 6.45	6	18	6.75	8.96	9	12.70	1,370	410	12
SSA 8.45	8	22	9	10.40	12	15.88	2,350	680	24
SSA 10.45	10	26	10.5	12.92	14	19.05	3,430	960	38
SSA 12.45	12	30	12	15.43	16	22.23	4,510	1,270	57
SSA 14.45	14	34	13.5	16.86	19	25.40	5,790	1,650	83
SSA 16.45	16	38	15	19.39	21	28.58	7,260	2,060	110
SSA 18.45	18	42	16.5	21.89	23	31.75	8,930	2,500	150
SSA 20.45	20	46	18	24.38	25	34.92	10,690	3,030	200
SSA 22.45	22	50	20	25.84	28	38.10	12,850	3,670	250
SSA 25.45	25	56	22	29.60	31	42.85	16,090	4,530	360
SSA 30.45	30	66	25	34.80	37	50.80	21,390	6,100	570

Specific uses :
Type SSA..45 comprises a stainless steel housing and a stainless steel ball, without linings or inserts, the housing being press formed onto the ball. This assembly method produces a bearing with good resistance to static loads. Requires generous lubrication.

Applications : corrosive environments, sea water, tropical climate, etc...

Materials used

Housing :
X 10 Cr Ni S 18 9 (AISI 303) stainless steel

Ball :
Hardened, ground, polished, X 46 CR 13 (AISI 420) stainless steel

Notes :
- The misalignment angle which can be achieved will depend on the method of mounting (p.15).

Available on request :
- Reduced play
- Original lubrication with Molykote BR2
- May be manufactured from other grades of stainless steel

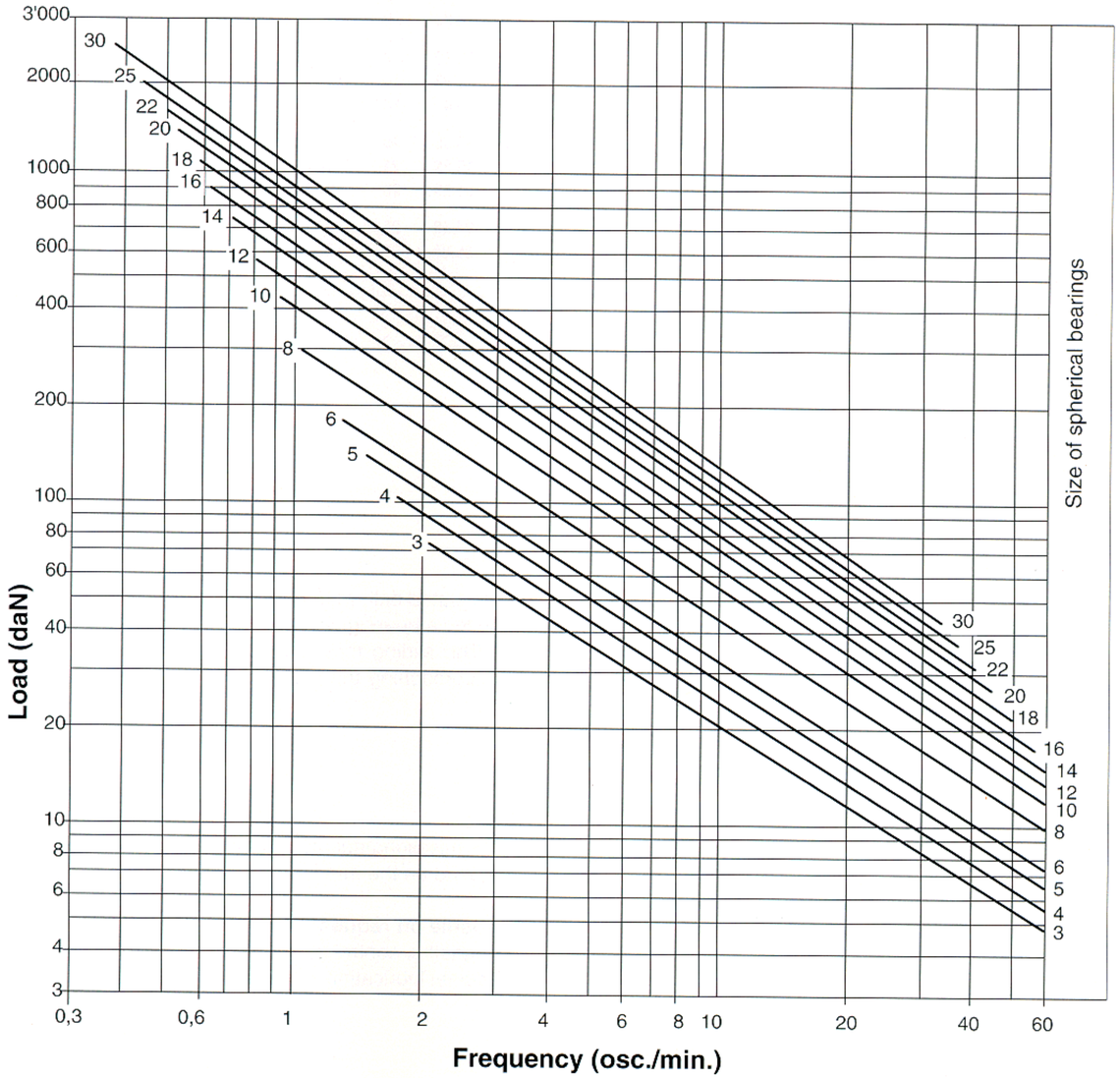
Unibal

Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SSA..45.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.

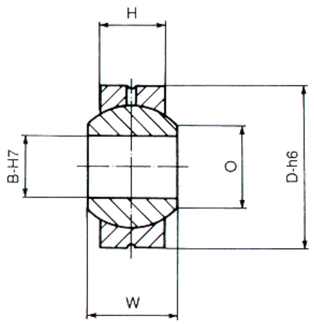


The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

SSA..50

Characteristics : high performance, steel on steel



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SSA 3.50	3	12	4.5	5.18	6	7.93	1,470	360	4
SSA 5.50	5	16	6	7.71	8	11.11	2,940	690	9
SSA 6.50	6	18	6.75	8.96	9	12.70	3,630	880	12
SSA 8.50	8	22	9	10.40	12	15.88	5,890	1,470	24
SSA 10.50	10	26	10.5	12.92	14	19.05	8,830	2,060	38
SSA 12.50	12	30	12	15.43	16	22.23	11,770	2,750	57
SSA 14.50	14	34	13.5	16.86	19	25.40	14,710	3,630	83
SSA 16.50	16	38	15	19.39	21	28.58	17,660	4,510	110
SSA 18.50	18	42	16.5	21.89	23	31.75	22,560	5,490	150
SSA 20.50	20	46	18	24.38	25	34.92	27,470	6,670	200
SSA 22.50	22	50	20	25.84	28	38.10	32,370	8,040	250

Specific uses :
Type SSA..50 comprises a high tensile steel housing and a chrome plated ball, without linings or inserts, the housing being pressed formed on to the ball. This assembly method produces a bearing with high resistance to static loads, whilst the chrome plated ball improves dynamic performance. The sliding moment (torque) must be carefully considered when the bearing is required to operate at speeds approaching the maximum allowable. It must be generously lubricated (steel on steel).

Applications: combined stresses, high static and dynamic loads.

Materials used

Housing :
High tensile steel, similar to –45 S 20, cadmium plated and yellow passivated.

Ball :
Hardened, ground, polished, hard chrome plated, 100 Cr 6 ball bearing steel

Notes :
- The misalignment angle which can be achieved will depend on the method of mounting (p.15)

Available on request :
- Magnaflux control (suffix M)
- Original lubrication with Molykote BR2

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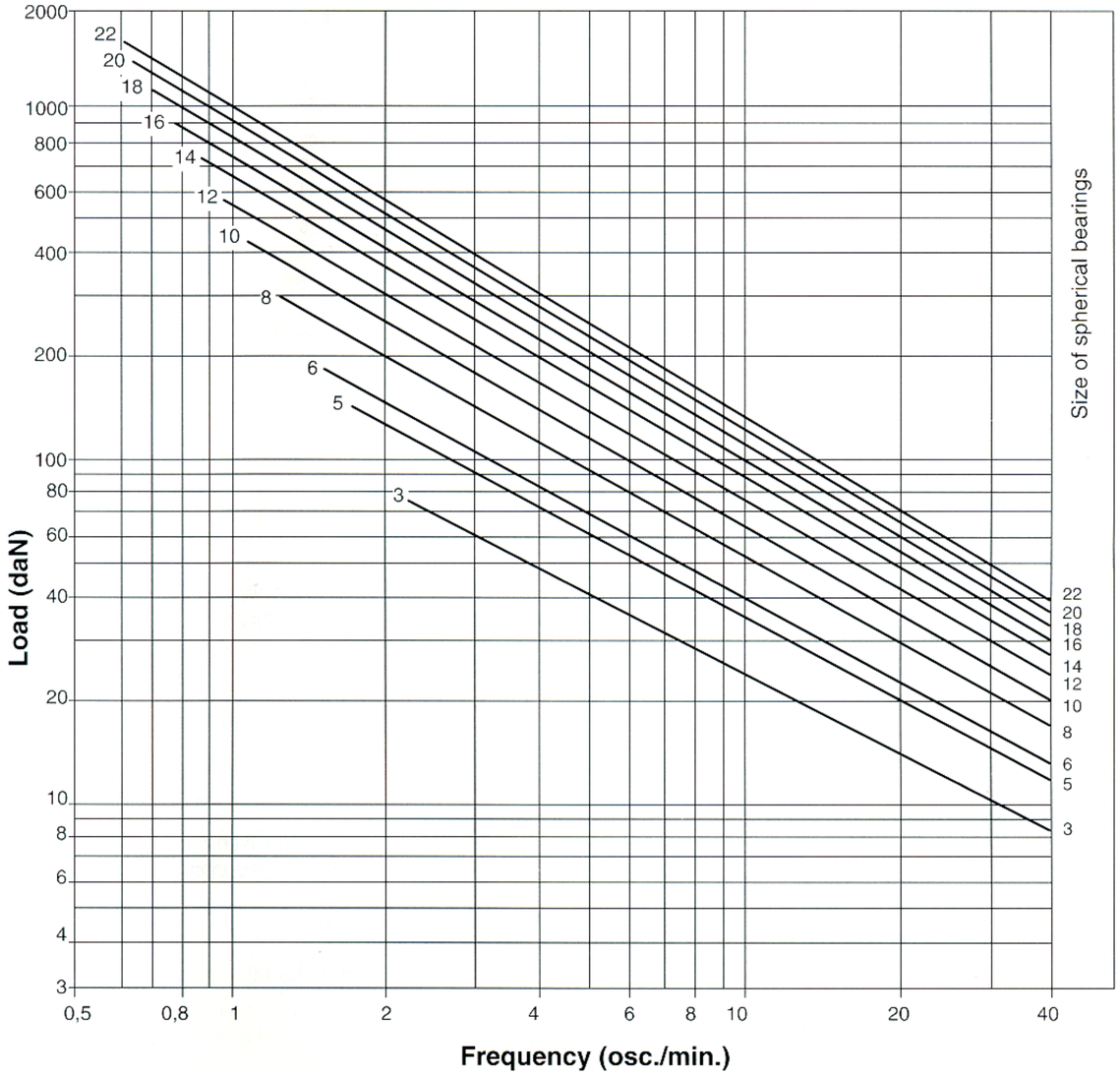
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SSA..50.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, regular maintenance and normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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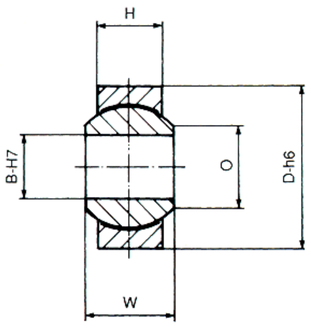
SSVV

Characteristics : UNIFLON® VV



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SSVV 2	2	9	3.6	3.60	4.8	6.00	510	180	3
SSVV 3	3	12	4.5	5.18	6	7.93	730	250	4
SSVV 4	4	14	5.25	6.46	7	9.52	1,100	350	6
SSVV 5	5	16	6	7.71	8	11.11	1,470	440	9
SSVV 6	6	18	6.75	8.96	9	12.70	1,860	500	12
SSVV 8	8	22	9	10.40	12	15.88	3,140	620	24
SSVV 10	10	26	10.5	12.92	14	19.05	4,410	750	38
SSVV 12	12	30	12	15.43	16	22.23	5,890	880	57
SSVV 14	14	34	13.5	16.86	19	25.40	7,450	1,000	83
SSVV 16	16	38	15	19.39	21	28.58	9,220	1,130	110
SSVV 18	18	42	16.5	21.89	23	31.75	11,480	1,250	150
SSVV 20	20	46	18	24.38	25	34.92	13,730	1,380	200
SSVV 22	22	50	20	25.84	28	38.10	16,680	1,500	250
SSVV 25	25	56	22	29.60	31	42.85	20,600	1,690	360
SSVV 30	30	66	25	34.80	37	50.80	27,470	2,010	570

Specific uses :
There is a liner of UNIFLON® VV between the ball and the race. The use of UNIFLON® VV eliminates the need for maintenance (lubrication) and the bearing is able to operate at a higher running speed (8m/min).
Applications: high speeds, without the need for maintenance.

Materials used

Housing :
Sizes 2 to 16 : C 35 Pb steel, cadmium plated.
Sizes 18 to 30 : Ck 35 steel, cadmium plated.

Ball :
Hardened, ground, polished, 100 Cr 6 ball bearing steel
UNIFLON® VV

Notes :
- The misalignment angle which can be achieved will depend on the method of mounting (p.15)

Available on request :
- Reduced play
- Magnaflux control (suffix M)

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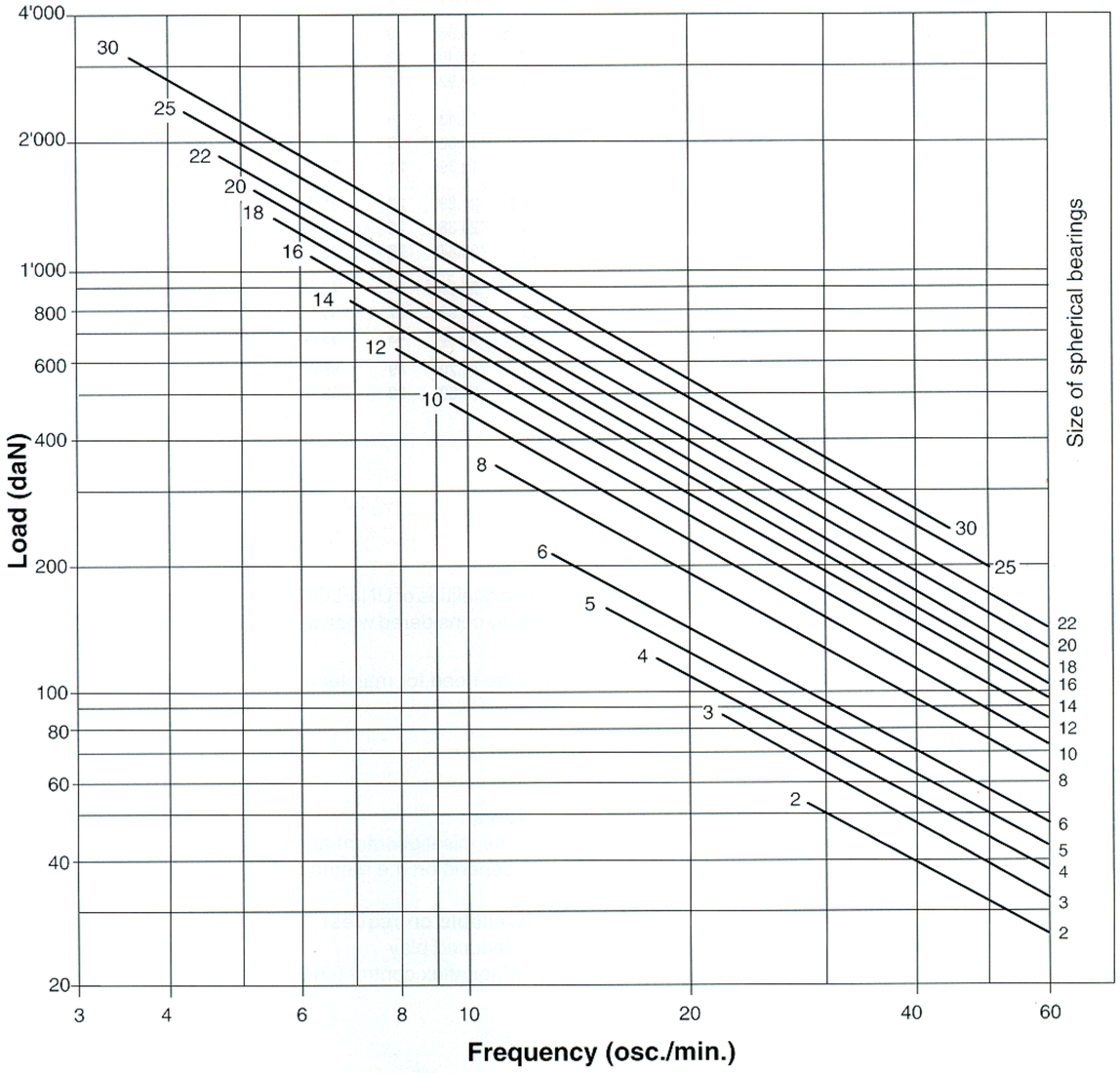
Unibal

Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SSVV.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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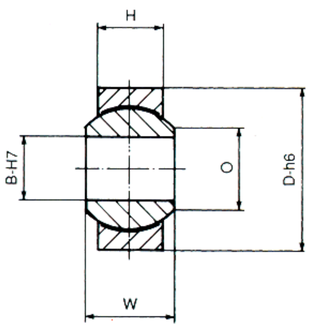
SSE

Characteristic : UNIFLON® E



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SSE 3	3	12	4.5	5.18	6	7.93	1,030	250	4
SSE 4	4	14	5.25	6.46	7	9.52	1,470	350	6
SSE 5	5	16	6	7.71	8	11.11	1,960	440	9
SSE 6	6	18	6.75	8.96	9	12.70	2,550	500	12
SSE 8	8	22	9	10.40	12	15.88	4,120	620	24
SSE 10	10	26	10.5	12.92	14	19.05	5,890	750	38
SSE 12	12	30	12	15.43	16	22.23	7,850	880	57
SSE 14	14	34	13.5	16.86	19	25.40	9,810	1,000	83
SSE 16	16	38	15	19.39	21	28.58	12,260	1,130	110
SSE 18	18	42	16.5	21.89	23	31.75	15,300	1,250	150
SSE 20	20	46	18	24.38	25	34.92	18,340	1,380	200
SSE 22	22	50	20	25.84	28	38.10	22,070	1,500	250
SSE 25	25	56	22	29.60	31	42.85	27,470	1,690	360
SSE 30	30	66	25	34.80	37	50.80	36,300	2,010	570
SSCP 35	35	78	30	40.30	43	59.00	50,000	-	850
SSCP 40	40	87	35	44.20	49	66.00	66,000	-	1,420
SSCP 50	50	108	45	55.80	60	82.00	100,000	-	2,630

Specific uses.
There is a liner of UNIFLON® E between the ball and the race. The qualities of UNIFLON® E allow higher dynamic loads and speed (6m/min). The sliding moment (torque) must be carefully considered when the bearing is required to operate at speeds approaching the maximum allowable.

Applications: high stresses (loads, frequencies etc ...), without the need for maintenance.

Materials used

Housing :
Sizes 3 to 16 : C 35 Pb steel, cadmium plated
Sizes 18 to 30 : Ck 35 steel, cadmium plated
Sizes 35 to 50 : 9 S Mn28 steel, carbonised

Ball :
Sizes 3 to 30 : hardened, ground, polished, 100 Cr 6 ball bearing steel, UNIFLON® E
Sizes 35 to 50 : hardened, ground, polished, 100 Cr 6 ball bearing steel

Inserts :
Sizes 3 to 30 : no inserts
Sizes 35 to 50 : Cu Zn40 AL2 zinc plated bronze, PTFE

Notes :
- The misalignement angle which can be achieved will depend on the method of mounting (p.15)

Available on request :
- Reduced play
- Magnaflux control (suffix M)

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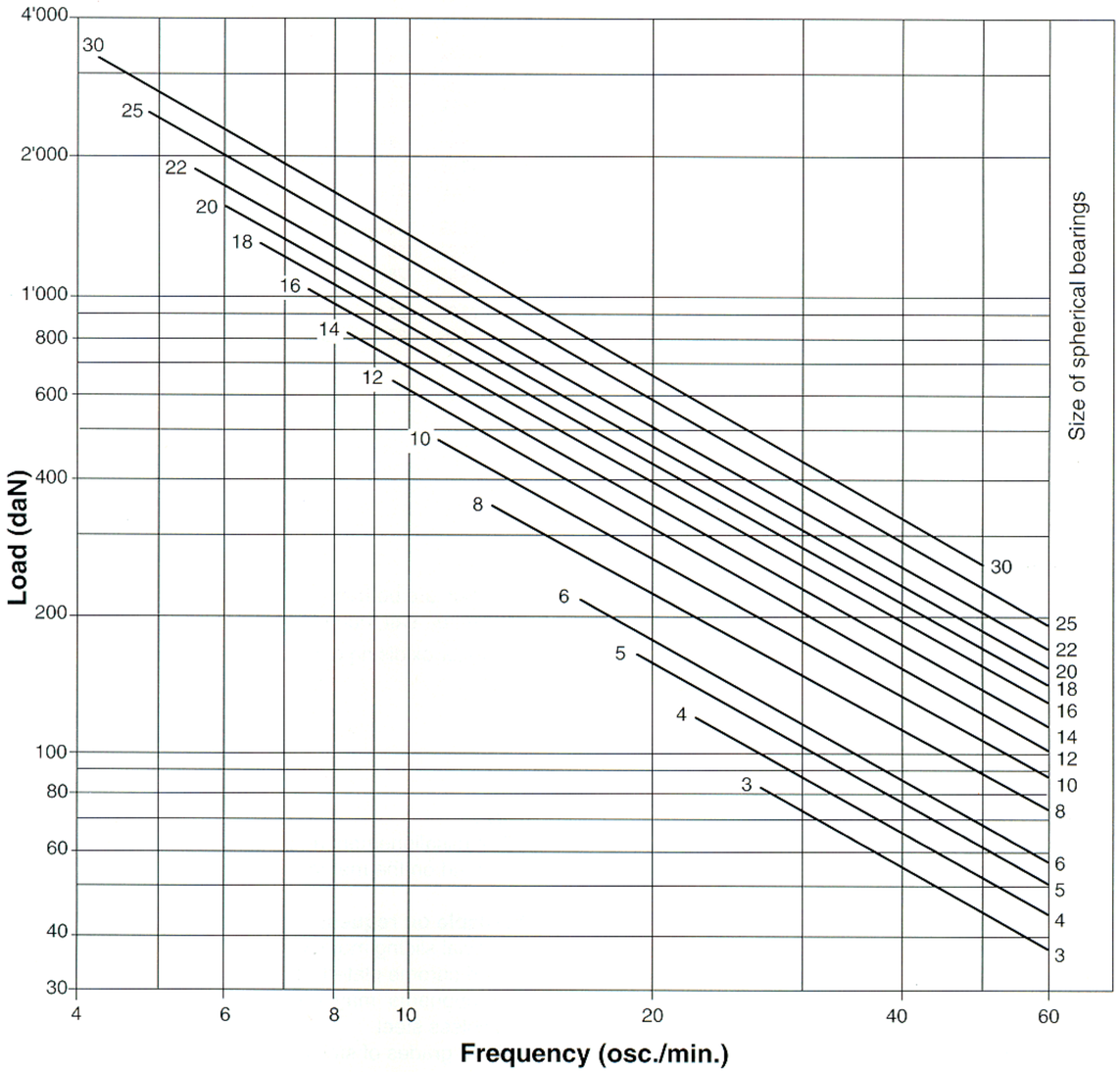
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SSE.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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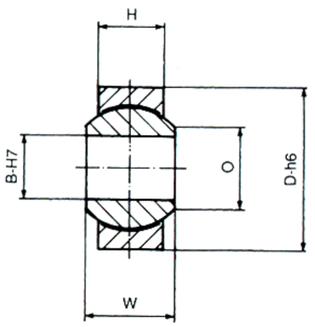
SSE..45

Characteristics : UNIFLON® E, stainless steel



Type		B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SSE	3.45	3	12	4.5	5.18	6	7.93	790	250	4
SSE	4.45	4	14	5.25	6.46	7	9.52	1,130	350	6
SSE	5.45	5	16	6	7.71	8	11.11	1,500	440	9
SSE	6.45	6	18	6.75	8.96	9	12.70	1,960	500	12
SSE	8.45	8	22	9	10.40	12	15.88	3,170	620	24
SSE	10.45	10	26	10.5	12.92	14	19.05	4,530	750	38
SSE	12.45	12	30	12	15.43	16	22.23	6,040	880	57
SSE	14.45	14	34	13.5	16.86	19	25.40	7,550	1,000	83
SSE	16.45	16	38	15	19.39	21	28.58	9,440	1,130	110
SSE	18.45	18	42	16.5	21.89	23	31.75	11,780	1,250	150
SSE	20.45	20	46	18	24.38	25	34.92	14,120	1,380	200
SSE	22.45	22	50	20	25.84	28	38.10	16,990	1,500	250
SSE	25.45	25	56	22	29.60	31	42.85	21,150	1,690	360
SSE	30.45	30	66	25	34.80	37	50.80	27,950	2,010	570

Specific uses :
There is a liner of UNIFLON® E between the ball and the housing which are both made from stainless steel. This type of spherical bearing is suitable for use in corrosive environments (water, salt, humidity, etc.).

Applications : spherical bearings exposed to atmospheric conditions or oxidising environments, without the need for lubrication.

Materials used

Housing :
Stainless steel X 10 Cr Ni S 18 9 (AISI 303)

Ball :
Hardened, ground, polished stainless steel X 46 Cr 13 (AISI 420)
UNIFLON® E

Notes :
- The misalignement angle which can be achieved will depend on the method of mounting.

Available on request :
- Special sliding moment
- Hard chrome plated ball
- Components may be manufactured entirely from stainless steel
- Other grades of stainless steel

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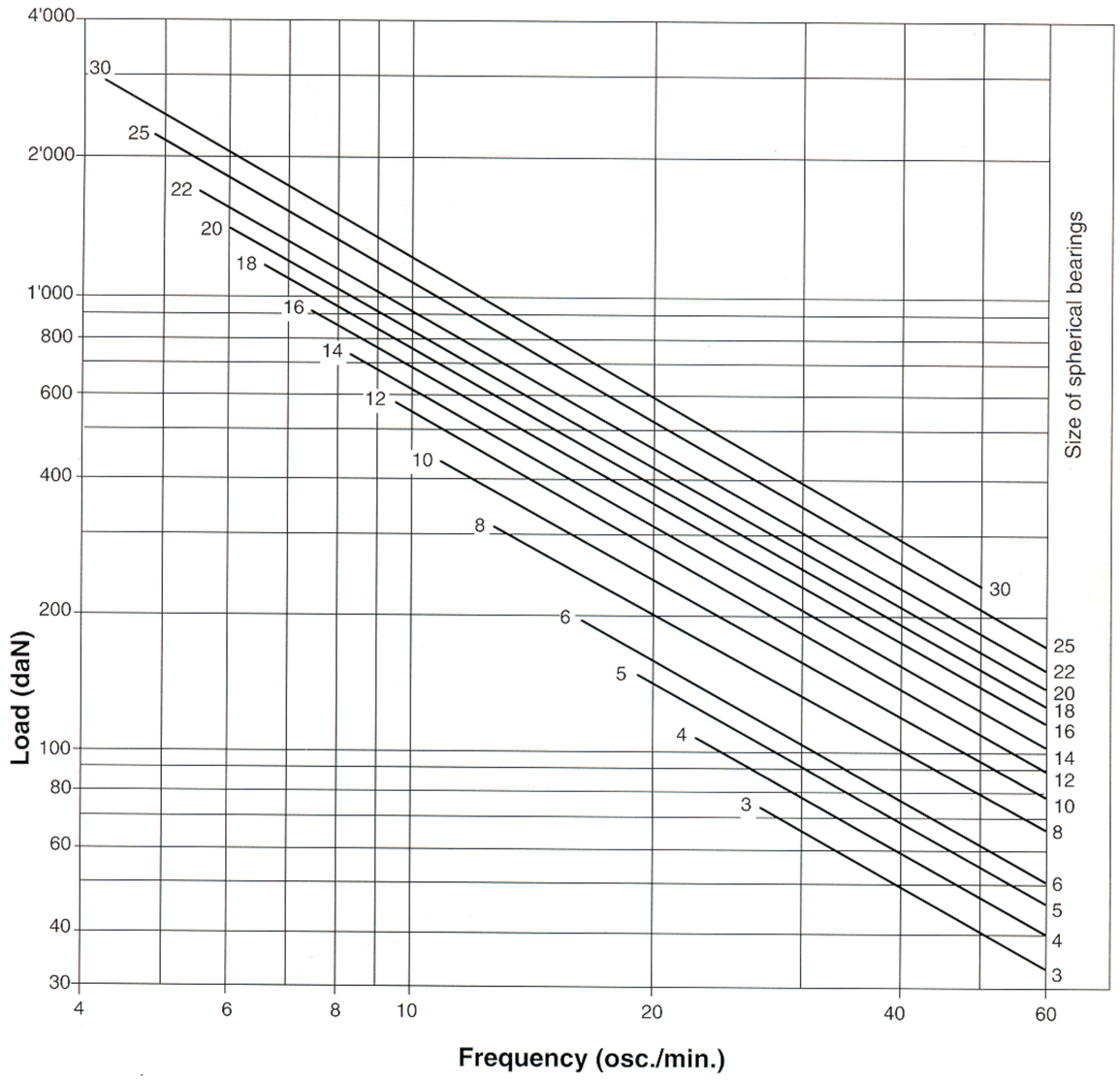
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SSE..45.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 120°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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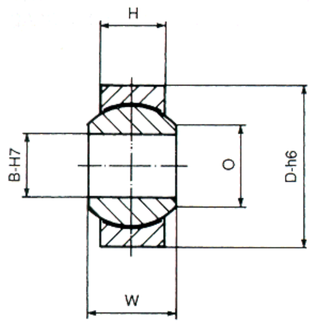
SSE..50

Characteristics : UNIFLON® E, high performance



Type	B	D	H	O	W	Ø Ball E	Static loads radial daN	Static loads axial daN	Weight g
SSE 5.50	5	16	6	7.71	8	11.11	2,940	440	9
SSE 6.50	6	18	6.75	8.96	9	12.70	3,630	500	12
SSE 8.50	8	22	9	10.40	12	15.88	5,890	620	24
SSE 10.50	10	26	10.5	12.92	14	19.05	8,830	750	38
SSE 12.50	12	30	12	15.43	16	22.23	11,770	880	57
SSE 14.50	14	34	13.5	16.86	19	25.40	14,710	1,000	83
SSE 16.50	16	38	15	19.39	21	28.58	17,660	1,130	110
SSE 18.50	18	42	16.5	21.89	23	31.75	22,560	1,250	150
SSE 20.50	20	46	18	24.38	25	34.92	27,470	1,380	200
SSE 22.50	22	50	20	25.84	28	38.10	32,370	1,500	250

Specific uses :
There is a liner of UNIFLON® E between the ball and the race. The hard chrome plated ball provides exceptional resistance to static and dynamic loads and a maximum running speed of 9m/min. The sliding moment (torque) must be carefully considered when the bearing is required to operate at speeds approaching the maximum allowable.
Applications: very high stresses and speeds, without the need for maintenance.

Materials used

Housing :
High tensile steel, similar to –45 S 20 cadmium plated and yellow passivated.

Ball :
Hardened, ground, polished, hard chrome plated, 100 Cr 6 ball bearing steel
UNIFLON® E

Notes :
- The misalignment angle which can be achieved will depend on the method of mounting (p.15)

Available on request :
- Magnaflux control (suffix M)

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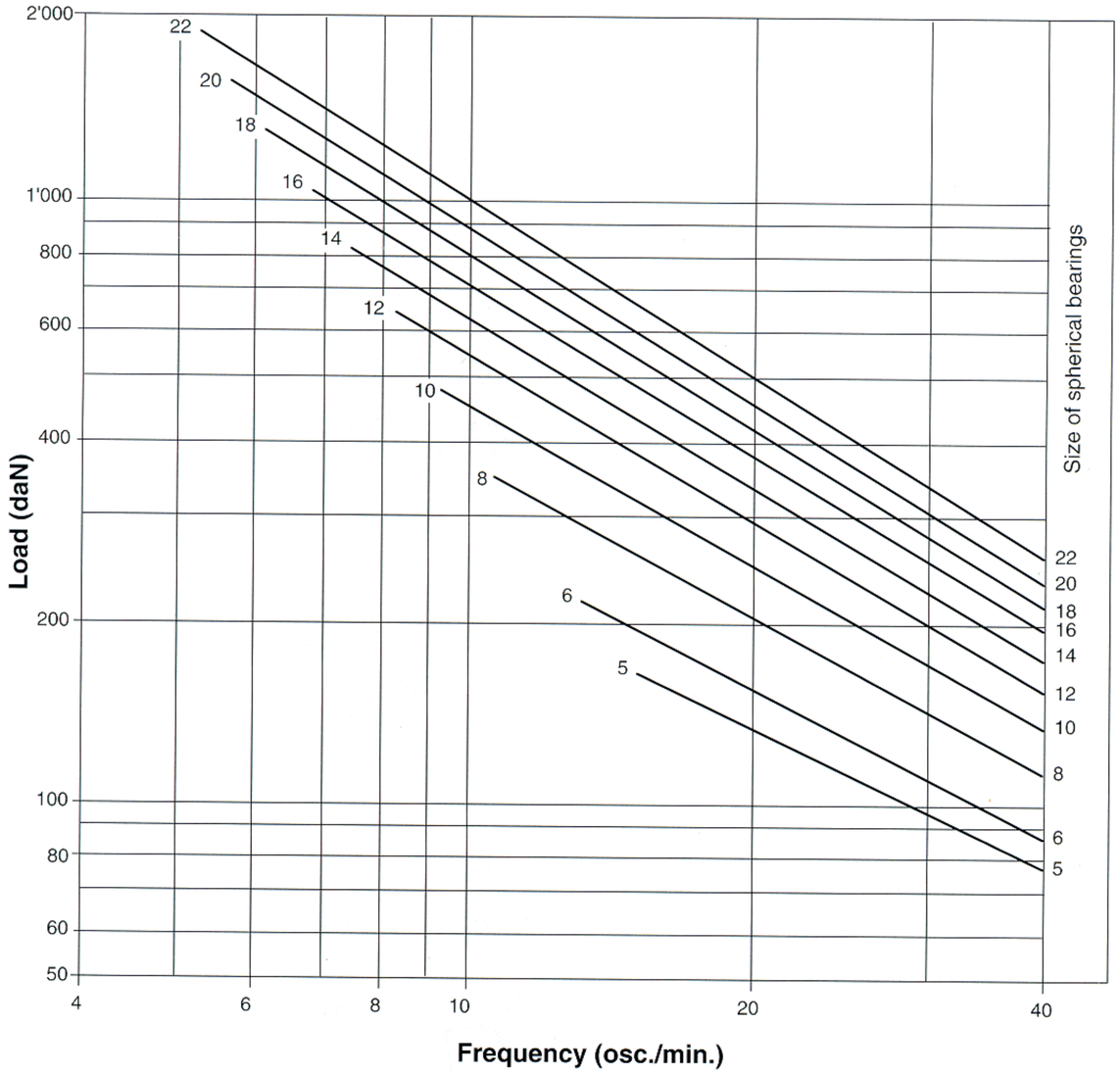
Graph showing dynamic radial loads

This graph allows you to check quickly and simply the allowable loads or frequencies for model SSE..50.

The information on this graph is based on a working life of 3000 hours.

Notes :
For higher stresses (loads, frequencies, etc...) or in order to determine actual working hours, refer to the dynamic calculations (p.8).
Dependant on operating conditions, the life expectancy calculated may be several times greater than the 3000 hours stated here.



The graph is valid for :
- Alternating, pulsating and continuous loads.
- Angles of oscillation (ß) between 1° and 60as°. Larger angles of oscillation or complete rotation of the ball through 360° are possible. Such applications fall outside the scope of the graph and will require special consideration; please refer to page 8 - Calculation of speed - or consult us.
- Normal conditions of use : absence of shocks and abrasive dust, normal temperatures (0° to 70°C), etc.

In the fold out section at the back of this catalogue you will find examples of the use of this graph.

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Mounting

Great care should be taken when mounting and installing our rod ends and spherical bearings, to ensure that they operate under optimum conditions.

Incorrect mounting will considerably reduce the life of the product. The examples of installation shown here illustrate some suitable methods for mounting our products.

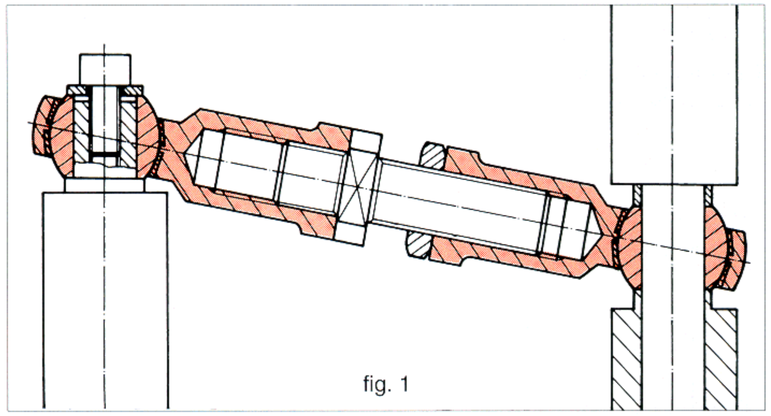

fig. 1

fig 1) Classic mounting of rod end housings : fastened together by means of a threaded rod to span two supports, secured with a locknut.
As a general rule, the balls are held in place by shouldered supports, sleeves, or by means of a set screw + washer as the illustration shows.

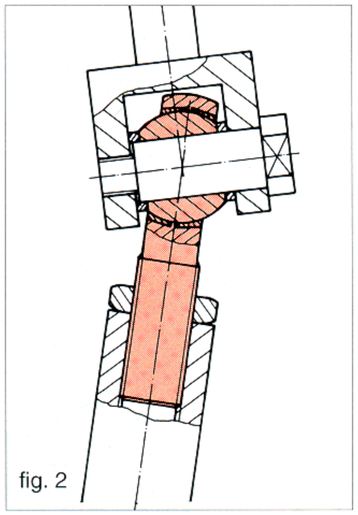

fig. 2

fig 2) The ball is held in a clamping fork, with a shouldered screw passing through the two lateral spacers, allowing a maximum misalignment angle.

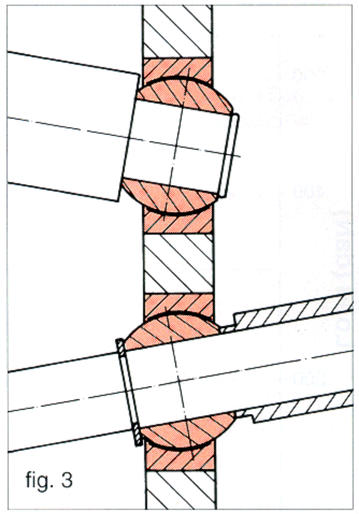

fig. 3

fig 3) The spherical bearings are pressed into bores machined to the correct size (see table 10, p.41). One of the balls is held by material set - swaging of the shaft end. Driving the ball on to the shaft is not good practice; the sliding moment will increase and the ball may even become locked into the housing.

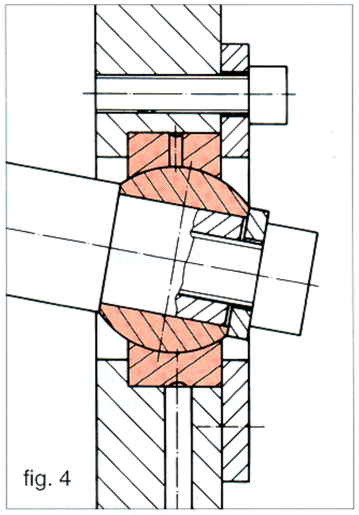

fig. 4

fig 4) This method of installation ensures that there is no stress on the housing. It is particularly suitable for applications involing high ball speeds, because the sliding moment is not modified during mounting. This rigid construction allows for strong axial and radial loads.

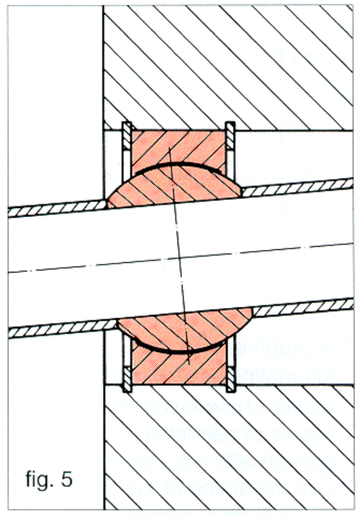

fig. 5

fig 5) A simple installation can be achieved using internal circlips. This installation method is not suitable for applications involving high axial loads..

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Some applications

Naval industry
Railway industry
Civil engineering industry

Aerospace industry
Food industry
Textile industry

Electrical appliances
Communication equipment
Kitchen appliances

Packaging machines
Construction machines
Wood working machines

Steam engines
Tractors
Trains, locomotives

Pantographs
Projectors
Presses

Knitting machines
Sewing machines
Mixers

Shock absorbers
Connecting rods
Cars, motor bikes

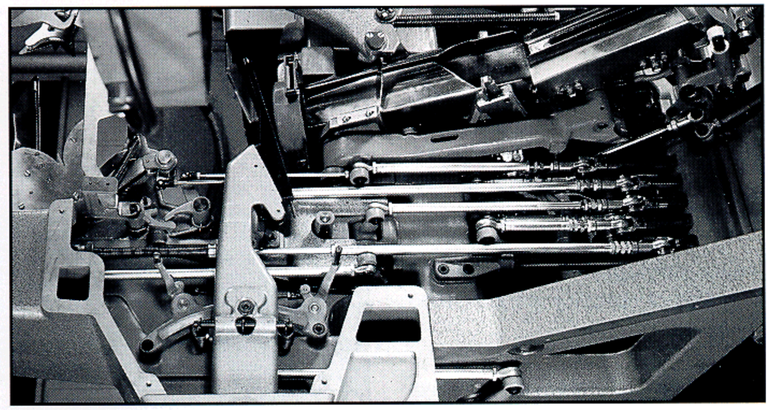
Machine tools
Agricultural machinery
Models

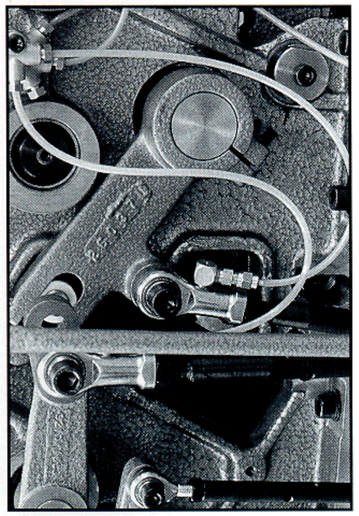
Scales
Automatic burners
Weighing machines, balances

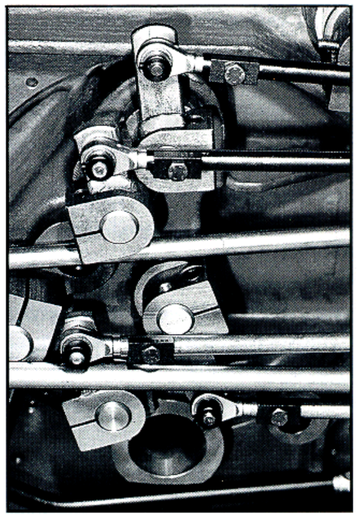
Musical instruments
Technical instruments
Laboratory instruments

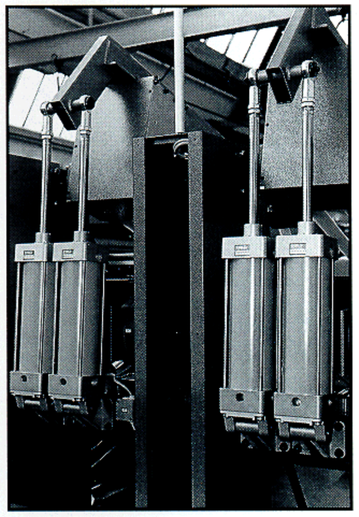
Fairground machines
Tape recorders
Charging machines

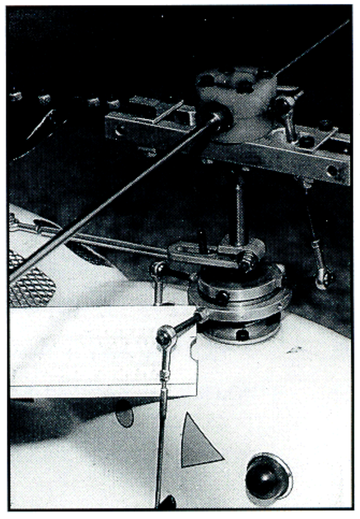
Loading machinery
Lifting machinery
Cutting machinery











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Special components available on request

This catalogue reflects our current production programme.

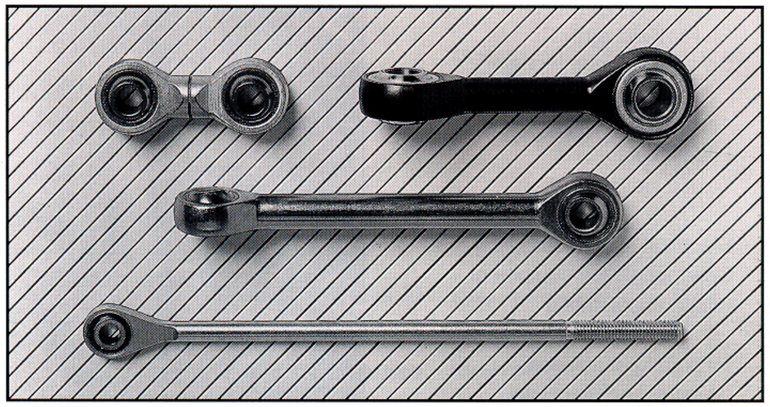
On request, we can produce a wide variety of special versions derived from standard products. When required, we can also develop special designs to suit your particular needs.

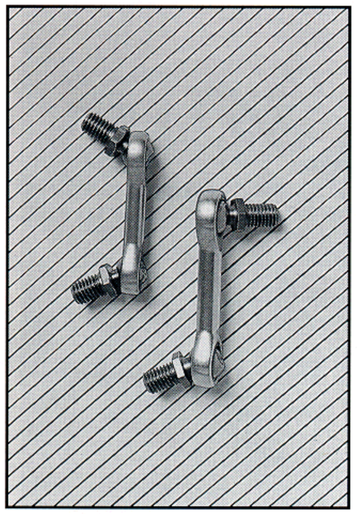
These photographs show some examples of specially manufactured products.

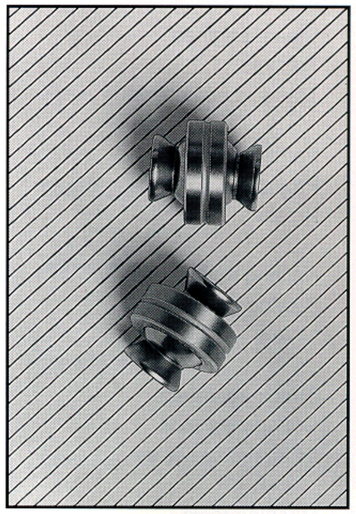
Our technical department is always available to advise you regarding special applications, in addition to which we can carry out tests in our laboratories, applying the loads and frequencies etc. which the component will experience in your application.

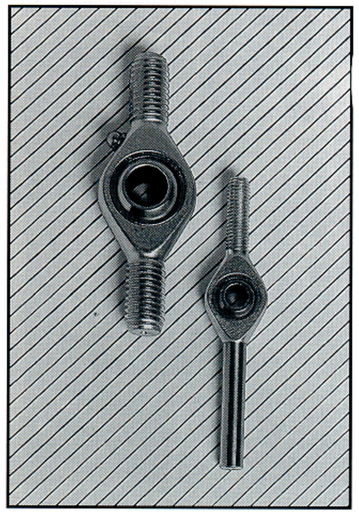
Our technical service is entirely at your disposal, to help solve your problems.

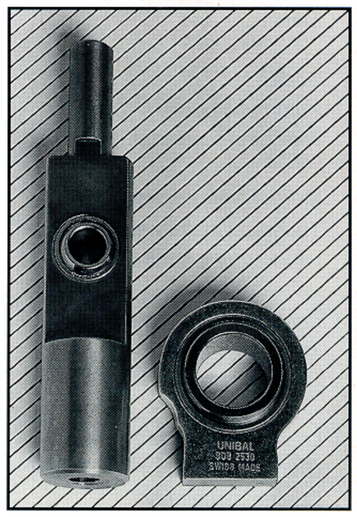
The "UNIBAL" trade mark is synonymous with the very best in quality and reliability.











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Conditions of supply

1. Except in the case of special dispensation expressly agreed between the two parties, the current conditions of supply, as well as the general conditions of contract for the supply of machinery and share parts of the VSM (Swiss Association of Machinery Manufactures) shall apply to all orders.

   All other arrangements are thus formally excluded.

2. **Our prices are ex-works**, exclusive of packing.

   The cost of packing, carriage and transport are calculated at lowest possible cost and cannot be deducted from the final invoice.

   Our deliveries are invoiced at the price indicated on the price list in force on the date of delivery, as confirmed by us.

3. **Special products** are those for which there is no corresponding order code listed in this catalogue. Orders for special products can only be accepted subject to our right to deliver and charge for up to 10 % more or less than the quantity ordered. Returns of special products cannot be accepted for credit or exchange unless a defect in production is proved.

4. **Our order acknowledgements** are checked meticulously and we should be notified of any errors within eight days. Orders are fulfilled in accordance with our acknowledgement confirmation.

5. **Minimum invoice totals** : are fixed according to the price list.

6. **Dispatch** takes place at the client's own risk.

7. **Payment** : 7 days net.

8. Every product leaving our factories is **guaranteed** for correct pricing, quality and precision.

   Replacement of any items exhibiting a manufacturing defect, which is duly brought to our attention, is made at our expense.

   The guarantee however is limited to the replacement of the defective item, to the exclusion of all other indemnity. Damage resulting from normal wear, from incorrect handling, or from modifications made after delivery, are completely excluded from the guarantee. Claims will only be considered if we are notified of them within fifteen days of receipt of the merchandise.

9. **Drawings, illustrations and technical data** : as a general rule, all data submitted by the client are used as a basis for the development of our own manufacturing design. Where we consider it appropriate, this design will be submitted to the client for approval; this design alone is valid for the execution of the order.

   Illustrations and data featured in our catalogue are only indicative and we are not bound by them.

10. **Modifications to any of our products** may occur from time to time.

    Modifications and improvements made to our products do not render us liable to replace existing components

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From information relating to the performance requirments of a rod end or spherical bearing, we can determine by calculation the type and size best suited to the application. Please enter all relevant details on a photocopy of this page and send or fax to us with your letter heading, your name, title and extension number.

Application profile

(Cross out information which does not apply)

Size preference	:	.....
Type preference	:	.....
Minimum life expectancy	:	.....hours
Static loads	:	yes / no
Dynamic loads	:	yes / no
Alternating, pulsating or continuous loads	:	.....
Load direction changes - frequency	:	...../min
Continuous loads	:	.....daN
Radial loads	:	.....daN
Axial loads	:	.....daN
Shock loads	:	yes / no
Estimated shock force	:	.....daN
Vibrations	:	yes / no
Frequency of vibrations	:	.....osc./min
Complete rotation of the ball (360°)	:	yes / no
Angle of oscillation : rotation	:	.....° (±)
Angle of oscillation : misalignment	:	.....° (±)
Oscillation frequency	:	.....osc./min
Ambient temperature	:	.....°C
Maintenance	:	yes / no
Frequency of maintenance	:	.....hours
Sliding moment preference (torque)	:	a) per catalogue
		b) .....daN
Special environment (abrasive, dusty)	:	yes / no
External influences	:	yes / no

Nature of external influences :

.....

.....

Other remarks :

.....

.....

Description of use (include a sketch or photos if possible) :

.....

.....

Date : ..... Signature : .....

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