

Bearing Supports

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EM
ENGINEERING MANUAL

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Movex bearing supports are a reliable solution for several markets, like beverage, food, pharmaceutical and industrial environments: based on the application requirements, different types and shapes can be used (standard, stainless steel, hygienic, watertight). This document provides guidelines for product selection, describing the main factors to be considered for a proper choice. For further information, please contact your sales representative.

The information of this manual will support you to achieve the best performance out of Movex Bearing supports, covering the most significant aspects that influence the product operation, such as load calculation, environmental conditions (temperatures, dusts, humidity...), installation, maintenance inspections.

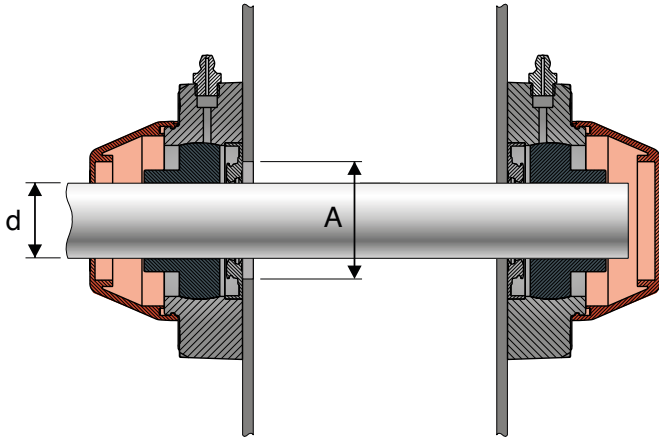
Shaft guidelines

This section describes the main characteristics of bearing supports.

A. Flanged bearing supports

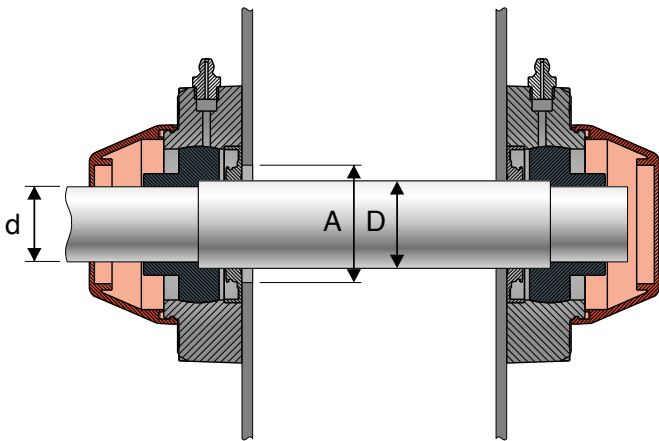
If bearing seals are used, dimension A must comply with the following table.

Plain shaft:



D	A	
	Min	Max
in		
3/4	1	1 1/8
1	1 1/8	1 1/4
1 1/4	1 1/2	1 5/8
1 7/16	1 3/4	1 7/8
1 1/2	1 3/4	1 7/8

Step-down shaft:

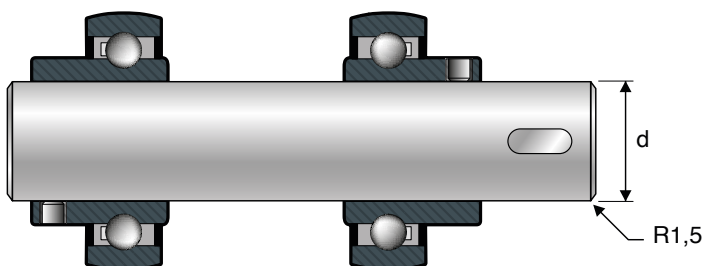


D	d	A		D	d	A	
		Min	Max			Min	Max
in				mm			
1.18	0.98	1.37	1.77	30	25	35	45
1.37	1.18	1.77	2.16	35	30	45	55
1.57	1.37	1.96	2.36	40	35	50	60
1.77	1.37	2.16	2.75	45	40	55	70

B. Coupling shaft/supports

Both shaft ends must have a radius to simplify the assembly phase. The shaft tolerance depends on the shaft diameter and number of revolutions.

Plain shaft:

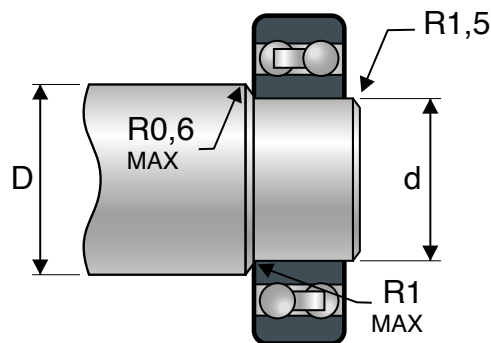


MEDIUM SPEED	HIGH SPEED
h9	h7

Shaft guidelines

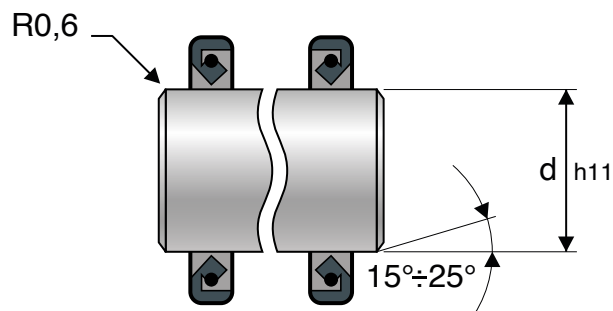
Step-down shaft:

For a proper installation, the shaft shall comply with the sketch below. The tolerance of diameter "d" shall be $-0.02 / -0.05$ mm.



C. Coupling shaft/seal

The drawing below shows the chamfers and radii required for a correct installation of the seals. The shaft surface must be smooth and without defects.



Mounting instructions



Warning! Turn off and lock-out facility power before servicing.

A. Preliminary inspection

- Inspect the shaft dimension and verify it complies with the tolerance shown in the table below.

SHAFT DIAMETER	SHAFT TOLERANCE
1/2" to 1 1/2"	Nominal to -0.0005 "
12mm to 40mm	Nominal to -0.013 mm

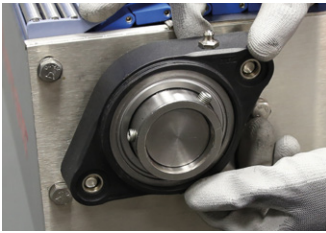


- Carry out detailed inspection of both the shaft and the bearing bore for debris or contaminants. Clean if required.
- Make sure the housing and the support surfaces are clean and free from burrs. The bearing must be installed on a flat surface. If applicable, the shims must cover the entire surface of the bearing.

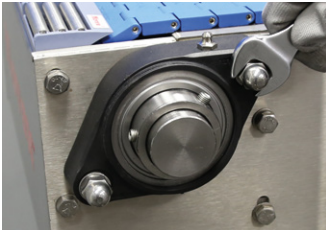
Mounting instructions

B. Installation (grubscrew version)

Don't apply load on the bearing support during installation.



- Slide the assembly onto the shaft by pushing on the inner ring. If too hard, use a piece of emery cloth to reduce the roughness of the shaft surface and try again. Repeat the process, if necessary.



- Install the mounting bolts and check the unit alignment. The bearing units on the two sides must be carefully aligned to achieve the expected lifetime. Tighten the bolts to the recommended torque (20 Nm).



- Tighten the grub screw according to recommended torque (as shown in the table below).

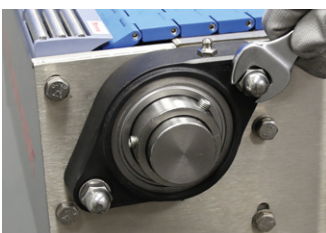
BORE DIAMETER	GRUB SCREW	RECOMMENDED TORQUE		BORE DIAMETER	GRUB SCREW	RECOMMENDED TORQUE	
		Nm	in-lbs			Nm	in-lbs
mm	mm			in	mm		
20, 25, 30	M6x1	5,4	48	$\frac{3}{4}, 1, 1 \frac{1}{4}$	M6x1	5,4	48
35, 40	M8x1	11,3	100	$1 \frac{7}{16}, 1 \frac{1}{2}$	M8x1	11.3	100

C. Installation (eccentric ring version)

- Don't apply load on the bearing support during installation.

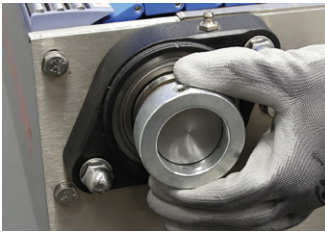


- Slide the assembly onto the shaft by pushing on the inner ring. If too hard, use a piece of emery cloth to reduce the roughness of the shaft surface and try again. Repeat the process, if necessary.

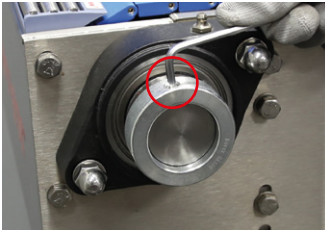


- Install the mounting bolts and check the unit alignment. The bearing units on the two sides must be carefully aligned to achieve the expected lifetime. Tighten the bolts to the recommended torque (20 Nm).

Mounting instructions



- Place the ring onto the shaft and turn it in the same shaft direction until the eccentric ring is engaged.

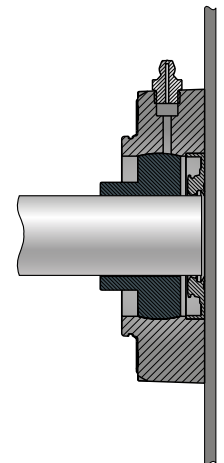


- Tighten the grub screw according to recommended torque (as shown in the table below).

BORE DIAMETER		GRUB SCREW		RECOMMENDED TORQUE		BORE DIAMETER		GRUB SCREW		RECOMMENDED TORQUE	
mm		mm		Nm	in-lbs	in		mm		Nm	in-lbs
20, 25, 30		M6x1		5,4	48	¾, 1, 1 ¼		M6x1		5,4	48
35, 40		M8x1		11,3	100	1 ⅞, 1 ½		M8x1		11.3	100

Lubrication and maintenance

Bearing assemblies are supplied with a lubrication fitting installed in the housing (grease nipple shown in the sketch at right). Long life bearings (available upon request) don't have a grease nipple because they are lubricated for life. Depending on the bearing type, the housing may have a plug with or without the threaded hole (solid).



SUPPORT	GREASE-NIPPLE	SUPPORT	GREASE-NIPPLE	SUPPORT	GREASE-NIPPLE
UCFL	M 1/8" GAS	CL	M 1/8" GAS	FL Hygienic	M 1/8" GAS
UCF	M 1/8" GAS	CS	M 1/8" GAS	F Hygienic	M 1/8" GAS
UCFA	M 1/8" GAS	SUCF	M 1/8" GAS	FB Hygienic	M 1/8" GAS
UCFL-H	M 1/8" GAS	SUCFL	M 1/8" GAS	UCP Hygienic	M 1/8" GAS
UCF-H	M 1/8" GAS	SUCFK	M 1/8" GAS	UCT Hygienic	M 1/8" GAS

Type of lubricant

The bearing is pre-lubricated with an H1 grade, synthetic base oil, complex calcium sulfonate soap thickener NLGI 2 greases. Re-greasing is not required during installation. Re-lubricate the bearings only with approved grease, following the table at page 9. Pressure of the grease device should be between 1.5 and 2.0 bar.

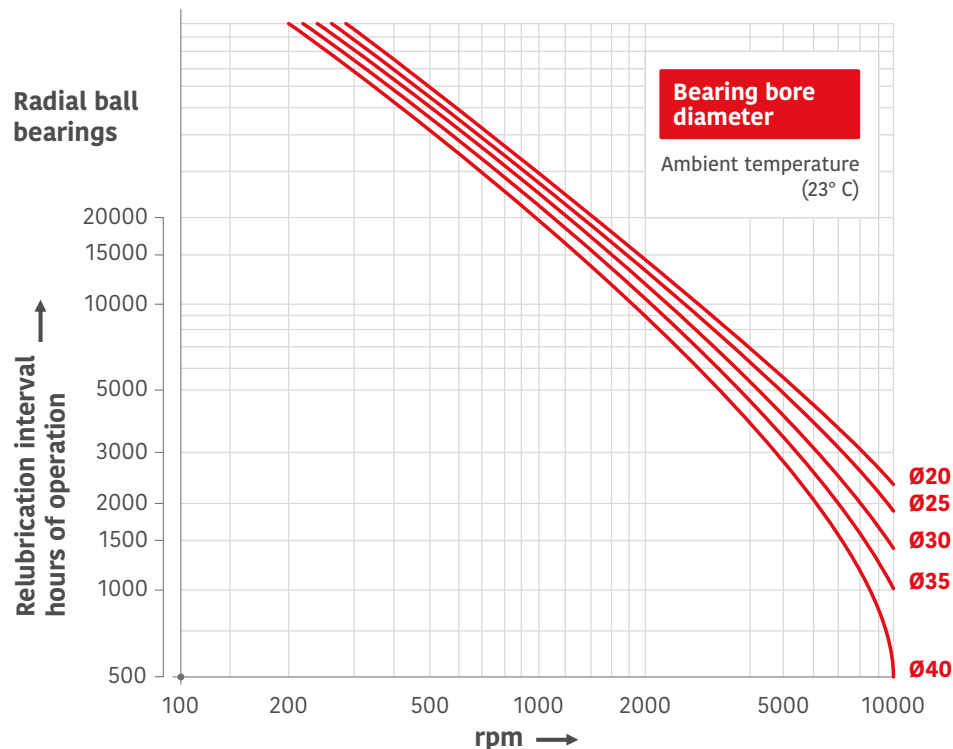
Pre-lubrication and Re-lubrication

All the bearings are supplied already greased. Before installation, make sure the seal lips are lightly lubricated to avoid potential damage during the first rotations.

Lubrication and maintenance

Lubrication interval

Dust, humidity, load, temperature significantly affect the time interval between re-lubrication. The table below can be used as a reference point, however the lubrication interval may vary depending on working conditions of the bearing supports.



Reduce re-lubrication interval, with higher environmental temperature: approximately reduce the lubrication interval by 50%, every 3° temperature increase.

Further reduce the interval with wet and dirty environment: minimum another 50%

Bearing selection

Aspects to consider:

A. Load magnitude and direction

To find the suitable bearing, it is important to determine the load applied and the direction. The load applied on a bearing can be radial, axial, or a combination of both. Movex® bearings are mostly used in applications where the load is mainly radial. Some axial load may be present, but negligible for the bearing selection. For these applications, the deep groove ball bearing is the most suitable bearing type, which is one of the most widely used in many industries and sectors.

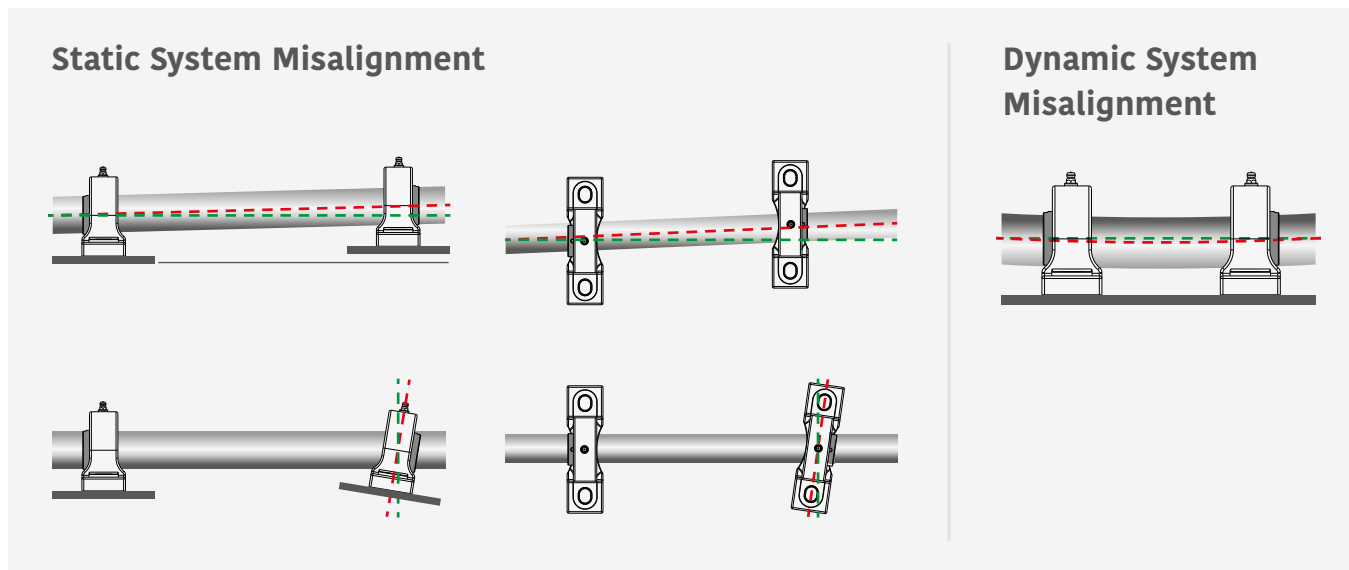
B. Misalignment

The bearing misalignment is a fundamental aspect to be observed during installation to achieve the expected bearing lifetime. The misalignment angle is defined as the angle between the inner race and the outer ring of a bearing. Typically, the misalignment angle must be below 10 arcmin (minute of arc). The bearing misalignment can be due to the following reasons:

- Static misalignment is the result of an incorrect installation, bearings that are not properly aligned. This produces an angular displacement resulting in a reduced bearing lifetime.
- Dynamic misalignment is an eccentric shaft rotation caused by shafting imperfections.

Bearing selection

Each bearing type is designed to bare a certain amount of static, dynamic or combined misalignment. When application misalignment exceeds the allowable limit for the specific bearing, increased contact stresses between bearing rolling elements and raceways occurs and bearing life is reduced.

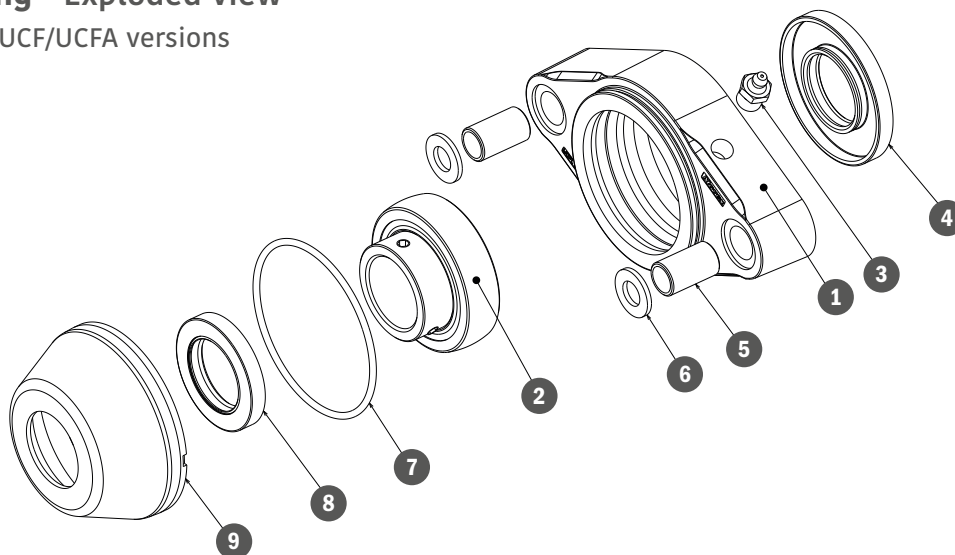


Environment

Environmental factors such as contamination by solids, exposure to moisture and thermal conditions are variables for bearing selection. Bearing components (seals, grease, insert material, etc.) can be modified to better suit a specific application. The availability of special bearing characteristics can be influenced by shaft size, bearing type and housing type. In addition, there are many factors that can influence bearing life: line conditions, humidity, temperature, dust level, cleaning methods are just a few examples. For further information, please contact our technical department.

UCFL Bearing - Exploded view

also valid for UCF/UCFA versions



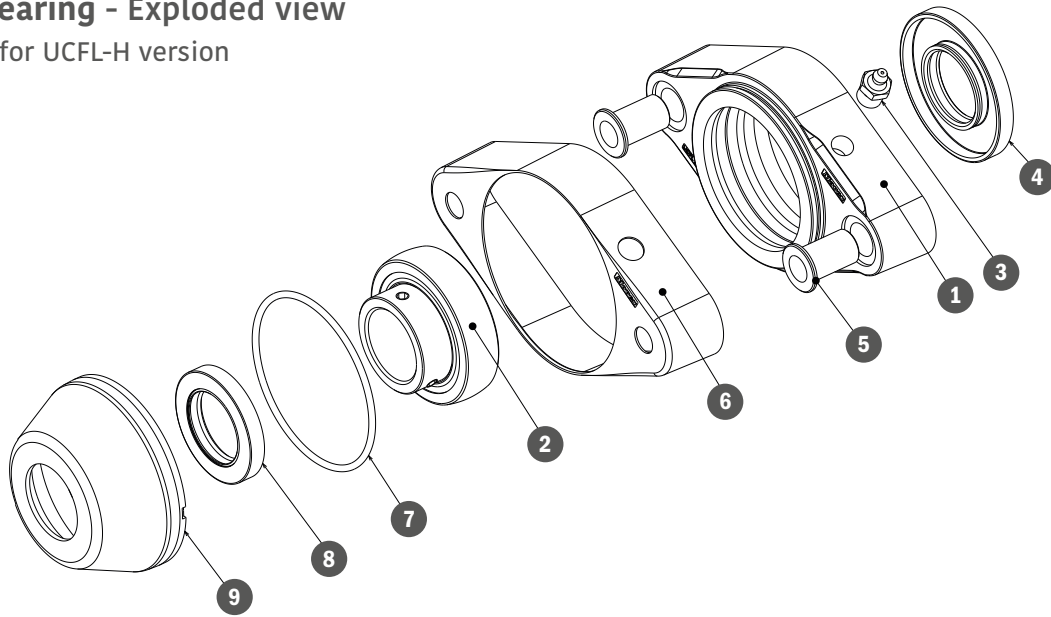
The design and the number of item vary depending on the Bearing version.

Nr.	Item description	Qty	Nr.	Item description	Qty
1	Bearing housing machined oval	1	6	Washer	2
2	Bearing with screw	1	7	O-ring	1
3	Grease nipple	1	8	Front oil seal	1
4	Back oil seal	1	9	Safety cap	1
5	Spacer	2			

Bearing selection

UCF-H Bearing - Exploded view

also valid for UCFL-H version

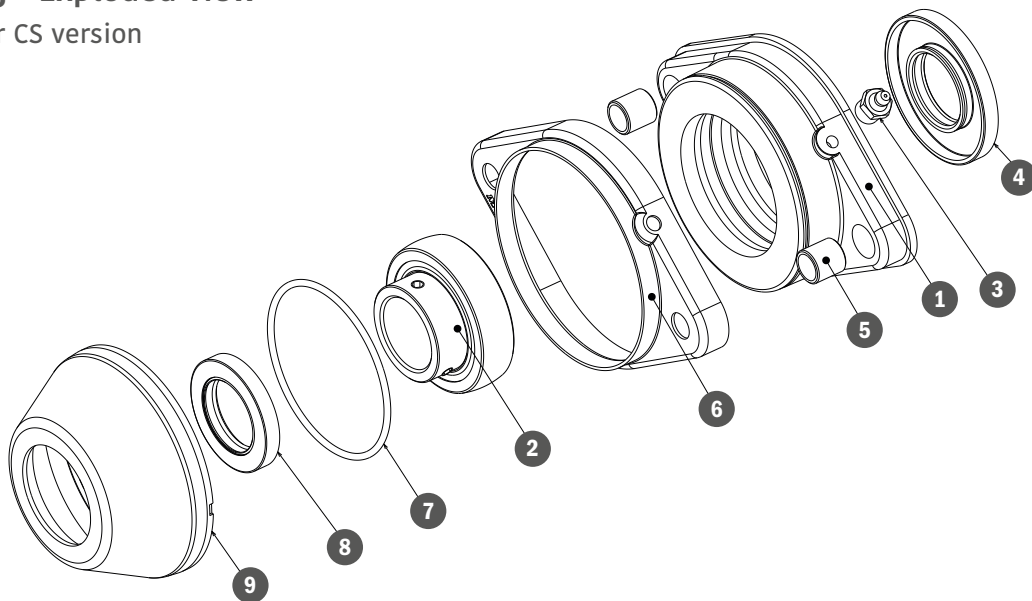


The design and the number of item vary depending on the Bearing version.

Nr.	Item description	Qty	Nr.	Item description	Qty
1	Bearing housing machined oval	1	6	Cover for bearing housing	1
2	Bearing with screw	1	7	O-ring	1
3	Grease nipple	1	8	Front oil seal	1
4	Back oil seal	1	9	Safety cap	1
5	Spacer	2			

CL Bearing - Exploded view

also valid for CS version



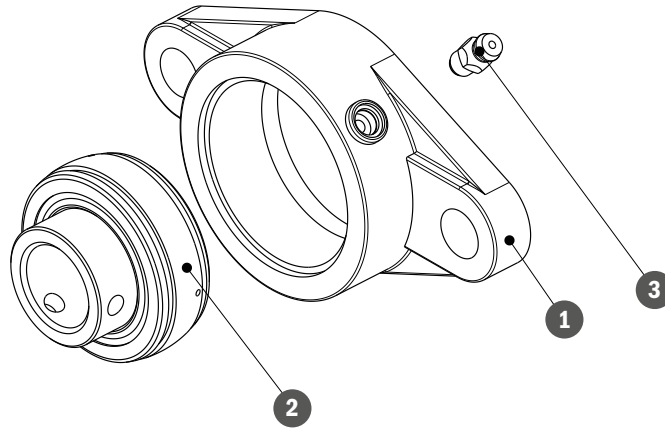
The design and the number of item vary depending on the Bearing version.

Nr.	Item description	Qty	Nr.	Item description	Qty
1	Bearing housing machined oval	1	6	Cover for bearing housing	1
2	Bearing with screw	1	7	O-ring	1
3	Grease nipple	1	8	Front oil seal	1
4	Back oil seal	1	9	Safety cap	1
5	Spacer	2			

Bearing selection

SUCFL Bearing - Exploded view

also valid for SUCF/SUCFK versions

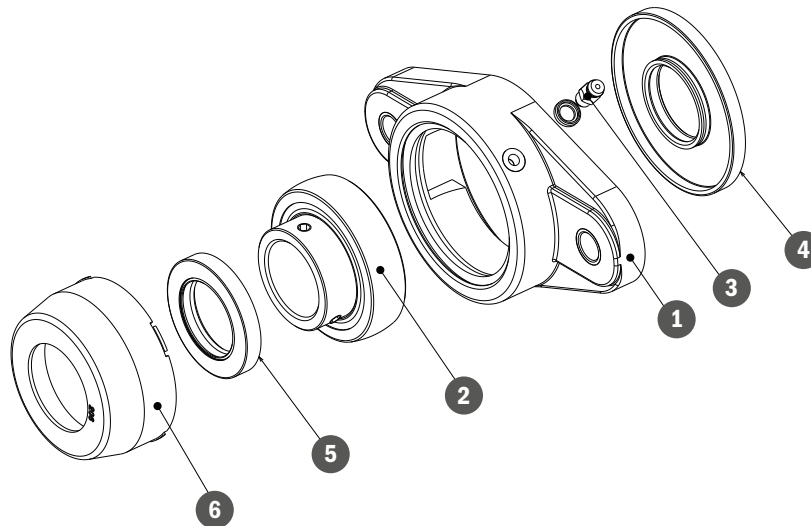


Nr.	Item description	Qty
1	Bearing housing oval - Stainless steel	1
2	Bearing with screw	1
3	Grease nipple	1

The design and the number of item vary depending on the Bearing version.

FL Hygienic Bearing - Exploded view

also valid for F/FB/UCP/UCT versions



The design and the number of item vary depending on the Bearing version.

Nr.	Item description	Qty	Nr.	Item description	Qty
1	Bearing housing machined oval	1	4	Back oil seal	1
2	Bearing with screw	1	5	Front oil seal	1
3	Grease nipple	1	6	Safety cap	1

Load calculation

The fatigue life of an individual bearing is the number of revolutions (or the number of operating hours at a constant speed) that the bearing operates before the first sign of metal fatigue (rolling contact fatigue (RCF) or spalling) occurs on one of its rings or rolling elements. Both laboratory testing and practical experience show considerable variations in the fatigue life of identical bearings operating under identical conditions.

To avoid fatigue failures of the bearing before the application reaches its desired lifetime, the statistical approach should be used to determine the bearing size. The rating life L₁₀ is the fatigue life that 90% of a sufficiently large group of identical bearings operating under identical conditions can be expected to attain or exceed. The rating life L₁₀ is a proven and effective tool which can be used to determine a bearing size that is adequate to avoid fatigue failures.

Considering only load and speed, the basic rating life L₁₀, can be calculated in accordance with ISO 281:

$$L_{10} = \left(\frac{C}{P} \right)^p$$

If the speed is constant, it is often preferable to calculate the life expressed in operating hours using:

$$L_{10h} = \left(\frac{10^6}{60n} \right) L_{10}$$

LEGEND:

L₁₀ Basic rating life (at 90% reliability) [millions of revolutions] **L_{10h}** Basic rating life (at 90% reliability) [operating hours]
C Basic dynamic load rating [kN] **P** Equivalent dynamic bearing load [kN] **n** rotational speed [r/min]
p exponent of the life equation = 3 for ball bearings = 10/3 for roller bearings

Load safety factor

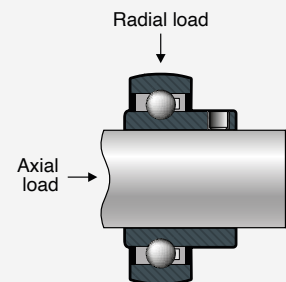
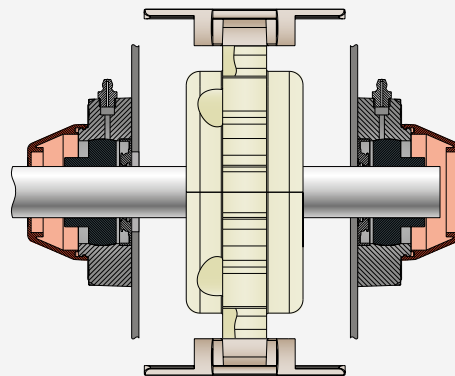
$$f_p = 1.5$$

$$P = F_r f_p$$

Example

880 Magnetic chain

Typical installation situation, bearing arrangement of the drive shaft of a standard conveyor.



Axial load = 0
 Radial load = chain pull force of the conveyor belt/chain

Calculation of the tensile force using the calculation tool ChainDim - Shaft diameter = 30mm

Result: Chain tensile force for a typical application = 400N

Chain tensile force incl. load factor = 400N * 1,5 = 600N

Speed = 118min⁻¹

Half the chain tensile force acts as radial load on each of the two bearings: $F_r = 300N$

Dynamic equivalent radial bearing load: $P = F_r = 300N$

Basic dynamic radial load rating (see product table): $C = 15730N$

Nominal life in operating hours: $L_{10h} = 16666/118\text{min}^{-1} * (15730N/300N)^3 = \text{approx. } 20.000.000h$



Housing maximum static load capacity


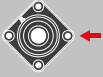
HOUSING MAXIMUM STATIC LOAD CAPACITY:



Values indicated in the table below are obtained at 23°C. They refer to polyamide housings.



For further information please contact our Engineering department.


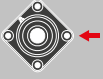
STANDARD SERIES



UCFL Series		
mm	N	N
20	9275	9275
25	10375	10925
30	14200	13650
35	14200	12550
40	14200	14200


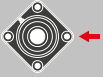
UCF Series		
mm	N	N
25	16575	19650
30	18575	19650
35	19650	24000
40	19650	24000

UCFA Series		
mm	N	N
20	3300	1100
25	3850	1100
30	3850	1100

UCFL-H Series		
mm	N	N
30	14200	13650
35	14200	12550
40	14200	14200




UCF-H Series		
mm	N	N
30	18750	19650
40	19650	24000




CL Series		
mm	N	N
30	14200	13650
35	14200	12550
40	14200	14200



CS Series		
mm	N	N
30	19650	24000
35	19650	24000
40	19650	24000




Housing maximum static load capacity


HYGIENIC SERIES

FL Series			
mm	N	N	N
20	8000	10000	10000
25	8725	10925	12000
30	10925	12000	13100
35	10925	12000	8725
40	12000	12000	13100

F Series			
mm	N	N	N
20	20000	15625	7000
25	20000	15625	7000
30	20750	16380	7650
35	20750	16380	17780
40	20750	16380	18550

FB Series		
mm	N	N
20	2850	950
25	3300	950
30	3300	950
35	3800	950
40	4950	950

UCP Series			
mm	N	N	N
20	4350	19650	5450
25	6550	19650	6550
30	7650	27300	8750
35	8750	29500	10900
40	8750	29500	10900

UCT Series	
mm	N
20	15200
25	22800
30	25650
35	27000
40	28000



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ENGINEERING MANUAL

Movex[®]

Movex S.p.A. a socio unico

Headquarters

Viale Industria, 22
24060 Castelli Calepio (BG)

P +39 035 8359711

F +39 035 4420873

Logistics Center

Via Repubblica, 25
24060 Castelli Calepio (BG)

info@movexii.com

www.movexii.com

Movex worldwide

Movex GmbH

P +49-6204-9375-0

Movex Brasil Ltda

P +55-15-3141-2550

Movex France

P +39-335-8085980

Movex AG India

P +91-120-4159660-62

Movex UK Ltd.

P +44-77-20678442

Movex Nederland

P +31-630-994850

Movex USA Inc.

P +1-919-274-5477

Movex SA de CV

P +52-1-3318458187

Movex CIS Countries

P +39-348-7769760