



Installation Guide



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QCB® is a registered trademark of NBC Group Ltd

QCB® offers one of the widest ranges of slewing rings, slew drives and ring gears available from a single supplier.

The range includes:-

- Trailer rings
- Single row ball bearings (Geared or ungeared)
- Double row ball bearings (Geared or ungeared)
- Single row crossed roller bearings (Geared or ungeared)
- Triple row roller bearings (Geared or ungeared)
- Ring gears
- Pinions and pinion shafts
- Slewing drives

This catalogue contains the installation instructions for slewing rings and trailer rings.

QCB® slewing rings and QCB® slewing drives are manufactured by selected manufacturers in China, Europe and elsewhere resulting in a quality product at a competitive price, all delivered when required.

All manufacturers have been audited by QCB's engineering staff and are ISO registered. They operate some of the most modern machinery and manufacturing processes in the world and compare favourably with traditional sources. Many have also passed additional and separate audits from some larger clients who operate safety critical equipment in the global market place.

The QCB® brand has become a trusted name in slewing ring bearings with a satisfied and international customer base in industries as diverse as mining, materials handling, offshore oil and gas, access platforms and process treatment plants.

SLEW RING INSTALLATION DATA

Slewing rings should be transported and stored in a horizontal position or on specially built incline cradles. Shock loads should be avoided as they may damage the raceways.

If stacked on pallets then care must be taken not to dislodge seals or grease fittings during movement. Wooden or runner spacers would be of benefit between bearings. Gear teeth must be protected from impact damage.

As supplied, slewing rings are generally packed for storage in a dry, covered store and for a period not exceeding 6 months.

Light surface corrosion may occur in humid conditions but this can usually be removed from external surfaces – it's more important that the raceways are well greased and rust free.

In extreme cases of long term storage the bearings may need professional dismantling and cleaning/ inspection / reassembly before use.

Large slewing rings usually have lifting holes for eye-bolts to assist lifting in the inner and outer rings. Check the weight of the ring to ensure slings and/or chains are of sufficient capacity.

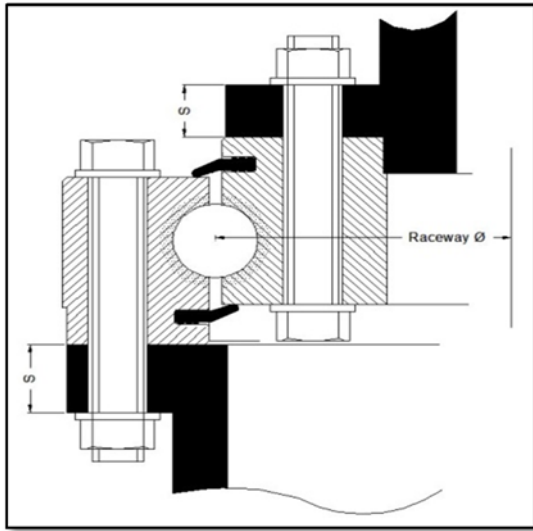
When unwrapping, care must be taken not to cut and damage the integral seal strips. Use of a blunt instrument to free any seal surfaces that may have become stuck to the running surface is recommended to avoid seal damage on start-up.

TRANSPORT, HANDLING & STORAGE

Standard commercial solvents (without chlorine) can be used to degrease the slewing rings if required. Use sparingly and do not let this work under the seals into the raceway area.

SUPPORT STRUCTURES

Slewing rings must be supported by flat, machined surfaces which are rigid enough to eliminate torsional buckling under load that would affect the smooth operation of the ring.



Support structure thickness

The suggested minimum thickness (S) of the supporting material is indicated below.

Raceway ϕ (mm)	500	750	1000	1250	1500	2000	2500	3000
Min. thickness (mm)	25	30	35	40	50	60	70	80

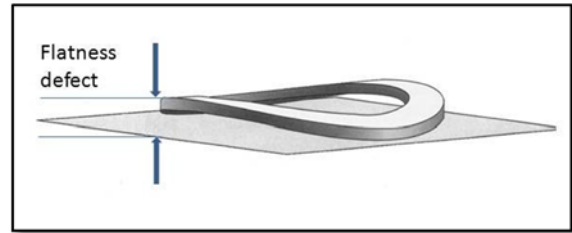
The width of the supporting flanges must at least equal the width of the ring it supports. Thick circular supports are preferred over thinner supports with reinforcement ribs.

With modern finite element analysis it may be possible to work with thinner materials.

Flatness defects under load must not exceed the values indicated below to avoid tight spots or seizure; both of which will reduce the life of the ring.

Raceway ϕ (mm)	500	750	1000	1250	1500	2000	2500	3000
Single row ball (mm)	0.12	0.18	0.21	0.25	0.28	0.33	0.38	0.42
X-roller or 2-row ball (mm)	0.10	0.12	0.15	0.18	0.20	0.25	0.29	0.32

These values are for “long waves” around the circumference. Shorter wave defects (e.g. between 2 bolt holes) must not exceed ¼ of these values.



Support structure flatness

Defects in the radial direction (sometimes referred to as “conicity”) must not exceed 0.05mm /m based on the raceway diameter.

If the above tolerances cannot be met, epoxy resins such as **CHOCKFAST ORANGE** may be used. Ask for details.

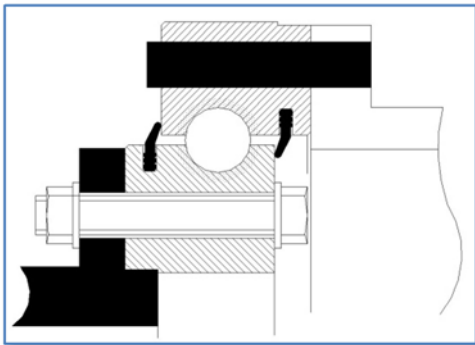
SLEW RING ORIENTATION

The filling plugs are positioned at the raceway hardening junctions. When fitting, the filling plugs must be positioned at the point of minimum strain (usually at right angles to the main load axis).

In some cases the bolt pattern will be asymmetric to force this orientation.

DOWEL PINS OR SPIGOTS

In the event of high radial loads, or if a slew ring is used with a horizontal axis of rotation the circularity of the slewing ring may be affected. If circularity cannot be maintained by use of a structural adhesive (e.g. LOCTITE 586 or similar), the machined diameters on the bearing rings must be used. If this is impossible then a system of dowel pins should be considered.



Using dowels or location diameters

FASTENING BOLTS

Although some manufacturers specify Grade 8.8 bolts, QCB® slewing rings are usually designed to be used with Grade 10.9 hexagon head or cap screw bolts. Check you have the correct grade of bolt available.

For bearings in “CC” steel (50Mn) the use of flat hardened washers is recommended to reduce surface pressures under the bolt head and nut. If cap screws are used the specific pressure under the bolt head should not exceed the limits of the material.

The use of any elastic (spring washers or Bellville washers) or serrated washers is prohibited and will negate the warranty.

Untreated bolts should be lightly oiled and tightened progressively using either a calibrated torque wrench or a hydraulic system, moving around the periphery of the slewing ring in 120 degree steps. The recommended bolt torque figures are tabulated overleaf.

Large diameter bolts should be tightened hydraulically.

Ensure that the slew ring rotation is tested during the tightening process (if possible) as any “tight points” will become evident and prompt immediate investigation. The bolt torque figures should be checked again before the machine enters service as a degree of “settling” may occur, then after 100 hours of operation, and thereafter at least on an annual basis.

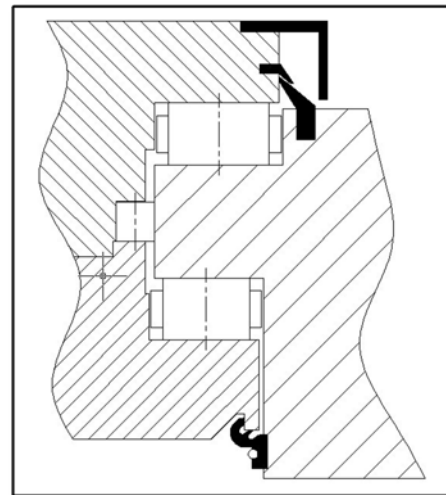
Strength class to DIN/ISO 898			Grade 8.8		Grade 10.9		Grade 12.9	
Yield point Rp 0.2 (N/mm ²)			640 for ≤ M16		940 MPa		1100 MPa	
			660 for > M16					
ISO thread DIN 13	Stress x- section area mm ²	Core x- section area mm ²	Tension force (KN)	Tightening torque (Nm)	Tension force (KN)	Tightening torque (Nm)	Tension force (KN)	Tightening torque (Nm)
M12	84.3	76.2	38.5	78	56	117	66	135
M14	115	105	53	126	77	184	90	216
M16	157	144	72	193	106	279	124	333
M18	193	175	92	270	129	387	151	459
M20	245	225	117	387	166	558	194	648
M22	303	282	146	522	208	747	243	873
M24	353	324	168	666	239	954	280	1116
M27	459	427	221	990	315	1395	370	1665
M30	561	519	270	1350	385	1890	450	2250
M33	694	547	335	To be determined by bolt elongation measurement	450	To be determined by bolt elongation measurement	560	To be determined by bolt elongation measurement
M36	817	759	395		560		660	
M39	976	913	475		670		790	
M42	1120	1045	542		772		904	
M45	1300	1224	632		905		1059	
M48	1470	1377	714		1018		1191	
M52	1760	1652	857		1221		1429	
M56	2030	1905	989		1408		1648	
M60	2360	2227	1156		1647		1927	

SEALS

QCB® slew rings are fitted with a nitrile or NBR rubber lip seal which rides on the surface of the adjacent ring. In some high temperature units this is replaced with a VITON lip seal.

Special seal arrangements will be proposed if required. These include:

- Double seals
- V-ring seals
- Quad section seals
- Metal shields
- Offshore seals



Special seals

Seals require annual inspection and possibly replacement if they are exposed.

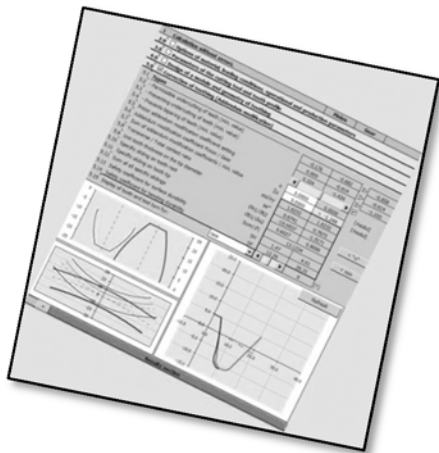
GEARING

Metric slew rings generally have a 20° involute spur gear, although helical gears exist.

Imperial bearings can use either a Fellows Stub gear or an American stub or full depth gear.

As many slewing rings exhibit an addendum correction it is imperative to get a suitably corrected pinion to ensure efficient meshing.

Our technical staff utilise the most up to date calculation software available in the design process.



Expert gear analysis

Material specific gear strength figures (F_{normal} and F_{max}) for all bearings are listed on the drawings.

Detailed gear analyses are offered for high torque or multi-drive applications.

BACKLASH

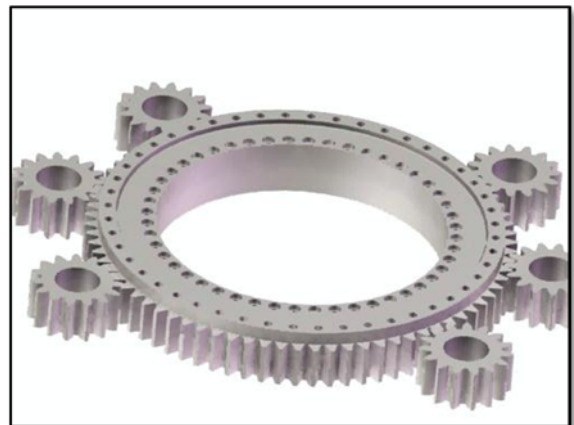
Pinion backlash must be set at the point of maximum eccentricity on the slew ring. This will be marked, usually by 3 painted teeth.

Ensure each pinion is properly aligned to the gear with good contact maintained over the full face width.

A minimum clearance of between 0.03 – 0.05 x module is recommended under normal circumstances.

MOD	Backlash (mm)	MOD	Backlash (mm)	MOD	Backlash (mm)
4	0.12 – 0.16	10	0.30 – 0.40	18	0.54 – 0.72
5	0.15 – 0.20	12	0.36 – 0.48	20	0.60 – 0.80
6	0.18 – 0.24	14	0.42 – 0.56	22	0.66 – 0.88
8	0.24 – 0.32	16	0.48 – 0.64	24	0.72 – 0.96

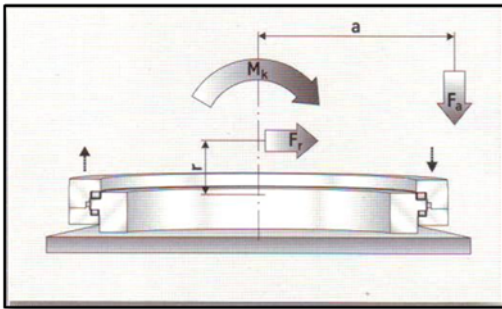
During installation the slewing rings should be rotated a few times to check the gear mesh.



Slew ring with multiple drive pinions

OPERATIONAL CLEARANCE AND WEAR

After assembly the clearance or total deflection of the slewing ring under known test conditions should be determined to serve as reference data for future clearance checks to determine the amount of wear in the bearing.

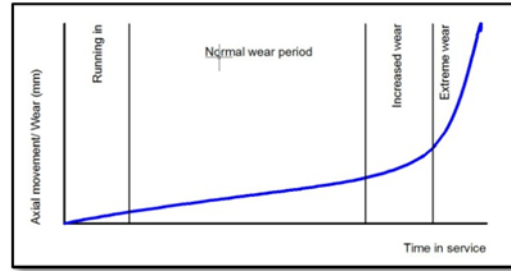


Simple wear check

The degree of “tilt” in the bearing can be measured, or the relative axial and radial movement of the rings using dial gauges. An average of at least 4 measurements around the circumference should be recorded.

Measurements should be taken as close to the raceways as possible to minimise the effects of elastic deflections in the structure. The measurement points should be marked so that the test can be recreated.

In general, slewing rings will wear at a linear rate in service. Once this rate of wear accelerates it is nearing the end of its service life.



Normal wear rates

Typical allowable wear figures for normal applications are tabulated below:-

For single and double row ball bearings

Track dia up to	Ball dia				
	20	25	30	35	40
(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
1000	1.4	1.4	1.5	1.7	1.9
1250		1.5	1.6	1.7	2.0
1500		1.6	1.7	1.7	2.0
1750			1.7	1.8	2.1
2000			1.8	1.9	2.2
2250				2.0	2.3
2500				2.0	2.3

For single row x-roller bearings

Track dia up to	Roller dia				
	16	20	25	32	40
(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
400	0.22	0.22	0.24		
800	0.25	0.27	0.29	0.33	0.38
1000	0.30	0.32	0.34	0.38	0.43
1500	0.50	0.52	0.54	0.58	0.63
2000		0.62	0.64	0.68	0.73
2500			0.74	0.78	0.83

These figures do not apply to safety critical applications (e.g. amusement rides).

As a “rule of thumb”, once the measured deflection exceeds 1.5x the initial figure, plans for the replacement of the slew ring should be made – considering that they are sometimes long lead items. If the measured deflection exceeds 2x the initial clearance then the ring should be replaced immediately for safety reasons.

RACEWAY LUBRICATION

QCB® slewing rings are factory filled with standard NLGI class 2 mineral oil based EP grease.

The raceways can be adequately lubricated by any good quality standard lithium based EP2 bearing grease. Typical raceway lubricants include:-

Brand	Bearing/ raceway grease	Operating temps
ARAL	Aralub HLP2	-30C to +120C
BECEM	Rhus L474/2 or High Lub L2EP	-20C to +120C
BP	Energol LS-EP-2	-20C to +120C
ESSO	Beacon EP2	-20C to +120C
TOTAL FINA ELF	Multis EP2 or Lical EP2	-30C to +120C
EXXONMOBIL	Mobilith SHC460	-30C to +120C
KLUBER	Centoplex 2 EP	-20C to +120C
RHENUS	Norlith MZP 2	-30C to +130C
SHELL	Retina EP2 or Alvania EP (LF) 2	-25C to +130C
FUCHS	Stabyl LT50	-50C to +130C

Slewing rings can be delivered with varying amounts of grease, or may have been subject to long term storage. *The onus is on the customer to check that the slewing ring is adequately lubricated when entered into service.*

The regreasing interval is best determined by the environment, and is mandatory after a long period of storage. In aggressive environments it must be recognised that the grease acts as a barrier to contamination.

Environmental conditions	Recommended relube interval
Dry & clean workshop	~300 hours operation or 6 months
Outside and exposed	~100-200 hours operation or 4 months
Aggressive environment	~50 hours operation or 2 months
Extreme conditions	~continuous lube preferred

Grease nipples are provided on one ring or the other, sometimes both. Use whichever is convenient.

During regreasing it is advisable to rotate the bearing to ensure distribution of the fresh grease as well as to avoid over pressurising the seals as this may force them out of their grooves.

As most slew rings rotate slowly, they can operate 100% full of grease. Ideally a thin smear of fresh grease should start to weep from under the lip seals.

A simple formula helps to determine the approximate amount of grease required in grams (all dimensions in mm)

- Single row ball brg
Grease qty (gr) = 0.7 x Raceway ϕ x ball ϕ^2 / 1000
- Single row roller brg
Grease qty (gr) = 0.5 x Raceway ϕ x roller ϕ^2 / 1000

GEAR LUBRICATION

The gear should be lubricated immediately after assembly and setting of the backlash. Suitable open gear grease should be brushed or sprayed on to cover the teeth completely.

Common gear lubricants include

Brand	Gear grease	Operating temps
ARAL	Aralub LFZ 1	-20C to +120C
BECEM	Berulit GA 400	-20C to +180C
BP	Energol WRL/ GR 154 GS	-20C to +120C
TOTAL FINA ELF	Cardrexa DC1 / Ceran AD	-20C to +125C
EXXONMOBIL	Mobiltac 81/ Mobilgear OGL 007	-20C to +120C
KLUBER	Grafloson CA 901	-20C to +180C
RHENUS	Norplex AKG 0	-20C to +200C
SHELL	Aeroshell Grease 14 / Malleus GL 205	-54C to +93C

AN AUTOMATIC LUBRICATION SYSTEM IS PREFERRED AS IT WILL INJECT SMALL QUANTITIES OF GREASE, OFTEN.

QCB SLEW RING NUMBERING SYSTEM

The QCB® bearing numbering system includes number and letters in specific groups and with the following meanings

E.g. H SEG H 1166 2 20 01 6 CC LM

H	Helical gear <i>(omit if not required)</i>
SEG	Style or family type code
H	Hardened gear <i>(omit if not required)</i>
1166	Outer diameter <i>(mm)</i>
2	Number of raceways
20	Size of major rolling element <i>("X20" if x-roller bearing)</i>
01	Design number
6	Precision grade <i>(omit if standard industrial clearances)</i>
CC	Material of inner & outer rings
LM	NBC designer

Family types

- FUN Flanged, ungeared
- FIG Flanged, internal gear
- FEG Flanged, external gear
- SUN Solid section, ungeared
- SIG Solid section, internal gear
- SEG Solid section, external gear

Design number

- 5- OEM designs – generally not for resale – can be a combination of features
- 6- Reserved for imperial dimension bearings
- Other combinations relate to seal or spacer changes away from standard

Precision grade

- - Standard industrial clearances as per drawing
- 6 P6 internal clearances
- 5 P5 internal clearances
- A Light preload

Most common materials

1st digit pertains to the inner ring, 2nd digit pertains to the outer ring

- CC 50Mn Broadly equivalent to C45 (common in Europe)
- AA 42CrMo4
- EE AISI 52100 Through hardened steel

TRAILER RINGS

NBC Group stock a range of trailer rings manufactured in Europe.

Intended for simple oscillatory movements on lightly loaded and slow speed trailers, they also find use in simple materials handling applications with light loading conditions due to economy in design.

Trailer rings do not have hardened raceways and therefore cannot be considered a replacement for a slewing ring.

Trailer rings are supplied undrilled and only lightly greased.

It is important that they are properly greased during installation and service as they are unsealed. Good quality lithium or lithium-calcium EP2 grease will be adequate in most applications.

Trailer rings flanges should be at least 50% supported by a stiff frame, with the loading plug located away from the direction of any radial load.

It's normal for 6 to 8 bolts to be added per flange, minimum size M12 to M16 (depending on diameter). Bolt torques should be checked monthly.

Metal tabs, welded to the frame, can be used to improve radial location.

Be aware that trailer rings are NOT precision bearings and dimensions such as overall height can vary by as much as 3mm, and diameters by as much as 5 – 8mm!

