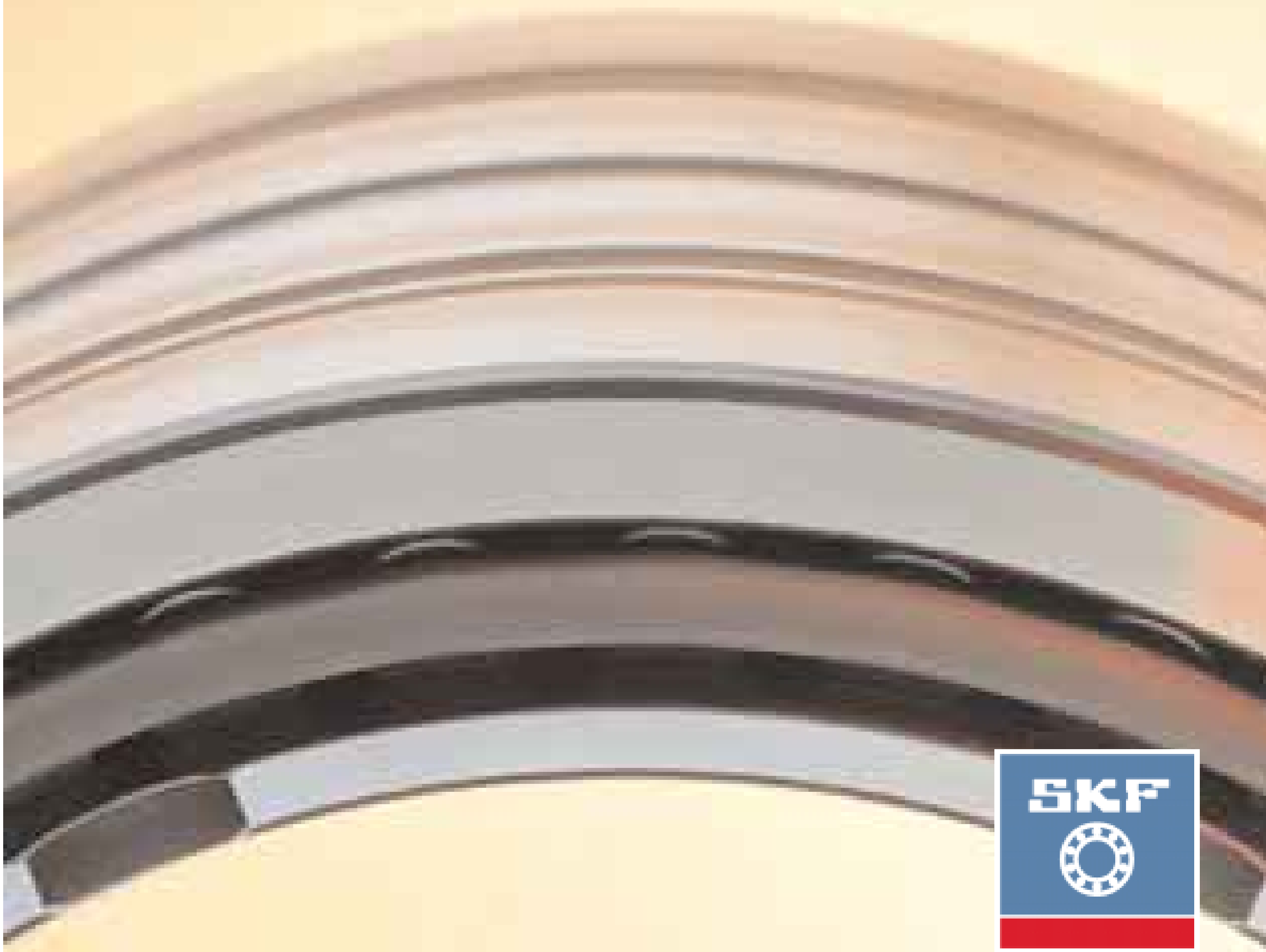
SKF

SKF four-row taper roller bearings without spacer rings cut installation costs



Contents

Made by SKF® stands for excellence. It symbolises our consistent endeavour to achieve total quality in everything we do. For those who use our products, “Made by SKF” implies three main benefits.

Reliability – thanks to modern, efficient products, based on our worldwide application know-how, optimised materials, forward-looking designs and the most advanced production techniques.

Cost effectiveness – resulting from the favourable ratio between our product quality plus service facilities, and the purchase price of the product.

Market lead – which you can achieve by taking advantage of our products and services. Increased operating time and reduced down-time, as well as improved output and product quality are the key to a successful partnership.

Reliable and easy to mount

Why four-row taper roller bearings?

Four-row taper roller bearings are used successfully worldwide for rolling mill bearing arrangements, particularly as work roll bearings for hot as well as cold rolling mills operating at low to moderate speeds. As the bearings can support both heavy radial loads and simultaneously acting axial loads the roll neck bearing arrangements are both simple and cost effective. It is usually not necessary to incorporate separate thrust bearings so that the roll necks can be kept reasonably short and the chocks at both sides of the roll can have the same design.

The most recent development where roll neck bearing arrangements are concerned are the four-row taper roller bearings without spacer rings (intermediate rings) listed in this brochure. The special advantages of these bearings include

- simpler mounting because of fewer components;
- improved load distribution over the four rows of rollers resulting in less wear and longer service lives;
- the reduced width tolerances of the inner rings make for simpler axial location of the bearing on the journal;
- the external dimensions are the same as conventional four-row taper roller bearings (with spacer rings).

Why four-row taper roller bearings from SKF?

SKF is well aquainted with the use of rolling bearings in rolling mills. As early as 1922 SKF introduced roller bearings as roll neck bearings in the SKF steelworks Hofors Bruk. Based on the success of this in-house venture SKF was able to quickly persuade the metallurgical industry of the merits of roller bearings and there was rapid development. The know-how accumulated over the years by SKF benefits both builders and users of rolling mills.

An extensive range

Standard designs

SKF four-row taper roller bearings without spacer rings are primarily produced with the TQON configuration (➔ **fig** 1). In this configuration there are four outer rings and two double-row inner rings, each with two roller and cage assemblies arranged face-to-face. The bearings are normally supplied with pressed steel cages, although the larger sizes may have pierced rollers and steel pin-type cages.

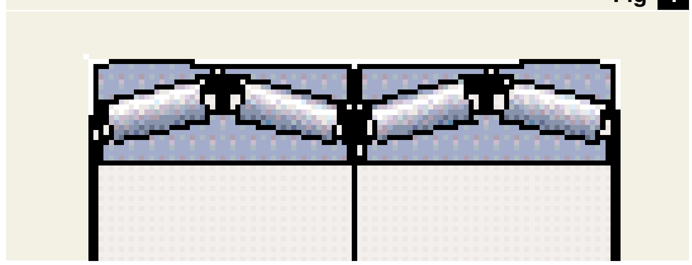
SKF four-row taper roller bearings without spacer rings are available in open as well as sealed versions in various designs, depending on bearing size and intended application.

As four-row taper roller bearings are mounted with a loose fit on the roll neck, the bearings can also be supplied with a helical groove in the inner ring bores and/or lubrication grooves in the side faces of the inner rings (➔ **fig** 6, **page 18**). These lubrication grooves enable lubricant to be supplied to the contact surfaces of the inner rings and journal seating where there is a risk of wear occurring. Wear particles can also be deposited in the helical grooves.

SKF four-row taper roller bearings without spacer rings are available in open as well as sealed versions in the following designs, depending on bearing size and intended application.

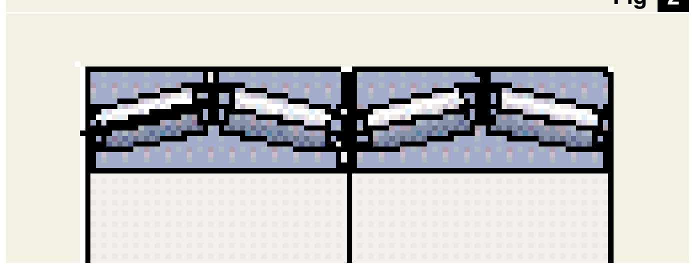
For good economy – sealed bear-

Fig 1



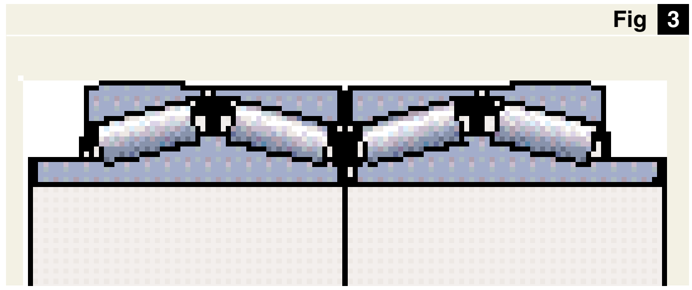
TQON design
Open bearings (without seals) of basic design with pressed steel cages

Fig 2



TQON.1 design
Open bearings (without seals) with pierced rollers and steel pin-type cages

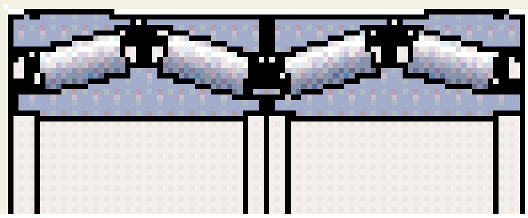
Fig 3



TQOEN design
Open bearings with extended inner rings. The extensions to the inner rings are designed as concentric sliding surfaces (counterfaces) for radial shaft seals and are ground.

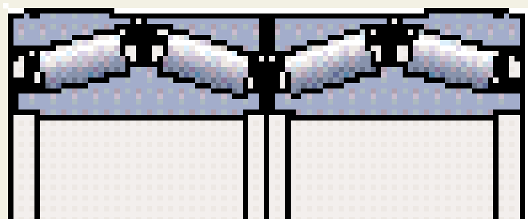
TQOSN design
With a radial shaft seal at both sides, to the VA901 specification; with lubrication grooves in the outer ring side faces and an additional sealing ring between the inner rings, with pressed steel cages

Fig 4



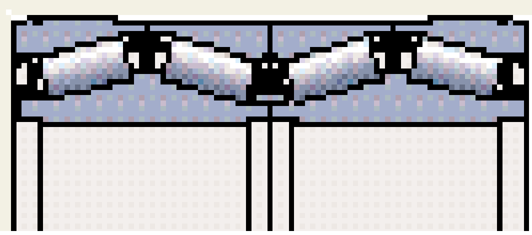
With a radial shaft seal at both sides, to the VA903 specification; with lubrication grooves in the outer ring side faces and an additional sealing ring between the inner rings, with pressed steel cages

Fig 5



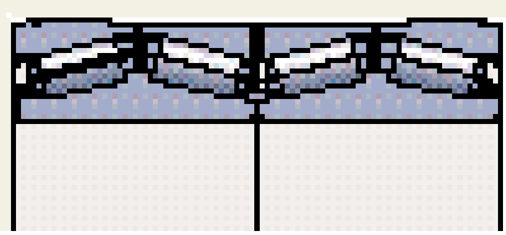
With a radial shaft seal at both sides, to the VA902 specification; cannot be relubricated with an additional sealing ring between the inner rings, with pressed steel cages

Fig 6



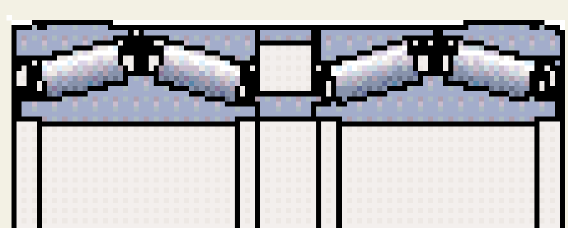
TQOSN.1 design
With a radial shaft seal at both sides, to the VA901 specification; with lubrication grooves in the outer ring side faces and an additional sealing ring between the inner rings, with pierced rollers and steel pin-type cages

Fig 7



TQOSNP design
With a radial shaft seal at both sides; with spacer sleeves between the double row roller and cage assemblies, with pressed steel cages

Fig 8



TQI design
With two double row roller and cage assemblies arranged back-to-back

Fig 9

ings
Whenever possible, sealed bearings should be used for rolling mills. Compared with open bearings they offer considerable advantages:

- they achieve longer service lives,
- grease consumption is reduced by up to 90 %,
- maintenance intervals can be extended, and
- grease does not escape from the bearings, and the emulsions used for rolling do not become contaminated.

Sealed bearings meet the ecological and economic requirements now being set. Open bearings can simply be replaced by sealed bearings as part of a re-build or refurbishment because the boundary dimensions are the same.

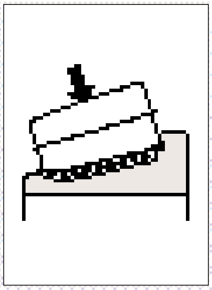
Other bearing designs

In addition to the bearings shown in this brochure, SKF also supplies four-row taper roller bearings with inner and outer intermediate (spacer) rings between the roller rows Nos. 2 and 3 (➔ **fig** 8).

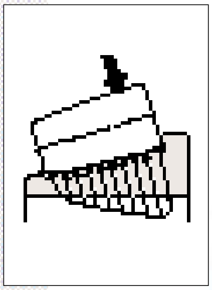
Bearings with the taper roller and cage assembly pairs in a back-to-back arrangement are also produced. These bearings have a double row and two single row inner rings and two double row outer rings (➔ **fig** 9). This arrangement of the roller rows provides relatively stiff bearing arrangements which can take up high tilting moments. For certain applications SKF also supplies bearings with a tapered bore. These are required when the bearing is to be mounted with an interference fit on the journal, for example, when high rolling speeds are to be employed.

Unique design features

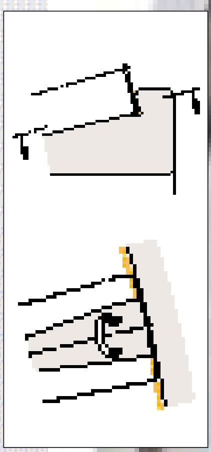
Even load distribution under normal loading; the length of the contact between rollers and raceways is extended, i.e. stress is reduced.



Improved stresss distribution and reduced edge stresses under heavy loads and also when misaligned, i.e. much higher operational reliability



Improved roller end/flange contact, i.e. much improved lubricant supply even under difficult conditions



SKF taper roller bearings are state-of-the-art products. SKF has made decisive improvements to the conditions in the contacts of taper roller bearings. The form of the sliding contact surfaces of the guide flange of the inner ring and of the roller ends has considerably enhanced lubricant supply to, and lubricant film formation in, the roller end/flange contacts. The rolling contact geometry in the bearings has also been considerably improved by the introduction of the so-called logarithmic profile resulting in optimised stress distribution over the contact. The special surfaces also favour lubricant film formation and the correct movement of the rollers. All these improvements have appreciably enhanced the performance of SKF taper roller bearings.

Sealed bearings

The radial shaft seals have the form of a C and extend over the cage of the two outboard roller and cage assemblies (➔ **figs** 4 to 8). Because of the compact design the bearings can incorporate rollers of the same, or almost the same length as the open bearings so that the load carrying capacity is the same or very similar.

The seals are made of fluoro rubber and reinforced with sheet steel. The garter spring is made of stainless steel and enables the sealing lip to exert the correct pressure on the counterface. The permissible sliding velocity is 35 m/s. The seals have high temperature resistance and chemical stability. The permissible operating temperature range at the sealing position is approximately –20 to +200 °C.

O-rings inserted in grooves in the outer ring outside surface ensure that no dirt or water can penetrate between the outer rings and the chock bore, which would otherwise cause corrosion.

The seal between the two inner rings of the VA901and VA902 (➔ **figs** 4 and 6) design variants consists of a steel reinforced ring of nitrile butadiene rubber. The permissible operating temperature range for this seal is –50 to +100 °C.

NB.
The radial shaft seals are made of fluoro rubber. At temperatures above 300 °C, this material gives off dangerous fumes. Once heated the seals will be dangerous to handle even when they have cooled down again. If it is necessary to handle bearings with fluoro rubber seals which have been subjected to excess temperatures, the safety instructions should be observed.

Successful bearing arrangements

Applications

- hot strip mills
- cold rolling mills
- finishing mills
- roughing mills
- universal beam mills
- wire and rod mills

Requirements

- long life
- precisely defined performance
- low maintenance costs
- no unplanned stoppages
- environmentally friendly
- technical advancement

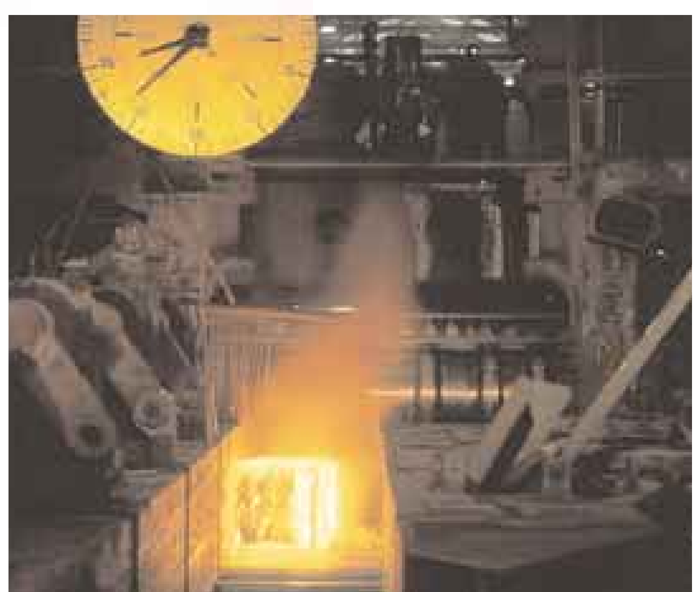
The solution

SKF four-row taper roller bearings have been successfully used in rolling mills around the world for decades. The bearings are characterised by accuracy and reliability even under extreme operating conditions.

Whether in hot or cold rolling mills for flat products or profiles, SKF four-row taper roller bearings are often the first choice.

Over the past 80 years, SKF has accumulated very considerable experience with rolling bearings in the steel industry and this know-how is available to customers of the world's largest rolling bearing producer at any time. SKF application engineers provide support to both machine builder and end user alike around the world. On request, SKF experts will assist in mounting bearings and training maintenance personnel. When needed, SKF specialists will solve problems on site anywhere in the world – saving time and money.

Rolling mills



Trouble-free operation – some useful hints

The competitive situation is such today that plant and machinery have to be optimally utilised. Applications where four-row taper roller bearings are employed are no exception.

To achieve such a goal it is necessary to plan ahead and to use the best equipment, mounting and dismounting procedures, tools and maintenance products.

SKF can provide assistance in reducing component part stores, avoiding unplanned stoppages, shortening repair times and thus improving machine uptime. This is part of the SKF trouble-free operation concept.

This also implies that SKF

- not only supplies high quality bearings and accessories whenever and wherever they are required,
- but also first class tools, condition monitoring equipment, seals and lubricants,
- as well as local and global training in mounting, dismounting and maintenance techniques, and of course, provides application engineering advice.

Some of these topics will be dealt with on the following pages. More information on the SKF trouble-free operation concept will be supplied on request.

Monitoring the bearings in operation

Properly dimensioned and properly mounted bearings are exceptionally reliable machine components – as long as an adequate supply of suitable lubricant is present and damaging events and detrimental operating conditions are avoided.

In spite of this it is sensible to check the performance of bearings in rolling mills either periodically or continually. This will allow incipient bearing damage to be detected and its size and severity assessed. It is then possible to plan the replacement of damaged bearings, thus avoiding sudden unplanned downtime.

The most effective way of monitoring the condition of bearings or machines is by vibration analysis. This is also the most reliable way of predicting bearing failure.

Condition monitoring

Condition monitoring can contribute to increasing machine uptime. SKF has developed a so-called multi-parameter measuring method. This method of monitoring consists of measuring various parameters. In addition to the vibration velocity, acceleration enveloping and SEE (Spectral Emitted Energy) other physical quantities are measured to enable the condition of a machine component or a complete machine to be evaluated.

The main areas of application of condition monitoring are:

- bearing monitoring, to detect damage at the earliest posssible stage;
- monitoring the general condition of a machine to identify problems which may lead to subsequent bearing failure, e.g. imbalance, misalignment, vibration, loose fasteners or even electric current.

SKF can offer a complete range of condition monitoring equipment – from hand-held vibration "pens" to complex systems for permanent installation for the continuous monitoring of bearings and machines.

SKF also supplies software for use with DOS or Windows for the organisation of data collection and evaluation. SKF experts will also assist in training personnel and installing the systems.

SKF condition monitoring equipment – a selection

Lubrication

No bearing arrangement will function properly unless it is adequately lubricated. Depending on the design, several options are available for the lubrication of SKF four-row taper roller bearings without spacer rings.

The bearings without seals (➔ **figs 1 to 3, page 4**) may be lubricated with grease (continuously or periodically) or with oil, for example, with circulating oil, or by the oil spot method, see also publication 4100 “SKF Bearing Maintenance Handbook”.

Sealed four-row taper roller bearings are available in variants which are either completely sealed and intended for grease lubrication, or which can be relubricated; for the latter, grease or oil spot lubrication can be applied.

The bearings without facility for relubrication, variant VA902 (➔ **fig 6, page 5**) should be filled with a high quality grease on mounting. It is recommended that the SKF grease LGMB 2 (➔ **page 32**) be used. The bearings can be operated – normally without relubrication – for some 1 000 to 1 500 hours in the chock, depending on the conditions. They should then be removed from the chock, dismounted, washed, preserved, inspected and then filled with grease and remounted in the cleaned and inspected chock, the outer rings having been turned through 90°.

The sealed bearings with relubrication feature, variants VA901 (➔ **fig 4, page 4**) and VA903 (➔ **fig 5, page 4**) when lubricated by the oil spot method can contribute to enhanced operational economy and reliability, particularly in cold rolling mills. Compared with oil mist lubrication, only about one tenth of the lubricant quantity is required. The oil can be very accurately metered so that there is no risk of over-lubrication with its attendant heat generation at high rolling speeds.

Oil having a viscosity of up to approximately 700 mm²/s can be used and requires no heating. Metered drops are transported to the bearing along the walls of the ducts and leads by air. The drops are released from the ducts and collect at the bottom of the bearing. The air exits via the seals and is clean so that it does not contaminate the environment. The air stream exits via the radial shaft seal, the V-ring and the labyrinth and serves to enhance the sealing efficiency of the labyrinth seal.

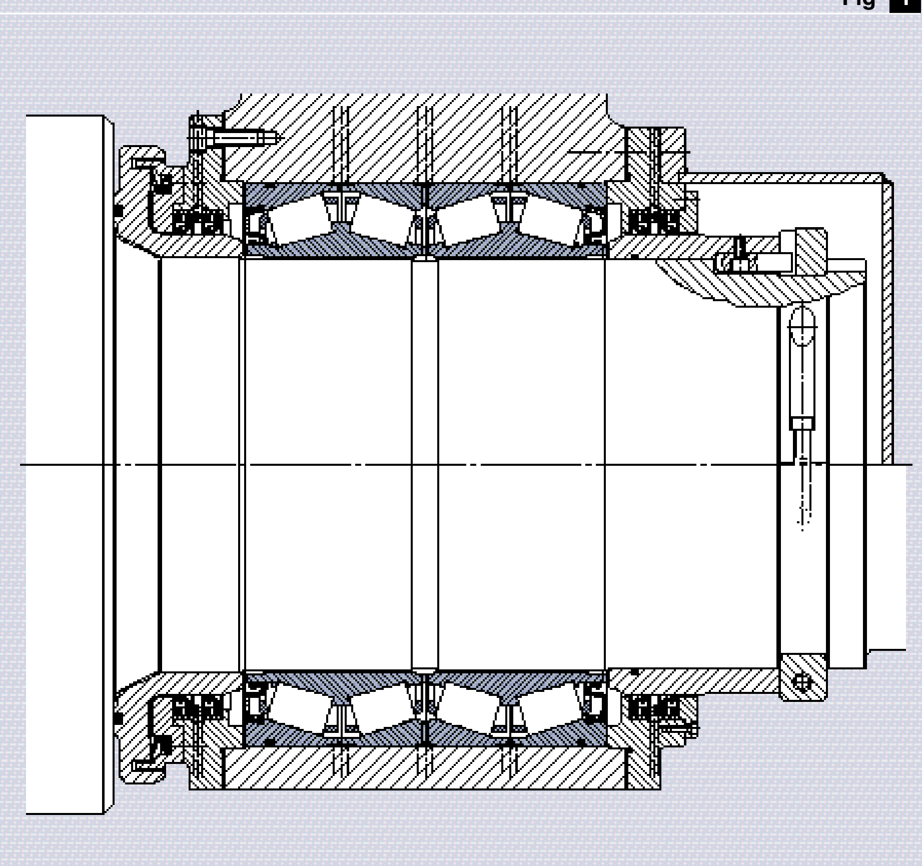
The air supplied to the oil spot lubrication equipment should first be dried to prevent moisture being introduced into the bearing and causing corrosion.

The oil/air mixture is introduced from above as shown in **fig 1** via the grooves in the side faces of the individual outer rings at three positions.

If oil spot lubrication is to be used with bearings of the VA901 design (➔ **fig 4, page 4**), the seal between the two inner rings should be removed. This enables the air to escape from the bearing via the outboard radial shaft seals and between the inner rings, as it can in the VA903 design (➔ **fig 5, page 4**).

Because the conditions in the chock are relatively clean, the use of the oil spot method can double the service life of the bearings.

Fig 1



Roll neck bearing arrangement for a cold rolling mill with a sealed four-row taper roller bearing lubricated by the oil spot method

Mounting

Four-row taper roller bearings are high-precision components and must be treated accordingly when mounting or dismounting. It is especially important to use suitable tools and other equipment and to follow the instructions carefully. When mounting four-row taper roller bearings, the individual components of the bearing must be mounted in the correct order. Parts which belong together are identified by letter markings. All the components of one bearing are also marked with the same serial number, so that the parts of one bearing are not mixed with those of another when several bearings are mounted at the same time.

In the majority of cases in rolling mills, the outer rings of the bearings are subjected to point load (constant direction). This means that only about one quarter of the outer ring raceway will be under load. For this reason, the outer rings are divided into four zones which are indicated by the markings I to IV on the side faces of the rings (➔ **fig 2**). The markings indicating load zone I are also joined by a line extending across the whole width of the outer rings. When mounting for the first time it is customary to install the bearing so that zone I lies in the direction of the load. After each inspection, the outer rings should be turned through 90° so that the next zone becomes the loaded zone.

To make sure that the bearing components are mounted in the correct order, a slip containing mounting instructions is packed with each bearing, where the various steps involved in mounting are described in detail (➔ **fig 3, page 16**).

General instructions will also be found in the SKF publication "Mounting and maintenance instructions for four-row taper roller bearings".

*The mounting of a bearing of the TQOSN design (➔ **fig 4, page 4**) is shown on pages 14 and 15*

Fig 2

Load zone markings

1. Outer ring A (with integral seal) is placed with the large side face upwards on a suitable support; inner ring A with side face A downwards is carefully lowered into the outer ring

2. The middle sealing ring is placed on inner ring A

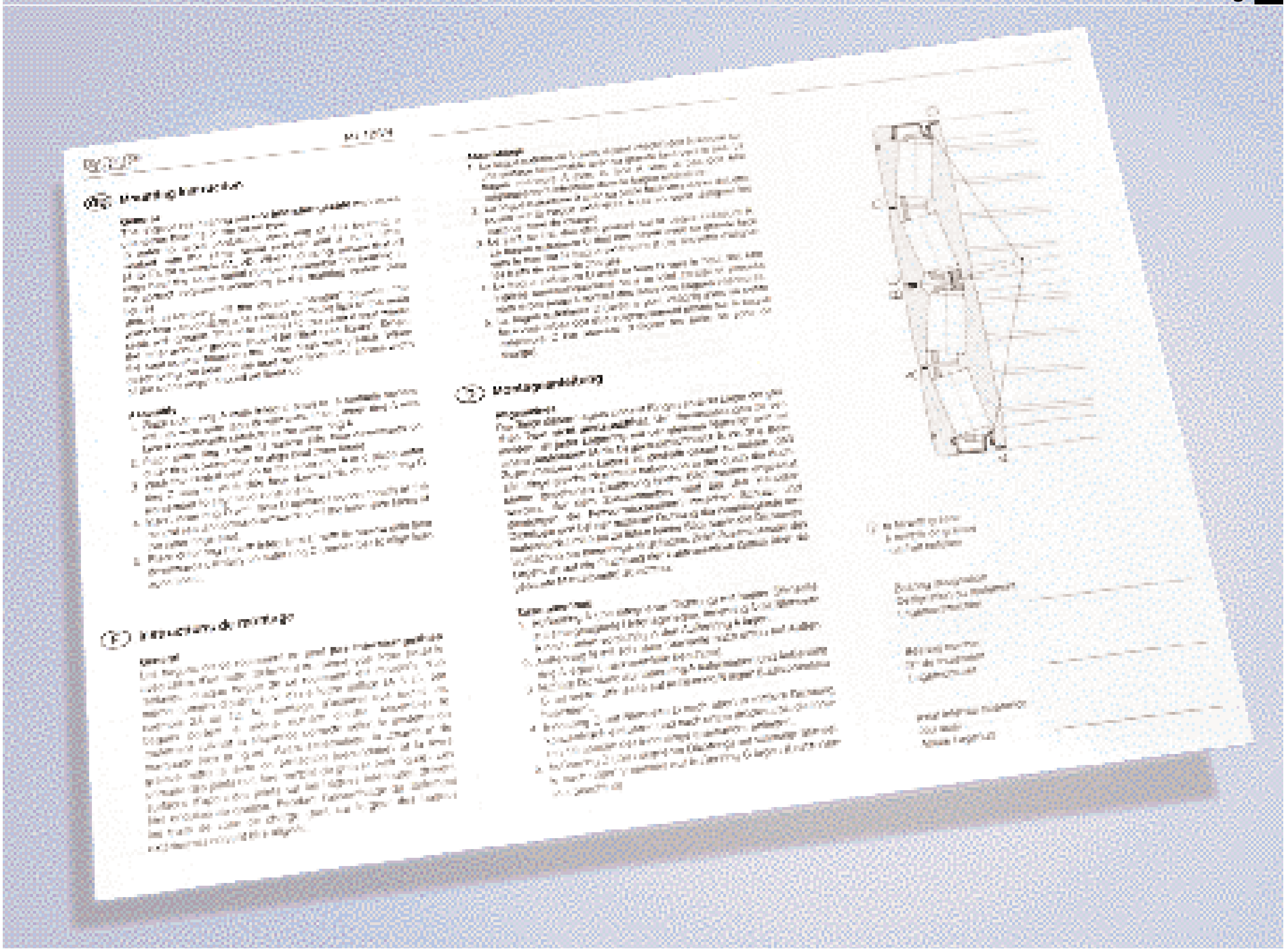
3. Outer ring B with the narrow side face downwards is placed on to outer ring A (remember to align load zone markings)

4. Outer ring C with large side face downwards is laid on to outer ring B (remember to align load zone markings)

5. Inner ring D with side face D upwards is carefully lowered into outer ring C, taking care that the middle sealing ring is not pushed out of position; the inner ring is then pressed downwards until the inboard side faces of the two inner rings abut each other

6. Outer ring D (with integral seal) with the narrow side face downwards is carefully lowered on to outer ring C (remember to align load zone markings)

Fig 3



Mounting instructions are supplied with every bearing

Dismounting

Four-row taper roller bearings are dismounted in the reverse order of mounting. Bearings which are to be re-used after dismounting should be treated with the same care as when mounting.

The bearing components should be carefully washed and oiled. If damage is detected in the outer ring raceway, the rollers and inner ring raceways must also be checked for damage. Minor damage can usually be repaired by the user. Bearings which are damaged can be returned to SKF for repair.

When remounting, the same procedure should be followed as for the first installation. It should be remembered that the outer rings should be turned through 90° so that another zone (II, III or IV) lies in the direction of the load.

Bearing storage

Before being packaged in wooden crates, SKF four-row taper roller bearings are treated with a rust inhibiting medium. They can be stored in their original unopened packaging for several years, provided the relative humidity in the storage room does not exceed 60 %.

The bearings should be stored lying flat on their sides and should not be removed from their packaging until immediately prior to mounting. This will ensure that they do not become soiled.

Bearing data – general

Dimensions (➔ fig 1)
The boundary dimensions of four-row taper roller bearings are not covered by an ISO standard. However, the dimensions of components of many of the inch-size bearings are in accordance with ABMA Standard 19.2-1994. Generally the bore and outside diameters correspond approximately to those specified in ISO 15-1981 for Diameter Series 9 and 0.

Tolerances (➔ fig 2)
SKF four-row taper roller bearings are made to Normal tolerances for metric and inch-size bearings except for some bearings which have higher dimensional accuracy corresponding to tolerance class P6 to DIN 620, sheet 3, 1964 (ISO R/577-1968, class 6). The running accuracy is to class P5 specifications.

The Normal and P5 tolerances of the metric bearings correspond to ISO 492:1994 (classes Normal and 5) and the Normal tolerances of the inch sizes are in accordance with ISO 578-1987 (now withdrawn) and ABMA Standard 19.2-1994, tolerance class 4.

The width tolerance of SKF four-row taper roller bearings without spacer rings is ±0,25 mm. Bearings with deviating width tolerances are indicated in the product tables by a footnote.

Axial clearance (➔ fig 3)
SKF four-row taper roller bearings are supplied as ready-to-mount assemblies with an axial internal clearance suited to the application.

Fig 1

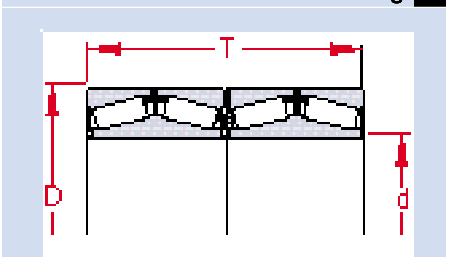


Fig 2

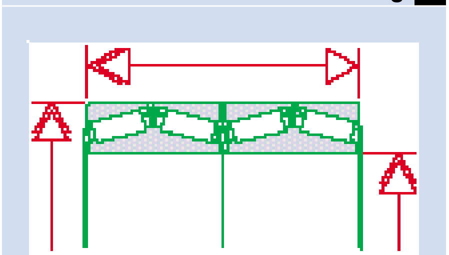


Fig 3

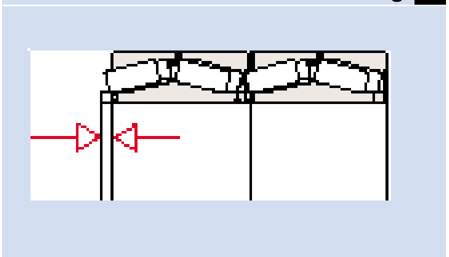


Fig 4

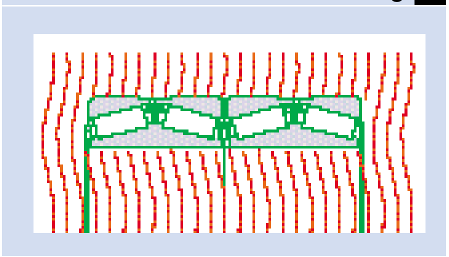
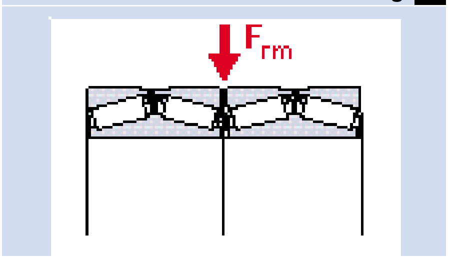


Fig 5



Influence of operating temperature on bearing material (➔ fig 4)
SKF taper roller bearings are subjected to a special heat treatment. They can be used at temperatures up to +150 °C without any inadmissible dimensional changes occurring.

Minimum load (➔ fig 5)
To ensure the correct performance of a bearing, it must always be subjected to a certain minimum load. The inertia forces of the rollers and cages as well as friction in the lubricant have a negative influence on the rolling conditions in the bearing and may lead to damaging sliding movements between the rollers and raceways.

The minimum load required to prevent this happening for a taper roller bearing is

$$F_{rm} = 0,02\ C$$

where
F_{rm} = minimum radial load, kN
C = basic dynamic load rating, kN

Generally, the weight of the components supported by the bearing and the external forces exceed the required minimum load. If this is not the case, the bearings must be subjected to an additional radial load.

Equivalent dynamic bearing load

$P = F_r + Y_1F_a$ bei $F_a/F_r \leq e$
$P = 0{,}67\ F_r + Y_2F_a$ bei $F_a/F_r > e$

the values of factors e, Y_1 and Y_2 for each individual bearing will be found in the bearing tables.

Equivalent static bearing load

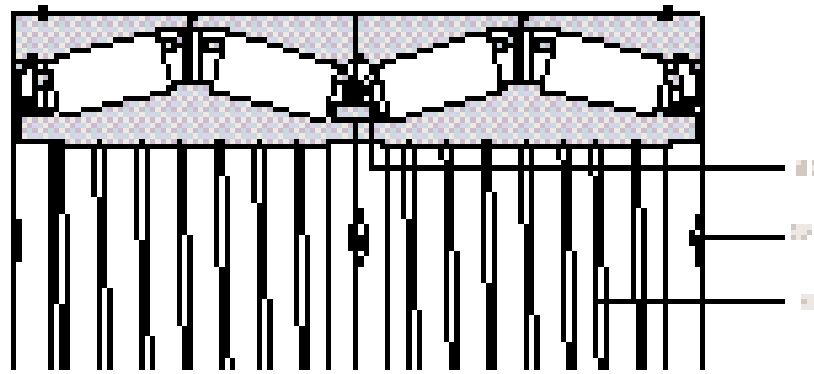
$P_0 = F_r + Y_0F_a$

The value of factor Y_0 for each individual bearing will be found in the bearing tables.

Comparative load ratings
Some rolling mill designers use load ratings for their calculations which are obtained using a different method than that specified by ISO 281:1990 and which are based on a rating life of 90 million revolutions (500 r/min for 3 000 hours). As it is not possible to compare such load ratings with the ISO ratings even when converting to 1 million revolutions (ISO life), so-called comparative load ratings are quoted in the bearing tables. These comparative ratings can only be used in the appropriate life formula and with the corresponding equivalent load calculation; they must not be used to calculate an ISO basic rating life.

Further details will be found in the SKF catalogue 4003 "Large bearings".

Fig 6



Design variant identification

Design identification

To facilitate identification of the various design features (➔ **fig 6**), the following letters are used in the bearing tables under the heading "Design" immediately after the design identification, e.g. TQON/GW.

G	helical groove in the bearing bore
GW	G + W
GWI	G + WI
GWISI	G + WI + SI
GWSI	G + W + SI
GWOY	G + WO + Y
LS	lubrication holes in the inner ring extensions on bearings to be installed vertically with rotating outer ring
W	lubrication grooves in the side faces of both outer and inner rings
WI	lubrication grooves in the inner ring side faces
WILS	WI + LS
WO	lubrication grooves in the outer ring side faces
SI	seal between the two inner rings
Y	annular groove and lubrication holes in the inner rings and gap between the inner rings

Designations and suffixes

SKF four-row taper roller bearings are "special" bearings and are usually identified by a Drawing Number. The numbering system has undergone some changes over the years, see the designation scheme opposite. Bearings which have a modified internal design compared with the original are identified by a suffix letter from A to E or a combination of these letters, e.g. AB. The meaning of these suffixes is specific to the Drawing Number.

BT4B - 334106 BG / HA1 C300 VA901

Bearing type

BT4-	four-row taper roller bearing (modern prefix)
BT4B	four-row taper roller bearing (earlier prefix)
–	the bearing type is not defined (old SKF system for special bearings)

Drawing No.

0(000)	special bearing with outside diameter < 420 mm
8(000)	special bearing with outside diameter 420 mm
328000 to **334999**	special taper roller bearing

Internal design

–	original (standard) design
A, B, C	modified internal design (also combinations of A, B and C, e.g. AB)
G	helical groove in bearing bore

Material

–	standard
HA1	outer and inner rings of case hardened steel
HA4	outer and inner rings and rollers of case hardened steel
HE1	outer and inner rings of vacuum remelted steel

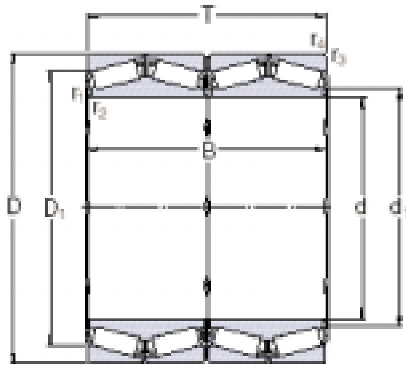
Bearing clearance

–	standard
C300	axial internal clearance different from standard; mean value 300 µm
C400	axial internal clearance different from standard; mean value 400 µm
etc.	

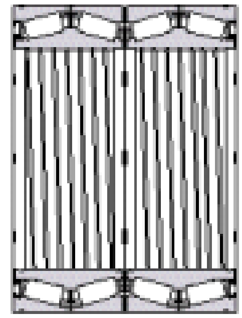
Other features

VA901	fluoro rubber seal at both sides, sealing ring between inner rings, can be relubricated via outer ring
VA902	fluoro rubber seal at both sides, sealing ring between inner rings, cannot be relubricated via outer ring
VA903	as VA901 but without sealing ring between inner rings
VA919	fluoro rubber seal at both sides, can be relubricated via outer ring, inner rings lubrication grooves in side faces, but with annular groove in bore and lubrication holes through guide flange
VA941	fluoro rubber seal at both sides, cannot be relubricated via outer ring, inner ring with lubrication grooves in inboard side faces and annular groove and lubrication holes at outboard side between inner rings, can be relubricated via outer ring

Four-row taper roller bearings without spacer rings
d **260,350 – 355,000** mm



TQON/GW



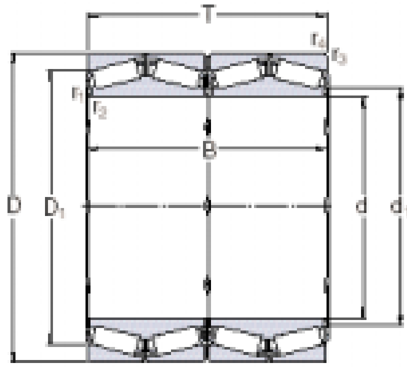
TQOSN/GW

Dimensions								Mass	Designation	Design
d	D	T	B	d_1 ≈	D_1 ≈	$r_{1,2}$ min	$r_{3,4}$ min			
mm/inch								kg	–	–
260,350 **10,2500**	422,275 16,6250	317,500 12,5000	314,325 12,3750	298	372	6,4	3,3	165	**BT4B 331487 BG/HA1**	TQON/GW
292,100 **11,500**	422,275 16,6250	269,875 10,6250	269,875 10,6250	324	379	6,4	3,3	125	**BT4B 331968 BG/HA1**	TQON/GW
304,800 **12,0000**	419,100 16,5000	269,875 10,6250	269,875 10,6250	328	378	1	6,4	105	**BT4-8057 G/HA1C300VA901**	TQOSN/GWSI
	495,300 19,5000	342,900 13,5000	342,900 13,5000	350	440	2	6,4	245	**BT4-8061 G/HA1C400VA901**	TQOSN/GWSI
304,902 **12,0040**	412,648 16,2460	266,700 10,5000	266,700 10,5000	325	374	3,3	3,3	100	**BT4-0004 G/HA1**	TQON/GW
317,500 **12,5000**	422,275 16,6250	269,875 10,6250	269,875 10,6250	342	384	1,5	3,3	105	**330870 BG**	TQON/GW
	422,275 16,6250	269,875 10,6250	269,875 10,6250	338	389	1,5	3,3	94,5	**BT4B 334023 BG/HA1VA901**	TQOSN/GWSI
	447,675 17,6250	327,025 12,8750	327,025 12,8750	340	398	3,3	3,3	165	**BT4B 331161 BG/HA1**	TQON/GW
330,302 **13,0040**	438,023 17,2450	254,000 10,000	247,650 9,7500	354	394	1,5	3,3	105	**BT4B 331664 AG/HA1**	TQON/GW
333,375 **13,1250**	469,900 18,5000	342,900 13,5000	342,900 13,5000	362	420	3,3	3,3	185	**BT4-8017/HA1C600VA941**	TQOSN/WILS
340,000 **13,3858**	520,000 20,4724	323,500 12,7362	323,500 12,7362	378	490	6	6	240	**BT4B 332963 B/HA1**	TQON/W
342,900 **13,5000**	533,400 21,0000	301,625 11,8750	307,975 12,1250	390	475	3,3	3,3	240	**BT4-8034 G/HA1**	TQON/GW
343,052 **13,5060**	457,098 17,9960	254,000 10,0000	254,000 10,0000	366	413	1,5	3,3	110	**330661 BG**	TQON/GW
	457,098 17,9960	254,000 10,0000	254,000 10,0000	362	420	1	3,3	110	**BT4B 328817 BG/HA1VA901**	TQOSN/GWSI
	457,098 17,9960	254,000 10,0000	254,000 10,0000	362	420	1	3,3	105	**BT4B 334106 BG/HA1C300VA901**	TQOSN/GWSI
347,662 **13,6874**	469,900 18,5000	260,350 10,2500	260,350 10,2500	372	430	1,5	3,3	125	**BT4B 331077 BG/HA1**	TQON/GW
355,000 **13,9764**	490,000 19,2913	316,000 12,4409	316,000 12,4409	382	446	1,5	3,3	170	**BT4-8020 G/HA1VA901**	TQOSN/GWSI

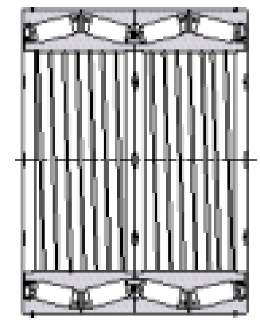
3

Designation	Basic load ratings dynamic C	static C_0	Fatigue load limit P_u	Calculation factors e	Y_1	Y_2	Y_0	Comperative data Load ratings radial C_F	axial C_{Fa}	Axial factor K
–	kN		kN	–				kN		–
BT4B 331487 BG/HA1	4 460	8 000	710	0,33	2	3	2	1 100	179	1,76
BT4B 331968 BG/HA1	3 800	8 000	680	0,31	2,2	3,3	2,2	930	142	1,87
BT4-8057 G/HA1C300VA901	2 920	6 700	585	0,31	2,2	3,3	2,2	710	110	1,85
BT4-8061 G/HA1C400VA901	5 120	9 300	780	0,40	1,7	2,5	1,6	1 250	245	1,47
BT4-0004 G/HA1	3 190	7 500	640	0,31	2,2	3,3	2,2	780	122	1,83
330870 BG	3 360	8 150	680	0,31	2,2	3,3	2,2	815	129	1,83
BT4B 334023 BG/HAVA901	2 640	6 550	570	0,33	2	3	2	695	114	1,76
BT4B 331161 BG/HA1	4 730	10 800	880	0,33	2	3	2	1 160	193	1,74
BT4B 331664 AG/HA1	2 810	7 350	600	0,46	1,5	2,2	1,4	680	154	1,27
BT4-8017/HA1C600VA941	4 130	10 200	830	0,33	2	3	2	1 000	165	1,76
BT4B 332963 B/HA1	5 610	10 400	880	0,30	2,3	3,4	2,2	1 370	194	2,01
BT4-8034 G/HA1	4 730	8 800	720	0,33	2	3	2	1 160	190	1,76
330661 BG	3 030	6 800	570	0,48	1,4	2,1	1,4	735	171	1,24
BT4B 328817 BG/HA1VA901	2 750	6 400	540	0,48	1,4	2,1	1,4	710	166	1,23
BT4B 334106 BG/HA1C300VA901	2 550	6 000	510	0,68	1	1,5	1	610	210	0,84
BT4B 331077 BG/HA1	3 910	8 500	695	0,33	2	3	2	950	153	1,76
BT4-8020 G/HA1VA901	4 460	10 000	830	0,33	2	3	2	1 080	177	1,75

Four-row taper roller bearings without spacer rings
d **355,600 – 420,000** mm



TQON/W



TQOSN/GW

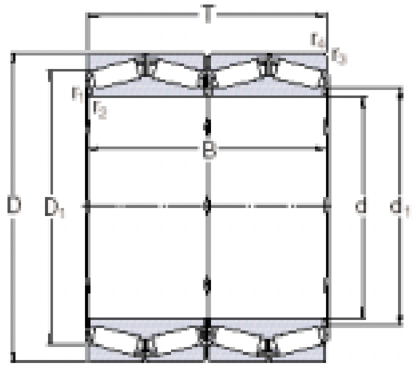
Dimensions								**Mass**	**Designation**	**Design**
d	D	T	B	d_1 ≈	D_1 ≈	$r_{1,2}$ min	$r_{3,4}$ min			
mm/inch								kg	–	–
355,600 **14,0000**	482,600 19,0000	269,875 10,6250	265,113 10,4375	382	432	1,5	3,3	140	**330662 BG**	TQON/GW
	482,600 19,0000	269,875 10,6250	265,113 10,4375	380	436	1,5	3,3	134	**BT4B 328870 BG/HA1VA901**	TQOSN/GWSI
	488,950 19,2500	317,500 12,5000	317,500 12,5000	392	448	1,5	3,3	180	**331271 BG**	TQON/GW
	488,950 19,2500	317,500 12,5000	317,500 12,5000	382	446	1	3,3	170	**BT4B 328912 BG/HA1C300VA903**	TQOSN/GW
360,000 **14,1732**	540,000 21,2598	325,000 12,7953	325,000 12,7953	398	485	1,5	3	250	**BT4-8015 G/HA1**	TQON/GW
380,000 **14,9606**	560,000 22,0472	360,000 14,1732	390,000 15,3543	417	500	3,3	5	300	**BT4-8033 G/HA1**	TQOEN/GW
384,175 **15,1250**	546,100 21,5000	400,050 15,7500	400,050 15,7500	416	496	3,3	6,4	300	**BT4-8025 G/HA1C300VA903**	TQOSN/GW
385,762 **15,1875**	514,350 20,2500	317,500 12,5000	317,500 12,5000	411	471	1	3,3	175	**BT4B 334042 BG/HA1VA901**	TQOSN/GWSI
406,400 **16,0000**	546,100 21,5000	288,925 11,3750	288,925 11,3750	434	494	1,5	6,4	185	**BT4B 330650 ABG/HA1**	TQON/GW
	546,100 21,5000	288,925 11,3750	288,925 11,3750	434	498	1,5	6,4	180	**BT4B 328838 BG/HA1VA901**	TQOSN/GWSI
	546,100 21,5000	288,925 11,3750	288,925 11,3750	434	498	1,5	6,4	180	**BT4B 328838 BG/HA1VA902**	TQOSN/GWISI
	546,100 21,5000	288,925 11,3750	288,925 11,3750	434	498	1,5	6,4	185	**BT4-8014 G/HA1VA901**	TQOSN/GWSI
	546,100 21,5000	288,925 11,3750	268,288 10,5625	434	494	1,5	6,4	180	**331465 BG**	TQON/GW
	546,100 21,5000	330,000 12,9921	330,000 12,9992	434	498	1,5	6,4	200	**BT4B 334093 BG/HA1VA902**	TQOSN/GWISI
406,400 **16,0000**	546,100 21,5000	330,000 12,9921	330,000 12,9992	438	498	1,5	6,4	225	**BT4B 334092 AG/HA1**	TQON/GW
	565,150 22,2500	440,000 17,3228	440,000 17,3228	436	508	1,5	6,4	340	**BT4-8002 G/HA1**	TQON/GW
409,575 **16,1250**	546,100 21,5000	334,962 13,1875	334,962 13,1875	434	498	1	6,4	205	**BT4-8021 G/HA1VA919**	TQOSN/GWOY
	546,100 21,5000	334,962 13,1875	334,962 13,1875	434	498	1	6,4	205	**BT4B 329004 BG/HA1VA901**	TQOSN/GWSI
	546,100 21,5000	334,962 13,1875	334,962 13,1875	438	490	1,5	6,4	220	**BT4B 331333 BG/HA1**	TQON/GW
420,000 **16,5354**	574,000 22,5984	480,000 18,8976	480,000 18,8976	450	530	2,5	5	345	**BT4-8018 G/HA1VA901**[1)]	TQOSN/GWSI

1) Non-standard inner ring width

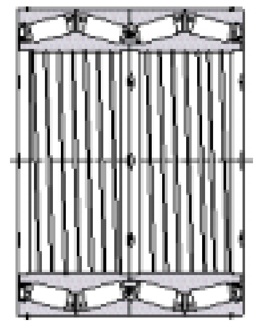
TQOEN/GW

Designation	Basic load ratings dynamic C	static C_0	Fatigue load limit P_u	Calculation factors e	Y_1	Y_2	Y_0	Comperative data Load ratings radial C_F	axial C_{Fa}	Axial factor K
–	kN		kN	–				kN		–
330662 BG	3 520	8 000	655	0,48	1,4	2,1	1,4	850	198	1,24
BT4B 328870 BG/HA1VA901	3 360	7 500	630	0,46	1,5	2,2	1,4	815	187	1,24
331271 BG	4 460	11 000	880	0,33	2	3	2	1 080	179	1,76
BT4B 328912 BG/HA1C300VA903	4 460	10 000	830	0,33	2	3	2	1 080	177	1,75
BT4-8015 G/HA1	5 720	10 800	900	0,30	2,3	3,4	2,2	1 400	207	1,93
BT4-8033 G/HA1	6 710	13 700	1 080	0,40	1,7	2,5	1,6	1 630	330	1,40
BT4-8025 G/HA1C300VA903	6 160	15 000	1 180	0,35	1,9	2,9	1,8	1 500	256	1,68
BT4B 334042 BG/HA1VA901	4 180	10 000	780	0,40	1,7	2,5	1,6	1 020	195	1,49
BT4B 330650 ABG/HA1	4 400	10 200	815	0,48	1,4	2,1	1,4	1 080	252	1,23
BT4B 328838 BG/HA1VA901	4 180	9 500	750	0,48	1,4	2,1	1,4	1 020	238	1,22
BT4B 328838 BG/HA1VA902	4 180	9 500	750	0,48	1,4	2,1	1,4	1 020	238	1,22
BT4-8014 G/HA1VA901	3 300	7 800	655	0,68	1	1,5	1	800	276	0,84
331465 BG	4 180	9 500	750	0,48	1,4	2,1	1,4	1 020	238	1,22
BT4B 334093 BG/HA1VA902	4 400	10 200	815	0,48	1,4	2,1	1,4	1 080	252	1,23
BT4B 334092 AG/HA1	5 010	13 200	1 000	0,43	1,6	2,3	1,6	1 220	254	1,40
BT4-8002 G/HA1	7 650	18 600	1 430	0,33	2	3	2	1 900	302	1,82
BT4-8021 G/HA1VA919	4 840	12 000	950	0,40	1,7	2,5	1,6	1 200	231	1,47
BT4B 329004 BG/HA1VA901	4 840	12 000	950	0,40	1,7	2,5	1,6	1 200	231	1,47
BT4B 331333 BG/HA1	5 010	13 200	1 000	0,43	1,6	2,3	1,6	1 220	254	1,40
BT4-8018 G/HA1VA901	7 210	18 600	1 430	0,31	2,2	3,3	2,2	1 760	279	1,83

Four-row taper roller bearings without spacer rings
d **430,000 – 482,600** mm



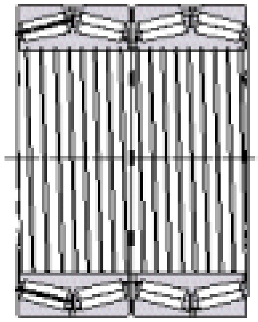
TQON/W



TQOSN/GWI

Dimensions								Mass	Designation	Design
d	D	T	B	d_1 ≈	D_1 ≈	$r_{1,2}$ min	$r_{3,4}$ min			
mm/inch								kg	–	–
430,000 **16,9291**	570,000 22,4409	380,000 14,9606	380,000 14,9606	458	510	2	5	260	**BT4-8049 G/HA1**	TQON/GW
	575,000 22,6378	380,000 14,9606	380,000 14,9606	458	518	1,5	5	280	**BT4-8006 BG/HA1**	TQON/GW
	640,000 25,1969	465,000 18,3071	465,000 18,3071	486	578	2,5	4	530	**BT4-8040 G/HA4**	TQON.1/GW
431,800 **17,000**	571,500 22,5000	279,400 11,0000	279,400 11,0000	458	530	1,5	3,3	185	**BT4-8019 G/HA1VA901**	TQOSN/GWSI
	571,500 22,5000	336,550 13,2500	336,550 13,2500	458	516	1,5	3,3	240	**BT4B 331226 BG/HA1**	TQON/GW
	571,500 22,5000	336,550 13,2500	336,550 13,2500	458	530	1,5	3,3	215	**BT4-8003 G/HA1VA902**	TQOSN/GWISI
440,000 **17,3228**	590,000 23,2283	480,000 18,8976	480,000 18,8976	468	539	1	5	365	**BT4B 334055 ABG/HA1VA902**[1]	TQOSN/GWISI
447,600 **17,6220**	635,000 25,0000	463,500 18,2480	463,500 18,2480	488	588	3,3	6,4	470	**BT4-8039 G/HA1VA901**	TQOSN/GWSI
450,000 **17,7165**	595,000 23,4252	368,000 14,4882	368,000 14,4882	484	550	3	6	265	**BT4-8023 G/HA1VA919**	TQOSN/GWOY
	595,000 23,4252	368,000 14,4882	368,000 14,4882	486	542	3	6	285	**BT4B 332773 AG/HA1**	TQON/GW
	595,000 23,4252	404,000 15,9055	404,000 15,9055	480	545	2	6	305	**BT4-8044 G/HA1VA902**[1]	TQOSN/GWISI
	595,000 23,4252	415,000 16,3386	415,000 16,3386	478	544	1,5	6	320	**BT4-8024 G/HA1**	TQON/GW
457,200 **18,0000**	596,900 23,5000	279,400 11,0000	276,225 10,8750	484	550	1,5	3,3	190	**BT4B 328827 ABG/HA1VA902**	TQOSN/GWISI
	596,900 23,5000	279,400 1,0000	276,225 10,8750	484	550	1,5	3,3	190	**BT4B 328827 BG/HA1VA902**	TQOSN/GWISI
475,000 **18,7008**	600,000 23,6220	368,000 14,4882	368,000 14,4882	500	554	2	6	250	**BT4B 328913 BG/HA1C555**	TQON/GW
	640,000 25,1968	360,000 14,1732	360,000 14,1732	512	568	2	6	335	**BT4-8035 G/HA1**	TQON/GW
479,425 **18,8750**	679,450 26,7500	495,300 19,5000	495,300 19,5000	520	610	3,3	6,4	585	**BT4B 330886 CG/HA1**	TQON/GW
	679,450 26,7500	495,300 19,5000	495,300 19,5000	520	610	3,3	6,4	565	**BT4B 334116 BG/HA1VA901**	TQOSN/GWSI
482,600 **19,0000**	615,950 24,2500	330,200 13,0000	330,200 13,0000	512	570	3,3	6,4	240	**330641 BG**	TQON/GW
	615,950 24,2500	330,200 13,0000	330,200 13,0000	512	570	3,3	6,4	240	**330641 BG/HE1**	TQON/GW
	615,950 24,2500	330,200 13,0000	330,200 13,0000	512	570	3,3	6,4	240	**330641 ABG/HE1**	TQON/GW

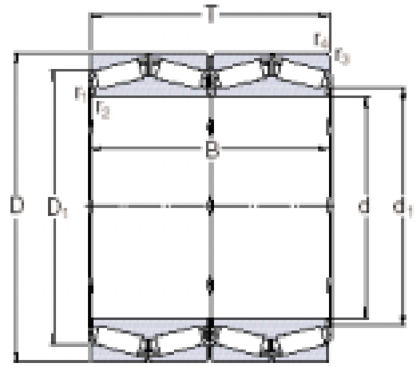
[1] Non-standard inner ring width



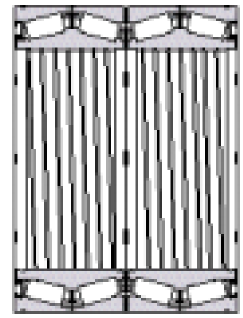
TQO.1/GW

Designation	Basic load ratings dynamic	static	Fatigue load limit	Calculation factors				Comperative data Load ratings radial	axial	Axial factor
	C	C_0	P_u	e	Y_1	Y_2	Y_0	C_F	C_{Fa}	K
–	kN		kN	–				kN		–
BT4-8049 G/HA1	5 280	14 000	1 060	0,44	1,5	2,3	1,4	1 290	282	1,33
BT4-8006 BG/HA1	6 440	16 600	1 250	0,40	1,7	2,5	1,6	1 560	315	1,43
BT-8040 G/HA4	9 520	21 200	1 560	0,26	2,6	3,9	2,5	2 360	308	2,21
BT4-8019 G/HA1VA901	3 740	9 000	735	0,54	1,25	1,8	1,3	915	243	1,07
BT4B 331226 BG/HA1	5 280	14 000	1 060	0,44	1,5	2,3	1,4	1 290	282	1,33
BT4-8003 G/HA1VA902	4 840	12 700	980	0,44	1,5	2,3	1,4	1 180	254	1,34
BT4B 334055 ABG/HA1VA902	7 650	20 000	1 460	0,28	2,4	3,6	2,5	1 860	255	2,12
BT4-8039 G/HA1VA901	7 650	20 000	1 460	0,33	2	3	2	1 900	313	1,76
BT4-8023 G/HA1VA919	5 280	13 700	1 040	0,31	2,2	3,3	2,2	1 290	206	1,82
BT4B 332773 AG/HA1	5 940	16 300	1 220	0,33	2	3	2	1 460	236	1,76
BT4-8044 G/HA1VA902	5 940	16 300	1 220	0,33	2	3	2	1 460	236	1,76
BT4-8024 G/HA1	7 040	19 000	1 400	0,31	2,2	3,3	2,2	1 730	267	1,87
BT4B 328827 ABG/HA1VA902	4 290	10 000	780	0,48	1,4	2,1	1,4	1 040	242	1,24
BT4B 328827 BG/HA1VA902	4 290	10 000	780	0,48	1,4	2,1	1,4	1 040	242	1,24
BT4B 328913 BG/HA1C555	5 720	16 600	1 250	0,30	2,3	3,4	2,2	1 400	200	2,03
BT4-8035 G/HA1	5 500	15 300	1 120	0,33	2	3	2	1 340	222	1,76
BT4B 330866 CG/HA1	10 100	25 500	1 830	0,33	2	3	2	2 500	409	1,76
BT4B 334116 BG/HA1VA901	9 350	22 400	1 660	0,33	2	3	2	2 280	372	1,76
330641 BG	5 500	15 300	1 120	0,33	2	3	2	1 340	222	1,76
330641 BG/HE1	5 500	15 300	1 120	0,33	2	3	2	1 340	222	1,76
330641 ABG/HE1	5 500	15 300	1 120	0,33	2	3	2	1 340	222	1,76

Four-row taper roller bearings without spacer rings
d **482,600 – 595,312** mm



TQON/W



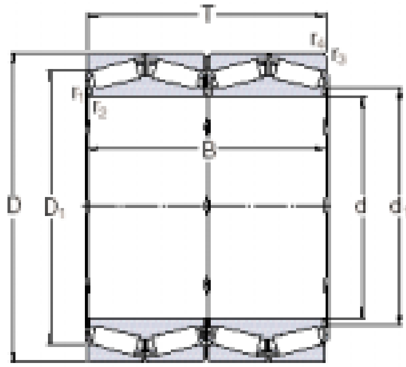
TQOSN/GW

Dimensions								Mass	Designation	Design
d	D	T	B	d_1 ≈	D_1 ≈	$r_{1,2}$ min	$r_{3,4}$ min			
mm/inch								kg	–	–
482,600	615,950	330,200	330,200	505	777	1	6,4	230	**BT4B 328842 BG/HA1VA901**	TQOSN/GWSI
19,0000	24,2500	13,0000	13,0000							
	615,950	330,200	330,200	505	777	1	6,4	230	**BT4B 328842 BG/HA1VA902**	TQOSN/GWISI
	24,2500	13,0000	13,0000							
	615,950	330,200	330,200	505	777	1	6,4	230	**BT4B 328842 ABG/HA1VA902**	TQOSN/GWISI
	24,2500	13,0000	13,0000							
482,600	615,950	330,200	330,200	512	570	6,4	6,4	240	**332096 BG**	TQON/GW
19,0000	24,2500	13,0000	13,0000							
	615,950	330,200	419,100	512	570	3,5	6,4	250	**BT4B 331626 BG/HA1**	TQOEN/GW
	24,2500	13,0000	16,5000							
	615,950	420,000	420,000	505	577	2,8	4,4	280	**BT4-8062 G/HA1VA901**	TQOSN/GWSI
	24,2500	16,5354	16,5354							
	635,000	421,000	421,000	512	578	3	6,4	365	**BT4B 334105 BG/HA1**	TQON/GW
	25,0000	16,5748	16,5748							
489,026	634,873	320,675	320,675	522	584	3,3	3,3	265	**331090 BG**	TQON/GW
19,2530	24,9950	12,6250	12,6250							
	634,873	320,675	320,675	516	588	2,5	3,3	240	**BT4B 334014 AAG/HA1VA901**	TQOSN/GWSI
	24,9950	12,6250	12,6250							
501,650	711,200	520,700	520,700	550	655	3,3	6,4	610	**BT4-8059 G/HA1VA901**	TQOSN/GWSI
19,7500	28,0000	20,5000	20,5000							
510,000	655,000	379,000	377,000	539	602	1,5	6,4	325	**BT4B 331747 AG/HA1**	TQON/GW
20,9787	25,7874	14,9213	14,8425							
514,350	673,100	422,275	422,275	537	606	3,3	6,4	395	**BT4-8045 G/HA1VA901**	TQOSN/GWSI
20,2500	26,5000	16,6250	16,6250							
	673,100	422,275	422,275	545	614	3,3	6,4	405	**331157 BG**	TQON/GW
	26,5000	16,6250	16,6250							
530,000	680,000	440,000	440,000	558	624	1,5	3	405	**BT4-8043 G/HA1**	TQON/GW
20,8661	26,7717	17,3228	17,3228							
540,000	690,000	400,000	400,000	568	635	2	5	370	**331978 BG**	TQON/GW
21,2598	27,1654	15,7480	15,7480							
	690,000	440,000	440,000	565	636	2	5	395	**BT4-8038 G/HA1VA901**	TQOSN/GWSI
	27,1654	17,3228	17,3228							
558,800	736,600	409,575	409,575	594	672	3,3	6,4	480	**BT4B 330993 AG/HA1**	TQON/GW
22,0000	29,0000	16,1250	16,1250							
	736,600	457,200	455,612	591	666	3,3	6,4	515	**BT4-8022 G/HA1VA919**	TQOSN/GWOY
	29,0000	18,0000	17,9375							
585,788	771,525	479,425	479,425	622	704	3,3	6,4	620	**BT4B 331093 BG/HA1**	TQON/GW
23,0625	30,3750	18,8750	18,8750							
595,312	844,550	615,950	615,950	642	754	3,3	6,4	1 180	**BT4B 331300 CG/HA1**	TQON/GW
23,4375	33,2500	24,2500	24,2500							

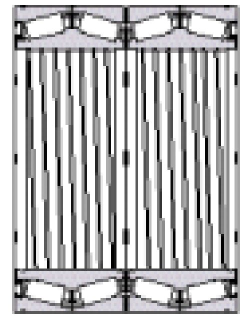
TQOEN/GW

Designation	Basic load ratings dynamic	static	Fatigue load limit	Calculation factors				Comperative data Load ratings radial	axial	Axial factor
	C	C_0	P_u	e	Y_1	Y_2	Y_0	C_F	C_{Fa}	K
–	kN		kN	–				kN		–
BT4B 328842 BG/HAVA901	5 280	13 700	1 060	0,33	2	3	2	1 290	213	1,76
BT4B 328842 BG/HAVA902	5 280	13 700	1 060	0,33	2	3	2	1 290	213	1,76
BT4B 328842 ABG/HA1VA902	5 280	13 700	1 060	0,33	2	3	2	1 290	213	1,76
332096 BG	5 500	15 300	1 120	0,33	2	3	2	1 340	222	1,76
BT4B 331626 BG/HA1	5 500	15 300	1 120	0,33	2	3	2	1 340	222	1,76
BT4-8062 G/HA1VA901	5 500	15 300	1 120	0,33	2	3	2	1 340	222	1,76
BT4B 334105 BG/HA1	7 370	20 400	1 460	0,33	2	3	2	1 800	295	1,76
331090 BG	5 500	14 600	1 080	0,35	1,9	2,9	1,8	1 340	224	1,70
BT4B 334014 AAG/HA1C300VA901	5 230	12 500	950	0,37	1,8	2,7	1,8	1 270	234	1,54
BT4-8059 G/HA1VA901	8 090	19 600	1 460	0,33	2	3	2	2 000	324	1,76
BT4B 331747 AG/HA1	6 820	19 000	1 370	0,33	2	3	2	1 660	273	1,76
BT4-8045 G/HA1VA901	6 820	19 000	1 370	0,33	2	3	2	1 660	273	1,76
331157 BG	7 810	21 600	1 560	0,31	2,2	3,3	2,2	1 930	301	1,83
BT4-8043 G/HA1	8 250	23 600	1 630	0,33	2	3	2	2 040	321	1,82
331978 BG	7 480	21 200	1 500	0,33	2	3	2	1 860	301	1,76
BT4-8038 G/HA1VA901	7 480	21 200	1 500	0,33	2	3	2	1 860	301	1,76
BT4B 330993 AG/HA1	8 250	22 000	1 560	0,35	1,9	2,9	1,8	2 040	346	1,69
BT4-8022 G/HA1VA919	8 580	23 200	1 630	0,35	1,9	2,9	1,8	2 120	355	1,69
BT4B 331093 BG/HA1	10 600	30 000	2 040	0,33	2	3	2	2 650	426	1,76
BT4B 331300 CG/HA1	15 100	39 000	2 550	0,33	2	3	2	3 750	602	1,76

Four-row taper roller bearings without spacer rings
d **609,600 – 1 346,200** mm

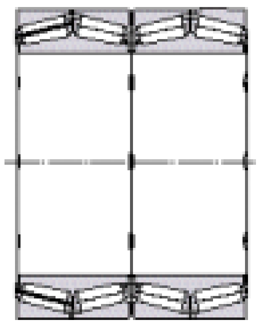


TQON/GW

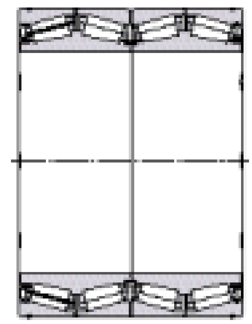


TQOSN/GW

Dimensions								Mass	Designation	Design
d	D	T	B	d_1 ≈	D_1 ≈	$r_{1,2}$ min	$r_{3,4}$ min			
mm/inch								kg	–	–
609,600 **24,0000**	787,400 31,0000	361,950 14,2500	361,950 14,2500	645	735	3,3	6,4	425	**BT4-8054 G/HA1VA902**	TQOSN/GWISI
620,000 **24,4094**	800,000 31,4961	363,500 14,3110	363,500 14,3110	655	740	2	6	440	**BT4-8055 G/HA1VA902**	TQOSN/GWISI
625,000 **24,6063**	815,000 32,0866	480,000 18,8976	480,000 18,8976	656	746	3,2	6,5	660	**BT4-8031/HA1**	TQON/W
650,000 **25,5906**	1 040,000 40,9449	610,000 24,0157	610,000 24,0157	740	905	15	10	1 970	**BT4-8036 G/HA1**	TQON/GW
	1 040,000 40,9449	610,000 24,0157	610,000 24,0157	730	905	15	10	1 970	**BT4-8037 G/HA1VA901**	TQOSN/GWSI
660,000 **25,9843**	1 070,000 42,1260	648,000 25,5118	648,000 25,5118	760	960	6	10	2 260	**BT4-8060 G/HA4C300VA901**	TQOSN.1/GWSI
660,400 **26,0000**	812,800 32,0000	365,125 14,3750	365,125 14,3750	698	756	3,3	6,4	415	**BT4B 331190 BG/HA1**	TQON/GW
	812,800 32,0000	365,125 14,3750	365,125 14,3750	692	784	2	6,4	395	**BT4B 328977 BG/HA1VA901**	TQOSN/GWSI
679,450 **26,7500**	901,700 35,5000	552,450 21,7500	552,450 21,7500	722	824	3,3	6,4	970	**BT4B 334015 BG/HA1VA901**	TQOSN/GWSI
685,800 **27,0000**	876,000 34,5000	355,600 14,0000	352,425 13,8750	730	805	3,3	6,4	525	**BT4B 331089 CG/HA1**	TQON/GW
	876,300 34,5000	355,600 14,0000	352,425 13,8750	730	818	3,3	6,4	505	**BT4B 328955 ABG/HA1VA902**	TQOSN/GWISI
	876,300 34,5000	355,600 14,0000	352,425 13,8750	730	818	3,3	6,4	505	**BT4B 328955 BG/HA1VA902**	TQOSN/GWISI
710,000 **27,9528**	900,000 35,4331	410,000 16,1417	410,000 16,1417	750	835	3	6	620	**BT4B 331351 BG/HA1**	TQON/GW
750,000 **29,5276**	950,000 37,4016	410,000 16,1417	410,000 16,1417	800	878	3	6	705	**BT4-8048 G/HA4**	TQON.1/GW
762,000 **30,0000**	1 066,800 42,0000	736,600 29,0000	723,900 28,5000	825	952	8,9	12,7	2 090	**BT4B 331907 BG/HA4**	TQON.1/GW
1 346,200 **53,0000**	1 729,740 68,1000	1 143,000 45,0000	1 143,000 45,0000	1 415	1 580	5	12	6 980	**BT4-8042 G/HA4**	TQON.1/GW



TQON.1/GW



TQOSN.1/GW

Designation	Basic load ratings dynamic	static	Fatigue load limit	Calculation factors				Comperative data Load ratings radial	axial	Axial factor
	C	C_0	P_u	e	Y_1	Y_2	Y_0	C_F	C_{Fa}	K
–	kN		kN	–				kN		–
BT4-8054 G/HA1VA902	7 370	18 600	1 370	0,37	1,8	2,7	1,8	1 800	323	1,58
BT4-8055 G/HA1VA902	7 040	18 000	1 320	0,37	1,8	2,7	1,8	1 730	314	1,56
BT4-8031/HA1	11 700	31 000	2 120	0,33	2	3	2	2 850	468	1,74
BT4-8036 G/HA1	17 600	36 500	2 500	0,31	2,2	3,3	2,2	4 400	679	1,84
BT4-8037 G/HA1VA901	17 600	36 500	2 500	0,31	2,2	3,3	2,2	4 400	679	1,84
BT4-8060 G/HA4C300VA901	19 000	38 000	2 500	0,31	2,2	3,3	2,2	4 750	749	1,83
BT4B 331190 BG/HA1	7 210	22 400	1 530	0,33	2	3	2	1 760	284	1,76
BT4B 328977 BG/HA1VA901	7 210	20 400	1 430	0,33	2	3	2	1 730	284	1,76
BT4B 334015 BG/HA1VA901	13 200	36 000	2 400	0,33	2	3	2	3 250	528	1,76
BT4B 331089 CG/HA1	7 810	22 000	1 500	0,43	1,6	2,3	1,6	1 900	393	1,40
BT4B 328955 ABG/HA1VA902	7 650	20 000	1 400	0,37	1,8	2,7	1,8	1 860	333	1,62
BT4B 328955 BG/HA1VA902	7 650	20 000	1 400	0,37	1,8	2,7	1,8	1 860	333	1,62
BT4B 331351 BG/HA1	9 680	27 000	1 800	0,35	1,9	2,9	1,8	2 360	404	1,66
BT4-8048 G/HA4	9 350	26 500	1 730	0,37	1,8	2,7	1,8	2 280	415	1,58
BT4B 331907 BG/HA4	22 000	58 500	3 600	0,33	2	3	2	5 500	909	1,76
BT4-8042 G/HA4	49 500	163 000	8 300	0,31	2,2	3,3	2,2	12 200	1 940	1,83

Other SKF products

CR radial shaft seals and V-rings

The environmental conditions in rolling mills are very unfavourable where bearings are concerned as there are considerable quantities of water, emulsions and solid contaminants, e.g. scale. This means that both the open and sealed bearings must be protected in the chocks by reliable external seals. SKF has a comprehensive range of large radial shaft seals and V-rings covering all the designs required for this external sealing.

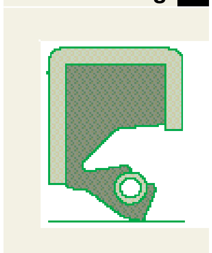
Radial shaft seals of the HDS1 and HDS2 designs (➔ **figs** 1 and 2) are particularly recommended for use in rolling mills. They are suitable for difficult sealing positions under arduous conditions and are resistant to wear and corrosion. These seals are characterised by their robust shell which covers three sides of the seal body, effectively protecting the spring-loaded sealing lip from mechanical damage.

The HDS3 design (➔ **figs** 3 and 4) incorporates spacer lugs on the seal face. These enable two or more such seals to be mounted in tandem at a given distance from each other, or can be useful when positioning the seal at the correct distance in the housing bore.

Detailed information on radial shaft seals and V-rings will be found in the SKF catalogue 4006 “CR seals”.

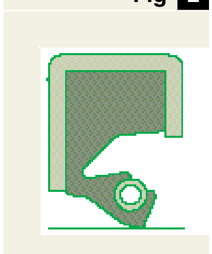
CR shaft repair sleeves

Fig 1



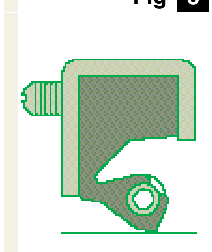
Radial shaft seal of the HDS1 design

Fig 2



Radial shaft seal of the HDS2 design

Fig 3



Radial shaft seal with spacer lug, HDS3 design

The design and finish of the counterface (the surface on which the sealing lip runs) are very important for the correct performance of shaft seals. Where possible the counterface should be hardened and ground. Excessive lip pressure and the presence of solid contaminants have a negative influence on sealing efficiency and may lead to tracks being worn in the counterface. In such cases it is not sufficient just to replace the seal to restore sealing efficiency. The counterface must be reworked and this is generally expensive and time-consuming.

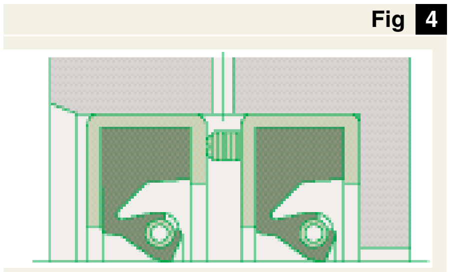
Where repairs to the counterface are necessary CR shaft repair sleeves (➔ **fig 5**) are the ideal solution. They are simply pressed on to the shaft and provide a new counterface. The sleeves for shaft diameters of 200 to 1 250 mm have a wall thickness of 2,4 mm and are made of high quality hot rolled steel with a hardness of 96 HRB. The counterface for the seal is finely finished and chromium plated to enhance its resistance to wear and corrosion. The sleeves are available either with a flange, the LDSLV3 design, or without a flange, the LDSLV4 design.

There are two alternative ways of using these LDSLV sleeves. The first is simply to push the sleeve into position over the damaged counterface and to use a seal which has a 4,8 mm larger bore diameter than the original (➔ **fig 6**). The second is to machine down the diameter of the worn counterface by 4,8 mm and use the same size of seal as the original (➔ **fig 6**).

In cases where seal wear and damage to the counterface can be expected it is recommended that an LDSLV sleeve is incorporated into the original design. It is not then necessary to rework and one and the same seal size can be used throughout.

More information on these shaft repair sleeves will be found in the SKF catalogue 4006 "CR seals".

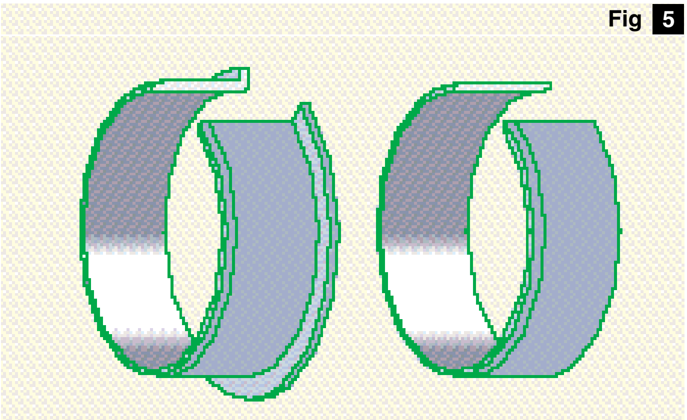
Fig 4



Radial shaft seals of the HDS design mounted adjacent to each other

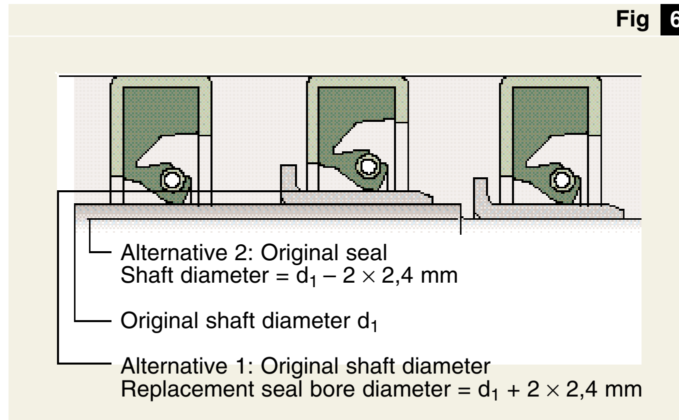
CR shaft repair sleeve with flange, LDSLV3 design, and without flange, LDSLV4 design

Fig 5



Alternative ways to repair shafts using the LDSLV sleeves

Fig 6



SKF lubricating greases

In the vast majority of applications, SKF four-row taper roller bearings are lubricated with grease. For the open and sealed bearings on work rolls it is recommended to use the SKF grease LGMB 2, see specification below. The grease is a high quality lithium/calcium base grease. The base oil is a mineral oil. The special characteristics of this grease are its

- excellent lubricating properties even under heavy loads,
- friction reducing and anti-wear properties,
- extremely good mechanical stability,
- very good resistance to water, and
- extremely good corrosion inhibiting properties.

The development of SKF lubricating greases has been based on extensive research efforts, testing and practical experience and has been undertaken specifically with bearing lubrication in mind. The strict specifications are designed to allow long bearing life.

This means that the user can be assured of obtaining the best bearing greases of consistently high quality from SKF worldwide. It also means products which are environmentally favourable as for the most part toxic heavy metal compounds have been replaced.

Consistency (NLGI Scale)	2
Soap base	lithium/calcium
Colour	dark brown
Base oil	mineral oil
Temperature range	
°C	–20 to +120
Dropping point	
ISO 2176, °C	min. 180
Kinematic viscosity of base oil	
at 40 °C, mm^2/s	780
at 100 °C, mm^2/s	36,8
Worked penetration (ISO 2137)	
60 strokes, 10^{-1} mm	265 – 295
difference after 100 000 strokes, 10^{-1} mm	max. +30
Roll stability	
50 h at 80 °C, 10^{-1} mm	max. +50
Corrosion inhibition	
SKF Emcor test, distilled water (DIN 51 802, IP220)	0 – 0
SKF Emcor wash-out test, distilled water	0 – 0
Water resistance	
DIN 51 807 Part 1, 3 h at 90 °C	max. 1
Oil bleed	
DIN 51817, 7 days at 40 °C, static, %	1 – 5
Copper corrosion	
DIN 51 811, 120 °C	max. 1
Four Ball Test	
Wear scan (DIN 51 350 Part 5) at 1 400 N, mm	max. 1,8
Weld load (DIN 51 350 Part 4), N	min. 3 000

SKF lubricating grease LGMB 2: Technical data

For full information on SKF greases please refer to the SKF publication MP 200 “The Tools for Trouble-Free Operation”.


SKF
GREASE LGMT

The SKF Group – a worldwide corporation

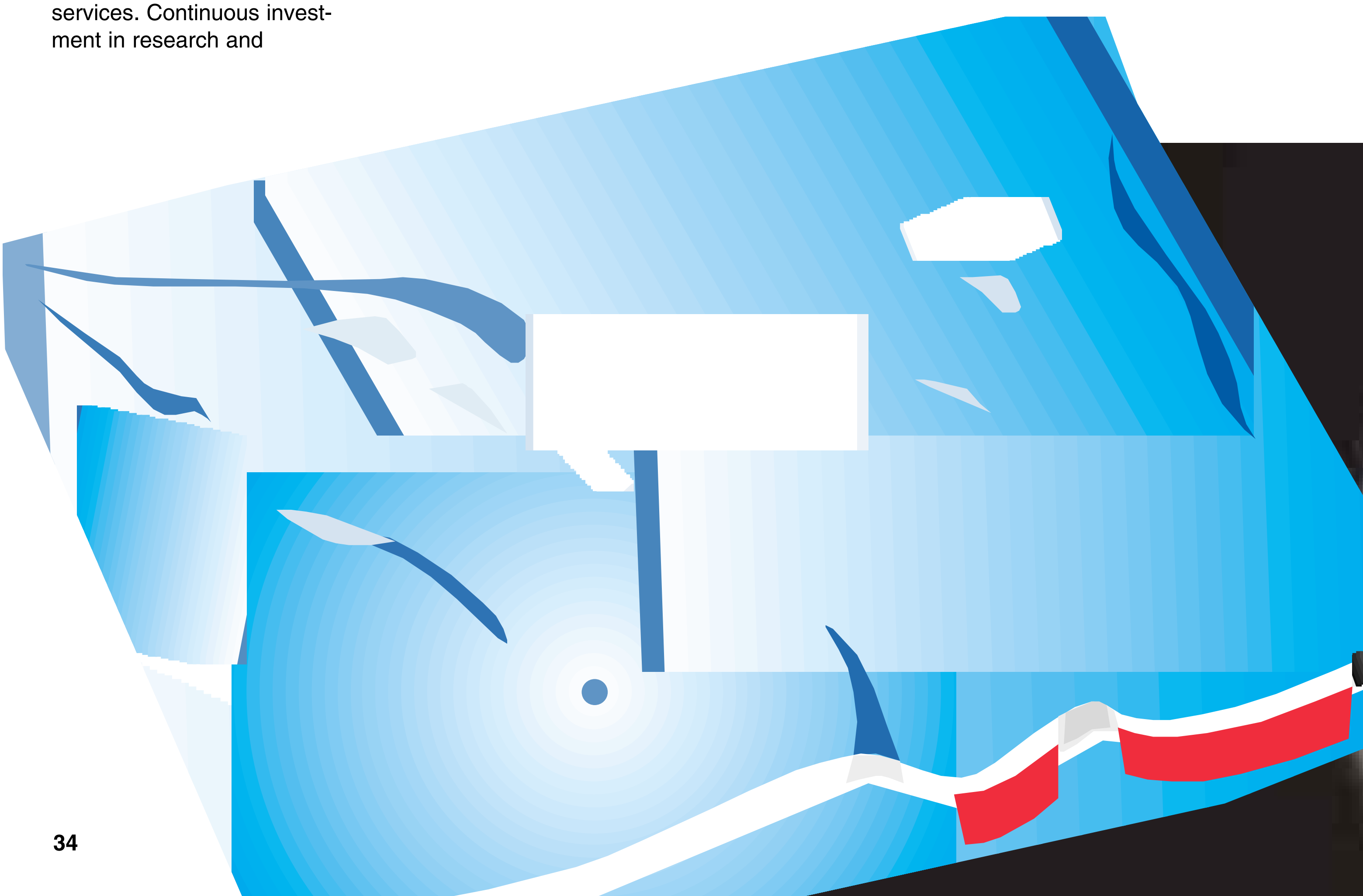
SKF is an international industrial Group operating in some 130 countries and is world leader in bearings.

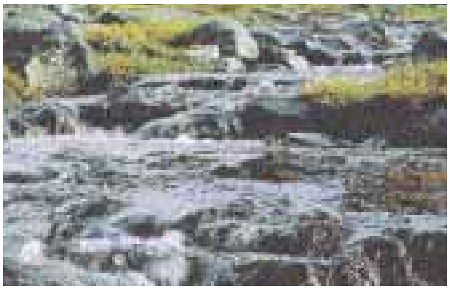
The company was founded in 1907 following the invention of the self-aligning ball bearing by Sven Wingquist and, after only a few years, SKF began to expand all over the world.

Today, SKF has some 43 000 employees and around 80 manufacturing facilities spread throughout the world. An international sales network includes a large number of sales companies and some 20 000 distributors and retailers. Worldwide availability of SKF products is supported by a comprehensive technical advisory service.

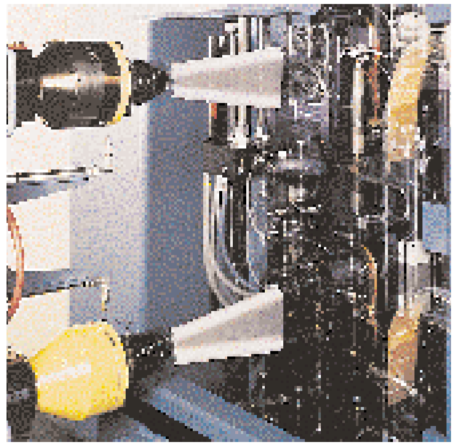
The key to success has been a consistent emphasis on maintaining the highest quality of its products and services. Continuous investment in research and development has also played a vital role, resulting in many examples of epoch-making innovations.

The business of the Group consists of bearings, seals, special steel and a comprehensive range of other high-tech industrial components. The experience gained in these various fields provides SKF with the essential knowledge and expertise required in order to provide the customers with the most advanced engineering products and efficient service.





The SKF house colours are blue and red, but the thinking is green. The latest example is the factory in Malaysia, where the bearing component cleaning process conforms to the strictest ecological standards. Instead of trichloroethylene, a water-based cleaning fluid is used in a closed system. The cleaning fluid is recycled in the factory's own treatment plant.



The SKF Engineering & Research Centre is situated just outside Utrecht in The Netherlands. In an area of 17 000 square metres (185 000 sq.ft) some 150 scientists, engineers and support staff are engaged in the further improvement of bearing performance. They are developing technologies aimed at achieving better materials, better designs, better lubricants and better seals – together leading to an even better understanding of the operation of a bearing in its application. This is also where the SKF Life Theory was evolved, enabling the design of bearings which are even more compact and offer even longer operational life.

SKF has developed the Channel concept in factories all over the world. This drastically reduces the lead time from raw material to end product as well as work in progress and finished goods in stock. The concept enables faster and smoother information flow, eliminates bottlenecks and bypasses unnecessary steps in production. The Channel team members have the knowledge and commitment needed to share the responsibility for fulfilling objectives in areas such as quality, delivery time, production flow etc.

SKF manufactures ball bearings, roller bearings and plain bearings. The smallest are just a few millimetres (a fraction of an inch) in diameter, the largest several metres. In order to protect the bearings effectively against the ingress of contamination and the escape of lubricant, SKF also manufactures oil and bearing seals. SKF's subsidiaries CR and RFT S.p.A. are among the world's largest producers of seals.

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