

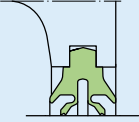
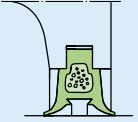
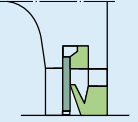
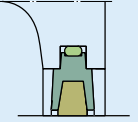
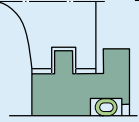
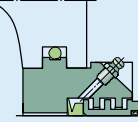
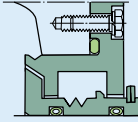
Standard seals

An important advantage of SNL plumber block housings is that they can be fitted with different types of seals. Standard SKF seals include split four-lip seals and split double-lip seals, V-ring seals, felt seals, labyrinth seals and heavy-duty "taconite" seals with a radial labyrinth. The seals are easy to install and are supplied separately.

All the standard seals, as well as the seals for use with oil lubrication, are shown in **table 1**, with an overview of the seal type, its design features and suitability for various

operating conditions. Detailed information about standard and special seals can be found on **pages 16 to 21**.

Table 1

Seal selection							
							
	TSN .. L	TSN .. G	TSN .. A	TSN .. C	TSN .. S	TSN .. ND	TSN .. TURU ¹⁾
Internal conditions							
Temperature, °C	-40 to +100	-40 to +100	-40 to +100	-40 to +100	-50 to +200	-40 to +100	-40 to +200
Temperature, °F	-40 to +210	-40 to +210	-40 to +210	-40 to +210	-60 to +390	-40 to +210	-40 to +390
Peripheral speed, m/s ²⁾	up to 13	up to 8	up to 7 above 7 ³⁾	up to 4	++	up to 12	++
Misalignment, degrees	0,5 to 1	0,5 to 1	1 to 1,5	up to 0,5	up to 0,3	up to 0,5	up to 1
Grease lubrication	++	4 m/s ⁴⁾	++ ⁵⁾	-	+	+	
Oil lubrication	--	--	--	--	--	--	++
Low friction	++	+	++	-	++	+	++
Axial shaft displacement	++	++	-	++	+	+	-
Vertical arrangement	+	+	++ ⁶⁾	--	--	-	--
Replacement	++	++	-	+	-	-	-
External conditions							
Dust	++	++	+	+	+	++	-
Fine particulate contaminants	++	++	+	-	+	++	+
Coarse particulate contaminants	+	+	-	-	+	++	+
Abrasive contaminants	+	+	--	+	++	++	++
Liquids when sprayed	+	+	+	-	--	++	-
Direct sunlight	+	+	--	++	++	++	++

¹⁾ Delivered as a complete unit only, i.e. housing with seals

²⁾ See **table 2** on **page 15** to convert peripheral speeds to rotational speeds

³⁾ When the V-ring is axially supported

⁴⁾ When using a housing with a grease escape hole (designation suffix V)

⁵⁾ If appropriate components are used; i.e. ASNA .. V end cover at the end of a shaft

⁶⁾ When the V-ring of the lower seal is mounted inboard

Symbols:
++ very suitable
+ suitable
- limited suitability
-- unsuitable

Four-lip seals

With shaft speeds continuously increasing, there was a need for a sealing solution that could accommodate higher speeds with the same high level of performance that the SKF double-lip seal could provide at lower speeds.

To meet that need, SKF developed a robust, easy-to-mount four-lip seal (→ **fig. 1**) that can accommodate peripheral speeds up to 13 m/s. This four-lip seal is made from a specially formulated thermoplastic elastomer. It is manufactured using a unique process that improves the finish of the contact surfaces so that there is less friction and heat generated by the seal. These four-lip seals, which are designed for grease lubrication, can accommodate speeds up to 13 m/s even if the housing uses a grease escape hole (suffix V). The seals are split so that they can be installed easily.

The permissible angular misalignment for shaft diameters ≤ 100 mm is approximately 1° and approximately $0,5^\circ$ for larger shafts. The seal counterface on the shaft should be ground and the surface roughness R_a should not exceed $3,2 \mu\text{m}$. The recommended shaft tolerance is h9. The axial movement of the shaft relative to the housing is not limited when four-lip seals are used. The permissible

operating temperature range for the seal is between -40 and $+100^\circ\text{C}$ (-40 to $+210^\circ\text{F}$). The seals are available from size TSN 507 L up to and including size TSN 522 L.

Each package of four-lip seals contains two seals. Consequently, when using an end cover, one seal can be kept as a spare. Four-lip seals are identified by the designation prefix TSN followed by the size identification and the suffix L, e.g. TSN 511 L.

Double-lip seals

Double-lip seals (→ **fig. 2**) are made of polyurethane, a wear-resistant material that has good elastic properties. The seals are split so that they are easy to install. They are intended for grease lubrication and can accommodate peripheral speeds of up to 8 m/s. The permissible angular misalignment for shaft diameters ≤ 100 mm is approximately 1° and approximately $0,5^\circ$ for larger sizes. The seal counterface on the shaft should be ground and the surface roughness R_a should not exceed $3,2 \mu\text{m}$. The recommended shaft tolerance is h9. When using housings with a grease escape hole (suffix V) the speed limit is 4 m/s due to increased pressure on the inner seal lip.

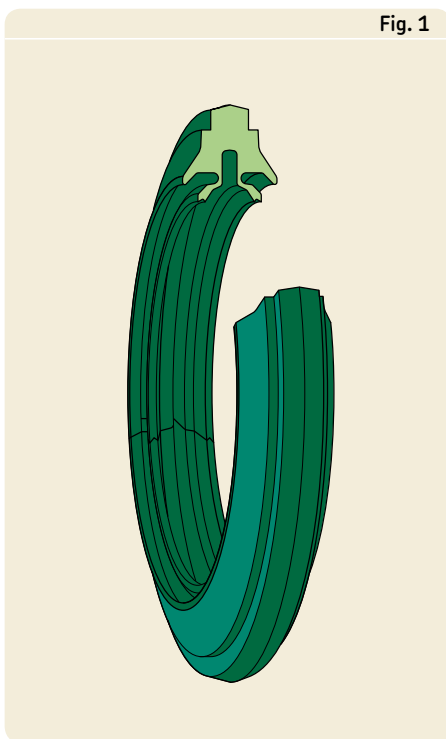
The axial movement of the shaft relative to the housing is not limited when double-lip seals are used.

Each package of double-lip seals contains two seals. Consequently, when using an end cover, one seal can be kept as a spare. Double-lip seals are identified by the designation prefix TSN followed by the size identification and the suffix G, e.g. TSN 506 G.

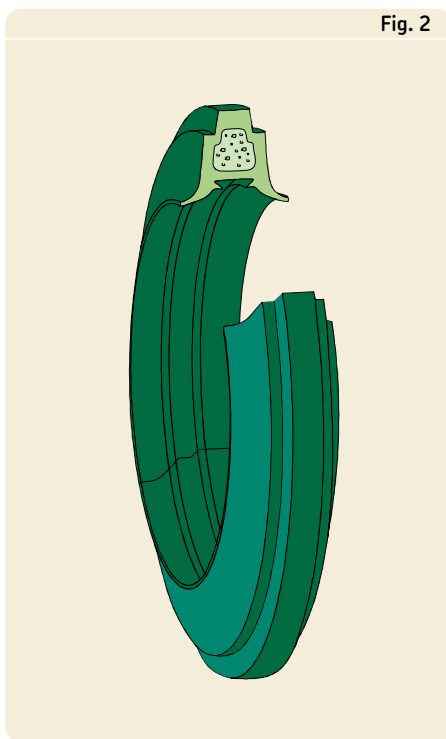
V-ring seals

V-ring seals (→ **fig. 3**) are two-piece seals that consist of a V-ring and a galvanized, sheet steel sealing washer. A rubber lip, vulcanized to the sealing washer, fits into the seal groove in the housing. The V-ring fits tight on the shaft and seals axially against the washer. As it is turning with the shaft, the V-ring acts as a flinger. These very efficient seals are typically used in difficult applications e.g. where there are high speeds or rough finished shafts. They can accommodate peripheral speeds in excess of 7 m/s if the V-ring is prevented from moving or lifting from the shaft by a support ring. Recommended dimensions for appropriate support rings (for axial and radial location) are provided in **table 3**.

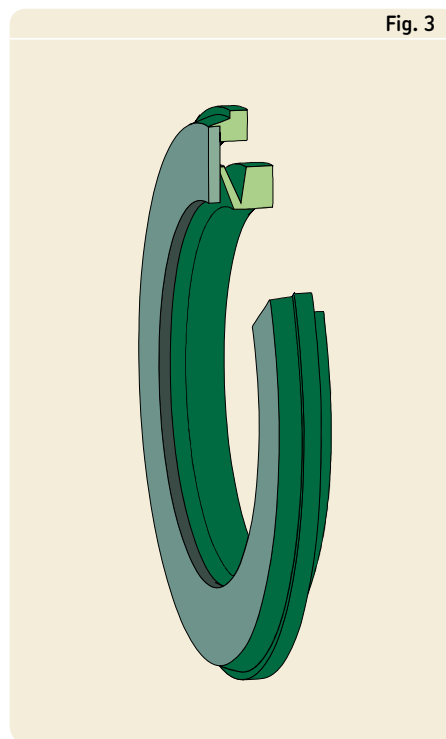
Four-lip seal



Double-lip seal



V-ring seal



Labyrinth seals

For applications where there are high speeds and/or extreme temperatures, SKF recommends using a labyrinth type seal (→ **fig. 5**). The standard labyrinth type seal is called a labyrinth ring. Labyrinth rings consist of a metal ring with two steps arranged radially. One step fits in the seal groove in the housing to form a gap type seal. The other step forms a gap type seal with the outside of the housing. A hollow, silicone rubber cord supplied with the seal holds the labyrinth ring in place on the shaft.

The standard labyrinth seals can accommodate approximately $0,3^\circ$ of angular misalignment and operating temperatures ranging from -50 to $+200^\circ\text{C}$ (-60 to $+390^\circ\text{F}$).

When labyrinth seals are used, axial movement of the shaft relative to the housing is not limited. The recommended shaft tolerance is h9.

Labyrinth rings are supplied singly. For through-shaft applications, two rings should be ordered. A labyrinth ring is identified by the designation prefix TSN followed by the size identification and the suffix S, e.g. TSN 511 S.

Taconite heavy-duty seals

Taconite is a very fine-grained mineral which is extremely difficult to seal against. For bearing arrangements which must operate under very arduous conditions such as those encountered in mining, labyrinth seals, which can be relubricated, are recommended, as grease enhances the sealing effect and extends the serviceability of the seals. SKF has developed two different designs of these heavy-duty seals (which can seal against taconite, hence the name) that can be supplied for use with SNL housings.

One taconite seal design (→ **fig. 6**) is based on a radial labyrinth seal and fits standard housings. A V-ring seal mounted on the shaft seals against the non-rotating part of the seal, which is inserted in the seal groove and prevents contaminants from penetrating to the bearing when the seal is relubricated. This grease is supplied via a grease fitting in the non-rotating part of the seal. Angular misalignments of the shaft of up to approximately $0,5^\circ$ are possible. The permissible operating temperature range for the seal is between -40 and $+100^\circ\text{C}$ (-40 to $+210^\circ\text{F}$).

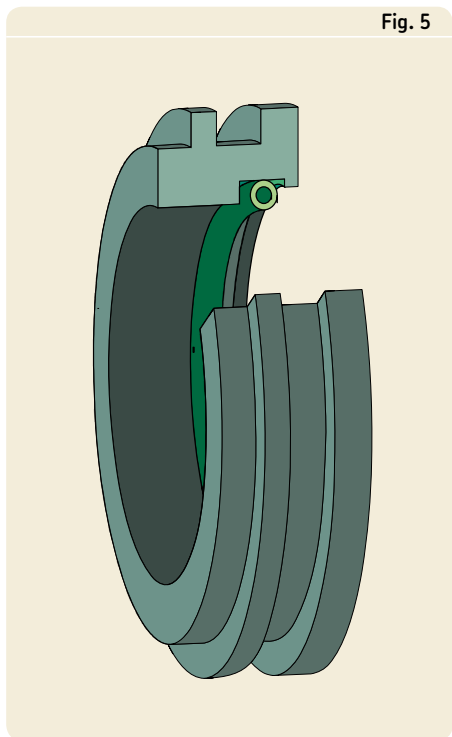
The axial movement of the shaft relative to the housing is limited for this type of taconite seal to ± 1 mm for shaft diameters up to 65 mm and to approximately $\pm 1,2$ mm for sizes up to 100 mm and $\pm 1,5$ mm for larger shaft diameters. The recommended shaft tolerance is h9.

These seals are supplied singly so that for housings used on through shafts, it is necessary to order two seals. The seal is identified by the designation prefix TSN followed by the size identification and the suffix ND, e.g. TSN 511 ND.

The other design of taconite seal (→ **fig. 7**) is based on a labyrinth seal with the labyrinth stages arranged axially and does not fit standard housings. The seal is relubricated via lubrication holes and nipples in the housing cap. The positions for the holes are marked by dimples in the casting. The permissible misalignment of the shaft relative to the housing for this seal is approximately $0,5^\circ$. The operating temperature range is from -40 to $+250^\circ\text{C}$ (-40 to 480°F). Axial movement of the shaft relative to the housing is also limited. The recommended shaft tolerance is h9.

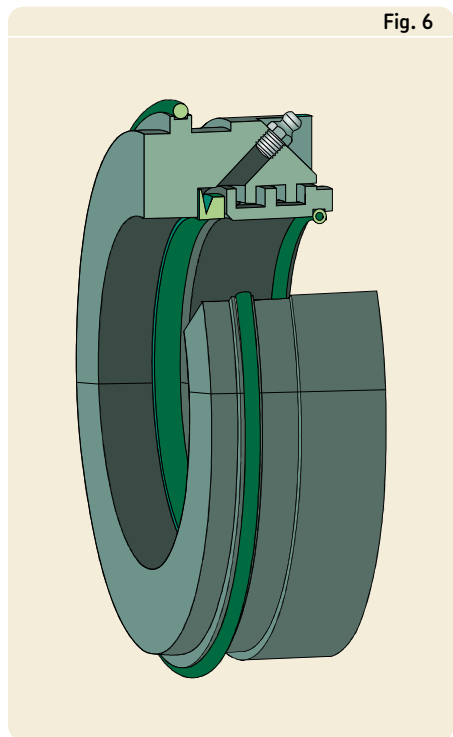
Labyrinth seal

Fig. 5



Taconite heavy-duty seal with a radial labyrinth

Fig. 6



Taconite heavy-duty seal with an axial labyrinth

Fig. 7

