Table of Contents

Skeleton Rotary Oil Seal

1. Overview

Rotary oil seals (oil seal, skeleton oil seal, rotary shaft lip seal ring) are standard contact seals, consisting of rubber elastomer, metal spring and other components.

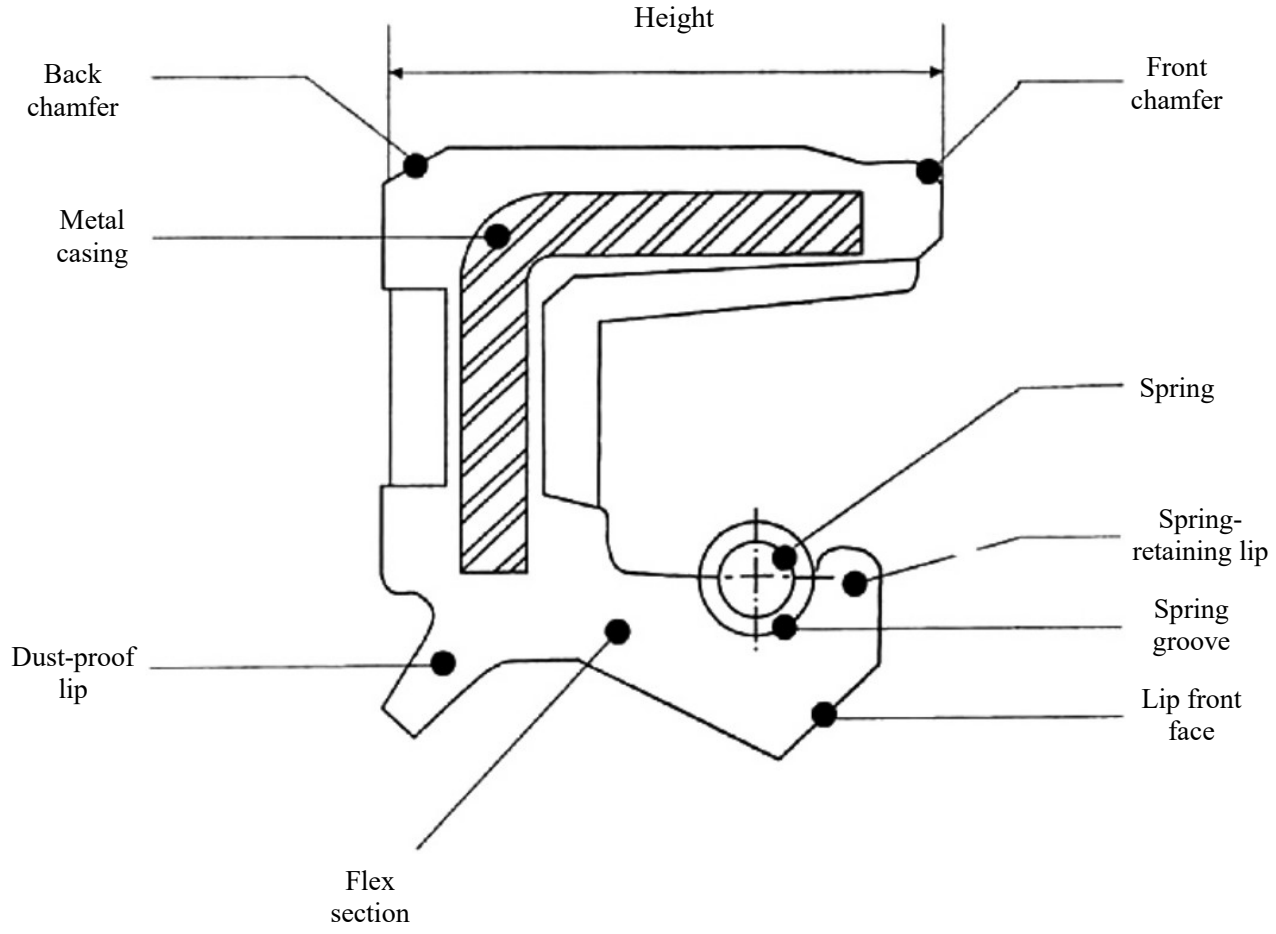
They are mainly used to prevent the leakage of liquid (lubricating oil) from the rotating shaft and oil seal housing, and also to prevent dust, dirt, water and other impurities from infiltrating and polluting the oil, which will affect the life of the whole mechanism.

They are generally used in work machinery, engineering machinery, vehicles, transportation equipment, chemical machinery, agricultural machinery, etc.

Features of rotary oil seals:

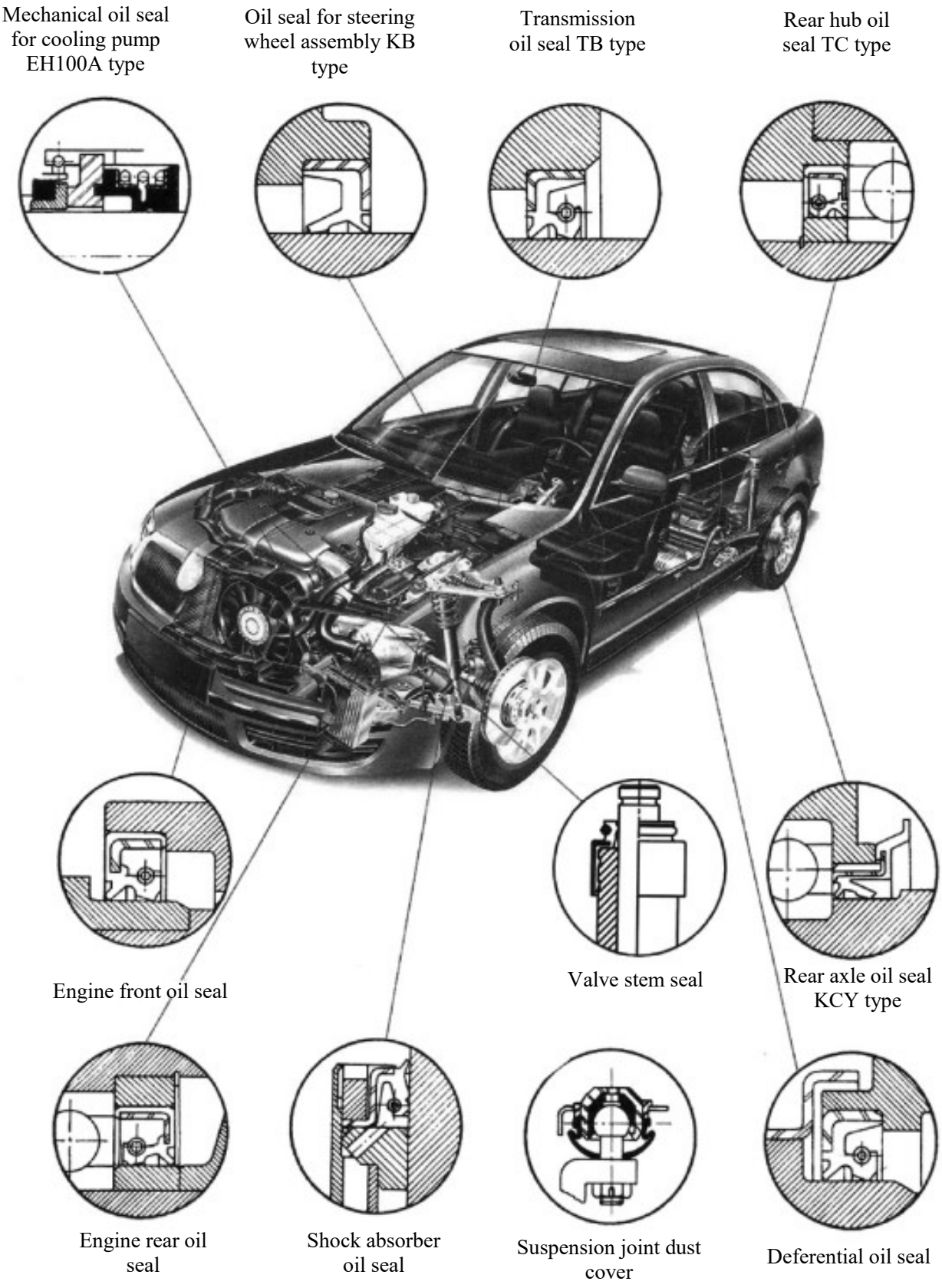
1. Leakage-proof of bearing grease, waterproof and dust-proof.
2. Small torque, good sealing.
3. Adaptability to higher rotation speed and run-out.
4. Simple structure, easy to install and disassemble.
5. Adaptability to different use environment.

2. Use Guide and Structural Diagram of Rotary Oil Seal



Structural diagram of rotary oil seal

Use cases of oil seal



Use case of eccentric oil seal

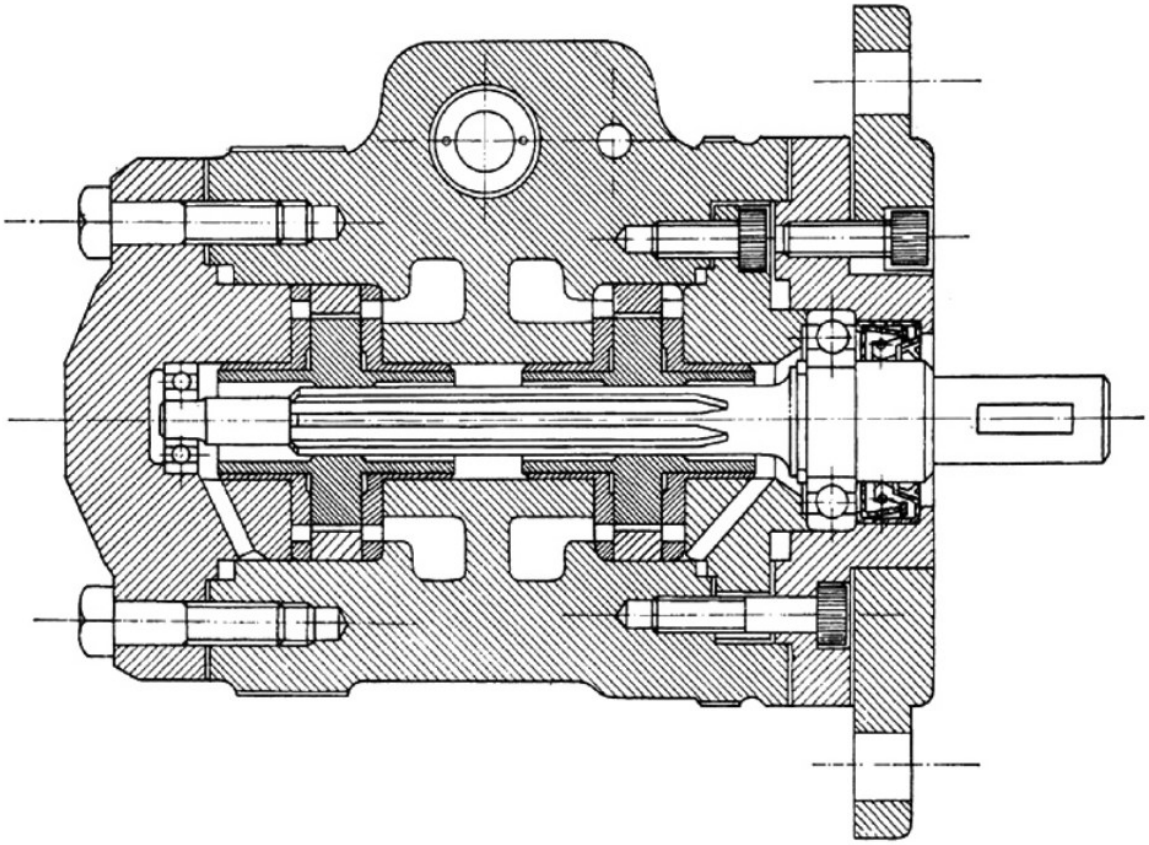


Figure 2
Gear coupling, CS type, preventing leakage of internal lubricating oil, and entering of external dust.

Use case of pressure-resistant oil seal

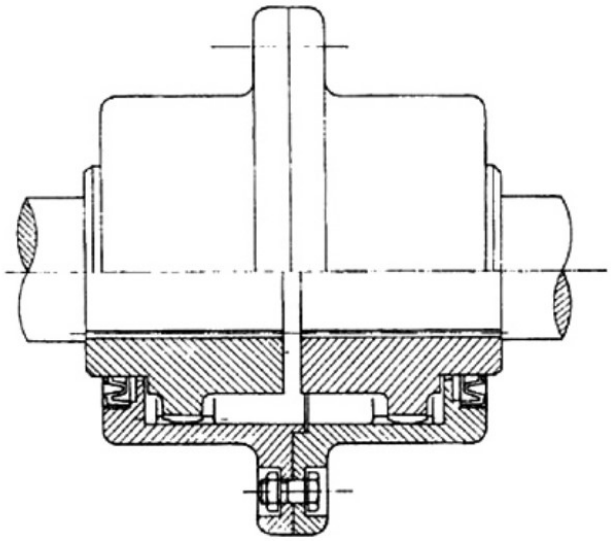


Figure 3
Hydraulic pump,
TXAI type, preventing leakage of internal lubricating oil and dust entering, and withstanding internal pressure.

Use case of dust-proof oil seal

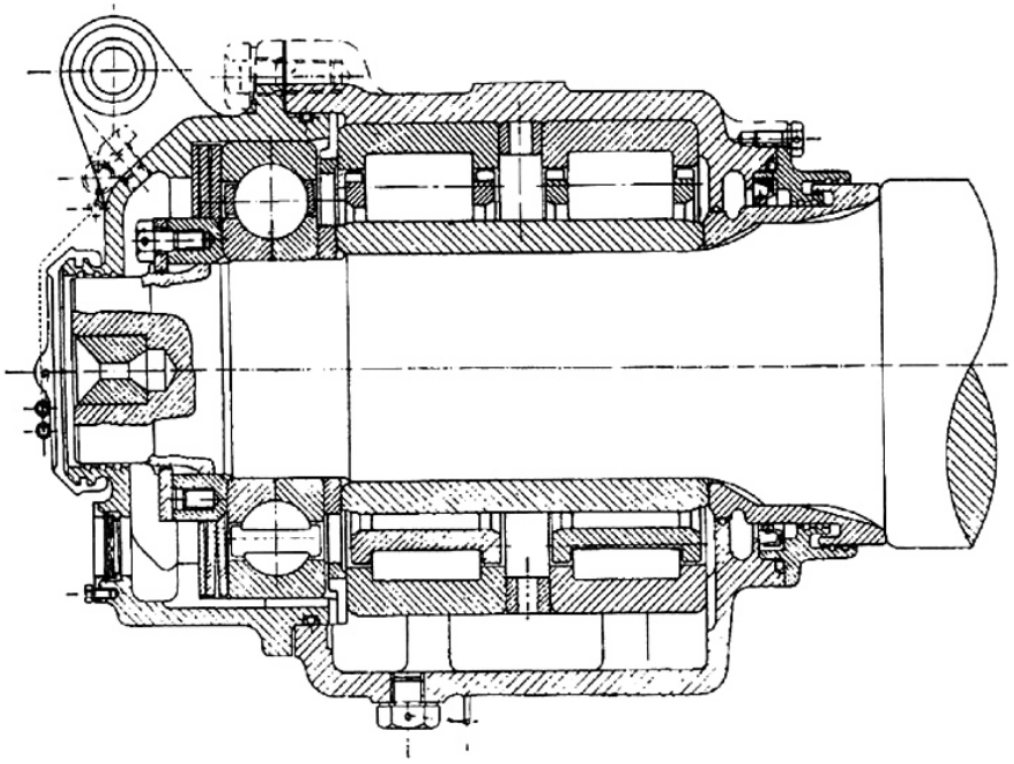


Figure 4
Journal box,
S type oil seal to prevent leakage of internal lubricating oil; and dust-proof oil seal to prevent dust from entering.

Use case of leakproof oil seal

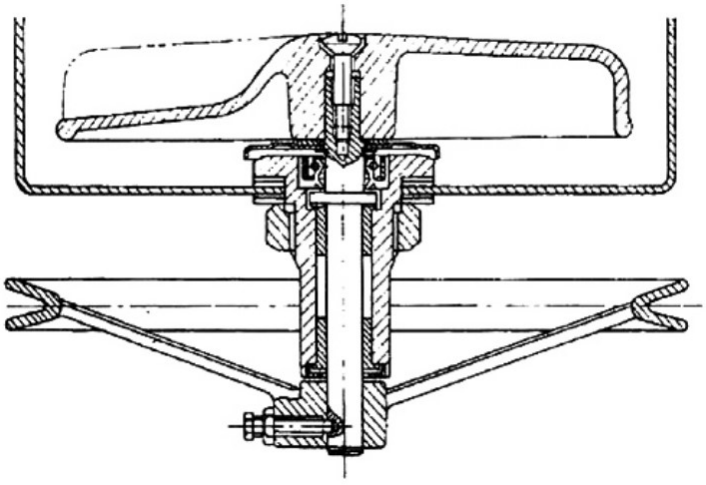
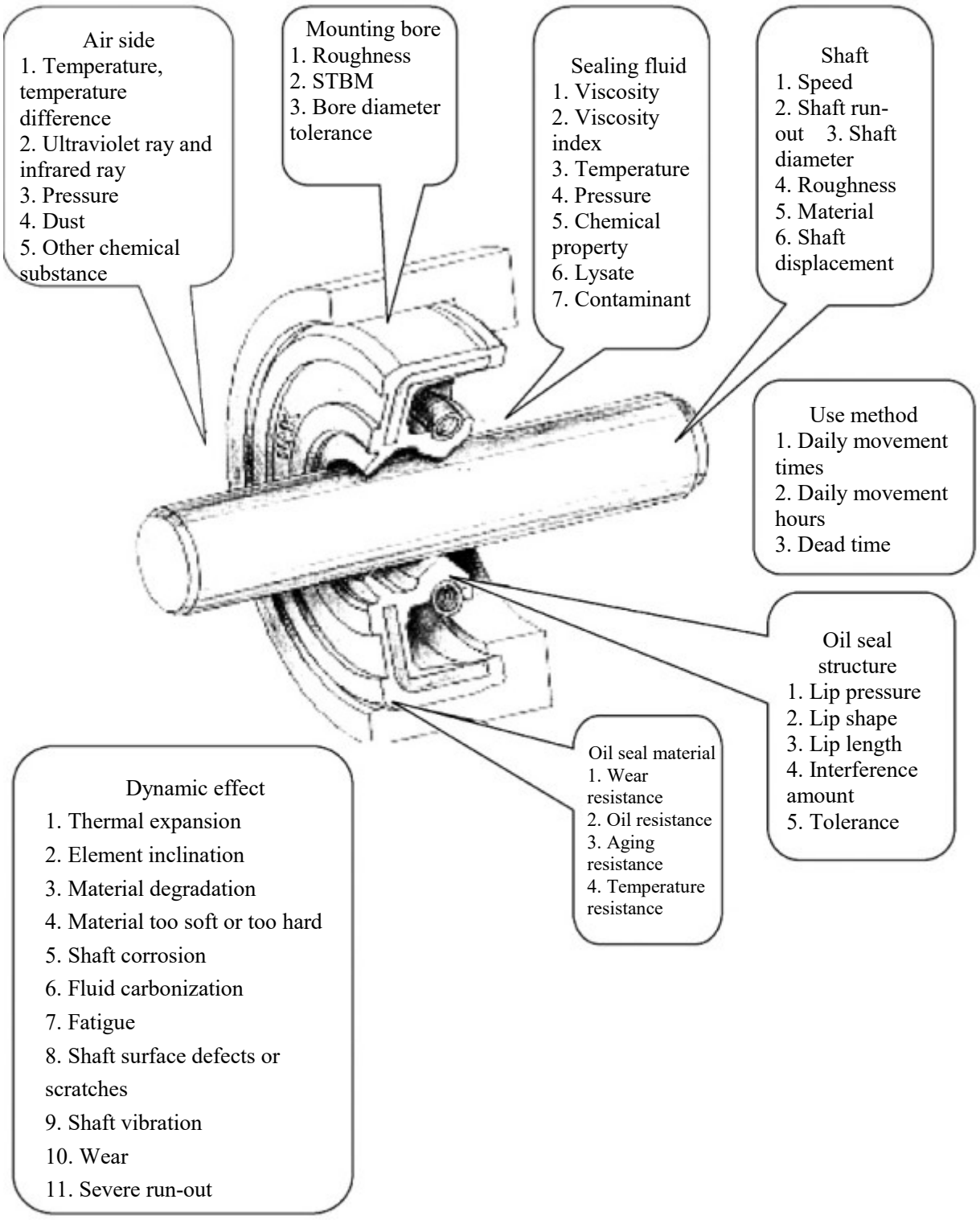


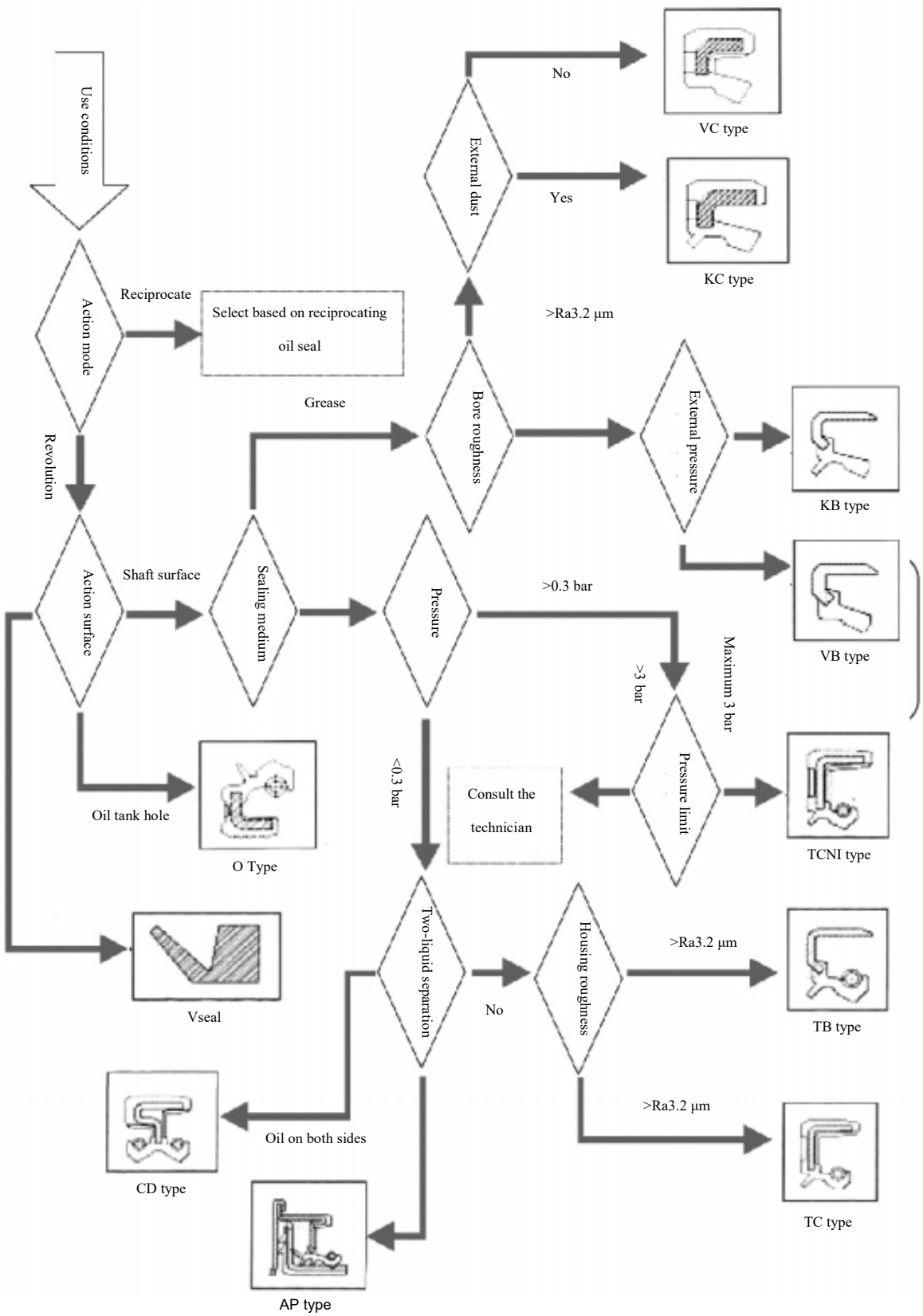
Figure 5
T type oil seal, with all metal of the oil seal made of water-resistant material, to prevent water leakage from pulsator of washing machines.

3. Selection of Rotary Oil Seals

3.1 Factors affecting oil seal performance

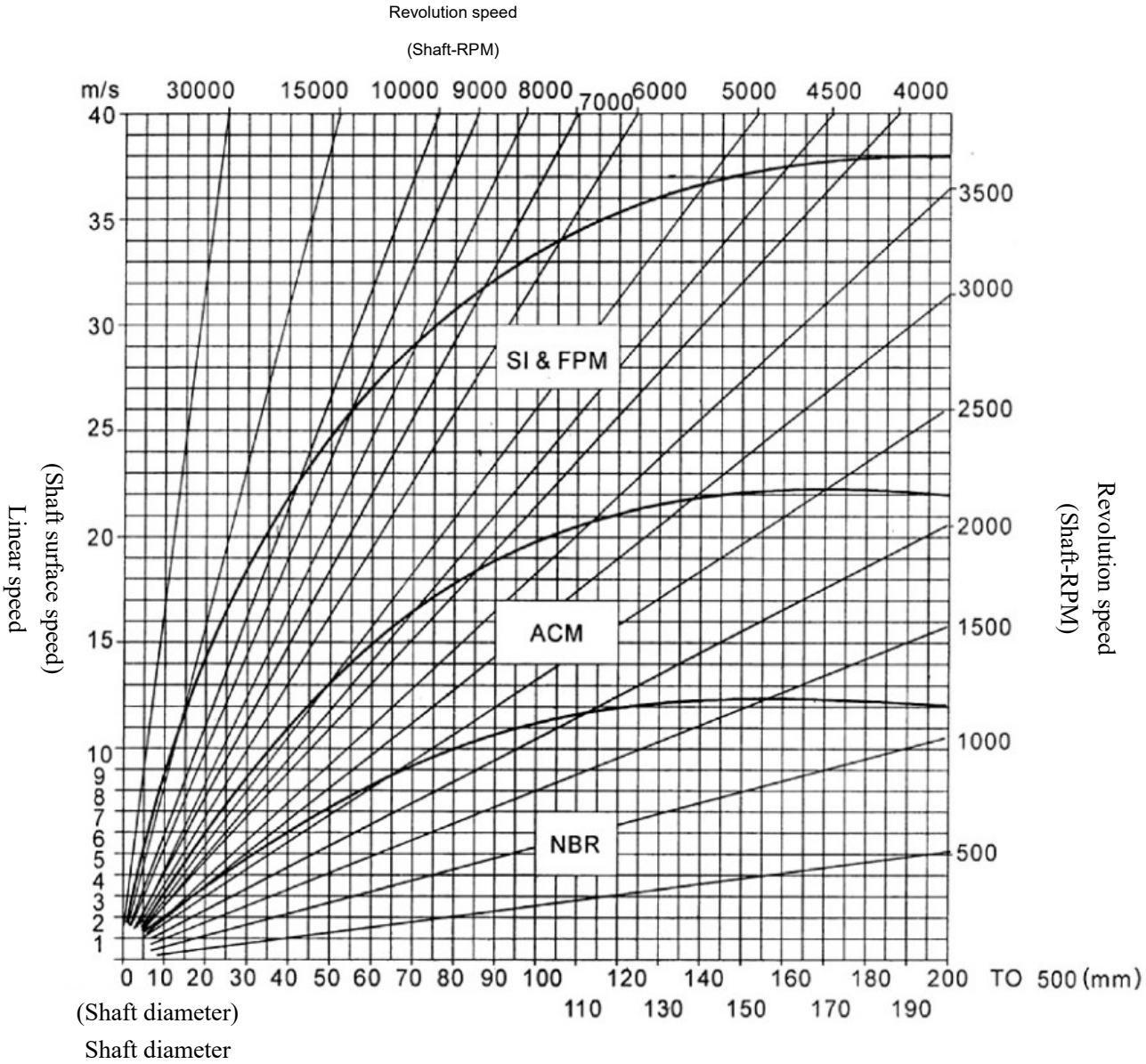


3.2 Type selection flow chart



Note: For special applications, please contact the technical personnel for advice.

4. Material and Circumferential Speed Chart of Rotary Oil Seal



4.1 Main features of rubber

The oil seal is affected by various factors such as working conditions, so attention must be paid to the functionality of the oil seal. Table 1 shows the resistance of rubber to different conditions.

Table 1 Resistance of rubber to different conditions

Rubber material	NBR	CR	E	ACM	VMQ	FVMQ	FKM
Tear resistance	○	⊙-○	⊙	△-⊙	△-⊙	△	⊙-○
Wear resistance	◎	◎	○	⊙	△-⊙	△	○
Compression set	○-◎	○-◎	○ ◎	○	⊙-○	○	○-◎
Rebound resilience 23°C	○	○-◎	○	©	△-⊙	©	©
Flame resistance	△	○-◎	△	△	○-◎	◎	◎
Weatherability	△	◎	◎	◎		◎	◎
Water resistance	◎	○	◎	△	○◎	◎	◎
Steam resistance	⊙-○	©	○-◎	×	⊙-○	⊙-○	○
Ozone resistance	△-⊙	◎	◎	◎	◎	◎	◎
Oxidation resistance	○	◎	◎	○	◎	◎	◎
Acid resistance (diluted)	○	◎	◎	△-⊙	○	◎	◎
Acid resistance (concentrated)	○	◎	◎	△-⊙	©	○	◎
Alkali resistance (diluted)	○	◎	◎	△-⊙	◎	×	◎
Alkali resistance (concentrated)	○	◎	◎	△-⊙	◎	○	×
Synthetic lubricant	○-◎	△	×	△	×	◎	◎
Low-polarity lubricating oil	◎	◎	×	◎	○	◎	◎
High-polarity lubricating oil	◎	○	×	◎	©	◎	◎
Animal and vegetable oils	○	○	○-◎	○	©	◎	◎
Gas permeation resistance	○-◎	○	⊙	○	△	△	◎
Conductivity resistance	△ ⊙	◎	◎	⊙	○◎	◎	○
Metal adhesion	○-◎	○ ◎	⊙ ⊖	○	○	⊙	⊙
◎Excellent ○Good ⊙Suitable △Limited ×Poor							

4.2 Stability of rubber to various chemicals, oils and solvents

Rubber is affected by the sealing conditions such as chemicals and oils, which may cause the rubber to loss its elasticity. Therefore, the environment in which rubber is applied should be taken into account in material selection. Table 2 shows the stability of rubber to various chemicals, and Table 3 shows the stability of rubber to various oils and solvents.

Table 2 Stability of rubber to various chemicals

	Fluid	CNBR	NBR	EPDM	CR	CSM	VMQ	FKM	ACM
	Water steam (150°C)	○	×	◎	×	×	×	△	×
Organic acids	Acetic acid	○	○	◎	◎	◎	◎	○	×
Inorganic acids	Hydrochloric acid (25%）	○	○	◎	◎	◎	◎	○	×
	Phosphoric acid (20%)	◎	○	◎	○	◎	○	◎	-
	Nitric acid (25%)	○	×	○	◎	◎	○	△	×
Alkalis	Sodium hydroxide (30%)	◎	○	◎	×		○	○	-
	Ammonia water (28%)	◎	◎	◎	◎	◎	◎	○	×
Salts	Sodium chloride (30%)	◎	◎	◎	©	◎	◎	◎	-
	Sodium carbonate (10%)	◎	◎	◎	◎	◎	◎	○	-
Oxidants	Hydrogen peroxide (3%)	○	△	○	△	◎	◎	◎	-
	Sodium hypochlorite (5%)	○	×	○	×	○	○	◎	×
Aliphatic carbohydrates	Isooctane	◎	◎	×	○	○	×	◎	◎
Aromatic carbohydrates	Methylbenzene	△	△	×	×	×	△	◎	×
Oxidized carbohydrates	Trichloroethylene	△	△	×	×	×	×	©	-
Alcohols	Methanol	◎	◎	◎	◎	◎	◎	△	×
	Ethyl alcohol	◎	◎	◎	©	◎	◎	◎	×
Ethers	Diethyl ether	△	△	△	×	×	×	×	×
Esters	Ethyl acetate	×	×	○	△	△	×	△	-
Ketones	Ethyl methyl ketone	×	×	◎	×	×	×	×	×
Aldehydes	Furfural	○	△	◎	×	×	×	×	×
Amines	Triethanolamine	◎	△	◎	◎	◎	×	×	×
	Carbon disulfide	△	△	×	×	×	-	◎	-

◎Excellent ○Resistant unless otherwise specified △Not resistant unless otherwise specified ×Not resistant

Table 3 Stability of rubber to various oils and solvents

Oil/Solvent \ Rubber type		HNBR	NBR	EPDM	SBR	PTFE	VMQ	FKM	ACM
Engine oil	SAE#30	◎	◎	×	×	◎	◎	◎	◎
	SAE 10W_#30	◎	◎	×	×	◎	○	◎	◎
Gear oil	Automotive	◎	©	×	×	◎	△	○	◎
	Industrial Type 2 (polar) synthetic base	◎	©	△	△	◎	△	○	△
Fluid type automatic transmission oil, automatic control fluid		◎	◎	×	×	◎	×	×	◎

Table 3 Stability of rubber to various oils and solvents (continued)

Oil/Solvent \ Rubber type		HNBR	NBR	EPDM	SBR	PTFE	VMQ	FKM	ACM
Brake oil	DOT3 (ethylene glycols)	×	△	○	○	◎			
	DOT5 (ethylene glycols)	×	△	○	○	◎			
	DOT5 (silicones)	◎	◎	×		◎		◎	◎
Pulley lubricating oil Type 2		○	○	×	×	◎	△	◎	◎
Machine oil (2# shaft lubricating oil)		○	○	×	×	◎	×	◎	
Hydraulic working oil (mineral oils)		◎	◎	×	×	◎	△	◎	◎
Inflammable working oil	Phosphate esters	×	×	×	×	◎	◎	△	×
	Water + ethylene glycols	○	○	×	×	◎	△	△	×
Cutting oil		◎	◎	×	×	◎	◎	◎	△
Grease	Mineral oils	◎	◎	×	◎	◎	◎	◎	◎
	Silicons	◎	◎	○	○	◎	×	◎	◎
	Fluorines	◎	◎	×	×	◎	◎	×	◎
Refrigerant	R12+paraffins	◎	○	×	×	◎	×	×	×
	R134a+ethylene glycols	○	△	◎	×	◎	×	×	×
Petrol		○	△	×	×	◎	×	◎	×
Naphtha, kerosene		○	△	×	×	◎	×	◎	×
Heavy oil		◎	○	×	×	◎	×	◎	△
Antifreeze (ethylene glycols)		○	○	◎	◎	◎	△	×	×
Warm water		◎	○	◎	◎	◎	○	○	×
Marine water		◎	○	◎	◎	◎	×	○	×
Water vapour		○	×	◎	△	◎	×	△	×
10% hydrochloric acid solution		○	○	◎	○	◎	○	○	○
30% sulfuric acid solution		△	△	○	△	◎	◎	△	△
10% nitric acid solution		○	×	○	×	◎	◎	△	×
40% sodium hydroxide solution		◎	○	◎	◎	◎	×	×	×
Benzene		×	×	×	×	◎	×	×	×
Alcohol		○	○	◎	◎	◎	○	○	×
Butanone		×	×	×	×	◎	△	×	×

◎Excellent ○Resistant unless otherwise specified △Not resistant unless otherwise specified ×Not resistant

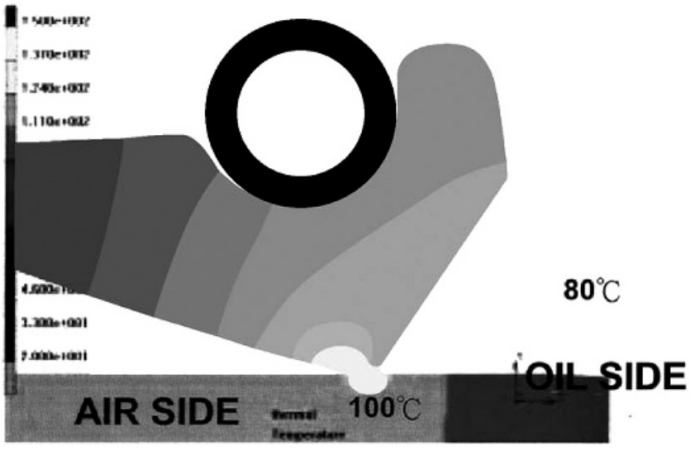
Applicable temperature range of rubber materials for various oils

When the rubber works with different sealing oils, it is necessary to pay attention to the working temperature range of the oils in addition to the compatibility of rubber and oils.

Table 4 Applicable temperature range of rubber materials for various oils

Oils	Continuous test temperature range	Periodic test temperature range	Automotive engine oil	Gear shaft oil	Automatic transmission oil	General hydraulic oil	Mineral lubricating oil	Silicon lubricating oil	Diesel engine oil	Gasoline/engine fuel oil (standard)	Gasoline/engine fuel oil (special)
Applicable temperature range (°C)			+150~-40	+150~—40	+160~-50	+100~-30	+100~-30	+250~-50			
Material											
NBR	+100~-30	+120~-30	100	90	100	100	100	100	*	*	*
FKM	+200~-20	+250~-20	150	150	160	100	100	200	150	150	150
EPDM	+120~-50	+150~-50	NS	NS	NS	NS	NS	120	NS	NS	NS
VMQ	+200~-55	+225~-55	130	*	*	*	100	*	NS	NS	NS
HNBR	+130~-30	+150~-30	130	110	130	100	100	130	*	*	*
IIR	+120~-40	+140~-40	NS	NS	NS	NS	NS	120	NS	NS	NS
AU Potvester PU	+80~-30	+100~-30	100	100	100	100	100	100	60	60	60
Polyester elastomer	+100~-40	+120~-40	100	100	100	100	100	100	60	60	60
PA Nylon	+100~-30	+120~-30	100	100	100	100	100	100	100	100	100
POM	+100~-45	+120~-45	100	100	100	100	100	100	100	100	100
PTFE	+200~-50	+200~-50	150	150	160	100	100	200	150	150	150
ACM	+130~-10	+150~-10	130	110	120	100	100	130	*	*	*
NS: The elastomer applies to a wide temperature range of the oil. *: This elastomer is not applicable to this oil (temperature unit: °C)											

For the selection of oil seal material, in addition to considering the type of sealing fluid, revolution speed and operating temperature, it is also necessary to pay attention to the temperature rise of the lip due to the contact with the shaft. In general, the temperature of the lip is about 20°C higher than the operating temperature, as shown in the figure below. Therefore, when choosing the material of oil seal, the temperature resistance of the rubber should be carefully considered.



In general, the temperature of the oil seal lip is over 20°C higher than the operating temperature.

4.3 Spring and metal casing

The function of spring is to provide certain pressing force to the lip of oil seal and prolong the life of oil seal, and choose appropriate spring force according to the circumferential speed and misalignment of shaft. The metal casing is the skeleton of the oil seal, which can make up the pressing force and make the oil seal completely embedded in the oil tank. For the selection of spring and metal casing materials, please refer to Table 5.

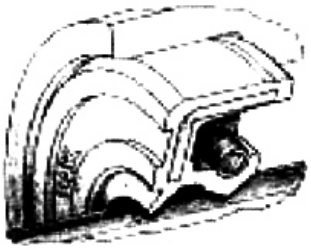
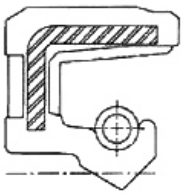
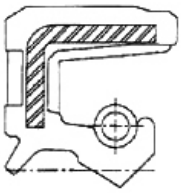
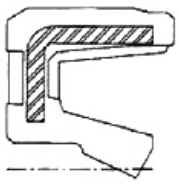
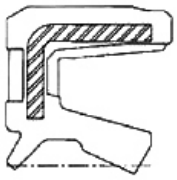
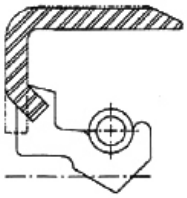
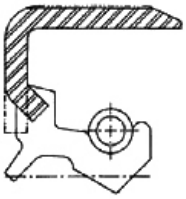
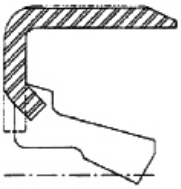
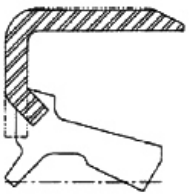
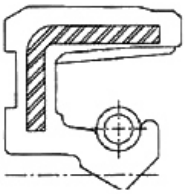
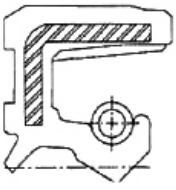
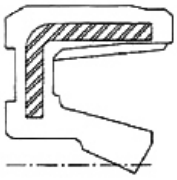
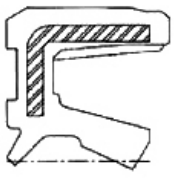
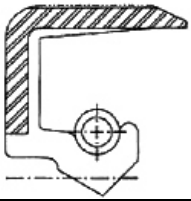
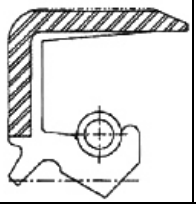
Seal object	Spring		
	Standard material	Special-purpose material	
	Carbon steel SAE 1070 SAE 1080	Stainless steel	
		SAE 30304	SAE 30316
Lubricating oil, grease	○	○	○
Water	×	○	○
Water vapour	×	○	○
Marine water	×	×	○
Acid	×	×	○
Alkali	×	○	○

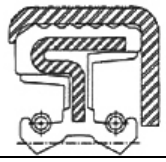
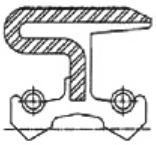
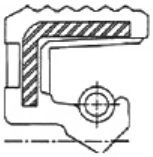
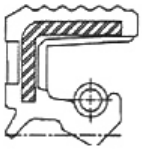
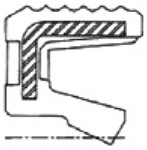
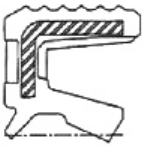
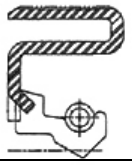
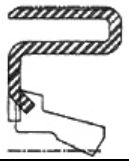
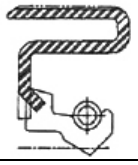
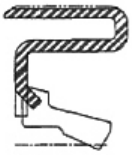
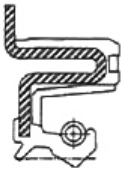
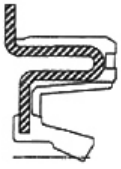
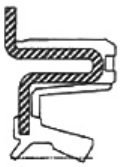
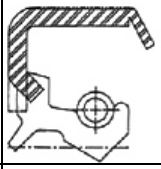
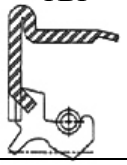
Table 5 Selection of spring material types and applicable conditions

Seal object	Metal casing		
	Standard material	Special-purpose material	
	Carbon steel SAE 1008	Stainless steel	
		SAE 30304	SAE 30316
Lubricating oil, grease	○	○	○
Water	×	○	○
Water vapour	×	○	○
Marine water	×	×	○
Acid	×	×	○
Alkali	×	○	○

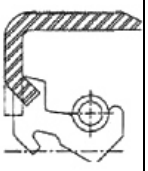
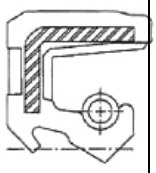
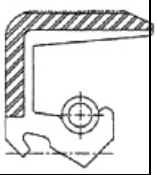
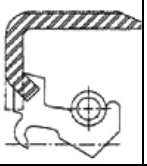
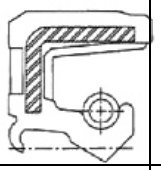
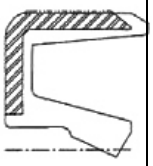
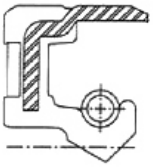
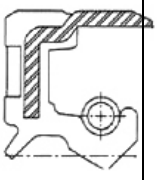
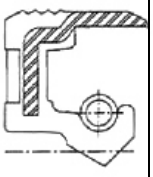
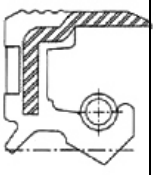
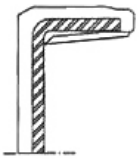
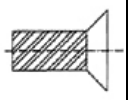
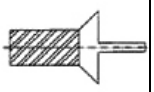
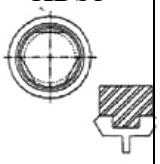
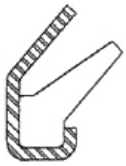
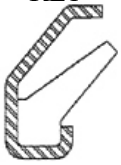
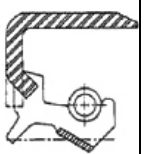
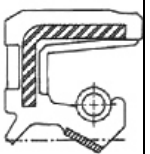
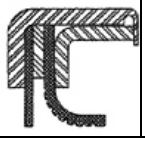
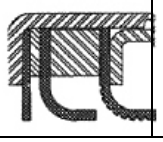
Table 5 Selection of metal casing material types and applicable conditions

5. Rotary Oil Seal Types

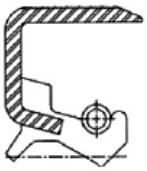
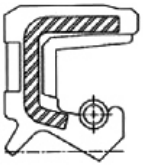
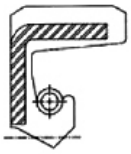
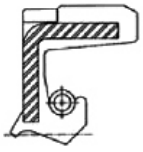
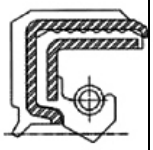
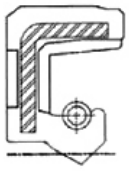
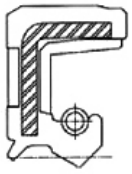
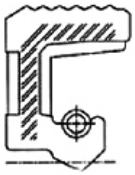
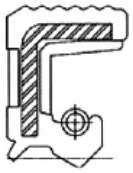
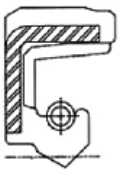
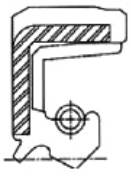
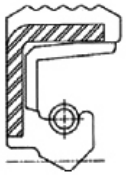
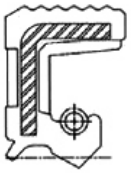
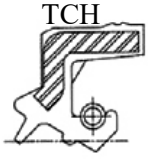
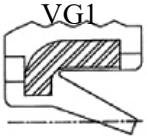
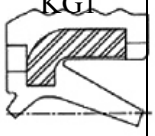
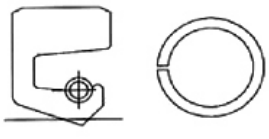
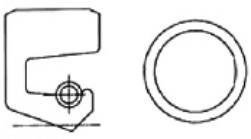
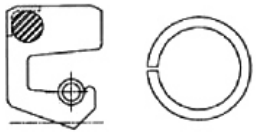
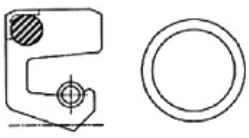
Type	Lip style	S	T	V	K
OD Style		Single lip, one spring, for use in low-pressure and pollution-free environments, with maximum pressure of 0.03 mpa (0.3 kgf/cm2)	Double lips, one spring, for use in low-pressure and dusty environments, with maximum pressure of 0.03 mpa (0.3 kgf/cm2)	Single lip, no spring, for use in pressure-free and pollution-free environments.	Double lips, no spring, for use in pressure-free and dusty environments.
C	Rubber-cased outside diameter design, to increase the sealing capacity of outside diameter	SC 	TC 	VC 	KC 
B	Metal outside diameter design, with a front chamfer for easy mounting.	SB 	TB 	VB 	KB 
A	Metal outside diameter design, combined with an inner iron casing to increase the structural rigidity.	SA 	TA 	VA 	KA 
F	Rubber-cased outside diameter design, to increase the sealing capacity of outside diameter; rubber lining fully covers the inner metal casing to prevent rusting.	SF 	TF 	VF 	KF 
M	Metal outside diameter with a front chamfer, rubber lining, especially suitable for preventing rusting.	SM 	TM 	VM 	KM 

Type	Design Characteristics	Seal Style			
D	Double main lips design, to isolate two kinds of sealing liquid.	DA 	DB 	DC 	DM 
G	External rubber tapping design, especially suitable for mounting bores of thermal expansion materials in high temperature environment.	SG 	TG 	VG 	KG 
H	Reverse metal-cased design, suitable for special assembly environment.	SH 	VH 	SH1 	VH1 
J	Exposed metal on outside diameter, with a peripheral flange, making it easy to replace and mount the oil seal.	SBJ 	TBJ 	VBJ 	KBJ 
	Rubber-cased outside diameter design, with a peripheral flange, making it easy to replace and mount the oil seal.	SCJ 	TCJ 	VCJ 	KCJ 
L	Similar to B-type oil seal, designed with beveled metal casing	SL 	TL 	VL 	KL 
P	Peripheral flange design, making it easy to replace and mount the oil seal, combined with an inner metal casing to increase the structural rigidity.	SAP 	TAP 	VAP 	KAP 
	Peripheral flange design, making it easy to replace and mount the oil seal	SBP 	TBP 	VBP 	KBP 

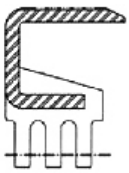
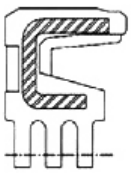
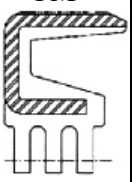
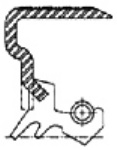
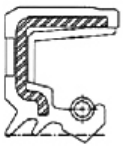
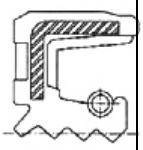
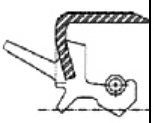
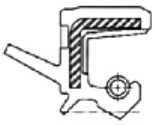
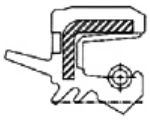
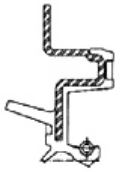
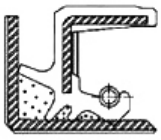
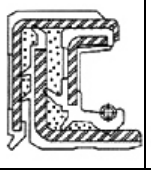
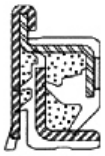
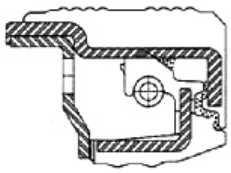
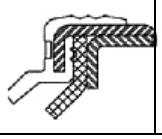
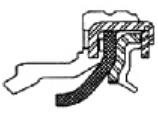
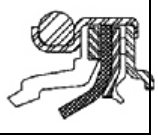
Skeleton Rotary Oil Seal

Type	Design Characteristics	Seal Style			
X	Reverse design of the minor lip.	TXA 	TXB 	TXC 	TXM 
X1	Reverse design of the minor lip.	TX1A 	TX1B 	TX1C 	TX1M 
Z	Similar to M-type oil seal, the rubber lining extends to cover the chamfer, improving the sealing performance of outside diameter.	SZ 	TZ 	VZ 	KZ 
BC/ BG	Half-rubber-cased outside diameter design, enjoying the characteristics of both B-type and C-type oil seals.	SBC 	TBC 	SBG 	TBG 
EC/ WS/ KDS	End Cap - Designed for sealing cover for outside diameter sealing. WS/KDS - Specially designed sealing washer.	EC 	WS 	Ws1 	KDS1 
RE/ VA/ VS	RE - Oil seal for side dust-proofing. VA/VS - Specially designed for side dust-proofing.	RE 	RE1 	VA 	VS 
PL	Rubber bonded PTFE design for the lip, enjoying excellent chemical resistance, high and low temperature resistance and low friction coefficient, suitable for applications with extremely high revolution speed, dry run and high pressure.	TA-PL 	TB-PL 	TC-PL 	TM-PL 
PA	Combined PTFE and oil return design, enjoying chemical resistance, high and low temperature resistance, and low coefficient of friction, suitable for applications with extremely high revolution speed and dry run.	PA1 	PA2 	PA4 	PA6 

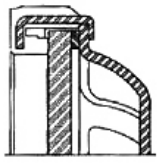
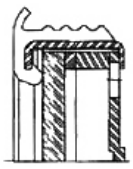
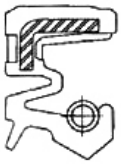
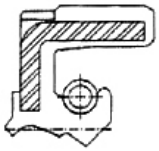
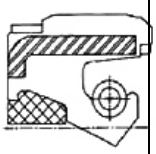
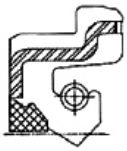
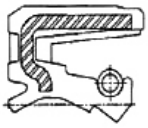
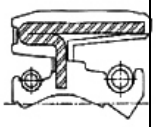
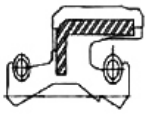
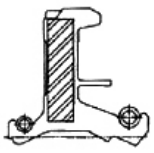
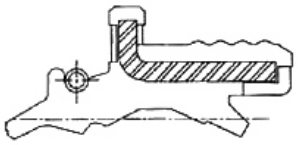
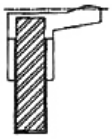
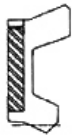
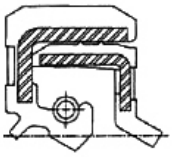
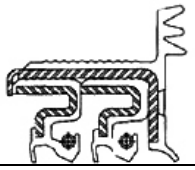
Skeleton Rotary Oil Seal

Type	Design Characteristics	Seal Style			
E	Metal casing with inward bending to reinforce the lip, with higher compression resistance.	TEA 	TEB 	TEC 	TEM 
N	High pressure resistant design. SDN and TDN are combined type oil seals.	SCN 	TCN 	SDN 	TDN 
N1	Medium pressure resistant design, with rubber covering the face. The maximum pressure is 0.35 mpa (3.5 kgf/cm2)	SCN1 	TCN1 	SGN1 	TGN1 
N2	Medium pressure resistant design, with exposed metal on the face The maximum pressure is 0.35 mpa (3.5 kgf/cm2)	SCN2 	TCN2 	SGN2 	TGN2 
O	Fixed to a rotary shaft for sealing of a mounting bore	OTA 	OTB 	OTC 	OTM 
TH/ G1	TH - Suitable for special mounting environment GI - Low lip friction design, suitable for applications with higher revolution speed.	TBHc 	TCH 	VG1 	KG1 
SQ	Cut-off type full rubber oil seal, suitable for heavy machinery, and applications with small mounting space or difficult disassembly.	SC 		SQ1 	
SQS	Cut-off type full rubber oil seal, suitable for heavy machinery, and applications with small mounting space or difficult disassembly. SQS and SQS1 are equipped with a spring to strengthen the structure.	SQS 		SQS 	

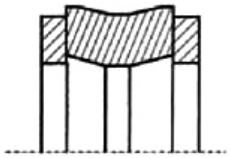
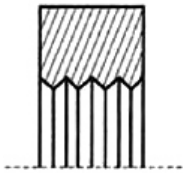
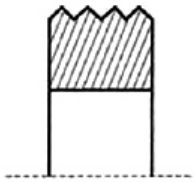
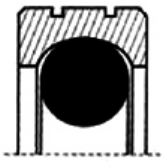
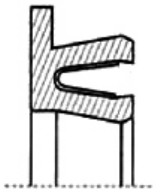
Skeleton Rotary Oil Seal

Type	Design Characteristics	Seal Style			
U	Square main lip design, suitable for dusty and muddy environment, mostly used in agricultural machinery.	UA 	IJB 	UC 	UM 
2/6	Adding an auxiliary lip, to provide better dust-proof effect.	TB2 	TC2 	TB6 	TC6 
9	Adding a face lip, to provide better dust-proof effect.	TB9 	TC9 	TC29 	TBCJ9 
VA	VA1 and VA2 are a combination of rubber and formed metal casing, and VA4 and VA6 are a combination of wool felt and metal casing, designed for sealing of grease.	VA1 	VA2 	VA4 	VA6 
AP	Suitable for dusty, muddy and weedy environment, mostly used for wheel hub oil seal of agricultural machinery, military vehicles and engineering vehicles.	AJ 	AO 	AP 	AP1 
	Suitable for dusty, muddy and weedy environment, mostly used for wheel hub oil seal of agricultural machinery, military vehicles and engineering vehicles.	AP3 	AP4 	AP5 	AP7 
ST	Specially designed self-revolution oil seal.	ST5 		ST11 	
VGA	Oil seal for air conditioning compressors	VGA2 	VGA3 	VGA5 	VGA6 

Skeleton Rotary Oil Seal

Type	Design Characteristics	Seal Style			
ECA	Oil seal for oil level sight glass	ECA1 	ECA3 	ECA4 	ECA5 
RO	Lip deflection design, for use in high run-out environments.	SBRO 	SLRO 	TCRO 	TC2R0 
VSS	Mainly used in engine combustion chamber valve, to control the right amount of engine oil, stably lubricating the steam valve and slide rod guide block during reciprocating movement.	VSB2 		VSC2 	
PS	Suitable for reciprocating movement, mainly used in conversion machinery of automotive power steering wheel, sealing the fluid pressure inside the steering system to prevent the loss of hydraulic fluid.	TC4P 	TCAP 	CNB 	CNB2 
4	Specially designed for shaft reciprocating movement, usually used in shock absorbers.	TC4 	TM4 	DC4 	DC41 
	Specially designed for shaft reciprocating movement, usually used in shock absorbers.	TC4S 	DC4S 	TG4JB 	
Piston Seals	Suitable for reciprocating movement air pressure environment.	PDV 	PSV 	PSV2 	PVC1 
TCA	Suitable for sealing water and laundry detergent in washing machines.	TCA3 		TGA6 	

Skeleton Rotary Oil Seal

Type	Design Characteristics	Seal Style	
R3	Rotary seal with a support ring	 R3	
R4 / R5	Rotary seal with bi-directional movement	 FP	 R5
RST / RSP	High-pressure rotary seal ring	 RST	 RSP
VR5/7	High-pressure rotary seal ring with reciprocating movement	 VR5/7	

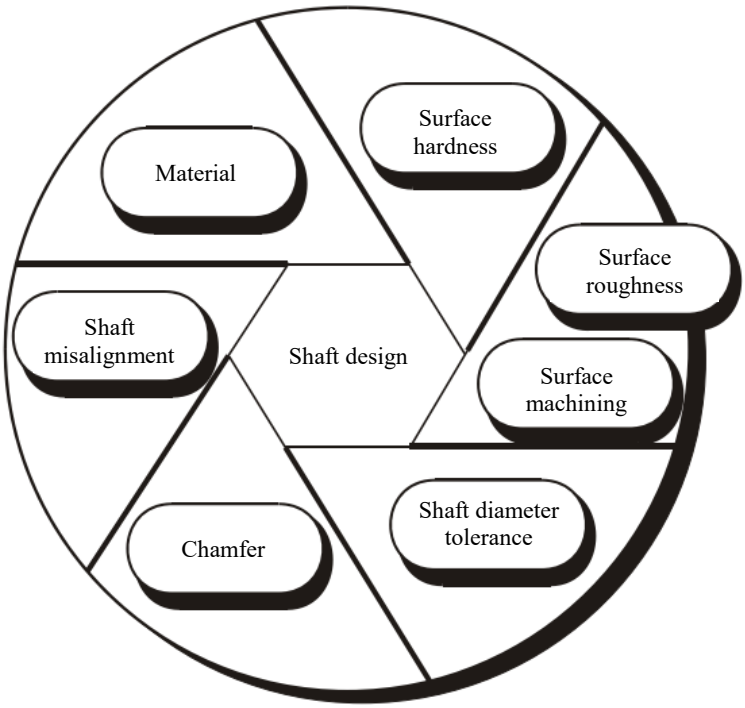
6. Mounting Environment of Rotary Oil Seal

6.1 Basic requirements of oil seal mounting environment for shaft and bore:

When designing the mounting environment of oil seal, special attention should be paid to the requirements of shafts and bores, because their design parameters will directly affect the service life of oil seal.

6.2 Shaft design:

To provide you the best rotary shaft oil seal, we must consider the material, roughness, hardness, chamfer, tolerance and misalignment of the shaft as follows.



6.2.1 Shaft material:

Oil seals work best on shafts made of carbon steel or stainless steel. Special attention should be given to the use of heat treatment or nitridation. The stainless steel shaft is more suitable to seal water at low revolution speeds.

6.2.2 Shaft roughness:

The shaft roughness is one of the factors affecting the life of the oil seal, so the roughness is required to be Ra 0.2~0.8μm or Rz 1~5μm, or Rmax 6. 3μm. No groove marks are allowed within the area of the contact surface.

6.2.3 Shaft surface hardness:

The shaft surface hardness also affects the life of oil seal, which generally shall not be less than HRC45; if the circumferential speed exceeds 4 m/s, the shaft surface hardness shall not be less than HRC55.

6.2.4 Shaft chamfer:

The shaft chamfer can guide the lip of the oil seal into the proper position. 15 to 30 degrees is recommended (as shown in Figure 6-1), and no burr is allowed on the chamfer. The recommended chamfer size is shown in the following table.

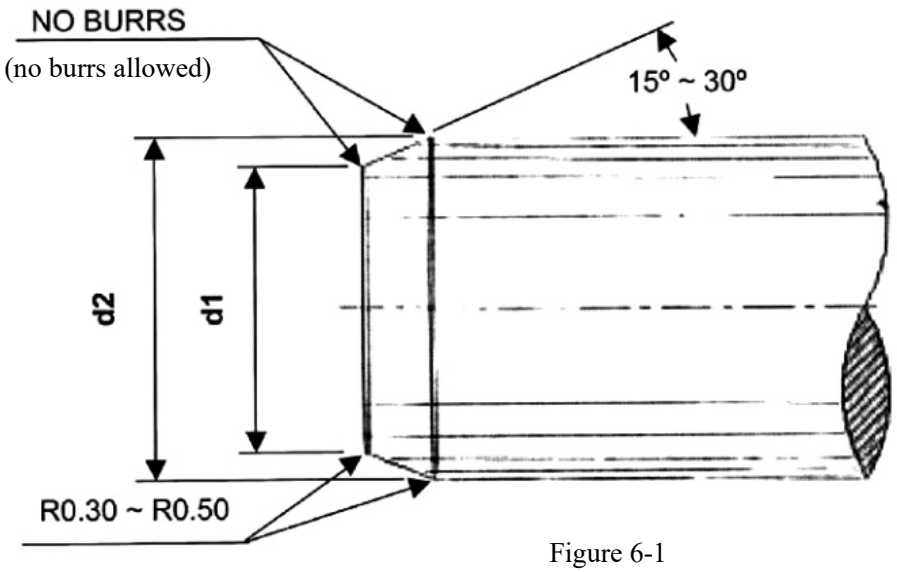


Figure 6-1

Table 6-1 Shaft chamfer size

Shaft diameter	d2-d1	Shaft diameter	d2-d1
≤10.00	1.5	50.01~70.00	4.0
10.01~20.00	2.0	70.01~95.00	4.5
20.01~30.00	2.5	95.01~130.00	5.5
30.01~40.00	3.0	130.01~240.00	7.0
40.00~50.00	3.5	240.01~500.00	11.0

6.2.5 Shaft tolerance:

For shaft tolerance, refer to RMA and ISO specifications, as shown in Table 6-2 and Table 6-3.

Shaft diameter	Tolerance
Below 4.00	+/-0.003
4.001~6.000	+/-0.004
6.001~10.00	+/-0.005
Above 10.001	+/-0.006

Table 6-2 Shaft tolerance (British system)

Shaft diameter	Tolerance
Below 3.00	+0.000/-0.060
3.01~6.00	+0.000/-0.075
6.01~10.00	+0.000/-0.090
10.01~18.00	+0.000/-0.110
18.01~30.00	+0.000/-0.130
30.01~50.00	+0.000/-0.160
50.01~80.00	+0.000/-0.190
80.01~120.00	+0.000/-0.220
120.01~180.00	+0.000/-0.250
180.01~250.00	+0.000/-0.290
250.01~315.00	+0.000/-0.320
315.01~400.00	+0.000/-0.360
400.01-500.00	+0.000/-0.400

Table 6-3 Shaft tolerance (metric system)

6.2.6 Shaft misalignment:

The performance of oil seal is affected by two types of shaft misalignment, i.e. shaft-to-bore misalignment (STBM) and run-out, as shown in Figures 6-2 and 6-3, respectively.

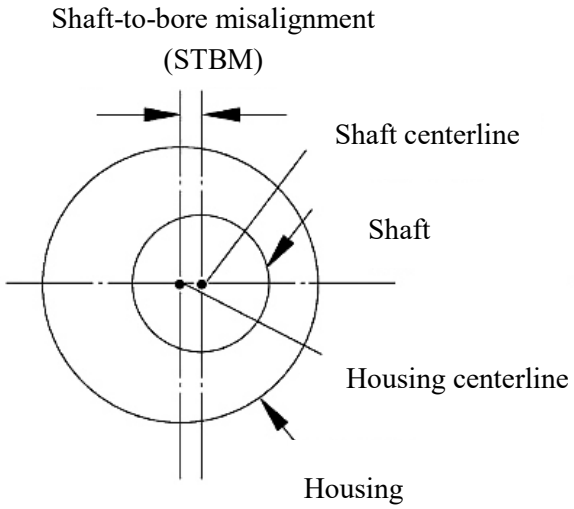


Figure 6-2

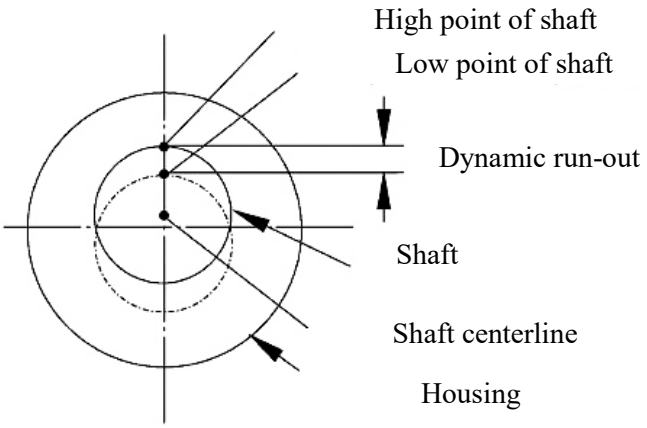


Figure 6-3

The allowable ranges of shaft run-out and STBM are as shown in Figures 6-4 and 6-5, respectively.

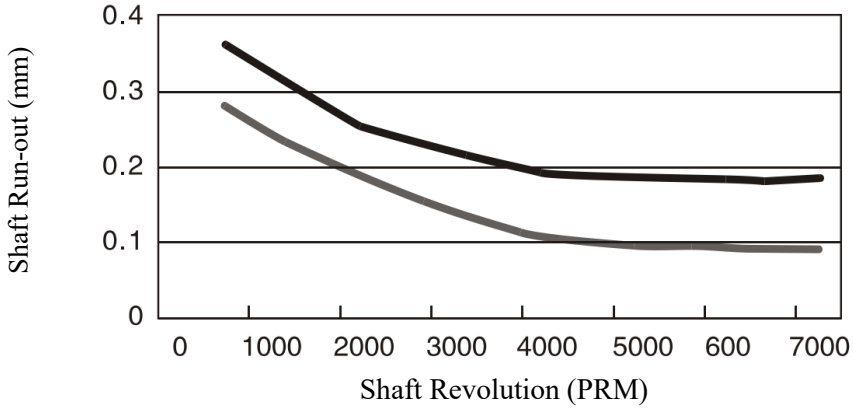


Figure 6-4

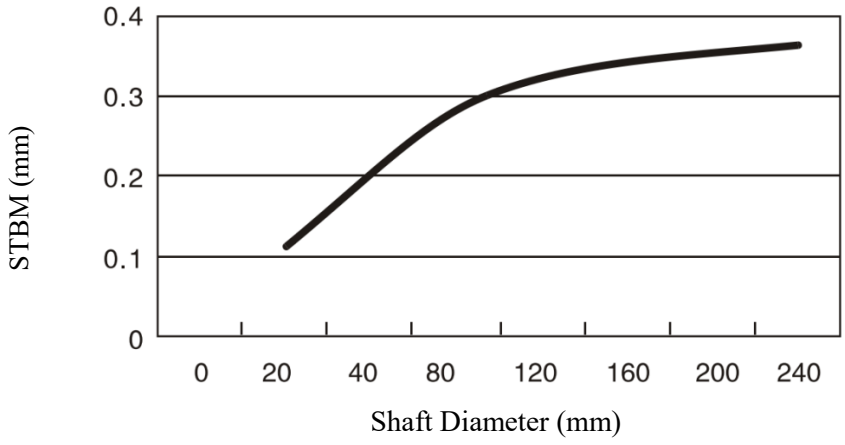
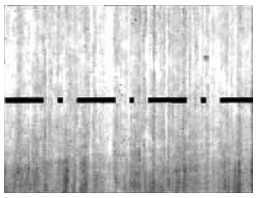
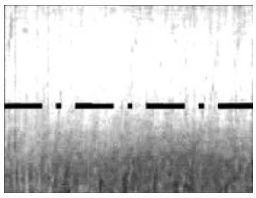
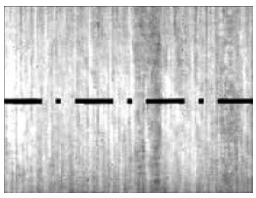
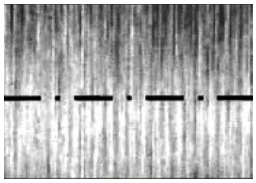


Figure 6-5

6.2.7 Shaft surface machining method:

Figure 6-6 shows the surface patterns of shafts after proper and improper machining.

	○ Axis Amplification: 63X	By using proper machining method, the machining pattern is perpendicular to the axis.
	× Axis Amplification: 63X	By using improper machining method, the machining pattern is inclined to the axis, resulting in oil leakage in a specific revolution direction of the shaft.
	○ Axis Amplification: 63X	By using improper machining method, the machining pattern is inclined to the axis, resulting in oil leakage in a specific revolution direction of the shaft.
	× Axis Amplification: 63X	By using proper machining method, the machining pattern is perpendicular to the axis.

If the machining pattern on the shaft surface is inclined to the axis, it will lead to oil leakage. Figure 6-7 below compares the oil leakage of shaft lead and non-shaft lead.

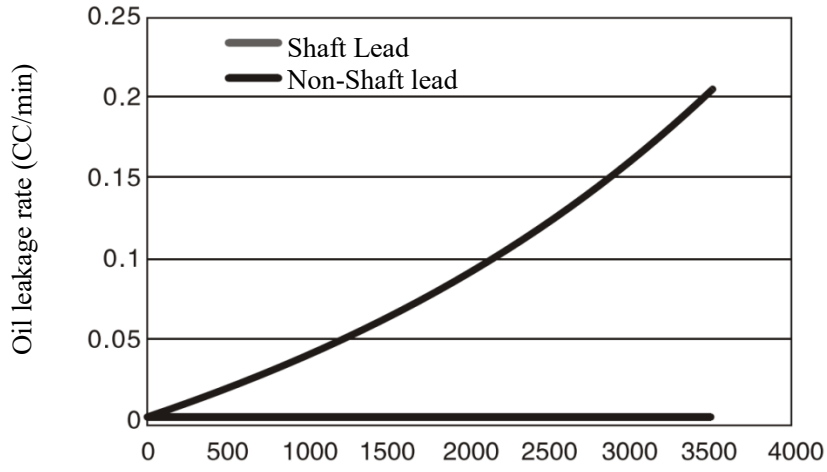
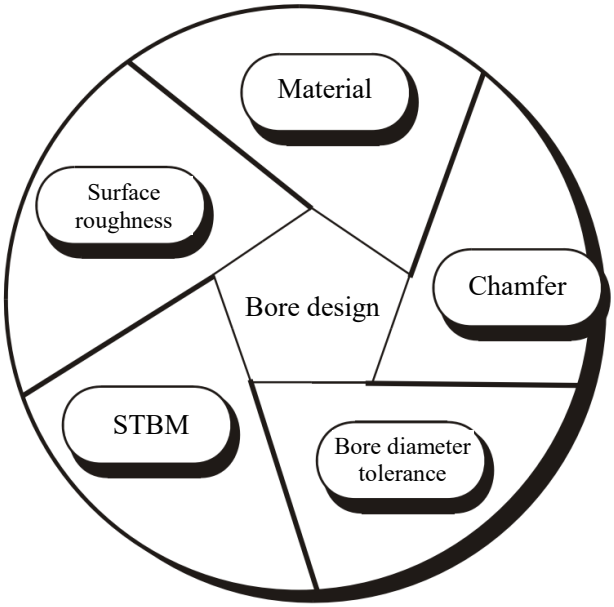


Figure 6-7

6.3 Bore design:

For the proper operation of oil seal, the requirements of oil seal mounting bores must be taken into account. We must consider the material, roughness, chamfer and tolerance used as follows.



6.3.1 Bore material:

When the mounting bore is made of steel and cast iron, it can provide a good sealing surface for the oil seal with rubber or metal outside diameter. For the mounting bore made of aluminum alloy, the oil seal with rubber outside diameter will have better sealing ability.

6.3.2 Bore roughness:

The roughness of the bore surface is 10μinch Ra or 2.5μm Ra if using oil seal with metal outside diameter or 150μinch Ra or 3.75μm Ra if using oil seal with rubber outside diameter.

6.3.3 Bore chamfer:

The bore chamfer facilitates the oil seal mounting, and the recommended design is as shown in Figure 6-8.

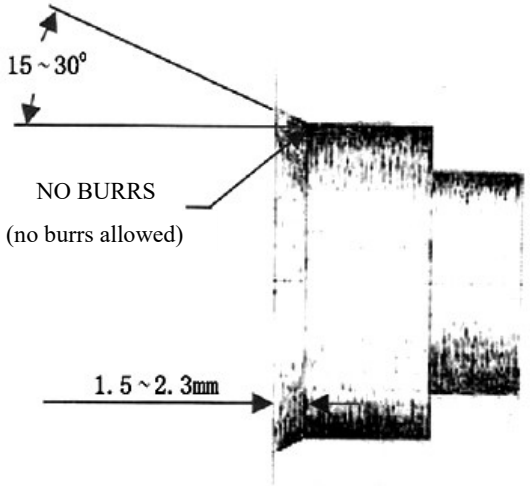


Figure 6-8

6.3.4 Bore tolerance:

For bore tolerance, refer to RMA and ISO specifications, as shown in Table 6-4 and Table 6-5.

Bore size	Tolerance
Below 3.000	+/-0.001
3.001~7.000	+/-0.0015
7.001~12.000	+/-0.002
12.001~20.000	+/-0.003
20.001~40.000	+/-0.004
40.001~60.000	+/-0.006

Table 6-4 Bore tolerance (British system)

Bore size	Tolerance
Below 10.00	+0.022/-0.000
10.01~18.00	+0.027/-0.000
18.01~30.00	+0.033/-0.000
30.01~50.00	+0.039/-0.000
50.01~80.00	+0.046/-0.000
80.01~120.00	+0.054/-0.000
120.01~180.00	+0.063/-0.000
180.01~250.00	+0.072/-0.000
250.01~315.00	+0.081/-0.000
315.01~400.00	+0.089/-0.000
415.01~500.00	+0.097/-0.000

Table 6-5 Bore tolerance (metric system)

7. Precautions for Mounting of Rotary Oil Seal

Preparation for mounting

1. The housing size shall be compared with the oil seal.
2. The housing size shall be compared with the outside diameter and width of the oil seal.
3. Check the end face processing of shaft and housing, and whether there is any damage to the outer edge.
4. Check the sealing lip of the oil seal for damage or deformation, and check the spring for coming off or rusting.
5. Clean the mounting parts.

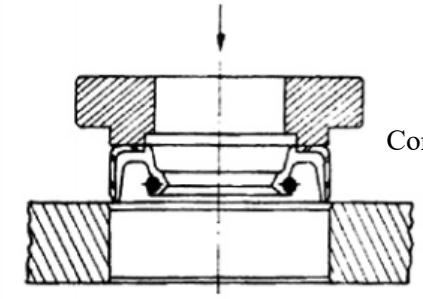
Mounting method

(1) Shaft part

Before inserting the oil seal into the shaft, grease must be applied to the sealing lip and the shaft surface, which can not only facilitate the mounting, but also reduce the dry wear at the time of operation. When a double-lip oil seal is used, grease must be applied between two lips (the amount of grease shall be 1/3-1/2 of the volume of the pit between the lips).

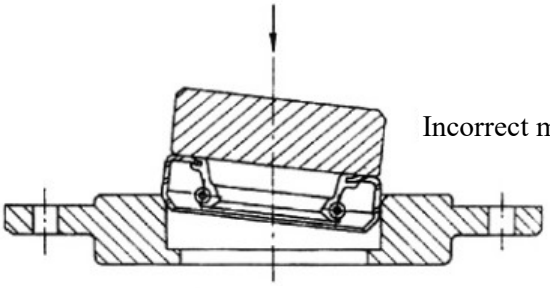
(2) Housing part

When mounting the housing, do not knock or forcefully press it. It shall be mounted by even pressure using the tools as shown in Figures 14, 15 and 16. If oil pressure or air pressure is used, the oil seal will be easily broken. At this time, the tool shown in Figure 14 can be used to carefully press it.



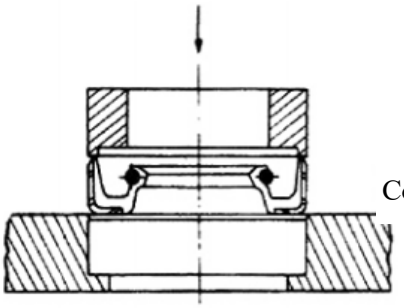
Correct mounting

Figure 14



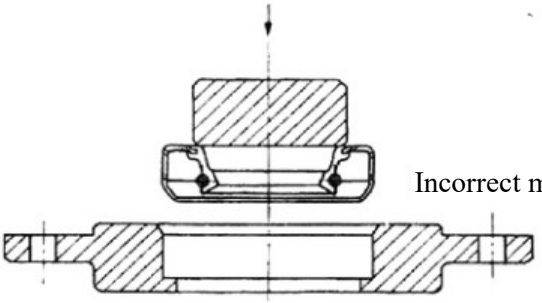
Incorrect mounting

Fig. 17



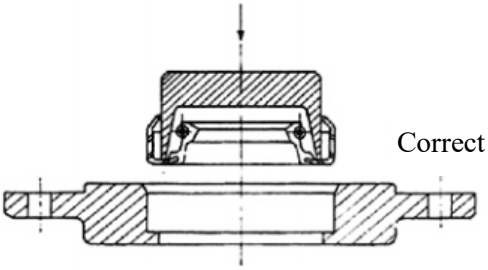
Correct mounting

Figure 15



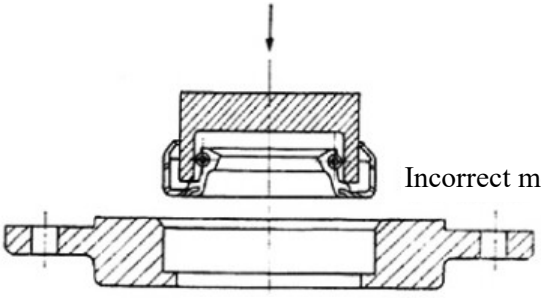
Incorrect mounting

Fig. 18



Correct mounting

Figure 16



Incorrect mounting

Fig. 19

Note: When applying non-drying grease on the shaft surface or inner surface of the housing, do not apply on the sealing lip by mistake.

(3) SQ-type oil seal

Cutting method

Cut the oil seal with a sharp tool (as thin as possible).

Remove the spring before cutting.

Cut on a flat workbench, which should be not too hard; otherwise, the tool may be damaged.

The cutting direction should be aligned with the centerline and cut vertically.

Make a cut with a heavy hammer.

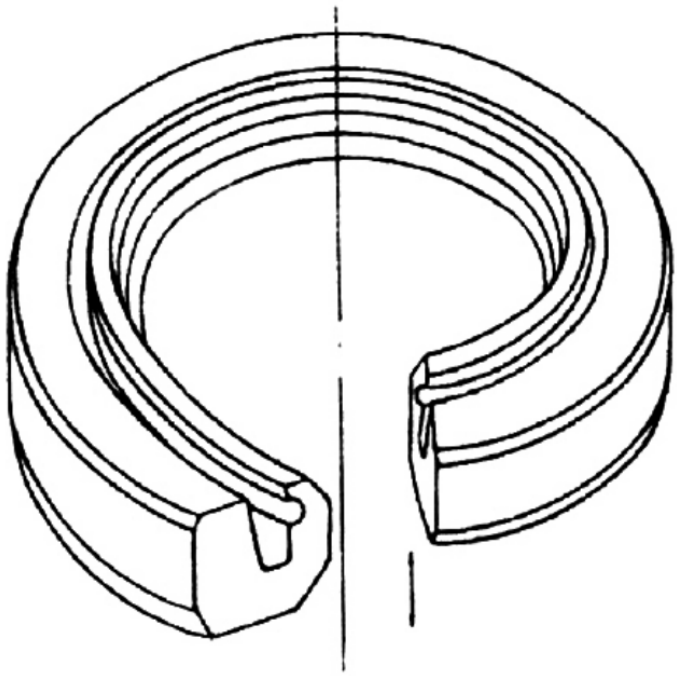


Fig. 20

Mounting

Open the oil seal in the direction of the shaft and mount it (Figure 20)

The cut part should be upward.

Don't put the cut part and the contact point of the spring in the same position.

No inadhesion is allowed at the cut part.

The removed oil seal shall not be reused.

Precautions after mounting:

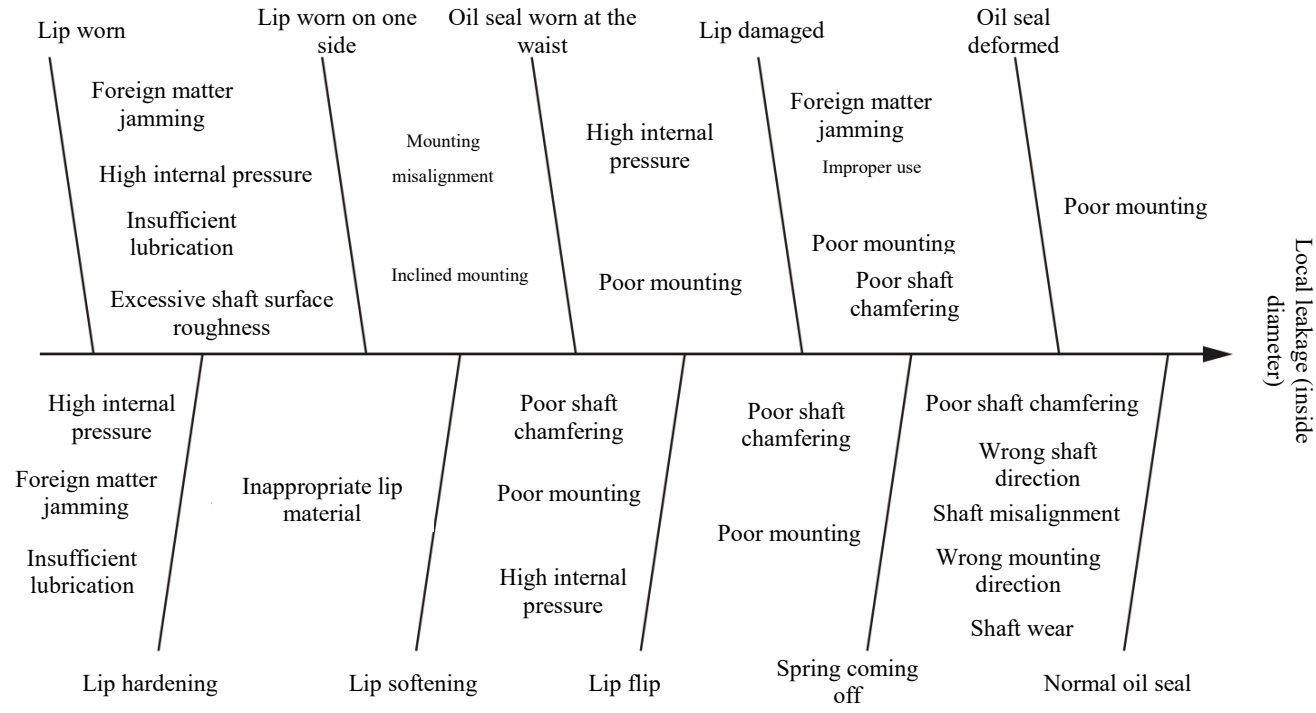
Do not clean the oil seal after mounting. If cleaning is required, please pay attention to the resistance of the oil seal material to the washing oil.

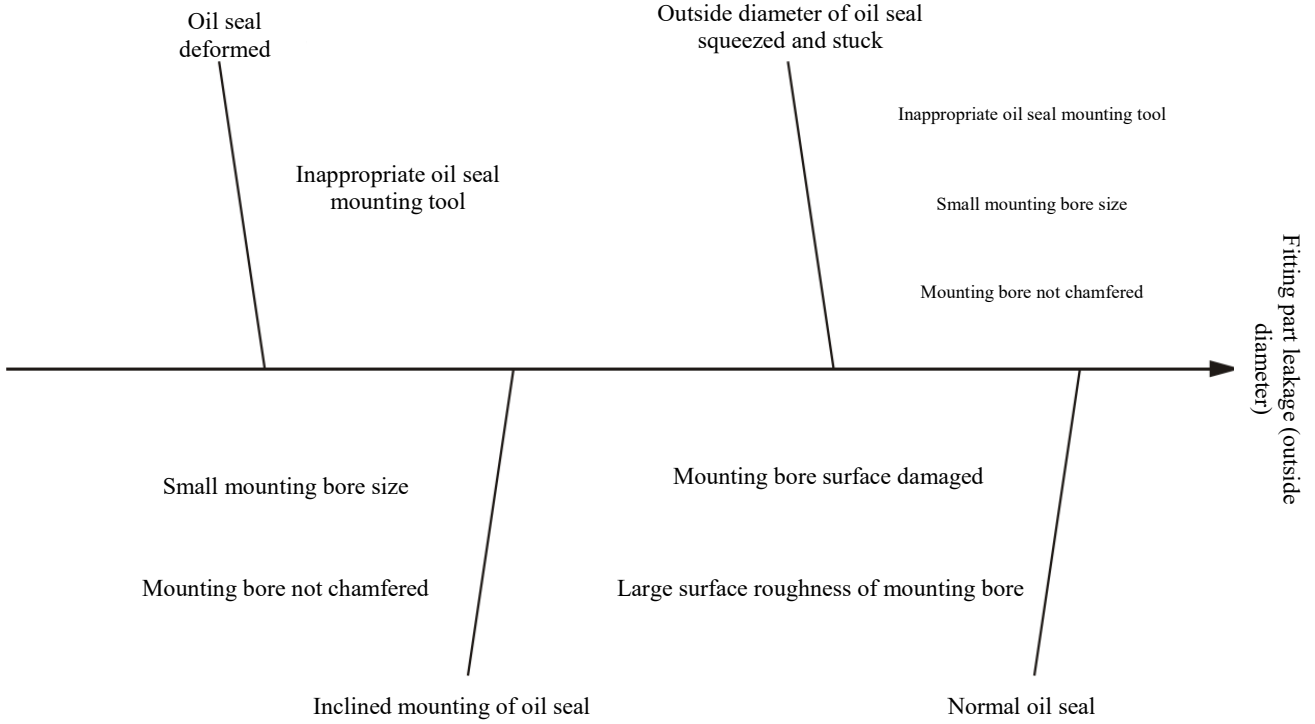
Do not paint the sealing lips or the reciprocating movement shaft when the oil seal part is to be painted.

Do not test drive at a high speed after mounting because the lubricant may dry out or it takes time for full lubrication.

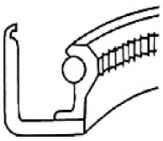
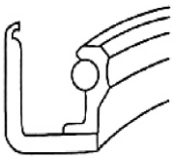
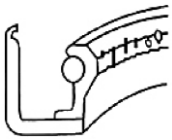
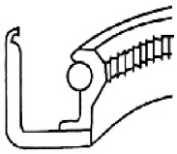
8. Failure Analysis of Rotary Oil Seal

8.1 Common failure reasons

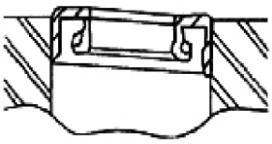
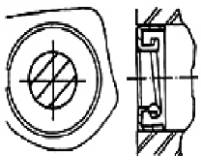
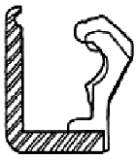
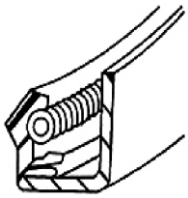




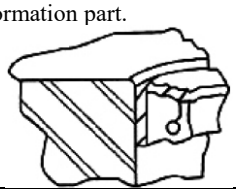
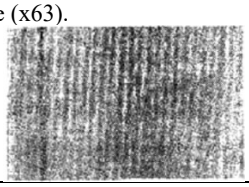
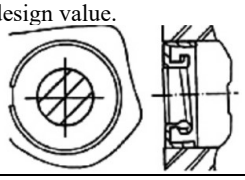
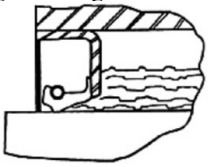
8.2.1 Lip leakage (inside diameter)

Failure item		Failure mode	Cause	Countermeasure
Lip worn	Excessive shaft surface roughness	Severe lip wear, with lead in the circumferential direction on the wear surface. 	Shaft surface roughness beyond the standard value range of Ra 0.2-0.8 μm, resulting in abnormal wear.	Correct the shaft surface roughness to within the standard value range of Ra 0.2-0.8 μm.
				Specify a shaft roughness for changing.
	Insufficient lubrication	Severe lip wear, causing the wear surface to loss luster.	Insufficient lubricating oil, resulting in dry friction of lip and abnormal wear.	Refill lubricating oil to the specified volume before rotation.
	High internal pressure	Severe lip wear, with depression. 	Pressure beyond the design value of oil seal.	Use a pressure-resistant oil seal.
				Set vent holes, so the structure is free of pressure.
	Foreign matter jamming	Severe lip wear, with depression. 	Lip stuck due to sand or dust clinging to the lip of the oil seal.	The shaft and oil seal should not be contaminated with sand or dust when mounting.
				Add dust-proof lip design to the oil seal if the mounting environment is poor.
Lip hardening	Insufficient lubrication	Smooth and lustrous lip with bursting on the hardened surface. 	Insufficient lubricating oil, resulting in dry friction of lip and abnormal wear.	Refill lubricating oil to the specified volume before rotation.
	Abnormal high temperature in local parts	Smooth and lustrous lip with cracking on the hardened surface.	Temperature beyond the design value of oil seal.	Use rubber material with good heat resistance.
			Lip temperature rise beyond the heat resistance limit of the rubber.	
	High internal pressure	Large contact width and lustrous lip with cracking on the hardened surface.	Pressure beyond the design value of oil seal.	Use a pressure-resistant oil seal.
				Set vent holes, so the structure is free of pressure.

Skeleton Rotary Oil Seal

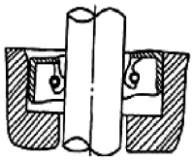
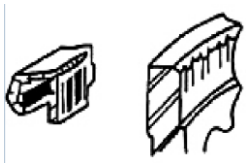
Failure item		Failure mode	Cause	Countermeasure
Lip worn on one side	Inclined mounting	Uneven contact width of lip and shaft 	Inclined oil seal due to small mounting bore size and forced mounting.	Use a mounting bore of proper size.
			Inclined oil seal due to mounting bore not chamfered and forced mounting.	Properly chamfer the mounting bore.
			Lack of proper mounting tools.	Use proper mounting tools.
	Mounting misalignment	Uneven contact width of lip and shaft 	Mount and run the shaft in case of offset with the bore.	Increase the coaxiality of shaft and mounting bore.
Lip softening	Improper lip material	Lip swelled and softened 	Lip swelling and softening due to unsuitable lubricating oil for the rubber	Use suitable lubricating oil
				Use suitable rubber material
Oil seal broken at the [illegible]	Poor mounting	Oil seal cracked at the waist. 	Oil seal cracked at the waist due to lip damage during mounting.	Align the centerline of shaft and mounting bore during mounting.
	High internal pressure		Pressure beyond the design value of oil seal.	Use a pressure-resistant oil seal.
Lip flip	Poor shaft chamfering	Part or all of the lip flipped	Incorrect chamfer size and angle at the shaft end, causing lip to get stuck at the shaft end and damaged.	Change the shaft chamfer to proper size and angle, and apply lubricant at the chamfer before mounting.
	Poor mounting		Lip flip due to misalignment of shaft and mounting bore.	Align the centerline of shaft and mounting bore during mounting. Apply lubricant at the shaft end.
	High internal pressure		Excessive pressure, causing abnormal force action on the lip to flip.	Use a pressure-resistant oil seal.
Spring coming off	Poor shaft chamfering	Part or all of the spring has come off. 	Incorrect chamfer size and angle at the shaft end, causing the lip to get stuck at the shaft end and the spring to come off.	Change the shaft chamfer to proper size and angle, and apply lubricant at the chamfer before mounting.
	Poor mounting		Spring coming off due to misalignment of shaft and mounting bore during mounting.	Align the centerline of shaft and mounting bore during mounting. Apply lubricant at the shaft end.

Skeleton Rotary Oil Seal

Failure item		Failure mode	Cause	Countermeasure
Lip damage	Poor shaft	Visible damage on the lip	Incorrect chamfer size and angle at the shaft end, causing lip to get stuck at the shaft end and damaged.	Change the shaft chamfer to proper size and angle.
	Poor mountin		Lip damaged during mounting due to burrs on the chamfer of the shaft.	Remove burrs.
	Improper use		Lip damaged due to contact with sharp objects during handling or mounting.	Avoid contact with the lip during handling and mounting.
Oil seal deformation	Foreign matter jamming	Foreign matter attached to the lip. 	Shaft stuck with lip due to long-term use in dusty and muddy environment.	Add dust-proof lip design to the oil seal if the mounting environment is poor.
	Poor mounting	Oil seal deformed, causing wider contact width at the lip deformation part. 	Oil seal deformed due to improper oil seal tools.	Use proper mounting tools.
Normal oil seal	Depressed and		Visible damage and depression on the shaft surface.	Change the contact position between shaft and lip.
	Wrong shaft direction		Shaft revolution in a fixed direction due to machining with a lathe (x63). 	Polish the vertical surface to change it directionality.
	Shaft misalignment		Shaft misalignment greater than the design value. 	Use a special oil seal that can withstand greater misalignment.
				Align the centerline of shaft and mounting bore during mounting.
	Wrong mounting		Wrong mounting direction. 	Direct the seal lip to the sealing medium during mounting.

Failure item		Failure mode	Cause	Countermeasure
Normal oil seal	Shaft wear		Foreign matter attached to the oil seal or shaft during mounting. Lubricating oil mixed with foreign matter and deteriorated. Lip stuck due to intrusion of foreign matter.	The shaft and oil seal should not be contaminated with sand or dust when mounting. Avoid excessive use of lubricant. Add dust-proof lip design to the oil seal.

8.2.2 Outside diameter leakage

Failure item	Failure mode	Cause	Countermeasure
Oil seal deformed	Partial break at the fitting part	Oil seal deformed due to improper oil seal mounting tools.	Use proper mounting tools.
		Local deformation of oil seal during use.	Be careful not to drop or hit hard objects when using.
Inclined mounting of oil seal	Visible inclined oil seal to the mounting bore and shaft before removing the oil seal.  Uneven contact width of seal lip after removing the oil seal.	Inclined oil seal due to small mounting bore size and forced mounting.	Use a mounting bore of proper size.
		Inclined oil seal due to mounting bore not chamfered and forced mounting.	Properly chamfer the mounting bore.
		Lack of proper mounting tools.	Use proper mounting tools.
Outside diameter of oil seal squeezed and stuck	Oil seal damaged in the outside diameter shaft direction or rubber crushed after removing the oil seal. 	Damaged oil seal due to small inside diameter of mounting bore and forced mounting.	Use a mounting bore of proper size.
		Damaged oil seal due to mounting bore not chamfered and forced mounting.	Properly chamfer the mounting bore.
		Oil seal crushed due to insufficient parallelism between the oil seal mounting tool and the mounting bore.	Make the oil seal mounting tool parallel to the mounting bore as required.

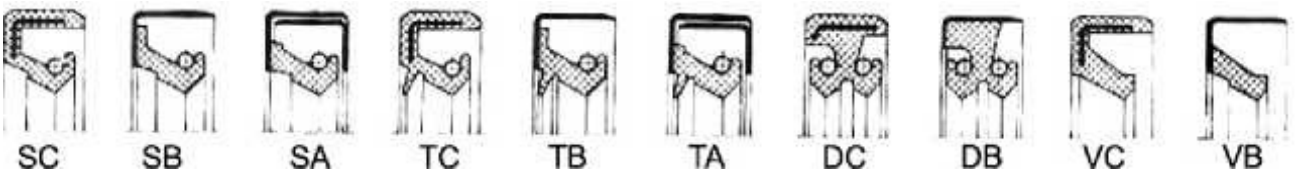
Failure item	Failure mode	Cause	Countermeasure
Normal oil seal		Mounting bore surface damaged due to foreign matter attaching to mounting bore and oil seal outside diameter when mounting the oil seal.	Avoid foreign matter from attaching to the mounting bore or oil seal when mounting the oil seal.
		Mounting bore surface pits or excessive roughness.	Specify the surface roughness of mounting bore.
		Mounting bore surface damaged due to burrs on the chamfered part of the mounting bore.	Remove the burrs on the chamfered part of the mounting bore.

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
3	10	3.5										▲
4	9	3										▲
4	12	6					▲					
4	14	5								▲		
4	16	7								▲		
5	12	3.5									▲	
5	12	5					▲			▲		
5	13	7					▲			▲		
5	14.5	7								▲		
5	15	4					▲			▲		
5	15	4.5								▲		
5	15	5					▲			▲		
5	15	6					▲			▲		
5	15	6.5								▲		
5	15	7								▲		
5	16	6					▲			▲		
5	16	7					▲			▲		
5	17	7					▲			▲		
5	17	8								▲		
5	18	5										▲
5	18	6								▲		
5	18	7					▲			▲		
5	18	8								▲		
5	18	9.5								▲		
5	19	5								▲		
5	19	7								▲		
5	22	7								▲		
5	25	7								▲		
6	10	12									▲	
6	11	3										▲
6	11	4										▲
6	12	4					▲			▲		
6	12	4.5					▲			▲		
6	12	5.5					▲			▲		
6	13	3										▲
6	13	4									▲	
6	13	4.5					▲			▲		
6	14	4				▲				▲		
6	15	4								▲		
6	15	6					▲			▲		
6	15	7								▲		
6	16	3.05							▲			
6	16	5					▲			▲		
6	16	6					▲			▲		
6	16	7				▲	▲			▲		
6	17	6					▲			▲		
6	17	7								▲		
6	18	7					▲			▲		
6	19	5					▲			▲		
6	19	6					▲			▲		
6	19	7					▲			▲		
6	20	5.5					▲			▲		
6	20	6								▲		
6	20	7								▲		
6	21	7					▲			▲		
6	22	5								▲		
6	22	6								▲		
6	22	7					▲			▲		
6	22	8								▲		
6	24	8								▲		
6	24	10								▲		
6	25	6					▲			▲		
6	31	7								▲		
6	52	8					▲					
7	13	4										▲
7	14	4								▲		▲
7	14	5					▲			▲		
7	14.5	5										▲
7	15	5					▲			▲		
7	16	4								▲		
7	16	6								▲	▲	▲
7	16	7				▲	▲			▲		
7	17	4								▲		
7	17	7								▲		
7	18	4								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
7	18	4.5								▲		
7	18	5								▲		
7	18	7				▲	▲			▲		
7	18	10								▲		
7	19	6					▲			▲		
7	19	7								▲		
7	20	5									▲	▲
7	20	7				▲	▲		▲	▲		
7	21.5	10								▲		
7	22	6								▲		
7	22	7					▲			▲		
7	22	8								▲		
7	22	10								▲		
7	26	5.5								▲		
7	26.2	5.5								▲		
7	26.4	5.5								▲		
8	12	3									▲	
8	13	2										▲
8	13	3										▲
8	13	4										▲
8	14	4				▲	▲			▲	▲	▲
8	14	5								▲		
8	14	6								▲		
8	15	4					▲			▲		
8	15	4.5								▲		
8	15	5					▲			▲		▲
8	15	7					▲			▲		
8	15.5	10				▲						
8	15	8				▲				▲		
8	16	2									▲	
8	16	3.5										▲
8	16	4								▲		
8	16	5				▲	▲			▲	▲	
8	16	6					▲			▲		
8	16	6.5					▲			▲		
8	16	7				▲	▲			▲		
8	16	7.5								▲		
8	16	8					▲			▲		
8	16	9							▲	▲		
8	16.8	6.5				▲						
8	17	4.5					▲			▲		
8	17	5								▲		▲
8	17	7								▲		
8	17	9								▲		
8	17	10								▲		
8	17	2					▲					
8	17.5	7								▲		
8	17.5	10							▲			
8	18	4									▲	▲
8	18	5					▲			▲		
8	18	6					▲			▲		
8	18	7				▲	▲			▲		
8	18	8								▲		▲
8	18	9				▲	▲					
8	19	6.5					▲			▲		
8	19	7					▲			▲		
8	19	8								▲		
8	19.5	10								▲		
8	20	5							▲	▲		
8	20	6					▲			▲		
8	20	7					▲			▲		
8	20	8					▲			▲		
8	20	10								▲		
8	21	5					▲			▲		
8	21	6					▲			▲		
8	22	5					▲				▲	▲
8	22	6								▲		
8	22	6.35								▲		
8	22	7				▲	▲			▲		
8	22	8			▲	▲	▲		▲	▲		
8	22	10								▲		
8	22	11								▲		
8	22.2	6.4					▲					
8	23	5								▲		
8	23	7										

Skeleton Rotary Oil Seal



d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
8	24	7				▲	▲			▲		
8	24	8					▲					
8	25	6										
8	25	7								▲		
8	25	8							▲	▲		
8	25.5	12								▲		
8	26	6					▲			▲		
8	26	7								▲		
8	26	8								▲		
8	28	5					▲			▲		
8	28	11								▲		
8	28.5	4.5								▲		
8	30	6								▲		
8	30	7					▲			▲		
8	30	8								▲		
8	32	5								▲		
8	34	8					▲			▲		
9	12.1	16								▲		
9	15	4								▲		
9	16	3										
9	16	4								▲		
9	16	5				▲	▲			▲		
9	16	6.5					▲					
9	16	7								▲		
9	17	4								▲		
9	17	5								▲		
9	17.5	4										▲
9	18	4.5								▲		
9	18	6				▲	▲			▲		
9	18	7					▲			▲		
9	19	4					▲			▲		
9	19	5				▲				▲		
9	19	6					▲			▲		
9	19	7							▲	▲		
9	20	4										▲
9	20	4.5								▲		
9	20	6					▲			▲		
9	20	7								▲		
9	20	8								▲		
9	20	9								▲		
9	21	5								▲		
9	21	9.5								▲		
9	21	10								▲		
9	22	5								▲	▲	▲
9	22	7				▲	▲		▲	▲		
9	24	7					▲			▲		
9	25	7								▲		
9	25	8					▲			▲		
9	25.5	12								▲		
9	26	7					▲			▲		
9	26.4	10								▲		
9	27.2	10								▲		
9	28	8										
9	29	7										
9	30	7								▲		
9	32	12								▲		
9	32.5	4.5								▲		
10	14	2.5										▲
10	15	5										
10	16	4					▲			▲		▲
10	16	5					▲			▲		
10	16	6				▲				▲		
10	16	7								▲		
1U	17	3					▲		▲	▲		▲
10	17	4				▲	▲			▲		
10	17	5				▲			▲	▲		▲
10	17	6					▲			▲		
10	17	7								▲		
10	18	4					▲		▲	▲		
10	18	5					▲			▲		
10	18	6					▲			▲		
10	18	7								▲		
10	18	8								▲		
10	19	4					▲			▲		▲
10	19	6					▲			▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	V6	VC
10	19	7				▲	▲			▲		
10	19	10								▲		
10	19	7								▲		
10	20	4								▲	▲	▲
10	20	4.5					▲			▲		
10	20	5				▲	▲			▲		
10	20	6					▲			▲		▲
10	20	7				▲	▲		▲	▲		
10	20	9								▲		
10	20	9.5								▲		
10	21	3.5									▲	
10	21	4								▲		
10	21	5					▲			▲		
10	21	6								▲		
10	21	7								▲		
10	21	8				▲	▲					
10	21.5	6.5								▲		
10	21.5	10								▲		
10	22	4					▲			▲		
10	22	5								▲		
10	22	6					▲			▲		
m	22	7				▲	▲			▲		
10	22	8			▲	▲	▲			▲		
10	22	11								▲		
10	22.3	8					▲					
10	23	7								▲		
10	23	8								▲		
10	23	9								▲		
10	23.5	7								▲		
10	23.5	8								▲		
10	23.5	9								▲		
10	24	4								▲		
10	24	6					▲			▲		
10	24	7					▲			▲		
10	24	10					▲			▲		
10	25	4.5								▲		
10	25	5								▲	▲	▲
10	25	6					▲			▲		
10	25	7				▲	▲		▲	▲		
10	25	8					▲			▲		
10	25	10								▲		
10	25.5	12								▲		
10	26	5.5					▲			▲		
10	26	6								▲		
10	26	7					▲			▲		
10	26	8				▲	▲			▲		
10	26	10								▲		
10	26.4	10								▲		
10	26.5	13								▲		
10	27.5	8								▲		
10	27.5	10								▲		
10	28	3.1									▲	
10	28	7					▲			▲		
10	28	8				▲	▲		▲	▲		
10	28	13.4								▲		
10	29	7								▲		
10	30	6								▲		
10	30	7				▲	▲			▲		
10	30	8								▲		
10	30	10					▲			▲		
10	30	12								▲		
10	31.9	13.4		▲						▲		
10	32	7								▲		
10	32	12								▲		
10	35	10					▲			▲		
10	40	7					▲			▲		
11	10	6					▲					
11	14.5	3.5									▲	
11	17	4					▲			▲		
11	17	5						▲	▲	▲		
11	17.2	4								▲		
11	18	4					▲			▲		
11	18	5								▲		
11	19	5				▲						
11	19	6								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
11	20	6				▲						
11	20	7								▲		
11	21	4										▲
11	21	7								▲		
11	21	8								▲		
11	22	5								▲		
11	22	6								▲		
11	22	7				▲	▲			▲		
11	22	8								▲		
11	23	7								▲		
11	23	8					▲			▲		
11	23.5	7								▲		
11	24	7								▲		
11	24	10					▲					
11	25	7				▲	▲		▲	▲		
11	25	8								▲		
11	26	6					▲			▲		
11	26	7					▲			▲		
11	28	7								▲		
11	30	5								▲		
11	30	7				▲	▲			▲		
11	30	10		▲			▲		▲	▲		
12	18	3					▲			▲	▲	▲
12	18	4				▲	▲			▲		
12	18	4.5					▲			▲		▲
12	16	5								▲	▲	▲
12	18	5				▲					▲	
12	18	7								▲		
12	18	11										▲
12	18.5	3										▲
12	19	3								▲	▲	
12	19	4					▲			▲		
12	19	4.5					▲			▲		
12	19	5				▲	▲			▲	▲	
12	19	6								▲		
12	19.5	7								▲		
12	20	4.5					▲			▲		
12	20	4					▲			▲		
12	20	5			▲	▲			▲	▲	▲	
12	20	5.5							▲			
12	20	6								▲		
12	20	7								▲		
12	20.5	3.5							▲			
1?	21	4					▲			▲		
12	21	5					▲			▲		
12	21	7					▲	▲	▲	▲		
12	22	4				▲				▲	▲	▲
12	22	4.5					▲			▲		
12	22	5					▲			▲		
12	22	6					▲			▲		
12	22	6.5					▲			▲		
12	22	7				▲	▲		▲	▲		
12	22	8					▲			▲		
12	22	9								▲		
12	23	7								▲		
12	23	8							▲	▲		
12	23	9					▲			▲		
12	23.5	8								▲		
12	24	4.5					▲			▲		
12	24	5					▲			▲		
12	24	6					▲			▲		
12	24	6.5					▲			▲		
12	24	7				▲	▲			▲		
12	24	7.5					▲					
12	24	8					▲			▲		
12	24	10					▲			▲		
12	24.5	10					▲					
12	25	4.5					▲			▲		
12	25	5				▲				▲	▲	▲
12	25	6				▲				▲		
12	25	7				▲	▲		▲	▲		
12	25.5	7								▲		
12	25	8								▲		
12	25	8.2								▲		
12	25	10								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
12	25	23				▲						
12	25	26.3								▲		
12	25	7								▲		
12	26	6					▲			▲		
12	26	7					▲			▲		
12	26	8					▲			▲		
12	26	10								▲		
12	26.3	6								▲		
12	27	7					▲			▲		
12	28	4.5								▲		
12	28	5					▲					
12	28	6								▲		
12	29	7										
12	28	7.5								▲		
12	28	8								▲		
12	28	10								▲		
12	28	13.4								▲		
12	28.5	7								▲		
12	29	4.5								▲		
12	30	5					▲			▲		
12	30	6					▲			▲	▲	▲
12	30	7					▲		▲	▲		
12	30	8								▲		
12	30	9				▲	▲		▲	▲		
12	30	10								▲		
12	32	4								▲		
12	32	5				▲	▲			▲	▲	▲
12	32	5.5								▲		
12	32	6				▲	▲			▲		
12	32	7				▲	▲			▲	▲	
12	32	8					▲					
12	32	10					▲			▲		
12	32	13.5			▲							
12	34	7								▲		
12	35	4.3					▲			▲		
12	35	6								▲		
12	35	7				▲				▲		
12	35	10					▲			▲		
12	36.5	15								▲		
12	37	7								▲		
12	37	10					▲			▲		
12	40	10								▲		
12	42	8					▲			▲		
12	45	7					▲			▲		
13	17.5	2.5									▲	
13	19	3									▲	▲
13	19	4.2							▲			
13	19.7	4.5							▲			
13	19.75	24.5									▲	
13	20	4							▲			
13	20	5								▲		
13	20	5.5							▲			
13	20	7								▲		
13	21	7								▲		
13	22	4					▲			▲		▲
13	22	5					▲		▲	▲		
13	22	5.5				▲			▲			
13	22	7					▲			▲		
13	22	6								▲		
13	23	2										▲
13	23	4					▲					
13	23	7								▲		
13	24	6				▲	▲			▲		
13	24	7					▲			▲		
13	25	4					▲			▲		
13	25	5					▲			▲		
13	25	7				▲	▲		▲	▲		
13	26	4										▲
13	26	5					▲			▲		
13	26	6					▲			▲		
13	26	7					▲			▲		
13	26	9								▲		
13	27	7								▲		
13	27	8								▲		
13	28	5					▲				▲	▲

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
13	28	7				▲	▲		▲	▲		
13	28	36		▲								
13	28.6	63.5										▲
13	29	7								▲		
13	30	3								▲		
13	30	5					▲			▲		
13	30	7								▲		
13	30	8				▲	▲			▲		
13	30	9				▲	▲		▲	▲		
13	30	10					▲			▲		
13	32	6					▲			▲		
13	32	7					▲			▲		
13	35	7								▲		
13	35	10					▲			▲		
13	37	7					▲					
13	50.8	63.5				▲						▲
14	20	3										
14	20	4								▲		▲
14	20	5								▲	▲	▲
14	20	7								▲		
14	21	4					▲					▲
14	21	5								▲		
14	21.9	3.55									▲	
14	22	4					▲			▲		
14	22	5				▲				▲		
14	22	6				▲				▲		
14	22	7								▲		
14	22.2	3.99					▲					
14	23	5										
14	23	6				▲	▲					
14	23	7								▲		
14	23.5	6					▲					
14	24	3.5								▲		
14	24	4					▲			▲	▲	▲
14	24	5					▲		▲	▲		
14	24	6				▲	▲		▲	▲	▲	▲
14	24	7				▲	▲		▲	▲		
14	24	8					▲			▲		
14	25	5					▲			▲		
14	25	5.5					▲					
14	25	6					▲			▲		
14	25	7				▲	▲		▲	▲		
14	25	8					▲			▲		
14	25	9								▲		
14	25	10					▲					
14	25	16								▲		
14	25	17.5								▲		
14	25.5	7								▲		
14	26	5									▲	
14	26	6					▲			▲		
14	26	7								▲		
14	26	8		▲						▲		
14	27	6					▲			▲		
14	27	7								▲		
14	27	8					▲			▲		
14	28	5									▲	▲
14	28	6								▲		
14	28	7		▲		▲	▲	▲	▲	▲		
14	28	8					▲			▲		
14	28	9								▲		
14	28	10								▲		
14	28	11							▲	▲		
14	28	13.4								▲		
14	28.5	13								▲		
14	28.58	7								▲		
14	29	7								▲		
14	30	6					▲			▲		
14	30	7					▲			▲		
14	30	7.5								▲		
14	30	8			▲	▲				▲		
14	30	9								▲		
14	30	10								▲		
14	32	5					▲			▲		
14	32	6								▲		
14	32	7								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
14	32	7.5								▲		
14	32	8								▲		
14	32	9				▲	▲		▲	▲		
14	32	10					▲			▲		
14	32	13.4								▲		
14	34	6									▲	▲
14	34	7					▲					
14	35	4.5								▲		
14	35	6								▲		
14	35	7					▲			▲		
14	35	8								▲		
14	35	10			▲	▲				▲		
14	36	7								▲		
14	40	7					▲			▲		
14	40	10								▲		
15	19	3									▲	
15	20	3				▲						▲
15	21	3								▲	▲	▲
15	21	4					▲			▲		▲
15	21	4.4							▲			
15	21	5					▲			▲		▲
15	21	6							▲			
15	21	7					▲					
15	21.6	7.6										▲
15	22	4								▲	▲	▲
15	22	5						▲	▲	▲		
15	22	7					▲			▲		
15	22	8					▲					
15	23	4					▲			▲		
15	23	5								▲	▲	▲
15	23	7								▲		
15	24	4					▲			▲		▲
15	24	4.5								▲		
15	24	4 75					▲			▲		
15	24	5					▲			▲		
15	24	6								▲		
15	24	6.5								▲		
15	24	7	▲			▲	▲		▲	▲		
15	24	8					▲					
15	24	9					▲					
15	24	10								▲		
15	24.5	5								▲		
15	24.5	7.2								▲		
15	24.7	2								▲		
15	25	4								▲	▲	A
15	25	4.5				▲	▲			▲	▲	▲
15	25	6			▲	▲	▲			▲		▲
15	25	7				▲	▲		▲	▲		
15	25	8								▲		
15	25.5	4.6					▲			▲		
15	25.5	7				▲	▲			▲		
15	26	3.5										▲
15	26	4					▲			▲		
15	26	4.5								▲		
15	26	5								▲		
15	26	6					▲		▲	▲		
15	26	7				▲	▲		▲	▲		
15	26	8								▲		
15	26	9				▲		▲	▲	▲		
15	26.5	4.6					▲			▲		
15	27	7					▲			▲		
1S	28	4					▲			▲		
15	28	5					▲			▲		
15	28	6					▲			▲		
15	28	7				▲	▲	▲	▲	▲		
15	28	8					▲			▲		
15	28	9					▲					
15	28	10								▲		
15	28	34.6					▲					
15	28.58	7								▲		
15	29	7								▲		
15	29.6	4							▲	▲		
15	30	4					▲				▲	▲
15	30	4.5					▲			▲		
15	30	5					▲			▲	▲	▲

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
15	30	5.5					▲		▲	▲		
15	30	6							▲	▲		
15	30	7	▲			▲	▲		▲	▲		
15	30	8					▲	▲	▲	▲		
15	30	10		▲	▲	▲	▲	▲	▲	▲		
15	30	12								▲		
15	31	5										▲
15	31	7					▲			▲		
15	31	10								▲		
15	32	5								▲		
15	32	5.5					▲			▲		
15	32	6									▲	▲
15	32	7				▲	▲		▲	▲		
15	32	7.5								▲		
15	32	8								▲		
15	32	9				▲	▲		▲	▲		
15	32	10								▲		
15	33	7					▲			▲		
15	33	10								▲		
15	34	10				▲	▲					
15	35	5					▲			▲		
15	35	5.5								▲		
15	35	6								▲	▲	▲
15	35	7				▲	▲		▲	▲		
15	35	8				▲	▲		▲	▲		
15	35	9								▲		
15	35	10					▲	▲	▲	▲		
15	35.5	5.5								▲		
15	36	7					▲			▲		
15	37	6								▲		
15	37	7				▲	▲			▲		
15	37	10					▲			▲		
15	38	7								▲		
15	38	10								▲		
15	38	12								▲		
15	39	10								▲		
15	40	7								▲		
15	40	8								▲		
15	40	10			▲	▲	▲			▲		
15	42	7					▲			▲		
15	42	8								▲		
15	42	10				▲	▲			▲		
15	46	7								▲		
15	47	10								▲		
15	48	8								▲		
15	50	7					▲			▲		
16	22	3								▲		▲
16	22	4				▲				▲		
16	22	5					▲			▲		
16	22	6								▲	▲	
16	22	7					▲			▲		
16	22.75	4								▲		
16	23	4								▲		
16	23	7								▲		
16	24	3								▲		
16	24	4				▲	▲		▲	▲	▲	▲
16	24	5					▲		▲	▲		
16	24	6							▲	▲		
16	24	6.5								▲		
16	24	7				▲	▲		▲	▲		
16	24.6	5.2									▲	
16	25	4								▲		
16	25	5								▲		
16	25	6					▲			▲		
16	25	7								▲		
16	25.5	6								▲		
16	25.5	7					▲					
16	26	3.5										▲
16	26	4					▲			▲		
16	26	5					▲			▲		
16	26	6					▲			▲		
16	26	7				▲	▲	▲	▲	▲		
16	26	8								▲		
16	26	12								▲		
16	27	6								▲		

d	D	H	DB	DC	SA	SB	SC	TA	IB	TC	VB	VC
16	27	7								▲		
16	28	4									▲	▲
16	28	5				▲	▲					
16	28	6				▲	▲			▲		
16	28	7		▲		▲	▲		▲	▲		
16	28	6.3							▲			
16	28	8					▲		▲	▲		
16	28	10								▲		
16	28.5	8								▲		
16	28.58	7			▲					▲		
16	28.65	7								▲		
16	28.8	6.8							▲			
16	29	4								▲		
16	29	7								▲		
16	29	9.5					▲			▲		
16	29	10					▲			▲		
16	30	4.5					▲			▲		
16	30	5					▲			▲	▲	▲
16	30	6								▲		
16	30	7			▲	▲	▲		▲	▲		
16	30	8					▲		▲	▲		
16	30	10					▲	▲	▲	▲		
16	31	5					▲					
16	31	39		▲								
16	31.5	6.5							▲			
16	32	6					▲			▲		
16	32	7				▲	▲			▲		
16	32	8				▲	▲			▲		
16	32	10			▲	▲				▲		
16	33	8					▲			▲		
16	34	4								▲		
16	34	10								▲		
16	35	6					▲			▲		
16	35	7				▲				▲		
16	35	8					▲			▲		
16	35	9		▲		▲	▲		▲	▲		
16	35	10					▲			▲		
16	36	7								▲		
16	36.5	7								▲		
16	37	7							▲	▲		
16	38	7					▲			▲		
16	38	8				▲		▲	▲	▲		
16	38	10					▲			▲		
16	40	5					▲			▲		
16	40	7								▲		
16	40	8								▲		
16	40	9								▲		
16	40	10								▲		
16	42	7								▲		
16	42	10								▲		
16	47	7								▲		
16	47	8								▲		
16	48	7								▲		
16	52	7								▲		
17	23	3									▲	
17	23	4				▲						
17	24	5					▲			▲		▲
17	24	7					▲			▲		
17	24.5	2								▲		
17	25	3								▲		
17	25	4					▲			▲		
17	25	4.5								▲		
17	25	5									▲	▲
17	25	5.5					▲					
17	25	6					▲			▲		
17	25	7								▲		
17	25	8								▲		
17	25	9								▲		
17	25	10								▲		
17	25.58	7								▲		
17	26	5					▲			▲		
17	26	6					▲			▲		
17	26	7					▲		▲	▲		
17	27	5								▲		
17	27	6								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
17	27	7								▲		
17	27	8								▲		
17	27	10					▲			▲		
17	28	4.5					▲			▲		
17	28	5				▲	▲			▲		
17	28	6	▲				▲		▲	▲		
17	28	6.5	▲									
17	28	7	▲			▲	▲		▲	▲		
17	28	8	▲	▲			▲			▲		
17	28	10								▲		
17	28	34.6					▲					
17	28	38					▲					
17	28,5	5					▲					
17	26.5	6					▲			▲		
17	28.5	7		▲						▲		
17	28.5	9								▲		
17	285	10								▲		
17	28.55	7.92				▲						
17	28.58	7								▲		
17	28.65	7								▲		
17	29	5					▲			▲		
17	29	7								▲		
17	29	8								▲		
17	29.7	1.6									▲	
17	30	4					▲			▲		
17	30	5					▲			▲	▲	▲
17	30	6				▲	▲		▲	▲		
17	30	7				▲	▲		▲	▲	▲	▲
17	30	8				▲	▲		▲	▲		
17	30	9		▲						▲		
17	30	10								▲		
17	31	6								▲		
17	31	7					▲		▲	▲		
17	31	8							▲	▲		
17	31.75	8								▲		
17	32	5								▲		
17	32	6								▲	▲	▲
17	32	7				▲	▲		▲	▲		
17	32	7.5								▲		
17	32	8				▲	▲		▲	▲		
17	32	10			▲	▲	▲			▲		
17	32	15								▲		
17	33	7				▲	▲	▲	▲	▲		
17	33	8					▲			▲		
17	33	10								▲		
17	33	15								▲		
17	34	4				▲	▲		▲	▲		
17	34	6								▲		
17	34	7					▲		▲	▲		
1/	34	7.9							▲			
17	34.5	4							▲			
17	35	5					▲			▲	▲	▲
17	35	6				▲	▲			▲		
17	35	7				▲	▲		▲	▲		
17	35	8				▲	▲		▲	▲		
17	35	9								▲		
17	35	10					▲		▲	▲		
17	36	7								▲		
17	37	5								▲		
17	37	7					▲		▲	▲		
17	37	10					▲	▲	▲	▲		
17	38	5								▲		
17	38	6								▲		
17	38	7				▲	▲		▲	▲		
17	39	9.5								▲		
17	39.9	5							▲	▲		
17	40	5								▲		
17	40	6					▲		▲	▲		
17	40	6.5					▲					
17	40	6.7					▲					
17	40	7					▲			▲		
17	40	8				▲	▲			▲		
17	40	8.5					▲			▲		
17	40	9							▲	▲		
17	40	10			▲	▲	▲			▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
17	42	2.2		▲								
17	42	5								▲		
17	42	7								▲		
17	45	7								▲		
17	47	7					▲			▲		
17	47	8								▲		
17	47	10					▲			▲		
17	24	4				▲	▲		▲	▲	▲	▲
17	24	5					▲			▲		
18	24	6					▲			▲		
18	24	7								▲		
18	25	4				▲				▲		
18	25	7								▲		
18	25	6.5										▲
18	25	7								▲		
18	26	4								▲	▲	
18	26	4.5								▲		
18	26	5					▲			▲		
18	26	6								▲		
18	26	7					▲			▲		
18	27	5					▲			▲		
18	27	7								▲		
18	28	4					▲			▲		
18	28	5					▲			▲		
18	28	6				▲				▲		
18	28	6.5								▲		
18	28	7				▲	▲		▲	▲		
18	28	8					▲			▲		
18	28	9								▲		
18	28	10								▲		
18	28.5	7								▲		
18	28.5	13.4								▲		
18	29	5					▲			▲		
18	29	6								▲		
18	29	7								▲		
18	30	5								▲	▲	▲
18	30	6								▲		
18	30	6.3								▲		
18	30	6.5								▲		
18	30	7		▲	▲	▲	▲		▲	▲		
18	30	7.5								▲		
18	30	8				▲	▲		▲	▲		
18	30	10		▲				▲	▲	▲		
18	31	7								▲		
18	31	8								▲		
18	31	10								▲		
18	31.5	7								▲		
18	31.7	8				▲						
18	32	4					▲			▲		
18	32	4.5					▲			▲		
18	32	4.7					▲					
18	32	5										▲
18	32	6								▲		
18	32	7					▲		▲	▲		
18	32	8					▲	▲	▲	▲		
18	32	9				▲	▲			▲		
18	32	10		▲						▲		
18	33	7								▲		
18	33	8						▲	▲	▲		
18	33	10		▲								
18	34	7								▲		
18	34	8							▲	▲		
18	35	4					▲					
18	35	5					▲			▲		
18	35	6					▲			▲	▲	▲
18	35	7				▲	▲			▲		
18	35	8				▲	▲		▲	▲		
18	35	9				▲	▲		▲	▲		
18	35	10			▲	▲	▲			▲		
18	36	7					▲			▲		
18	36	8								▲		
18	37	5					▲			▲		
18	37	6					▲			▲		
18	37	7								▲		
18	37	8					▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SO	TA	TB	TC	VB	VC
18	38	5					▲			▲		
18	38	6								▲		
18	38	7				▲	▲		▲	▲	▲	▲
18	38	8								▲		
18	38	10								▲		
18	40	6								▲		
18	40	7					▲			▲		
18	40	8								▲		
18	40	10					▲			▲		
18	42	7								▲		
18	42	8					▲			▲		
18	42	10								▲		
18	43	8.5					▲			▲		
18	47	8								▲		
18	47	10								▲		
19	25	3										▲
19	25	7										▲
19	26	5					▲					▲
19	26.5	4									▲	
19	26.5	7								▲		
19	20.97	4.6										▲
19	27	4								▲		
19	27	4.6										▲
19	27	5								▲		
19	27	6			▲	▲	▲			▲		
19	27	7								▲		
19	27	10								▲		
19	27.25	5								▲		
19	27.5	8								▲		
19	28	5					▲			▲		
19	28	6								▲		
19	28	7								▲		
19	28.56	4.3									▲	
19	29	5					▲			▲		
19	29	7		▲						▲		
19	30	4.5								▲		
19	30	6					▲			▲		
19	30	6				▲				▲		
19	30	6.5								▲		
19	30	7					▲		▲	▲		▲
19	30	8				▲	▲			▲		
19	30	9								▲		
19	30.5	8.5							▲	▲		
19	31	6					▲			▲		
19	31	8					▲			▲		
19	32	4								▲		
19	32	5								▲		
19	32	6								▲		
19	32	6.5								▲		
19	32	6.6							▲			
19	32	7								▲		
19	32	8							▲	▲		
19	32	10								▲		
19	33	7								▲		
19	33	8								▲		
19	33.3	8								▲		
19	33.35	10								▲		
19	33.5	7								▲		
19	33.5	8								▲		
19	34	6								▲		
19	34	7					▲			▲		
19	34	8								▲		
19	34	10								▲		
19	34	15								▲		
19	35	5								▲		
19	35	5.5					▲					
19	35	6					▲			▲	▲	▲
19	35	7					▲		▲	▲		
19	35	8				▲	▲		▲	▲		
19	35	9.5								▲		
19	35	10					▲			▲		
19	35	10.3						▲	▲	▲		
19	35	11					▲					
19	35.05	10					▲					
19	36	7					▲		▲	▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
19	36	8					▲			▲		
19	36	10										
19	36	16								▲		
19	37	6										
19	37	7					▲					
19	37	8			▲	▲	▲			▲		
19	38	7				▲	▲		▲	▲		
19	38	8										
19	38	10				▲	▲		▲	▲		
19	39	7										
19	40	6									▲	▲
19	40	7										
19	40	6					▲			▲		
19	40	10										
19	41	8								▲		
19	41.5	7								▲		
19	41.5	8										
19	42	6.5										
19	42	7								▲		
19	44	7										
19	45.2	6.6					▲					
19	46	17										
19	47	7								▲		▲
19	47	8										
19	47	10								▲		
19	47	13								▲		
19	50	7								▲		
19	52	6										
19	52	7								▲		
20	25	7								▲		
20	26	3										▲
20	26	4				▲	▲			▲	▲	▲
20	26	5								▲		
20	26	6								▲	▲	▲
20	26	7										
20	27	4								▲		▲
20	28	3										
20	28	4					▲		▲	▲	▲	
20	28	5										
20	28	6					▲			▲		▲
20	28	7				▲				▲		
20	28	10										
20	28	11								▲		
20	28.4	4										
20	29	7								▲		
20	30	4					▲			▲		
20	30	4.5					▲			▲		▲
20	30	4.7										
20	30	5				▲	▲		▲	▲		
20	30	5.5										
20	30	6					▲		▲	▲		
20	30	7				▲	▲		▲	▲		▲
20	30	8										
20	30	9										
20	30	10										
20	30	33.5					▲					
20	31	5								▲		
20	31	6										
20	31	7				▲			▲	▲		
20	31.75	5										
20	32	5				▲	▲			▲	▲	▲
20	32	6				▲	▲		▲	▲		
20	32	7				▲	▲		▲	▲		
20	32	7.8										
20	32	8				▲	▲		▲	▲		
20	32	8.5								▲		
20	32	9										
20	32	10										
20	32	12								▲		
20	32.5	5										
20	33	5								▲		
20	33	7										
20	33	8					▲			▲		
20	33	9										
20	33	10		▲	▲	▲	▲			▲		

Skeleton Rotary Oil Seal

d	D	H	D6	DC	SA	SB	SC	TA	TB	TC	VB	VC
20	33.5	7					▲			▲		
20	34	4					▲			▲		
20	34	5					▲				▲	▲
20	34	6					▲			▲		
20	34	7				▲	▲	▲	▲	▲		
20	34	8								▲		
20	34	10		▲								
20	35	4								▲		
20	35	4.5							▲	▲		▲
20	35	5					▲			▲		
20	35	5.5					▲			▲		
20	35	6					▲			▲	▲	▲
20	35	7		▲		▲	▲		▲	▲		
20	35	8		▲	▲	▲	▲		▲	▲		
20	35	9								▲		
20	35	10			▲	▲	▲		▲	▲		
20	35	11								▲		
20	35	12							▲	▲		
20	35	13								▲		
20	35.5	5					▲					
20	36	6								▲		
20	36	7				▲	▲		▲	▲		
20	36	8								▲		
20	36	9		▲								
20	36	10		▲		▲	▲			▲		
20	36	12								▲		
20	37	6								▲		
20	37	7					▲		▲	▲		
20	37	7.5					▲			▲		
20	37	8					▲			▲		
20	37	9							▲	▲		
20	37	10					▲		▲	▲		
20	38	5					▲			▲		
20	38	6					▲			▲		
20	38	6.5								▲		
20	38	7					▲		▲	▲		
20	38	8					▲			▲		
20	38	10					▲			▲		
20	38	15		▲						▲		
20	38.9	5					▲					
20	40	4					▲	▲	▲	▲		
20	40	5								▲	▲	▲
20	40	6								▲		
20	40	6.5										▲
20	40	7		▲		▲	▲		▲	▲	▲	▲
20	40	8		▲		▲	▲		▲	▲		
20	40	9		▲			▲		▲	▲		
20	40	9.5								▲		
20	40	10		▲	▲	▲	▲	▲	▲	▲		
20	40	11				▲	▲		▲	▲		
20	40	12								▲		
20	40	19										
20	40	60					▲					
20	40	10.5								▲		
20	41	5								▲		
20	41	7								▲		
20	41.5	7								▲		
20	42	5								▲		
20	42	6								▲	▲	▲
20	42	6.5								▲		
20	42	7				▲	▲		▲	▲		
20	42	8							▲	▲		
20	42	10				▲	▲			▲		
20	42	12								▲		
20	43	7.5					▲			▲		
20	43	8								▲		
20	44	8								▲		
20	44	12							▲	▲		
20	45	5								▲		
20	45	7								▲		
20	45	8							▲	▲		
20	45	10					▲			▲		
20	45	12				▲	▲		▲	▲		
20	46	6					▲			▲		
20	46	7								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
20	46	8								▲		
20	47	5								▲		
20	47	6								▲	▲	▲
20	47	7				▲	▲		▲	▲		
20	47	8								▲		
20	47	8.5								▲		
20	47	9					▲			▲		
20	47	10			▲	▲	▲	▲	▲	▲		
20	47	11								▲		
20	47	12								▲		
20	47	12.5		▲								
20	47	13								▲		
20	47.08	12.7						▲	▲	▲		
20	47.5	7								▲		
20	47.8	12.7								▲		
20	48	7								▲		
20	48	9					▲			▲		
20	48	10								▲		
20	49	7								▲		
20	50	7								▲		
20	50	8								▲		
20	50	10								▲		
20	52	6					▲			▲		
20	52	7					▲	▲	▲	▲		
20	52	8								▲		
20	52	9								▲		
20	52	10					▲		▲	▲		
20	54	7								▲		
20	55	10						▲	▲	▲		
20	55	12								▲		
20	60.4	7								▲		
20	62	6.5					▲			▲		
20	62	8								▲		
20	62	10								▲		
20	72	10					▲			▲		
21	28	4					▲			▲		
21	29	4									▲	
21	29.6	4.5										▲
21	30	6.5				▲	▲			▲		
21	31	5								▲		
21	31	7					▲			▲		
21	32	5					▲			▲		
21	32	5.5							▲	▲		
21	32	7		▲						▲		
21	33	7								▲		
21	32	5.5								▲		
21	32	7								▲		
21	32	8								▲		
21	35	4								▲		
21	35	5				▲						
21	35	6					▲			▲		
21	35	7		▲		▲	▲			▲		
21	35	8		▲		▲				▲		
21	35	8.5					▲					
21	35	10					▲			▲		
21	35	13								▲		
21	36	7					▲			▲		
21	36	10								▲		
21	36	15								▲		
21	36.5	8.5					▲					
21	37	7					▲			▲		▲
21	38	7					▲					
21	38	8							▲	▲		
21	40	6								▲		
21	40	7							▲	▲	▲	▲
21	40	10								▲		
21	42	7								▲		
21	47	10					▲			▲		
21	48	8					▲			▲		
21	52	8								▲		
22	28	4						▲		▲	▲	
22	30	4								▲		
22	30	4.5								▲		
22	30	5.5					▲			▲		
22	30	6					▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
22	30	7					▲			▲		
22	30	8								▲		
22	30	6.5								▲		
22	30	7								▲		
22	30	8								▲		
22	31	3.5								▲		
22	31	5				▲	▲			▲		▲
22	31	5.1								▲		
22	31	6								▲		
22	31	6.5					▲					
22	31	7				▲				▲		
22	31.5	7								▲		
22	31.75	6.3							▲			
22	32	4					▲			▲		
22	32	4.5								▲		
22	32	5					▲			▲	▲	▲
22	32	5.5					▲			▲		
22	32	5.6					▲			▲		
22	32	6				▲				▲		
22	32	7			▲	▲	▲	▲	▲	▲		
22	32	5								▲		
22	32	10					▲			▲		
22	33	5								▲		
22	33	6								▲		
22	33	6.5								▲		
22	33	7					▲			▲		
22	33	10								▲		
22	34	5					▲			▲	▲	▲
22	34	6								▲		
22	34	6.5								▲		
22	34	7					▲			▲		
22	34	8							▲	▲		
22	34	10								▲		
22	34	15								▲		
22	35	5				▲	▲			▲	▲	▲
22	35	5.5								▲		
22	35	6					▲		▲	▲		
22	35	7		▲		▲	▲	▲	▲	▲		
22	35	8				▲	▲	▲	▲	▲		
22	35	9								▲		
22	35	10		▲			▲		▲	▲		
22	35	12						▲	▲	▲		
22	36	5								▲		
22	36	6					▲			▲		
22	36	7					▲			▲		
22	36	8							▲	▲		
22	36	10		▲		▲	▲		▲	▲		
22	375	9								▲		
22	37	6					▲			▲		
22	37	7								▲		
22	37	8				▲	▲					
22	37	8.5								▲		
22	37	9								▲		
22	37	10								▲		
22	38	5								▲		
22	38	6					▲			▲	▲	▲
22	38	7				▲	▲		▲	▲		
22	38	7.5					▲					
22	38	8				▲	▲		▲	▲		
22	38	9								▲		
22	38	9.5								▲		
22	38	10								▲		
22	38	12				▲	▲					
22	39	6						▲	▲	▲		
22	39	7								▲		
22	40	5					▲			▲		
22	40	6								▲		
22	40	7		▲			▲		▲	▲		
22	40	8		▲		▲	▲		▲	▲		
22	40	9							▲	▲		
22	40	10				▲	▲			▲		
22	40	11							▲	▲		
22	40	11.5								▲		
22	40	12								▲		
22	40	16								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
22	41	7								▲		
22	41.2	7								▲		
22	41.25	6								▲		
22	41.25	7					▲	▲	▲	▲		
22	42	5								▲	▲	▲
22	42	6								▲		
22	42	7				▲	▲		▲	▲		
22	42	8					▲		▲	▲		
22	42	10				▲	▲	▲	▲	▲		
22	42	10.5								▲		
22	42	11				▲	▲		▲	▲		
22	42	12								▲		
22	43	7								▲		
22	43	8								▲		
22	44	7								▲		
22	44	8								▲		
22	45	5								▲		
22	45	7					▲			▲		
22	45	8								▲		
22	45	10					▲			▲		
22	47	7				▲	▲			▲	▲	▲
22	47	8				▲				▲		
22	47	10					▲		▲	▲		
22	45	7								▲		
22	45	8								▲		
22	45	10								▲		
22	45	11								▲		
22	48	5								▲		
22	48	7								▲		
22	48	10					▲			▲		
22	48	11								▲		
22	50	7								▲		
22	50	8			▲	▲				▲		
22	50	10								▲		
22	50.8	9.52								▲		
22	51	10								▲		
22	52	8								▲		
22	52	10					▲			▲		
22	52	7					▲			▲		
22	56	7					▲			▲		
22	56	10						▲	▲	▲		
22	62	7					▲			▲		
22	62	10								▲		
22	62	12								▲		
23	29	3								▲		
23	30	7								▲		
23	31	5					▲					
23	32	5							▲	▲		
23	32	7				▲	▲			▲	▲	▲
23	32	10.5							▲	▲		
23	33.5	6					▲					
23	35	6					▲			▲		
23	35	6.5					▲					
23	35	7								▲		▲
23	35	8					▲	▲	▲			
23	35	10.5								▲		
23	36	6								▲		
23	36	7								▲		
23	36	10								▲		
23	37	6								▲		
23	37	7					▲			▲		
23	38	6.5										▲
23	38	7					▲			▲		
23	38	8					▲			▲		
23	40	5								▲		
23	40	6					▲			▲		
23	40	7							▲	▲		
23	40	8					▲			▲		
23	40	10					▲			▲		
23	41.28	9.53						▲	▲	▲		
23	42	6								▲	▲	▲
23	42	7				▲	▲			▲		
23	42	8						▲	▲	▲		
23	42	9								▲		
23	42	10								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
23	42	11				▲	▲		▲	▲		
23	42.5	7								▲		
23	43	8								▲		
23	45	8								▲		
23	45	10								▲		
23	45	11								▲		
23	46	10								▲		
23	47	7								▲		
23	47	8								▲		
23	47	10								▲		
23	48	10								▲		
23	52	10					▲			▲		
23	52	11								▲		
23	55	7								▲		
24	31	7								▲		
24	32	4								▲	▲	
24	32	5					▲			▲		
24	32	6					▲					
24	32	7				▲	▲				▲	
24	32	9								▲		
24	33	4										▲
24	33	5					▲			▲		
24	33	7					▲			▲		
24	33	10.5							▲			
24	34	5.5								▲		
24	34	7					▲			▲		
24	35	4				▲						
24	35	5				▲			▲	▲		
24	35	5.5								▲		
24	35	6					▲			▲		
24	35	7		▲			▲			▲		
24	35	8					▲		▲	▲		
24	36	5.5								▲		
24	36	6										
24	36	7								▲		
24	36	8								▲		
24	36.5	8								▲		
24	37	5								▲		
24	37	7				▲	▲			▲		
24	37	8.5								▲		
24	38	5									▲	▲
24	38	7				▲	▲			▲		
24	38	8				▲	▲		▲	▲		
24	38	8.5				▲	▲		▲	▲		
24	38	10										
24	38	11								▲		
24	38.2	7								▲		
24	38.5	10								▲		
24	38.8	7								▲		
24	40	5					▲					
24	40	6									▲	▲
24	40	7				▲	▲			▲		
24	40	8				▲	▲		▲	▲		
24	40	10					▲			▲		
24	41	6										
24	41	8								▲		
24	41	10								▲		
24	42	7					▲			▲		
24	42	8								▲		
24	42	10			▲	▲	▲		▲	▲		
24	43	6								▲		
24	43	7							▲	▲		
24	43	8.5						▲	▲	▲		
24	43	9								▲		
24	45	5										
24	45	6								▲		
24	45	7				▲	▲		▲	▲		
24	45	8								▲		
24	45	10							▲	▲		
24	45	11								▲		
24	46	8								▲		
24	46	10								▲		
24	47	5									▲	▲
24	47	6								▲		
24	47	7					▲			▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	ve	VC
24	47	8								▲		
24	47	10					▲			▲		
24	48	7								▲		
24	43	8								▲		
24	49	8								▲		
24	49	12								▲		
24	49	18								▲		
24	50	8								▲		
24	50	10					▲			▲		
24	50	12								▲		
24	51	7								▲		
24	52	7								▲		
24	52	8								▲		
24	52	10					▲			▲		
24	52	11								▲		
24	54	14								▲		
24	55	10								▲		
24	62	7								▲		
24	62	10								▲		
25	24	8								▲		
25	29.5	10								▲		
25	30	7								▲		
25	31	7				▲			▲	▲		
25	32	4					▲			▲		
25	32	5								▲	▲	
25	32	6					▲			▲		
25	32	7				▲	▲		▲	▲		
25	32.3	2.8									▲	
25	33	4					▲					
25	33	6					▲		▲	▲		
25	33	7					▲			▲		
25	34	5					▲		▲	▲		
25	34	7								▲		
25	34.93	6.6				▲						
25	35	4								▲		
25	35	5					▲			▲	▲	▲
25	35	5.5				▲			▲			▲
25	35	6				▲	▲		▲	▲		
25	35	6.5								▲		
25	35	7				▲	▲		▲	▲		
25	35	8		▲	▲	▲				▲		
25	35	9								▲		
25	35	10		▲			▲	▲	▲	▲		
25	36	5								▲		
25	36	6								▲		
25	36	7				▲	▲			▲		
25	36	8								▲		
25	36	9								▲		
25	36	10								▲		
25	37	5					▲			▲		
25	37	6					▲			▲		
25	37	7				▲	▲			▲		
25	37	8				▲	▲		▲	▲		
25	37	8.5					▲					
25	37	10					▲			▲		
25	38	5					▲			▲	▲	▲
25	38	6					▲			▲		
25	38	7				▲	▲		▲	▲		
25	38	8				▲	▲	▲	▲	▲		
25	38	10								▲		
25	38.3	10					▲					
25	39	7								▲		
25	39	8								▲		
25	39	9					▲					
25	39	10								▲		
25	39.5	10								▲		
25	39.5	12							▲			
25	40	3					▲					
25	40	5				▲	▲			▲	▲	▲
25	40	6										
25	40	7				▲	▲		▲	▲		
25	40	8		▲		▲	▲	▲	▲	▲		
25	40	9										
25	40	10				▲	▲	▲	▲	▲		
25	40	12						▲	▲	▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
25	40.6	7.5								▲		
25	25	6								▲	▲	▲
25	41	7								▲		
25	41	8					▲			▲		
25	41	10								▲		
25	41.1	6								▲		
25	41.1	8								▲		
25	41.2	6								▲		
25	41.2	8								▲		
25	41.25	6								▲		
25	41.25	7							▲	▲		
25	41.25	7.3								▲		
25	41.25	8						▲	▲	▲		
25	41.28	7								▲		
25	41.5	6								▲		
25	41.5	7								▲		
25	41.5	8							▲	▲		
25	41.55	10								▲		
25	41.7	7					▲					
25	42	5									▲	▲
25	42	5.5								▲		
25	42	6					▲			▲		
25	42	6.3					▲					
25	42	6.4								▲		
25	42	7				▲	▲			▲		
25	42	8				▲	▲		▲	▲		
25	42	8.5					▲					
25	42	9								▲		
25	42	10		▲	▲	▲	▲	▲	▲	▲		
25	42	11				▲	▲		▲	▲		
25	42	12								▲		
25	42.5	10						▲				
25	42.9	9.5			▲	▲	▲	▲	▲	▲		
25	43	7								▲		
25	43	8							▲	▲		
25	43	9					▲			▲		
25	43	10								▲		
25	43	12								▲		
25	44	6										
25	44	7		▲		▲	▲			▲		
25	44	8								▲		
25	44	10								▲		
25	44.42	9.53							▲			
25	44.45	5								▲		
25	44.45	7								▲		
25	44.45	10						▲	▲	▲		
25	445	5								▲		
25	44.5	5.1								▲		
25	44.5	6								▲		
25	44.5	7								▲		
25	44.5	8							▲			
25	44.6	5					▲					
25	45	5					▲			▲	▲	▲
25	25	7				▲	▲		▲	▲	▲	▲
25	45	8				▲	▲		▲	▲		
25	45	9								▲		
25	45	10					▲	▲	▲	▲		
25	45	11				▲	▲		▲	▲		
25	45	12							▲	▲		
25	45	18								▲		
25	46	6								▲		
25	46	7					▲		▲	▲		
25	46	8								▲		
25	46	10								▲		
25	46	15								▲		
25	47	5								▲	▲	▲
25	47	6				▲	▲		▲	▲	▲	▲
25	47	7				▲	▲		▲	▲		
25	47	8		▲		▲	▲		▲	▲		
25	47	9			▲	▲				▲		
25	47	10	▲		▲	▲	▲	▲	▲	▲		
25	47	12								▲		
25	47	12.5								▲		
25	47	54								▲		
25	47.7	6.5				▲						

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
25	47.7	8				▲						
25	48	7							▲	▲		▲
25	48	8				▲	▲			▲		
25	48	10								A		
25	49	7								▲		
25	49	10								▲		
25	49	12							▲	▲		
25	50	5									▲	▲
25	50	7					▲			▲		
25	50	8								▲		
25	50	9				▲	▲					
25	50	10				▲	▲			▲		
25	50	12				▲	▲		▲	▲		
25	50	14							▲	▲		
25	51	10								▲		
25	52	5					▲			▲		
25	52	6					▲					
25	52	7				▲	▲		▲	▲		
25	52	8		▲		▲	▲		▲	▲		
25	52	9		▲	▲	▲		▲		▲		
25	52	10			▲	▲	▲	▲	▲	▲		
25	52	11								▲		
25	52	12		▲	▲	▲	▲	▲	▲	▲		
25	52	15								▲		
25	52	17		▲								
25	52.4	6.5				▲						
25	53	5					▲					
25	53	7								▲		
25	53	8					▲					
25	53	10								▲		
25	54	8								▲		
25	55	8				▲				▲		
25	55	9								▲		
25	55	10								▲		
25	55	11								▲		
25	55	12								▲		
25	57	10								▲		
25	53	10								▲		
25	60	8								▲		
25	60	10								▲		
25	62	6					▲					
25	62	7					▲			▲		
25	62	8					▲			▲		
25	62	10			▲	▲	▲	▲		▲		
25	62	11								▲		
25	62	12								▲		
25	62	1S						▲	▲			
25	65	10								▲		
25	65	12								▲		
25	65	14								▲		
25	70	10								▲		
25	70	17								▲		
25	72	7					▲			▲		
25	72	8								▲		
26	34	4					▲			▲		
26	35	4					▲			▲		
26	35	5					▲			▲		
26	36	6								▲		
26	35	7					▲			▲		
26	35.5	5								▲		
26	35.5	6								▲		
26	36	5								▲		
26	36	7					▲			▲		
26	36	8				▲	▲					
26	36	10								▲		
26	36	10.5							▲	▲		
26	37	6							▲	▲		
26	37	7				▲	▲			▲		
26	37	7.8								A		
26	37	8								▲		
26	37	10					▲			▲		
26	37	10.5		▲					▲	▲		
26	37	12								▲		
26	38	5								▲		
26	38	6				▲	▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DS	DC	SA	SB	SC	TA	TB	TC	VB	VC
26	38	6.5					▲			▲		
26	38	7							▲	▲		
26	38	8				▲	▲			▲		
26	38	10								▲		
26	39	10					▲					
26	40	5					▲			▲	▲	▲
26	40	6			▲					▲		
26	40	7							▲	▲		
26	40	8				▲	▲	▲	▲	▲		
26	40	9							▲	▲		
26	40	10								▲		
26	41	5										▲
26	41	7								▲		
26	42	6					▲			▲	▲	▲
26	42	7					▲			▲		
26	42	8				▲	▲		▲	▲		
26	42	9					▲			▲		
26	42	10			▲	▲		▲		▲		
26	42	12								▲		
26	43	5								▲		
26	43	7								▲		
26	43	8								▲		
26	43	10								▲		
26	44	7								▲		
26	44	8								▲		
26	45	6								▲		
26	45	7								▲		
26	45	8								▲		
26	45	9								▲		
26	45	10				▲			▲	▲		
26	46	7								▲		
26	47	5					▲			▲		
26	47	6								▲		
26	47	7					▲			▲		
26	47	8								▲		
26	47	9								▲		
26	47	10			▲	▲	▲			▲		
26	47	11								▲		
26	48	12								▲		
26	48	6									▲	▲
26	48	7								▲		
26	48	8								▲		
26	48	10								▲		
26	48	11							▲	▲		
26	50	7								▲		
26	50	8								▲		
26	50	9					▲					
26	50	10								▲		
26	52	7								▲		
26	52	8					▲		▲	▲		
26	52	9								▲		
26	52	10								▲		
26	62	8								▲		
26	62	9								▲		
26	72	10								▲		
27	34	4								▲		
27	35	7								▲		
27	36	6								▲		
27	36	7								▲		
27	37	3.2										▲
27	37	5										▲
27	37	6								▲		
27	37	7					▲			▲		
27	37	8								▲		
27	38	5								▲		
27	38	6								▲		
27	38	7								▲		
27	38	8								▲		
27	38	11								▲		
27	39	9					▲					
27	39	10								▲		
27	39	10.5		▲					▲	▲		
27	39	17.5								▲		
27	39.7	6.35						▲	▲	▲		
27	40	5								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
27	40	6					▲			▲		
27	40	7								▲		
27	40	8				▲	▲			▲		
27	40	9								▲		
27	40	9.5								▲		
27	40	10								▲		
27	40	12								▲		
27	41	7								▲		
27	41	10								▲		
27	41.28	7.96					▲			▲		
27	41.20	9.53								▲		
27	42	7							▲	▲	▲	▲
27	42	8		▲	▲	▲				▲		
27	42	9								▲		
27	42	10			▲	▲	▲			▲		
27	42.5	8								▲		
27	43	7								▲		
27	43	8								▲		
27	43	9				▲	▲	▲	▲	▲		
27	43	10								▲		
27	44.45	6.35						▲	▲	▲		
27	44.45	9.53								▲		
27	44.45	11.13						▲	▲	▲		
27	45	7								▲		
27	45	8					▲			▲		
27	45	9								▲		
27	47	11					▲			▲		
27	47	5.5								▲		
27	47	6					▲			▲		
27	47	7					▲			▲		
27	47	8					▲			▲	▲	▲
27	47	10				▲	▲			▲		
27	47	11				▲	▲		▲	▲		
27	47.62	6.35				▲						
27	47.63	6.35						▲	▲	▲		
27	48	8							▲	▲		
27	48	9								▲		
27	48	10					▲					
27	49	7.5					▲					
27	50	7								▲		
27	50	10					▲			▲		
27	50.8	9.53								▲		
27	50.8	11.51						▲	▲	▲		
27	50.8	12.7						▲	▲	▲		
27	51	10								▲		
27	52	3.7					▲					
27	52	8				▲	▲			▲		
27	52	10			▲	▲				▲		
27	52.4	11.13								▲		
27	53	7								▲		
27	55	7								▲		
27	55	8								▲		
27	75	12								▲		
27	77	7								▲		
28	35	5					▲			▲		
28	35	7								▲		
28	35	8								▲		
28	36	6						▲	▲	▲		
28	36	7								▲		
28	36	8					▲	▲	▲	▲		
28	36	11						▲	▲	▲		
28	37	4								▲		
28	37	4.5					▲					
28	37	5								▲		
28	37	6							▲	▲		
28	3?	7								▲		
28	37	8					▲			▲		
28	38	5					▲			▲		
28	38	5.5					▲			▲		
28	38	6					▲			▲		
28	38	7			▲	▲	▲			▲		
28	38	8				▲	▲			▲		
28	38	9								▲		
28	38	10				▲				▲		
28	39	7					▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
28	39	8								▲		
28	39	9								▲		
28	39.8	6.5					▲		▲			
28	40	5					▲			▲	▲	▲
28	40	6					▲			▲		
28	40	7			▲	▲	▲			▲		
28	40	7.3								▲		
28	40	8		▲		▲	▲	▲	▲	▲		
28	40	9								▲		
28	40	10				▲	▲			▲		
28	40	10.5					▲		▲	▲		
28	41	7								▲		
28	41	8							▲	▲		
28	41.5	10.5						▲	▲			
28	41.5	8								▲		
28	42	6			▲					▲		
28	42	7				▲	▲		▲	▲		
28	42	6				▲	▲		▲	▲		
28	42	10						▲		▲		
28	42	11								▲		
28	42.5	8								▲		
28	42.9	10								▲		
28	43	7							▲	▲		
28	43	8						▲	▲	▲		
28	43	10			▲	▲	▲			▲		
28	44	6								▲		
28	44	7								▲		
28	44	8				▲	▲		▲	▲		
28	44	10				▲	▲			▲		
28	44	11							▲	▲		
28	44	15								▲		
28	44.5	7								▲		
28	45	5								▲		
28	45	6								▲	▲	▲
28	45	7								▲		
28	45	8		▲		▲	▲		▲	▲		
28	45	9								▲		
28	45	10								▲		
28	45	11							▲	▲		
28	46	7								▲		
28	46	8					▲			▲		
28	46	10					▲			▲		
28	46.5	8					▲					
28	47	4										▲
28	47	5								▲	▲	▲
28	47	6								▲		
28	47	7				▲	▲		▲	▲		
28	47	8		▲	▲	▲	▲	▲	▲	▲		
28	47	9		▲								
28	47	10				▲	▲	▲	▲	▲		
28	48	5						▲		▲	▲	▲
28	48	6									▲	▲
28	48	7								▲		
28	48	8			▲	▲			▲	▲		
28	48	10					▲			▲		
28	48	11				▲	▲		▲	▲		
28	48.8	8								▲		
28	49	7								▲		
28	49	10								▲		
28	49.5	9								▲		
28	50	6								▲	▲	▲
28	50	7								▲		
28	50	8				▲	▲			▲		
28	50	10				▲	▲			▲		
28	50	11								▲		
28	50.8	10								▲		
28	51	6								▲		
28	51	8								▲		
28	51	10								▲		
28	52	6								▲		
28	52	7					▲			▲		
28	52	8								▲		
28	52	10					▲			▲		
28	52	12			▲	▲	▲			▲		
28	55	7								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
28	55	9			▲	▲				▲		
28	55	10								▲		
28	56	6								▲		
28	56	7								▲		
28	56	8		▲						▲		
28	56	10								▲		
28	57	10								▲		
28	58	6								▲		
28	58	8								▲		
28	58	10								▲		
28	60	10								▲		
28	62	7								▲		
28	62	10					▲			▲		
28	65	7								▲		
28	67	10								▲		
28	70	10								▲		
28	72	12			▲	▲				▲		
29	38	5										▲
29	38	5.5					▲					
29	38	6					▲			▲		
29	38	7								▲		
29	38.1	6					▲					
29	40	7					▲			▲		
29	40	8								▲		
29	40	11								▲		
29	40.5	11								▲		
29	41	5					▲			▲		
29	41	10						▲	▲	▲		
29	42	6								▲		
29	42	7					▲			▲		
29	42	8								▲		
29	42	10								▲		
29	43	8								▲		
29	43	10								▲		
29	44.7	3.54							▲			
29	45	7								▲		
29	45	8								▲		
29	45	9							▲	▲		
29	45	10				▲		▲	▲	▲		
29	45	12										
29	46	7								▲		
29	46	9								▲		
29	46	10					▲			▲		
29	47	8					▲			▲		
29	47	10								▲		
29	48	10								▲		
29	49.5	9								▲		
29	50	7								▲		
29	50	8								▲		
29	50	10					▲	▲		▲		
29	52	7								▲		
29	52	9					▲			▲		
29	52	10								▲		
29	55	7								▲		
29	55	9								▲		
29	55	10								▲		
29	56	10								▲		
29	62	10					▲			▲		
29	64	3.5								▲		
30	37	4				▲	▲		▲	▲		
30	37	6								▲		
30	37	6.5					▲		▲	▲		
30	37	7								▲		
30	37	8					▲			▲		
30	38	4					▲			▲		
30	36	5								▲		
30	38	6								▲		
30	38	7					▲			▲		
30	38	8								▲		
30	38	10								▲		
30	38	28.5								▲		
30	39	7				▲	▲	▲	▲	▲		
30	40	4				▲	▲			▲		▲
30	40	5					▲			▲	▲	▲
30	40	6								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
30	40	7				▲	▲		▲	▲		
30	40	8				▲				▲		
30	40	10					▲		▲	▲		
30	40	10.5								▲		
30	40	12								▲		
30	40.5	7								▲		
30	41	7								▲		
30	41	9						▲	▲	▲		
30	41	10							▲			
30	41	10.5								▲		
30	41.3	6								▲		
30	41.5	7								▲		
30	42	4.5					▲			▲		
30	42	5								▲	▲	▲
30	42	5.5								▲		
30	42	5.7					▲			▲		
30	42	6				▲	▲			▲		
30	42	7			▲	▲	▲		▲	▲		
30	42	8					▲		▲	▲		
30	42	9								▲		
30	42	10								▲		
30	42	10.5		▲			▲			▲		
30	42	11		▲								
30	42	12								▲		
30	42.5	4.5					▲					
30	42.5	8								▲		
30	43	5										▲
30	43	7							▲	▲		
30	43	8			▲	▲	▲		▲	▲		
30	43	8.5								▲		
30	43	9					▲			▲		
30	43	10								▲		
30	43.5	7								▲		
30	43.5	10						▲	▲	▲		
30	43.76	9							▲			
30	44	6							▲			
30	44	7					▲		▲	▲		
30	44	8								▲		
30	44	9				▲	▲		▲	▲		
30	44	10				▲	▲			▲		
30	44	12								▲		
30	44.45	7							▲	▲		
30	44.45	10								▲		
30	44.5	7								▲		
30	45	5					▲			▲		
30	45	6							▲	▲	▲	▲
30	45	7				▲	▲		▲	▲		
30	45	8			▲	▲	▲	▲	▲	▲		
30	45	9				▲	▲			▲		
30	45	10					▲			▲		
30	45	11				▲	▲		▲	▲		
30	45	12				▲	▲			▲		
30	45	13								▲		
30	46	5					▲			▲	▲	▲
30	46	6.5					▲					
30	46	7							▲	▲		
30	46	8								▲		
30	46	8.5								▲		
30	46	9				▲	▲		▲	▲		
30	46	10							▲	▲		
30	46.5	7.5								▲		
30	46.5	8								▲		
30	46.5	9								▲		
30	47	4					▲					
30	47	5								▲		
30	47	6					▲			▲		
30	47	7				▲	▲		▲	▲		
30	47	8			▲	▲	▲		▲	▲		
30	47	10	▲		▲	▲	▲	▲	▲	▲		
30	47	12				▲	▲					
30	47.3	9.5							▲	▲		
30	47.5	8								▲		
30	48	6									▲	▲
30	48	7							▲	▲		
30	48	8				▲	▲		▲	▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
30	48	10			▲	▲	▲			▲		
30	48	11				▲	▲		▲	▲		
30	49	7								▲		
30	50	5									▲	▲
30	50	6.5										▲
30	50	7				▲	▲		▲	▲		
30	50	8		▲		▲	▲		▲	▲	▲	▲
30	50	9				▲	▲					
30	50	10		▲	▲	▲	▲	▲	▲	▲		
30	50	11				▲	▲		▲	▲		
30	50	12			▲	▲	▲			▲		
30	50	13							▲	▲		
30	50	15								▲		
30	50.8	7								▲		
30	51	6			▲	▲				▲		
30	51	7								▲		
30	51	9								▲		
30	51	10								▲		
30	52	4					▲					
30	52	5					▲			▲	▲	▲
30	52	6					▲			▲		
30	52	7				▲	▲		▲	▲		
30	52	8					▲		▲	▲		
30	52	8.5					▲			▲		
30	52	9						▲	▲	▲		
30	52	10			▲	▲	▲	▲	▲	▲		
30	52	11							▲	▲		
30	52	12			▲	▲	▲	▲	▲	▲		
30	52	14								▲		
30	53	8								▲		
30	53	10								▲		
30	53.5	10								▲		
30	53.5	10.13								▲		
30	53.5	14								▲		
30	54	6						▲	▲	▲		
30	54	7								▲		
30	54	8								▲		
30	54	9								▲		
30	54	10								▲		
30	54	12								▲		
30	55	5									▲	▲
30	55	6								▲		
30	55	7					▲		▲	▲		
30	55	8		▲						▲		
30	55	10					▲	▲	▲	▲		
30	55	11								▲		
30	55	12			▲	▲	▲	▲	▲	▲		
30	55	14							▲	▲		
30	56	5									▲	▲
30	56	6								▲		
30	56	7					▲			▲		
30	56	8					▲			▲		
30	56	10								▲		
30	56	12			▲	▲	▲			▲		
30	57	7								▲		
30	57	8					▲			▲		
30	57	9								▲		
30	57	10			▲	▲				▲		
30	56	8								▲		
30	58	10								▲		
30	60	7								▲		
30	60	8								▲		
30	60	10			▲	▲	▲	▲	▲	▲		
30	60	12			▲	▲				▲		
30	62	5								▲		
30	62	6				▲				▲		
30	62	7				▲	▲		▲	▲		
30	62	8					▲			▲		
30	62	9								▲		
30	62	10		▲	▲	▲	▲	▲	▲	▲		
30	62	11								▲		
30	62	12			▲	▲	▲			▲		
30	65	7								▲		
30	65	8								▲		
30	65	10					▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
30	65	11								▲		
30	65	12								▲		
30	65	13						▲	▲	▲		
30	66	12								▲		
30	68	7					▲			▲		
30	68	10								▲		
30	68	12								▲		
30	70	8								▲		
30	70	8.5								▲		
30	70	10								▲		
30	72	6				▲				▲		
30	72	7					▲		▲	▲		
30	72	8					▲			▲		
30	72	10			▲	▲	▲			▲		
30	72	11								▲		
30	72	12			▲	▲		▲	▲	▲		
30	75	9								▲		
30	75	10								▲		
30	77	9								▲		
30	77	10								▲		
30	80	10								▲		
30	85	10					▲			▲		
31	38	3.35									▲	
31	39	8					▲					
31	41	12.5										
31	41	5										▲
31	41	9.1							▲	▲		
31	42	8					▲			▲		
31	42.8	6.5					▲					
31	42.9	6.5								▲		
31	43	4.75					▲					
31	43	7								▲		
31	43	8		▲						▲		
31	43	10								▲		
31	43	10.3		▲								
31	43	12.5								▲		
31	44	7								▲		
31	44	8								▲		
31	45	7								▲		
31	45	9							▲	▲		
31	46	6								▲		
31	46	8								▲		
31	47	7				▲	▲			▲		
31	47	8								▲		
31	47	10								▲		
31	46	7								▲		
31	48	10								▲		
31	49	7								▲		
31	50	4					▲					
31	50	8				▲	▲			▲		
31	50	8.5								▲		
31	52	6								▲		
31	52	7					▲			▲		
31	52	9					▲			▲		
31	54	7.5								▲		
31	55	9					▲			▲		
31	58	8		▲								
31	62	5								▲		
31	62	5.8								▲		
31	62.1	4.3				▲						
31	62.5	4.5					▲			▲		
32	39	4								▲		
32	39	7							▲	▲		
32	39.5	4					▲					
32	40	5					▲			▲		▲
32	40	7					▲			▲		
32	40	8								▲		
32	40	10								▲		
32	41	7							▲	▲		
32	41.25	7								▲		
32	42	5								▲		
32	42	6								▲		
32	42	7				▲	▲		▲	▲		
32	42	8								▲		
32	42	9								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
32	43	4.75										▲
32	43	5								▲		
32	43	5.5								▲		
32	43	7								▲		
32	43	8								▲		
32	43	9								▲		
32	43	10				▲	▲					
32	43	12.5								▲		
32	44	6								▲		
32	44	7								▲		
32	44	8		▲						▲		
32	44	9				▲	▲	▲	▲	▲		
32	44	10					▲		▲	▲		
32	44	10.5		▲					▲	▲		
32	44	12								▲		
32	44.2	7								▲		
32	44.5	7								▲		
32	44.45	7								▲		
32	44.45	9								▲		
32	44.57	7							▲	▲		
32	45	5									▲	▲
32	45	6					▲			▲		
32	45	6.5								▲		
32	45	7					▲		▲	▲		
32	45	7.7								▲		
32	45	8		▲	▲	▲	▲		▲	▲		
32	45	10					▲			▲		
32	46	6								▲		
32	46	7							▲	▲		
32	46	8				▲	▲			▲		
32	46	11		▲								
32	47	6								▲		
32	47	6.8					▲					
32	47	7					▲		▲	▲		
32	47	8				▲	▲			▲		
32	47	10					▲	▲	▲	▲		
32	47	12								▲		
32	47.3	9.5								▲		
32	47.8	11								▲		
32	48	4.5										▲
32	48	5					▲			▲		
32	48	6									▲	▲
32	48	7				▲	▲			▲		
32	48	8		▲		▲	▲		▲	▲		
32	48	10		▲						▲		
32	48	11								▲		
32	48	12								▲		
32	49	8								▲		
32	49	10								▲		
32	49	12								▲		
32	49.5	10								▲		
32	50	6								▲		
32	50	7					▲			▲		
32	50	8				▲	▲			▲		
32	50	10					▲		▲	▲		
32	50	12			▲	▲	▲			▲		
32	50.37	6.35									▲	
32	50.8	7								▲		
32	51	8					▲		▲	▲		
32	51	9					▲			▲		
32	51	9.5								▲		
32	51	10				▲				▲		
32	51	12								▲		
32	52	5					▲			▲	▲	▲
32	52	6					▲					
32	52	6.5				▲				▲		
32	52	7			▲	▲	▲	▲	▲	▲		
32	52	7.5					▲			▲		
32	52	8				▲	▲		▲	▲		
32	52	9			▲	▲				▲		
32	52	10			▲	▲	▲	▲	▲	▲		
32	52	11			▲	▲	▲		▲	▲		
32	52	12			▲	▲	▲	▲		▲		
32	52	13								▲		
32	53	5								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
32	53	7								▲		
32	54	8					▲			▲		
32	54	10					▲		▲	▲		
32	54	68								▲		
32	55	7								▲		
32	55	8								▲		
32	55	10			▲	▲	▲			▲		
32	55	11								▲		
32	55	12					▲	▲	▲	▲		
32	56	7								▲		
32	56	8								▲		
32	56	9								▲		
32	56	10			▲	▲	▲	▲	▲	▲		
32	56	11								▲		
32	56	12					▲			▲		
32	57	7.5								▲		
32	57	8								▲		
32	57	10								▲		
32	57	11								▲		
32	57.2	10								▲		
32	58	7						▲	▲	▲		
32	58	8						▲		▲		
32	58	10								▲		
32	58	12						▲	▲	▲		
32	60	5										▲
32	60	8					▲			▲		
32	60	10			▲	▲				▲		
32	60	12			▲	▲				▲		
32	62	6					▲			▲		
32	62	7								▲		
32	62	8		▲						▲		
32	62	9		▲								
32	62	10			▲	▲	▲			▲		
32	62	12					▲			▲		
32	63	5								▲		
32	63.5	10								▲		
32	64	7								▲		
32	64	12										
32	65	6.5								▲		
32	65	7.5					▲					
32	65	8								▲		
32	65	9								▲		
32	65	10			▲	▲		▲	▲	▲		
32	65	12						▲	▲	▲		
32	65	13								▲		
32	66	10					▲			▲		
32	68	8								▲		
32	68	10								▲		
32	70	8					▲			▲		
32	70	10		▲						▲		
32	72	7							▲	▲		
32	72	10		▲						▲		
32	72	8								▲		
32	72	10								▲		
32	72	12								▲		
32	73	10								▲		
32	74	11							▲			
32	78	9.5		▲								
32	78	10								▲		
32	85	12								▲		
33	41	7								▲		
33	42	12								▲		
33	43	6						▲		▲		
33	43	7						▲		▲		
33	43	8								▲		
33	44	7							▲	▲		
33	44	8						▲	▲	▲		
33	44	8.9								▲		
33	45	7								▲		
33	45	8					▲			▲		
33	45	10								▲		
33	45	11								▲		
33	46	4								▲		
33	46	8								▲		
33	46	10								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
33	46	10.5								▲		
33	46	11		▲								
33	47	8								▲		
33	47	10								▲		
33	48	8					▲	▲	▲	▲		
33	48	8.9								▲		
33	48	10								▲		
33	49	12								▲		
33	49.5	9								▲		
33	50	6								▲		
33	50	7				▲	▲		▲	▲		
33	50	8				▲	▲			▲		
33	50	10					▲			▲		
33	50	11							▲	▲		
33	50	12						▲	▲	▲		
33	52	5								▲		
33	52	6					▲			▲		
33	52	7				▲	▲	▲	▲	▲		
33	52	8								▲		
33	52	8.5								▲		
33	52	10								▲		
33	52.4	10							▲			
33	54	10					▲					
33	54	11					▲					
33	55	5								▲		
33	55	8								▲		
33	55	9.5						▲	▲	▲		
33	55	10						▲	▲	▲		
33	55	11								▲		
33	55	12						▲	▲	▲		
33	56	8								▲		
33	56	10								▲		
33	56	12					▲	▲		▲		
33	57	7								▲		
33	58	10								▲		
33	59	11								▲		
33	59	12								▲		
33	60	10						▲	▲	▲		
33	62	10					▲	▲	▲	▲		
33	63	9								▲		
33	66	9								▲		
33	66	12								▲		
33	66	13								▲		
33	68	10								▲		
33	72	8								▲		
34	39	3								▲		▲
34	41	4								▲		
34	41	7								▲		
34	43	4.5								▲		
34	43	7								▲		
34	44	7							▲	▲		
34	44	8						▲	▲	▲		
34	44	10						▲	▲	▲		
34	45	6					▲			▲		
34	45	7					▲			▲		
34	45	8								▲		
34	45	9								▲		
34	46	5					▲			▲		
34	46	8			▲	▲	▲			▲		
34	46	10					▲			▲		
34	46	10.5							▲			
34	47	7					▲		▲	▲		
34	47	8								▲		
34	47	9								▲		
34	47	10								▲		
34	48	7								▲		
34	48	7.5					▲					
34	48	8				▲	▲		▲	▲		
34	48	10								▲		
34	48	11								▲		
34	49	7								▲		
34	49	8								▲		
34	50	7				▲	▲			▲		
34	50	8					▲			▲		
34	50	9								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
34	50	10			▲	▲	▲			▲		
34	50	12								▲		
34	52	5								▲		
34	52	7					▲			▲		
34	52	7.5					▲			▲		
34	52	8					▲			▲		
34	52	10			▲	▲	▲			▲		
34	52	11							▲	▲		
34	52	11.5								▲		
34	52.4	10							▲			
34	54	7								▲		
34	54	7.5								▲		
34	54	8						▲	▲	▲	▲	▲
34	54	9								▲		
34	54	10						▲		▲		
34	54	11				▲	▲		▲	▲		
34	54	12.5								▲		
34	55	7								▲		
34	55	8								▲		
34	55	9					▲			▲		
34	55	9.5								▲		
34	55	10								▲		
34	S5	11								▲		
34	55	12								▲		
34	56	8								▲		
34	56.6	12.7							▲			
34	57	7								▲		
34	57	10								▲		
34	58	6								▲		
34	58	8						▲	▲	▲		
34	58	10								▲		
34	58	46			▲	▲	▲			▲		
34	59	10								▲		
34	60	8								▲		
34	62	7					▲			▲		
34	62	8								▲		
34	62	10			▲	▲	▲			▲		
34	63	9								▲		
34	63	10								▲		
34	63	16								▲		
34	64	13								▲		
34	70	10						▲	▲	▲		
34	72	10			▲	▲				▲		
34	72	11								▲		
34	72	12			▲	▲				▲		
34	72	12.5								▲		
34	72	14								▲		
34	72	14.5								▲		
34	75	10								▲		
34	80	10								▲		
34	83	11.5								▲		
35	42	3									▲	
35	42	4				▲			▲	▲	▲	
35	42	7								▲		
35	42	8								▲		
35	43	6					▲			▲		
35	44	7							▲	▲		
35	45	4								▲		
35	45	5							▲	▲	▲	▲
35	45	6					▲			▲		
35	45	7				▲	▲			▲		
35	45	6							▲	▲		
35	45	10					▲	▲	▲	▲		
35	45	12								▲		
35	46	7					▲		▲	▲		
35	46	8								▲		
35	46	10								▲		
35	46	11								▲		
35	47	4.5					▲			▲		
35	47	5					▲			▲	▲	▲
35	47	6					▲			▲		
35	47	7				▲	▲		▲	▲		
35	47	8					▲			▲		
35	47	9								▲		
35	47	10			▲	▲				▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
35	47	10.5								▲		
35	47	6								▲		
35	47	7				▲	▲			▲		
35	47	8										
35	47	9					▲			▲		
										▲		
35	47	10								▲		
35	47	10.5							▲			
35	47	12								▲		
35	47.65	6										
35	47.7	8					▲					
							▲					
35	48	4										▲
35	48	5									▲	▲
35	48	7								▲		
35	48	8										
35	48	9				▲	▲	▲	▲	▲		
							▲			▲		
35	48	10					▲			▲		
35	48	10.5								▲		
35	48	11		▲			▲					
35	48	11.5								▲		
35	48	12								▲		
35	48	15								▲		
35	49	6								▲		
35	49	7			▲	▲				▲		
35	49	8								▲		
35	49	10								▲		
35	49	12				▲						
35	49	12.5								▲		
35	49.5	12								▲		
35	50	4.5				▲				▲		
35	50	5									▲	▲
35	35	6				▲				▲	▲	▲
35	50	7				▲	▲		▲	▲		
35	50	8			▲	▲	▲	▲	▲	▲		
35	50	9			▲	▲			▲	▲		
35	50	9.5						▲	▲	▲		
35	50	10			▲	▲	▲	▲	▲	▲		
35	50	11				▲	▲			▲		
35	50	12			▲	▲	▲	▲	▲	▲		
35	51	7								▲		
35	51	8					▲			▲		
35	51	9								▲		
35	51	10								▲		
35	51	12								▲		
35	51	14								▲		
35	52	5									▲	▲
35	52	6							▲	▲		
35	52	6.5							▲	▲		
35	52	7			▲	▲	▲	▲	▲	▲		
35	52	7.75								▲		
35	52	6				▲	▲	▲	▲	▲		
35	52	8.8			▲	▲	▲			▲		
35	52	9				▲	▲		▲	▲		
35	52	10		▲	▲	▲	▲	▲	▲	▲		
35	52	11							▲	▲		
35	52	12			▲	▲	▲	▲	▲	▲		
35	52	15						▲	▲	▲		
35	53	8					▲			▲		
35	53	9								▲		
35	53	10								▲		
35	54	6										
35	54	7					▲			▲		
35	54	6						▲	▲	▲		
35	54	10					▲			▲		
35	54	11								▲		
35	54	12								▲		
35	54.08	7.9								▲		
35	55	5					▲			▲	▲	▲
35	55	7								▲		
35	55	8			▲	▲	▲	▲	▲	▲	▲	▲
35	55	9				▲	▲		▲	▲		
35	55	10			▲	▲	▲	▲	▲	▲		
35	55	11				▲	▲	▲	▲	▲		
35	55	12			▲	▲			▲	▲		
35	55.5	9								▲		
35	56	7								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TO	VB	VC
35	56	8				▲				▲		
35	56	9								▲		
35	56	10			▲	▲	▲		▲	▲		
35	56	12				▲	▲			▲		
35	57	6					▲			▲		
35	57	8								▲		
35	57	9						▲	▲	▲		
35	57	10						▲	▲	▲		
35	57	13								▲		
35	58	7								▲		
35	58	7.5					▲			▲		
35	58	8							▲	▲		
35	58	9				▲	▲	▲	▲	▲		
35	58	10			▲	▲	▲		▲	▲		
35	58	11								▲		
35	58	12		▲	▲	▲	▲			▲		
35	58	13			▲	▲				▲		
35	60	5									▲	▲
35	60	7					▲			▲		
35	60	8				▲	▲			▲		
35	60	10			▲	▲	▲			▲		
35	60	12			▲	▲	▲		▲	▲		
35	60	13								▲		
35	60	14							▲	▲		
35	60	15								▲		
35	60	15.5								▲		
35	61	6										▲
35	62	5			▲	▲	▲			▲		
35	62	5.6					▲					
35	62	6								▲	▲	▲
35	62	7				▲	▲		▲	▲		
35	62	8			▲	▲				▲		
35	62	9								▲		
35	62	9.5								▲		
35	62	10			▲	▲	▲			▲		
35	62	12		▲	▲	▲	▲	▲	▲	▲		
35	63	7								▲		
35	63.5	9								▲		
35	64	8							▲	▲		
35	64	9								▲		
35	64	11								▲		
35	64	12						▲	▲	▲		
35	64	13								▲		
35	65	7								▲		
35	65	8								▲		
35	65	9								▲		
35	65	10			▲	▲	▲			▲		
35	65	12						▲	▲	▲		
35	65	13						▲	▲	▲		
35	67	7					▲			▲		
35	67	10								▲		
35	67	12								▲		
35	67	6								▲		
35	68	8						▲	▲	▲		
35	68	9								▲		
35	68	10					▲			▲		
35	68	12					▲			▲		
35	70	8								▲		
35	70	10								▲		
35	70	12			▲	▲				▲		
35	72	7					▲			▲		
35	72	7.5								▲		
35	72	8								▲		
35	72	9								▲		
35	72	9.5							▲	▲		
35	72	9.8								▲		
35	72	10			▲	▲	▲	▲	▲	▲		
35	72	12			▲	▲	▲			▲		
35	74	6								▲		
35	74	10								▲		
35	75	8								▲		
35	75	9		▲						▲		
35	75	12								▲		
35	76	9								▲		
35	76	10						▲	▲	▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB
35	78	8								▲	
35	80	7						▲	▲	▲	
35	80	8				▲				▲	
35	80	10					▲			▲	
35	60	11								▲	
35	60	12			▲	▲	▲			▲	
35	80	13			▲	▲	▲			▲	
35	82	7								▲	
35	83	12			▲					▲	
35	85	10				▲		▲	▲	▲	
35	90	10								▲	
36	42	3									
36	42	60					▲				
36	45	6					▲			▲	
36	46	6								▲	
36	46	7								▲	
36	46	9			▲	▲				▲	
36	47	4								▲	
36	47	7				▲	▲			▲	
36	47	8								▲	
36	47.5	6.5								▲	
36	48	4									
36	48	7								▲	
36	48	8								▲	
36	48	9								▲	
36	48	10								▲	
36	48	10.5								▲	
36	49	7								▲	
36	49	11								▲	
36	50	5					▲				
36	50	6								▲	
36	50	7				▲	▲	▲	▲	▲	
36	50	8								▲	
36	50	9								▲	
36	50	10				▲	▲			▲	
36	50.8	8						▲	▲	▲	
36	51	8								▲	
36	52	5					▲			▲	
36	52.5	6.5					▲			▲	
36	52	7					▲			▲	
36	52	8								▲	
36	52	9						▲	▲	▲	
36	52	10								▲	
36	52	11							▲		
36	53	7					▲			▲	
36	53	9								▲	
36	54	6.5					▲			▲	
36	54	7					▲		▲	▲	
36	54	7.4			▲	▲				▲	
36	54	7.5								▲	
36	54	8				▲	▲			▲	
36	54	10			▲	▲	▲			▲	
36	54	11							▲	▲	
36	55	7							▲	▲	
36	55	8								▲	
36	55	10						▲	▲	▲	
36	56	9								▲	
36	56	10					▲			▲	
36	56	12								▲	
36	57.15	6.35							▲	▲	
36	58	8							▲	▲	
36	58	10					▲			▲	
36	58	12					▲		▲	▲	
36	59.3	9								▲	
36	60	7								▲	
36	60	9.5								▲	
36	60	10						▲	▲	▲	
36	60	15.5								▲	
36	61	12						▲	▲	▲	
36	62	6		▲							
36	62	7					▲			▲	
36	62	10			▲	▲				▲	
36	63.4	12.5								▲	
36	63.5	9								▲	
36	63.6	9.5								▲	

Skeleton Rotary Oil Seal

d	D	H	D6	DC	SA	SB	SC	TA	TB	TO	VB	VC
22	30	7					▲			▲		
22	30	8								▲		
22	30	6.5								▲		
22	30	7								▲		
22	30	8								▲		
22	31	3.5								▲		
22	31	5				▲	▲			▲		▲
22	31	5.1								▲		
22	31	6								▲		
22	31	6.5					▲					
22	31	7				▲				▲		
22	31.5	7								▲		
22	31.75	6.3							▲			
22	32	4					▲			▲		
22	32	4.5								▲		
22	32	5					▲			▲	▲	▲
22	32	5.5					▲			▲		
22	32	5.6					▲			▲		
22	32	6				▲				▲		
22	32	7			▲	▲	▲	▲	▲	▲		
22	32	8								▲		
22	32	10					▲			▲		
22	33	5								▲		
22	33	6								▲		
22	33	6.5								▲		
22	33	7					▲			▲		
22	33	10								▲		
22	34	5					▲			▲	▲	▲
22	34	6								▲		
22	34	6.5								▲		
22	34	7					▲			▲		
22	34	8							▲	▲		
22	34	10								▲		
22	34	15								▲		
22	35	5				▲	▲			▲	▲	▲
22	35	5.5								▲		
22	35	6					▲		▲	▲		
22	35	7		▲		▲	▲	▲	▲	▲		
22	35	8				▲	▲	▲	▲	▲		
22	35	9								▲		
22	35	10		▲			▲		▲	▲		
22	35	12						▲	▲	▲		
22	36	5								▲		
22	36	6					▲			▲		
22	36	7					▲			▲		
22	36	8							▲	▲		
22	36	10		▲		▲	▲		▲	▲		
22	37.5	9								▲		
22	37	6					▲			▲		
22	37	7								▲		
22	37	8				▲	▲					
22	37	8.5								▲		
22	37	9								▲		
22	37	10								▲		
22	38	5								▲		
22	38	6					▲			▲	▲	▲
22	38	7				▲	▲		▲	▲		
22	38	7.5					▲					
22	38	8				▲	▲		▲	▲		
22	38	9								▲		
22	38	9.5								▲		
22	38	10								▲		
22	38	12				▲	▲					
22	39	6						▲	▲	▲		
22	39	7								▲		
22	40	5					▲			▲		
22	40	6								▲		
22	40	7		▲			▲		▲	▲		
22	40	8		▲		▲	▲		▲	▲		
22	40	9							▲	▲		
22	40	10				▲	▲			▲		
22	40	11							▲	▲		
22	40	11.5								▲		
22	40	12								▲		
22	40	16								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
22	41	7								▲		
22	41.2	7								▲		
22	41.25	6								▲		
22	41.25	7					▲	▲	▲	▲		
22	42	5								▲	▲	▲
22	42	6								▲		
22	42	7				▲	▲		▲	▲		
22	42	8					▲		▲	▲		
22	42	10				▲	▲	▲	▲	▲		
22	42	10.5								▲		
22	42	11				▲	▲		▲	▲		
22	42	12								▲		
22	43	7								▲		
22	43	8								▲		
22	44	7								▲		
22	44	8								▲		
22	45	5								▲		
22	45	7					▲			▲		
22	45	8								▲		
22	45	10					▲			▲		
22	47	7				▲	▲			▲	▲	▲
22	47	8				▲				▲		
22	47	10					▲		▲	▲		
22	45	7								▲		
22	45	8								▲		
22	45	10								▲		
22	45	11								▲		
22	48	5								▲		
22	48	7								▲		
22	48	10					▲			▲		
22	48	11								▲		
22	50	7								▲		
22	50	8			▲	▲				▲		
22	50	10								▲		
22	50.8	9.52								▲		
22	51	10								▲		
22	52	8								▲		
22	52	10					▲			▲		
22	52	7					▲			▲		
22	56	7					▲			▲		
22	56	10						▲	▲	▲		
22	62	7					▲			▲		
22	62	10								▲		
22	62	12								▲		
23	29	3								▲		
23	30	7								▲		
23	31	5					▲					
23	32	5							▲	▲		
23	32	7				▲	▲			▲	▲	▲
23	32	10.5							▲	▲		
23	33.5	6					▲					
23	35	6					▲			▲		
23	35	6.5					▲					
23	35	7								▲		▲
23	35	8					▲	▲	▲			
23	35	10.5								▲		
23	36	6								▲		
23	36	7								▲		
23	36	10								▲		
23	37	6								▲		
23	37	7					▲			▲		
23	38	6.5										▲
23	38	7					▲			▲		
23	38	8					▲			▲		
23	40	5								▲		
23	40	6					▲			▲		
23	40	7							▲	▲		
23	40	8					▲			▲		
23	40	10					▲			▲		
23	41.28	9.53						▲	▲	▲		
23	42	6								▲	▲	▲
23	42	7				▲	▲			▲		
23	42	8						▲	▲	▲		
23	42	9								▲		
23	42	10								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
38	62	14								▲		
38	63	9								▲		
38	63	10							▲			
38	63.5	10								▲		
38	64	5									▲	▲
38	64	10								▲		
38	64	12					▲			▲		
38	65	8					▲			▲		
38	65	9						▲	▲	▲		
38	65	10				▲	▲	▲	▲	▲		
38	65	11								▲		
38	65	12						▲	▲	▲		
38	66	10								▲		
38	67.5	11								▲		
38	68	8								▲		
38	68	10					▲			▲		
38	68	12							▲	▲		
38	69.4	10								▲		
38	70	8								▲		
38	70	10					▲	▲	▲	▲		
38	71	12								▲		
38	72	8								▲		
38	72	10			▲	▲	▲			▲		
38	72	11								▲		
38	72	12			▲	▲				▲		
38	74	8								▲		
38	74	10							▲	▲		
38	74	11				▲			▲	▲		
38	75	10								▲		
38	75.5	10								▲		
38	80	8								▲		
38	80	10					▲			▲		
38	80	12								▲		
38	83	12					▲	▲	▲	▲		
38	90	8				▲				▲		
39	47	5					▲					
39	50	9						▲	▲	▲		
39	50.4	8.5							▲			
39	50.5	7							▲	▲		
39	50.55	8.5						▲	▲	▲		
39	51	7.5					▲			▲		
39	52	7						▲	▲	▲		
39	52	8					▲			▲		
39	52	10								▲		
39	54	7								▲		
39	54	10.5						▲	▲	▲		
39	55.5	9					▲			▲		
39	56	7								▲		
39	59	7								▲		
39	60	8								▲		
39	60	10						▲	▲	▲		
33	62	11						▲	▲	▲		
39	63.5	7.94					▲					
39	64	9								▲		
39	65	8								▲		
39	65	9					▲			▲		
39	68.2	13							▲			
39	80	12								▲		
39	46	8					▲			▲		
40	47	4				▲			▲	▲		
40	47	7								▲		
40	46	6.3					▲			▲		
40	48	8					▲			▲		
40	49	6							▲	▲		
40	49	8								▲		
40	49.5	5.5								▲		
40	50	4					▲			▲		
40	50	5				▲				▲		
40	50	6.5								▲		
40	50	7								▲		
40	50	8					▲			▲		
40	50	10								▲		
40	50	11					▲					
40	51	5								▲		
40	51	6								▲		

d	D	H	D8	DC	SA	SB	SC	TA	TB	TC	VB	VC
40	51	7.5							▲	▲		
40	52	5								▲	▲	▲
40	52	6								▲		
40	52	7		▲		▲	▲		▲	▲		
40	62	8				▲	▲		▲	▲		
40	52	8.5							▲			
40	52	9								▲		
40	52	10								▲		
40	52	10.5								▲		
40	52	56								▲		
40	52	58								▲		
40	53	7					▲		▲	▲		
40	53	8								▲		
40	53	10								▲		
40	53.7	10								▲		
40	54	5							▲	▲		
40	54	5.5							▲	▲		
40	54	7							▲	▲		
40	54	7.5								▲		
40	54	8							▲			
40	54	9								▲		
40	54	10								▲		
40	55	5									▲	▲
40	55	6								▲		
40	55	6.5					▲		▲			
40	55	7				▲	▲		▲	▲		
40	55	8	▲			▲	▲		▲	▲		
40	55	9				▲	▲		▲	▲		
40	55	10				▲	▲			▲		
40	55	11								▲		
40	55	12				▲				▲		
40	56	6								▲		
40	56	7							▲	▲		
40	56	8				▲	▲			▲		
40	56	9								▲		
40	56	10					▲		▲	▲		
40	56	11								▲		
40	56	12								▲		
40	57	7							▲	▲		
40	57	10								▲		
40	57.15	10				▲						
40	57.2	10								▲		
40	58	5								▲		
40	58	55								▲		
40	58	6								▲	▲	▲
40	58	7				▲	▲			▲		
40	58	8		▲		▲	▲		▲	▲		
40	58	9								▲		
40	58	10			▲	▲	▲			▲		
40	58	12						▲	▲	▲		
40	58.8	9.4								▲		
40	59	9.5								▲		
40	59	10								▲		
40	59	11								▲		
40	60	5									▲	▲
40	60	7					▲			▲		
40	60	8				▲	▲			▲		
40	60	9								▲		
40	60	10		▲	▲	▲	▲	▲	▲	▲		
40	60	12			▲	▲	▲		▲	▲		
40	61	10								▲		
40	62	5								▲	▲	▲
40	62	6								▲	▲	▲
40	62	6.5								▲		
40	62	7			▲	▲	▲			▲		
40	62	8			▲	▲	▲	▲	▲	▲	▲	▲
40	62	9			▲	▲				▲		
40	62	10		▲	▲	▲	▲	▲	▲	▲		
40	62	11					▲	▲	▲	▲		
40	62	11.5					▲			▲		
40	62	12			▲	▲	▲	▲	▲	▲		
40	62	13								▲		
40	62	14								▲		
40	62	72								▲		
40	63	7							▲	▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
40	63	8								▲		
40	63	10					▲			▲		
40	63	12								▲		
40	63.35	10								▲		
40	63.5	10								▲		
40	63.5	12								▲		
40	64	10								▲		
4n	64	12							▲	▲		
40	64	13								▲		
40	64	16							▲			
40	65	5									▲	▲
40	65	6									▲	▲
40	65	7								▲		
40	65	8								▲		
40	65	9			▲	▲	▲			▲		
40	65	10			▲	▲	▲		▲	▲		
40	65	12			▲	▲	▲	▲	▲	▲		
40	65	13								▲		
40	65	14				▲	▲		▲	▲		
40	65.02	6.35									▲	
40	65.4	10								▲		
40	65.5	13							▲			
40	66	9								▲		
40	66	10								▲		
40	67	8								▲		
40	67	10								▲		
40	67	11								▲		
40	68	6					▲			▲		
40	68	7				▲	▲			▲		
40	68	8				▲	▲			▲		
40	68	10					▲		▲	▲		
40	68	11							▲	▲		
40	68	12					▲			▲		
40	69	9								▲		
40	70	8					▲			▲		
40	70	10			▲	▲	▲			▲		
40	70	11					▲	▲	▲	▲		
40	70	20								▲		
40	71	8								▲		
40	72	7			▲	▲	▲			▲		
40	72	8					▲			▲		
40	72	9			▲	▲				▲		
40	72	10			▲	▲	▲	▲	▲	▲		
40	72	11								▲		
40	72	12			▲	▲	▲		▲	▲		
40	72	80								▲		
40	74	10								▲		
40	75	8				▲				▲		
40	75	10								▲		
40	75	12								▲		
40	75	73					▲			▲		
40	76	8								▲		
40	76	9								▲		
40	76	10								▲		
40	78	8								▲		
40	78	10					▲			▲		
40	80	7								▲		
40	80	8					▲			▲		
40	80	10			▲	▲	▲	▲	▲	▲		
40	80	12			▲	▲				▲		
40	80	13			▲	▲	▲			▲		
40	85	8								▲		
40	85	10					▲	▲	▲	▲		
40	85	11						▲	▲	▲		
40	88	6					▲			▲		
40	90	7								▲		
40	90	8				▲	▲			▲		
40	90	9								▲		
40	90	9.5					▲					
40	90	10					▲			▲		
40	90	12			▲	▲	▲			▲		
40	110	10								▲		
41	48	4								▲		
41	50	7								▲		
41	50.8	5				▲						

d	D	H	OB	DC	SA	SB	SC	TA	TB	TC	VB	VC
41	50.8	6							▲	▲		
41	52	7							▲	▲		
41	52	8					▲			▲		
41	53	7				▲		▲	▲	▲		
41	53	6		▲						▲		
41	54	4										▲
41	54	6.5									▲	
41	54	7								▲		
41	54	12		▲				▲	▲	▲		
41	55	6							▲	▲		
41	55	7							▲	▲		
41	55	8.5					▲			▲		
41	55	9						▲	▲	▲		
41	55.7	9								▲		
41	56	7			▲	▲	▲	▲	▲	▲		
41	56	8								▲		
41	56	9				▲						
41	56	10					▲			▲		
41	58	9								▲		
41	61	10						▲	▲	▲		
41	63	6					▲			▲		
41	64	10								▲		
41	65	6							▲	▲		
41	66	8								▲		
41	71.5	14								▲		
41	95	9			▲	▲				▲		
42	50	4					▲			▲		
42	50	5							▲	▲		
42	50	6								▲		
42	50	7					▲			▲		
42	50	9								▲		
42	50	10								▲		
42	51	7								▲		
42	52	4							▲	▲		
42	52	5					▲			▲		
42	52	6								▲		
42	52	7								▲		
42	52	8								▲		
42	52	10			▲	▲				▲		
42	53	6								▲		
42	53	7							▲	▲		
42	53	8						▲	▲	▲		
42	54	5								▲		
42	54	7							▲	▲		
42	54	7.5						▲	▲	▲		
42	55	5								▲		
42	55	6							▲	▲	▲	▲
42	55	7			▲	▲	▲	▲	▲	▲	▲	▲
42	55	8			▲	▲	▲			▲		
42	55	9			▲	▲	▲	▲	▲	▲		
42	55	10								▲		
42	56	5					▲			▲		
42	56	6					▲			▲		
42	56	7				▲	▲		▲	▲		
42	56	9							▲	▲		
42	56	10						▲	▲	▲		
42	56.3	7					▲					
42	57	14								▲		
42	57.15	10			▲	▲				▲		
42	58	8			▲	▲	▲		▲	▲		
42	58	8							▲	▲		
42	58	10				▲	▲			▲		
42	58	12					▲			▲		
42	58	13								▲		
42	59.5	10								▲		
42	60	7								▲	▲	▲
42	60	8					▲	▲	▲	▲		
42	60	9				▲	▲		▲	▲		
42	60	10			▲	▲	▲			▲		
42	60	12				▲	▲	▲	▲	▲		
42	60	14								▲		
42	61.96	10					▲					
42	62	6			▲	▲	▲	▲	▲	▲		
42	62	7					▲		▲	▲		
42	62	8			▲	▲	▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
42	62	9								▲		
42	62	10				▲	▲	▲	▲	▲		
42	62	11								▲		
42	62	12			▲	▲	▲	▲	▲	▲		
42	63	7								▲		
42	63	8								▲		
42	63	10								▲		
42	63.5	12								▲		
42	64	7								▲		
42	64	8								▲		
42	64	10								▲		
42	64	13								▲		
42	65	8					▲			▲		
42	65	9				▲	▲		▲	▲	▲	▲
42	65	10			▲	▲	▲	▲	▲	▲		
42	66	12			▲	▲	▲	▲	▲	▲		
42	66	8						▲	▲	▲		
42	66	10								▲		
42	67	10								▲		
42	67	12								▲		
42	68	8								▲		
42	68	10					▲			▲		
42	68	11					▲			▲		
42	68	12								▲		
42	68	15								▲		
42	69	10					▲			▲		
42	70	8								▲		
42	70	9								▲		
42	70	10								▲		
42	70	12								▲		
42	72	6								▲		
42	72	7					▲			▲		
42	72	8					▲			▲		
42	72	9						▲	▲	▲		
42	72	10			▲	▲	▲	▲	▲	▲		
42	72	12			▲	▲			▲	▲		
42	72.5	10								▲		
42	72.5	12							▲	▲		
42	73	10								▲		
42	75	10								▲		
42	76	12								▲		
42	78	10								▲		
42	80	8								▲		
42	80	9								▲		
42	80	10								▲		
42	80	13			▲	▲				▲		
42	81	13					▲			▲		
43	50	9								▲		
43	52	10				▲	▲					
43	53	5					▲			▲		
43	53.57	9.53								▲		
43	54	6						▲	▲	▲		
43	54	6.5								▲		
43	54	7							▲	▲		
43	54	7.5					▲		▲	▲		
43	54	9								▲		
43	54	10								▲		
43	55	7								▲		
43	55	10								▲		
43	55	9								▲		
43	55	10								▲		
43	58	10.5								▲		
43	58	7								▲		
43	58	8							▲	▲		
43	58	10								▲		
43	58	13.5					▲			▲		
43	58.5	8								▲		
43	59	8							▲	▲		
43	60	10				▲	▲			▲		
43	60	15								▲		
43	62	8								▲		
43	62	10						▲	▲	▲		
43	62	12								▲		
43	63	8					▲			▲		
43	63	13								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
43	63.5	7								▲		
43	63	10								▲		
43	63.6	65.05							▲			
43	64	12								▲		
43	65	8								▲		
43	65	10					▲			▲		
43	65	12.5							▲	▲		
43	65	13					▲			▲		
43	66	10							▲	▲		
43	68	8								▲		
43	70	10						▲	▲	▲		
43	70	12						▲	▲	▲		
43	70	13						▲	▲	▲		
43	72	10								▲		
43	73	10								▲		
43	75	10					▲			▲		
43	75	12						▲	▲	▲		
43	78	7								▲		
43	80	10					▲			▲		
43	80	14								▲		
43	82	10								▲		
44	50	3									▲	
44	54	4					▲			▲		
44	54	4.5							▲	▲		
44	54	6								▲		
44	54	7								▲		
44	54	7.5				▲			▲			
44	54	8								▲		
44	54	9								▲		
44	54	10								▲		
44	55	7								▲		
44	56	7				▲	▲					
44	58	7			▲	▲				▲		
44	58	8								▲		
44	58	9								▲		
44	58	10								▲		
44	58.4	10					▲			▲		
44	60	7								▲		
44	60	8					▲			▲		
44	60	9							▲	▲		
44	60	10			▲	▲	▲			▲		
44	60	12								▲		
44	61	8								▲		
44	61.2	9.5							▲			
44	62	7				▲				▲		
44	62	8			▲	▲	▲		▲	▲		
44	62	9								▲		
44	62	10					▲		▲	▲		
44	62	11.5								▲		
44	62	12			▲	▲				▲		
44	62	14								▲		
44	62	14.6								▲		
44	63	7						▲	▲	▲		
44	63.5	7.9							▲			
44	63.5	9.7				▲						
44	63.5	10								▲		
44	64	8						▲	▲	▲		
44	64	9								▲		
44	64	10								▲		
44	65	8				▲				▲		
44	65	10					▲			▲		
44	65	11								▲		
44	65	71								▲		
44	68	6					▲			▲		
44	68	8								▲		
44	68	10								▲		
44	68	12					▲			▲		
44	69	11								▲		
44	70	8								▲		
44	70	12								▲		
44	72	8						▲	▲	▲		
44	72	9								▲		
44	72	10					▲			▲		
44	72	12			▲	▲	▲			▲		
44	74	10								▲		

Skeleton Rotary Oil Seal


SB


SA


TC


TB


TA


DC


DB


VC


VB

39	63.5	7.94					▲						
39	64	9								▲			
39	65	8								▲			
39	65	9					▲			▲			
44	80	13						▲					
44	90	10						▲					
44	92	10						▲	▲	▲			
45	50	10								▲			
45	51	6								▲			
45	52	4								▲			
45	52	4.5				▲				▲			
45	52	5					▲			▲			
45	52	6					▲			▲			
45	52	7				▲	▲		▲	▲			
45	52	8			▲	▲	▲			▲			
45	52	9								▲			
45	52	10						▲	▲	▲			
45	53	7							▲	▲			
45	53	8								▲			
45	53	8.5								▲			
45	54	4.5								▲			
45	54	5								▲			
45	54	5.5							▲	▲			
45	54	7							▲	▲			
45	54	8						▲	▲	▲			
45	54	9								▲			
45	54	10								▲			
45	55	4					▲			▲	▲		
45	55	6						▲	▲	▲			
45	55	6.5					▲			▲			
45	55	7				▲	▲	▲	▲	▲			
45	55	7.5							▲	▲			
45	55	8			▲	▲	▲	▲	▲	▲			
45	55	9			▲	▲	▲	▲	▲	▲			
45	55	10			▲	▲	▲	▲	▲	▲			
45	55	12			▲	▲		▲	▲	▲			
45	56	6					▲			▲			
45	56	7				▲	▲		▲	▲			
45	56	8					▲	▲	▲	▲			
45	56	9					▲	▲	▲	▲			
45	56	10			▲	▲				▲			
45	56	12					▲			▲			
45	57	5.5								▲			
45	57	7					▲			▲			
45	57	7.5					▲			▲			
45	57	9								▲			
45	57	9.5								▲			
45	57	10								▲			
45	57	11								▲			
45	57.5	10			▲	▲	▲			▲			
45	57.8	6.35				▲							
45	58	7					▲			▲			
45	58	8					▲			▲			
45	58	9			▲	▲	▲	▲	▲	▲			
45	58	10			▲	▲	▲			▲			
45	58	12						▲	▲	▲			
45	59	7								▲			
45	59	8					▲			▲			
45	59	9.5								▲			
45	59	10							▲	▲			
45	59.13	10				▲				▲			
45	59.5	fi								▲			
45	60	5								▲			
45	60	6					▲			▲	▲	▲	
45	60	6.5					▲			▲			
45	60	7			▲	▲	▲	▲	▲	▲			
45	60	8			▲	▲	▲	▲	▲	▲			
45	60	9				▲	▲	▲	▲	▲			
45	60	10			▲	▲	▲			▲			
45	60	12			▲	▲	▲			▲			
45	61	9				▲	▲			▲			
45	61	10							▲	▲			
45	62	6								▲			
45	62	7			▲	▲	▲	▲	▲	▲	▲	▲	
45	62	8			▲	▲	▲	▲	▲	▲		▲	
45	62	8.5								▲		▲	

40	59	10								▲			
40	59	11								▲			
40	60	5									▲	▲	
40	60	7					▲			▲			
40	60	8				▲	▲			▲			
40	60	9								▲			
40	60	10		▲	▲	▲	▲	▲	▲	▲			
40	60	12			▲	▲	▲	▲	▲	▲			
45	63	8								▲			
45	63	10								▲			
45	63	1?						▲	▲	▲			
45	63.5	10								▲			
45	64	6								▲			
45	64	7								▲			
45	64	8								▲			
45	64	9								▲			
45	64	10								▲			
45	64	12			▲				▲	▲			
45	65	5							▲	▲	▲	▲	
45	65	6				▲				▲			
45	65	7								▲			
45	65	8		▲	▲	▲	▲	▲	▲	▲			
45	65	9			▲					▲			
45	65	10		▲	▲	▲	▲	▲		▲	▲	▲	
45	65	11								▲			
45	65	12			▲	▲	▲	▲		▲			
45	66	6				▲				▲			
45	66	10				▲				▲			
45	66	11								▲			
45	66	12								▲			
45	67	7						▲	▲	▲			
45	67	8				▲				▲			
45	67	10								▲			
45	67	12								▲			
45	67	13								▲			
45	68	6									▲	▲	
45	68	7								▲			
45	68	8				▲				▲			
45	68	9			▲	▲			▲	▲	▲	▲	
45	68	10			▲	▲				▲			
45	68	12			▲	▲			▲	▲			
45	68	14							▲	▲			
45	69	10								▲			
45	69	12						▲	▲	▲			
45	69.1	12				▲				▲			
45	70	5								▲			▲
45	70	6									▲	▲	
45	70	7				▲				▲			
45	70	8								▲			
45	70	10			▲	▲	▲			▲			
45	70	12				▲	▲		▲	▲			
45	70	14				▲	▲		▲	▲			
45	70	20			▲	▲		▲	▲	▲			
45	71	6.5								▲			
45	71	10								▲			
45	72	6									▲	▲	
45	72	7				▲				▲			
45	72	6				▲				▲			
45	72	9				▲				▲			
45	72	10			▲	▲			▲	▲			
45	72	11								▲			
45	72	12			▲	▲	▲	▲	▲	▲			
45	72	13								▲			
45	12	15								▲			
45	72	20				▲							
45	72	43								▲			
45	73	7								▲			
45	73	10								▲			
45	73	12						▲	▲	▲			
45	74	6.5							▲				
45	75	6				▲				▲			
45	75	7								▲			
45	75	8				▲		▲	▲	▲			
45	75	10				▲				▲			
45	75	12			▲	▲		▲	▲	▲			
45	75	15								▲			
45	76	10								▲			

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
45	76.4	12.5								▲		
45	76.9	12.6								▲		
45	78	7								▲		
45	78	8			▲	▲				▲		
45	78	10					▲					
45	78	12							▲	▲		
45	78	13					▲			▲		
45	80	7								▲		
45	80	8					▲	▲	▲	▲		
45	80	10			▲	▲	▲	▲	▲	▲		
45	60	12								▲		
45	80	13			▲	▲	▲	▲	▲	▲		
45	81	7								▲		
45	82	10								▲		
45	82	12								▲		
45	85	8			▲	▲				▲		
45	85	10			▲	▲	▲	▲	▲	▲		
45	85	12								▲		
45	85	13			▲	▲	▲			▲		
45	90	8					▲			▲		
45	90	10								▲		
45	90	13						▲	▲	▲		
45	100	8								▲		
45	100	10								▲		
45	120	12								▲		
46	54	4							▲	▲		
46	56	4							▲			
46	56	8								▲		
46	59	10								▲		
46	59	12								▲		
46	60	7			▲	▲				▲		
46	60	8					▲			▲		
46	60	10								▲		
46	62	8								▲		
46	62	9					▲			▲		
46	64	8					▲			▲		
46	64	9								▲		
46	64	10								▲		
46	64	11							▲	▲		
46	65	7								▲		
46	65	8								▲		
46	65	9				▲	▲			▲		
46	65	10					▲					
46	66	10								▲		
46	68	6				▲						
46	68	8					▲			▲		
46	68	10								▲		
46	68	12						▲	▲	▲		
46	70	8								▲		
46	70	9								▲		
46	70	10					▲			▲		
46	70	14								▲		
46	73	8								▲		
46	73	10								▲		
46	76	10			▲	▲	▲			▲		
46	80	10								▲		
46	94.4	8								▲		
46	94.5	8										▲
46	94.5	8.9								▲		
46	102	13								▲		
47	55	7								▲		
47	56	7					▲		▲	▲		
47	57	7								▲		
47	58	6					▲			▲		
47	5S	7								▲		
47	60	7								▲		
47	60	8								▲		
47	60	10								▲		
47	61.5	5.5					▲					
47	62	6					▲			▲		
47	62	7								▲		
47	62	8		▲			▲			▲		
47	62	9			▲	▲				▲		
47	62	10								▲		
47	63.5	12								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
47	64	8								▲		
47	64	12								▲		
47	65	7								▲		
47	65	8								▲		
47	65	10					▲			▲		
47	66	10								▲		
47	66	12								▲		
47	67	12					▲			▲		
47	68	6					▲			▲		
47	68	10								▲		
47	70	8								▲		
47	70	9								▲		
47	70	10								▲		
47	70	11								▲		
47	70	12				▲	▲			▲		
47	72	7					▲		▲	▲		
47	72	8			▲	▲				▲		
47	72	9					▲			▲		
47	72	10			▲	▲	▲			▲		
47	72	12								▲		
47	74	10								▲		
47	76.5	9								▲		
47	80	12								▲		
47	90	8								▲		
47	90	12								▲		
48	58	4			▲	▲	▲			▲		▲
48	58	8					▲					
48	58	10							▲	▲		
48	60	7								▲		
48	60	8						▲	▲	▲		
48	60	9						▲	▲	▲		
48	60	10						▲	▲	▲		
48	61.82	6.36				▲				▲		
48	62	5										▲
48	62	6								▲	▲	▲
48	62	7			▲	▲		▲	▲	▲		
48	62	7.9								▲		
48	62	8			▲	▲	▲			▲	▲	▲
48	62	9				▲	▲		▲	▲		
48	62	10			▲	▲		▲	▲	▲		
48	62	11								▲		
48	62	12					▲			▲		
48	62	13								▲		
48	63	10								▲		
48	63	11.3								▲		
48	63.5	8								▲		
48	63.5	10								▲		
48	64	8								▲		
48	64	9					▲					
48	64	10								▲		
48	64	12						▲	▲	▲		
48	65	7					▲			▲	▲	▲
48	65	6					▲			▲		
48	65	9				▲	▲	▲	▲	▲		
48	6S	10			▲	▲	▲	▲	▲	▲		
48	65	12			▲	▲	▲	▲	▲	▲		
48	65	14			▲	▲				▲		
48	65	15								▲		
48	66	10								▲		
48	66	12								▲		
48	67	9								▲		
48	67	10								▲		
48	68	7								▲		
48	68	8				▲				▲		
48	68	9								▲		
48	68	10			▲	▲	▲			▲		
48	68	11								▲		
48	68	12					▲			▲		
48	68	14								▲		
48	69	7								▲		
48	69	10				▲			▲	▲		
48	70	6									▲	▲
48	70	7								▲		
48	70	8								▲		
48	70	9				▲	▲	▲	▲	▲		▲

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
48	70	9.2					▲			▲		
48	70	9.5						▲	▲	▲		
48	70	10					▲	▲	▲	▲		
48	70	11								▲		
48	70	12				▲	▲		▲	▲		
48	70	14							▲	▲		
48	70.5	9								▲		
48	72	7					▲		▲	▲		
48	72	8					▲			▲		
48	72	8.5								▲		
48	72	9								▲		
48	72	10		▲	▲	▲	▲			▲		
48	72	11		▲								
48	72	12			▲	▲				▲		
48	72.5	10						▲	▲	▲		
48	72.5	12								▲		
48	73	7						▲	▲	▲		
48	73	9								▲		
48	73	10								▲		
48	73	12								▲		
48	74	10					▲			▲		
48	74	11							▲	▲		
48	75	9								▲		
48	75	10								▲		
48	75	11								▲		
48	75	12						▲	▲	▲		
48	76	12								▲		
48	76	13								▲		
48	77	12								▲		
48	79	9								▲		
48	80	8					▲	▲	▲	▲		
48	80	10					▲			▲		
48	80	12								▲		
48	80	13			▲	▲	▲			▲		
48	82	8							▲	▲		
48	82	10								▲		
48	82	11								▲		
48	82	12							▲	▲		
48	82.5	10								▲		
48	63	7								▲		
48	84	7								▲		
48	85	8								▲		
48	85	10								▲		
48	90	11				▲				▲		
48	90	10			▲	▲	▲			▲		
48	90	13								▲		
49	56	10									▲	
49	58	4									▲	
49	60	7								▲		
49	62	10								▲		
49	63	8								▲		
49	65	8								▲		
49	65	10					▲			▲		
49	68	8								▲		
49	68	8								▲		
49	68	12					▲			▲		
49	70	11							▲	▲		
49	72	10					▲			▲		
49	76	10								▲		
49	76.2	9.39							▲			
49	76.3	12.7								▲		
49	77	18								▲		
49	85	10							▲			
49	92	10						▲	▲	▲		
49	100	10								▲		
50	58	4								▲	▲	
50	58	4.5					▲			▲		
50	58	9								▲		
50	60	7					▲			▲		
50	60	8								▲		
50	60	9								▲		
50	60	10					▲			▲		
50	60	12								▲		
50	62	5					▲			▲	▲	
50	62	5.5								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
50	62	7				▲	▲			▲		
50	62	8						▲	▲	▲		
50	62	9							▲	▲		
50	62	10			▲	▲	▲	▲	▲	▲		
50	62	12								▲		
50	63	6							▲	▲		
50	63	8						▲	▲	▲		
50	63	9								▲		
50	64	6.5								▲		
50	64	8								▲		
50	64	9								▲		
50	64	10				▲	▲			▲		
50	64	12								▲		
50	65	6								▲	▲	▲
50	65	7								▲		
50	65	8		▲	▲	▲	▲	▲	▲	▲		
50	65	9				▲	▲	▲	▲	▲		
50	65	10			▲	▲	▲	▲	▲	▲		
50	65.3	8								▲		
50	65.5	9.52							▲			
50	66	8								▲		
50	66.5	9								▲		
50	66	7.93					▲			▲		
50	66	8					▲			▲		
50	66	10					▲			▲		
50	67	5.5										▲
50	67	7								▲		
50	67	9						▲	▲	▲		
50	67	10								▲		
50	67	11								▲		
50	68	6								▲		
50	68	7							▲	▲	▲	▲
50	68	8					▲	▲.	▲	▲		
50	68	8.5										▲
50	68	9				▲	▲	▲	▲	▲		
50	68	10			▲	▲	▲	▲	▲	▲		
50	68	12			▲	▲	▲			▲		
50	68	14			▲	▲		▲	▲	▲		
50	69	8								▲		
50	69	10							▲	▲		
50	69.5	9.5							▲			
50	70	6								▲		
50	70	7						▲		▲		
50	70	8			▲	▲		▲	A	▲		
50	70	9				▲		▲	▲	▲		
50	70	10			▲	▲	▲	▲	▲	▲		
50	70	11							▲	▲		
50	70	12			▲	▲	▲	▲	▲	▲		
50	70	13.5						▲	▲	▲		
50	70	14			▲	▲				▲		
50	72	5								▲	A	▲
50	72	6					▲			▲	▲	▲
50	72	7						▲	▲	▲		
50	72	8			▲	▲	▲	▲		▲		
50	72	9				▲	▲		▲	▲	▲	▲
50	72	10			▲	▲	▲	▲	▲	▲		
50	72	12			▲	▲	▲	▲	▲	▲		
50	72	13		▲		▲	▲					
50	72	14							▲	▲		
50	72	15		▲				▲	▲	▲		
50	72	18	▲									
50	72	78								▲		
50	72.5	9								▲		
50	72.5	12		▲						▲		
50	73	6								▲		
50	73	8								▲		
50	73	9						▲	▲	▲		
50	73	10								▲		
50	73	12								▲		
50	74	10					▲	▲	▲	▲		
50	74	12				▲	▲			▲		
50	75	5										▲
50	75	6								▲		
50	75	8						▲	▲	▲		
50	75	10			▲	▲	▲	▲	▲	▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
50	75	12			▲	▲	▲	▲	▲	▲		
50	75	13								▲		
50	76	10								▲		
50	76	12			▲	▲		▲		▲		
50	76.2	9.53								▲		
50	77	10								▲		
50	77.5	9							▲			
50	78	8								▲		
50	78	10					▲			▲		
50	78	12								▲		
50	80	6								▲	▲	▲
50	80	7								▲	▲	▲
50	80	8			▲	▲	▲			▲		
50	80	10			▲	▲	▲	▲	▲	▲		
50	80	12			▲	▲	▲	▲	▲	▲		
50	80	13			▲	▲	▲	▲	▲	▲		
50	80	14				▲	▲		▲	▲		
50	81	10								▲		
50	81	12								▲		
50	81	13							▲	▲		
50	82	8								▲		
50	82	12								▲		
50	83	12								▲		
50	85	8								▲		
50	85	10			▲	▲				▲		
50	85	12								▲		
50	85	13			▲	▲	▲	▲	▲	▲		
50	86	10								▲		
50	88	10								▲		
50	90	8								▲		
50	90	9								▲		
50	90	10			▲	▲	▲		▲	▲		
50	90	12								▲		
50	90	13					▲			▲		
50	92	10						▲	▲	▲		
50	92	14								▲		
50	100	10						▲	▲	▲		
50	100	12								▲		
50	110	10								▲		
50	110	10.5					▲			▲		
50	110	12						▲	▲	▲		
50	110	13								▲		
50	120	12								▲		
51	62	7				▲	▲			▲		
51	62	8					▲			▲		
51	62	9						▲	▲	▲		
51	62	10								▲		
51	63	8		▲				▲	▲	▲		
51	64	7								▲		
51	65	7						▲	▲	▲		
51	65	9						▲	▲	▲		
51	65	13								▲		
51	70	9				▲						
51	70	10								▲		
51	72	10					▲		▲	▲		
51	73	8					▲		▲			
51	76	9.5					▲			▲		
51	76	10						▲	▲	▲		
52	60	5					▲					
52	60	7								▲		
52	62	7								▲		
52	62	9							▲	▲		
52	62	10								▲		
52	63	6								▲		
52	63	8							▲	▲		
52	63	9								▲		
52	64	9						▲	▲	▲		
52	65	6									▲	▲
52	65	8					▲			▲		
52	65	9				▲	▲	▲	▲	▲		
52	65	10						▲	▲	▲		
52	65	12								▲		
52	65.5	7.5								▲		
52	66	7								▲		
52	66	7.5							▲			

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
52	66	8								▲		
52	67	7								▲		
52	67	9								▲		
52	67	7								▲		
52	68	8					▲		▲	▲		
52	68	9					▲	▲	▲	▲		
52	68	10			▲	▲	▲	▲	▲	▲		
52	68	12			▲	▲				▲		
52	68	13					▲			▲		
52	68	13.5						▲	▲	▲		
52	69	10					▲			▲		
52	70	7							▲	▲	▲	▲
52	70	8								▲		
52	70	9				▲	▲	▲	▲	▲		
52	70	10			▲	▲		▲	▲	▲		
52	70	12						▲	▲	▲		
52	70	13					▲			▲		
52	72	7								▲		
52	72	7.8								▲		
52	72	8					▲	▲	▲	▲		
52	72	9								▲		
52	72	10			▲	▲	▲	▲	▲	▲		
52	72	12			▲	▲	▲	▲	▲	▲		
52	73	9.5					▲			▲		
52	73	10						▲	▲	▲		
52	73	13								▲		
52	75	8					▲			▲	▲	▲
52	75	9				▲	▲		▲	▲		
52	75	10			▲	▲				▲		
52	75	12			▲	▲	▲	▲	▲	▲		
52	75	13							▲			
52	75	14							▲	▲		
52	75	14.7						▲	▲	▲		
52	75	15								▲		
52	76	8								▲		
52	76	10			▲	▲				▲		
52	78	8								▲		
52	78	10								▲		
52	78	12							▲	▲		
52	78	13					▲			▲		
52	78	15								▲		
52	79	10								▲		
52	80	8					▲			▲		
52	80	10			▲	▲	▲			▲		
52	80	12								▲		
52	80	13			▲	▲	▲	▲	▲	▲		
52	82	8							▲	▲		
52	84	10								▲		
52	84	14								▲		
52	85	8					▲			▲		
52	85	9								▲		
52	85	10			▲	▲	▲		▲	▲		
52	85	13								▲		
52	87	8								▲		
52	90	10					▲			▲		
52	90	13			▲	▲				▲		
52	100	10						▲	▲	▲		
53	60	10					▲					
53	62	8						▲	▲	▲		
53	63	8								▲		
53	63	10					▲			▲		
53	65	10								▲		
53	65	12							▲	▲		
53	66	6.4								▲		
53	68	7								▲		
53	68	10			▲	▲	▲	▲		▲		
53	68	13		▲			▲			▲		
53	68.2	7								▲		
53	70	10								▲		
53	72	10								▲		
53	72	12								▲		
53	73	10								▲		
53	73	13								▲		
53	76	12								▲		
53	80	10								▲		

Skeleton Rotary Oil Seal

d	D	H	QB	DC	SA	SB	SC	TA	TB	TC	VB	VC
53	80	13					▲	▲	▲	▲		
53	82	10								▲		
53	90	13			▲	▲				▲		
53	100	13						▲	▲	▲		
54	64	9								▲		
54	64	13								▲		
54	65	8								▲		
54	65	9						▲	▲	▲		
54	65	10						▲	▲	▲		
54	65	13						▲	▲	▲		
54	66	7								▲		
54	67	7								▲		
54	67	9								▲		
54	66	8								▲		
54	68	9								▲		
54	68	10								▲		
54	68	10.5					▲			▲		
54	68	12								▲		
54	69	10								▲		
54	70	7								▲		
54	70	9					▲		▲	▲		
54	70	10			▲	▲	▲		▲	▲		
54	70.5	10					▲					
54	71.7	7								▲		
54	72	5					▲			▲		
54	72	6.5								▲		
54	72	7							▲	▲		
54	72	8					▲			▲		
54	72	9								▲		
54	72	10					▲	▲	▲	▲		
54	72	12			▲	▲	▲			▲		
54	72.5	9						▲	▲	▲		
54	72.5	10								▲		
54	73	65					▲			▲		
54	73	8								▲		
54	73	93					▲			▲		
54	73	10						▲	▲	▲		
54	74	8			▲	▲	▲			▲		
54	74	10			▲	▲				▲		
54	74	8								▲		
54	75	10								▲		
54	75	12					▲			▲		
54	76	8							▲	▲		
54	76	9								▲		
54	76	12					▲			▲		
54	76	13								▲		
54	762	10								▲		
54	78	10								▲		
54	73	12					▲			▲		
54	80	8					▲			▲		
54	80	10			▲	▲				▲		
54	80	13								▲		
54	80.96	22.86									▲	
54	81	10							▲	▲		
54	81	12								▲		
54	82	10				▲	▲	▲	▲	▲		
54	82	11						▲	▲	▲		
54	82	11.45								▲		
54	82	13								▲		
54	85	7								▲		
54	85	8								▲		
54	85	10				▲	▲			▲		
54	85	15					▲			▲		
54	90	10								▲		
54	92	12.5								▲		
54	90	13				▲	▲			▲		
55	65	4								▲		
55	65	5								▲		
55	65	7					▲			▲		
55	65	8								▲		
55	65	10								▲		
55	65	12						▲	▲	▲		
55	66	8					▲			▲		
55	66	8.5								▲		
55	67	4									▲	

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
55	67	6								▲		
55	67	10								▲		
55	68	8					▲		▲	▲		
55	68	8.5								▲		
55	68	9						▲		▲		
55	68	10								▲		
55	68	12						▲	▲	▲		
55	69	5.5								▲		
55	69	8								▲		
55	70	6					▲			▲	▲	▲
55	70	7					▲			▲		
55	70	8			▲	▲	▲	▲	▲	▲		
55	70	9				▲	▲			▲		
55	70	10			▲	▲	▲	▲	▲	▲		
55	70	12						▲	▲	▲		
55	72	6						▲	▲	▲		
55	72	7								▲	▲	▲
55	72	8			▲	▲	▲			▲		
55	72	9				▲	▲		▲	▲		
55	72	10			▲	▲	▲	▲	▲	▲		
55	72	12			▲	▲	▲		▲	▲		
55	72	13					▲			▲		
55	73	6								▲		
55	73	7					▲					
55	73	8								▲		
55	73	3.5										▲
55	73	10						▲	▲	▲		
55	73	11.8							▲			
55	73	12.2								▲		
55	73.1	10								▲		
55	73.4	8								▲		
55	73.43	8								▲		
55	73.65	11								▲		
55	74	6									▲	▲
55	74	10								▲		
55	75	7								▲		
55	75	8						▲	▲	▲		
55	75	9							▲	▲		
55	75	10			▲	▲	▲			▲		
55	75	12			▲	▲	▲	▲		▲		
55	75	15								▲		
55	75	16								▲		
55	76	8								▲		
55	76	9.5								▲		
55	76	10								▲		
55	76	12					▲	▲	▲	▲		
55	76	15								▲		
55	76.5	12								▲		
55	77	10					▲		▲	▲		
55	78	8					▲			▲		
55	78	9				▲	▲		▲	▲	▲	▲
55	78	10					▲			▲		
55	78	12		▲		▲	▲	▲	▲	▲		
55	78	13			▲	▲				▲		
55	78	14							▲	▲		
55	79	13							▲	▲		
55	79.5	13								▲		
55	80	8			▲	▲	▲		▲	▲		
55	80	10		▲	▲	▲	▲	▲	▲	▲		
55	80	12		▲		▲	▲	▲	▲	▲		
55	80	13			▲	▲	▲	▲	▲	▲		
55	82	8								▲		
55	82	9								▲		
55	82	9.35								▲		
55	82	10					▲		▲	▲		
55	82	12					▲	▲	▲	▲		
55	82	16								▲		
55	84	14								▲		
55	85	8			▲	▲	▲			▲		
55	85	10					▲	▲	▲	▲		
55	85	12					▲			▲		
55	85	13			▲	▲	▲	▲	▲	▲		
55	85	14				▲	▲		▲	▲		
55	87	12								▲		
55	88	10					▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
55	88	12								▲		
55	90	8			▲	▲	▲	▲	▲	▲		
55	90	9								▲		
55	90	10				▲	▲			▲		
55	90	11								▲		
55	90	12								▲		
55	90	13			▲	▲	▲			▲		
55	95	9								▲		
55	95	10								▲		
55	100	9.5								▲		
55	100	10					▲	▲	▲	▲		
55	100	12					▲			▲		
55	100	13			▲	▲	▲			▲		
55	100	15								▲		
55	100	16					▲			▲		
55	110	10						▲	▲	▲		
55	120	12								▲		
55	64.6	5.3					▲					
55	65	12								▲		
55	66	6.5							▲			
56	68	10								▲		
56	69	10								▲		
56	70	6									▲	▲
56	70	8										
56	70	8.6								▲		
56	70	9								▲		
56	70	9.6								▲		
56	70	10					▲			▲		
56	71	10								▲		
56	72	7								▲		
56	72	8					▲			▲		
56	72	9							▲	▲		
56	72	11.5								▲		
56	72	12.5						▲	▲	▲		
56	72	12.5								▲		
56	73	8							▲			
56	73	10								▲		
56	73	12.5								▲		
56	73.15	10								▲		
56	74	8							▲			
56	74	10								▲		
56	75	7					▲			▲		
56	75	8			▲	▲		▲	▲	▲		
56	75	10						▲	▲	▲		
56	76	9.5								▲		
56	78	8					▲			▲		
56	78	9							▲	▲		
56	78	10.5							▲			
56	78	12			▲	▲	▲		▲	▲		
56	80	8					▲			▲		
56	80	8.5						▲	▲	▲		
56	80	10								▲		
56	80	12								▲		
56	80	13								▲		
56	82	8								▲		
56	82	12								▲		
56	85	8					▲			▲		
56	85	10								▲		
56	85	13								▲		
56	86	13								▲		
56	89	10								▲		
56	90	8						▲	▲	▲		
56	90	10					▲			▲		
56	90	13								▲		
56	100	10						▲	▲	▲		
56	102	10						▲	▲	▲		
57	65	9							▲			
57	67	6							▲	▲		
57	67	7								▲		
57	67	9								▲		
57	68	9						▲	▲	▲		
57	69	10								▲		
57	69.5	10								▲		
57	71	7								▲		
57	71	8								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
57	71	8.5								▲		
57	72	10			▲	▲				▲		
57	73	7								▲		
57	74	10								▲		
57	75	7.5								▲		
57	75	10								▲		
57	75	12								▲		
57	76	10								▲		
57	77	7								▲		
57	77	10								▲		
57	77	12							▲	▲		
57	78	10				▲	▲			▲		
57	78	13								▲		
57	78	16.5								▲		
57	79	9							▲			
57	79.5	10								▲		
57	79.5	13								▲		
57	80	8						▲	▲	▲		
57	80	12								▲		
57	81	13								▲		
57	82.5	10								▲		
57	85	10								▲		
57	85	12			▲	▲				▲		
57	85	13			▲	▲				▲		
57	86	12								▲		
57	86	13								▲		
57	87	15								▲		
57	90	10								▲		
57	90	13			▲	▲	▲			▲		
57	110	10						▲	▲	▲		
58	68	9						▲	▲	▲		
58	68	10					▲			▲		
58	70	7						▲		▲		
58	70	9								▲		
58	70	10								▲		
58	70	11								▲		
58	72	6									▲	▲
58	72	7				▲		▲		▲		
58	72	8				▲	▲			▲		
58	72	9					▲			▲		
58	72	10								▲		
58	72	12								▲		
58	73	10								▲		
58	74	8								▲		
58	75	5					▲			▲		
58	75	7									▲	▲
58	75	8			▲	▲				▲		
58	75	9				▲	▲	▲	▲	▲		
58	75	10					▲			▲		
58	75	11					▲			▲		
58	75	12			▲	▲	▲	▲	▲	▲		
58	75	13								▲		
58	75	15						▲	▲	▲		
58	76	7.8								▲		
58	76	9					▲			▲		
58	76	10						▲	▲	▲		
58	76	13								▲		
58	78	9								▲		
58	78	10								▲		
58	78	12								▲		
58	78	13					▲			▲		
58	78	18	▲									
58	79	10								▲		
58	80	5								▲	▲	▲
58	80	6									▲	▲
58	80	8					▲			▲		
58	80	9				▲	▲		▲	▲	▲	▲
58	80	10			▲	▲	▲	▲	▲	▲		
58	80	10			▲	▲	▲	▲	▲	▲		
58	80	13					▲			▲		
58	81	12								▲		
58	81.2	5								▲		
58	82	10								▲		
58	82	12								▲		
58	83	10								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
58	85	7								▲		
58	85	8							▲	▲		
58	85	9								▲		
58	85	10					▲			▲		
58	85	12					▲			▲		
58	85	13			▲	▲				▲		
58	87	7							▲			
58	90	8					▲			▲		
58	90	9								▲		
58	90	10					▲			▲		
58	90	11					▲		▲	▲		
58	90	12				▲	▲			▲		
58	90	13			▲	▲	▲	▲	▲	▲		
58	110	12								▲		
59	72	12							▲	▲		
59	72	12.3								▲		
59	75	10						▲	▲	▲		
59	78.3	8								▲		
59	80	7					▲			▲		
59	83	12								▲		
59	85	8					▲			▲		
60	67	4									▲	
60	70	7				▲	▲			▲		
60	70	8					▲			▲		
60	70	10								▲		
60	70	12								▲		
60	72	7								▲		
60	72	7.5							▲	▲		
60	72	8				▲	▲	▲	▲	▲		
60	72	9								▲		
60	72	10								▲		
60	72	12								▲		
60	72	18				▲						
60	74	7.5							▲			
60	74	9								▲		
60	74	10						▲		▲		
60	74	12					▲	▲	▲	▲		
60	75	6									▲	▲
60	75	7					▲			▲		
60	75	8			▲	▲	▲	▲	▲	▲		
60	75	9				▲	▲	▲	▲	▲		
60	75	10				▲	▲			▲		
60	75	12								▲		
60	75.18	11								▲		
60	76	10					▲			▲		
60	76	11								▲		
60	77	6			▲	▲	▲			▲		
60	77	10								▲		
60	77	12						▲	▲	▲		
60	78	7					▲			▲	▲	▲
60	78	8								▲		
60	78	9			▲	▲	▲		▲	▲		
60	78	10					▲			▲		
60	78	12								▲		
60	78	13					▲			▲		
60	79	10								▲		
60	80	5								▲		
60	80	7								▲		
60	80	7.5								▲		
60	80	8			▲	▲	▲	▲	▲	▲		
60	80	9							▲	▲		
60	80	10			▲	▲	▲	▲	▲	▲		
60	80	12		▲	▲	▲	▲	▲	▲	▲		
60	80	13			▲	▲	▲	▲	▲	▲		
60	82	6								▲	▲	▲
60	82	7					▲			▲		
60	82	8								▲		
60	82	9				▲	▲		▲	▲	▲	▲
60	82	10					▲	▲	▲	▲		
60	82	11								▲		
60	82	12				▲	▲	▲	▲	▲		
60	82	13.5							▲			
60	82	14							▲	▲		
60	83	13						▲	▲	▲		
60	84	10								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
60	85	6								▲	▲	▲
60	85	8					▲			▲		
60	85	10			▲	▲	▲	▲	▲	▲		
60	85	11								▲		
60	85	12			▲	▲	▲		▲	▲		
60	85	13			▲	▲	▲	▲	▲	▲		
60	85.5	12								▲		
60	86	10								▲		
60	88	10								▲		
60	88	12								▲		
60	88	14								▲		
60	90	6					▲			▲		
60	90	7									▲	▲
60	90	8			▲	▲	▲			▲		
60	90	10			▲	▲	▲	▲	▲	▲		
60	90	11							▲	▲		
60	90	12			▲	▲				▲		
60	90	13				▲	▲		▲	▲		
60	90	14				▲	▲		▲	▲		
60	90	16								▲		
60	91	16								▲		
60	92	12								▲		
60	92	13			▲	▲	▲	▲	▲	▲		
60	93	13					▲			▲		
60	95	14								▲		
60	95	10					▲	▲	▲	▲		
60	95	12								▲		
60	95	1a				▲	▲			▲		
60	96	13					▲			▲		
60	97	7								▲		
60	98.5	13								▲		
60	100	10					▲			▲		
60	100	12			▲	▲				▲		
60	100	13						▲	▲	▲		
60	103	12							▲	▲		
60	104	12								▲		
60	110	8								▲		
60	110	10					▲			▲		
60	110	12					▲			▲		
60	110	13			▲	▲	▲.			▲		
60	114	12.5								▲		
60	120	13								▲		
61	85	10								▲		
61	85	13						▲	▲	▲		
61	89	12.5								▲		
62	72	9								▲		
62	75	6									▲	▲
62	75	10				▲		▲	▲	▲		
62	75	1?								▲		
62	76	10					▲		▲	▲		
62	78	5								▲		
62	78	10								▲		
62	80	6.5				▲						
62	80	8								▲		
62	80	9			▲	▲		▲	▲	▲		
62	80	10			▲	▲	▲	▲	▲	▲		
62	80	11								▲		
62	80	12			▲	▲	▲			▲		
62	81	6								▲		
62	82	7								▲		
62	82	10					▲			▲		
62	82	12					▲	▲	▲	▲		
62	82	13								▲		
62	82.5	12								▲		
62	83	9								▲		
62	83	12			▲	▲				▲		
62	83	15					▲			▲		
62	84	9								▲		
62	85	6									▲	▲
62	85	8		▲				▲	▲	▲		
62	85	9				▲	▲		▲	▲		
62	85	10			▲	▲	▲	▲	▲	▲		
62	85	12			▲	▲	▲		▲	▲		
62	85	13			▲	▲				▲		
62	85.7	10								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	T6	TC	VB	VC
62	87	8								▲		
62	88	12								▲		
62	90	8								▲		
62	90	10			▲	▲	▲	▲	▲	▲		
62	90	11					▲			▲		
62	90	12			▲	▲		▲		▲		
62	90	12.5			▲	▲				▲		
62	90	13			▲	▲	▲	▲	▲	▲		
62	92	12								▲		
62	95	10					▲			▲		
62	95	12								▲		
62	95	13								▲		
62	100	10								▲		
62	100	12					▲			▲		
62	100	13								▲		
62	101	15								▲		
62	110	10								▲		
62	110	12					▲			▲		
62	110	13					▲			▲		
62	120	12								▲		
63	73	12								▲		
63	75	6						▲	▲	▲		
63	75	9								▲		
63	78	8								▲		
63	78	10					▲					
63	79	12								▲		
63	80	7									▲	▲
63	80	8							▲	▲		
63	80	9				▲	▲		▲	▲		
63	80	10								▲		
63	80	12						▲	▲	▲		
63	80	13						▲	▲	▲		
63	82	9						▲	▲	▲		
63	85	8								▲		
63	65	9				▲	▲			▲		
63	85	10					▲			▲		
63	85	12			▲	▲	▲		▲	▲		
63	85	13					▲			▲		
63	85.5	10								▲		
63	88	12								▲		
63	88	12								▲		
63	90	7								▲		
63	90	8								▲		
63	90	10						▲		▲		
63	90	12								▲		
63	92	13								▲		
63	93	12								▲		
63	100	13					▲			▲		
63	110	12					▲			▲		
63	110	13					▲			▲		
64	80	7					▲			▲		
64	80	8					▲	▲	▲	▲		
64	80	10								▲		
64	80	12								▲		
64	80	13					▲			▲		
64	82	8								▲		
64	83	10								▲		
64	84	10								▲		
64	84	16								▲		
64	85	8								▲		
64	85	10			▲	▲				▲		
64	85	12								▲		
64	85	16								▲		
64	86	10								▲		
64	88	15								▲		
64	89	12							▲	▲		
64	89	13.2			▲	▲				▲		
64	69	14								▲		
64	90	9						▲	▲	▲		
64	90	10			▲	▲				▲		
64	90	12						▲	▲	▲		
64	90	13			▲	▲	▲	▲	▲	▲		
64	95	10								▲		
64	120	12								▲		
65	75	5					▲			▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
65	75	7					▲			▲		
65	75	8								▲		
65	75	10								▲		
65	75	12								▲		
65	77	12						▲	▲	▲		
65	77	12.5					▲					
65	78	12								▲		
65	80	8				▲	▲	▲	▲	▲		
65	80	9						▲	▲	▲		
65	80	10					▲	▲	▲	▲		
65	80	11								▲		
65	80	12			▲	▲	▲			▲		
65	80	13					▲			▲		
65	81	13								▲		
65	82	8								▲		
65	82	9								▲		
65	82	10			▲	▲	▲			▲		
65	82	12				▲	▲			▲		
65	83	10						▲	▲	▲		
65	83.5	10								▲		
65	84	7								▲		
65	84	9								▲		
65	84	12								▲		
65	85	5					▲			▲		
65	S5	8					▲			▲		
65	85	9									▲	▲
65	85	10		▲	▲	▲	▲	▲	▲	▲		
65	85	12			▲	▲	▲	▲	▲	▲		
65	85	13			▲	▲	▲			▲		
65	85	16						▲	▲	▲		
65	86	12								▲		
65	88	5									▲	▲
65	88	6									▲	▲
65	88	8					▲			▲		
65	88	9								▲		
65	88	10		▲						▲		
65	88	12				▲	▲		▲	▲		
65	88	14							▲	▲		
65	89	13								▲		
65	89.1	14				▲						
65	89.2	12.7								▲		
65	90	8								▲		
65	90	10				▲	▲	▲	▲	▲		
65	90	11.5								▲		
65	90	12				▲	▲	▲	▲	▲		
65	90	13				▲	▲	▲	▲	▲		
65	90	15				▲				▲		
65	90	95								▲		
65	92	10								▲		
65	92	12					▲	▲	▲	▲		
65	92	13						▲	▲	▲		
65	95	10			▲	▲	▲			▲		
65	95	12				▲	▲			▲		
65	95	13			▲	▲				▲		
65	95	14				▲	▲		▲	▲		
65	95	16							▲	▲		
65	98	15								▲		
65	100	9.5								▲		
65	100	10			▲	▲	▲			▲		
65	100	12							▲	▲		
65	100	13			▲	▲	▲	▲	▲	▲		
65	100	15								▲		
65	102	12								▲		
65	102	13								▲		
65	105	10						▲	▲	▲		
65	105	12								▲		
65	110	10								▲		
65	110	12						▲	▲	▲		
65	110	13								▲		
65	115	12								▲		
65	115	13								▲		
65	120	10						▲	▲	▲		
65	120	12								▲		
65	120	13								▲		
65	120	15								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
65	125	12					▲			▲		
65	140	10								▲		
66	80	9						▲	▲	▲		
66	80	17										
66	85	10								▲		
								▲	▲	▲		
66	86	10				▲	▲					
66	90	10						▲	▲	▲		
66	90	13			▲	▲				▲		
67	80	10										
67	82	7			▲	▲		▲	▲	▲		
										▲		
67	85	10			▲	▲		▲	▲	▲		
67	86	10								▲		
67	89	12.6								▲		
67	90	10										
68	78	7				▲	▲					
					▲	▲				▲		
68	80	7					▲			▲		
68	80	8					▲			▲		
68	80	10								▲		
68	82	7										
68	82	8					▲			▲		
							▲			▲		
68	82	10								▲		
68	82	12								▲		
68	83	10								▲		
68	84	9										
68	85	8								▲		
68	85	10					▲		▲	▲		
68	85	13					▲			▲		
68	86	8								▲		
68	86	10										
68	87	8								▲		
										▲		
68	88	8								▲		
68	88	9								▲		
68	88	10						▲	▲	▲		
68	88	12										
68	88.9	12						▲	▲			
68	90	7								▲	▲	▲
68	90	8				▲				▲		
68	90	10			▲	▲	▲	▲	▲	▲		
68	90	12										
68	90	13				▲	▲	▲	▲	▲		
							▲	▲	▲	▲		
68	92	10						▲		▲		
68	92	12							▲	▲		
68	94	8								▲		
68	94	10										
68	95	8								▲		
										▲		
68	95	10					▲			▲		
68	95	12					▲			▲		
68	95	13				▲	▲	▲	▲	▲		
68	98	10										
68	100	7								▲		
68	100	10			▲	▲	▲					
68	100	12						▲	▲	▲		
68	100	13					▲			▲		
68	110	13										
69	85	8			▲	▲		▲	▲	▲		
					▲	▲	▲			▲		
69	85	10						▲	▲	▲		
69	90	10					▲			▲		
69	92	12							▲			
70	80	6										
70	80	8					▲			▲		
70	80	10								▲		
70	80	12								▲		
70	81	6.5					▲			▲		
70	81.5	7										
70	82	10								▲		
										▲		
70	82	12						▲	▲	▲		
70	82.5	10								▲		
70	84	8								▲		
70	84	10										
70	85	6								▲		
						▲	▲			▲		
70	85	7					▲			▲		
70	85	8			▲	▲	▲	▲	▲	▲		
70	85	9								▲		
70	85	10					▲			▲		
70	85	12						▲	▲	▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
70	85	16		▲								
70	87	10								▲		
70	88	7									A	A
70	88	8								▲		
70	88	10								▲		
70	88	12				▲	▲		▲	▲		
70	89	12								▲		
70	90	5					▲			▲		
70	90	7					▲			▲		
70	90	8					▲			▲		
70	90	10			▲	▲	▲	▲	▲	▲	▲	▲
70	90	11						▲	▲	▲		
70	90	12		▲	▲	▲	▲	▲	▲	▲		
70	90	13										
70	90	13.5						▲	▲	▲		
70	92	5									▲	▲
70	92	7									▲	▲
70	92	8.5								▲		
70	92	9								▲		
70	92	10								▲		
70	92	12				▲	▲		▲	▲	▲	▲
70	92	13								▲		
70	92	14							▲	▲		
70	93	12								▲		
70	94	10								▲		
70	94	12								▲		
70	95	7									▲	▲
70	95	8						▲	▲	▲		
70	95	10			▲	▲	▲			▲		
70	95	12					▲			▲		
70	95	13										
70	95	14								▲		
70	95	17								▲		
70	98	12								▲		
70	98	13								▲		
70	98.5	13								▲		
70	100	6					▲			▲		
70	100	8					▲			▲		
70	100	10			▲	▲	▲	▲	▲	▲		
70	100	12					▲	▲	▲	▲		
70	100	13			▲	▲	▲	▲	▲	▲		
70	100	14					▲	▲	▲	▲		
70	100	15								▲		
70	101.5	12								▲		
70	102	12								▲		
70	102	12.5					▲			▲		
70	102	13								▲		
70	102	15						▲	▲	▲		
70	105	HI				▲				▲		
70	105	12								▲		
70	105	13			▲	▲	▲	▲	▲	▲		
70	105	15								▲		
70	106	14						▲	▲	▲		
70	110	8								▲		
70	110	10					▲			▲		
70	110	12					▲			▲		
70	110	13					▲	▲	▲	▲		
70	111	8								▲		
70	112	10								▲		
70	112	12					▲			▲		
70	112	13			▲	▲				▲		
70	112	14							▲			
70	112	18								▲		
70	115	13								▲		
70	115	15								▲		
70	120	10						▲	▲	▲		
70	120	12								▲		
70	120	13			▲	▲	▲			▲		
70	125	10					▲			▲		
70	125	12								▲		
70	125	13								▲		
70	130	12						▲	▲	▲		
70	130	13								▲		
70	135	12					▲			▲		
71	87	10								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
71	88	8						▲	▲	▲		
71	88	10								▲		
71	95	13				▲	▲		▲	▲		
71	100	17								▲		
72	82	6					▲			▲		
72	84	7							▲	▲		
72	85	8					▲			▲		
72	85	9								▲		
72	85	10					▲			▲		
72	86	7								▲		
72	86	7.5								▲		
72	88	8				▲				▲		
72	90	8			▲	▲	▲	▲	▲	▲		
72	90	10			▲	▲	▲	▲	▲	▲		
72	90	12								▲		
72	90	13								▲		
72	92	17							▲	▲		
72	94	8						▲	▲	▲		
72	94	10						▲	▲	▲		
72	94	12								▲		
72	95	10					▲	▲	▲	▲		
72	95	12					▲			▲		
72	95	13			▲	▲			▲	▲		
72	96	9								▲		
72	96	10								▲		
72	98	9								▲		
72	100	10					▲			▲		
72	100	12				▲	▲	▲	▲	▲		
72	100	13					▲	▲	▲	▲		
72	102	13								▲		
72	105	10								▲		
72	105	13			▲	▲	▲	▲	▲	▲		
72	110	13					▲			▲		
72	100	10					▲			▲		
72	115	13								▲		
72	130	12					▲			▲		
72	140	12								▲		
73	90	7								▲		
73	90	8						▲	▲	▲		
73	90	9								▲		
73	93	13								▲		
73	95	10					▲			▲		
73	96	9										
73	100	13								▲		
73	108	12										
73	120	8								▲	▲	
74	88	12										
74	89	12								▲		
74	90	10				▲				▲		
74	90	12								▲		
74	90	13								▲		
74	92	10								▲		
74	93	12								▲		
74	95	7								▲	▲	▲
74	95	10								▲		
74	95	13						▲	▲	▲		
74	96	9								▲		
74	96	10								▲		
74	96	12										
74	97	12								▲		
74	98	10								▲		
74	98	12								▲		
74	100	10							▲			
74	100	13								▲		
74	101.78	12.7						▲	▲	▲		
74	102	13								▲		
74	105	12					▲			▲		
74	108	10								▲		
74	142	14								▲		
75	85	1U								▲		
75	85	12								▲		
75	90	6								▲		
75	90	7										
75	90	8			▲	▲	▲			▲		
75	90	10			▲	▲	▲			▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
75	90	11.5								▲		
75	90	12			▲	▲				A		
75	90	13						▲	▲	▲		
75	92	7					▲			▲		
75	92	12								▲		
75	93	9								▲		
75	93	10								▲		
75	94	10								▲		
75	94	12								▲		
75	94	13								▲		
75	95	5				▲	▲			▲		
75	95	7								▲		
75	95	8			▲	▲	▲			▲		
75	95	9								▲		
75	95	10			▲	▲	▲	▲	▲	▲		
75	95	11								▲		
75	95	12					▲	▲	▲	▲		
75	95	13			▲	▲	▲	▲	▲	▲		
75	95	14								▲		
75	95	15								▲		
75	96	11						▲	▲	▲		
75	98	12						▲	▲	▲		
75	100	7					▲			▲	▲	▲
75	100	8								▲	▲	▲
75	100	10			▲	▲	▲	▲	▲	▲		
75	100	11			▲	▲	▲			▲		
75	100	13			▲	▲	▲	▲	▲	▲		
75	100	14								▲		
75	100	15	▲							▲		
75	100	17						▲	▲	▲		
75	100	18								▲		
75	101	13								▲		
75	102	10								▲		
75	102	12						▲		▲		
75	102	13			▲			▲	▲	▲		
75	105	10			▲	▲				▲		
75	105	12		▲	▲	▲	▲	▲	▲	▲		
75	105	13				▲	▲	▲	▲	▲		
75	105	15				▲	▲	▲	▲	▲		
75	106	13								▲		
75	107	10					▲			▲		
75	108	10								▲		
75	108	13						▲	▲	▲		
75	110	10								▲		
75	110	12			▲	▲	▲			▲		
75	110	13				▲	▲	▲	▲	▲		
75	115	9.5								▲		
75	115	10					▲			▲		
75	115	12					▲	▲	▲	▲		
75	115	13								▲		
75	120	10			▲	▲				▲		
75	120	12					▲			▲		
75	120	13								▲		
75	120	15					▲					
75	121	13						▲	▲	▲		
75	122	13						▲	▲	▲		
75	125	12								▲		
75	130	13					▲			▲		
76	93	10								▲		
76	95	11								▲		
76	98	9								▲		
76	98	12								▲		
76	100	11					▲					
76	100	12								▲		
76	100	16								▲		
76	102	8								▲		
76	102	11								▲		
76	102	12					▲			▲		
76	105	12					▲			▲		
76	105	13					▲			▲		
76	114	14								▲		
76	114	15								▲		
77	93	10						▲	▲	▲		
77	95	10			▲	▲	▲			▲		
77	100	10			▲	▲	▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
77	100	11.5								▲		
78	95	8			▲	▲				▲		
78	95	10								▲		
78	95	11					▲			▲		
78	95	13						▲	▲	▲		
78	98	12								▲		
78	100	10					▲			▲		
78	100	12			▲	▲				▲		
78	100	13				▲	▲		▲	▲		
78	105	10								▲		
78	105	13			▲	▲	▲			▲		
78	108	13						▲		▲		
78	110	10								▲		
78	110	12					▲	▲	▲	▲		
78	110	13					▲			▲		
78	113	13					▲			▲		
78	113	14								▲		
78	115	10					▲			▲		
78	115	13						▲	▲	▲		
78	120	7								▲		
78	102	12.5								▲		
78	146.75	12.8				▲						
80	90	6								▲		
80	95	5				▲						
80	95	6									▲	▲
80	95	8					▲			▲		
80	95	10								▲		
80	95	12								▲		
80	95	13								▲		
80	96	9					▲			▲		
80	96	12								▲		
80	98	5.5					▲					
80	98	10								▲		
80	98	11			▲	▲				▲		
80	99	13					▲			▲		
80	100	7					▲			▲	▲	▲
80	100	8								▲		
80	100	8.5								▲		
80	100	9				▲	▲					
80	100	10		▲	▲	▲	▲	▲	▲	▲		
80	100	12			▲	▲		▲	▲	▲		
80	100	13			▲	▲	▲	▲	▲	▲		
80	100	14								▲		
80	100	15								▲		
80	100	18								▲		
80	102	11								▲		
80	102	13								▲		
80	105	7									▲	▲
80	105	8								▲		
80	105	8.5								▲		
80	105	10					▲			▲		
80	105	12					▲	▲	▲	▲		
80	105	13			▲	▲	▲	▲	▲	▲		
80	105	14								▲		
80	105	15			▲	▲		▲	▲	▲		
80	105	20	▲									
80	108	13							▲	▲		
80	108	15								▲		
80	110	7									▲	▲
80	110	10		▲	▲	▲	▲			▲		
80	110	12			▲	▲	▲			▲		
80	110	13			▲	▲	▲	▲	▲	▲		
80	110	14								▲		
80	110	15				▲	▲			▲		
80	112	12			▲	▲				▲		
80	115	10					▲			▲		
80	115	12					▲			▲		
80	115	13					▲			▲		
80	115	15				▲	▲		▲	▲		
80	120	10								▲		
80	120	12			▲	▲	▲			▲		
80	120	13					▲			▲		
80	122	10.5								▲		
80	125	10								▲		
80	125	12			▲	▲	▲			▲		

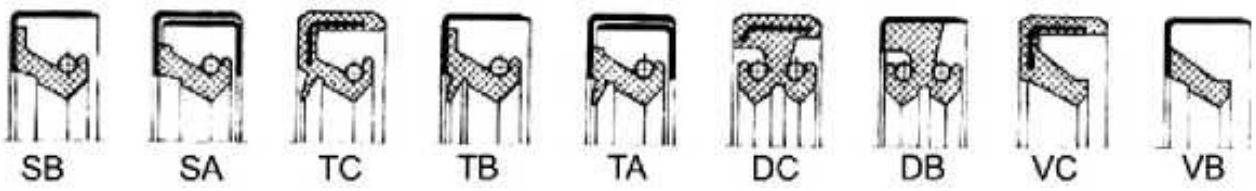
d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
80	125	13								▲		
80	125	14								▲		
80	128	10								▲		
80	130	12								▲		
80	130	13					▲	▲	▲	▲		
80	135	12								▲		
80	140	13					▲			▲		
80	140	13			▲	▲	▲			▲		
80	145	13					▲			▲		
80	150	12						▲	▲	▲		
80	150	15						▲	▲	▲		
80	150.5	13					▲					
80	165	13								▲		
81	96	10								▲		
81	100	10			▲	▲				▲		
81	100.1	11.5								▲		
82	95	10								▲		
82	100	10					▲			▲		
82	100	12								▲		
82	100	10								▲		
82	100	12						▲	▲	▲		
82	102	12								▲		
82	102	13						▲	▲	▲		
82	105	12				▲	▲			▲		
82	105	13			▲	▲		▲	▲	▲		
82	105	14					▲			▲		
82	108	10						▲				
82	110	12					▲			▲		
82	110	13								▲		
82	114.5	12						▲		▲		
82	114.65	13								▲		
82	120	13								▲		
83	160	13								▲		
83	100	9			▲	▲				▲		
83	100	10								▲		
83	100	13						▲	▲	▲		
83	104	11								▲		
83	110	12			▲	▲				▲		
84	110	13								▲		
84	110	14					▲					
84	100	13						▲	▲	▲		
84	102	13								▲		
84	105	12								▲		
84	105	13			▲	▲	▲			▲		
84	110	12				▲		▲		▲		
84	110	13						▲	▲	▲		
84	110	13.5								▲		
84	110	16								▲		
85	100	6								▲		
85	100	8								▲		
85	100	9					▲	▲	▲	▲	▲	▲
85	100	111						▲	▲	▲		
85	100	12			▲	▲		▲	▲	▲		
85	100	13								▲		
85	102	9								▲		
85	102	12								▲		
85	102	13					▲	▲	▲	▲		
85	103	8.5								▲		
85	103	13								▲		
85	105	8					▲			▲		
85	105	9									▲	▲
85	105	10			▲	▲	▲	▲	▲	▲		
85	105	11								▲		
85	105	12			▲	▲			▲	▲		
85	105	13			▲	▲	▲	▲	▲	▲		
85	105	15			▲	▲						
85	108	12								▲		
85	108	14						▲	▲	▲		
85	110	6								▲		
85	110	7			▲	▲	▲			▲	▲	▲
85	110	8									▲	▲
85	110	10								▲		
85	110	11								▲		
85	110	12			▲	▲	▲	▲	▲	▲		
85	110	13			▲	▲	▲	▲	▲	▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
85	110	15			▲	▲			▲	▲		
85	111	10								▲		
85	113	12								▲		
85	114	13								▲		
85	114.5	13								▲		
85	115	12								▲		
85	115	13					▲	▲	▲	▲		
85	115	15					▲		▲	▲		
85	115	16					▲			▲		
85	115.5	13								▲		
85	117.5	9.4					▲					
85	117.55	12								▲		
85	120	10								▲		
85	120	12			▲	▲	▲	▲	▲	▲		
85	120	13			▲	▲		▲	▲	▲		
85	120	14								▲		
85	120	15			▲	▲	▲		▲	▲		
85	120	17								▲		
85	124	12								▲		
85	124	14								▲		
85	125	7								▲		
85	125	12					▲			▲		
85	125	13								▲		
85	125	14								▲		
85	130	10								▲		
85	130	12					▲			▲		
85	130	13								▲		
85	130	15								▲		
85	130	22					▲			▲		
85	135	13								▲		
85	140	12					▲			▲		
85	140	13			▲	▲				▲		
85	140	14								▲		
85	150	12					▲			▲		
85	150	13								▲		
85	195	15								▲		
86	103	10								▲		
86	104	11.8								▲		
86	105	13						▲	▲	▲		
86	106	8								▲		
86	106	13					▲			▲		
87	100	12								▲		
87	105	9								▲		
87	108	11								▲		
87	110	13					▲			▲		
87	114.65	13								▲		
88	100	10								▲		
88	105	10								▲		
88	105	18								▲		
88	108	11								▲		
88	110	12					▲			▲		
88	110	13					▲			▲		
88	115	12								▲		
88	115	13				▲	▲	▲	▲	▲		
88	120	12					▲			▲		
88	120	13								▲		
88	125	13						▲	▲	▲		
88	126	12					▲			▲		
88	128	10					▲			▲		
88	128	12					▲			▲		
88	140	13					▲			▲		
89	114	14								▲		
89	115	13								▲		
90	100	7.5								▲		
90	100	10								▲		
90	100	12								▲		
90	105	8						▲	▲	▲		
90	105	9								▲		
90	105	10					▲			▲		
90	105	12								▲		
90	105	13								▲		
90	110	5.5					▲			▲		
90	110	7					▲			▲		
90	110	7.5								▲		
90	110	0			▲	▲	▲	▲	▲	▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
90	110	10			▲	▲	▲	▲	▲	▲		
90	110	11								▲		
90	110	12			▲	▲	▲			▲		
90	110	13			▲	▲	▲	▲	▲	▲		
90	110	14								▲		
90	110	15			▲	▲	▲			▲		
90	110	16			▲		▲	▲	▲.	▲		
90	112	12								▲		
90	112.7	13			▲	▲		▲	▲	▲		
90	114	7								▲		
90	114.5	13						▲		▲		
90	115	5									▲	▲
90	115	8					▲			▲		
90	115	9			▲	▲	▲			▲		
90	115	10								▲		
90	115	12								▲		
90	115	13			▲	▲	▲	▲	▲	▲	▲	▲
90	115	15				▲	▲		▲	▲		
90	115	20								▲		
90	117.5	12.5								▲		
90	118	12						▲	▲	▲		
90	118	13						▲	▲	▲		
90	118	15								▲		
90	120	10					▲			▲		
90	120	12			▲	▲	▲			▲		
90	120	13										
90	120	15			▲	▲	▲		▲	▲		
90	122	12.5						▲	▲	▲		
90	122	14								▲		
90	125	12								▲		
90	125	13			▲	▲	▲	▲	▲	▲		
90	125	15				▲	▲		▲	▲		
90	125	16					▲			▲		
90	125	17							▲	▲		
90	130	10								▲		
90	130	12					▲			▲		
90	130	13			▲	▲	▲	▲	▲	▲		
90	130	13						▲	▲.	▲		
90	135	12								▲		
90	135	13								▲		
90	135	15						▲	▲	▲		
90	140	10								▲		
90	140	12								▲		
90	140	13			▲	▲	▲	▲	▲	▲		
90	160	13								▲		
91	100	12					▲					
91	111	10						▲	▲	▲		
92	105	10								▲		
92	110	10								▲		
92	110	12								▲		
92	110	13						▲	▲	▲		
92	112	10								▲		
92	115	13						▲	▲	▲		
92	120	12					▲			▲		
92	120	13										
92	120	14					▲					
92	145	18								▲		
93	108	7								▲		
93	110	12								▲		
93	115	13			▲	▲				▲		
93	120	13			▲	▲		▲	▲	▲		
93	127	11								▲		
93	130	13						▲	▲	▲		
94	110	10.8								▲		
94	114	7				▲				▲		
94	120.65	12.7			▲							
94	105	9								▲		
95	105	13								▲		
95	110	7								▲		
95	110	9			▲	▲	▲	▲	▲	▲		
95	110	10					▲	▲	▲	▲		
95	110	11								▲		
95	110	12					▲			▲		
95	110	13			▲	▲	▲	▲	▲	▲		
95	112	12								▲		

Skeleton Rotary Oil Seal



d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
95	112	12.5								▲		
95	114	8								▲		
95	114	12								▲		
95	115	8					▲			▲		
95	115	9									▲	▲
95	115	10				▲				▲		
95	115	11								▲		
95	115	12					▲	▲	▲	▲		
95	115	13		▲	▲	▲	▲	▲	▲	▲		
95	115	15					▲					
95	117	12								▲		
95	120	7					▲			▲		
95	120	8									▲	▲
95	120	10					▲			▲		
95	120	12			▲	▲	▲	▲	▲	▲		
95	120	13			▲	▲	▲	▲	▲	▲		
95	120	15			▲	▲			▲	▲		
95	120	17	▲									
95	125	10								▲		
95	125	12			▲	▲	▲	▲	▲	▲		
95	125	13			▲	▲	▲	▲	▲	▲		
95	125	14				▲	▲					
95	125	15			▲	▲				▲		
95	125	16								▲		
95	125	18								▲		
95	125	20								▲		
95	127	10								▲		
95	128	12						▲	▲	▲		
95	130	10								▲		
95	130	12					▲			▲		
95	130	13			▲	▲	▲	▲	▲	▲		
95	130	15			▲	▲	▲	▲	▲	▲		
95	130	12								▲		
95	130	13					▲		▲	▲		
95	130	15								▲		
95	130	17							▲	▲		
95	135	12								▲		
95	136	13			▲					▲	▲	▲
95	135	14								▲		
95	135	20								▲		
95	136.5	18						▲	▲	▲		
95	140	13						▲	▲	▲		
95	145	8					▲			▲		
95	145	10								▲		
95	145	12								▲		
95	145	13					▲			▲		
95	145	15								▲		
95	165	15					▲			▲		
95	170	13						▲	▲	▲		
96	112	10					▲			▲		
96	113	15								▲		
96	120	12						▲	▲	▲		
96	136	10					▲			▲		
97	114	12						▲	▲	▲		
97	120	13								▲		
97	123	14								▲		
97	124.13	13								▲		
97	130	13						▲	▲	▲		
98	110	13								▲		
98	116	10								▲		
98	120	7								▲		
98	120	12								▲		
98	120	13			▲	▲	▲	▲	▲	▲		
98	120	15				▲	▲					
98	124	13								▲		
98	125	12								▲		
98	125	13			▲	▲	▲			▲		
98	128	10					▲			▲		
98	130	13						▲	▲	▲		
98	135	13								▲		
98	136.65	12.7						▲	▲	▲		
100	112	9								▲		
100	114	7							▲	▲		
100	114	10						▲	▲	▲		
100	114	12						▲	▲	▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
100	115	9			▲	▲	▲	▲	▲	▲		
100	115	10					▲			▲		
100	115	12								▲		
100	116	12								▲		
100	118	9			▲	▲				▲		
100	118	10								▲		
100	118	12								▲		
100	120	8			▲	▲		▲	▲	▲		
100	120	10			▲	▲	▲		▲	▲		
100	120	11					▲	▲	▲	▲		
100	120	12			▲	▲	▲	▲	▲	▲		
100	120	13			▲	▲	▲	▲	▲	▲		
100	120	15					▲			▲		
100	120	17								▲		
100	122	13								▲		
100	124	8					▲			▲		
100	124	12								▲		
100	125	8								▲	▲	▲
100	125	10								▲		
100	125	12			▲	▲	▲	▲	▲	▲		
100	125	13			▲	▲	▲	▲	▲	▲		
100	125	14								▲		
100	125	15				▲	▲		▲	▲		
100	125	23	▲							▲		
100	127	10								▲		
100	127	12								▲		
100	127	13					▲		▲	▲		
100	130	10			▲	▲				▲		
100	130	12			▲	▲	▲		▲	▲		
100	130	13		▲	▲	▲	▲	▲	▲	▲		
100	130	14					▲			▲		
100	130	15				▲	▲	▲	▲	▲		
100	135	10								▲		
100	135	12								▲		
100	135	13						▲	▲	▲		
100	135	14								▲		
100	135	1S							▲	▲		
100	135	17							▲	▲		
100	137	11								▲		
100	139	19								▲		
100	140	10								▲		
100	140	12								▲		
100	140	13			▲	▲	▲	▲	▲	▲		
100	140	15						▲	▲	▲		
100	142	10								▲		
100	145	13								▲		
100	145	14								▲		
100	145	15								▲		
100	150	10								▲		
100	150	12					▲			▲		
100	150	12.7								▲		
100	150	13						▲	▲	▲		
100	150	14								▲		
100	150	15								▲		
100	162	12								▲		
100	165	13								▲		
100	180	12								▲		
100	180	13					▲			▲		
100	185	13					▲			▲		
101	114	10							▲	▲		
102	115	10								▲		
102	116	14						▲	▲	▲		
102	120	12					▲			▲		
102	125	13								▲		
102	130	13					▲			▲		
102	135	13								▲		
102	170	13								▲		
103	125	13				▲	▲			▲		
104	125	10					▲			▲		
104	130	13								▲		
104	180.5	13								▲		
105	120	7				▲	▲			▲		
105	120	8						▲	▲	▲		
105	120	10					▲			▲		
105	120	11					▲	▲	▲	▲		

Skeleton Rotary Oil Seal

d	0	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
105	120	13					▲			▲		
105	120	15			▲	▲				▲		
105	125	6								▲		
105	125	10				▲				▲		
105	125	11.7								▲		
105	125	12				▲	▲		▲	▲		
105	125	12.5								▲		
105	125	13			▲	▲	▲	▲	▲	▲		
105	125	15				▲	▲					
105	125	16						▲	▲	▲		
105	127	10								▲		
105	130	9.5								▲		
105	130	10								▲		
105	130	12		▲	▲	▲	▲	▲	▲	▲		
105	130	13			▲	▲	▲	▲	▲	▲		
105	130	15			▲	▲	▲			▲		
105	135	12								▲		
105	135	13					▲	▲	▲	▲		
105	135	14				▲	▲		▲	▲		
105	135	15				▲	▲			▲		
105	135	16							▲	▲		
105	135	18	▲									
105	136	13								▲		
105	140	12				▲	▲			▲		
105	140	13			▲	▲	▲	▲	▲	▲		
105	140	14								▲		
105	140	15			▲	▲		▲	▲	▲		
105	140	16								▲		
105	145	12								▲		
105	145	13								▲		
105	145	15								▲		
105	145	16					▲		▲	▲		
105	150	12									▲	▲
105	150	15			▲	▲				▲		
105	160	12								▲		
105	180	13								▲		
106	126	13								▲		
107	130	13								▲		
108	130	13			▲	▲				▲		
108	135	15								▲		
108	140	13						▲	▲	▲		
108	160	13								▲		
110	125	9.5							▲	▲		
110	125	12					▲			▲		
110	125	13					▲			▲		
110	126	18								▲		
110	127.5	13								▲		
110	128	9			▲	▲		▲	▲	▲		
110	130	8					▲			▲		
110	130	10					▲			▲		
110	130	12			▲	▲	▲			▲		
110	130	13			▲	▲	▲	▲	▲	▲		
110	130	14								▲		
110	130	14.5					▲			▲		
110	130	15			▲	▲		▲	▲	▲		
110	130	18								▲		
110	135	10								▲		
110	135	12					▲			▲		
110	135	13			▲	▲	▲	▲	▲	▲		
110	135	14							▲	▲		
110	135	15								▲		
110	140	8					▲			▲	▲	▲
110	140	9						▲	▲	▲		
110	140	10			▲	▲	▲			▲		
110	140	12			▲	▲	▲			▲		
110	140	13			▲	▲	▲	▲	▲	▲		
110	140	14				▲	▲		▲	▲		
110	140	15			▲	▲	▲			▲		
110	140	16							▲	▲		
110	142.85	12						▲		▲		
110	142.85	14						▲				
110	145	12				▲				▲		
110	145	13			▲	▲				▲		
110	145	14				▲	▲			▲		
110	145	15				▲	▲	▲	▲	▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	ve	VC
110	145	17							▲	▲		
110	146.5	13						▲		▲		
110	148	15								▲		
110	150	12								▲		
110	150	13					▲	▲	▲	▲		
110	150	15			▲	▲		▲	▲	▲	▲	▲
110	152	15								▲		
110	160	12						▲	▲	▲		
110	160	13						▲	▲	▲		
110	160	14								▲		
110	160	15					▲			▲		
110	160	16						▲	▲	▲		
110	165	12						▲	▲	▲		
110	167	17								▲		
110	170	12								▲		
110	170	12.7						▲	▲	▲		
110	170	13								▲		
110	180	12								▲		
110	180	15								▲		
110	200	13					▲			▲		
112	130	7									▲	▲
112	130	8							▲	▲		
112	130	12						▲	▲	▲		
112	130	13						▲	▲	▲		
112	132	7.5					▲			▲		
112	145	14				▲	▲		▲	▲		
112	140	12								▲		
112	140	13					▲	▲	▲	▲		
112	140	15								▲		
112	142	12								▲		
112	146.5	15								▲		
113	140	13			▲	▲				▲		
113	160	12			▲	▲				▲		
114	126	6								▲		
114	130	13								▲		
114	135	12								▲		
114	135	13						▲	▲	▲		
114	140	10					▲					
114	140	13								▲		
114	145	13						▲	▲	▲		
114	145	14				▲	▲			▲		
114	159	14						▲		▲		
115	130	12					▲	▲	▲	▲		
115	130	13					▲					
115	135	8									▲	▲
115	135	9			▲	▲				▲		
115	135	10					▲			▲		
115	135	12								▲		
115	135	13			▲	▲	▲	▲	▲	▲		
115	135	14								▲		
115	135	15								▲		
115	140	10					▲			▲		
115	140	12			▲	▲	▲	▲	▲	▲		
115	140	13			▲	▲	▲	▲	▲	▲	▲	▲
115	140	14								▲		
115	140	I2			▲	▲			▲	▲		
115	140	17						▲	▲	▲		
115	143	12								▲		
115	143	17								▲		
115	145	12						▲	▲	▲		
115	145	13					▲	▲	▲	▲		
115	145	14				▲	▲		▲	▲		
115	145	15			▲	▲	▲			▲		
115	145	16							▲	▲		
115	146.5	13								▲		
115	150	12					▲			▲		
115	150	13			▲	▲	▲	▲	▲	▲		
115	150	14								▲		
115	150	15						▲	▲	▲		
115	150	16				▲	▲		▲	▲		
115	151	10								▲		
115	155	10								▲		
115	155	12								▲		
115	156	27								▲		
115	159	14								▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
115	160	13						▲	▲	▲		
115	160	15			▲	▲				▲		
115	165	15								▲		
115	180	15								▲		
116	132	12								▲		
116	135	13						▲	▲	▲		
116	160	13								▲		
117	142.7	13								▲		
117	136.5	13								▲		
117	190	15								▲		
118	136	13				▲		▲	▲	▲		
118	140	13			▲	▲		▲	▲	▲		
118	148	15								▲		
118	150	12					▲	▲	▲	▲		
118	150	15					▲	▲	▲	▲		
119	153	15								▲		
120	130	7					▲			▲		
120	132	6									▲	
120	140	10					▲			▲		
120	140	11								▲		
120	140	12						▲	▲	▲		
120	140	13			▲	▲	▲	▲	▲	▲		
120	140	14					▲	▲	▲	▲		
120	140	15					▲	▲	▲	▲		
120	145	10								▲		
120	145	12								▲		
120	145	13						▲	▲	▲		
120	145	14								▲		
120	145	15						▲	▲			
120	146	12			▲	▲				▲		
120	146	13								▲		
120	150	10								▲		
120	150	11								▲		
120	150	12					▲	▲	▲	▲		
120	150	13			▲	▲	▲	▲	▲	▲		
120	150	14			▲	▲	▲	▲	▲	▲	▲	▲
120	150	15			▲	▲	▲	▲	▲	▲		
120	150	16							▲	▲		
120	150	18								▲		
120	150	22	▲									
120	152	23								▲		
120	152.4	13						▲	▲	▲		
120	153	15										
120	155	12					▲			▲		
120	155	13								▲		
120	155	14								▲		
120	155	15								▲		
120	155	16				▲	▲		▲	▲		
120	155	18							▲	▲		
120	159	14								▲		
120	160	12			▲	▲	▲	▲	▲	▲		
120	160	13			▲	▲	▲	▲	▲	▲		
120	160	14								▲		
120	160	15			▲	▲	▲	▲	▲	▲		
120	160	16								▲		
120	165	14								▲		
120	170	15			▲	▲				▲		
120	170	16								▲		
120	180	13										
120	180	15						▲	▲	▲		
120	200	14								▲		
120	141	12								▲		
122	150	13					▲			▲		
122	150	15					▲			▲		
122	152.4	18						▲	▲	▲		
124	146	14							▲			
124	146	23								▲		
124	159	14								▲		
124	170	14								▲		
124	170	14.5								▲		
124	136	13								▲		
125	140	7									▲	
125	140	10					▲			▲		
125	140	12										
125	142	13								▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
125	143	13								▲		
125	145	12								▲		
125	145	13						▲	▲	▲		
125	145	14								▲		
125	146	10								▲		
125	146	14								▲		
125	146.5	13								▲		
125	150	12			▲	▲	▲	▲	▲	▲		
125	150	13			▲		▲	▲	▲	▲		
125	150	14					▲		▲	▲		
125	150	15			▲	▲	▲	▲	▲	▲		
125	152	13								▲		
125	152.4	15			▲	▲		▲	▲	▲		
125	155	13					▲			▲		
125	155	14				▲	▲		▲	▲		
125	155	15								▲		
125	155	16								▲		
125	159	13					▲			▲		
125	160	12					▲	▲	▲	▲		
125	160	13						▲	▲	▲		
125	160	14								▲		
125	160	15			▲	▲	▲	▲		▲		
125	160	16							▲	▲		
125	160	18							▲	▲		
125	161.92	14						▲				
125	160	15								▲		
125	160	16				▲	▲			▲		
125	160	17						▲	▲	▲		
125	162	13								▲		
125	165	15								▲		
125	170	13			▲	▲			▲	▲		
125	170	15								▲		
125	180	12								▲		
126	140	13								▲		
126	146	10								▲		
126	146	13								▲		
126	146	10						▲	▲	▲		
127	146.05	12.7					▲			▲		
127	146.05	15.88						▲	▲	▲		
127	147	11.5						▲	▲	▲		
127	150	12								▲		
127	150	13					▲			▲		
127	152.4	12.7					▲			▲		
127	152.48	12.7						▲	▲	▲		
127	158.75	12.7			▲	▲		▲	▲	▲		
127	158.75	14.28			▲					▲		
127	158.75	14.29										
127	158.75	14.3					▲			▲		
127	158.75	15.88			▲	▲				▲		
127	158.75	21.03						▲	▲	▲		
127	165.1	12.7						▲	▲	▲		
127	165.1	15.88								▲		
127	170	14					▲			▲		
127	180	12								▲		
127	190.5	14.3						▲	▲	▲		
128	146	13.5								▲		
128	148	14								▲		
128	150	9					▲			▲		
128	150	13								▲		
128	150	15					▲					
128	153	18				▲	▲					
128	160	15						▲	▲	▲		
129	160	13						▲	▲	▲		
130	150	10			▲	▲		▲	▲	▲		
130	150	12								▲		
130	150	13						▲	▲	▲		
130	150	14			▲	▲		▲	▲	▲		
130	150	15								▲		
130	152.5	12								▲		
130	153	12								▲		
130	155	10					▲	▲	▲	▲		
130	155	12								▲		
130	155	13						▲	▲	▲		
130	155	14								▲		
								▲	▲	▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
130	158	13								▲		
130	160	8				▲				▲		
130	160	12			▲	▲	▲			▲		
130	160	13			▲	▲	▲	▲	▲	▲		
130	160	14			▲	▲	▲	▲	▲	▲		
130	160	15			▲	▲	▲	▲	▲	▲		
130	160	16			▲	▲	▲		▲	▲		
130	162	9								▲		
130	164	14								▲		
130	163	10								▲		
130	165	13							▲	▲		
130	165	14								▲		
130	165	15					▲	▲	▲	▲		
130	170	8.5					▲					
130	170	12					▲			▲		
130	170	13					▲	▲	▲	▲		
130	170	14					▲			▲		
130	170	15				▲	▲	▲	▲	▲		
130	170	16				▲	▲					
130	180	13								▲		
130	180	15			▲	▲				▲		
130	185	12								▲		
130	190	12						▲	▲	▲		
130	190	15								▲		
130	200	12								▲		
130	230	14								▲		
132	150	13			▲	▲	▲			▲		
132	150	15					▲			▲		
132	159	12								▲		
132	159	14								▲		
132	160	12				▲				▲		
132	160	13			▲	▲				▲		
132	160	15			▲	▲				▲		
133	160	12								▲		
133	160	15								▲		
134	150	15						▲	▲	▲		
134	152.4	11						▲	▲	▲		
134	170	14								▲		
135	150	15								▲		
135	152	11						▲	▲	▲		
135	152	9								▲		
135	155	12								▲		
135	155	13								▲		
135	156	14								▲		
135	159	13								▲		
135	160	12					▲			▲		
135	160	13			▲	▲	▲	▲	▲	▲		
135	160	14					▲		▲	▲		
135	160	15					▲	▲	▲	▲		
135	162	10								▲		
135	162	13						▲	▲	▲		
135	165	12					▲			▲		
135	165	13								▲		
135	165	14			▲	▲	▲	▲	▲	▲	▲	▲
135	165	15						▲	▲	▲		
135	168.2	15							▲			
135	170	12			▲	▲	▲			▲		
135	170	13								▲		
135	170	14					▲			▲		
135	170	15				▲	▲	▲	▲	▲		
135	175	12								▲		
135	175	15								▲		
135	175	16			▲	▲			▲	▲		
135	180	13								▲		
135	180	16						▲	▲	▲		
135	190	15					▲			▲		
135	192	16					▲			▲		
137	170	15					▲					
138	152	12						▲	▲	▲		
138	152	13						▲	▲	▲		
138	157	13						▲	▲	▲		
138	160	15					▲			▲		
138	162	13								▲		
138	165	12							▲			
140	160	8					▲			▲		

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
140	160	10					▲			▲		
140	160	12					▲			▲		
140	160	13		▲	▲	▲	▲	▲	▲	▲		
140	160	14						▲	▲	▲		
140	160	15			▲	▲	▲			▲		
140	162	12								▲		
140	165	10								▲		
140	165	12			▲	▲	▲	▲	▲	▲		
140	165	13						▲	▲	▲		
140	165	15			▲	▲	▲	▲	▲	▲	▲	▲
140	165	16								▲		
140	168	13						▲	▲	▲		
140	168	14								▲		
140	168	16								▲		
140	170	10									▲	▲
140	170	12					▲			▲		
140	170	13			▲	▲	▲	▲	▲	▲		
140	170	14			▲	▲	▲	▲	▲	▲	▲	▲
140	170	15			▲	▲	▲	▲	▲	▲		
140	170	16								▲		
140	175	13						▲		▲		
140	175	15		▲				▲		▲		
140	175	16								▲		
140	180	12					▲	▲	▲	▲		
140	180	13					▲			▲		
140	180	14					▲			▲		
140	180	15			▲	▲	▲	▲	▲	▲		
140	180	16							▲	▲		
140	185	16				▲	▲					
140	190	12						▲	▲	▲		
140	190	15						▲	▲	▲		
140	210	15								▲		
140	220	16								▲		
140	230	15								▲		
142	157	10								▲		
142	165	10								▲		
142	166	10								▲		
142	168	14								▲		
142	168	16						▲	▲	▲		
143	165	10						▲	▲	▲		
143	167	13								▲		
143	168.3	12.7								▲		
143	175	16					▲			▲		
144	160	10			▲	▲				▲		
144	160	12					▲			▲		
144	160	13						▲	▲	▲		
144	172	15								▲		
144	180	15						▲	▲	▲		
145	160	10					▲			▲		
145	160	12								▲		
145	160	13						▲	▲	▲		
145	164	14						▲	▲	▲		
145	165	10								▲		
145	165	12								▲		
145	165	13			▲	▲				▲		
145	165	14						▲	▲	▲		
145	165	15					▲			▲		
145	167	13								▲		
145	168	10								▲		
145	168	12								▲		
145	168	13						▲	▲	▲		
145	168	16								▲		
145	170	12								▲		
145	170	13						▲	▲	▲		
145	170	14						▲	▲	▲		
145	170	15			▲	▲	▲	▲	▲	▲		
145	170	20								▲		
145	175	12					▲			▲		
145	175	13			▲	▲	▲	▲	▲	▲		
145	175	14			▲	▲	▲	▲	▲	▲		
145	175	15			▲	▲	▲	▲	▲	▲		
145	175	16							▲	▲		
145	176	14							▲	▲		
145	180	12					▲			▲		
145	180	13			▲	▲	▲	▲	▲	▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
145	180	14					▲			▲		
145	180	15						▲	▲	▲		
145	185	13						▲	▲	▲		
145	185	15					▲	▲		▲		
145	185	16							▲	▲		
145	190	13					▲					
145	190	16				▲	▲		▲	▲		
146	163	7								▲		
146	164	14						▲	▲	▲		
146	170	14						▲	▲	▲		
146	170	18						▲	▲	▲		
146	171.45	12.8								▲		
146	225	20								▲		
148	170	13								▲		
148	170	14								▲		
148	170	14.5					▲	▲	▲	▲		
148	170	15			▲	▲	▲	▲	▲	▲		
148	170	18								▲		
148	180	15						▲	▲	▲		
150	162	9					▲			▲		
150	165	14						▲	▲	▲		
150	168	12					▲			▲		
150	168	13							▲	▲		
150	168	14						▲	▲	▲		
150	168	15								▲		
150	170	12						▲	▲	▲		
150	170	13					▲	▲	▲	▲		
150	170	14						▲				
150	170	15			▲	▲		▲		▲		
150	172	10								▲		
150	172	12								▲		
150	172	13						▲	▲	▲		
150	172	17								▲		
150	172	18								▲		
150	175	10								▲		
150	175	12.5							▲			
150	175	14								▲		
150	177.8	13								▲		
150	180	12					▲			▲		
150	180	13					▲			▲		
150	180	14				▲	▲		▲	▲		
150	180	15				▲	▲	▲		▲		
150	180	16							▲	▲		
150	180	17								▲		
150	180	18								▲		
150	180	12					▲	▲	▲	▲		
150	180	13			▲	▲	▲	▲	▲	▲		
150	180	14				▲	▲	▲	▲	▲		
150	180	15			▲	▲	▲	▲	▲	▲		
150	180	16			▲	▲				▲		
150	180	17						▲	▲	▲		
150	180	18								▲		
150	185	I5								▲		
150	18S	16								▲		
150	190	15			▲	▲			▲	▲		
150	195	20				▲	▲					
150	200	15								▲		
150	210	12								▲		
150	210	14						▲	▲	▲		
150	225	12								▲		
152	180	15						▲	▲	▲		
152	182	15								▲		
153	171.2	12							▲			
154	172	14						▲	▲	▲		
154	175	12						▲	▲	▲		
154	175	13								▲		
154	175	14								▲		
154	180	15						▲	▲	▲		
154	180	15								▲		
154	180	17								▲		
154	180	18						▲	▲	▲		
155	172	13						▲	▲	▲		
155	172	14						▲	▲	▲		
155	174	12					▲			▲		
155	174	13.5								▲		

d	D	H	DB	DC	SA	SB	SC	TA	T8	TC	VB	VC
155	175	13								▲		
155	176	16						▲	▲	▲		
155	180	10								▲		
155	180	12								▲		
155	180	13						▲	▲	▲		
155	180	15			▲	▲	▲	▲	▲	▲		
155	180	15							▲	▲		
155	182	15								▲		
155	182.5	16								▲		
155	185	14						▲	▲	▲		
155	185	15			▲	▲	▲			▲		
155	185	16								▲		
155	190	13								▲		
155	190	14				▲	▲					
155	190	15			▲	▲	▲	▲	▲	▲		
155	190	17						▲	▲	▲		
155	199	15								▲		
155	200	10							▲			
155	200	15			▲	▲				▲		
155	200	20				▲	▲		▲	▲		
155	200	22.5							▲			
155	210	15								▲		
155	210	25								▲		
158	180	16						▲	▲	▲		
158	182	17						▲	▲	▲		
158	187.3	13								▲		
160	180	10				▲		▲	▲	▲		
160	180	12			▲	▲				▲		
160	180	13						▲	▲	▲		
160	180	15			▲	▲	▲	▲	▲	▲		
160	180	17								▲		
160	182	17						▲	▲	▲		
160	185	10			▲	▲	▲			▲		
160	185	12								▲		
160	185	13							▲	▲		
160	185	14								▲		
160	185	15								▲		
160	187.8	10								▲		
160	188	14								▲		
160	188	15								▲		
160	190	8								▲		
160	190	10								▲		
160	190	12								▲		
160	190	13			▲	▲	▲	▲	▲	▲		
160	190	14				▲	▲			▲		
160	190	15			▲	▲	▲	▲	▲	▲		
160	190	16				▲	▲	▲	▲	▲		
160	190	23	▲									
160	192	12								▲		
160	195	15						▲		▲		
160	195	18				▲	▲					
160	196	20							▲	▲		
160	200	12					▲			▲		
160	200	13								▲		
160	200	14				▲	▲			▲		
160	200	15			▲	▲	▲			▲		
160	200	20				▲	▲					
160	210	20				▲	▲			▲		
160	215	15				▲						
160	240	15							▲	▲		
162	182	14								▲		
162	187	12								▲		
162	187.5	15								▲		
162	190	12					▲			▲		
163	200	20								▲		
165	180	10								▲		
165	185	13						▲	▲	▲		
165	188	15								▲		
165	190	13			▲	▲	▲	▲	▲	▲	▲	▲
165	190	14								▲		
165	190	15			▲	▲	▲	▲	▲	▲		
165	190	16								▲		
165	195	14								▲		
165	195	16								▲		
165	195	18			▲	▲	▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
165	200	13								▲		
165	200	14								▲		
165	200	15					▲			▲		
165	203.5	16								▲		
165	203.5	18						▲		▲		
165	220	20				▲	▲					
168	190	16								▲		
169	184	17					▲			▲		
170	190	8.5								▲		
170	190	8.8								▲		
170	190	10						▲	▲	▲		
170	190	12			▲	▲				▲		
170	190	13					▲			▲		
170	190	14								▲		
170	190	15			▲	▲	▲			▲		
170	195	18						▲	▲	▲		
170	200	12					▲			▲		
170	200	14								▲		
170	200	15			▲	▲	▲	▲	▲	▲		
170	200	16			▲	▲	▲	▲	▲	▲		
170	200	18								▲		
170	204	10								▲		
170	205	15						▲	▲	▲		
170	205	16							▲	▲		
170	205	18								▲		
170	210	15				▲	▲			▲		
170	210	16					▲			▲		
170	215	15					▲			▲		
170	215	16								▲		
170	220	15								▲		
170	225	16							▲	▲		
170	225	20				▲	▲		▲	▲		
170	225	23								▲		
172	200	15			▲	▲				▲		
174	191	9								▲		
174	230	22.5								▲		
175	191	12								▲		
175	200	13						▲	▲	▲		
175	200	15			▲	▲	▲	▲	▲	▲		
175	205	15					▲			▲		
175	210	14					▲			▲		
175	210	15			▲	▲				▲		
175	210	16			▲	▲				▲		
175	215	13								▲		
175	215	15						▲	▲	▲		
175	215	16			▲	▲				▲		
178	230	20				▲	▲			▲		
178	203.5	12								▲		
178	204	16								▲		
178	206	16								▲		
178	215	16					▲			▲		
180	200	12					▲		▲	▲		
180	200	13					▲	▲	▲	▲		
180	200	14								▲		
180	200	15			▲	▲	▲	▲	▲	▲		
180	200	16								▲		
180	205	15								▲		
180	210	10								▲		
180	210	13								▲		
180	210	14								▲		
180	210	15			▲	▲	▲	▲	▲	▲		
180	210	16			▲	▲	▲		▲	▲		
180	210	18								▲		
180	215	15			▲	▲		▲	▲	▲		
180	215	16			▲	▲	▲	▲	▲	▲		
180	215	18						▲	▲	▲		
180	220	13								▲		
180	220	14					▲					
180	220	15				▲	▲	▲	▲	▲		
180	220	16			▲	▲	▲	▲	▲	▲		
180	220	18								▲		
180	220	20				▲	▲					
180	221	20							▲			
180	225	15				▲						
180	225	20				▲	▲					

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
180	230	15					▲					
180	230	10			▲	▲				▲		
180	235	20				▲	▲					
180	260	10								▲		
185	210	10					▲			▲		
185	210	13					▲			▲		
185	210	14							▲	▲		
185	210	15					▲		▲	▲		
185	215	15			▲	▲	▲			▲		
185	215	10			▲	▲	▲			▲		
185	220	15					▲			▲		
185	225	18								▲		
180	230	16			▲	▲				▲		
185	240	22								▲		
185	250	24								▲		
188	215	16			▲	▲				▲		
190	238	16								▲		
190	208	10					▲			▲		
190	210	10								▲		
190	210	15					▲			▲		
190	215	15					▲	▲	▲	▲		
190	215	16								▲		
190	220	10								▲		
190	220	12					▲	▲	▲	▲		
190	220	13						▲	▲	▲		
190	220	14				▲	▲					
190	220	15			▲	▲	▲	▲	▲	▲		
190	220	16			▲	▲	▲			▲		
190	220	22								▲		
190	225	12					▲			▲		
190	225	13								▲		
190	225	15				▲	▲			▲		
190	225	16			▲	▲	▲	▲	▲	▲		
190	226	20				▲	▲					
190	230	15			▲	▲	▲	▲		▲		
190	230	16			▲	▲				▲		
190	230	18								▲		
190	240	15								▲		
190	240	25								▲		
190	245	22				▲	▲					
190	260	12								▲		
192	210	10				▲	▲			▲		
195	215	15								▲		
195	220	15									▲	▲
195	220	16						▲	▲	▲		
195	225	16								▲		
195	230	15			▲	▲	▲	▲	▲	▲		
195	230	16			▲	▲	▲			▲		
195	230	20								▲		
195	231	20								▲		
195	235	15								▲		
195	235	16								▲		
195	240	15								▲		
195	250	22			▲	▲				▲		
195	255	20								▲		
198	230	15								▲		
200	215	15								▲		
200	220	15								▲		
200	225	15					▲			▲		
200	230	13				▲	▲			▲		
200	230	14			▲	▲	▲			▲		
200	230	15			▲	▲	▲	▲	▲	▲		
200	230	16			▲	▲	▲			▲	▲	▲
200	230	18				▲	▲	▲				
200	235	15								▲		
200	235	16				▲	▲	▲	▲	▲		
200	235	18					▲		▲	▲		
200	240	15					▲	▲		▲		
200	240	16			▲	▲	▲			▲		
200	240	16.5					▲			▲		
200	240	17							▲	▲		
200	240	18								▲		
200	240	20				▲	▲		▲	▲		
200	242	20				▲	▲					
200	250	15			▲	▲	▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
200	250	16				▲	▲			▲		
200	250	20								▲		
200	255	22				▲	▲			▲		
200	310	18								▲		
200	330	15								▲		
205	225	18								▲		
205	230	15			▲	▲	▲			▲		
205	230	16			▲	▲	▲			▲		
205	235	16								▲		
205	235	18							▲	▲		
205	250	16					▲			▲		
205	260	23				▲	▲					
210	230	15				▲	▲			▲		
210	240	12			▲	▲				▲		
210	240	15			▲	▲	▲	▲	▲	▲		
210	245	18								▲		
210	250	15					▲			▲		
210	250	16			▲	▲	▲	▲	▲	▲		
210	250	18				▲	▲					
210	250	20				▲	▲	▲	▲	▲		
210	255	16								▲		
210	260	16							▲	▲		
210	265	18								▲		
210	265	23				▲	▲					
210	265	25				▲	▲		▲	▲		
210	270	16								▲		
210	275	26								▲		
210	290	20								▲		
210	240	12			▲	▲	▲			▲		
210	240	15								▲		
210	245	12								▲		
215	245	15								▲		
215	245	16						▲	▲	▲		
215	248	15								▲		
215	250	15								▲		
215	250	16			▲	▲	▲			▲		
215	255	18					▲			▲		
215	275	26								▲		
218	250	16			▲	▲				▲		
220	230	10						▲				
220	245	15								▲		
220	250	11			▲	▲				▲		
220	250	12								▲	▲	▲
220	250	13								▲		
220	250	14					▲			▲		
220	250	15			▲	▲	▲	▲	▲	▲		
220	250	16					▲	▲	▲	▲		
220	255	16				▲	▲			▲		
220	255	18						▲	▲	▲		
220	259	22				▲	▲					
220	260	14					▲			▲		
220	260	15					▲			▲		
220	260	16					▲			▲		
220	260	18								▲		
220	260	22				▲	▲	▲	▲	▲		
220	270	13								▲		
220	270	15			▲	▲				▲		
220	275	23				▲	▲		▲	▲		
220	275	26							▲	▲		
225	250	15								▲		
225	260	15								▲		
230	255	10				▲	▲			▲		
230	255	15			▲	▲	▲			▲		
230	255	18								▲		
230	260	15			▲	▲	▲	▲	▲	▲		
230	260	18								▲		
230	260	20										
230	269	22					▲			▲		
230	270	15			▲	▲	▲			▲		
230	270	16			▲	▲		▲	▲	▲		
230	270	18								▲		
230	270	20							▲	▲		
230	270	22								▲		
230	280	15					▲			▲		
230	280	16					▲			▲		

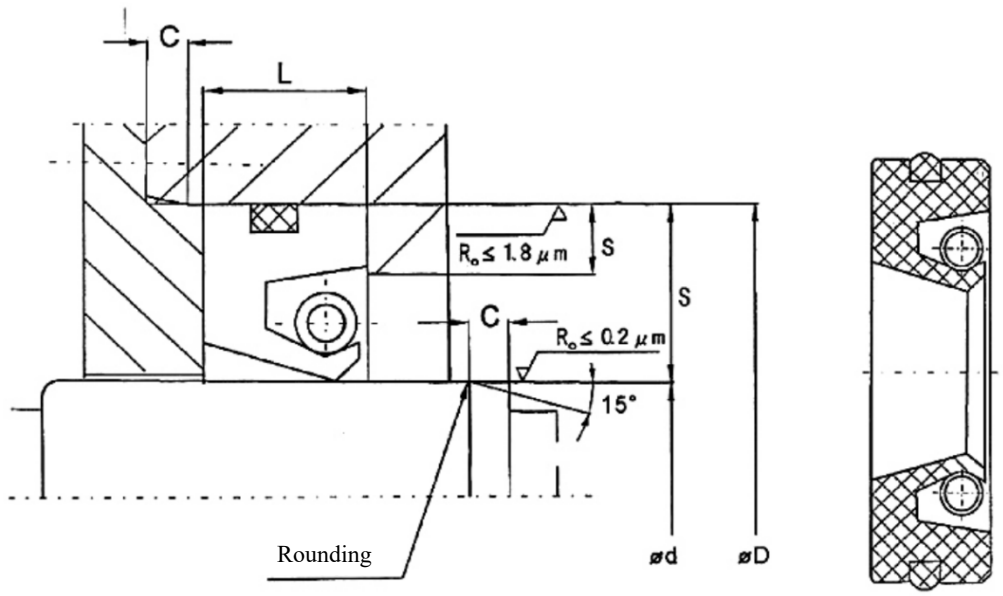
d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
230	285	22								▲		
230	285	23				▲	▲			▲		
235	260	15						▲	▲	▲		
235	270	16			▲	▲	▲	▲		▲		
235	275	16								▲		
235	285	15										
240	265	19								▲		
240	270	13								▲		
240	270	14								▲		
240	270	15			▲	▲	▲	▲	▲	▲		
240	270	16								▲		
240	270	18										
240	270	20							▲	▲		
240	273	16										
240	275	15								▲		
240	275	16				▲	▲		▲	▲		
240	275	18							▲	▲		
240	280	14					▲					
240	280	15					▲	▲	▲	▲	▲	▲
240	260	16			▲	▲		▲		▲		
240	280	18								▲		
240	280	19				▲	▲		▲	▲		
240	280	20								▲		
240	290	15								▲		
240	300	18								▲		
240	300	25				▲	▲					
245	270	16			▲	▲				▲		
250	280	15								▲		
250	288	21.5								▲		
250	185	16				▲	▲					
250	190	16				▲	▲					
250	280	15			▲	▲	▲	▲	▲	▲		
250	280	16			▲	▲	▲			▲		
250	280	17							▲	▲		
250	285	15					▲					
250	285	18						▲	▲	▲		
250	290	15					▲			▲		
250	290	16			▲	▲				▲		
250	290	20					▲			▲		
250	310	25				▲	▲		▲	▲		
254	279.4	14.3			▲	▲				▲		
254	292.1	14.28					▲			▲		
260	290	16			▲	▲				▲		
260	260	15										
260	280	16			▲	▲				▲		
260	290	15					▲			▲		
260	290	16			▲	▲	▲	▲	▲	▲		
260	290	20						▲	▲	▲		
260	300	14					▲					
260	300	15				▲	▲			▲		
260	300	16			▲	▲				▲		
260	300	18			▲	▲				▲		
260	300	20		▲	▲	▲	▲	▲	▲	▲		
260	320	25				▲	▲		▲	▲		
260	290	16			▲	▲				▲		
265	290	16						▲		▲		
265	300	16			▲	▲				▲		
270	300	15			▲	▲				▲		
270	310	15					▲		▲	▲		
270	310	16					▲	▲	▲	▲		
270	310	20										
270	320	15								▲		
270	320	17								▲		
270	320	20										
270	330	25				▲	▲	▲	▲	▲		
275	294	12			▲	▲	▲			▲		
275	310	15								▲		
275	320	20					▲					
275	310	15						▲	▲	▲		
280	310	16			▲	▲	▲			▲		
280	316	18				▲	▲					
280	320	15				▲	▲			▲		
280	320	16					▲			▲		
280	320	18			▲	▲	▲			▲		
280	320	20			▲	▲	▲			▲		

Skeleton Rotary Oil Seal

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC
280	320	22							▲	▲		
280	330	24				▲	▲					
280	340	28				▲	▲		▲	▲		
285	310	16			▲	▲		▲		▲		
285	320	20								▲		
290	320	15				▲	▲			▲		
290	320	18			▲					▲		
290	330	18			▲	▲	▲	▲	▲	▲		
290	350	25				▲	▲		▲	▲		
300	330	16								▲		
300	332	16			▲	▲				▲		
300	335	17						▲				
300	340	15								▲		
300	340	16					▲			▲		
300	340	18					▲			▲		
300	340	20			▲	▲	▲	▲		▲		
300	345	22				▲	▲					
300	360	25				▲	▲		▲	▲		
310	350	18								▲		
300	410	18								▲		
310	350	20								▲		
315	355	18			▲			▲	▲	▲		
320	350	25				▲	▲					
315	365	16			▲	▲				▲		
320	350	15					▲			▲		
320	350	18			▲	▲		▲	▲	▲		
320	360	16					▲					
320	360	18								▲		
320	360	20			▲	▲		▲	▲	▲		
325	365	20		▲	▲							
323	374	25			▲							
330	370	18			▲	▲		▲		▲		
340	370	15								▲		
340	372	16			▲	▲		▲		▲		
340	360	16					▲					
340	380	18						▲	▲	▲		
340	380	20			▲	▲				▲		
350	380	16				▲						
350	390	18			▲	▲				▲		
350	400	23								▲		
350	410	28								▲		
360	390	15								▲		
360	400	15					▲					
370	400	16							▲			
360	400	18							▲	▲		
360	400	20					▲	▲		▲		
370	410	15								▲		
375	420	20			▲	▲				▲		
380	420	16						▲	▲			
380	420	20			▲	▲				▲		
380	430	19			▲			▲				
390	430	20								▲		
400	440	20			▲	▲	▲			▲		
410	440	15								▲		
420	460	20			▲	▲		▲		▲		
420	470	22					▲					
430	480	22					▲			▲		
440	480	20								▲		
440	490	25					▲			▲		
460	500	20			▲	▲						
467	510	20					▲					
475	530	18			▲							
480	520	20			▲							
480	530	25								▲		
520	545	18.5								▲		
530	560	22						▲		▲		
540	565	20								▲		
560	600	18								▲		
660	610	20				▲				▲		
310	340	15							▲			
390	425	18						▲				
680	720	30		▲								

d	D	H	DB	DC	SA	SB	SC	TA	TB	TC	VB	VC

10. No-skeleton Rotary Oil Seal



Performance Parameters:

Pressure: ≤1 MPa

Temperature: -30°C~+200°C

Linear speed: 15 m/s

Material: PTFE/charring composite

O-ring: FPM 80

Mounting size

No.	001	002	003	004	005	006
Shaft diameter Φd h11	6-45	45-65	65-85	85-125	125-200	200-300
Bore diameter ΦDH8	d+9 to 35	d+12 to 35	d+15 to 35	d+19 to 35	d+20 to 35	d+30 to 40
Groove width 1+0.2						
Standard size	7	8	10	12	15	15
Non-standard size	5.5-10	6-12	7-13	8-15	9-20	10-25
C	2	2.5	3	3	4	4
S	3	3	4	4	5	5

Size Chart

d	D	H
5	16	7
6	16	7
7	16	7
10	22	7
10	24	7
10	25	7
10	28	7
12	22	7
12	24	7
12	25	7
12	28	7
12	28	8
12	30	7
14	30	7
15	24	7
15	26	7
15	30	7
15	30	8
15	32	7
15	35	7
16	26	7
16	30	7
16	35	7
17	30	7
17	35	7
17	35	8
18	30	7
18	32	7
18	35	7
20	30	7
20	32	10
20	35	7
20	35	10
20	40	7
20	47	7
22	35	7
22	40	7
22	40	8
22	47	7
25	35	7
25	35	8
25	38	7
25	40	7
25	42	7

d	D	H
25	42	8
25	47	7
25	52	7
27	47	7
28	40	7
28	44	10
28	47	7
28	47	10
28	52	7
30	40	7
30	42	7
30	45	7
30	47	7
30	47	10
30	50	7
30	52	7
32	45	8
32	47	7
32	47	8
32	47	10
32	52	8
35	47	7
35	47	8
35	50	7
35	50	8
35	50	10
35	52	7
35	52	8
35	55	8
35	62	8
35	72	8
37	50	10
38	55	8
38	58	8
38	62	8
40	52	8
40	55	7
40	55	8
40	55	10
40	60	8
40	60	10
40	62	8
40	62	9
40	62	10

The above sizes are commonly used specifications, and other specifications are available for order.

No-Skeleton Rotary Oil Seal

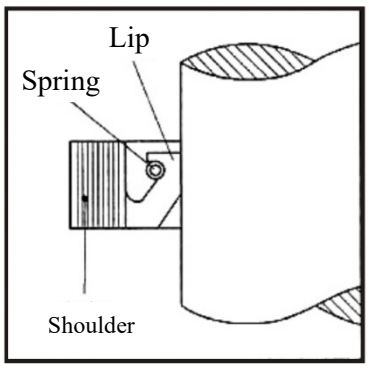
Size Chart

d	D	H
42	55	7
42	55	8
42	58	7
42	60	8
42	60	10
42	62	8
45	58	7
45	60	8
45	62	8
45	62	10
45	65	8
48	65	10
50	65	10
50	62	8
50	65	8
50	65	10
50	68	8
50	70	8
50	70	10
50	72	8
50	72	10
52	75	10
52	68	8
55	72	8
55	70	8
55	72	8
55	72	10
55	80	8
58	80	8
60	75	8
60	80	8
60	80	10
60	85	8
62	80	8
62	80	10
65	80	10
65	85	8
65	85	10
65	90	10
65	100	10
70	90	9
70	90	10
70	95	10
70	100	10

d	D	H
72	100	10
75	95	10
75	95	13
75	100	10
80	100	10
80	110	10
85	100	12
85	110	10
85	120	12
86	105	10
90	110	10
90	120	12
95	120	12
95	125	12
100	120	12
100	125	12
100	130	12
100	130	13
105	130	12
110	130	12
110	140	12
110	140	13
115	140	12
115	150	12
120	140	12
120	140	13
120	150	12
125	150	12
125	150	15
125	160	12
130	150	15
130	160	12
130	160	15
135	170	15
140	165	10
140	170	15
150	180	14
150	180	15
155	190	15
160	190	15
170	200	15
175	205	15
180	210	15
200	230	15

The above sizes are commonly used specifications, and other specifications are available for order.

11. Carcoseal Rotary Seal



CARC0SEAL7UN

I. Summary

Carcoseal rotary oil seals were originally developed for use in large rolling mills (e.g., rolls, gearboxes) and various heavy machinery. Now they have been widely used on various rotary shafts to seal various lubricants, greases, water and other fluids.

II. Structure

The structure of Carcoseal rotary oil seal is simple and mainly consists of three parts.

1. Lip

Material: PTFE + rubber Since PTFE has low friction and self-lubricating properties, adding PTFE to the lip reduces frictional resistance and frictional heating, thus extending the service life and increasing the revolution speed limit of the oil seal. The self-lubricating property of PTFE also allows the oil seal to be used in some dry friction applications. As PTFE is evenly distributed inside the rubber lip, when the lip wears out, new PTFE appears to maintain the self-lubrication of the lip.

2. Spring

Material: stainless steel

All springs of Carcoseal rotary oil seals are made of stainless steel and provided with a special thermal treatment to keep the spring stable and elastic for a long time. Stainless steel can resist the corrosion of water, distilled water and seawater, and its performance is much better than other carbon steel springs.

3. Shoulder

Material: Cotton thread reinforced fiber + rubber

Unlike other traditional metal skeleton oil seals, Carcoseal rotary oil seals have no metal skeleton, but are very tough and flexible. For different types of rotary oil seals (such as covered, uncovered), Carcoseal adds special fiber material to obtain different hardness to meet the rigidity required for use.

Function:

1) The shoulder and lip are vulcanized into one in the mold during production
2) The function of the shoulder is to fix the oil seal in the housing bore and maintain a certain fitting force. At the same time, the shoulder fills the housing bore to prevent fluid leakage from the periphery of the oil seal.
3) The spring provides a suitable compression force to maintain an effective contact area between the lip and the shaft.
4) The lip is a soft elastomer that acts as a seal for the fluid.

III. Features

1) Easy mounting: Carcoseal oil seal can be easily pressed into the shaft bore by hand without using any tool or hammer, and the same applies to the removal of oil seal;
2) Carcoseal oil seal is pressed tightly into the outside diameter, preventing the outside diameter from leakage, and no additional washer is required;
3) There are no metal parts other than the spring, so there is no chance of endangering the shaft centerline or the housing bore during mounting. When mounting metal-cased oil seals on large bearings, incorrect mounting will result in very serious consequences;
4) Due to the high adaptability of Carcoseal oil seal, it can correct the fitting between the oil seal and shaft bore without demanding round shaft and bore and small tolerance;

5) Carcoseal oil seal can absorb large misalignment;
6) Carcoseal oil seal is rust-free as a whole, including the spring which is made of stainless steel. Carcoseal is available in different materials to resist various corrosive fluids, including phosphate esters;
7) The design of the Carcoseal lip allows for a small amount of shaft misalignment. The role of the spring is to provide the minimum necessary holding force to ensure the necessary lip-shaft contact and sealing to avoid unnecessary lip-shaft wear;
8) The Carcoseal lip is designed to resist folding when the shaft is loaded into the bearing;
9) Since the outside diameter of the Carcoseal oil seal is larger than the diameter of the mounting bore, all parts of the Carcoseal oil seal, including the lip, are squeezed after mounting, thus preventing dust or debris from entering the lip. It also avoids the risk of tearing of the lip edge, which is usually stretched after the metal skeleton oil seal is mounted into the shaft;
10) The Carcoseal oil seal removed can be reused if it is used under good conditions and free from deformation and damage.

IV. Materials

Carcoseal shaft seal is divided into three parts: Lip, shoulder and spring, which are made of different materials.

1. Standard materials

The standard materials are applicable in oil, water or oil-water emulsifier with the following material characteristics:

For Carcoseal/UN and Carcoseal/SCA

Materials	Temperature (°C)	Speed m/s	Pressure (Mpa)	Medium
S820	-40~+120	15	0	Oil, water, oil-water emulsifier
HT720	-40-+170	25	0	
Z420	-30-+200	25	0	

For Carcoseal / AP:

Materials	Temperature (°C)	PV Factor (P=MPa, V=m/s)
S820	-40—120	4
HT720	-40-+170	5
Z420	-30—200	6

2. Special materials

Carcoseal oil seals are available in different materials to meet different needs.

■ Viton-teflon

It is used in applications up to 220°C and where corrosion resistance is required. When non-flammable phosphate ester is used,

the general rubber will be easily corroded and peeled off, but Viton materials can work properly.

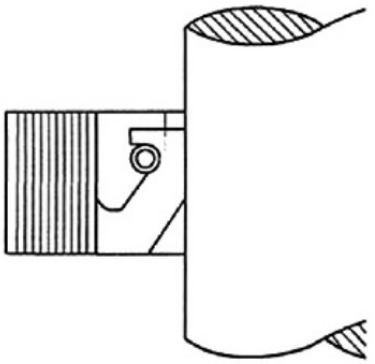
■ Other materials:

Besides Viton and natural rubber, other materials are also available to meet customers' requirements.

V. Carcoflon treatment

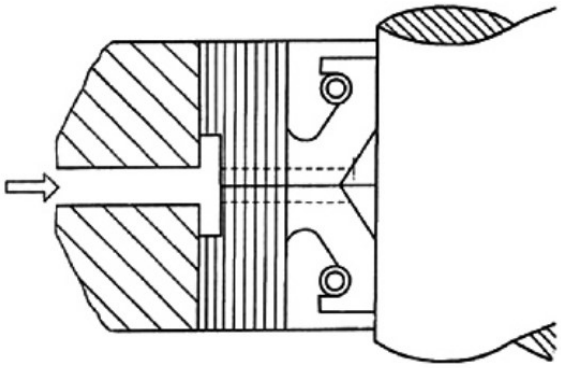
A thin layer of Carcoflon treatment on the surface of oil seal lip can reduce the friction coefficient between rubber and metal to 1/20, i.e. from the original friction coefficient of 2 to 0.11. The relative movement between the lip and rotating shaft will generate heat accumulation, and the high speed rotation will make the lip withstand very high temperature. Through Carcoflon treatment, the self-lubricating property and low friction coefficient of PTFE can reduce heat generation, maintain good lubrication performance and improve the life of oil seal.

VI. Types



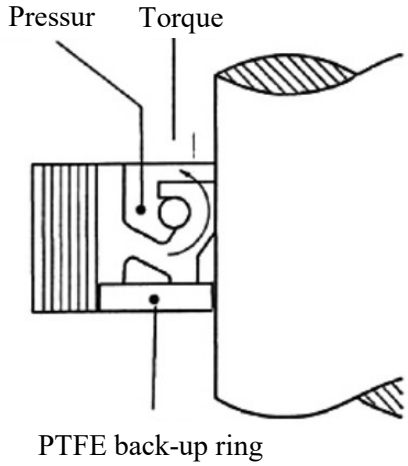
CARCO SEAL/UN

Carcoseal/UN is our most popular type that covers most applications.



CARCO SEAL/UN/SCA

Similar to Carcoseal/UN but with ports and groove to allow inlet of grease between seals in case of tandem fitting.

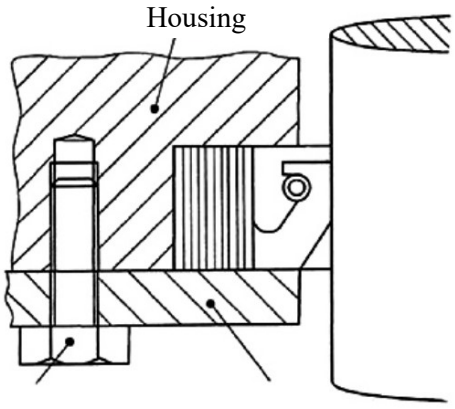


CARCO SEAL/AP

Designed for high-pressure applications. Similar to Carcoseal/UN but with a modified lip design and a PTFE back-up ring to prevent the lip from being folded under high pressure.

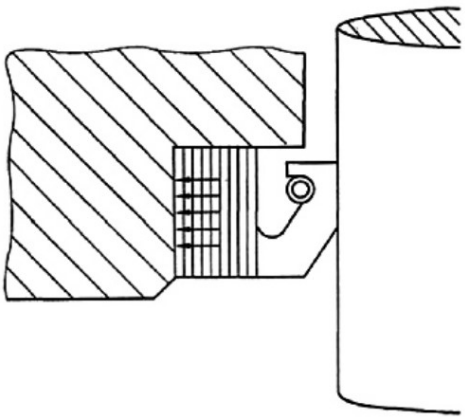
The lip design can be seen in the cross-sectional drawing. A torque is generated at the lip under pressure, and the contact area between the lip and the shaft increases as the pressure increases. This design allows the lip to have less contact area with the shaft at low pressure, and the contact area changes with the pressure so that the lip has less friction with the shaft.

VII. Mounting types



Mounting of standard covered CARCO SEAL

Generally, the Carcoseal rotary oil seal requires an additional cover, which is attached to the housing with a locking bolt. In this way, the rotary oil seal is subjected to a proper compression force, ensuring the sealing of the entire seal on the outside diameter.

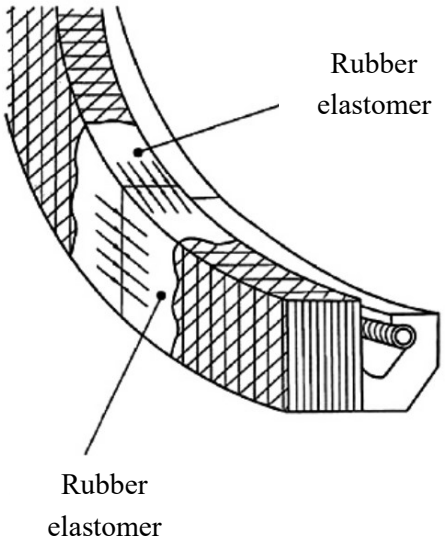


Uncovered CARCO SEAL/SF

The Carcoseal/SF is designed for applications where the use of a cover plate is not possible and requires a seal with a hard shoulder to hold it in place and prevent leakage from the outside diameter. The shoulder must be harder than the cover plate.

Please specify the word "SF" when selection, such as Carcosel/UN/SF

Note: The high-pressure Carcoseal/AP and CARCO SEAL/split must be provided with a cover plate.



CARCO SEAL/split

For applications that require bypassing the shaft core and other special applications, a split rotary seal must be used to reduce disassembly and assembly costs.

Carcoseal/split rotary seals are designed for this purpose. To ensure effective sealing performance at the split, Carcoseal vulcanizes a special rubber elastomer on both ends of the split. Due to the elasticity of the rubber, the split ends are sealed well after mounting.

Note: A. Except for Carcoseal/AP and Carcoseal/SF rotary seals, all Carcoseal rotary seals are available in split type;

B. The split type rotary seal is not recommended for applications with large misalignment.

Please specify the word "split" when selection, such as Carcosel/UN/split

VIII. Factors affecting the sealing effect

There are about 70 factors affecting the sealing effect of Carco oil seal. Some factors are related to the oil seal design, such as material and structure; and some others affect the life and sealing effect of the oil seal, such as medium, temperature, pressure, lubrication, and speed. These factors interact with each other.

1. Fluid

Selecting the right material can resist the corrosion and chemical reaction of the fluid. Carcoseal S820 standard materials are available for common rotating media such as mineral oils, greases, water, hydraulic fluids, and oil-water emulsions. Viton can be used for other fluids such as phosphate ester. If you have any questions, please contact us.

2. Temperature

Low temperature will cause the lip to freeze and become brittle and fragile, and high temperature will cause rubber aging and lip hardening. The temperature refers to the temperature of the oil seal lip, not the temperature of the sealing fluid. In fact:

A) increased revolution speed; B) poor surface finish; and C) poor lubrication;

can produce frictional heat that can raise the temperature of the lip to 5°C higher than that of the liquid. Carco Viton is suitable for temperatures from -30°C to +200°C and the instantaneous temperature resistance can be up to 220°C. Carco S820 is suitable for temperatures from -40°C to +120°C and the instantaneous temperature resistance can be up to 150°C.

3. Lubrication

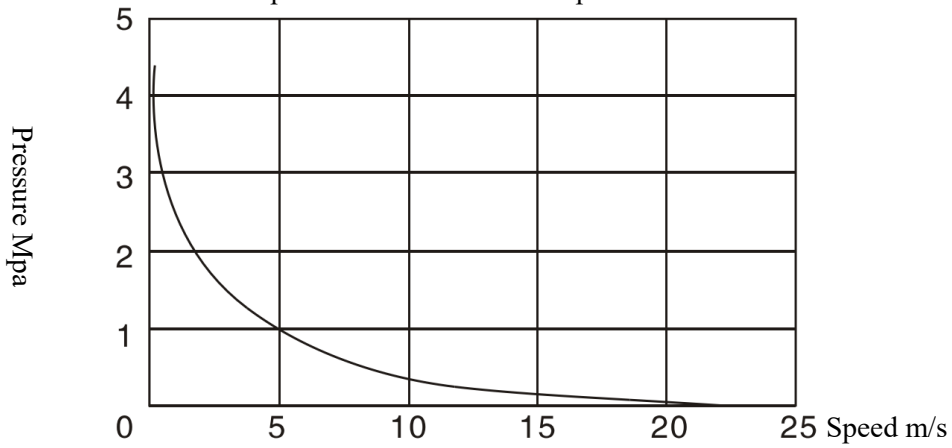
Good lubrication is the key to ensure the long life of Carcoseal. Under normal conditions, Carco rotary oil seals are used to seal lubricants or greases, so lubrication is not a problem.

In rare cases where there is dry friction, it is recommended to treat the lip with Carcoflon. Apply a little grease to both the lip and the shaft before mounting. If two seals are mounted on the same shaft, it is possible that one seal is lubricated and the other is dry-frictioned. Carcoseal allows greasing between the two seals.

4. Pressure

1) Carcoseal/UN is not designed to be used under pressure, because pressure will force the lip of the seal to fold and increase the frictional resistance. Carcoseal can resist a pressure of 0.05 MPa at a low speed and almost 0 MPa at 10m/s or higher speed.
2) Carcoseal/AP is designed to be used under pressure. The strong PTFE back-up ring and unique lip design allow it to withstand certain pressure.

Speed-Pressure Relationship Chart



As the pressure increases, the contact area between the lip and shaft increases, the temperature suddenly rises, and the allowable speed reduces. If the pressure rises to 5MPa, the allowable speed will be reduced to 0.

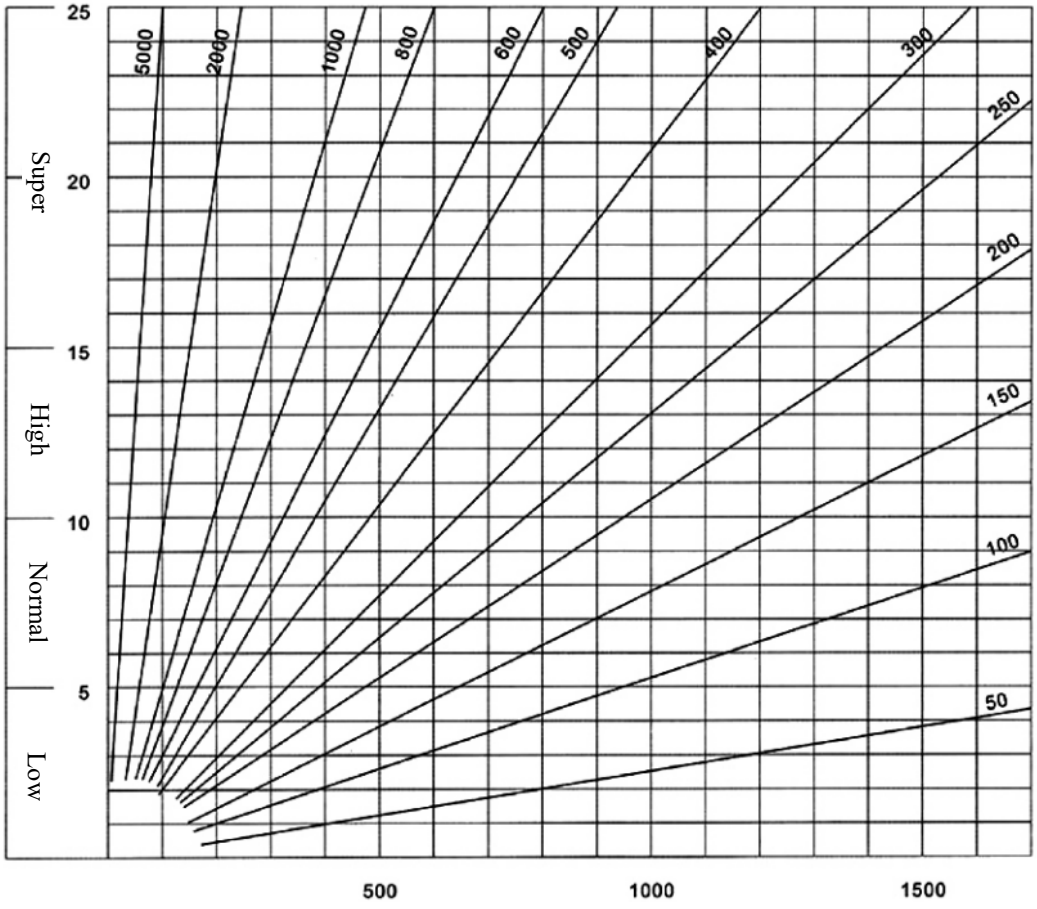
5. Speed

Speed is a factor that must be considered when choosing an oil seal. The speed is divided into four levels: low speed 0-5 m/s, normal speed 5-10 m/s, high speed 10-15 m/s, and super speed 15-25 m/s. The limit of speed is limited by the temperature because the speed increase will finally cause the increase of the lip temperature. Therefore, the limit of speed is the tolerance of the lip to the temperature. Under the best conditions, Carcoseal can be used at super speed, but in fact, it is often affected by the following factors:

1) Shaft material and surface finish
2) STBM or shaft run-out
3) Fluid temperature
4) Fluid pressure
5) Lubrication of the lip

Revolution Speed - Linear Speed Conversion Table

Revolution speed (rpm)



Shaft diameter (mm)

IX. Storage

Pay attention to the following points when storing the Carcoseal rotary oil seal:

1) Carcoseal rotary oil seals are packed in individual cartons and it is recommended that unused seals should be stored in their original cartons, which can be stacked.
2) Carcoseal should be stored away from light, in a dry, UV-free, and dust-proof environment, and away from places where there is vibration, such as engines.
3) When taking the oil seal from the carton for mounting, be careful not to damage the lip of the oil seal.

Design, Machining and Mounting of Mechanical Parts

Carco shaft seals are produced with the most suitable materials based on our long experience and under strict control of every production process. Each shaft seal is inspected before it leaves the factory. However, satisfactory sealing effect will depend on proper mounting and matching machined parts.

I. Shaft design

1. Materials

Materials: Carbon steel, stainless steel

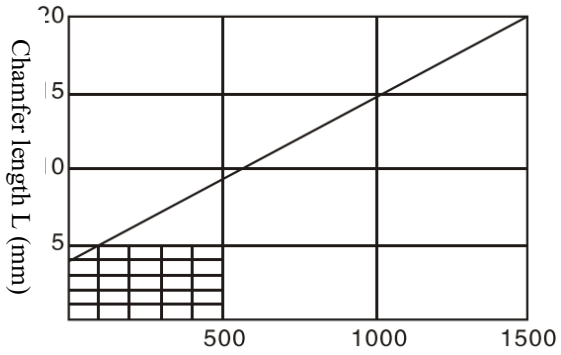
The surface shall be provided with chromium coating for high-speed revolution, with the hardness of HRC40/45. The chromium coating layer should not be too thin, otherwise it may peel off and affect the sealing result. The tempering time of the shaft should not be too short, and the speed should be slow to ensure a uniform tempered surface.

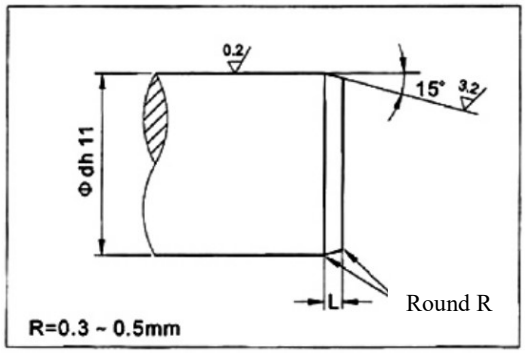
2. Design

A. Chamfering

In order not to damage the lip of the rotary shaft seal when mounting or removing the Carcoseal, the shaft must be chamfered during design.

Recommended relationship between chamfer length and shaft diameter





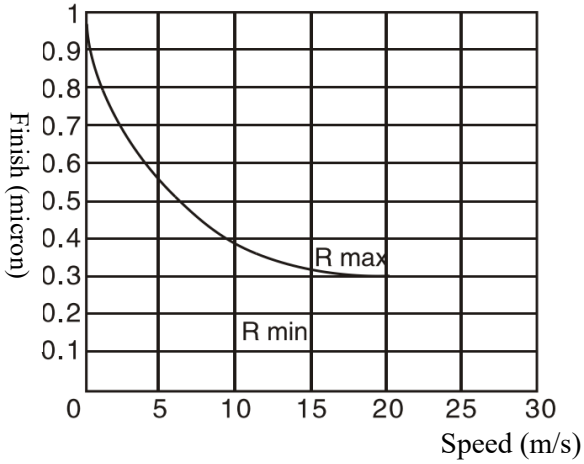
B. Tolerance fit

The tolerance fit of non-pressure resistant oil seals shall be according to Φdh11; and the tolerance fit of Carcoseal/AP pressure resistant oil seal shall be according to Φdh8.

C. Shaft surface finish

The shaft surface must be smooth and free of burrs and scratches to avoid damage to the seal lips. In addition, spiral machining marks will produce pumping effect and lead to leakage, so it is recommended to grind the oil seal mounting area by way of inserted radial feed grinding, which is better than the transverse axial feed grinding.

The surface finish requirement is higher as the speed increases, but too smooth surface is not recommended. Ra should be greater than 0.1 micron, because too smooth surface can't hold lubricant, resulting in poor lubrication effect and shorter seal life.



Recommended shaft finish

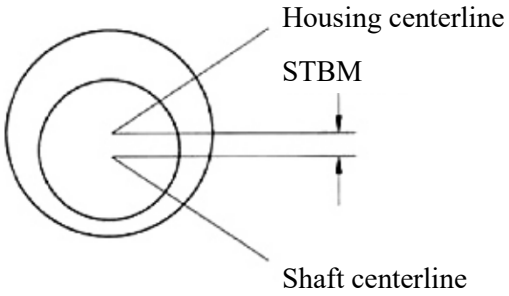
Ra0.1~0.5microsm

D. Eccentricity

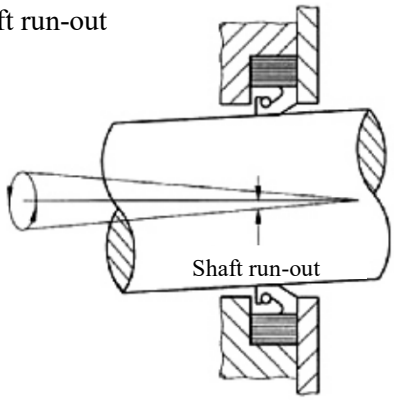
The eccentricity of shaft and housing bore affects the sealing effect of rotary oil seals.

Eccentricity is divided into STBM and run-out.

STBM:



Shaft run-out

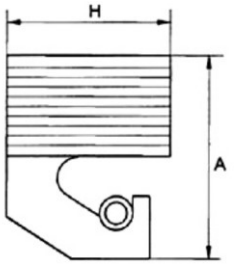


The no-skeleton shoulder design of Carcoseal oil seal makes its shaft coaxiality requirement lower than that of metal skeleton oil seal. This advantage is more prominent in the case of larger rotary oil seals, such as those with a shaft diameter of over 300 mm. The following is a detailed description of Carcoscal's allowable STBM and run-out.

■ Maximum allowable STBM

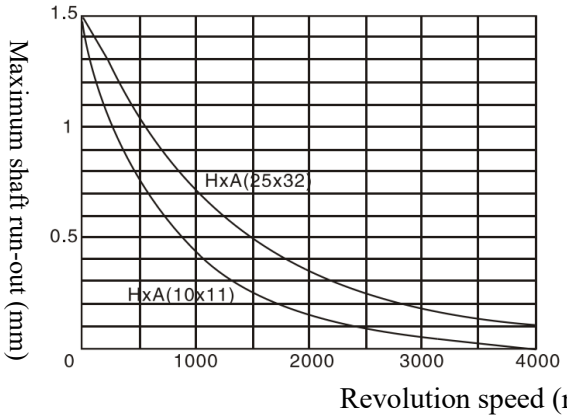
The maximum STBM is related to the cross-sectional dimensions H and A of Carcoseal rotary oil seal. The larger H and A, the larger the allowable STBM.

D Shaft diameter (mm)	Cross-sectional dimension H x A (mm)	Maximum STBM (mm)
100-250	16X20	0.50
20-400	20X22	0.55
400-600	22X25	0.62
>600	25X32	0.70



■ Maximum allowable run-out

The run-out is related to the shaft revolution speed. The higher the revolution speed, the smaller the allowable run-out. Also, the run-out is related to the cross-sectional dimensions H and A of Carcoseal rotary oil seals. The larger H and A, the larger the allowable shaft run-out.

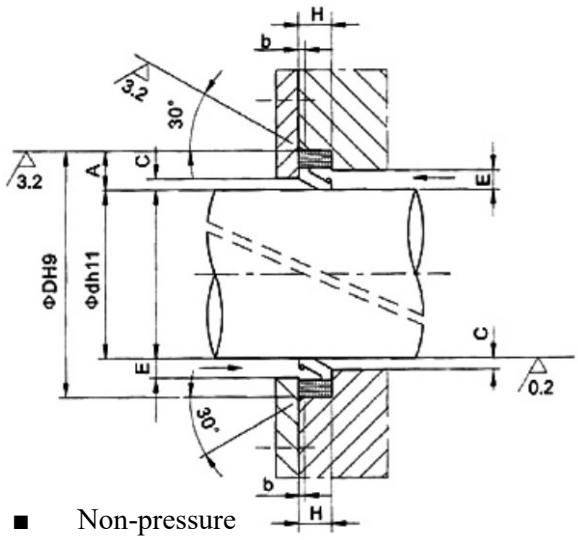


II. Design of housing sealing groove

1. Tolerance

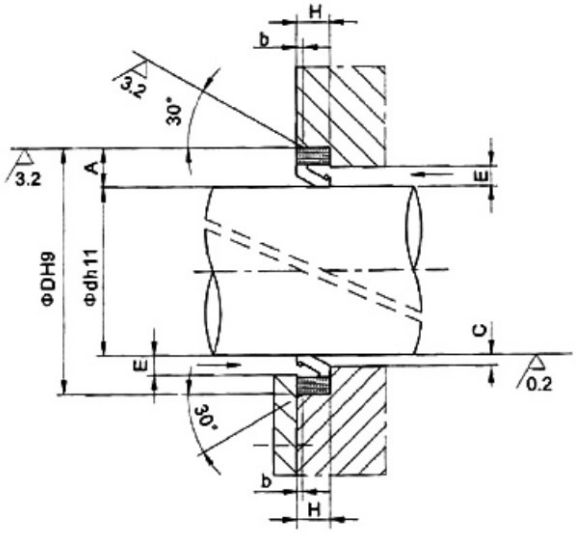
As the Carco rotary oil seal has no metal skeleton, the machining requirements for groove outside diameter are not strict.

The recommended housing bore diameter tolerance of non-pressure resistant oil seals is ΦDH9, and of pressure-resistant oil seals is ΦDH8.



■ Non-pressure

A. Covered structure

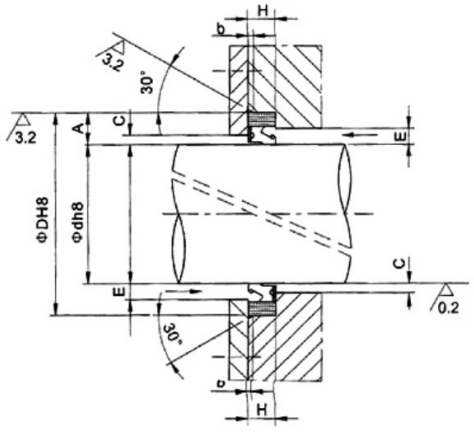


B. Uncovered structure Carcoseal/SF

Requirement: Sufficient cover strength and bolt number.

■ Relationship between diameter and groove cross-sectional dimensions

d(mm)	H×A(mm)	b(mm)	E(mm)	C(mm)	Groove width (mm)	
					H1(mm)	H2(mm)
100-250	16×20	2.0	9	4	16±0.1	$16^{+0.5}_{-0}$
250-400	20×22	2.2	11	6	20 ±0.2	20^{+1}_{-0}
400-600	22×25	2.5	11	7	22 ±0.2	22^{+1}_{-0}
>600	25×32	3.2	14	8	25 ±0.2	25^{+1}_{-0}



Pressure-resistant oil seal Carcoseal/AP

A. Covered structure

■ Relationship between diameter and groove cross-sectional dimensions

d	H×A	b	E	C	H
<50	10×11	1.2	5	0.5	$10^{+0}_{-0.1}$
50-100	12.5×16	1.5	7	0.5	$12.5^{+0}_{-0.1}$
100-250	16×20	2.0	9	1	$16^{+0}_{-0.1}$
250-400	20×22	2.2	11	1	$20^{+0}_{-0.2}$
400-600	22×25	2.5	11	1	$22^{+0}_{-0.2}$
>600	25×32	3.2	14	1.5	$25^{+0}_{-0.2}$

IV. Mounting

Carcoseal is easy to mount. However, correct mounting will have a great impact on the sealing result of oil seal. Please follow the steps below to mount the oil seal.

1. General rules of mounting applicable to all types of oil seals

- Check that the size of Carcoseal to be mounted is correct. Because Carcoseal has large elasticity, it has lower requirements on size. If the size is too large, it will cause frictional heating and reduce the service life of the oil seal; if the size is too small, it will cause leakage;
- Check whether the Carcoseal lip is damaged. Clean the oil seal to remove the dust accumulated during storage. Wipe clean the grease between the shaft and housing. Grease the Carcoseal lip by hand, adjust the spring to distribute it evenly, and mount the oil seal to the shaft bore according to the respective mounting instructions;
- The correct lip orientation is towards the shaft for sealing and facing outwards for dust-proofing to prevent foreign objects from entering;
- After mounting the oil seal, check again whether the lip is damaged. Adequate chamfering of shaft ends is recommended. If without chamfering, the oil seal should be mounted with the help of a sleeve;
- After mounting, check for any damage, whether the spring tightness is appropriate, and whether the oil seal is fixed in place in the groove. Note: The spring tension is calculated according to the H9/h11 fitting tolerance. If the fitting tolerance is large, it is recommended to shorten the spring (up to 5%) to compensate for the large gap.

2.Carcoseal/UN

- Place the Carcoseal seal into the groove by hand. Since the outside diameter of the Carcoseal seal is larger than the inside diameter of the housing, press it in forcibly; if necessary, press the seal into a "heart" shape and press the recessed part firmly to the circumference. In some cases, a plastic rod or rubber hammer can be used. (see the figure on the right)
- In cases where there is a cover plate, the Carcoseal can be pressed into the groove with evenly distributed bolts.

3.Carcoseal/UN/SF

When mounting the oil seal in uncovered applications, follow the steps below:

- Carefully remove grease from the housing and do not get any grease on the shoulder of the oil seal;
- Press the oil seal into the groove in an "8" shape, as shown in the figure on the right;
- After mounting, make sure that there is no stress around the shoulders. It is important that the outside diameter of oil seal is attached tightly to the inside diameter of housing bore and evenly distributed around;
- If the oil seal must be attached to the maximum extent to the housing bore, the grease in the sealing groove must be carefully removed, and Loctitc 638 adhesive must be applied on the outer ring of oil seal.

4 .Carcoseal/UN/SCA

- Check whether the opening groove of the housing and the grease interface between the two oil seals are correct.

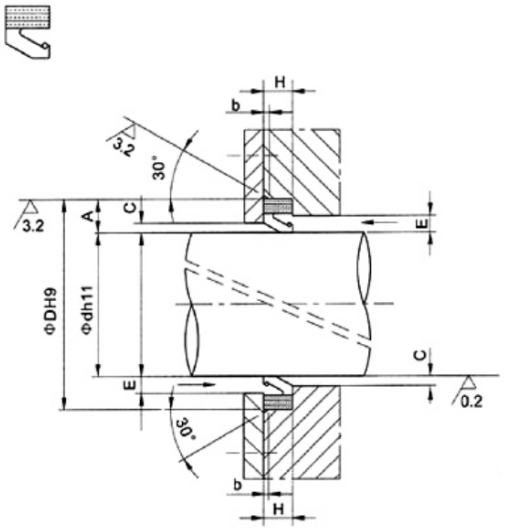
5.Carcoseal/UN/split

- Split the spring interface and engage it after by bypassing the shaft core. To avoid the final torsion, twist one end before engaging, and the oil seal split should be on the top. If there are two split oil seals mounted in the same groove, the splits should be placed on the top and 30° apart from each other from left to right.

6. Used as dust scraping ring

- When the hydraulic equipment is used in a dusty environment, the tie rod may be damaged. It is recommended to mount a Carcoseal behind the hydraulic seal, to play the role of dust scraping. The lip of the Carcoseal must face outwards to avoid the ingress of particles.

Carcoseal/UN



Technical Parameters

Working temperature: -40~+120℃ (material No.: S820)

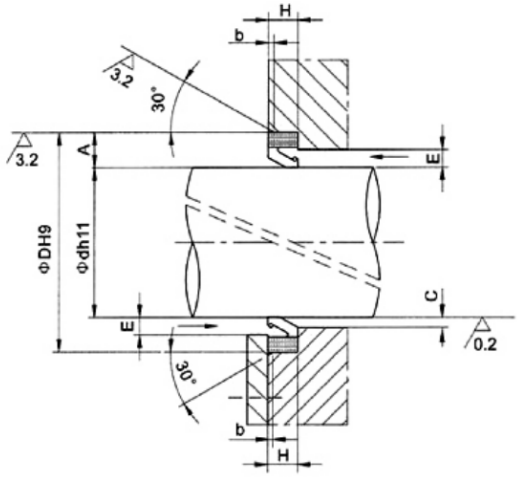
-40~+170℃ (material No.: HT720)

-30~+200℃ (material No.: Z420)

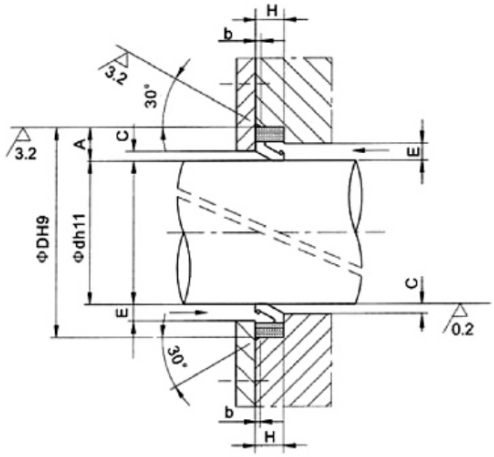
Maximum speed: 15 m/s (S820)

25m/s (HT720,Z420)

Carcoseal/UN/SF



Carcoseal/UN/split



Relationship between diameter and groove cross-sectional dimensions

d(mm)	H×A(mm)	b(mm)	E(mm)	C(mm)	H(mm)
100-250	16×20	2.0	9	4	16±0.1
250-400	20×22	2,2	11	6	20 ±0.2
400-600	22×25	2.5	11	7	22 ±0.2
>600	25×32	3.2	14	8	25 ±0.2

Technical Parameters

Working temperature: -40~+120°C (material No.: S820)

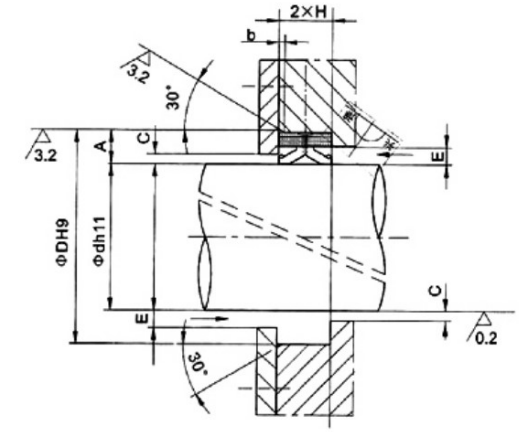
-40~+170°C (material No.: HT720)

-30~+200°C (material No.: Z420)

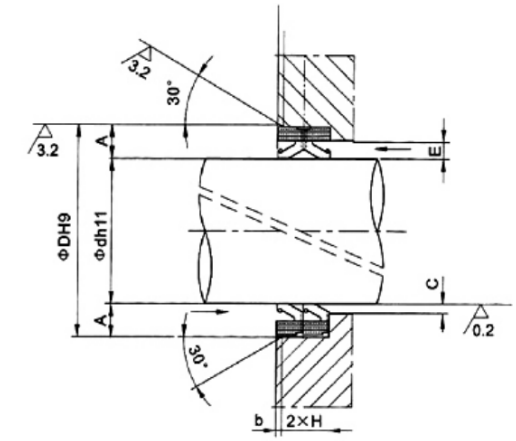
Maximum speed: 15 m/s (S820)

25m/s (HT720,Z420)

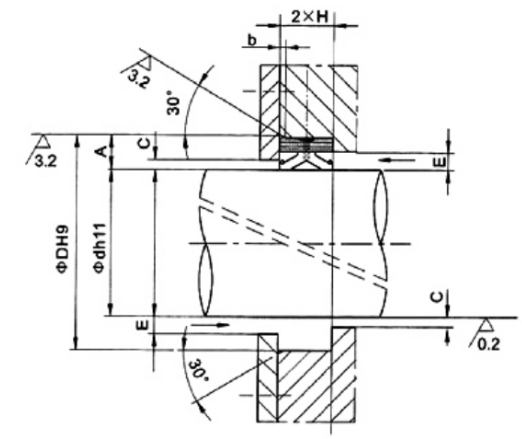
Carcoseal/SCA



Carcoseal/SCA/SF



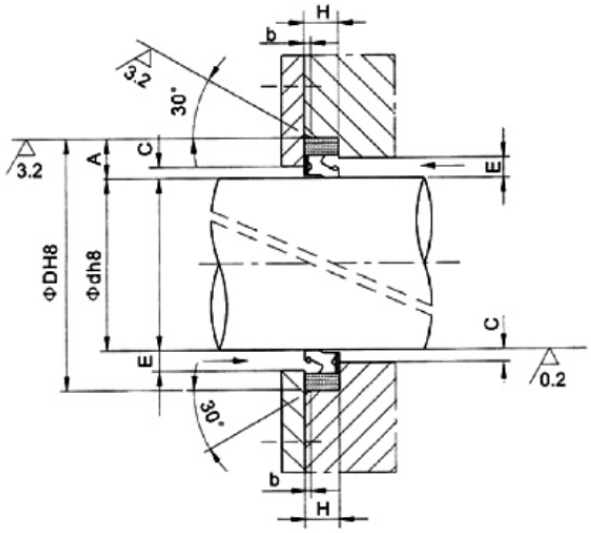
Carcoseal/UN/split



Relationship between diameter and groove cross-sectional dimensions

d(mm)	H×A(mm)	b(mm)	E(mm)	2×H(mm)
100-250	16×20	2.0	9	32 ± 0.2
250-400	20×22	2.2	11	40 ±0.3
400-600	22×25	2.5	11	44 ±0.3
>600	25×32	3.2	14	50 ±0.4

Carcoseal/AP



Technical Parameters

Working temperature: -40~+120℃ (material No.: S820)

-40~+170℃ (material No.: HT720)

-30~+200℃ (material No.: Z420)

PV coefficient: 4 (S820)

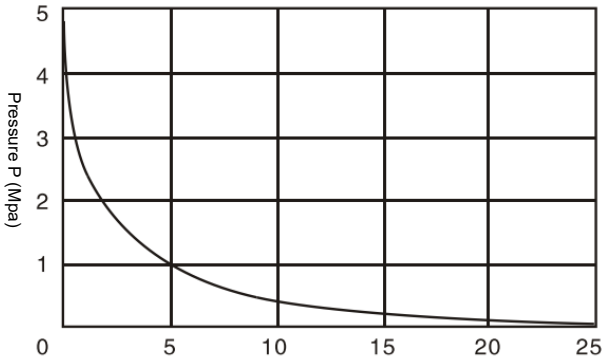
5(HT720)

6 (Z420)

Note: PV coefficient is P*V (P=MPa, V=m/s)

Please refer to the speed-pressure relationship chart below.

Speed-Pressure Relationship Chart



Relationship between diameter and groove cross-sectional dimensions

d(mm)	H×A(mm)	b(mm)	E(mm)	C(mm)	H(mm)
<50	10×11	1.2	5	0.5	$10^{+0}_{-0.1}$
50-100	12.5×16	1.5	7	0.5	$12.5^{+0}_{-0.1}$
100-250	16×20	2.0	9	1	$16^{+0}_{-0.1}$
250-400	20×22	2.2	11	1	$20^{+0}_{-0.2}$
400-600	22×25	2.5	11	1	$22^{+0}_{-0.2}$
>600	25×32	3.2	14	1.5	$25^{+0}_{-0.2}$

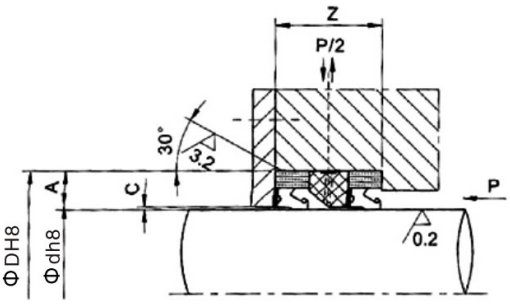
■ Several combinations of Carcoseal/AP

In addition to the standard single oil seal mounting, the Carcoseal/AP can also be mounted in the following ways:

1) Two seals in tandem

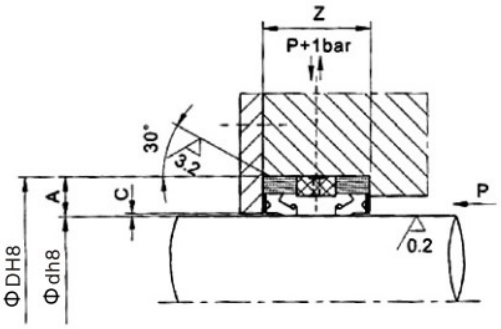
2) Two seals lip to lip

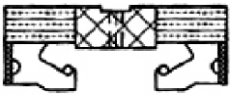
3) Series of seals with spacers



Carcoseal/AP Two seals in tandem

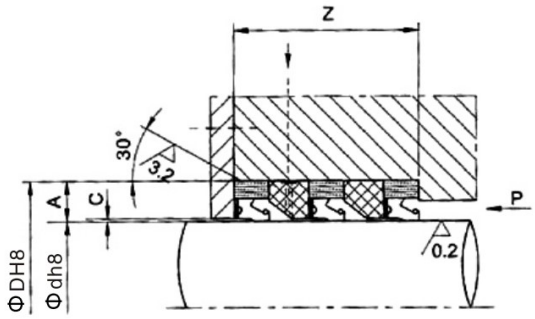
As shown in the left figure, half of the pressure of the sealed fluid enters the housing and acts on the two rotary seals. The first seal is subjected to a differential pressure exactly equal to half of the pressure of the sealed fluid, so the pressure resistance will be twice as high. In addition, the fluid temperature inside the housing is cooled by the constant circulation, so that the Carcoseal/AP seal can still be used at very high temperatures.

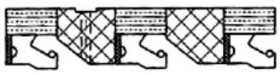




Carcoseal/AP Two seals lip to lip

As shown in the left figure, the pressure of the circulating fluid in the housing will be slightly higher than the pressure of the sealed fluid. This fluid pressure difference ensures that the sealed fluid will not enter the housing under any circumstances.

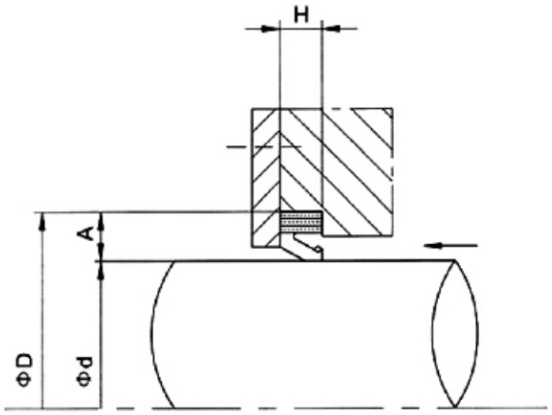


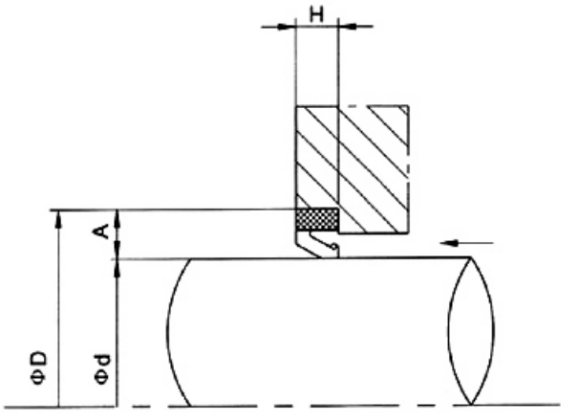


Carcoseal/AP Series of seals with spacers

As shown in the left figure, a series of Carcoseal/AP rotary oil seals are separated by spacers for applications where sealing requirement is critical and the spacers serve to dissipate heat and hold the seals in place.

Carcoseal Rotary Seal





Common Size Chart

d (mm)	D (mm)	H (mm)	A (mm)
100	140	16	20
105	145	16	20
110	150	16	20
115	155	16	20
120	160	16	20
125	165	16	20
130	170	16	20
135	175	16	20
140	180	16	20
150	190	16	20
160	200	16	20
170	210	16	20
180	220	16	20
190	230	16	20
200	240	16	20
210	250	16	20
220	260	16	20
230	270	16	20
240	280	16	20
250	290	16	20
260	304	20	22
270	314	20	22
280	324	20	22
290	334	20	22
300	344	20	22

d (mm)	D (mm)	H (mm)	A (mm)
310	354	20	22
320	364	20	22
330	374	20	22
340	384	20	22
350	394	20	22
360	404	20	22
380	424	20	22
400	444	20	22
420	470	22	25
440	490	22	25
460	510	22	25
480	530	22	25
500	550	22	25
540	590	22	25
580	630	22	25
620	684	25	32
650	714	25	32
700	764	25	32
730	794	25	32
750	814	25	32
800	864	25	32
850	914	25	32
920	984	25	32
1000	1064	25	32

d (mm)	D (mm)	H (mm)	A (mm)
4	5l/4	1/2	5/8
4l/2	6	5/8	3/4
5	6 l/2	5/8	3/4
5l/2	7	5/8	3/4
6	7 l/2	5/8	3/4
6 l/2	8	5/8	3/4
7	8 l/2	5/8	3/4
7	9	5/8	3/4
8	9l/2	5/8	3/4
8 l/2	10	5/8	3/4
9	10 l/2	5/8	3/4
9 l/2	11	3/4	3/4
10	11 l/2	3/4	3/4
11	1 23/4	3/4	7/8
12	1 33/4	3/4	7/8
13	143/4	3/4	7/8
14	1 53/4	3/4	7/8
16	173/4	3/4	7/8
18	1 93/4	3/4	7/8
20	213/4	3/4	7/8
22	233/4	3/4	7/8
24	26 l/2	1	11/4
26	28 l/2	1	11/4
30	32 l/2	1	11/4
411/4	433/4	1	11/4

d (mm)	D (mm)	H (mm)	A (mm)
100	115	8.9	7.5
100	115	9	7.5
100	120	13	10
100	125	13	12.5
100	125	15	12.5
100	125.4	12.7	12.7
100	130	15	15
100	130	12	15
100	132	12.5	16
100.1	120.6	9.5	10.2
101.6	127	9.5	12.7
101.6	127	12.7	12.7
101.6	130.2	15.9	14.3
101.6	130.3	14.3	14.3
101.6	139.7	19	19
101.6	142.9	12.7	20.6
104.4	142.4	16	19
104.7	130.1	9.5	12.7
105	129	13	12
105	130	12	12.5
105	130	13	12.5
105	133.5	12.7	14.3
105	137	16	16
105	140	12	17.5
105	143	16	19
107.9	133.3	12.7	12.7
107.9	138.1	12.7	15
107.9	139.8	14.2	15.9
107.9	146	14.2	19
107.9	146.1	12.7	19.1
110	126	9	8
110	126	12	8
110	130	13	10
110	130	9	10
110	130	12	10
110	135	12	12.5

d (mm)	D (mm)	H (mm)	A (mm)
110	140	12	15
110	140	14	15
110	140	16	15
110	141	13.7	15.5
110	145	19	17.5
111.1	139.4	12.7	14.3
112	142	15.2	15
112.6	134.9	9.5	11.1
112.7	139.7	12.7	13.5
114	140	13.3	13
114	154	15.5	20
114	154	16	20
114.3	136.5	10.3	11.1
114.3	139.7	11.11	12.7
114.3	139.7	14.3	12.7
114.3	139.7	13.5	12.7
114.3	139.7	12.7	12.7
114.3	152.4	19	19
114.3	152.4	22.2	19
115	137	8.8	11
115	140	12	12.5
115	140	13	12.5
115	140.4	9.5	12.7
115	145	12	15
115	145	15	15
115	150	15	17.5
117.4	146.1	9.5	14.3
117.4	152.4	15.9	17.5
117.5	143	14.3	12.7
118	140	14	11
119	147.6	12.7	14.3
119	144.5	12.7	12.7
119.1	145	10	12.9
119.1	152.4	9	16.6
120	140	12.5	10
120	140	14.5	10

d (mm)	D (mm)	H (mm)	A (mm)
120	140	13	10
120	144	15.5	12
120	145	15.5	12.5
120	145.4	12.7	12.7
120	150	13	15
120	150	15	15
120	150	16	15
120	152	16	16
120	160	12	20
120	170	15	25
120.6	158.7	15.9	19
123.8	149.2	12	12.7
123.8	149.2	12.7	12.7
123.8	158.7	13.5	17.4
123.8	158.7	14.3	17.4
124.2	159.2	15	17.5
125	140	10	7.5
125	150	12	12.5
125	150	15	12.5
125	153.5	12.7	14.2
125	155	12	15
125	160	15	17.5
125	160	12	17.5
125	165	15	20
125.4	155.6	12.7	15.1
127	146	9.5	9.5
127	152.4	9.5	12.7
127	157	15	15
127	158.7	14.2	15.9
127	171.4	15.9	22.2
128	165	15	18.5
130	150	10	10
130	150	12	10
130	155	10	12.5
130	155	15.5	12.5
130	160	12	15

d (mm)	D (mm)	H (mm)	A (mm)
130	160	15	15
130	160	16	15
130	165	13	17.5
130.2	155,6	12.7	12.7
131.7	158.7	12.7	13.5
133.3	158.7	15.9	12.7
133.3	158.9	12.7	12.8
133.3	161.9	15.9	14.3
133.3	171.4	15.9	19
133.3	171.4	22.2	19
133.5	153.5	8.5	10
134	169	15	17.5
135	157	8.8	11
135	160	12	12.5
135	165	13	15
135	167	15	16
135	170	12	17.5
135	170	13	17.5
135	170	16.5	17.5
136	160	10	12
136.5	161.9	15.9	12.7
138	180	15	21
139	155	10	8
139	169	14.6	15
139.7	165.1	12.7	12,7
139.7	171.4	15.9	15.9
139.7	171.6	12.7	15.9
139.7	190	12.7	25.1
140	155	10	7.5
140	160	13	10
140	165	15	12.5
140	168	21	14
140	170	15	15
140	171.8	12.7	15.9
140	180	12	20
140	180	15	20

d (mm)	D (mm)	H (mm)	A (mm)
140	190	15	25
143	165	10	11
143	174.5	15.9	15.9
144	180	15	18
145	170	15	12.5
145	170	13	12.5
145	176.7	15.9	15.9
145	180	12	17.5
145	180	14	17.5
146	177.8	14.3	15.9
146	177.8	15.9	15.9
146	171.4	12.7	12.7
146	174.6	15.9	14.3
146	184.1	15.9	19
149	179	13	15
149	180	16	15.5
149.2	174.6	12.7	12.7
149.2	177.8	12.7	14.3
150	172	12.7	11
150	180	12	15
150	180	13	15
150	180	15	15
150	180	16	15
150	185	15	17.5
150	188	16	19
150	190	20	20
152	180	14	14
152	190	19	19
152.4	172.4	12.7	10.1
152.4	177.8	12.7	12.7
152.4	181	12.7	14.3
152.4	190.5	17	19
152.4	190.5	19	19
152.4	190.5	12.7	19
154	180	12.2	13
154	181.4	12.7	137

d (mm)	D (mm)	H (mm)	A (mm)
155	175	10.8	10
155	180	12.5	12.5
155	180	15	12.5
155	190	13	17.5
158.7	182.7	16	12
158.7	190.5	15.9	15.9
158.7	190.5	19	15.9
158.7	193.6	17.4	17.4
159	200	16	20.5
160	188	21	14
160	190	16	15
160	190	15	15
161.9	187.3	12.7	12.7
165	190	15	12.5
165	195	15	15
165	200	15	17.5
165	203	19	19
165	205	16	20
165.1	196.8	15.9	15.9
165.1	203.2	19	19
165.1	215.9	15.9	25.4
168	200	16	16
168.3	200	15.9	15.9
168.3	206.4	17.5	19
168.3	206.4	19	19
169	200	12	15.5
169	201	12.5	16
170	192	10.7	11
170	195	14.2	12.5
170	200	15	15
170	200	12	15
170	205	18	17.5
170	220	15	25
170.2	202	12.7	15.9
171.5	196.9	9.5	12.7
171.4	203.2	15.9	15.9

d (mm)	D (mm)	H (mm)	A (mm)
171.4	196.9	15.9	12.7
172.3	191.3	12.2	9.5
174	214	16	20
174.6	203.2	15.9	14.3
174.6	215.9	15.9	20.6
175	200	15	12.7
175	205	15	15
175	215	15	20
175	215	16	20
176.2	206.3	15.9	15
176.2	208	19	15.9
177.8	203.2	12.7	12.7
177.8	203.2	15.9	12.7
177.8	209.5	15.9	15.9
177.8	212.7	15.9	17.4
177.8	222.2	15.9	22.2
177.8	222.5	19	22.3
180	200	15	10
180	205	12.5	12.5
180	210	12	15
180	210	15	15
180	212	16	16
180	215	15	17.5
180	216	21.8	18
180	218.1	15.9	19
180	220	13	20
180	230	16	25
182	215	16	16.5
182.5	214.5	15.6	16
184.1	224.1	15.6	20
185	210	13	12.5
185	215	16	15
185	220	16	17.5
185	225	16	20
185	230	16	22.5
185.7	212.7	15.9	13.5

d (mm)	D (mm)	H (mm)	A (mm)
190	212	11.7	11
190	215	16	12.5
190	220	15	15
190	220	16	15
190	220.4	12.7	15.2
190	225	18	17.5
190	230	15	20
190.1	234.9	15.4	22.4
190.5	215.9	15.9	12.7
190.5	222.2	15.9	15.9
192.1	222.3	11.1	15.1
193.6	219.1	15.9	12.7
194	232.1	19	19
195	220	15	12.5
195	220.4	12.7	12.9
195	230	15	17.5
195	230	16	17.5
196	228	16	16
196	235	19	19.5
196.8	222.2	15.9	12.7
196.8	234.9	19	19
196.8	247.6	22.2	25.4
198.7	238.7	16	20
199.2	250	15.9	25.4
200	225	15	12.5
200	230	16	15
200	230	15	15
200	231.7	15.9	15.9
200	235	18.2	17.5
200	238.1	15.9	19
200	238.1	19	19
200	240	15	20
200	250	15	25
200	250	18	25
200	228.6	11.1	14.3
203.2	228.6	15.9	12.7

d (mm)	D (mm)	H (mm)	A (mm)
203.9	238.1	17.4	17.1
205	230	16	12.5
205	245	16	20
205	245	20	20
205	250	16	22.5
206.3	231.7	12.7	12.7
206.4	238.2	15.9	15.9
207.9	258.7	25.4	25.4
209	241.3	15.9	15.9
209.6	260.4	20.6	25.4
210	235.4	12.7	12.7
210	245	15	17.5
210	245	18	17.5
210	246	16	18
210	250	15	20
210	274	26	32
212.5	251	16	19.2
212.7	247.6	15.9	17.4
212.8	247.6	19	17.4
213	248	16	17.5
215	240	12	12.5
215	245	16	15
215	247	12.5	16
215	251	12.5	18
215,9	241.3	15.9	12.7
215.9	241.3	12.7	12.7
215.9	247.6	19	15.9
215.9	266.7	19	25.4
215.9	266.7	25.4	25.4
216	241.5	12.7	12.7
216	254	16	19
216	254	19	19
216.9	254	19	18.5
217	242.4	10	12.7
218	245	12.5	13.5
218	270	212	26

d (mm)	D (mm)	H (mm)	A (mm)
218.9	285.9	20	20
219.1	260.3	19	20.6
219.1	250.9	15.9	15.9
220	250	12	15
220	250	15	15
220	250	16	15
220	250	19	15
220	254	16	17
220	255	16	17.5
220	255	18	17.5
220	258	25.4	19
220	260	15	20
220	260	20	20
220	270	16	25
222.2	260.3	17.4	19
222.2	269.8	19	23.8
225	250	12.5	12.5
225	260	16	17.5
225	270	16	22.5
226	258	16	16
227	265.1	19	19
228	258	16	15
228	268	20	20
228.6	260.3	15.9	15.9
228.6	268.5	16	20
228.6	273	19	22.2
228.6	279.4	19	25.4
228.6	279.4	25.4	25.4
230	255	11.7	12.5
230	255	10	12.5
230	255	15	12.5
230	255.4	12.7	12.7
230	258.4	13	14.3
230	260	12.5	15
230	260	15	15
230	260	16	15

d (mm)	D (mm)	H (mm)	A (mm)
230	265	18	17.5
230	274.4	19	22.2
230	280	15	25
230	285	23	27.5
234.9	273	19	19
235	270	16	17.5
235	270	18	17.5
235	275	20	20
240	270	15	15
240	270	17	15
240	275	18	17.5
240	276	18	18
240	278	17	19
240	280	17.5	20
241.3	279.4	19	19
241.3	290.5	14.7	24.6
241.3	292.1	20.6	25.4
244.4	276.2	15.9	15.9
244.5	282.6	15.9	19
245	270	13	12.5
245	270	16	12.5
247.6	273	15.9	12.7
247.6	282.5	19	17.4
248.3	288.3	16	20
248.5	288.5	18.6	20
250	280	15	15
250	280	16	15
250	281.7	12.7	15.9
250	285	18	17.5
250	285	20	17.5
250	285.8	17.5	17.9
250	300	20	25
250	310	25	30
252.6	290.7	15.9	19
253	285	11	16
254	297	9.3	12.5

d (mm)	D (mm)	H (mm)	A (mm)
254	279.4	14.2	12.7
254	279.4	15	12.7
254	279.4	19	12.7
254	292.1	12.7	19
254	292.1	19	19
254	304.7	25.4	25.4
254.5	294.5	16	20
255	285	11	15
255	285	15	15
255	295	16	20
255	310	18	27.5
258.3	302.5	20	22
260	285	18	12.5
260	290	16	15
260	290	19	15
260	291.7	15.9	15.9
260	292	12.5	16
260	298	17	19
260	300	18	20
260	300	20	20
260	305	22	22.5
260	310	16	25
260	310	18	25
263.5	295.2	22.2	15.9
264	308	21.5	22.5
265	300	16	17.5
265	310	16	22.5
265.1	296.8	22.2	15.9
266.6	317.5	19	25.4
266.7	298.4	15.9	15.9
266.7	304.8	17.4	19
270	300	15	15
270	310	16	20
270	310	20	20
272	304	16.5	16
272	304	16	16

d (mm)	D (mm)	H (mm)	A (mm)
273	317	19	22
273	311.1	14.2	19
274.8	320	16	22.6
275	310	15	17.5
277	317	19	20
278.5	322.5	20	22
278.5	322.5	20	22
279.4	304.8	15.9	12.7
279.4	311.2	15.9	15.9
279.4	314.3	19	17.4
279.4	317.5	15.9	19
280	310	15	15
280	310	16	15
280	318	15	19
280	320	18	20
280	320	20	20
280	320	16	20
280	324	19.2	22
280	325	24	22.5
285	310	16	12.5
285	325	16	20
285.7	323.8	15.9	19
285.7	323.8	19	19
286	330	16	22
287.2	331.2	20	22
288	332.4	19	22.2
288.9	339.7	20.6	25.4
290	320	15	15
290	322	12.5	16
290	330	16	20
290	330	18	20
290	330	20	20
290	335	20	22.5
290	340.8	15.9	25.4
290	340.8	20.6	25.4
290.5	341.3	22.5	25.4

d (mm)	D (mm)	H (mm)	A (mm)
292.1	317.5	12.7	12.7
292.1	232.8	15.9	15.9
292.1	330.2	18	19
292.1	330.2	17.6	19
292.1	330.2	18	19
292.1	330.2	19	19
292.1	336.5	19	22.2
292.1	342.9	25.4	15.4
294.1	332.2	17.4	19
294.1	332.2	15.9	19
295	325	15	15
295	335	16	20
295	339	20	22
295.3	333.4	19	19
298	323.4	10	12.7
298.4	336.5	17.4	19
298.4	342.9	19	22.2
298.4	355.6	25.4	28.6
298.4	358.7	25.9	30.1
300	332	15	16
300	332	16	16
300	335	16	17.5
300	335	18	17.5
300	340	18	20
300	340	20	20
300	340	16	20
300	340	25	20
300	344	22	22
300	350	22	25
300	350	25	25
300	360	25	30
300	364	25	32
300	370	18	35
304.8	342.9	15.9	19
304.8	355.6	25.4	25.4
304.9	343	18	19

d (mm)	D (mm)	H (mm)	A (mm)
305	340	15	17.5
305	349	20	22
305	355	15	25
305	362	19	28.5
308	342.9	15.9	17.4
308	352.4	19	22.2
310	350	17.5	20
310	350	18	20
310	355	24	22.5
310	370	28	30
311.1	349.2	19	19
311.1	355.6	19	22.2
311.1	361.9	25.4	25.4
312.5	3535	20	20.5
314.3	365.1	19	25.4
315	347	13	16
315	355	18	20
315	359	20	22
315	365	20	25
315	380	29	32.5
315.7	353.8	19	19.5
317	361	20	22
317.5	355.6	17.4	19
317.5	355.6	19	19
317,5	355.6	20.6	19.1
317.5	368	19	25.4
317.5	368.3	25.4	25.4
320	350	15	15
320	355	16	17.5
320	350	15	15
320	355	16	17.5
320	360	18	20
320	360	20	20
320.7	371.1	25.4	25.5
323	363	16	20
323.8	374.6	25.4	25.4

d (mm)	D (mm)	H (mm)	A (mm)
323.8	374.6	19.4	25.4
325	365	16	20
325	365	20	20
325	365	22	20
325	369	20	22
328	372	20.2	22
330	370	18	20
330	370	20	20
330	374	22	22
330	374	19	22
330	380.8	19	25.4
330.2	368.3	17.4	19
330.2	368.6	19	19
330.2	381	25.4	25.4
335	375	18	20
335	379	20	22
335	400	35	32.5
336.5	374.6	17.4	19
336.5	377.8	25.4	20.6
338	382	20	22
340	370	15	15
340	370	18	15
340	370	20	15
340	372	16	16
340	373	16	16.5
340	378	16	19
340	380	18	20
340	380	20	20
340	400	28	30
342.9	381	19	19
342.9	387.3	19	22.2
342.9	393.7	25	25.4
345	389	20	22
345	395	20	25
346	390	20	22
346.5	378	15.6	15.7

d (mm)	D (mm)	H (mm)	A (mm)
347.7	385.8	19	19
348	380	16	16
350	387.3	19	18.5
350	390	15	20
350	390	16	20
350	390	18	20
350	390	20	20
350	394	22	22
350	400.8	20.6	25.4
350	405	20	27.5
350.5	395	20.6	22.2
355	379	20	12
355	393.7	16	19.3
355	394	20	19.5
355.1	406.5	19	25.7
355.6	393.7	17.4	19
355.6	406.4	19	25.4
360	390	18	15
360	400	16	20
360	400	20	20
360	410	22	25
361.9	400	16	19
361.9	412.7	20.6	25.4
362	400	20	19
362	406	19.5	22
362	406	20	22
362	406	22	22
365	405	18	20
365	409	20	22
367	419.1	21	26.5
368.3	406.4	13	19
368.3	411.7	19	21.7
369	405.4	19	18.2
370	410	15	20
370	410	20	20
370	414	20	22

d (mm)	D (mm)	H (mm)	A (mm)
370	414	19	22
370	414	25	22
374.6	419.1	17.4	22.2
374.6	419.1	19	22.2
375	419	20	22
375	419	22.2	22
375	420	16	22.5
376.2	427	22	25.4
378	428	18.5	25
380	410	12.5	15
380	419.2	25	19.6
380	419.2	12.5	19.6
380	420	15	20
380	420	18	20
380	420	20	20
380	420	22	20
380	435	25	27.5
380	438	23	29
380	440	25	30
381	425.4	19	22.2
381	431.8	19	25.4
381	432	25	25.5
384	414	15	15
384.2	428.6	19	22.2
385	430	25	22.5
385	438	32	26.5
387	431	22.5	22
390	420	14	15
390	420	6	15
390	424.8	13.5	17.4
390	430	18	20
390	430	20	20
390	434	20	22
390	434	19.2	22
391.5	442.3	27.4	25.4
393.7	463.5	28.5	34.9

d (mm)	D (mm)	H (mm)	A (mm)
395	430	18	17.5
395	439	20	22
395	431	18	18
397.5	441.5	20	22
397.5	447.5	20	25
400	438	17.5	19
400	438.1	19	19
400	440	18	20
400	440	20	20
400	444	19.2	22
400	444.5	22	22.2
400	445.5	22	22.7
400	450	20	25
400	450	22	25
405	455	22	25
406.3	457.1	20	25.4
406.4	444.5	19	19
406.4	457.2	19	25.4
406.4	457.2	21.2	25.4
406.4	457.2	22.2	25.4
406.4	457.2	24	25.4
406.4	457.2	25	25.4
406.4	457.2	25.4	25.4
406.4	457.2	28.6	25.4
406.4	457.2	20.6	25.4
410	450	20	20
413	455	20	21
415	455	20	20
415	459	20	22
417	457	19.8	20
417	467	25	25
419.1	450.8	19	15.9
419.1	450.8	22.2	15.9
419.7	469.6	22.2	25.4
420	460	19	20
420	460	20	20

d (mm)	D (mm)	H (mm)	A (mm)
420	470	20	25
420	470	25	25
425.4	463.5	17.4	9
425.5	482.6	23	28.5
430	474	20	22
430	480	20	25
430	480	22	25
430	480	25	25
430	480.5	15	25.3
430	490	25	30
431.8	469.9	17.5	19
431.8	482.6	20.6	25.4
435	485	22	25
435.6	473.7	19	19
437	487	19.8	25
437	*AQ7*	21.5	25
438.2	476.3	19	19
438.2	476.3	20.6	19
440	469	12.5	14.5
440	480	20	20
440	481.4	20.6	20.7
440	484.3	19	22.1
440	490	25	25
440	490	20	25
440	490	20.5	25
444.4	495.2	25	25.4
445	495	22	25
446	486	16	20
446	497	22	25
450	494	20	22
450	500	20	25
450	500	22	25
450	500	25	25
454	504.8	21	25.4
457.2	495.3	17.4	19
457.2	508	22	25.4

d (mm)	D (mm)	H (mm)	A (mm)
458	494	12	18
460	500	18	20
460	500	20	20
460	510	25	25
460	510.8	20.6	25.4
460	510.8	25.4	25.4
460	520	30	30
467	510	20	21.5
469.9	520.7	22.2	25.4
469.9	520.7	23	25.4
470	520	22	25
470	520	25	25
470.8	525.8	18	27.5
474	514	20	20
475	530	18	27.5
475	530	20	27.5
480	520	20	20
480	520	16	20
480	530	25	25
482	530	20	24
482.6	520.7	19	19
482.6	520.7	23.8	19
482.6	533.4	23	25.4
485	535	22	25
497	538	20	20.5
497.5	546	22	24.2
500	540	20	20
500	544	20	22
500	550	20	25
500	558.8	19	29.4
500	558.8	22	29.4
501.6	549	22	23.7
503	552	20	24.5
508	555	22	23.5
508	558	22	25
508	558	25	25

d (mm)	D (mm)	H (mm)	A (mm)
508	558.8	22.2	25.4
508	584.2	25.4	38.1
508.5	559.3	22.2	25.4
510	550	20	25
510	554	20	22
510	560	20	25
510	560	22	25
514.3	565.1	22	25.4
520	570	19	25
520	570	22	25
520	570	25	25
520	570.8	20.6	25.4
520	572	25	26
520.7	558.8	19	19
520.7	571.5	22.2	25.4
520.7	577.8	22.2	28.5
525	575	22	25
527	587	30	30
530	565	20	17.5
530	570	22	20
530	566	18	18
530	580	22	25
530	580	20	25
530	580	25	25
530	580.8	22.2	25.4
533	577	25	22
533.4	584.2	22.2	25.4
540	584	20	22
542	578	18	18
545	595	22	25
546.1	596.8	22.2	25.4
546.1	609.6	25.4	31.7
550	600	22	25
550	610	25	30
556	600	22	22
556.5	606.5	21.6	25

d (mm)	D (mm)	H (mm)	A (mm)
558	589	19	15.5
558.8	596.9	19	19
560	598	19	19
560	610	22	25
560	610	20	25
570	620	22	25
570	620	25	25
571.1	622.3	20.8	25.6
571.5	622.3	22.2	25.4
571.5	641.6	29.1	35
575	611	16	18
575	625	22	25
577.9	618.1	14.7	20.1
580	605.4	12.7	12.7
580	615	20	17.5
580	616	16	18
582.1	634.9	30.1	26.4
584.2	622.3	19	19
586	646	22	30
590	640	20	25
590	640	22	25
596	646	22	25
596.8	647.6	22.2	25.4
596.9	660.4	25.4	31.7
600	632	12.5	16
600	640	20	20
600	650	30	25
600	650	22	25
603	640	16	18.5
604	640	18	18
606.4	644.5	19	19
609.6	660.4	22.2	25.4
610	660	22	25
615	665	24.5	25
616.5	677.5	25	30.5
620	670	22	25

d (mm)	D (mm)	H (mm)	A (mm)
620.7	660.4	15.9	19.8
622.3	673.5	20.8	25.6
625	689	25	32
634.9	685.7	22.2	25.4
635	685.8	19	25.4
650	689	19	19.5
650	690	20	20
660	710	22	25
660	711.2	22.2	25.6
660	724	25	32
665	729	25	32
670	735	25	32.5
680	730	20	25
681	744.5	25.4	31.7
685	749	25	32
685.8	736.6	22.2	25.4
686	740	25	27
698.5	749.3	20.6	25.4
710	770	30	30
710	774	25	32
711.1	761.9	20.6	25.4
715	779	25	32
723.9	774.7	15.9	25.4
723.9	774.7	25.4	25.4
723.9	774.7	22.2	25.4
725.4	776.2	22	25.4
730.2	781	22.2	25.4
736.6	786.6	20	25
740	790	20	25
744	808	25	32
749.3	800.1	22.2	25.4
750	780	18	25
750	789	19	19.5
750	810	30	30
757.5	821	25.4	31.7
760	800	20	20

d (mm)	D (mm)	H (mm)	A (mm)
760	820	30	30
761.9	815.9	25.4	27
765	825	26	30
774.7	820	22.2	22.6
774.7	825.5	23	25.4
774.7	850.8	25.4	38.1
775	839	25	32
777	841	25	32
780	844	25	32
786	836	25	25
788.5	839.3	18.8	25.4
790	850	30	30
790	854	25	32
800	860	30	30
800	870	30	35
810	860	25	25
810	870	25	30
816	866.8	22.5	25.4
820	870.8	22.2	25.4
820	884	25	32
832	870	19	19
840	904	25	32
850	910	30	30
857.6	921.6	25	32
860	920	25	30
869.9	933.4	25.4	31.7
870	900	18	15
876	940	25	32
880	944	25	32
882.6	933.4	22.2	25.4
889	939.8	25.4	25.4
889	952.5	19	31.7
889	952.5	22.2	31.7
890	954	25	32
900	960	30	30
900	980	23	40

d (mm)	D (mm)	H (mm)	A (mm)
907	959	22	26
908	958.8	21.5	25.4
914.4	965.2	22.2	25.4
920	970	22	25
939	1003	25	32
940	995	25	27.5
940	1000	30	30
950	980	18	15
950	1000	25	25
950	1010	30	30
952.4	1003.3	22.2	25.4
960	1024	25	32
965.2	1016	22	25.4
1000	1060	25	30
1028.7	1079.5	22.2	25.4
1046.1	1096.9	22.2	25.4
1073	1149.2	38.1	38.1
1105	1155.7	22	25.3
1150	1214	25	32
1191.5	1241.5	24.4	25
1250	1314	25	32
1302	1353	22	25.5
1320	1398	32	39
1580	1644	25	32

Molds are available for the above sizes.
CARCO can also provide other sizes according to customers' requirements

12. Rotary V-ring

Overview

The v-ring is made of pure rubber material without reinforcement structure such as fiber or metal sheet in the middle, thus it has good elasticity, easy to stretch and extremely convenient to mount. It has interference fit with the shaft and rotates together with the shaft.

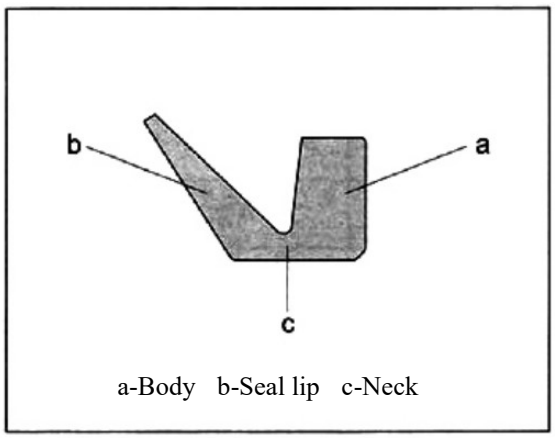
Because of their simple structure, ease of use and high reliability, V-rings are widely used in industrial engineering, water treatment devices, mills, lathes and other fields, greatly reducing the design workload of groove and mounting.

I. Features and advantages of V-ring

The V-ring is fixed on the shaft by its own elastic tension, and the flexible seal lip keeps in contact with the surface of the shaft seat with a small contact force.

The flexible seal lip can compensate the shaft misalignment, shaft-to-bore eccentricity, and shaft machining error.

The seal lip prevents the internal grease or oil from leaking and the external dust and dirt from entering. As the V-ring carries out revolution movement with the shaft, due to the centrifugal force, its body acts like a slip ring to prevent dirt from intruding into the working medium.



a-Body b-Seal lip c-Neck

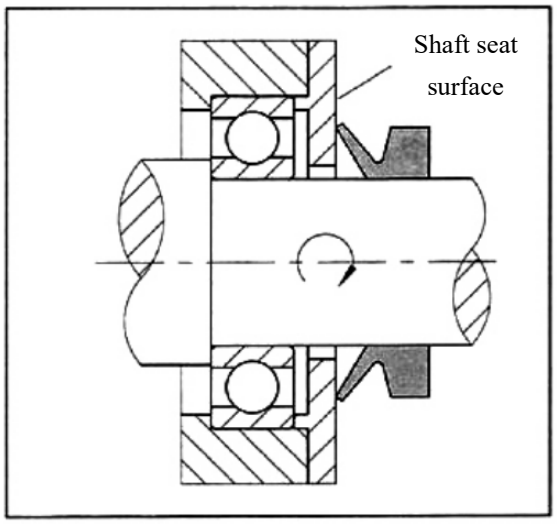
The above figure shows the structure and composition of a V-ring.

Advantages

Unlike other oil seals, the V-ring relies on its elastic sealing lip to form radial sealing. The seal lip has good mobility and adaptability, so it requires a smaller tolerance fit and a simpler design than other seals, and can compensate the rotating shaft misalignment.

V-ring enjoys the following advantages:

- Pure rubber elastomer material without metal parts;
- Reduced design effort and no machining requirements for mounting;
- No requirements for shaft fitting surface machining, roughness, hardness and hardening of shaft surface;
- Simple and reliable mounting and removal;
- Small surface contact pressure, reducing friction force, friction loss and frictional heating, and prolonging the service life;
- Good sealing and dust-proof performance.



II. Materials

V-rings are generally available in two materials:

1. Standard NBR material of 60 Shore A
Material code: N60
Temperature: -30℃～+110℃
Medium: Mineral oil, air, water, emulsion, and grease

2. FPM of 65 Shore A
Material code: V65
Temperature: -20℃～+200℃
Medium: Mineral oil, synthetic oil, grease, acid, and alkali

※ Other V-ring materials can refer to the selection of o-ring materials.

III. Four standard designs of V-rings

Section shape				
Model	VA type	VS type	VL type	VE type
	Most commonly used design.	Wide and tapered body to provide a tight fit to the shaft.	A very narrow axial cross-section, compact structure, often used in combination with labyrinth oil seals.	Mainly used as a second seal for heavy-duty applications. It has the largest cross-section and allows for large axial displacements.
Size range	Shaft diameter: 2.7~2020 mm	Shaft diameter: 4.5~210 mm	Shaft diameter: 105~2025 mm	Shaft diameter: 450~2010 mm

IV. Design principle

1. Selection of V-ring

The size of the V-ring can often be selected from a group of diameter dimensions. If the nominal diameter of the shaft is at the boundary of the two recommended values, then the next larger group of V-rings should be used.

2. Design of fitting surface

The fitting surface shall be obtained by finishing method. Recommended Ra=10~16μm

3. Shaft deflection angle

Unlike other shaft seals, V-rings can work with certain deflection, and the recommended deflection angle is 1°.

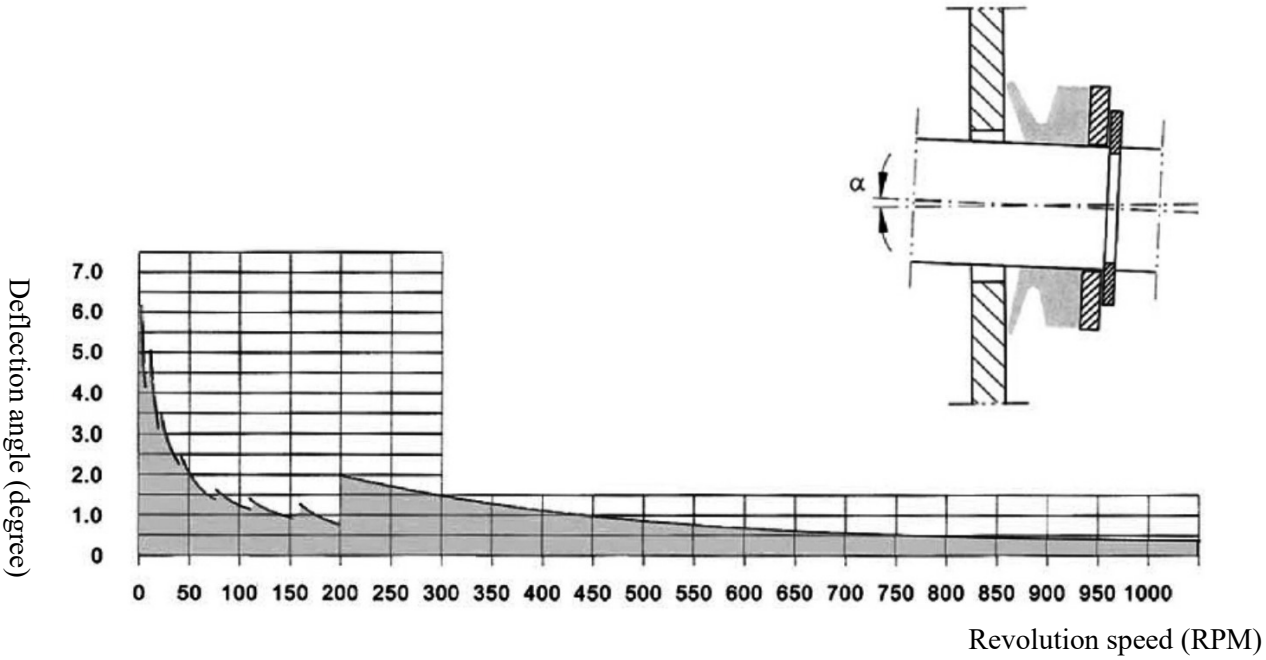


Figure 1 Maximum allowable deflection angles for the VA- and VS-type V-rings

4. Eccentricity and run-out

The total tolerance for the eccentricity and run-out should not exceed the guideline values provided in Table 1.

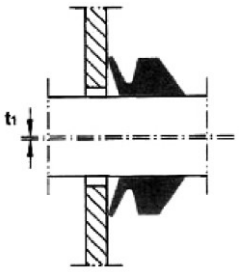
V-rings can tolerate misalignment between the shaft and housing. Guideline values for the maximum permissible misalignment are provided in Figure 1. These values apply to the VA- and VS-type V-rings, provided they are supported axially on the shaft.

The permissible misalignment values for very compact VL-type V-rings are appreciably lower. However, VE-type V-rings have larger cross-section and can tolerate large misalignment. When the V-ring is not supported axially on the shaft, the value obtained in Figure 1 should be reduced, and the calculation formula is as follows:

a = a max-0. 0005n

a - Permissible misalignment when the V-ring is not supported axially on the shaft, in degrees
amax - Maximum permissible misalignment of V-rings obtained from Figure 1, in degrees
n - Revolution speed, in RPM

Table 1 Eccentricity and run-out tolerances



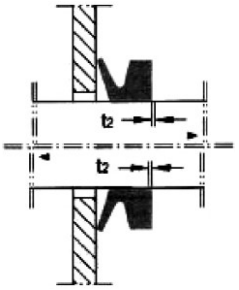
	Shaft diameter d1	Total tolerance for eccentricity and run-out t1
VA and VS type	≤9.5	0.4
	9.5-19.5	0.6
	19.5-38	0.9
	38-68	1.1
	68-105	1.4
	105-155	1.6
	155-210	1.9
	210-2020	3.6
VL type	135-630	1.5
VE type	450-2100	6

Unit: mm

5. Axial displacement

The permissible axial displacement of the V-ring relative to the contact surface is shown in Table 2.

Table 2 Axial displacement



	Shaft diameter d1	Total tolerance for eccentricity and run-out t2
VA and VS type	≤9.5	0.4
	9.5-19.5	0.6
	19.5-38	0.8
	38-68	1
	68-105	1.2
	105-155	1.5
	155-210	1.8
	210-2020	4
VL type	135-630	1.5
VE type	450-2100	12

Unit: mm

6. Sliding velocity and back-up ring

The V-ring is capable of operating at a certain sliding velocity. It should be noted that when the velocity approaches 12 m/s, the circumferential speed will increase and the friction loss will increase. When the above velocity is exceeded, excessive centrifugal force will cause the seal lip to detach. When the velocity exceeds 15 m/s, the lip of the V-ring will be separated from the joint surface, and it will only play a gap sealing role. Therefore, the V-ring should be fixed axially and radially when it rotates with the shaft at its boundary speed of about 10 m/s or 12 m/s. The back-up L-ring shown in Table 3 can meet this requirement. It is machined or directly stamped from steel, alloy, etc. There are no strict restrictions on the outside diameter and height of the back-up ring. The following are recommended back-up L-ring bores and bore depths.

The marked dimensions of back-up ring bore diameter can be obtained by the following formula with sufficient accuracy.

$$di=dl+2C\ \sqrt{(2d-dl)/d-x}$$

Where

di = Marked dimension of back-up ring bore diameter

d1 = shaft diameter

d = Inside diameter of unmounted V-rings, see the product table

c = Cross-sectional height of V-ring, see the product table

x = Correction coefficients that vary according to size, see Table 3

The recommended tolerance for bore diameter di is H9.

Unit: mm

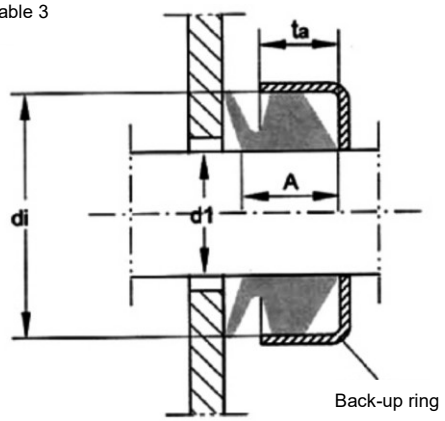
The back-up ring should be located slightly behind the V-ring. Therefore, the following bore depth dimensions, ta (in mm), are recommended for different design types of V-rings:

-VA： ta=0. 83A -VL： ta=4

-vs： ta=0. 86 (A~C)+C -VE： ta=20

The width of the V-ring shaft seat, A, and its cross-sectional height, C, can be obtained from the product table.

Table 3



Correction coefficient X

Shaft diameter d1	Coefficient X
7— 16	0.2
16— 58	0.3
58— 135	0.4
135— 180	0.5
> 180	0.8

Unit: mm

V. Mounting

The mounting of V-rings does not require a design of mounting chamfers. V-rings are elastomeric and can be stretched up to 20% and pushed onto other parts, making them extremely easy to mount (Figure 1).

In many cases, V-rings can be mounted with a simple bladeless tool (as shown in Figure 2) by rotating the shaft and pushing or aligning the V-ring to the correct mounting position.

If replacing the V-ring involves the time-consuming task of removing several other parts, the V-ring can be cut into two parts, placed in the proper position and then joined together with a bonding material and tool; be careful not to stretch the joint.

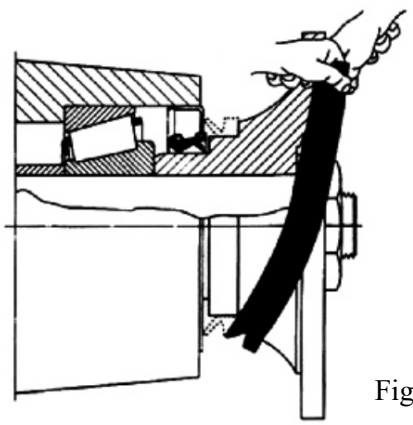


Figure 1

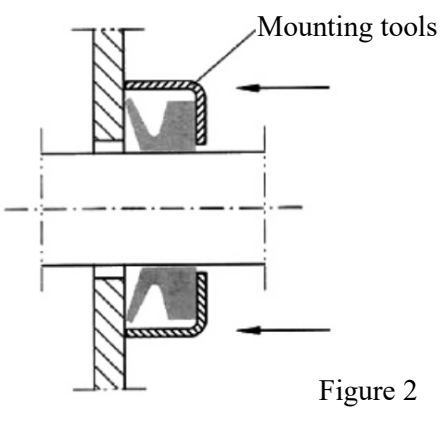
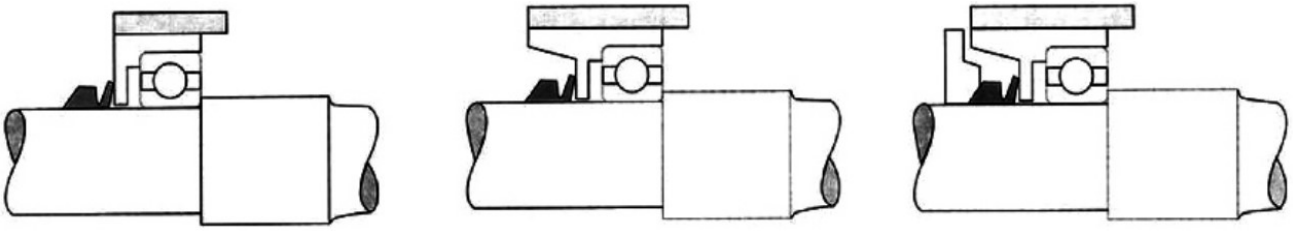


Figure 2

VI. Applications of V-rings

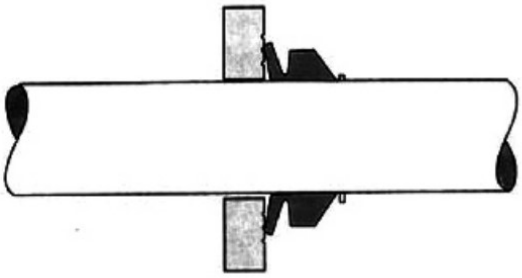
1. V-rings are used to seal the grease, and also to prevent dust and water from entering.

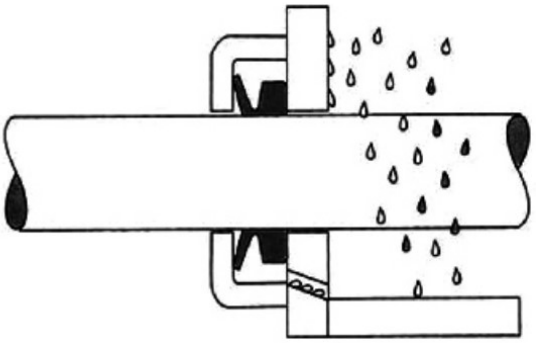


2. V-rings are used to seal grease.

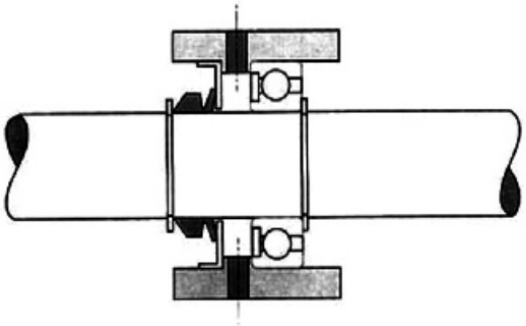
A. If the shaft is fixed to rotate in one direction, spiral grooves can be opened at the lip contact surface, so that the oil flows out of the shaft surface through the pumping effect.

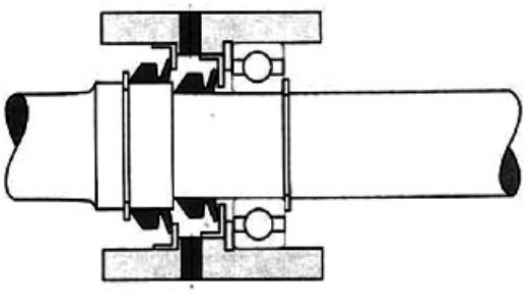
B. If the shaft rotates in two directions, use the drainage groove as the oil return hole.



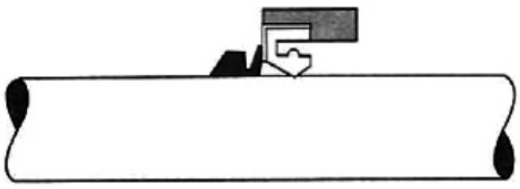


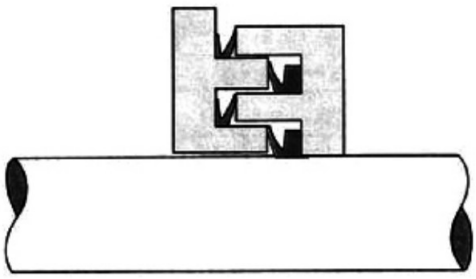
3. V-rings serve as waterproof seals.





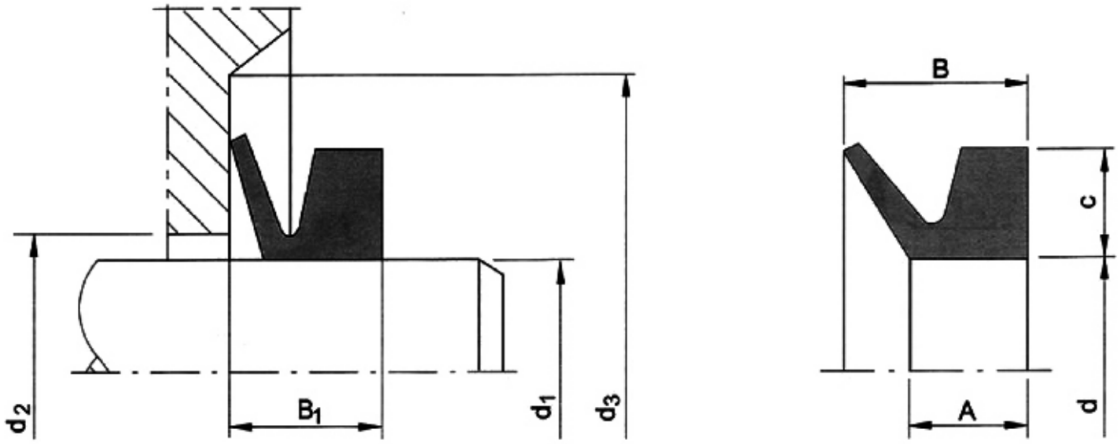
4. V-rings serve as auxiliary seals for other seals.





Rotary V-Ring

VA-type V-ring



Mounting diagram

When the shaft diameter d1 is at the boundary of two V-rings, select the larger V-ring. The unit of all dimensions is mm.

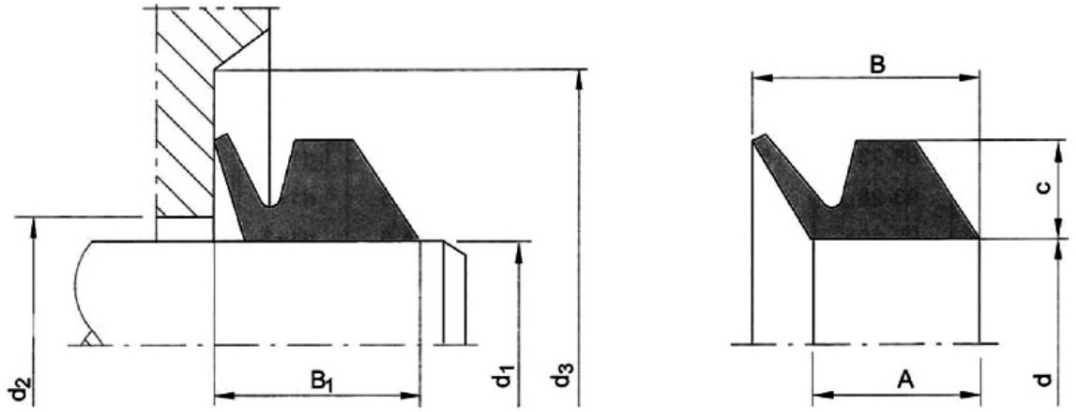
VA Size Chart

Model	Shaft diameter d1	Inside diameter d	Cross-sectional height C	Cross-sectional dimension A	Cross-sectional dimension B	Dimension d2	Dimension d3	Mounting dimension B1
VA-3	2.7-3.5	2.5	1.5	2.1	3.0	D1+1	d1+4	2.5 ±0.3
VA-4	3.5 - 4.5	3.2	2	2.4	3.7	D1+1	d1+6	3.0 ±0.4
VA-5	4.5-5.5	4	2	2.4	3.7	D1+1	d1+6	3.0 ±0.4
VA-6	5.5-6.5	5	2	2.4	3.7	d1+1	d1+6	3.0 ±0.4
VA-7	6.5-8.0	6	2	2.4	3.7	d1+1	d1+6	3.0 ±0.4
VA-8	8.0-9.5	7	2	2.4	3.7	d1+1	d1+6	3.0 ±0.4
VA-10	9.5-11.5	9	3	3.4	5.5	d1+1	d1+9	4.5 ±0.6
VA-12	11.5-12.5	10.5	3	3.4	5.5	d1+1	d1+9	4.5 ±0.6
VA-13	12.5-13.5	11.7	3	3.4	5.5	d1+1	d1+9	4.5 ±0.6
VA-14	13.5-15.5	12.5	3	3.4	5.5	d1+1	d1+9	4.5 ±0.6
VA-16	15.5-17	14	3	3.4	5.5	d1+1	d1+9	4.5 ±0.6
VA-18	17.5-19	16	3	3.4	5.5	d1+1	d1+9	4.5 ±0.6
VA-20	19-21	18	4	4.7	7.5	d1+2	d1+12	6.0 ±0.8
VA-22	21-24	20	4	4.7	7.5	d1+2	d1+12	6.0 ±0.8
VA-25	24-27	22	4	4.7	7.5	d1+2	d1+12	6.0 ±0.8
VA-28	27-29	25	4	4.7	7.5	d1+2	d1+12	6.0 ± 0.8
VA-30	29-31	27	4	4.7	7.5	d1+2	d1+12	6.0 ± 0.8
VA-32	31-33	29	4	4.7	7.5	d1+2	d1+12	6.0 ± 0.8

Model	Shaft diameter d1	Inside diameter d	Cross-sectional height C	Cross-sectional dimension A	Cross-sectional dimension B	Dimension d2	Dimension d3	Mounting dimension B1
VA-35	33-36	31	4	4.7	7.5	d1+2	d1+12	6.0 ± 0.8
VA-38	36-38	34	4	4.7	7.5	d1+2	d1+12	6.0 ±0.8
VA-40	38-43	36	5	5.5	9.0	d1+2	d1+15	7.0 ±1.0
VA-45	43-48	40	5	5.5	9.0	d1+2	d1+15	7.0 ±1.0
VA-50	48-53	45	5	5.5	9.0	d1+2	d1+15	7.0 ±1.0
VA-55	53-58	49	5	5.5	9.0	d1+2	d1+15	7.0 ±1.0
VA-60	58-63	54	5	5.5	9.0	d1+2	d1+15	7.0 ±1.0
VA-65	63-68	58	5	5.5	9.0	d1+2	d1+15	7.0 ±1.0
VA-70	68-73	63	6	6.8	11.0	d1+3	d1+18	9.0 ±1.2
VA-75	73-78	67	6	6.8	11.0	d1+3	d1+18	9.0 ±1.2
VA-80	78-83	72	6	6.8	11.0	d1+3	d1+18	9.0 ±1.2
VA-85	83-88	76	6	6.8	11.0	d1+3	d1+18	9.0 ±1.2
VA-90	88-93	81	6	6.8	11.0	d1+3	d1+18	9.0 ±1.2
VA-95	93-98	85	6	6.8	11.0	d1+3	d1+18	9.0 ±1.2
VA-100	98-105	90	6	6.8	11.0	d1+3	d1+18	9.0 ±1.2
VA-110	105-115	99	7	7.9	12.8	d1+4	d1+21	10.5 ±1.5
VA-120	115-125	108	7	7.9	12.8	d1+4	d1+21	10.5 ±1.5
VA-130	125-135	117	7	7.9	12.8	d1+4	d1+21	10.5 ±1.5
VA-140	135-145	126	7	7.9	12.8	d1+4	d1+21	10.5 ±1.5
VA-150	145-155	135	7	7.9	12.8	d1+4	d1+21	10.5 ±1.5
VA-160	155-165	144	8	9.0	14.5	d1+4	d1+24	12.0 ±1.8
VA-170	165-175	153	8	9.0	14.5	d1+4	d1+24	12.0 ±1.8
VA-180	175-185	162	8	9.0	14.5	d1+4	d1+24	12.0 ±1.8
VA-190	185-195	171	8	9.0	14.5	d1+4	d1+24	12.0 ±1.8
VA-199	195-210	180	8	9.0	14.5	d1+4	d1+24	12.0 ±1.8
VA-200	190-210	180	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-220	210-235	198	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-250	235-265	225	15	14.3	25.0	d1+10	d1-h45	20.0 ±4.0
VA-275	265-290	247	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-300	290-310	270	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-325	310-335	292	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-350	335-365	315	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-375	365-390	337	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-400	390-430	360	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-450	430-480	405	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0

Model	Shaft diameter d1	Inside diameter d	Cross-sectional height C	Cross-sectional dimension A	Cross-sectional dimension B	Dimension d2	Dimension d3	Mounting dimension B1
VA-500	480-530	450	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-550	530-580	495	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-600	580-630	540	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-650	630-665	600	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-700	665-705	630	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-725	705-745	670	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-750	745-785	705	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-800	785-830	745	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-850	830-875	785	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-900	875-920	825	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-950	920-965	865	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1000	965-1015	910	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1050	1015-1065	955	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1100	1065-1115	1000	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1150	1150-1165	1045	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1200	1165-1215	1090	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1250	1215-1270	1135	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1300	1270-1320	1180	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1350	1320-1370	1225	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1400	1370-1420	1270	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1450	1420-1470	1315	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1500	1470-1520	1360	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1550	1520-1570	1405	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1600	1570-1620	1450	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1650	1620-1670	1495	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1700	1670-1720	1540	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1750	1720-1770	1585	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1800	1770-1820	1630	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1850	1820-1870	1675	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1900	1870-1920	1720	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-1950	1920-1970	1765	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0
VA-2000	1970-2020	1810	15	14.3	25.0	d1+10	d1+45	20.0 ±4.0

Mounting diagram and size chart of VS-type V-rings



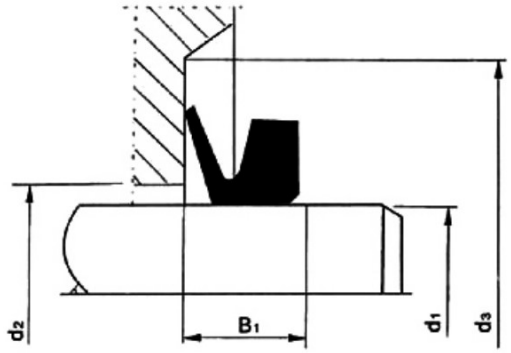
VS Size Chart

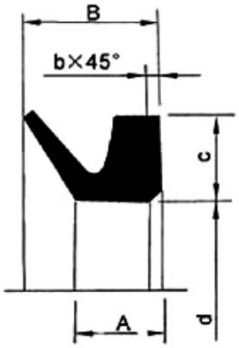
Model	Shaft diameter d1	Inside diameter d	Cross-sectional height C	Cross-sectional dimension A	Cross-sectional dimension B	Dimension d2	Dimension d3	Mounting dimension B1
VS-5	4.5-5.5	4	2	3.9	5.2	d1+1	d1+6	4.5 ± 0.4
VS-6	5.5-6.5	5	2	3.9	5.2	d1+1	d1+6	4.5 ±0.4
VS-7	6.5-8.0	6	2	3.9	5.2	d1+1	d1+6	4.5 ± 0.4
VS-8	8.0-9.5	7	2	3.9	5.2	d1+1	d1+6	4.5 ±0.4
VS-10	9.5-11.5	9	3	5.6	7.7	d1+1	d1+9	6.7 ± 0.6
VS-12	11.5-13.5	10.5	3	5.6	7.7	d1+1	d1+9	6.7 ±0.6
VS-14	13.5-15.5	12.5	3	5.6	7.7	d1+1	d1+9	6.7 ± 0.6
VS-16	15.5-17.5	14	3	5.6	7.7	d1+1	d1+9	6.7 ±0.6
VS-18	17.5-19	16	3	5.6	7.7	d1+1	d1+9	6.7 ± 0.6
VS-20	19-21	18	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-22	21-24	20	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-25	24-27	22	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-28	27-29	25	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-30	29-31	27	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-32	31-33	29	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-35	33-36	31	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-38	36-38	34	4	7.9	10.5	d1+2	d1+12	9.0 ±0.8
VS-40	3843	36	5	9.5	13.0	d1+2	d1+15	11.0±1.0
VS-45	43^48	40	5	9.5	13.0	d1+2	d1+15	11.0±1.0
VS-50	48-53	45	5	9.5	13.0	d1+2	d1+15	11.0±1.0

Model	Shaft diameter d1	Inside diameter d	Cross-sectional height C	Cross-sectional dimension A	Cross-sectional dimension B	Dimension d2	Dimension d3	Mounting dimension B1
VS-52	53-58	49	5	9.5	13.0	d1+2	d1+15	11.0±1.0
VS-60	58-63	54	5	9.5	13.0	d1+2	d1+15	11.0±1.0
VS-65	63-68	58	5	9.5	13.0	d1+2	d1+15	11.0±1.0
VS-70	68-73	63	6	11.3	15.5	d1+3	d1+18	13.5 ±1.2
VS-75	73-78	67	6	11.3	15.5	d1+3	d1+18	13.5 ±1.2
VS-80	78-83	72	6	11.3	15.5	d1+3	d1+18	13.5 ±1.2
VS-85	83-88	76	6	11.3	15.5	d1+3	d1+18	13.5 ±1.2
VS-90	88-93	81	6	11.3	15.5	d1+3	d1+18	13.5 ±1.2
VS-95	93-98	85	6	11.3	15.5	d1+3	d1+18	13.5 ±1.2
VS-100	98-105	90	6	11.3	15.5	d1+3	d1+18	13.5 ±1.2
VS-110	105-115	99	7	13.1	18.0	d1+4	d1+21	15.5 ±1.5
VS-120	115-125	108	7	13.1	18.0	d1+4	d1+21	15.5 ±1.5
VS-130	125-135	117	7	13.1	18.0	d1+4	d1+21	15.5 ±1.5
VS-140	135-145	126	7	13.1	18.0	d1+4	d1+21	15.5 ±1.5
VS-150	145-155	135	7	13.1	18.0	d1+4	d1+21	15.5 ±1.5
VS-160	155-165	144	8	15.0	20.5	d1+4	d1+24	18.5 ±1.8
VS-170	165-175	153	8	15.0	20.5	d1+4	d1+24	18.5 ±1.8
VS-180	175-185	162	8	15.0	20.5	d1+4	d1+24	18.5 ±1.8
VS-190	185-195	171	8	15.0	20.5	d1+4	d1+24	18.5 ±1.8
VS-199	195-210	180	8	15.0	20.5	d1+4	d1+24	18.5 ±1.8

VS-type V-ring with the inside diameter greater than 210 mm shall be customized

Mounting diagram and size chart of VL-type V-rings





■ Cross-section and mounting size

Model	C	A	B	B1	Bamin	Bzmin
VC	6.5	6	10.5	8±1.5	d1±20	d1 ± 5

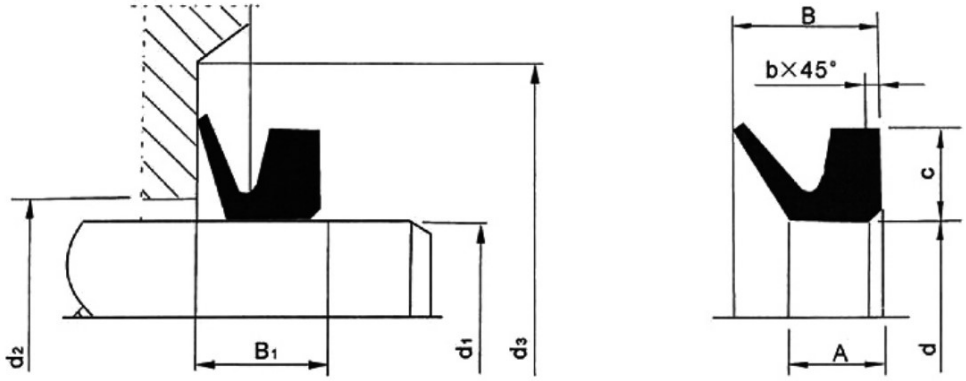
VL Size Chart

Model	Shaft diameter d1	Inside diameter d
VL-110	105-115	99
VL-120	115-125	108
VL-130	125-135	117
VL-140	135-145	126
VL-150	145-155	135
VL-160	155-165	144
VL-170	165-175	153
VL-180	175-185	162
VL-190	185-195	171
VL-200	195-210	182
VL-220	210-233	198
VL-250	233-260	225
VL-275	260-285	247
VL-300	285-310	270
VL-325	310-335	292
VL-350	335-365	315
VL-375	365-385	337
VL-400	385-410	360
VL-425	410-440	382
VL-450	440-475	405
VL-500	475-510	450
VL-525	510-540	472
VL-550	540-575	495
VL-600	575-625	540
VL-650	625-675	600
VL-700	675-710	630
VL-725	710-740	670

Model	Shaft diameter d1	Inside diameter d
VL-750	740-775	705
VL-800	775-825	745
VL-850	825-875	785
VL-900	875-925	825
VL-950	925-975	865
VL-1000	975-1025	910
VL-1050	1025-1075	955
VL-1100	1075-1125	1000
VL-1150	1125-1175	1045
VL-1200	1175-1225	1090
VL-1250	1225-1275	1135
VL-1300	1257-1325	1180
VL-1350	1325-1375	1225
VL-1400	1375-1425	1270
VL-1450	1425-1475	1315
VL-1500	1475-1525	1360
VL-1550	1525-1575	1405
VL-1600	1575-1625	1450
VL-1650	1625-1675	1495
VL-1700	1675-1725	1540
VL-1750	1725-1775	1585
VL-1800	1775-1825	1630
VL-1850	1825-1875	1675
VL-1900	1875-1925	1720
VL-1950	1925-1975	1765
VL-2000	1975-2025	1810

Rotary V-Ring

Mounting diagram and size chart of VL-type V-rings



■ Cross-section and mounting size

Model	C	A	B	B1	d3mln	D2max
VE	30.0	32.5	65.5	50 ±12.0	d1±115	d1±24

VE Size Chart

Model	Shaft diameter d1	Inside diameter d
VE-450	450-455	439
VE-455	455-460	444
VE-460	460-465	448
VE-465	465-470	453
VE-470	470-475	458
VE-475	475-480	463
VE-480	480-485	468
VE-485	485-490	473
VE-490	490-495	478
VE-495	495-500	483
VE-500	500-505	488
VE-505	505-510	493
VE-510	510-515	497
VE-515	515-520	502
VE-520	520-525	507
VE-525	525-530	512
VE-530	530-535	517
VE-535	535-540	521
VE-540	540-545	526

Model	Shaft diameter d1	Inside diameter d
VE-545	545-550	531
VE-550	550-555	536
VE-555	555-560	541
VE-560	560-565	546
VE-565	565-570	550
VE-570	570-575	555
VE-575	575-580	560
VE-580	580-585	565
VE-585	585-590	570
VE-590	590-600	575
VE-600	600-610	582
VE-610	610-620	592
VE-620	620-630	602
VE-630	630-640	612
VE-640	640-650	621
VE-650	650-660	631
VE-660	660-670	640
VE-670	670-680	650
VE-680	680-690	660

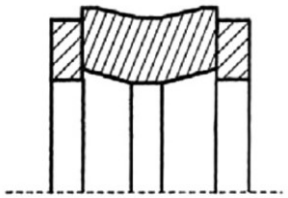
Model	Shaft diameter d1	Inside diameter d
VE-690	690-700	670
VE-700	700-710	680
VE-710	710-720	690
VE-720	720-730	699
VE-730	730-740	709
VE-740	740-750	718
VE-750	750-758	728
VE-760	758-766	735
VE-770	766-774	743
VE-780	774-783	751
VE-790	783-792	759
VE-800	792-801	768
VE-810	801-810	777
VE-820	810-821	786
VE-830	821-831	796
VE-840	831-841	805
VE-850	841-851	814
VE-860	851-861	824
VE-870	861-871	833
VE-880	871-882	843
VE-890	882-892	853
VE-900	892-912	871
VE-920	912-922	880
VE-930	922-933	890
VE-940	933-944	900
VE-950	944-955	911
VE-960	955-966	921
VE-970	966-977	932
VE-980	977-988	942
VE-990	988-999	953
VE-1000	999-1010	963
VE-1020	1010-1025	973
VE-1040	1025-1045	990

Model	Shaft diameter d1	Inside diameter d
VE-1060	1045-1065	1008
VE-1080	1065-1085	1027
VE-1100	1085-1105	1045
VE-1120	1105-1125	1065
VE-1140	1125-1145	1084
VE-1160	1450-1165	1103
VE-1180	1165-1185	1121
VE-1200	1185-1205	1139
VE-1220	1205-1225	1157
VE-1240	1225-1245	1176
VE-1260	1245-1270	1195
VE-1280	1270-1295	1218
VE-1300	1295-1315	1240
VE-1325	1315-1340	1259
VE-1350	1340-1365	1281
VE-1375	1365-1390	1305
VE-1400	1390-1415	1328
VE-1425	1415-1440	1350
VE-1450	1440-1465	1374
VE-1475	1465-1490	1397
VE-1500	1490-1515	1419
VE-1525	1515-1540	1443
VE-1550	1540-1570	1467
VE-1575	1570-1600	1495
VE-1600	1600-1640	1524
VE-1650	1640-1680	1559
VE-1700	1680-1720	1596
VE-1750	1720-1765	1632
VE-1800	1765-1810	1671
VE-1850	1810-1855	1714
VE-1900	1855-1905	1753
VE-1950	1905-1955	1794
VE-2000	1955-2010	1844

VL-type V-ring with the inside diameter greater than 2010 mm shall be customized

13. R3/R4/R5 Rotary Seals

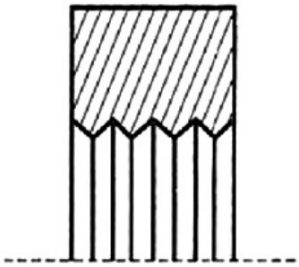
These rotary seals move in two ways and are equipped with a back-up ring. They are stably embedded in the groove, allowing for greater extrusion gap and pressure, and are mostly used on rotating shafts of excavating equipment.



R3

Temperature: -30°C~100°C
Pressure: 16 mpa PU
Pressure: 10 mpa NBR
Speed: 0.2 m/s

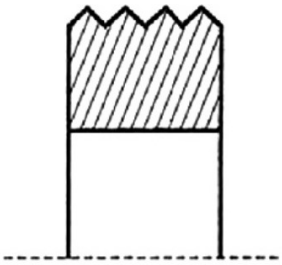
Shaft: Rotary seal, two-way movement, stably embedded in the narrow groove, and tooth-shaped sealing surface.



R4

Rotary Shaft Oil Seal
Temperature: -30°C~100°C
Pressure: 16 mpa PU
Pressure: 10 mpa NBR
Speed: 0.2 m/s

Piston: Rotary seal, two-way movement, stably embedded in the narrow groove, and tooth-shaped sealing surface.



R5

Rotary Piston Oil Seal
Temperature: -30°C~100°C
Pressure: 16 mpa PU
Pressure: 10 mpa NBR
Speed: 0.2 m/s

Rotary oil seals of any specifications within the size range are available.

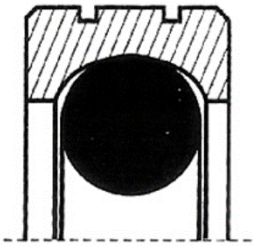
14. RSP (Rotary Piston Oil Seal)

Overview:

Rotary hydraulic transmission is commonly used in modern industry, especially in civil engineering machinery, construction machinery and automotive equipment industry. Based on this, a high-pressure rotary seal was developed.

The high-pressure rotary seal is used for rotating or swinging rods, shafts, rotary joints and other parts. It is a seal that can withstand bi-directional pressure or alternating pressure.

The RSP type rotary seal is a piston seal mounted on a shaft.



RSP

Note:

A high-pressure rotary seal consists of a sealing ring of modified PTFE material with one or two annular grooves and a O-ring, where the O-ring acts as an elastic force-applying element to hold the hard ring tightly against the sliding surface.

To ensure that the hydraulic pressure acts on the O-ring, several radial grooves are designed and machined into the side of the sealing ring.

Advantages:

1. Low starting resistance, no crawling phenomenon, ensuring the smoothness of the movement.
2. Small frictional force.
3. Good wear resistance and dimensional stability.
4. Simple groove structure and small size.
5. Reduced friction due to the lubricant chamber on the outer circumference.
6. Wide size range.

Mounting chamfer:

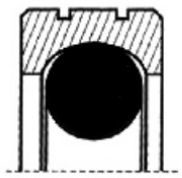
To avoid seal damage during mounting, it is advisable to use the mounting chamfer, with an angle β of 15°-20° and length as follows:

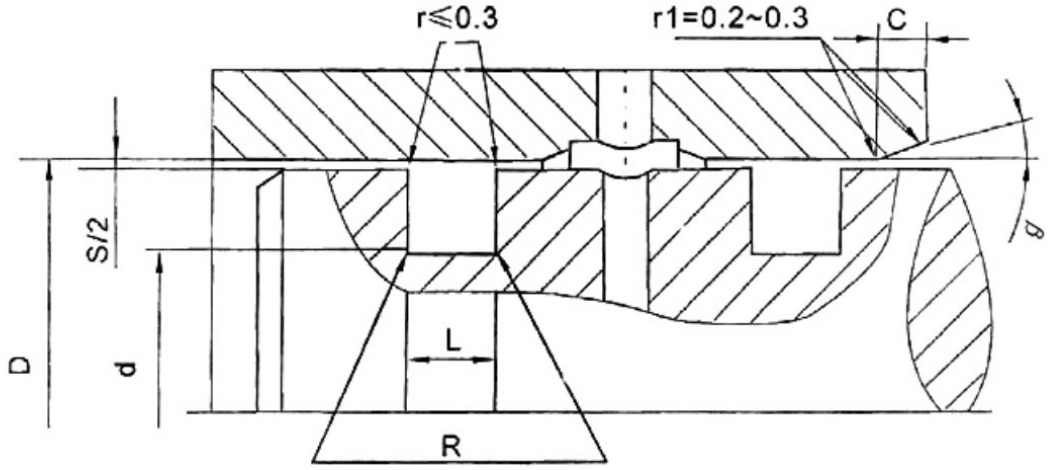
Cross-section code	A	B	C	D	E	F
Chamfer length Cmin(mm)	2	3	4	5	7	8

Surface finish

Surface finish	Ra	Rz
Sliding surface	0.2μm	1.6μm
Groove bottom	1.6μm	6.3μm
Groove side	1.6μm	6.3μm

RSP (Rotary Piston Oil Seal)





Cross-section code	O-ring wire diameter	Recommended standard piston range D	Width L	Groove diameter D	Radial gap S		Chamfer radius Rmax
					0-10MPa	10-20MPa	
A	1.78	8-39.9	2.20	D-4.90	0.30	0.20	0.4
B	2.62	40-79.9	3.20	D-7.50	0.40	0.30	0.6
C	3.53	80-132.9	4.20	D-11.0	0.50	0.40	1.00
D	5.33	133-329.9	6.30	D-15.5	0.60	0.50	1.30
E	6.99	330-699.9	8.10	D-21.0	0.60	0.50	1.80
F	8.40	670-999.9	9.50	D-28.0	0.90	0.60	2.50

Cylinder inside diameter	Groove dimensions		Smax		Chamfer
D H9	d h9	L+0.2	0-10Mpa	10-20Mpa	Rmax
10.00	5.10	2.20	0.30	0.20	0.40
12.00	7.10	2.20	0.30	0.20	0.40
14.00	9.10	2.20	0.30	0,20	0.40
15.00	10.10	2.20	0.30	0.20	0.40
16.00	11.10	2.20	0.30	0.20	0.40
18.00	13.10	2.20	0.30	0.20	0.40
20.00	15.10	2.20	0.30	0.20	0.40
22.00	17.10	2.20	0.30	0.20	0.40
25.00	20.10	2.20	0.30	0.20	0.40
28.00	23.10	2.20	0.30	0.20	0.40
30.00	25.10	2.20	0.30	0.20	0.40
32.00	27.10	2.20	0.30	0.20	0.40
35.00	30.10	2.20	0.30	0.20	0.40
40.00	32.50	3.20	0.40	0.30	0.60
42.00	34.50	3.20	0.40	0.30	0.60
45.00	37.50	3.20	0.40	0.30	0.60
48.00	40.50	3.20	0.40	0.30	0.60
50.00	42.50	3.20	0.40	0.30	0.60
55.00	47.50	3.20	0.40	0.30	0.60
56.00	48.50	3.20	0.40	0.30	0.60
60.00	52.50	3.20	0.40	0.30	0.60
63.00	55.50	3.20	0.40	0.30	0.60
65.00	57.50	3.20	0.40	0.30	0.60
70.00	62.50	3.20	0.40	0.30	0.60
75.00	67.50	3.20	0.40	0.30	0.60
80.00	69.00	4.20	0.50	0.40	1.00
85.00	74.00	4.20	0.50	0.40	1.00
90.00	79.00	4.20	0.50	0.40	1.00
95.00	84.00	4.20	0.50	0.40	1.00
100.00	89.00	4.20	0.50	0.40	1.00

The above sizes are commonly used specifications, and other specifications are available for order.

Cylinder inside diameter	Groove dimensions		Smax		Chamfer
DH9	dh9	L+0.2	0-10Mpa	10-20Mpa	Rmax
105.00	94.00	4.20	0.50	0.40	1.00
110.00	99.00	4.20	0.50	0.40	1.00
115.00	104.00	4.20	0.50	0.40	1.00
120.00	109.00	4.20	0.50	0.40	1.00
125.00	114.00	4.20	0.50	0.40	1.00
130.00	119.00	4.20	0.50	0.40	1.00
135.00	119.50	6.30	0.60	0.50	1.30
140.00	124.50	6.30	0.60	0.50	1.30
145.00	129.50	6.30	0.60	0.50	1.30
150.00	134.50	6.30	0.60	0.50	1.30
160.00	144.50	6.30	0.60	0.50	1.30
170.00	154.50	6.30	0.60	0.50	1.30
180.00	164.50	6.30	0.60	0.50	1.30
190.00	174.50	6.30	0.60	0.50	1.30
200.00	184.50	6.30	0.60	0.50	1.30
210.00	194.50	6.30	0.60	0.50	1.30
220.00	204.50	6.30	0.60	0.50	1.30
230.00	214.50	6.30	0.60	0.50	1.30
240.00	224.50	6.30	0.60	0.50	1.30
250.00	234.50	6.30	0.60	0.50	1.30
260.00	244.50	6.30	0.60	0.50	1,30
270.00	254.50	6.30	0.60	0.50	1.30
280.00	264.50	6.30	0.60	0.50	1.30
300.00	284.50	6.30	0.60	0.50	1.30
320.00	304.50	6.30	0.60	0.50	1.30
350.00	329.00	8.10	0.60	0.50	1.80
400,00	379.00	8.10	0.60	0.50	1.80
450.00	429.00	8.10	0.60	0.50	1.80
480.00	459.00	8.10	0.60	0.50	1.80
500.00	479.00	8.10	0.60	0.50	1.80
600.00	579.00	8.10	0.60	0.50	1.80

The above sizes are commonly used specifications, and other specifications are available for order.

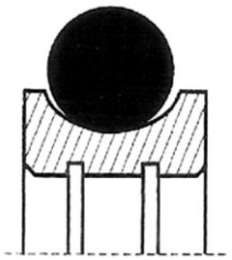
15. RST (Rotary Shaft Oil Seal)

Overview:

Rotary hydraulic transmission is commonly used in modern industry, especially in civil engineering machinery, construction machinery and automotive equipment industry. Based on this, a high-pressure rotary seal was developed.

The high-pressure rotary seal is used for rotating or swinging rods, shafts, rotary joints and other parts. It is a seal that can withstand bi-directional pressure or alternating pressure.

The RST type rotary seal is a piston rod seal mounted on a shaft.



RST

Note:

A high pressure rotary seal consists of a sealing ring of modified PTFE material with one or two annular grooves and a O-ring, where the O-ring acts as an elastic force-applying element to hold the hard ring tightly against the sliding surface.

To ensure that the hydraulic pressure acts on the O-ring, several radial grooves are designed and machined into the side of the sealing ring.

Advantages:

1. Low starting resistance, no crawling phenomenon, ensuring the smoothness of the movement.
2. Small frictional force.
3. Good wear resistance and dimensional stability.
4. Simple groove structure and small size.
5. Reduced friction due to the lubricant chamber on the outer circumference.
6. Wide size range.

Mounting chamfer:

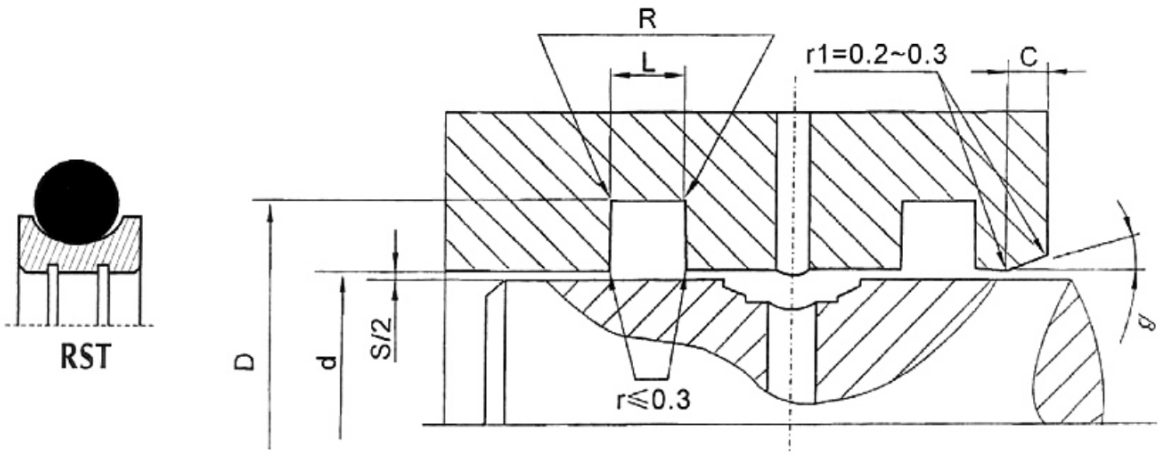
To avoid seal damage during mounting, it is advisable to use the mounting chamfer, with an angle β of 15°-20° and length as follows:

Cross-section code	A	B	C	D	E	F
Chamfer length	2	3	4	5	7	8

Surface finish

Surface finish	Ra	Rz
Sliding surface	0.2 m	1.6 m
Groove bottom	1.6 m	6.3 m
Groove side	1.6 m	6.3 m

RST (Rotary Shaft Oil Seal)



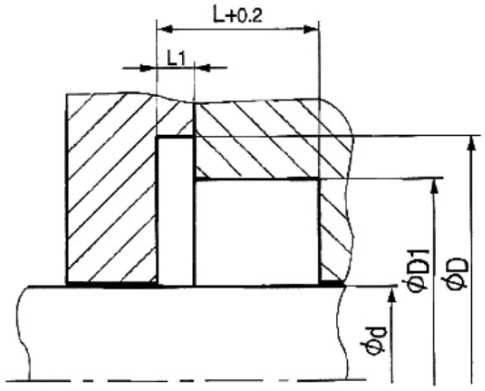
Cross-section code	O-ring wire diameter	Recommended standard piston range D	Width L	Groove diameter D	Radial gap S		Chamfer radius Rmax
					0-10MPa	10-20MPa	
A	1.78	6-18.9	2.20	D+4.90	0.30	0.20	0.4
B	2.62	19-37.9	3.20	D+7.50	0.40	0.30	0.6
C	3.53	38-199.9	4.20	D+11.0	0.50	0.40	1.00
D	5.33	200-255.9	6.30	D+15.5	0.60	0.50	1.30
E	6.99	256-649.9	8.10	D+21.0	0.60	0.50	1.80
F	8.40	650-999.9	9.50	D+28.0	0.70	0.60	2.00

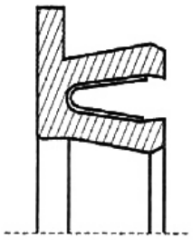
Piston rod diameter	Groove dimensions		Smax		Chamfer
df8	DH9	L+0.2	0-10Mpa	10-20Mpa	Rmax
6.00	10.90	2.20	0.30	0.20	0.40
8.00	12.90	2.20	0.30	0.20	0.40
10.00	14.90	2.20	0.30	0.20	0.40
12.00	16.90	2.20	0.30	0.20	0.40
15.00	19.90	2.20	0.30	0.20	0.40
18.00	22.90	2.20	0.30	0.20	0.40
20.00	27.50	3.20	0.40	0.30	0.60
22.00	29.50	3.20	0.40	0.30	0.60
25.00	32.50	3.20	0.40	0.30	0.60
28.00	35.50	3.20	0.40	0.30	0.60
30.00	37.50	3.20	0.40	0.30	0.60
32.00	39.50	3.20	0.40	0.30	0.60
35.00	42.50	3.20	0.40	0.30	0.60
38.00	49.00	4.20	0.50	0.40	1.00
40.00	51.00	4.20	0.50	0.40	1.00
42.00	53.00	4.20	0.50	0.40	1.00
45.00	56.00	4.20	0.50	0.40	1.00
50.00	61.00	4.20	0.50	0.40	1.00
55.00	66.00	4.20	0.50	0.40	1.00
56.00	67.00	4.20	0.50	0.40	1.00
60.00	71.00	4.20	0.50	0.40	1.00
63.00	74.00	4.20	0.50	0.40	1.00
65.00	76.00	4.20	0.50	0.40	1.00
70.00	81.00	4.20	0.50	0.40	1.00
75.00	86.00	4.20	0.50	0.40	1.00
80.00	91.00	4.20	0.50	0.40	1.00
85.00	96.00	4.20	0.50	0.40	1.00
90.00	101.00	4.20	0.50	0.40	1.00
95.00	106.00	4.20	0.50	0.40	1.00
100.00	111.00	4.20	0.50	0.40	1.00

The above sizes are commonly used specifications, and other specifications are available for order.

Piston rod diameter	Groove dimensions		Smax		Chamfer
df8	D H9	L+0.2	0-10Mpa	10-20Mpa	Rmax
105.00	116.00	4.20	0.50	0.40	1.00
110.00	121.00	4.20	0.50	0.40	1.00
115.00	126.00	4.20	0.50	0.40	1.00
120.00	131.00	4.20	0.50	0.40	1.00
125.00	136.00	4.20	0.50	0.40	1.00
130.00	141.00	4.20	0.50	0.40	1.00
135.00	146.00	4.20	0.50	0.40	1.00
140.00	151.00	4.20	0.50	0.40	1.00
150.00	161.00	4.20	0.50	0.40	1.00
160.00	171.00	4.20	0.50	0.40	1.00
170.00	181.00	4.20	0.50	0.40	1.00
180.00	191.00	4.20	0.50	0.40	1.00
200.00	215.50	6.30	0.60	0.50	1.30
210.00	225.50	6.30	0.60	0.50	1.30
220.00	235.50	6.30	0.60	0.50	1.30
230.00	245.50	6.30	0.60	0.50	1.30
240.00	255.50	6.30	0.60	0.50	1.30
250.00	265.50	6.30	0.60	0.50	1.30
260.00	281.00	8.10	0.60	0.50	1.80
270.00	291.00	8.10	0.60	0.50	1.80
280.00	301.00	8.10	0.60	0.50	1.80
300.00	321.00	8.10	0.60	0.50	1.80
320.00	341.00	8.10	0.60	0.50	1.80
350.00	371.00	8.10	0.60	0.50	1.80
360.00	381.00	8.10	0.60	0.50	1.80
380.00	401.00	8.10	0.60	0.50	1.80
400.00	421.00	8.10	0.60	0.50	1.80
420.00	441.00	8.10	0.60	0.50	1.80
450.00	471.00	8.10	0.60	0.50	1.80
480.00	501.00	8.10	0.60	0.50	1.80
500.00	521.00	8.10	0.60	0.50	1.80

The above sizes are commonly used specifications, and other specifications are available for order.





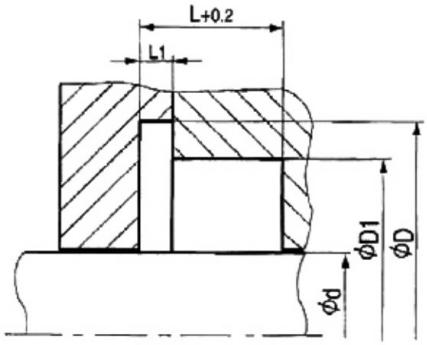
The following dimensions are required for ordering:
OD .....Outside diameter
Od .....Inside diameter
L.....Groove length

Surface finish	Rtmax (μm)	Ra (μm)
Sliding surface matching rubber/PU seals Sliding surface matching PTFE seals	≤2.5 ≤2	≤0.1-0.5 ≤0.05-0.3
Groove bottom Groove side	≤6.3 ≤15	≤1.6 ≤3
Tolerance		
Φ d	f8	
Φ D	H8	

Seal type VR5/7
Main applications:
Suitable for rotary shaft end sealing, mostly used in petroleum and chemical industries
Advantages:
Low friction, corrosion resistant, high temperature resistant, suitable for high speed revolution
Materials:
PTFE, stainless steel spring

Technical Parameters
Temperature: -200℃～+260℃
Speed: 15 m/s
Pressure: 350 bar/35 mpa

Example of sealing groove



The following table lists the standard groove dimensions

Φd	ΦD	ΦD1	L	L1
5-19.9	Φd+9	Φd+5	3.6	0.85
20-39.9	Φd+12.5	Φd+7	4.8	1.35
40-399.9	Φd+17.5	Φd+10.5	7.1	1.8
≥400	Φd+14	Φd+22	9.5	2.8

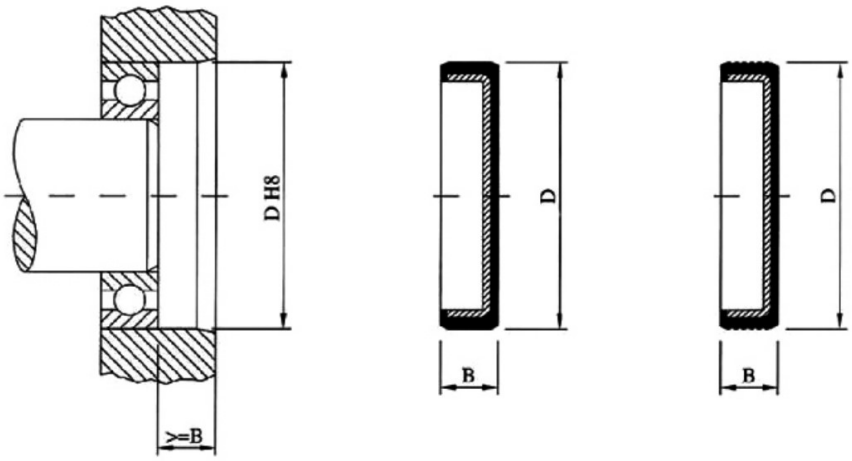
VR5/7 (Rotary Shaft Oil Seal)

dh9	D1H9	L+0.2
5	10	3.6
6	11	3.6
8	13	3.6
10	15	3.6
12	17	3.6
14	19	3.6
15	20	3.6
16	21	3.6
18	23	3.6
20	27	4.8
22	29	4.8
25	32	4.8
28	35	4.8
30	37	4.8
32	39	4.8
36	43	4.8
40	50.5	7.1
42	52.5	7.1
45	55.5	7.1
48	58.5	7.1
50	60.5	7.1
52	62.5	7.1
55	65.5	7.1
56	66.5	7.1
60	70.5	7.1
63	73.5	7.1
65	75.5	7.1
70	80.5	7.1
75	85.5	7.1
80	90.5	7.1
85	95.5	7.1
90	100.5	7.1
95	105.5	7.1

dh9	D1H9	L+0.2
100	110.5	7.1
105	115.5	7.1
110	120.5	7.1
115	125.5	7.1
120	130.5	7.1
125	135.5	7.1
130	140.5	7.1
135	145.5	7.1
140	150.5	7.1
150	160.5	7.1
160	170.5	7.1
170	180.5	7.1
180	190.5	7.1
190	200.5	7.1
200	210.5	7.1
210	220.5	7.1
220	230.5	7.1
230	240.5	7.1
240	250.5	7.1
250	260.5	7.1
280	290.5	7.1
300	310.5	7.1
320	330.5	7.1
350	360.5	7.1
360	370.5	7.1
400	414	9.5
420	434	9.5
450	464	9.5
480	494	9.5
500	514	9.5
600	614	9.5
700	714	9.5

The above sizes are commonly used specifications, and other specifications are available for order.

17. EC&ECW (End Cover Seal)



type	D	B
EC	12	5
EC	12.78	2.54
EC	13	4.5
ECW	19	6
EC	19	7
EC	22	4
EC	22	5
EC	22	7
EC	24	7
EC	25	5
EC	25	7
EC	25.35	6.4
EC	26	6.5
EC	28	4
EC	28	7
EC	30	4
EC	30	5
EC	30	6
EC	30	8
EC	31.75	4.8
EC	32	5
EC	32	7
EC	32	8
EC	32	9.5
EC	34	8
EC	34	18
EC	35	3.5
EC	35	5
EC	35	6.5
EC	35	7

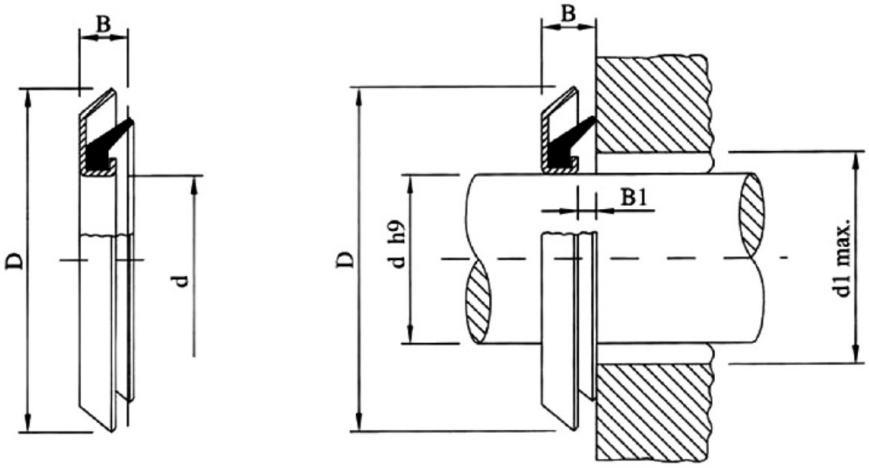
type	D	B
ECW	35	8
EC	35	8
EC	37	5
EC	37	7
EC	37	10
EC	38	10
ECW	38.05	7.9
EC	38.1	4.8
EC	38.1	6.4
EC	39.69	6.4
EC	40	2.5
EC	40	5
EC	40	7
EC	40	7
EC	40	8
ECW	41.23	7.9
EC	42	7
EC	42	8
EC	42	9.5
EC	45.29	6.4
EC	45.97	6.4
EC	47	5
EC	47	6.5
EC	47	7
EC	47	8
EC	47	8
ECW	47	8.5
EC	47	10
EC	47.02	4.7
EC	47.02	6.4

EC&ECW (End Cover Seal)

type	D	B
EC	50	7
EC	50	9
EC	50	16
ECW	50.34	7.9
EC	50.8	6.4
EC	50.8	7.9
EC	52	6
EC	52	7
EC	52	8
ECW	52	9
EC	52	10
EC	52	10
EC	55	7
EC	55	10
EC	58.74	7.9
EC	58.75	7.9
EC	60	7
EC	60	16
ECW	60.27	7.9
EC	62	4.3
EC	62	6.4
EC	62	7
EC	62	8
ECW	62	8
ECW	62	8.9
EC	62	9.5
EC	63.5	7.9
EC	63.55	6.4
EC	65	8
EC	65	10
EC	66.62	7.9
EC	68	8
EC	70	7.9
EC	70	10
EC	70	16
ECW	72	8.5
EC	72	9
EC	72	9
ECW	72	9.8
EC	72	10
EC	75	7
EC	80	10
EC	80	12
EC	80	16
EC	82.65	6.4

type	D	B
EC	85	10
ECW	85	10.7
EC	85	12
EC	85	20
EC	87	12
EC	88.9	9.5
EC	90	7
EC	90	10
ECW	90	11.5
EC	90	12
ECW	95	10
EC	100	10
ECW	100	11.3
EC	100	12
EC	100	25
EC	100	31
EC	110	10
EC	110	12
EC	110	21
EC	120	12
EC	120	27
EC	120	33
EC	125	12
EC	130	12
EC	130	27
EC	140	15
EC	140	37
EC	145	15
EC	150	15
EC	150	27
EC	160	15
EC	170	15
EC	170	43
EC	180	12
EC	180	30
EC	190	12
EC	210	27
EC	225	14
EC	240	15
EC	260	15

18. RE&RE1 (End Cover Seal)

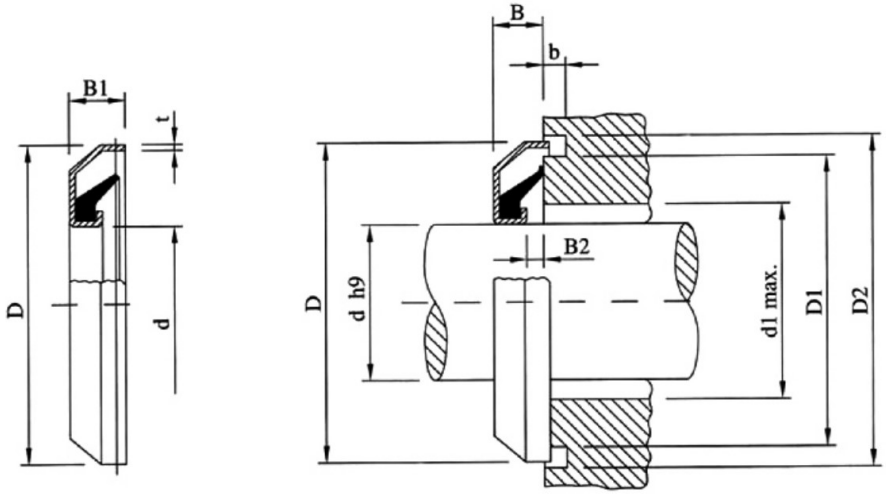


RE

d	D	B	B1	d1
10	24	3.5	1	15
11	26	3.5	1	17
12	26	3.5	1	17
14	30	4	1	21
15	30	4	1	21
16	32	4	1	23
17	32	4	1	23
18	33	4	1	24
20	35	4	1	26
22	40	4	1	31
24	40	4	1	31
25	40	4	1	31
25.4	45	4	1	31
26	40	4	1	31
28	43	4	1	34
30	47	4.5	1	37
32	49	4.5	1	39
35	52	4.5	1	42
38	55	4.5	1	45
40	57	4.5	1	47
41	57	4.5	1	48
42	59	4.5	1	49
45	62	4.5	1	52
48	65	4.5	1	55
50	70	5.5	1	58
52	72	5.5	1	60

d	D	B	B1	d1
54	76	5.5	1	62
55	75	5.5	1	63
58	78	5.5	1	66
60	80	5.5	1	68
62	82	5.5	1	70
65	85	5.5	1	73
68	88	5.5	1	76
70	90	5.5	1	78
72	92	5.5	1	80
75	95	5.5	1	83
75	96	5.5	1	83
78	98	5.5	1	86
80	100	5.5	1	88
85	105	5.5	1	93
90	110	5.5	1	98
95	115	5.5	1	103
100	120	5.5	1	108
105	125	5.5	1	113
135	159	6.5	1	145
225	250	7.5	1	235

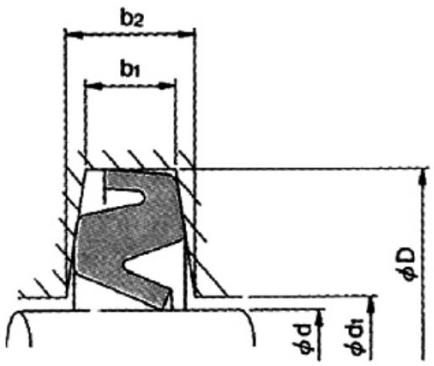
RE&RE1 (End Cover Seal)



RE1

d	D	B	B1	B2	d	d1	D1	D2	t
15	32	4	6	1	3	21	29	34	0.5
17	34	4	6	1	3	23	31	36	0.5
20	37	4	6	1	3	26	34	39	0.5
25	42	4	6	1	3	31	39	44	0.5
26	43	4	6	1	3	32	40	45	0.5
30	48	4.5	6.5	1	3	37	45	50	0.5
32	53	4.5	6.5	1	3	39	50	55	0.5
33.34	53.1	4.5	6.5	1	3	40.3	50	55	0.5
35	53	4.5	6.5	1	3	42	50	55	0.5
40	58	4.5	6.5	1	3	47	55	60	0.5
41.28	57.9	4.5	6.5	1	3	48.3	55	60	0.5
44.45	63	4.5	6.5	1	3	51.5	60	65	0.5
44.45	74	4.5	6.5	1	3	51.5	71.2	76.2	0.5
45	63	4.5	6.5	1	3	52	60	65	0.5
50	72	5.5	7.5	1	3	58	68.5	74	0.75
55	77	5.5	7.5	1	3	63	73.5	79	0.75
60	82	5.5	7.5	1	3	68	78.5	84	0.75
65	87	5.5	7.5	1	3	73	83.5	89	0.75
70	92	5.5	7.5	1	3	78	88.5	94	0.75
75	97	5.5	7.5	1	3	83	93.5	99	0.75
80	102	5.5	7.5	1	3	88	98.5	104	0.75
85	107	5.5	7.5	1	3	93	103.5	109	0.75
90	112	5.5	7.5	1	3	98	108.5	114	0.75
95	117	5.5	7.5	1	3	103	113.5	119	0.75
100	122	5.5	7.5	1	3	108	118.5	124	0.75
110	132.08	5.5	7.5	1	3	118	128.5	134	0.75

ZF type

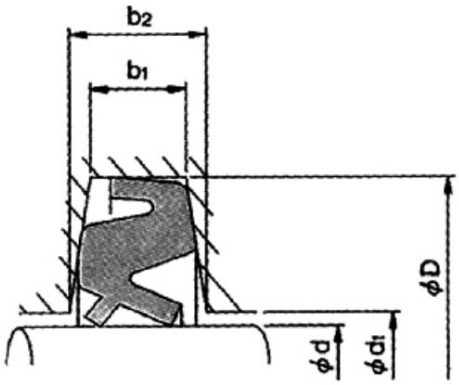


NBR

Shaft diameter d	Groove dimensions			
	D	d2	b1	b2
10	21	11	3	4.2
12	23	13	3	4.2
15	26	16	3	4.2
17	28	18	3	4.2
19.05	31	20	3	4.4
20	31	21.5	3	4.2
25	38	26.5	4	5.4
28.58	43	29.6	4	5.6
30	43	31.5	4	5.4
30.16	43	31.2	4	5.4
31.75	48	32.8	4	5.9
34.92	48	35.9	4	5.5
35	48	36.5	4	5.4
38.1	53	39.1	4	5.7
40	53	41.5	4	5.4
44.45	58	45.5	4	5.5
45	58	46.5	4	5.4
49.21	67	50.2	5	7.1
50	67	51.5	5	6.9
50.8	67	51.8	5	6.9
55	72	56.5	5	6.9
57.15	77	58.7	5	7.2
60	77	62	5	6.8
60.32	77	61.8	5	6.9
63.5	82	65	5	7.1
65	82	67	5	6.8
69.85	89	71.4	6	8.2
70	89	72	6	8.1
74.61	94	76.1	6	8.2
75	94	77	6	8.1
79.38	99	80.9	6	8.2
80	99	82	6	8.1
85	104	87	6	8.1

Shaft diameter d	Groove dimensions			
	D	d2	b1	b2
88.9	111	90.9	7	9.5
90	111	92	7	9.3
95	116	97	7	9.3
95.25	116	97.2	7	9.3
100	125	102	8	10.8
100.01	125	102	8	10.8
105	130	107	8	10.8
110	135	113	8	10.7
114.3	140	116.3	8	10.9
115	140	118	8	10.7
120	149	123	9	12.2
125	154	128	9	12.2
125.41	154	127.4	9	12.3
130	159	133	9	12.2
135	164	138	9	12.2
139.7	173	141.7	10	13.8
140	173	143	10	13.7
150	183	153	10	13.7
160	193	163	10	13.7
170	203	173	10	13.7
180	213	183	10	13.7
190	223	193	10	13.7
200	240	203	11	15.5
210	250	213	11	15.5
220	260	223	11	15.5
240	286	243	12	17.3
250	296	253	12	17.3
260	306	263	12	17.3
280	332	283	13	19
300	352	303	13	19
320	372	323	14	20
380	432	383	14	20

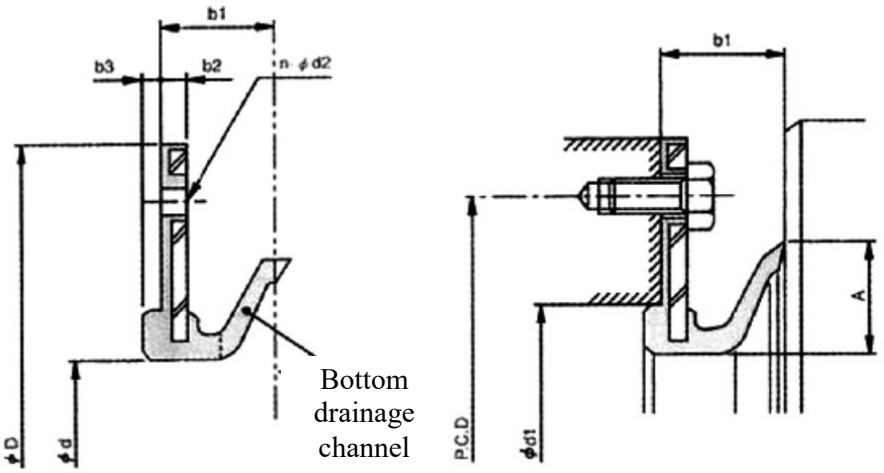
ZT type



NBR

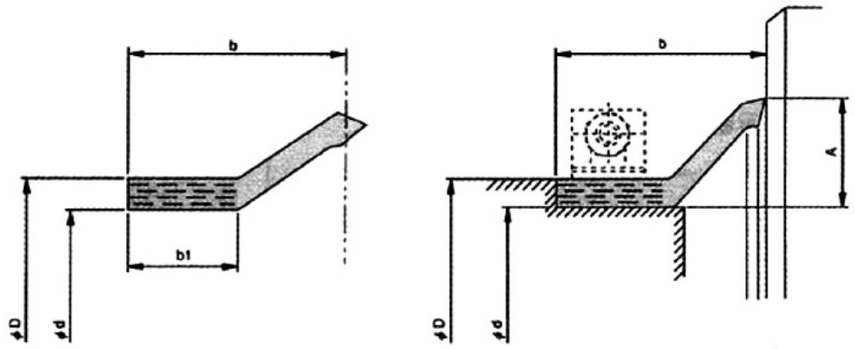
Shaft diameter d	Groove dimensions			
	D	d2	b1	b2
15	26	16	3	4.2
20	31	21.5	3	4.2
25	38	26.5	4	5.4
30	43	31.5	4	5.4
35	48	36.5	4	5.4
40	53	41.5	4	5.4
45	58	46.5	4	5.4
50	67	51.5	5	6.9
55	72	56,5	5	6.9
60	77	62	5	6.8
65	82	67	5	6.8
70	89	72	6	8.1
75	94	77	6	8.1
80	99	82	6	8.1
85	104	87	6	8.1
90	111	92	7	9.3
95	116	97	7	9.3
100	125	102	8	10.8
105	130	107	8	10.8
110	135	113	8	10.7
115	140	118	8	10.7

Shaft diameter d	Groove dimensions			
	D	d2	bi	b2
20	149	123	9	12.2
125	154	128	9	12.2
130	159	133	9	12.2
135	164	138	9	12.2
140	173	143	10	13.7
150	183	153	10	13.7
160	193	163	10	13.7
170	203	173	10	13.7
180	213	183	10	13.7
190	223	193	10	13.7
200	240	203	11	15.5
220	260	223	11	15.5
240	286	243	12	17.3



NBR

Size						
Shaft diameter d	Outside Diameter D	Width			n (places)	d2
		d2	b1	b3		
190	244	19	5	0	8	8
227	280	35	5	0	8	9
320	380	30	8	0	6	9.5
325	385	30	8	0	6	9.5
330	400	35	5	0	8	9.5
340	435	30	5	0	8	9
350	414	35	5	0	8	10
380	455	35	8	0	8	12
420	480	26	5	0	8	10
430	490	26	8	0	12	10
435	489	25.4	5	0	8	10
440	510	26	8	0	12	9
440	514	35	5	0	8	12
440	530	50	10	0	8	14
458	540	26	8	0	12	11.5
580	650	51	10	0	12	12
650	760	45	12	0	12	12
680	778	45	12	0	12	14
705	830	76.2	11	0	8	18
710	810	46	10	0	8	14
740	840	56.2	10	0	16	18
760	842	35	8	0	12	11
760	898	40	10	0	10	12
870	975	40	10	0	12	15
932	1042	24	5	3	6	12
962	1035	46.8	6	3	24	12
1000	1108	38	10	0	12	14
1052	1134	37	9	5	24	12
1120	1230	25	5	5	16	10
1148	1240	40	5	5	22	14
1310	1400	50	9	5	24	14
1704	1795	62	12	5	18	11



NBR

Size				
Inside Diameter d	Outside Diameter D	Width b1	Width b2	A
400	416	35	21	26
440	456	35	21	26
450	466	35	21	26
450	466	40	26	24
460	476	40	26	24
520	536	35	21	26
535	551	35	21	26
545	561	35	21	26
546	562	35	21	26
550	566	35	21	26
590	606	50	36	24
595	611	35	21	26
600	616	40	26	24
605	621	35	21	26
625	641	35	21	26
655	671	40	26	24
700	716	45	31	24
715	731	40	26	24
720	736	35	21	26
770	786	50	36	24
780	796	45	31	24
790	806	70	56	24

Size				
Inside Diameter d	Outside Diameter D	Width b1	Width b2	A
800	816	40	26	24
835	856	75	40	40
850	866	45	31	24
875	891	40	26	24
900	916	50	36	24
940	956	50	36	24
962	978	35	21	26
990	1006	40	26	24
1020	1036	40	26	24
1030	1046	35	21	26
1060	1076	40	26	24
1070	1086	50	26	24
1090	1106	45	31	24
1100	1116	45	31	24
1120	1136	45	31	24
1145	1161	55	41	24
1165	1181	50	36	24
1180	1196	50	36	24
1210	1226	50	36	24
1294	1315	75	40	40
1524	1545	75	40	40