Standard Rotary Seals

Type A

- Additional inner case to reinforce structural rigidity.
- Suitable for larger diameters and installation from behind.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s


SA


TA


VA


KA

Type B

- Outer metal case provides a firm and accurate seat in the housing, but the static sealing on OD is partially limited.
- Suitable for steel or case iron housing materials.
- The temperature range is depending on the material.

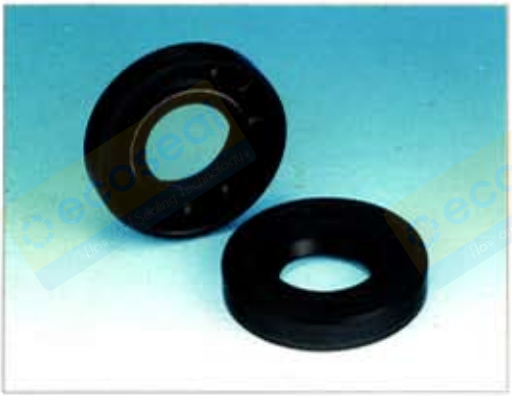
O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s


SB


TB


VB


KB



Type C

- Rubber covered OD to increase the OD sealing capability.
- Suitable for soft alloy, plastic, steel or cast iron housing materials.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s


SC


TC


VC


KC

Type D

- Special design of two spring-loaded lips in opposite directions
- Designed for applications in which sealing two fluids is required.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -790 mm	-55°C -225°C	≤ 0.3bar	≤ 10m/s


DA


DB


DC


DM

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Standard Rotary Seals

Type F

- Special design of an additional inner rubber lining for better protection of the inner case.
- Rubber covered OD for improving the sealing on OD.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

SF TF VF KF

Type G

- Special design of a corrugated OD
- Particularly suitable for applications where the housing material is subject to large thermal expansion or press fitting.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

SG TG VG KG

Type L

- Special design of metal OD with leading edge to assist in the alignment during installation and replacement
- Refined metal case adds additional structural rigidity
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

SL TL VL KL

Type M

- Refined metal OD with a lead-in chamfer.
- Designed with an additional inner rubber lining particularly fit for protecting the case from erosive fluid.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

SM TM VM KM

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

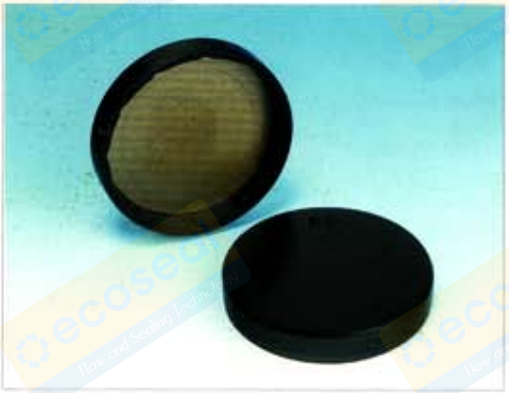
Standard Rotary Seals

Type Z

- Similar to Type M but the inner rubber lining covers the leading edge of the metal OD for improved sealing capability.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

SZ TZ VZ KZ



Type EC/EG Gear Box End Cap Seal

- Designed for static applications to act as a plug or barrier.
- With rubber OD or corrugated rubber OD.
- Common applications include sealing in the gearbox as an end cap.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar	-

EC EG EC1 EC2

Type G1

- Special design of a corrugated rubber OD with a lip profile suitable for applications with limited radial space.
- High-deflection sealing lip to ensure better sealing.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-40°C -200°C	-	≤ 10m/s

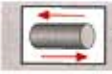
VG1 KG1

Type N11 Pressure Resistant Seal

- Special design of the short flex section provides better pressure resistance.
- Special material and structural designs for different levels of high-pressure applications.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-40°C -200°C	≤ 10bar	≤ 5 m/s

TCN11 SCN11 SFN11 SMN11

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Standard Rotary Seals

Type 2/6/9

- Special design of multiple dust lips to provide better protection against heavy contamination.
- Type 2-Used when a secondary dust lip is needed.
- Type 6-Used for added dust or fine contaminate protection.
- Type 9-Special design combining the functions of radial shaft seal and axial face seal to provide sealing for shaft as well as sealing against a perpendicular counter surface.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3 bar	≤ 8 m/s

TB2 TC2 TC6 TC9

Type Q

- Rubber OD with split design.
- For use where radial space is limited and can be supplied with a split for ease of installation.
- Extra spring within SQS and SQS1 reinforces fastening.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-40°C -200°C	-	≤ 8 m/s

SQ SQ1 SQS SQS1

Type ECA Oil Gauge Seal

- Used for oil gauge seal.

O.D. Range	Temperature Range	Pressure Range	Velocity
16-40 mm	-40°C -100°C	-	-

ECA1 ECA2 ECA3 ECA4

Type PA Teflon Seal

- Designed with PTFE (Teflon) bonded sealing lip and hydrodynamic aid
- Excellent chemical resistance and temperature capability, and low friction.
- Suitable for high-speed applications, and when the reductions of under lip running temperature are required.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -300 mm	-50°C -250°C	≤ 3bar	≤ 30 m/s

PA1 PA2 PA4 PA6

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Standard Rotary Seals

Type PL Teflon Seal

- Designed with a PTFE (Teflon) bonded sealing lip
- Excellent chemical resistance and temperature capability, and low friction.
- Suitable for high-speed applications, and when the reductions of under lip running temperature are required.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -250 mm	-40°C -200°C	≤ 0.3bar	≤ 30 m/s

TA-PL TB-PL TC-PL TM-PL

Type TCA Washing Maching Seal

- Special design for the washing machine to seal water and washing powder.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -200 mm	-30°C -100°C	-	≤ 5 m/s

TCA3 TCA5

Type TH

- For heavy-duty dirt exclusion, and O.D. sealing ability in the housing is required.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-40°C -100°C	≤ 0.5bar	≤ 5 m/s

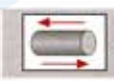
TBH TCH

Type VA

- Special design to seal inner grease and prevent the ingress of the dust or dirt.
- Assembled after rubber and case are molded.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-40°C -150°C	-	≤ 5 m/s

VA1 VA2 VA4 VA6

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type H

- Special design of reversed metal OD direction, suitable for special installation.
- Allows installation from both sides.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

Type J

- Special design of flanged OD allows easy installation and replacement
- Refined metal case adds additional structural rigidity and restricts the installation depth into the housing.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

Type X

- Special design of a reversed secondary lip for dust exclusion.
- The cavity will allow pre-lubrication of the seal to combat initial dry running or where space is limited
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-55°C -225°C	≤ 0.3bar(w/spring)	≤ 10m/s

Type BC/BG

- Special design of half-covered rubber OD with both the benefits of Type B, Type C, or Type G
- This design provides the benefits of a mental-to-metal press fit and the rubber OD sealing capability to counter rough or worn housings
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
20 -500 mm	-55°C -225°C	≤ 0.3bar	≤ 10m/s

SYMBOL: =Rotary =Reciprocating =Oscillating =Helix =Static

Automotive Seals

Type O

- External lip seal with the same design characteristics as standard radial lip seal.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-40°C -200°C	≤ 0.3bar	≤ 10 m/s

OTA

OTB

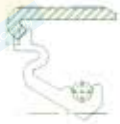
OTC

OTM

Type RO

- Special design of flexible lip with higher deflection

O.D. Range	Temperature Range	Pressure Range	Velocity
20 -790 mm	-30°C -200°C	-	≤ 5 m/s



SBRO

SLRO

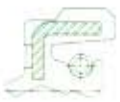
TCRO

TC2RO

Type 4 Shock Absorber Seal

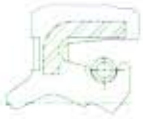
- Special design for motorcycle and bicycle shock absorbers.
- Semicircle design of the secondary lip to reduce friction and prevent lip distortion to facilitate the reciprocating movements.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-30°C -100°C	≤ 6.5 bar(w/spring)	≤ 1.5 m/s



TC4Y

TG4JY

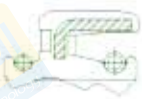


TC4

Type 4/AS Shock Absorber Seal

- Special design for shock absorbers.
- Semicircle design of the secondary lip to reduce friction and prevent lip distortion to facilitate the reciprocating movements.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -200 mm	-30°C -100°C	≤ 6.5 bar	≤ 1.5 m/s



DC4

DC4S

TC4S

AS1

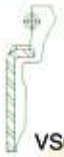
SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type VS Valve Stem Seal

- Metal OD with resin lip and rubber lip to offer greater friction resistance.
- Maintains an appropriate and stable oil leak volume over long periods of operation to ensure the proper functioning of the valve stem.

O.D. Range	Temperature Range	Pressure Range	Velocity
7 -30 mm	-25°C -200°C	-	≤ 8 m/s


VSB2


VSC2


VSG4


VSC5

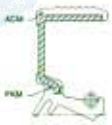
Type BI Engine Seal

- Special design of two different rubber compounds for OD and lip.
- With a focus on the sealing lip to provide better material to lower the seal cost.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-25°C -200°C	≤ 0.3 bar	≤ 10 m/s


TC-BI


TG-BI


TG2-BI


TGK1-BI

Type CNB Power Steering Seal

- Special design for sealing in the power steering system of the vehicle.
- Excellent sealing capability for highly pressurized hydraulic fluids of power steering oil and driving in low friction.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -100 mm	-30°C -150°C	≤ 100 bar	≤ 0.075 m/s


CNB


CNB1


CNB2


CNBW11

Type 4P Power Steering Seal

- Special design for sealing in the power steering system of the vehicle.
- Excellent sealing capability for highly pressurized hydraulic fluids of power steering oil.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -300 mm	-30°C -150°C	≤ 25 bar	≤ 0.28 m/s


TG4P


TC4P


SG4P


SGAP

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Automotive Seals

Type C.V.Joint Boot

- Technical components for protecting the transmission system from external contaminants to ensure proper lubrication that is essential to the delicate mechanism of both the wheel and the gearbox C.V. Joints

O.D. Range	Temperature Range	Pressure Range	Velocity
20 -200 mm	-40°C -100°C	-	-

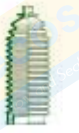
BOOT

Type Bellow

- Installed on the steering system to protect the parts of the steering rack against external contaminants to maintain proper lubrication of the gears that are key components of the steering rack.

O.D. Range	Temperature Range	Pressure Range	Velocity
20 -200 mm	-40°C -100°C	-	-

BELLOW



BELLOW 1

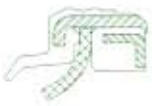
BELLOW 2

BELLOW 3

Type VGA Air Compressor Seal

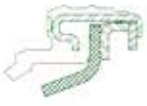
- Design for air compressor.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -300 mm	-30°C -100°C	≤ 5 bar	≤ 30 m/s



VGA1

VGA2



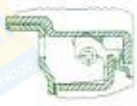
VGA3

VGA4

Type ST Hub Seal

- Composite seal with special design
- Labyrinth dust lip design reduces heat generation and prevents mud penetration.
- Special design of hydrodynamic aid increases pumping rate and reduces temperature raise and rubber wear.

O.D. Range	Temperature Range	Pressure Range	Velocity
30 -300 mm	-30°C -200°C	≤ 0.15 bar	≤ 20 m/s



ST5

ST7

ST15

ST34

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Agriculture & Construction Seals

Type U

- Special triple flat lip design suitable for use in heavy dirt applications.
- Commonly used in agricultural equipment in which external contaminants are many.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
15 -300 mm	-40°C -200°C	-	≤ 3.5 m/s


UA


UB


UC


UM

Type AP Agricultural Seal

- Special design for heavy dirt exclusion.
- With a press fit on the shaft and also in the housing it is easy to install and replace without damage to the shaft or the housing.
- Variations as well as custom designs are available for different equipment and applications.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
30-300 mm	-40°C -200°C	≤ 0.3bar	≤ 3.5 m/s


AP1


AP2


AP3

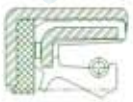

AP4

Type CRS

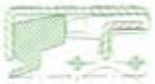
- Special design with PU and felt composed which can increase the dust-proof capability.

O.D. Range	Temperature Range	Pressure Range	Velocity
15-250 mm	-40°C -150°C	≤ 0.3bar	≤ 10 m/s


CRS2


CRS10


CRS11


CRS13

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type UNP2

- Seal designed with symmetric lips can be used for pistion and rod application

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -250 mm	-40°C -100°C	≤ 400 bar	≤ 1 m/s

UNP2

Type for Both Rod & Piston Seal

- Seal designed with symmetric lips can be used for piston and rod application.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -250 mm	-40°C -100°C	≤ 300 bar	≤ 1 m/s

UNP

UNP1

CNP

UP1

Type for Both Rod & Piston Seal

- A loaded U-packing with a fitted O-ring, and the O-ring provides extreme loads for effective sealing at low or zero pressure.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -250 mm	-40°C -100°C	≤ 350 bar	≤ 0.5 m/s

HB

HD

HS

Type for Both Rod & Piston Seal

- A loaded U-packing with a fitted X-ring, and the X-Ring under the U-packing provides positive wiping for effective sealing at low or zero pressure.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -250 mm	-40°C -100°C	≤ 350 bar	≤ 0.5 m/s

HBX

HDX

HSX

SYMBOL: =Rotary =Reciprocating =Oscillating =Helix =Static

Type Rod Seal

■ Seal designed with asymmetric lips. Usually used for rod hydraulic application.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -250 mm	-40°C -100°C	≤ 400 bar	≤ 0.5 m/s

UIP

UIP2

CIP

LIP

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type Piston Seal

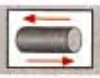
■ Seal designed with asymmetric lips. Usually used for rod hydraulic application.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -250 mm	-40°C -100°C	≤ 400 bar	≤ 0.5 m/s

UOP

COP

LOP

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type Wiper Seal

■ Popular dust seals. Used for heavy duty application.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 - 250 mm	-40°C -100°C	-	≤ 1 m/s

WP1 WP2 WP8 WP10

Type Wiper Seal

■ Popular dust seals. Add the steel case clad. Used for heavy duty application.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 - 265 mm	-40°C -100°C	-	≤ 1 m/s

WP3 WP4 WP5 WP6

Type Wiper Seal

■ Popular dust seals. Add the steel case skeleton. Used for heavy duty application.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 - 265 mm	-40°C -100°C	-	≤ 1 m/s

WP7 WP9 WP11 WP16

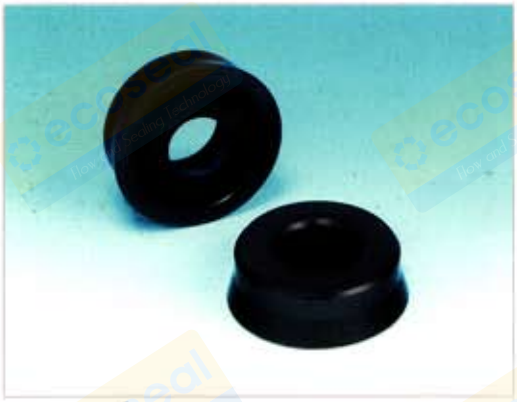
Type Wiper Seal

■ Used for heavy duty application.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 - 250 mm	-40°C -100°C	-	≤ 1 m/s

WP21 WP22

SYMBOL: =Rotary =Reciprocating =Oscillating =Helix =Static



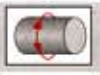
Type for Both Rod & Piston Seal

- Seal designed with symmetric lips can be used for piston and rod application.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -790 mm	-55°C -225°C	≤ 100 bar	≤ 0.5 m/s

UNR

CNR

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type PV Gas Spring Seal

- Special design for the gas spring to prevent the leakage of the gas.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -100 mm	-30°C -100°C	≤ 160 bar	≤ 0.05 m/s

PVC1

PVG2

PVG3

Type UIR

- Seal designed with asymmetric lips. Usually used for rod hydraulic application.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -790 mm	-55°C -225°C	≤ 150 bar	≤ 0.5 m/s

UIR

Type CIR

- Seal designed with asymmetric lips. The lip seal may easily be snapped into the grooves. The seal should be taken carefully and not be pulled over sharp edges.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -300 mm	-55°C -225°C	≤ 100 bar	≤ 0.5 m/s

CIR

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type Piston Seal

- Seal designed with a case body, spring and rubber lip.
- Seals feature is stable for high pressure and slower speed.

O.D. Range	Temperature Range	Pressure Range	Velocity
20 -790 mm	-30°C -100°C	≤ 60 bar	≤ 0.5 m/s


PDC


PDH


PSC

Type COR

- Seal designed with asymmetric lips. The lip seal may easily be snapped into the grooves. The seal should be taken carefully and not be pulled over sharp edges.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -790 mm	-55°C -225°C	≤ 100 bar	≤ 0.5 m/s


COR

Type LOR

- Flange packings are single-acting non-symmetrical lip-type piston seals designed to retrofit the older well known leather packings.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -790 mm	-55°C -225°C	≤ 40 bar	≤ 0.5 m/s


LOR

Type PP

- Seal designed with the asymmetric lips. Usually used for piston application.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
8 -790 mm	-55°C -225°C	≤150 bar	≤ 0.5 m/s


PP

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type Piston Seal

- Seal designed with a case body and rubber lips.
- Usually used for larger pressure condition than standard seal.

O.D. Range	Temperature Range	Pressure Range	Velocity
20 -790 mm	-30°C -200°C	≤12 bar	≤ 1 m/s

PDV

PDV1

Type Piston Seal

- Seal designed with a case body and rubber lip.
- Usually used for larger pressure condition than standard seal.

O.D. Range	Temperature Range	Pressure Range	Velocity
20 -790 mm	-30°C -100°C	≤12 bar	≤ 1 m/s

PSV

PSV1

PSV2

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type Wiper Seal

- Popular dust seals with the steel case clad added.
- Used for heavy-duty applications.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-30°C -200°C	-	≤ 1 m/s

WPB WPK WPM WPV

Type Wiper Seal

- Popular dust seals with the steel case clad added.
- Used for heavy-duty applications.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-30°C -200°C	-	≤ 1 m/s

WPC WPR WP13

Type Wiper Seal

- Popular dust seals.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-30°C -200°C	-	≤ 1 m/s

WP12 WP14 WP15 WP17

Type Wiper Seal

- Popular dust seals.

O.D. Range	Temperature Range	Pressure Range	Velocity
10 -790 mm	-30°C -200°C	-	≤ 1 m/s

WP19 WP24

SYMBOL: =Rotary =Reciprocating =Oscillating =Helix =Static

Type V-SEAL

- V Seals are mounted on the shaft, rotates with the shaft, and seal against a perpendicular counter surface.
- They protect bearings and radial seals in dirty and demanding applications.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
5.5 -790 mm	-40°C -200°C	-	≤ 10 m/s

VA

VS

VL

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Axial Face Seals

Type RE Axial Face Seal

- Axial Face Seals are mounted on the shaft, rotates with the shaft, and seal against a perpendicular counter face
- Metal case added on a rubber V-ring to increase rigidity and enhance protection against dust.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
24-250 mm	-40°C -200°C	-	≤ 10 m/s

RE

RE1

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Type WS/KDS Bonded Seal

- The bonded seal is a static seal used as a sealing ring fitted under the bolt head and nut.
- We offer standard as well as the self-centering type with complete thread sizes.
- The temperature range is depending on the material.

O.D. Range	Temperature Range	Pressure Range	Velocity
150 mm	-40°C -200°C	-	-

WS

WS1

KDS

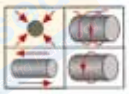
KDS1

SYMBOL:  =Rotary  =Reciprocating  =Oscillating  =Helix  =Static

Ring

Type Ring

- O-ring, X-ring, Square ring, D-ring, H-ring, V-ring, Backup Ring Custom shapes and sizes.
- Complete AS568, JIS B2401 P/G/S O-rings
- Made of high-performance rubber compounds with excellent capabilities.
- The temperature range is depending on the material.

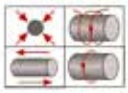


O.D. Range	Temperature Range	Pressure Range	Velocity
0.74 -800 mm	-55°C -225°C	≤ 400bar	-

O-RING X-RING □-RING H-RING

Type O-Ring Kit

- AS568, JIS, Metric as well as Inch kits available.
- Standard 70 Shore A hardness as well as customer specified durometer O-rings available.
- The temperature range is depending on the material.



O.D. Range	Temperature Range	Pressure Range	Velocity
6.46 -57.46 mm	-55°C -225°C	-	-

SYMBOL: =Rotary =Reciprocating =Oscillating =Helix =Static

Rubber Molded Parts & Cap

Type DSP Medical Seal

- A black thermoplastic medical grade elastomer with good fluid resistance certified non-toxic of compliance for biocompatibility. Drug Master has been established at US FDA National Center for drugs and biologics
- Application: medical disposable syringes.

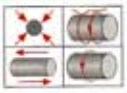
O.D. Range	Temperature Range	Pressure Range	Velocity
4.9 -50 mm	-60°C -125°C	-	≤ 0.05m/s

DSP

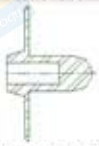
DSP 1

Type Rubber Parts

- Made of high-performance rubber compounds with excellent capabilities.
- Molded specifically to the customer requirements or applicational criteria.
- The temperature range is depending on the material.

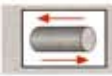


O.D. Range	Temperature Range	Pressure Range	Velocity
800 mm	-55°C -225°C	-	-



RUBBER PART

GASKET

SYMBOL:	 =Rotary	 =Reciprocating	 =Oscillating	 =Helix	 =Static

1. Rubber Material Symbol

<Table 1> ASTM rubber classification that used by NAK

Symbol	Abbreviation	Name	ASTM Classification
A	TPV	Thermoplastic vulcanized	
B	SBR	Styrene Butadiene Rubber	AA, BA
C	CR	Chloroprene Rubber	BC, BE
E	EPDM	Ethylene Propylene Diene Rubber	BA, CA, DA
F	FVMQ	Fluorinated Silicone Rubber	FK
G	CSM	Chlorosulfonated Polyethylene	CE
H	HNBR	Hydrogenated NBR Rubber	DH
J	TPEE	Thermoplastic Polyether/Polyester	
M	AEM	Ethylene/Acrylic Rubber	EE, EF, EG
N	NBR	Acrylonitrile Butadiene Rubber	BF, BG, BK, CH
P	ACM	Polyacrylate Rubber	DF, DH
R	NR	Natural Rubber	AA
S	VMQ	Silicone Rubber	FC, FE, GE
T	PTFE	Polytetrafluoro Ethylene	
U	TPU	Thermoplastic Polyurethane	BG
V	FKM	Fluorocarbon Rubber	HK
X	XNBR	Carboxylated NBR	BF, BG, CH
Z		Other	

2.Rubber Types and General Property

<Table 2>Rubber types and their properties

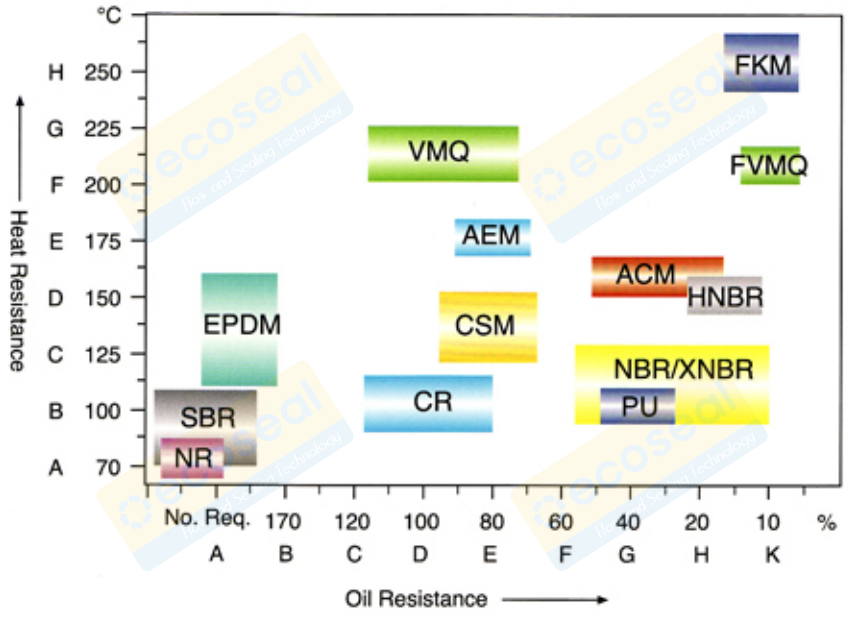
Item / Type	Temp. Range(°C) Hign Temp.	Low Temp.	Property	
TPV	125	-60	Good heat, chemical, slip, low temperature and weather resistance. Poor compression set and abrasion resistance.	
SBR	100	-40	Could mix with NR and other synthetic rubber. Poor mechanical property and low cureing speed, low elasticity, high heat build-up.	
CR	100	-40	Good resistance to moderate acid, alkali, salt solutions, commercial oils and fuels. Poor property in chromic and nitric acids, aromatics and chlorinatedhy drocarbons.	
EPDM	150	-55	Stable in polar fluids(alcohol, ketone and glycol), and hydrochloric acid. Due to the low specific gravity, it can compound to high filler content.	
FVMQ	225	-60	Excellent high and low temperature, petroleum oils hydrocarbon fuels and compression set. Application to o-ring, rubber seal, medical devices and food environment.	
CSM	135	-25	Good ozone and weather, heat, chemicals, electrical, low flammability. Mainly application to outer diameter of oil seal sealing.	
AEM	150	-25	Compsosed of a terpolymer of ethylene, methyl acrylate, and an acid-containing monomer as a cure site. It exhibits properties similar to those of Polyacrylate, but with extended low temperature range and with enhanced mechanical properties. Good oil, ozone and weather resistance.	
HNBR			HNBR is made from NBR by hydrogenation; it has high temperature resistance, abrasion resistance and good physical properties.	
	125	-40	Sulfur Cure	Better heat resistance and oil resistance than NBR (if containing heavy metal salt, rubber color will be affected).
	150	-40	Peroxide Cure	The Peroxide cured HNBR suits more widely temperature range, better antioxidant and would not affect color.
TPEE	140	-60	Good heat, oil, slip, electrical and low temperature resistance. Poor compression set resistance and cost expensive.	
NBR			Good resistance to alcohol, amines, petroleum oils, and gasoline's over a wide range of temperature. Also good resistance to caustic salts and fair acid. Poor in strong oxidizing agents, chlorinated hydrocarbons, ketones, and esters.	
	100	-55	Low ACN	Increase low temperature resistance and elastic property. Used in where low temperature property is more important than oil resistance property.
	100	-40	Mid ACN	The property is between low and high ACN content. Used in low aromatic content or in where a little swell is acceptable.
	100	-25	High ACN	Increase oil resistance, heat resistance, tensile strength, Hardness, abrasion resistance is improved, also increase gas impermeability; usually used in where high oil resistance is required, such as oil well, fuel battery cap, fuel hose, and other place where aromatic fuel, oil and solvent.

2.Rubber Types and General Property

<Table 2>Rubber types and their properties

Item / Type	Temp. Range(°C) Hign Temp.	Low Temp.	Property	
ACM	150	-10	Widely used in diaphragm, hose for automotive application. Good resistance to heat, ozone and oil. Generally attacked by water, alcohol, glycol and aromatic hydrocarbons. The molecular structure contains ethyl acrylate(EA)*butyl acrylate (BA) and methoxy ethyl acrylate(MEA). More BA content get more low temperature resistance, more MEA content get more oil resistance.	
NR	70	-40	Excellent compression set, high tensile strength, resilience, abrasion and tear resistance, good friction characteristics, excellent bonding capabilities to metal substrate, and good vibration dampening characteristics.	
VMQ	225	-55	The most widely temperature ranges for application. Good weather and ozone resistance. But poor mechanical property and poor chemical resistance.	
PTFE	250	-150	Due to the low friction coefficient, it is used in oil seal lip. Poor elastic property.	
PU	100	-40	Polyurethane is one of the groups of elastic thermoplastic materials. PU has been used in seal technology for many years because of their physical characteristics. It is an organic material of high molecular weight whose chemical composition is characterized by a large number of urethane groups. In addition, it is characterized by extremely good mechanical properties such as high tensile strength, abrasive resistance, tear strength, and extrusion strength. However, it is not resistant to polar solvents, chlorinated hydrocarbons, aromatics, brake fluids, acids, and alkalis.	
FKM			Excellent chemical resistance except ester and ketone.	
	250	-25	Dipolymer	Copolymer of vinylidiene fluoride and hexafluoro propylene, 66% fluorine content.
		-20	Tripolymer	Copolymer of vinylidiene fluoride, hexafluoro propylene and tetrafluro ethylene, 68% fluorine content, more fluid resistance than dipolymer.
XNBR	100	-40	Modification of traditional NBR with the insertion of acidic groups. Better tensile strength, modulus, abrasion than NBR.	

3. Material Application Temperature Range



<Figure 1> Rubber Material application temperature range

4. Typical Properties of Selected Elastomer

<Table 3> The Typical Properties of Selected Elastomer

Rubber Material	NBR	CR	EPDM	ACM	VMQ	FVMQ	FKM
Tear Strength	○	⊙-○	⊙	△-⊙	△-⊙	△	⊙-○
Abrasion Resistance	◎	◎	○	⊙	△-⊙	△	○
Compression Set	○-◎	○-◎	○-◎	○	⊙-◎	○	○-◎
Resilience 23°C	○	○-◎	○	⊙	△-◎	⊙	⊙
Fire resistance	△	○-◎	△	△	⊙-◎	◎	◎
Weather resistance	△	◎	◎	◎	◎	◎	◎
Water Resistance	◎	○	◎	△	○-◎	◎	◎
Steam Resistance	⊙-○	⊙	○-◎	×	⊙-○	⊙-○	○
Ozone Resistance	△-⊙	◎	◎	◎	◎	◎	◎
Oxygen resistance	○	◎	◎	○	◎	◎	◎
Acid Resistance (Dilute)	○	◎	◎	△-⊙	○	◎	◎
Acid Resistance (Concentrate)	○	◎	◎	△-⊙	⊙	○	◎
Base Resistance (Dilute)	○	◎	◎	△-⊙	◎	◎	◎
Base Resistance (Concentrate)	○	◎	◎	△-⊙	◎	○	×
Synthetic Lubricant	○-◎	△	×	△	×	◎	◎
Low Polar Lubricant	◎	◎	×	◎	○	◎	◎
High Polar Lubricant	◎	○	×	◎	⊙	◎	◎
Animal、Vegetable Oil	○	○	○-◎	○	◎	◎	◎
Gas impermeability	○-◎	○	⊙	○	△	△	◎
Electricity resistance	△-⊙	◎	◎	⊙	○-◎	◎	○
Metal Adhesion	○-◎	○-◎	⊙-○	○	○	⊙	⊙

◎ : Excellent ○ : Good ⊙ : Fair △ : Poor × : Very Poor

5. The Stability of Rubber in Chemicals, Oils, and Fluids

<Table 4> Rubber Chemical Resistance Guide

	Fluid	HNBR	NBR	EPDM	CR	CSM	VMQ	FKM	ACM
	Steam (150°C)	○	×	◎	×	×	×	△	×
Organic Acid	Acetic Acid	○	○	_	◎	◎	◎	○	×
Inorganic Acid	hydrochloric acid (25%)	○	○	◎	◎	◎	◎	○	×
	Phosphoric Acid (20%)	◎	○	◎	○	◎	○	◎	—
	Nitric Acid (25%)	○	×	○	◎	◎	○	△	×
Base	Sodium Hydroxide (30%)	_	○	◎	×	◎	○	○	—
	Ammonia (28%)	_	◎	◎	◎	◎	◎	○	×
Salt Solution	NaCl (30%)	◎	◎	◎	◎	◎	◎	◎	—
	Na2CO3 (10%)	◎	◎	◎	◎	◎	◎	○	—
Oxidizing Agent	Hydrogen Peroxide (3%)	○	△	○	△	◎	◎	◎	—
	Sodium Chloride (5%)	○	×	○	×	○	○	◎	×
Parafinc Fluid	Isooctane	◎	◎	×	○	○	×	◎	◎
Aromatic Fluid	Benzene	△	△	×	×	×	△	◎	×
Chlorinated Fluid	Trichloroethylene	△	△	×	×	×	×	◎	—
Alcohol	Methanol	◎	◎	◎	◎	◎	◎	△	×
	Ethanol	◎	◎	◎	◎	◎	◎	◎	×
Ether	Ethyl Ether	△	△	△	×	×	×	×	×
Ester	Ethyl Ester	×	×	○	△	△	×	△	—
Ketone	Methyl Ethyl Ketone	×	×	◎	×	×	×	×	×
Aldehyde	Furfural	○	△	◎	×	×	×	×	×
Amine	Trihydroxyethylamine	◎	△	◎	◎	◎	×	×	×
	Carbon Disulfide	△	△	×	×	×	—	◎	—

◎ : Excellent ○ : Good △ : Fair × : Poor

5. The Stability of Rubber in Chemicals, Oils, and Fluids

<Table 5> Oil and Fluid Resistance of Rubber

Oil,Chemical	Rubber	HNBR	NBR	EPDM	SBR	PTFE	VMQ	FKM	ACM
Engine oil	SAE #30	◎	◎	×	×	◎	◎	◎	◎
	SAE 10W-#30	◎	◎	×	×	◎	○	◎	◎
Gear oil	Vehicles used	◎	◎	×	×	◎	△	○	◎
	Industrial synthetic base	◎	◎	△	△	◎	△	○	△
Auto transmission Fluid		◎	◎	×	×	◎	×	○	◎
Brake Fluid	DOT 3 (Glycol)	×	△	○	○	◎	○	×	×
	DOT 5 (Glycol)	×	△	○	○	◎	○	×	×
	DOT 5 (silicone base)	◎	◎	×	○	◎	×	○	○
Turbine oil		○	○	×	×	◎	△	◎	◎
Mechanical oil(No.2 lubrication oil)		○	○	×	×	◎	×	◎	○
Hydraulic oil(mineral oil)		◎	◎	×	×	◎	△	◎	◎
Antiburn oil	Phosphoric ester	×	×	×	×	◎	◎	△	×
	Water + ethylene glycol	○	○	×	×	◎	△	△	×
Cutting oil		◎	◎	×	×	◎	◎	◎	△
Grease	Mineral	◎	◎	×	×	◎	◎	◎	◎
	Silicone	◎	◎	×	○	◎	×	◎	◎
	Fluoro	◎	◎	×	×	◎	◎	×	◎
Cooling media	R12 + paraffinic	◎	○	×	×	◎	×	×	×
	R134a + glycol	○	△	◎	×	◎	×	×	×
Gasoline		○	△	×	×	◎	×	◎	×
Naphtha		○	△	×	×	◎	×	◎	×
Heavy oil		◎	○	×	×	◎	×	◎	△
Antifreeze fluid (ethylene glycol)		○	○	◎	◎	◎	△	×	×
Warm water		◎	○	◎	◎	◎	○	○	×
Salt water		◎	○	◎	◎	◎	×	○	×
Steam		○	×	○	△	◎	×	×	×
Hydrochloric acid 10%		○	○	◎	○	◎	○	○	○
Sulfuric acid 30%		△	△	○	△	◎	×	△	△
Nitric acid 10%		△	×	○	×	◎	×	△	×
Sodium hydroxide 40%		◎	○	◎	◎	◎	×	×	×
Benzene		×	×	×	×	◎	×	×	×
Alcohol		○	○	◎	◎	◎	○	○	×
Acetone		×	×	×	×	◎	△	×	×

◎ : Excellent ○ : Fair △ : Poor × : Failure

6. Material Code System

1st Digit ---------- Material

2nd Digit ---------- Color

3rd Digit ---------- Hardness

4th & 5th Digit ------ Property (Sequential Number)

<Table 6> Material code

1st Digit		2nd Digit		3rd Digit	
Material		Color		Hardness	
Symbol	Meaning	Symbol	Meaning	Symbol	Meaning
A	Santoprene	A	Tangerine	A	95
B	SBR	B	Blue	9	90
C	CR	G	Green	B	85
E	EPDM	K	Black	8	80
F	FVMQ	N	Brown	C	75
G	Hypalon	P	Transparent	7	70
H	HNBR	R	Red	D	65
J	Hytrel	T	Gray	6	60
R	NR	U	Purple	E	55
M	VAMAC	W	White	5	50
N	NBR			F	45
P	ACM			0	coating
S	Silicone				
T	PTFE				
U	PU				
V	FKM				
X	XNBR				

Gater spring

It offers radial load for sealing lip, and it also can prolong the seal life. We have to consider shaft speed, shaft run-out and anticorrosive factors to select a proper garter spring. <Table 7> shows the spring material and its application.

<Table 7> spring material and its application

Fluid	Spring Material			
	Carbon Steel		Stainless Steel	
	SAE 1070	SAE 1080	SAE 30304	SAE 30316
Oil / Grease	○		○	○
Water	×		○	○
Steam	×		○	○
Salt water	×		×	○
Acid	×		×	○
Alkali	×		○	○

Case

Case can improve seal stiffness and sealing function. It also helps the seal to be installed correctly. <Table 8> shows the case material and its application.

<Table 8> case material and its application

Fluid	Case Material		
	Carbon Steel	Stainless Steel	
	SAE 1080	SAE 30304	SAE 30316
Oil / Grease	○	○	○
Water	×	○	○
Steam	×	○	○
Salt water	×	×	○
Acid	×	×	○
Alkali	×	○	○