



● Cat. No. 040E · 06-2025

PACKINGS

HYDRAULIC SEALING SYSTEMS

NOK CORPORATION

Globally Recognized World Class Quality

The NOK Plastics & Polyurethane Division, which is a production base for packings, has obtained ISO 9001 certification, an international quality standard.

We will continue to supply products that meet our customers' needs and strive to further improve our quality so that we can earn even higher levels of trust than ever before.

NOK Plastics & Polyurethane Division: ISO 9001 certified (in March, 1999)



NOK Plastics & Polyurethane Division 187-11, Usuba, Hanakawa-cho, Kitaibaraki-shi, Ibaraki Prefecture, JAPAN

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High-performance brand that contributes to the environment through low-friction technologies

- In this Catalog, both the International System of Units (SI) and the conventional system of units are used.
- The notation of surface roughness on the catalog comply with JIS B 0601: 2001

Catalogues of models UNI, V99F and V96H type were discontinued at the end of September 2024. Details of product specifications and handling are provided in the same manner as for other general packings catalogs.

Before using the packing

1. Storage notes

When storing packings :

1. Do not open the packaging unnecessarily. “Dust” may stick to the packing or scratch it.
2. Avoid exposure to direct sunlight and store in a cool place.
Ultraviolet light and humidity may promote deterioration and dimensional change of rubber and resin material.
3. When storing products already unpacked, be careful that foreign materials do not stick or become embedded.
Store them in their original condition, in tightly sealed polyamide to prevent dimensional change resulting from humidity.
4. Do not replace packings near any heat source such as a boiler, stove, etc. Heat may deteriorate the material.
5. Do not place packings near electric motors or equipment generating ozone.
6. Avoid hanging packings with a nail, wire or suspending them with a string as this may cause deformation and scratches on the top end of the lip.
7. Sometimes, color changes or white powder appears on the surface of packings (blooming phenomenon).
This will not affect the function of the packing.
8. Rareflon rings of combination seals may be easily scratched if dropped or impacted by an external force.
Handle with care.

2. Storage period of packings

The following table shows the storage period of packings.

Use the storage period as a guide when storing.

Product	Material	Storage period
Rubber material products	Iron rubber* (PUR)	10 years
	Nitrile rubber (NBR)	10 years
	Hydrogenated nitrile rubber (H-NBR)	10 years
	Silicon rubber (VMQ)	20 years
	Fluoro rubber (FKM)	20 years
Rubber baked products	Nitrile rubber (NBR)	10 years
	Fluoro rubber (FKM)	10 years
Resin	Rareflon* (PTFE)	20 years
	Polyamide (PA)	20 years
	Resin fiber polyester	20 years
	Fabric reinforced phenolic (—)	20 years

*“Iron rubber” and “Rareflon” are trade registered trademarks of NOK CORPORATION.

A registered trademarks of NOK CORPORATION	General name
Iron rubber	Polyurethane elastomer
Rareflon	Polytetrafluoroethylene resin

- The storage periods shown above are applicable to products sealed in standard packing and stored in a cool dry place away from direct sunlight.
 - Dimensional changes due to moisture absorption of polyamide resin are not covered since it would depend greatly on the storage environment.
 - The indicated storage periods do not account for rust formation on the metal parts of bonded seal products, since rust is largely influenced by the storage environment.
 - Before using a packing that has been kept in storage for an extended period of time, check that it is free from rust.
- All compatibility data, application information, design & material information and technical data in this catalogue are compiled as reference material to make a basic packing selection.
A selected standard design from this catalogue may not conform to the actual use of an application, due to unknown factors of the application.
Please confirm the actual compatibility of a selected product with your application before using it.
- The contents are subject to change without notice.

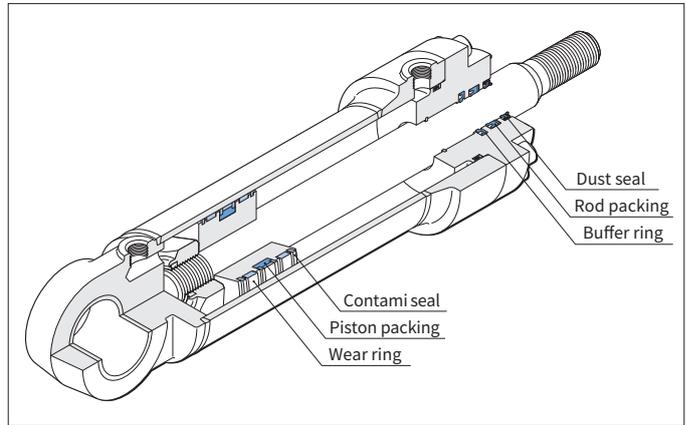
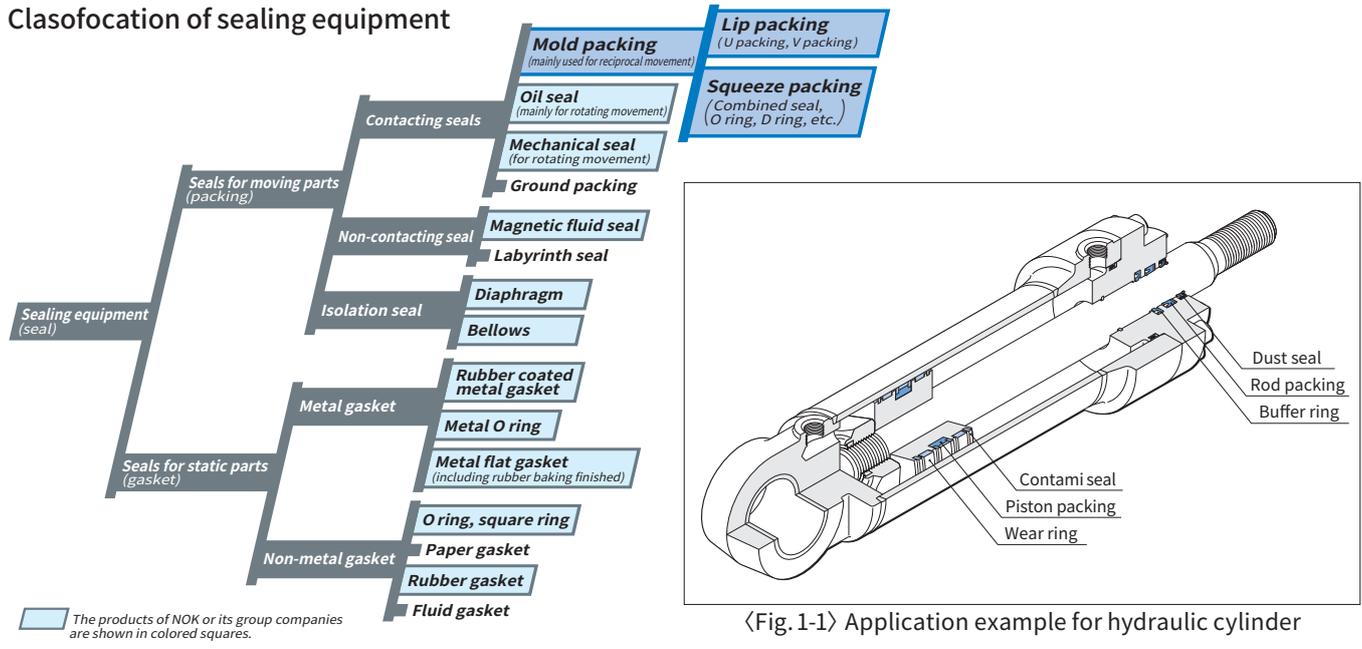
The packing described in this catalog is not designed and manufactured to be suitable for medical devices. Do not use this packing for medical devices touching bodily fluids or body tissues.

1. What are NOK Hydraulic Sealing Systems?

(1) Hydraulic sealing systems

are general terms describing sealing systems (seals) used for moving parts (usually with reciprocal movement) of hydraulic equipment. Different types of seals may be combined, depending on the application. Different types of seals are classified... below according to the application, form and material. Lip packings are most frequently used for reciprocal moving parts. An application example for a hydraulic cylinder is shown in Fig. 1-1.

Classification of sealing equipment

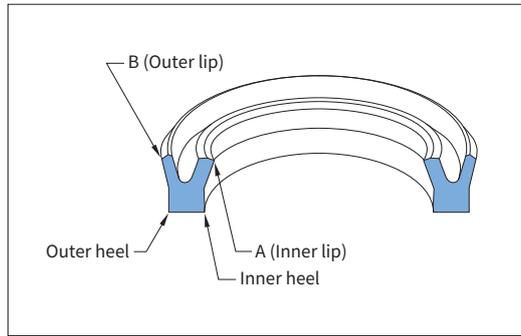


<Fig. 1-1> Application example for hydraulic cylinder

For effective application, hydraulic sealing systems should combine various sealing devices most appropriate for specific operating conditions and usage.

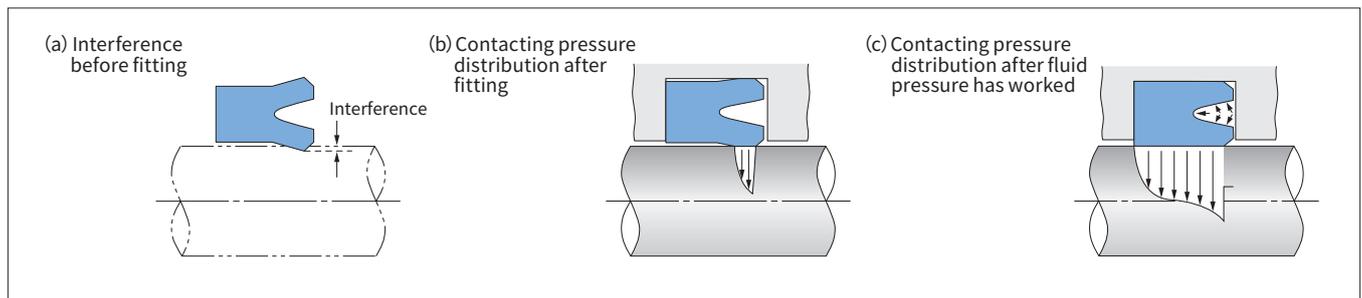
(2) What are lip packings?

As its name suggests, a U packing is a general term describing a packing with a U-shaped groove as shown in Fig. 1-2. This packing has an inner lip "A" and outer lip "B".



<Fig. 1-2> U packing

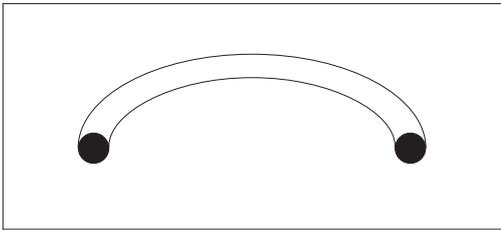
Fig. 1-3 shows a U packing deformed by interference when fitted into the installation groove, which makes the lip contact with the rod. When fluid pressure (oil pressure) is added, the heel of the packing becomes deformed so the complete sliding surface is intact with the rod surface. The condition of contacting pressure distribution of the lip and heel is closely related with the sealing characteristics of the packing. The relationship between sealing characteristics and contacting pressure distribution is described on page 4.



<Fig. 1-3> Contacting pressure distribution of U packing

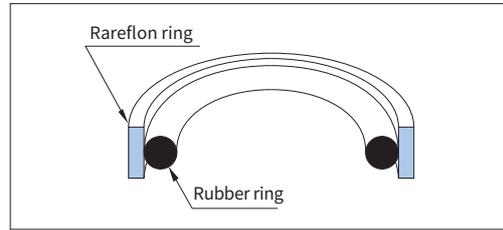
(3) What are squeeze packings?

This type of packing applies a rubber-like elastic object onto the sealed surface.



<Fig. 1-4> O ring

An O-ring Fig. 1-4 with an O-shaped profile is a typical squeeze packing. Significant pressure on the sealing surface is required to compress and deform the profile for sealing. For this reason, significant frictional resistance and high-sliding frictional heat is created resulting in a short life of the packing. To reduce sliding frictional resistance and frictional heat, the compression and deformation ratio of the O-ring should be decreased, which will, however, reduce the sealing ability.



<Fig. 1-5> Example of combined seal

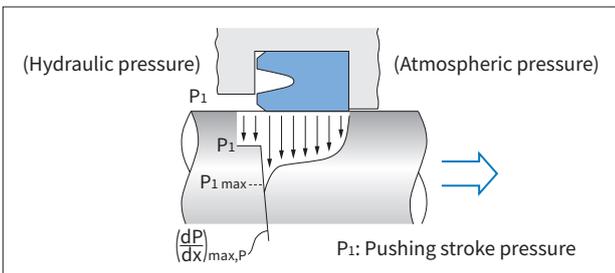
To decrease friction, a combined seal (called a SP seal) has been developed with low-friction rareflon (PTFE) on the sliding surface Fig. 1-5.

Compared to the lip packing, the combined seal has a lower sealing ability but offers lower sliding resistance. Because of these characteristics, this seal is mainly used as a piston packing for hydraulic cylinders.

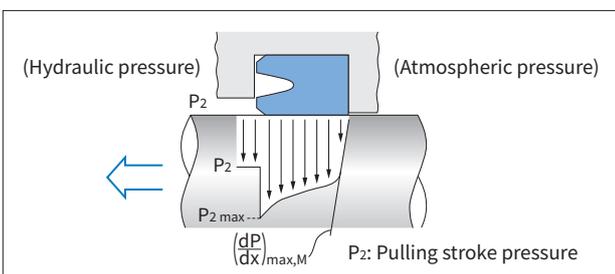
(4) How do packings seal?

By what means do packings for reciprocal movement seal hydraulic fluid? A U packing serves as a good example to illustrate sealing capability.

As shown in Fig. 1-6, when the rod moves to the right, the U packing is contacting with the rod under pressure distribution created by the peak pressure ($P_{1\max}$) that is higher than the inner pressure (P_1). Thickness of the fluid/oil passing through the packing becomes thinner as the absolute value of the maximum contacting pressure gradient of the hydraulic pressure of the pressure distribution $|dp/dx|_{\max,P}$ becomes greater. Conversely, when the rod moves to the left by the inner pressure (P_2) on the U packing Fig. 1-7, the thickness of the fluid/oil passing through the packing depends on absolute value of the maximum contacting pressure gradient of the atmospheric pressure $|dp/dx|_{\max,M}$. To reduce friction, a fluid/oil film on the sliding surface of the packing is necessary. NOK designs packings with well-balanced contacting pressure distribution to form optimum fluid/oil film on the sliding surface.



<Fig. 1-6> Contacting pressure distribution (pushing stroke)



<Fig. 1-7> Contacting pressure distribution (pulling stroke)

The minimum oil film thickness of the sliding surface depends on the maximum contacting pressure gradient, speed, and oil viscosity, and can be determined from the formula (1) below.

$$h = \sqrt{\frac{8\mu U}{9 |dp/dx|_{\max}}} \dots\dots\dots (1)$$

μ : Oil viscosity (Pa·s)
 U : Speed (m/s)

$|dp/dx|_{\max}$: Absolute value of the maximum contacting pressure gradient (Pa/m)

In the case of a hydraulic cylinder, the thickness of the fluid/oil film created at the pushing stroke (when the rod extends) (h_P) and at the pulling stroke (when the rod compresses) (h_M) can be determined respectively by the formula (2) and (3).

$$h_P = \sqrt{\frac{8\mu U_P}{9 |dp/dx|_{\max,P}}} \dots\dots\dots (2)$$

$$h_M = \sqrt{\frac{8\mu U_M}{9 |dp/dx|_{\max,M}}} \dots\dots\dots (3)$$

U_P : Speed of the pushing stroke (m/s)
 U_M : Speed of the pulling stroke (m/s)

$|dp/dx|_{\max,P}$: Absolute value of the maximum contacting pressure gradient of hydraulic pressure at the pushing stroke (Pa/m)

$|dp/dx|_{\max,M}$: Absolute value of the maximum contacting pressure gradient of atmospheric pressure at the pulling stroke (Pa/m)

Therefore, if the speed of both the pushing and pulling stroke is the same ($U_P=U_M$), $h_P \leq h_M$ is the condition for sealing and the packing satisfying the formula below

$$|dp/dx|_{\max,P} \geq |dp/dx|_{\max,M}$$

can be regarded to have a good sealing performance.

(5) Lubrication characteristics

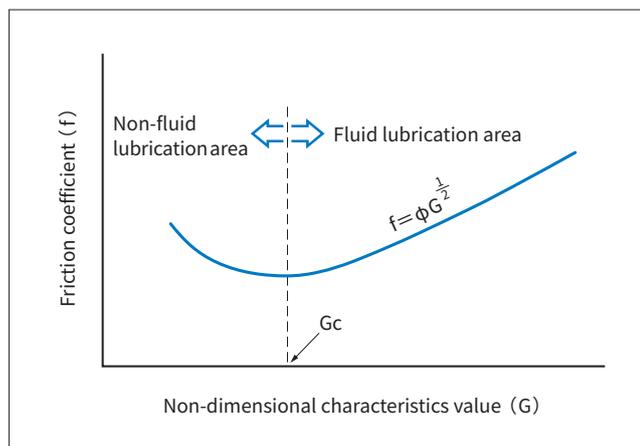
One of the most important features of a packing for reciprocal movement is to have low friction on the sliding surface to assure long life.

To reduce friction, proper lubricant (oil film) is necessary for the sliding surface of the packing for reciprocal movement. How do lubrication characteristics change according to operating conditions?

To understand globally the lubricating requirements of a packing's sliding surface, it is necessary to know dynamic friction characteristics when pressure, speed and fluid oil viscosity effecting the surface have changed.

An example of a U packing for a hydraulic cylinder rod helps explain this. The relationship between nondimensional characteristics value G , that is determined by the form of U packings and its operating condition and the friction coefficient f , is determined in Fig. 1-8. The range where the friction coefficient has a positive gradient is described as fluid lubrication in the lubrication theory. Within this range, the rod and the packing are in contact with each other through oil film, assuring a long packing life without wearing, even if a relative reciprocal movement occurs.

Within the range where the coefficient (f) has a negative gradient, the oil film between the packing and the rod is destroyed. This range is called the non-fluid lubrication area.



〈Fig.1-8〉 Example of non-dimensional characteristics graph (U packing)

Where,

- f : Friction coefficient
- ϕ : Constant that is determined by the condition of oil film
- G : Non-dimensional characteristics value ($= \mu LU / Pr$)
- Pr : Compression force of packing (N)
- μ : Viscosity of fluid oil (Pa·s)
- L : Circumference length of the shaft (m)
- U : Speed (m/s)

Switching point G_c of the non-dimensional characteristics value where the fluid lubrication area shifts to the non-fluid lubrication area varies depending on the maximum contacting pressure gradient of the packing and the surface roughness of the rod and can be obtained by the formula (4) below.

$$G_c = \frac{9}{8\pi} \left(\frac{b}{\bar{p}} \right) \left| \frac{dp}{dx} \right|_{\max} \left(\frac{Rz}{b} \right)^2 \dots\dots\dots (4)$$

Where,

- b : Contacting width of the packing (m)
- \bar{p} : Average contacting pressure of the packing (Pa)
- Rz : Maximum surface roughness of the rod (m)

Note: The surface roughness notation in this catalogue conforms to JIS B 0601 : 2001.

About compression force and extension force

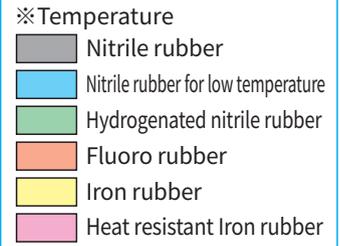
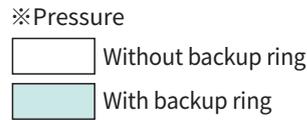
The forces created by the rod or piston packings that are fitted on the mounting groove and in contact with the contacting surface (the surface of the rod or the inner surface of the cylinder) is called compression force and extension force, respectively. The sealing ability of packings for reciprocal movement depends on the maximum contacting pressure gradient of the pushing and pulling stroke. Therefore, the values of the compression and extension force are not sufficient to judge the sealing ability of a packing for reciprocal movement.

2. Selecting, Types, and Features

Selecting material and the type most suitable for the operating condition is necessary to obtain optimal performance of the packing. In this chapter, we will describe the application range of seals and related products for hydraulic equipment, plus means of selection.

(1) Types and features of hydraulic seals for reciprocating application

a. Special packings for piston seals



<Table 2-1> Hydraulic seals for reciprocating motion (Special packings for piston seals)

Type	Classification	NOK type	Shape	Material	Main applicable fluid	Pressure (MPa)		Temperature (°C)		Speed (m/s)
						Remark 1	Remark 2			
U packing		ODI		Iron rubber (U801)	•General petroleum hydraulic fluid	35	70	-35	100	0.03~1.0
		OSI		Iron rubber (U801)		30	42	-30	100	
		OUI		U801		30	42	-30	100	
				U641		-10	110			
		OUHR		A505		-25	100			
				A567		-55	80			
OKH		A566	-25	100						
		A567	-55	80						
Special packings for piston seals	Combination seals	SPGO (Combination)		① Rareflon (19YF) ② Nitrile rubber Fluoro rubber	A305	-30	100	160		
				F201	-20	160				
		SPG (Combination)		① Rareflon (19YF) ② Nitrile rubber Fluoro rubber	A980	-40	100	160		
					F201	-20	160			
		SPGM (Combination)		① Rareflon (55YF) ② Nitrile rubber Fluoro rubber	A305	-30	100	160		
					F201	-20	160			
		SPGN (Combination)		① Polyamide resin (21NB) ② Nitrile rubber (A626)		50	-30	110	0.005~1.5	
SPGW (Combination)		① Rareflon (19YF) ② Polyamide resin (12NM or 80NP) ③ Nitrile rubber Fluoro rubber Hydrogenated nitrile rubber	A980	-40	100	120				
			F201	-20	160					
			G928	-25	120					
SPGC (Combination)		① Rareflon (31BF) ② Nitrile rubber Fluoro rubber	A305	-30	100	160				
F201	-20	160								
C packing		CPI		Iron rubber (U801)	•General petroleum hydraulic fluid oil	7		-35	100	0.01~0.3
		CPH		Nitrile rubber (A102) (A103) (A104) (A505)		-25	100			

- Remark 1) Depending on the size of extrusion gap, backup ring might be necessary. Refer to Fig.2-7 on page 17 and dimension table.
- Remark 2) Applicable temperature ranges for packings are indicated by colors for each rubber material. (←See the figure to the left.)
- Remark 3) When using the packing at a low speed, stick slip may occur depending on the cylinder structure or the using condition. In this case, consult NOK separately.
- Remark 4) Some small diameter type cannot be installed with internal groove.
- Remark 5) Items with a “—” mark in the dimension table column have unique specifications. Please consult NOK before ordering since there is no dimension description.
- Remark 6) When using a special fluid, consult NOK.

In the following case, the combined effect of operating conditions must be carefully considered, therefore, please consult NOK.

- (1) In case of minimum pressure exceeding 3MPa at all times
- (2) In case of using packing at the border range of applicable temperature and pressure
- (3) In case of using packing with extremely short strokes (See examples of using with extremely short strokes on page 151 and 152.)
- (4) In case of using packing when speed of extending stroke of rod is greater than that of contracting stroke

	Stroke (mm)	Sliding resistance	Installation with integrated groove <small>Remark 4)</small>	Feature	Dimension table(page)	
2,000 or below		Medium	No	•Designed for large section, applicable for wide pressure range	•Iron rubber U801, has excellent wear resistance and sealing ability.	42
		Medium	Yes	•Designed for smaller section, and able to be fitted into integrated groove	•Packings with a smaller section than ODI	47
		Medium	Yes		•Improvement has been made to prevent damages caused by back pressure. •Material with heat resistance, U641 is also available.	49
		Small	Yes		•Improvement against stick slip has been made. •The friction resistance is low and an improvement has been made to prevent damages caused by back pressure. •Nitrile rubber that has excellent low temperature resistance is employed and can be used with special low temperature hydraulic fluid oil (MIL H 5606E).	50
		Small	Yes		•Installation space is saved because of bidirectional sealing ability by single packing.	•Improvement against stick slip has been made. •Nitrile rubber that has excellent low temperature resistance is employed and can be used with special low temperature hydraulic fluid oil (MIL H 5606E). •It can be used with combination of back-up ring BRL. (See the page 37)
		Very small	Yes	•Rareflon is used for sliding material. This packing has low frictional resistance, eliminating stick slip and assuring high wear resistance. •Installation space is saved because of bidirectional sealing ability by single packing.	•This is a standard type of combination seal for wide range of application. •This has the same performance as that of SPG. Installation space is saved because of JIS standard O ring.	52
		Very small	Yes		•This has the same performance as SPGO. This is used in case the service range of pressure	54
		Very small	Yes		•This has the same performance as SPGO. This is used in case the service range of pressure is wide and sliding speed is high.	56
		Small	Yes	•Polyamide resin is used for sliding material. This packing has assuring high durability. •Installation space is saved because of bidirectional sealing ability by single packing.	•Suppresses venting leaks; provided with slit to allow hydraulic insertion at edge of seal ring. •Easy to attach using one point step cut on seal ring. •More compact than SPGW.	57
		Very small	Yes	•Rareflon is used for sliding material. This packing has low friction resistance eliminating stick slip and assuring high wear resistance. •Installation space is saved because of bidirectional sealing ability by single packing.	•This is a seal for high pressure operation with improved ability of SPG for oil scraping off. •Backup ring material of polyamide resin to improve the durability.	58
		Very small	Yes		•This packing can be fitted on to O ring groove (JIS B 2406 P series). •This has less sliding friction than O ring to improve the durability. •This can also be used for pneumatic equipment.	60
		Small	No		•Packing material, Iron rubber U801 has excellent wear resistance and sealing ability.	63
		Small	No	•This packing is used for relatively low pressure operation.	•Packing material, nitrile rubber, has excellent oil resistance and reduces sliding friction.	64

(1) Types and features of hydraulic seals for reciprocating application

b. Special packings for rod seals

※Pressure

Without backup ring

With backup ring

※Temperature

Nitrile rubber

Nitrile rubber for low temperature

Hydrogenated nitrile rubber

Fluoro rubber

Iron rubber

Heat resistant Iron rubber

<Table 2-2> Hydraulic seals for reciprocating motion (Special packings for rod seals)

Type	Classifi- cation	NOK type	Shape	Material	Main applicable fluid	Pressure (MPa) ^{Remark 1)}		Temperature (°C) ^{Remark 2)}		Speed (m/s)
						Without backup ring	With backup ring	Without backup ring	With backup ring	
Special packings for rod seals	U packing	IDI		Iron rubber (U801)	U801	35	70	-35	100	0.03~ 1.0
		ISI		Iron rubber	U801 U641	30	42	-30	100 110	
		IUIS		Iron rubber	U801 U641	30	42	-30	100 110	
		IUH		Nitrile rubber	A505 A567 G928	14	21	-55	80 120	
		UNI	 (Combination)	①Iron rubber (U801) ②Silicon rubber (S813)	U801	30	42	-45	100	
	Combination seals	SPNO	 (Combination)	①Rareflon (19YF) ②Nitrile rubber Fluoro rubber	A305 F201	35		-30	100 160	0.005 ~1.5
		SPN	 (Combination)	①Rareflon (19YF) ②Nitrile rubber Fluoro rubber	A980 F201	35		-40	100 160	
		SPNS	 (Combination)	①Rareflon (55YF) ②Nitrile rubber Fluoro rubber	A305 F201	35		-30	100 160	
		SPNC	 (Combination)	①Rareflon (31BF) ②Nitrile rubber Fluoro rubber	A305	2		-30	100	
					F201		-20	160		

Remark 1) Depending on the size of extrusion gap, backup ring might be necessary. Refer to Fig.2-7 on page 17 and dimension table.

Remark 2) Applicable temperature ranges for packings are indicated by colors for each rubber material. (←See the figure to the left.)

Remark 3) When using the packing at a low speed, stick slip may occur depending on the cylinder structure or the using condition. In this case, consult NOK separately.

Remark 4) Some small diameter type cannot be installed with internal groove.

Remark 5) Items with a “—” mark in the dimension table column have unique specifications. Please consult NOK before ordering since there is no dimension description.

Remark 6) When using a special fluid, consult NOK.

In the following case, the combined effect of operating conditions must be carefully considered, therefore, please consult NOK.

- (1) In case of minimum pressure exceeding 3MPa at all times
- (2) In case of using packing at the border range of applicable temperature and pressure
- (3) In case of using packing with extremely short strokes (See examples of using with extremely short strokes on page 151 and 152.)
- (4) In case of using packing when speed of extending stroke of rod is greater than that of contracting stroke

Stroke (mm)	Sliding resistance	Installation with integrated groove <small>Remark 4)</small>		Feature	Dimension table(page)
2,000 or below	Medium	No	•Packings with large section can be used for wide range of pressure.	•Packing material, Iron rubber U801 has excellent wear resistance and sealing ability.	65
	Medium	Yes	•Packings with small section can be fitted in integrated groove.	•Packings with a smaller section of IDI. •Material with heat resistance, U641 is also available.	71
	Medium	Yes		•Improvement is made to prevent damage caused by back pressure. •Heat resistant U641 is also available.	73
	Small	Yes <small>Remark 4)</small>		•Improvement is made to prevent the damages caused by back pressure. •Material with excellent cold resistance, nitrile rubber A567 is also available. This can be used for special low temperature oil (MIL H 5606E). •Heat resistant, wear resistant hydrogenated nitrile rubber (H-NBR) G928 material also available.	74
	Medium	No		•This packing is used for low temperature and high pressure operations.	•Iron rubber is used for material and back ring can prevent the lack of interference at low temperature.
	Very small	Yes <small>Remark 4)</small>	•Rareflon is used for sliding material. This packing has low frictional resistance, eliminating stick slip and assuring high wear resistance.	•This is a standard type of combination seal and can be used for wide range of operation.	76
	Very small	Yes <small>Remark 4)</small>		•This has the same performance as SPNO. This is used in case the service range of pressure is wide and sliding speed is high.	78
	Very small	Yes <small>Remark 4)</small>		•Compared to SPNO and SPN, the product is excellent in the sealing performance.	79
	Very small	No	•Rareflon is used for sliding material. This packing has low friction resistance eliminating stick slip and assuring high wear resistance. •Installation space is saved because of bi-directional sealing ability by single packing.	•This packing can be fitted on to O ring groove (JIS B 2406 P series). •This has less sliding friction than O ring to improve the durability. •This can also be used for pneumatic equipment.	81

(1) Types and features of hydraulic seals for reciprocating application

c. Packings for both piston and rod seals

※Pressure

Without backup ring

With backup ring

※Temperature

Nitrile rubber

Nitrile rubber for low temperature

Fluoro rubber

Iron rubber

Heat resistant Iron rubber

<Table 2-3> Hydraulic seals for reciprocating motion (Packings for both piston and rod seals)

Type	Classi- fication	NOK type	Shape	Material	Main applicable fluid	Pressure (MPa) ^{Remark 1)}		Temperature (°C) ^{Remark 2)}		Speed (m/s)	
						Without backup ring	With backup ring	Without backup ring	With backup ring		
Packings for both piston and rod seals	U packing	UPI		Iron rubber (U801)	U801	30	35	-35	100	0.03~1.0	
		USI		Iron rubber (U801)	U593	21		-35	80		
		UPH		Nitrile rubber Fluoro rubber	A505	•General petroleum hydraulic fluid oil •Water-glycol type hydraulic fluid oil •Oil-water emulsion type hydraulic fluid oil	15	32	-25	100	0.008~1.0
					F357	•General petroleum hydraulic fluid oil •Phosphate ester type hydraulic fluid oil			-10	150	
USH		Nitrile rubber Fluoro rubber	A505	•General petroleum hydraulic fluid oil •Water-glycol type hydraulic fluid oil •Oil-water emulsion type hydraulic fluid oil	14	21	-25	100	0.008~1.0		
			A567	•Low temperature petroleum hydraulic fluid oil (General petroleum hydraulic fluid oil) Note:When using general petroleum-derived operating oil, we recommend A527.			-55	80			
V packing	V99F		Fabric reinforced nitrile rubber	21AG	•General petroleum hydraulic fluid oil •Water-glycol type hydraulic fluid oil •Oil-water emulsion type hydraulic fluid oil •Water	4	16	-25	100	0.05~1.0	
						30 (5枚)					
V96H		Nitrile rubber Fluoro rubber	A505	•General petroleum hydraulic fluid oil •Water-glycol type hydraulic fluid oil •Oil-water emulsion type hydraulic fluid oil •Water	4	8	-25	100	0.05~0.5		
			F357	•General petroleum hydraulic fluid oil •Phosphate ester type hydraulic fluid oil •Agricultural chemicals			30 (5枚)			-10	150

- Remark 1) Depending on the size of extrusion gap, backup ring might be necessary. Refer to Fig.2-7 on page 17 and dimension table.
- Remark 2) Applicable temperature ranges for packings are indicated by colors for each rubber material. (←See the figure to the left.)
- Remark 3) When using the packing at a low speed, stick slip may occur depending on the cylinder structure or the using condition. In this case, consult NOK separately.
- Remark 4) Some small diameter type cannot be installed with internal groove.
- Remark 5) Items with a “—” mark in the dimension table column have unique specifications. Please consult NOK before ordering since there is no dimension description.
- Remark 6) When using a special fluid, consult NOK.

In the following case, the combined effect of operating conditions must be carefully considered, therefore, please consult NOK.

- (1) In case of minimum pressure exceeding 3MPa at all times
- (2) In case of using packing at the border range of applicable temperature and pressure
- (3) In case of using packing with extremely short strokes (See examples of using with extremely short strokes on page 151 and 152.)
- (4) In case of using packing when speed of extending stroke of rod is greater than that of contracting stroke

Stroke (mm)	Sliding resistance	Remark 4) Installation with integrated groove	Feature	Dimension table(page)	
2,000 or below	Medium	No	<ul style="list-style-type: none"> • This can be used both for piston and rod seals. • This packing has large section and can be used for wide range of operations. 	<ul style="list-style-type: none"> • Material, Iron rubber U801, has excellent wear resistance and sealing ability. 	84
	Small	Remark 4) Yes	<ul style="list-style-type: none"> • This can be used both for piston and rod seals. • This packing has small section and can be fitted in integrated groove. 	<ul style="list-style-type: none"> • This is a type with smaller section of UPI. • Improvement has been made to prevent damages caused by back pressure. 	88
	Medium	No	<ul style="list-style-type: none"> • This can be used both for piston and rod seals. • This packing has large section and can be used for wide range of operations. 	<ul style="list-style-type: none"> • Nitrile rubber and fluoro rubber are available for material to assure wide range of operating temperature. • Wide variation of size is available. 	90
	Small	Remark 4) Yes	<ul style="list-style-type: none"> • This can be used both for piston and rod seals. • This packing has small section and can be fitted in integrated groove. 	<ul style="list-style-type: none"> • This is a type with a smaller section of UPH. 	95
					—
	Large	No	<ul style="list-style-type: none"> • This can be used for severe operating conditions by plying packings according to the operation pressure. • Installation width is larger than U packings. Less sealing ability than U packings. 	<ul style="list-style-type: none"> • This is a standard type of V packing. 	—
Large	No	<ul style="list-style-type: none"> • Compared with V99F, this is selected in case the sealing performance is more important. 		—	
				—	

(2) Types and features of dust seals

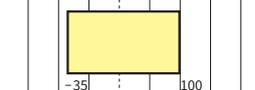
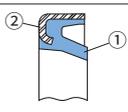
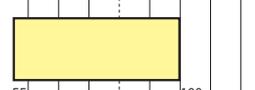
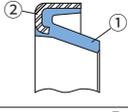
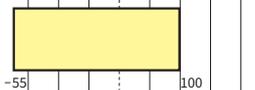
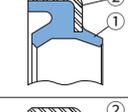
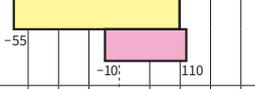
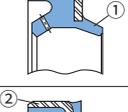
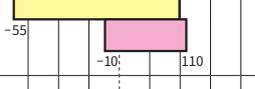
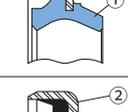
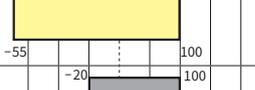
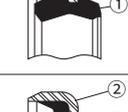
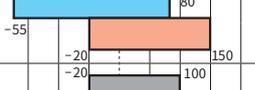
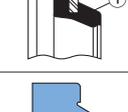
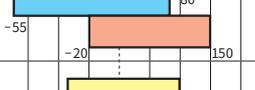
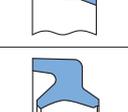
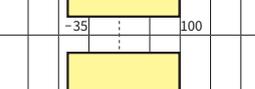
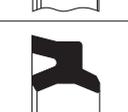
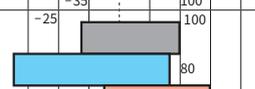
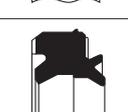
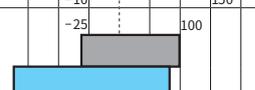
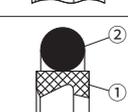
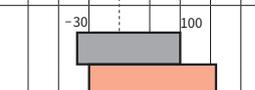
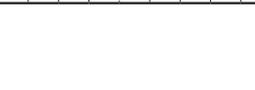
a. Dust seals for reciprocating motion

The main feature of a dust seal is to seal outside dust. In addition, a sealing system using a dust seal, combined with rod packings and a buffer ring, can prevent oil film being scraped out.

Specific performance will vary depending upon the type of dust seal. Therefore, if maintaining oil film on a cylinder is more important, please consult NOK.

※Temperature	
	Nitrile rubber
	Nitrile rubber for low temperature
	Fluoro rubber
	Iron rubber
	Heat resistant Iron rubber

<Table 2-4> Dust seals for reciprocating motion

Type	NOK type	Shape	Material	Main applicable fluid	Temperature (°C) ^{Remark 1)}		Dust proof performance	Oil scraping proof performance
					-50 -40 -20 0 100 200			
Dust seals	DKI	 (組合せ)	① Iron rubber (U801) ② Cold rolled steel plate sheet (SPCC)	• Outside dust			◎	Medium
	DWI		① Iron rubber (U801) ② Cold rolled steel plate sheet (SPCC)				◎	Small
	DWIR		① Iron rubber (U801) ② Cold rolled steel plate sheet (SPCC)				○	Very small
	DKBI		① Iron rubber (U801) ② Cold rolled steel plate sheet (SPCC)				◎	Very small
	DKBI3		① Iron rubber (U801) ② Cold rolled steel plate sheet (SPCC)				◎	Very small
	DKBZ		① Iron rubber (U801) ② Cold rolled steel plate sheet (SPCC)				◎	Very small
	DKB		① Nitrile rubber Fluoro rubber ② Cold rolled steel plate sheet (SPCC)				○	Very small
	DKH		① Nitrile rubber Fluoro rubber ② Cold rolled steel plate sheet (SPCC)				○	Medium
	DSI		Iron rubber (U801)				○	Medium
	LBI		Iron rubber (U801)				○	Small
	LBH		Nitrile rubber Fluoro rubber				○	Small
	LBHK		Nitrile rubber				○	Small
	DSPB		① Rareflon (11YF) ② Nitrile rubber Fluoro rubber				○	Small

Remark 1) Applicable temperature ranges for packings are indicated by colors for each rubber material. (← See the figure to the left.)

Remark 2) When using the packing at a low speed, stick slip may occur depending on the cylinder structure or the using condition. In this case, consult NOK separately.

Remark 3) Some small diameter type cannot be installed with internal groove.

Remark 4) Items with a “—” mark in the dimension table column have unique specifications. Please consult NOK before ordering since there is no dimension description.

	Requirement of stopper	Installation with integrated groove	Feature	Dimension table(page)
	No	No	• This is a standard type of dust seal of Iron rubber with high dust proof performance.	98
	No	No	• Employing Iron rubber as material, this seal serves under severe dust conditions such as construction equipment.	100
	No	No	• Employing Iron rubber as material, this has the same performance as DWI, excellent in preventing of oil scraping out and in follow-ability to the eccentricity.	101
	No	No	• Employing Iron rubber as material, this is a double-lip dust seal to prevent oil scraping off.	102
	Yes	No	• Small one point hole in DKBI oil lip allows pressure build-up to escape and prevents loss or damage to the dust seal.	103
	Yes	No	• Thanks to the improved dust resistance of the DKBI, the dust seal provides a better balance between dust resistance and oil scraping performance.	104
	Yes	No	• Employing nitrile rubber as material, this is a double-lip dust seal to prevent oil scraping off.	105 — —
	No	No	• Employing nitrile rubber as material, this is a single-lip dust seal. • Material A795: for diameter ø300 or below A104: for diameter over ø300	106 — —
	—	Yes	• Employing Iron rubber as material, this is a single-lip all rubber dust seal.	107
	—	Yes	• This product uses the iron rubber as the material, and is a double-lip rubber-only dust seal aiming at preventing scrape-out of oil.	109
	—	Yes	• This is a double-lip all rubber dust seal to prevent oil scraping off. • Nitrile rubber and fluoro rubber are available as material for wide range of operating temperature.	110 — 110
	—	Yes	• This product has a sub-lip in the dust lip, is effective in preventing water from entering, and can be used both indoor and outdoor. • This product has a notch in the oil lip and lower back of the packing, and is excellent in accumulation pressure prevention characteristics.	112
	—	Remark 3) Yes	• Prevents entry of dust, protects equipment, and maintain, sealing performance of packings. • Rareflon is used for sliding material. This packing has low frictional resistance, eliminating stick slip.	113 —

(2) Types and features of dust seals

b. Dust seals for oscillating application

Dust seals for oscillating motion are mainly used for hinge pin and bush parts. In contrast to dust seals for reciprocating motion, the shape of lip is specially designed to reduce torque and have a relief effect by rear-side greasing, this assures good performance in severe dust conditions.

<Table 2-5> Dust seals for oscillating and rotating movement

Type	Classification	NOK type	Shape	Material	Main applicable fluid	Pressure (MPa)	Temperature (°C) <small>Remark 1)</small>	
							-50	-20
Dust seals for oscillating application	Hinge pin dust seals	DLI		① Iron rubber ② Cold rolled steel plate sheet (SPCC)	• Outside dust	—	-35	100
				U801				
				① Iron rubber (U451) ② Cold rolled steel plate sheet (SPCC)				80
				U451				

※ Temperature

- Nitrile rubber
- Fluoro rubber
- Iron rubber
- Heat resistant Iron rubber
- Heat & cold resistant wide-range iron rubber

(3) Types and features of related products for hydraulic equipment

Selecting the right combination of packings and related products for the specific operating conditions will insure proper sealing effectiveness.

<Table 2-6> Relating products for reciprocal movement

Type	Classification	NOK type	Shape	Material	Main applicable fluid	Pressure (MPa)	Temperature (°C) <small>Remark 1)</small>				
							0	20	40	60	-50
Special packing for rod seals	Buffer ring	HBY		① Iron rubber ② Polyamide resin (12NM or 80NP)	• General petroleum hydraulic fluid	—	50	-55	100		
				U801							
				① Rareflon (55YF) ② Nitrile rubber Fluoro rubber	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil • General petroleum hydraulic fluid oil • Phosphate ester type hydraulic fluid oil	35	-55	-30	100		
				A305							
				F201					160		
Relating products for reciprocal movement	Wear rings	RYT		Rareflon (05ZF)	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil • Phosphate ester type hydraulic fluid oil • Low temperature petroleum hydraulic fluid oil	—	-55	220			
		WRT2		Rareflon (08GF)					-55	220	
		WR		Fabric reinforced phenolic resin					12RS	-55	120
									15RS		
		WRR		Fabric reinforced phenolic resin					12RS	-55	120
									15RS		
				WR		Resin fiber polyester (88RS)	—	-60	130		
	Contami seals	KZT		Rareflon (05ZF)	—	-55	220				
		Backup ring	BRT2		Rareflon (19YF)	—	-55	220			
			BRT3								
					BRN2		Polyamide resin (80NP)	—	-55	120	
					BRN3		• General petroleum hydraulic fluid oil • Phosphate ester type hydraulic fluid oil • Low temperature petroleum hydraulic fluid oil				
				BRL		Polyamide resin (63NP)	—	-55	120		

- Remark 1)** Permissible temperature ranges for dust seals are indicated by colors for each rubber material. (←See the figure to the left.)
- Remark 2)** When using the packing at a low speed, stick slip may occur depending on the cylinder structure or the using condition. In this case, consult NOK separately.
- Remark 3)** Combination backup ring part numbers are listed on each applicable packing's dimension table.

In the following case, the combined effect of operating conditions must be carefully considered, therefore, please consult NOK.

- (1) In case of minimum pressure exceeding 3MPa at all times
- (2) In case of using packing at the border range of applicable temperature and pressure
- (3) In case of using packing with extremely short strokes (See examples of using with extremely short strokes on page 151 and 152.)

Speed (m/s)	Feature	Dimension table(page)
—	<ul style="list-style-type: none"> • This is a dust seal for oscillating and rotating movement for hinge pin and bush. This can be used under severe dust conditions to improve the durability of the equipment. 	115
—	<ul style="list-style-type: none"> • Relief effect makes easy to drain used grease when filling up new grease. 	116

Speed (m/s)	Feature	Dimension table(page)
0.03 ~1.0	<ul style="list-style-type: none"> • This is used in combination with rod packing to absorb the impact and fluctuating pressure at high load, to isolate high temperature fluid, and to improve the durability of the packing. 	117
0.005 ~1.5		118
0.005 ~1.5	<ul style="list-style-type: none"> • This is used as bearing of piston to prevent its scoring or eccentricity and to improve the durability of the packings. 	—
0.005 ~1.0		120
0.005 ~1.0		121
0.005 ~1.0	<ul style="list-style-type: none"> • This is used as bearing of rod to prevent its scoring or eccentricity and to improve the durability of the packings. 	—
0.005 ~1.0		—
0.005 ~1.5	<ul style="list-style-type: none"> • This is used as bearing of piston & rod to prevent its scoring or eccentricity and to improve the durability of the packings. 	124
0.005 ~1.5	<ul style="list-style-type: none"> • This is used in combination with piston packings and wear rings to prevent damages of packings caused by foreign object in oil within the cylinder and to improve the durability of packings. • When used in combination with rod packing and metal bush, damages of the rod can be prevented because of the foreign object submerging function of rareflon. • One point cut is provided and oil pressure bypass slot is also provided to prevent pressure accumulation. 	126
—	<ul style="list-style-type: none"> • This is used to prevent extrusion of packings and to improve the pressure resistance of the packings. 	—
—		—
—		—

(4) Application range of backup ring

a. The role of backup ring

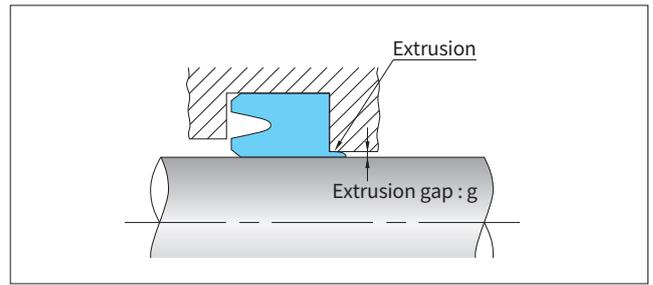
If the extrusion gap is too large for the operating pressure of the packing, the heels of the packing may be damaged by extrusion Fig. 2-1.

In such case, a backup ring is necessary to prevent extrusion of the packing and to improve the durability Fig. 2-2.

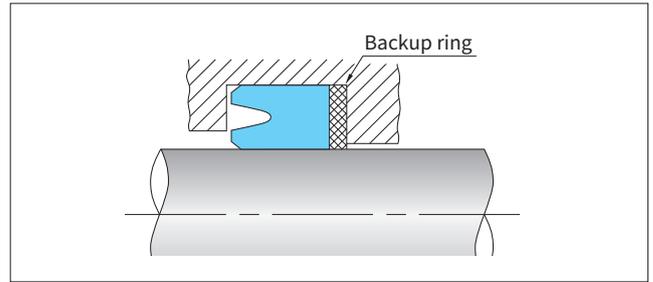
Fig. 2-7 on page 17 shows the relationship between operating pressure and extrusion gap.

b. Mechanism preventing extrusion

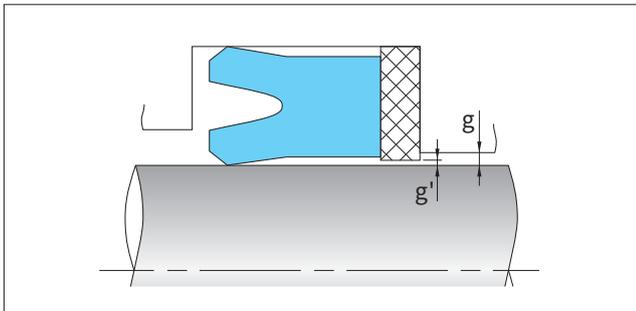
When the pressure is loaded, the backup ring is compressed and deformed to reduce the gap ($g' \rightarrow 0$), which prevents the extrusion of the packing heel Fig. 2-3 and 4.



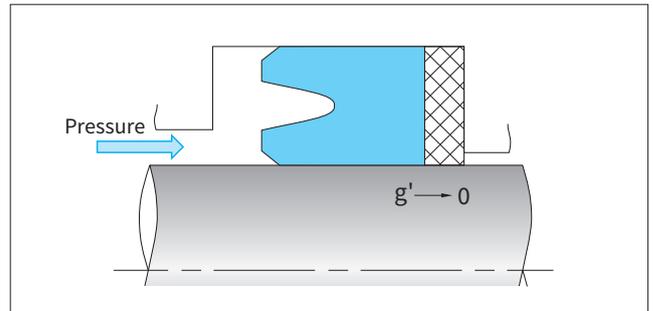
<Fig. 2-1>



<Fig. 2-2>



<Fig. 2-3>



<Fig. 2-4>

c. Application range of backup ring

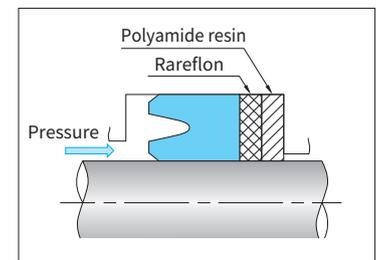
Material characteristics required for a backup ring are easy compression deformation and extrusion resistance under working pressure. Friction resistance and low-friction characteristics are also important because a compressed and deformed backup ring moves in contact with the sliding surface. Considering these requirements, NOK made available two engineered plastic materials;

polytetrafluoro-ethylene (PTFE) resin (NOK rareflon) and polyamide resin. Rareflon is mainly used, while polyamide resin with high rigidity against deformation is used in high pressure conditions. Table 2-7 shows guidelines for material selection and Table 2-8 on page 17 shows the sign and characteristics of these materials and applicable packing type signs.

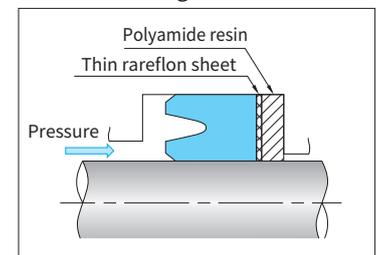
<Table 2-7> Guideline for backup ring material selection

Packing material	Pressure (MPa)				
	0	14	32	35	70
Iron rubber	Polyamide resin				
Nitrile, fluororubber, etc.					
	Rareflon		※ Combination of NOK rareflon and polyamide resin (Fig. 2-5) ※ Thin rareflon sheet (see Fig. 2-6) : Effective in adapting to the current groove or as a measure against abrasion (wear) in the heel section.		

- Remark 1)** This table is a guideline for backup ring material selection. In selecting a packing, conditions other than pressure, such as extrusion gap, temperature, and packing shape, should also be considered.
- Remark 2)** Some of the packing profiles, especially small sizes, may not fit in the appropriate groove.
- Remark 3)** The dimensions of the polyamide resin may change due to moisture adsorption. If moisture-proof packaging is necessary, consult NOK.
- Remark 4)** When using larger diameter (inner diameter (d) exceeding the classification 300mm), consult NOK.



<Fig. 2-5>



<Fig. 2-6> An example of using the Thin rareflon sheet

〈Table 2-8〉 Material code and characteristics of backup ring

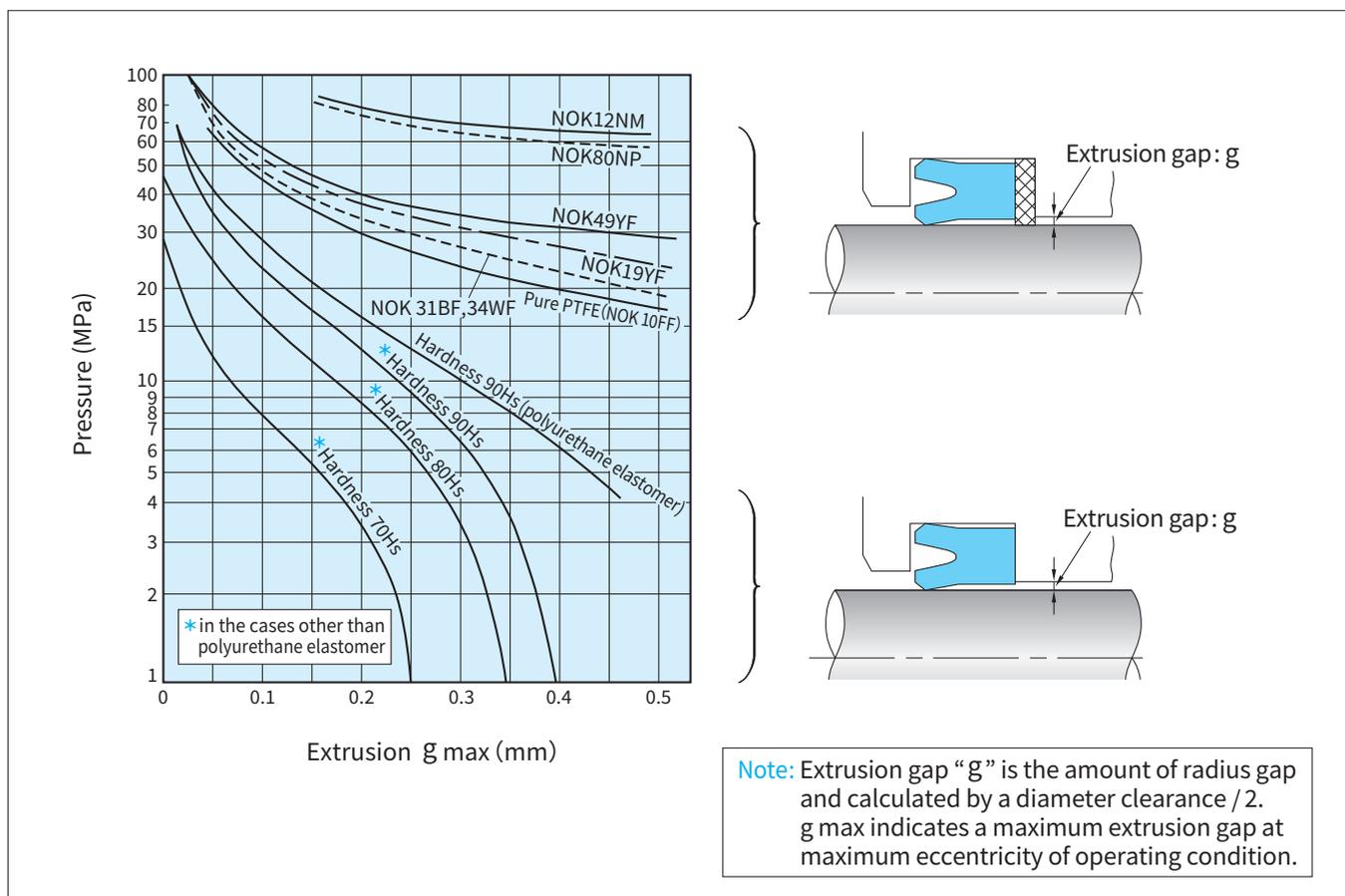
Material	NOK material code	Features	Durability	Applicable packing type sign
Rareflon	10FF	Pure PTFE. This material is excellent in heat resistance, cold resistance, and chemical resistance		OUHR UPH, USH IUH
	31BF	Low frictional resistance material with improved frictional and creep resistance against pure PTFE		
	34WF	Material boasts pure PTFE characteristics with enhanced wear resistance and creep resistance		
	19YF	Standard material with high resistance against extrusion and friction under high pressure operation		
	49YF	Special material with improved extrusion resistance of 19YF		
Polyamide resin	80NP	Material with high resistance against extrusion and friction for high pressure. Its machining manufacturing process makes large diameter seals available	High	ODI, OSI, OUIS, UPI, USI IDI, ISI, IUIS, UNI
	12NM	Material for injection molding having the same performance as 80NP with smaller dimension changes by water absorption		

※ The dimensions of the polyamide resin may change due to moisture adsorption. If the moisture-proof packaging is necessary, consult NOK separately.

d. Extrusion limit

Fig. 2-7 is extrusion limit curves prescribed by JFPS1003 showing extrusions of rubber material for packings. This figure also shows the extrusion limit curves of NOK backup ring materials. The extrusion value of packings

and backup rings varies depending on the temperature, pressure, and operating time. Therefore, please refer to the extrusion limit curves on dimension tables of each type for proper application.



〈Fig. 2-7〉 Extrusion limit curves

※ Extrusion limit may vary depending on the temperature, pressure, and operating time.

Therefore, please consult NOK when using under excessive high temperature and high pressure condition for long term use.

(5) Application range of wear ring

a. The role of wear rings

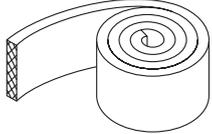
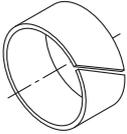
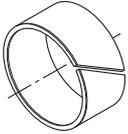
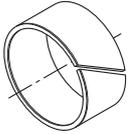
Wear rings are used as bearings on a piston to prevent scuffing the piston and cylinder, minimize the eccentricity, and improve the durability of packings.

b. Selecting the wear rings

Select the shape and material of a wear ring according to the operating condition. For low speed and heavy load operations such as construction equipment, type WR with

fabric reinforced phenolic resin (NOK 12RS·15RS)·resin fiber polyester (NOK 88RS) is recommended. This material has excellent characteristics against compression load. For high speed and light load operations or operations where stick slip may be possible, type RYT of rareflon (NOK 05ZF) or type WRT (NOK 88RS) is recommended. This material has excellent characteristics against friction and wear. Table 2-9 shows the characteristics and application range of each wear ring type.

〈Table 2-9〉 Characteristics and application range of wear ring

Type	RYT	WRT2	WR·WRR	WR
Shape				
Material (NOK sign)	Rareflon (rareflon 05ZF)	Rareflon (rareflon 08GF)	Fabric reinforced phenolic resin (NOK 12RS, 15RS)	Resin fiber polyester (NOK 88RS)
Characteristics	<ul style="list-style-type: none"> ● Low friction and stick slip suppresses wear ring ● Excellent wear resistance under high speed and light load operation ● Supplied in hoop (10m/roll) enabling to be cut according to the cylinder diameter 	<ul style="list-style-type: none"> ● Low friction and stick slip suppresses wear ring ● Excellent wear resistance under high speed and light load operation ● Thin rareflon sheet has a bias cut at one location and any required size for diameter and width is available 	<ul style="list-style-type: none"> ● NOK standard wear ring having excellent compression resistance characteristics ● Excellent wear resistance under low speed and heavy load operation ● Wide range of diameter and width size are available. Each piece has one point biascut. (Sizes other than those on the dimension table are available.) ● Wear rings of rareflon (WRT) are also available 	<ul style="list-style-type: none"> ● Wear ring with high impact strength and lateral load resistance ● Suitable for pistons and rods ● Each piece has one point biascut. (Sizes other than those on the dimension table are available.)
Allowable temperature range	-55~220°C		-55~120°C	-60~130°C

c. Dimension set up of wear rings

RYT (NOK 05ZF) and WR (NOK 12RS) of various diameter sizes and width sizes are prepared so that the customer can select them according to cylinder diameter and groove size. For details, see the dimension table on pages 120 to 125. Consult NOK for WRT2 (NOK 08GF) and WR (NOK 15RS) manufacturing. Set width size “h”, using the following calculation expression.

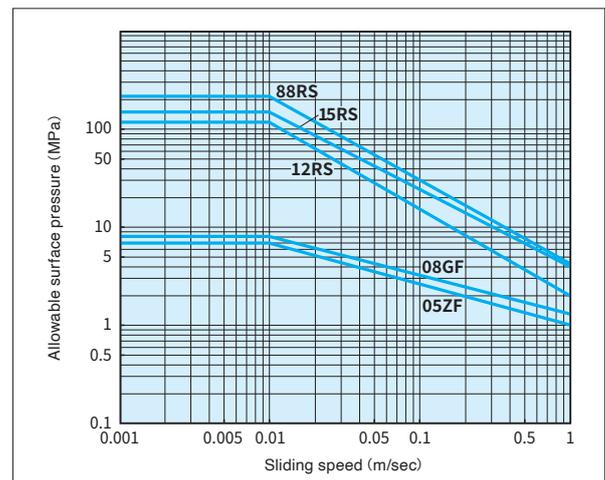
$$h_{\min} \geq \frac{F \cdot S_0}{\sigma \cdot D \cdot \pi \cdot (1/3)} + 2C \cdots \cdots (a)$$

Allowable surface pressure of wear ring material : σ

Fig. 2-8 shows the allowable surface pressure of wear ring material under the oil lubrication condition.

The allowable surface pressure varies with sliding speed.

h min : Minimum width size of wear ring (mm)
 F : Load charged on wear ring (N)
 S₀ : Safety coefficient
 σ : Allowable surface pressure of wear ring material (MPa)
 D : Inner diameter of cylinder tube (mm)
 C : Chamfer width of wear ring (mm)
 (12RS·15RS : C=0.8, 05ZF·08GF : C=0)



〈Fig. 2-8〉 Sliding speed and wear ring material's allowable surface pressure

Load that is applied to wear ring : F

The load that is applied to wear rings is based on the principle of leverage and is calculated using the following calculation expression.

① When lateral load exists

〈Piston〉

$$W \times L_2 = F_1 \times L_1$$

$$F_1 = W \times \frac{L_2}{L_1} \dots\dots(b)$$

〈Rod〉

$$F_2 = F_1 + W$$

$$F_2 = W \times \frac{L_1 + L_2}{L_1} \dots\dots(c)$$

② When lateral load does not exist

〈For both piston and rod〉

$$F^* = (\text{Piston's weight} + \text{rod's weight}) + \frac{1}{200} \times \frac{\pi \cdot D^2}{4} \times P_{\text{max}} \dots\dots(d)$$

$$* F = F_1 = F_2$$

Safety rate : S₀

① When lateral load exists

$$S_0 \begin{cases} \text{When impact lateral load does not exist : 1.5} \\ \text{When impact lateral load exists : 4} \end{cases}$$

② When lateral load does not exist

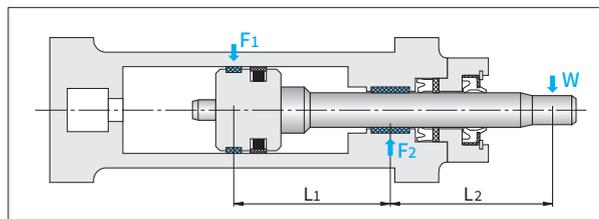
$$S_0 = 1$$

RYT (NOK 05ZF) can be cut according to the inner diameter of the cylinder tube as long as the installation groove dimensions are the same, so there is not necessary to prepare a wear ring for each cylinder size.

For width size h, refer to “c. Setting the dimensions of the wear ring” for calculation and setting.

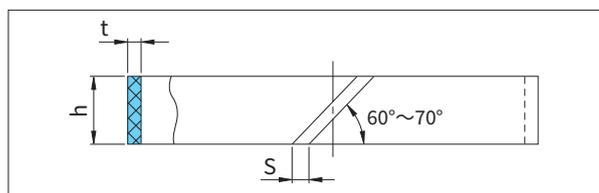
Calculate length “L” which is cut according to the inner diameter of the cylinder, using the following calculation expression:

$$L = \pi \cdot (D - t) - S$$



〈Fig. 2-9〉

- W : Lateral load (N)
- L1, L2 : Distance (mm)
- D : Inner diameter of cylinder tube (mm)
- P max : Maximum pressure (MPa)
- F1 : Load that is applied to wear ring for piston (N)
- F2 : Load that is applied to wear ring for rod (N)



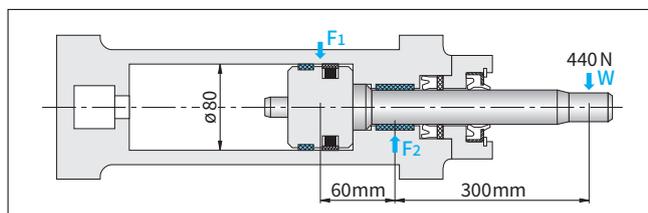
〈Fig. 2-10〉

- D : Inner diameter of cylinder tube (mm)
- t : Thickness of wear ring (mm)
- S : Clearance of wear ring (mm)

Note: For t and S, see the dimension table on page 120.

Example Calculation example of width size of wear ring

Calculate the width size of wear ring (type: WR, material: 12RS) for the piston, based on the following using condition.



〈Conditions〉

Item	Description
Maximum lateral load (W)	440 N
Maximum rod length (L2)	300 mm
Minimum bearing clearance (L1)	60 mm
Speed (V)	0.3 m/s
Cylinder tube inner diameter (D)	ø80
Impact lateral load	Yes

Step 1 What is the load applied to the wear ring?

First, calculate load F1 for the wear ring. Since the above condition includes lateral load, calculate the load that is applied to the wear ring, using expression (b).

$$F_1 = W \times \frac{L_2}{L_1} = 440 \times \frac{300}{60} = 2200 \text{ (N)}$$

Step 2 What is the allowable surface pressure of wear ring material?

The line drawing in Fig. 2-8 shows that the allowable surface pressure of 12RS material at V=0.3 m/s is 6 MPa.

Step 3 What is the dimension of Step 3 wear ring width?

Assign the values obtained in the above steps (1) and (2) to the expression (a) that calculates width size “h” (minimum). Also, when impact lateral load exists, set the safety rate S₀ to 4.

$$h_{\text{min}} \geq \frac{2200 \times 4}{6 \times 80 \times \pi \times (1/3)} + 1.6$$

$$= 19.1 \text{ mm}$$

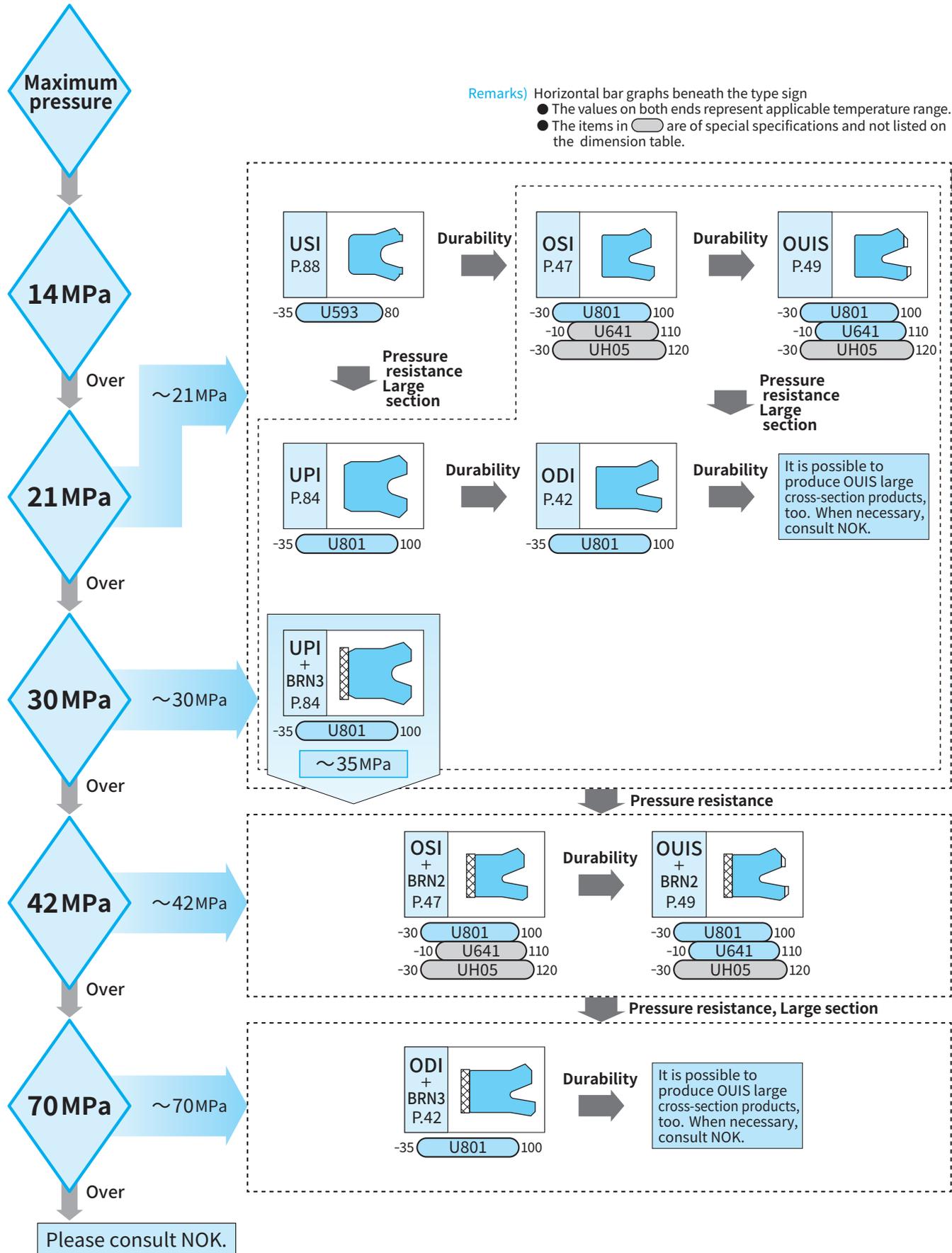
From the above, 20 mm is obtained for the width size of wear ring for the piston under the above conditions. Note: When setting width size, round up the value after the decimal point.

(6) Flow chart for selecting the packing type

NOK provides a wide range of seals in various conditions. A selection flow chart is shown to determine the optimum seal.

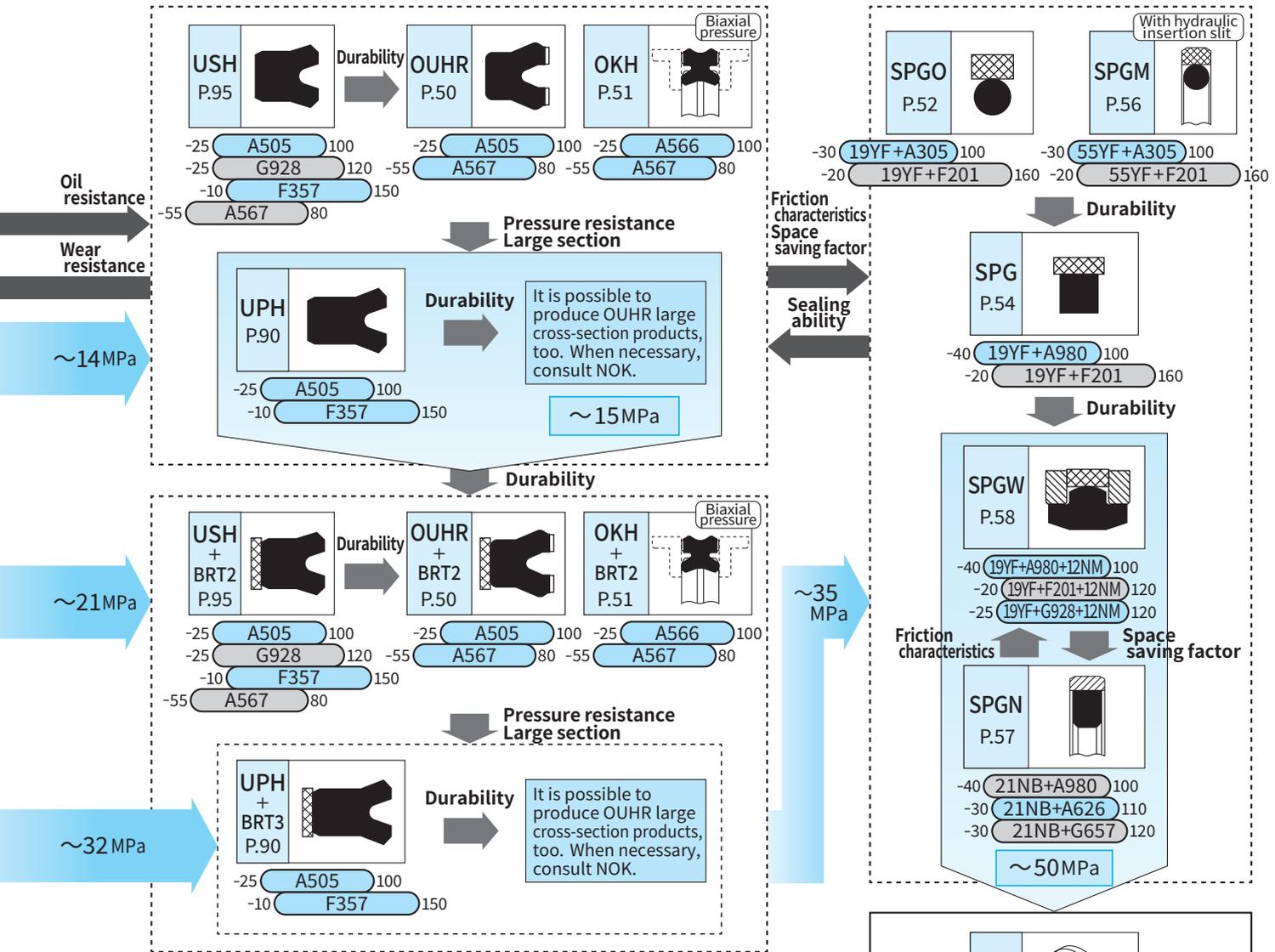
1. After selecting the packing type, check if the working temperature, the speed, and the stroke are in the applicable range for each seal, by referring to pages 6 and 15.

a. Piston seals <Fig. 2-11>



2. Check the affinity between the oil that is used and the seal material, refer to Table 3-1 and Table 3-2 on pages 26 to 29.
3. Check the sealing system of the equipment and model that are used, by referring to page 39 and to the use example in Chapter D.

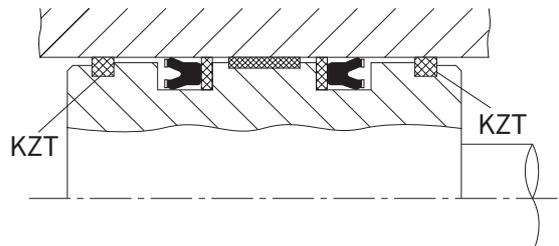
When using a special oil or using the under the condition outside the applicable range, consult NOK separately.



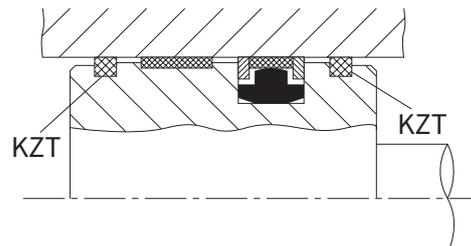
In combination with the contamination seal, the piston seal prevents damage due to foreign objects or adiabatic compression, thus being able to improve the durability of the piston seal. (See “Burnout phenomenon” on page 152 to 153.)

Example of sealing system using contami seals

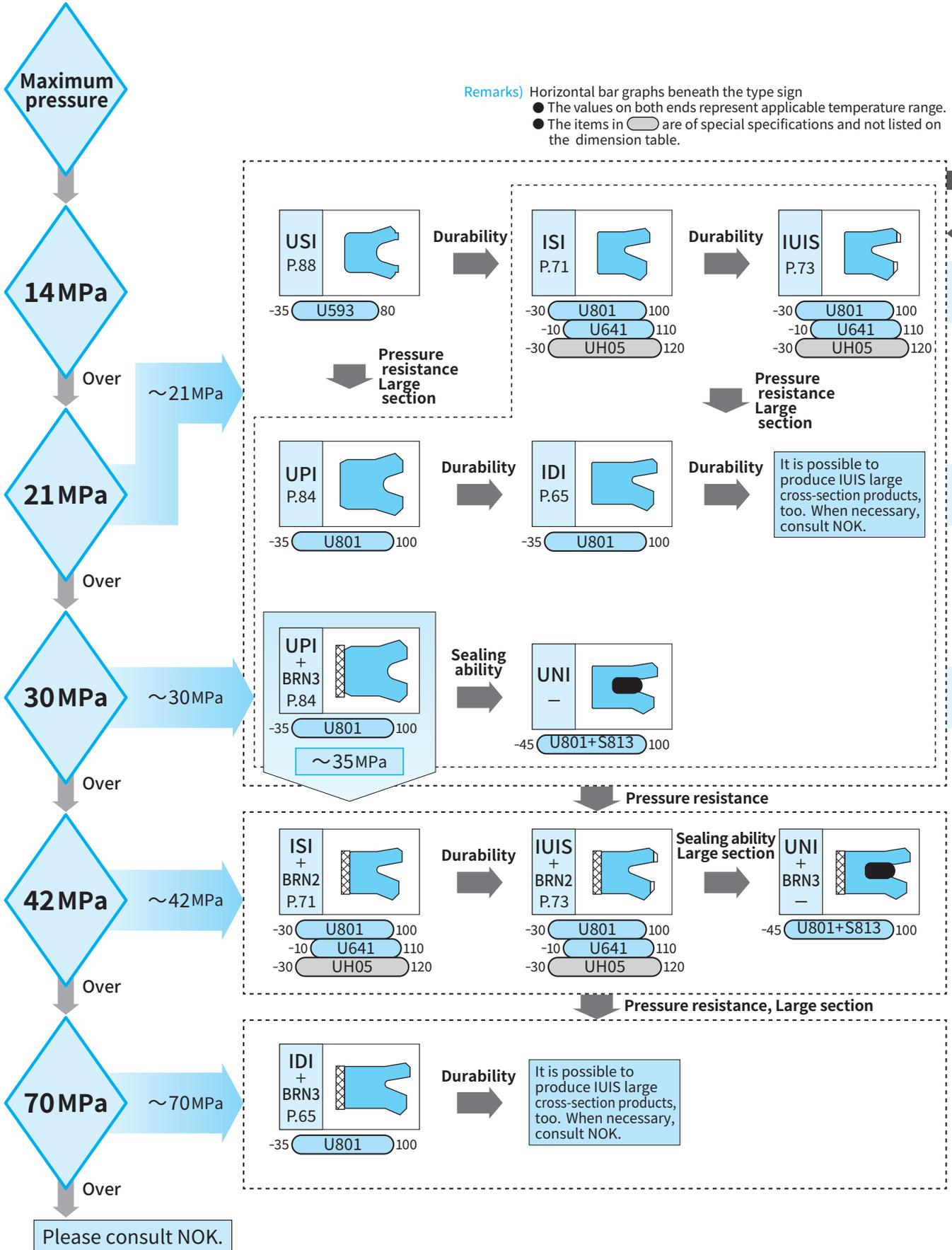
Example of system 1

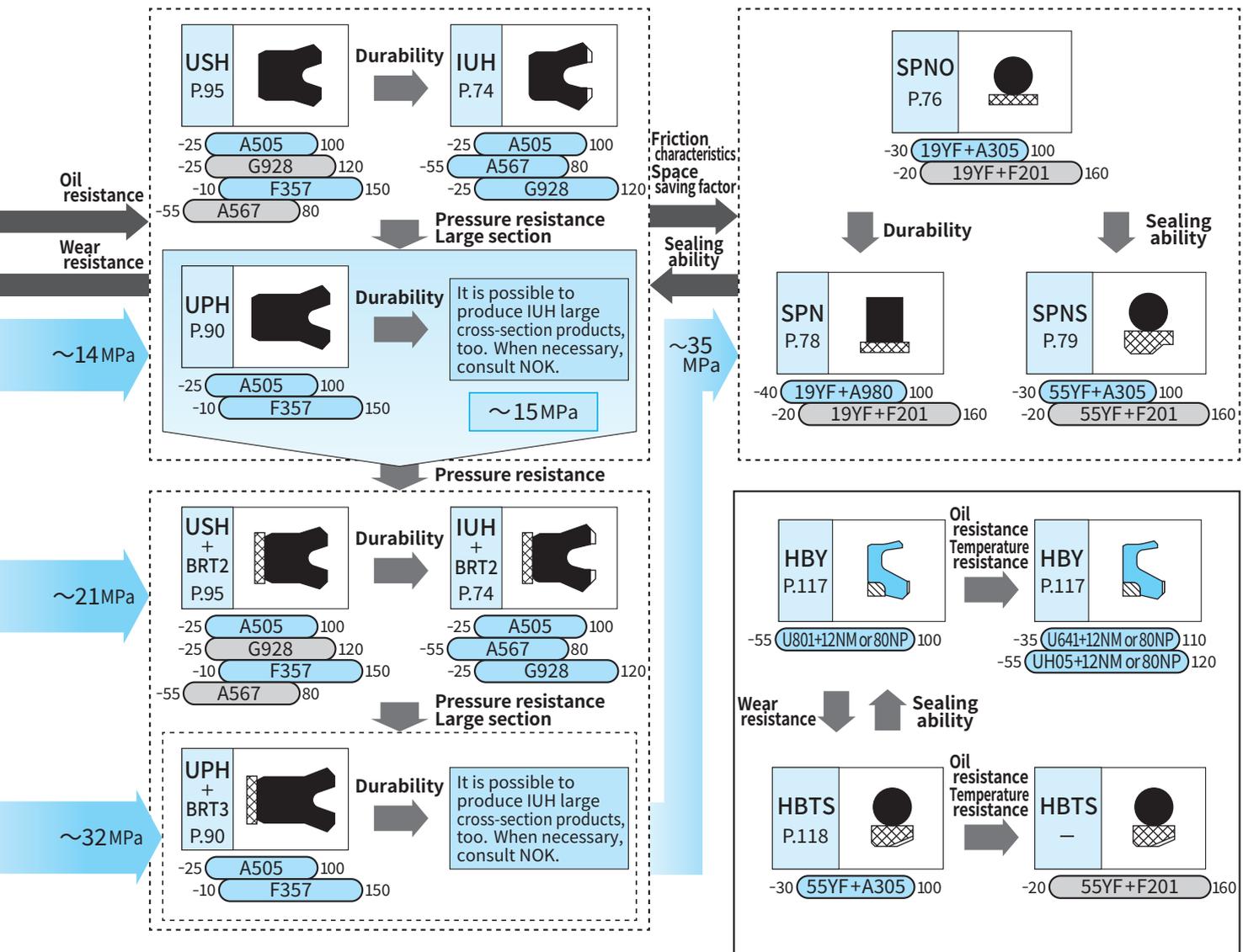


Example of system 2



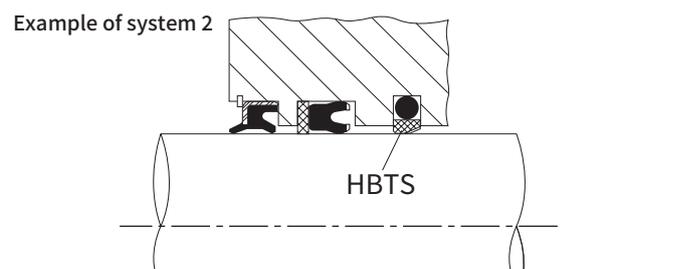
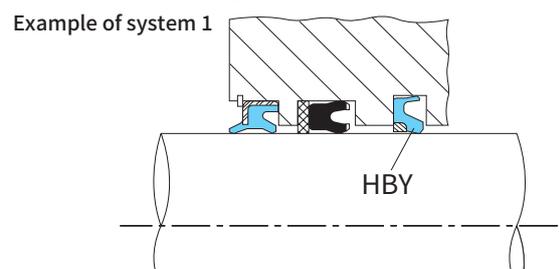
b. Rod seals (Fig. 2-12)





In combination with the buffer ring, the rod seal is effective in buffering the impact pressure, in inhibiting the oil temperature transfer, and in reducing the sliding heat generation, thus being able to improve the durability of the rod seal. (See "Buffer ring" on page 150 to 151.)

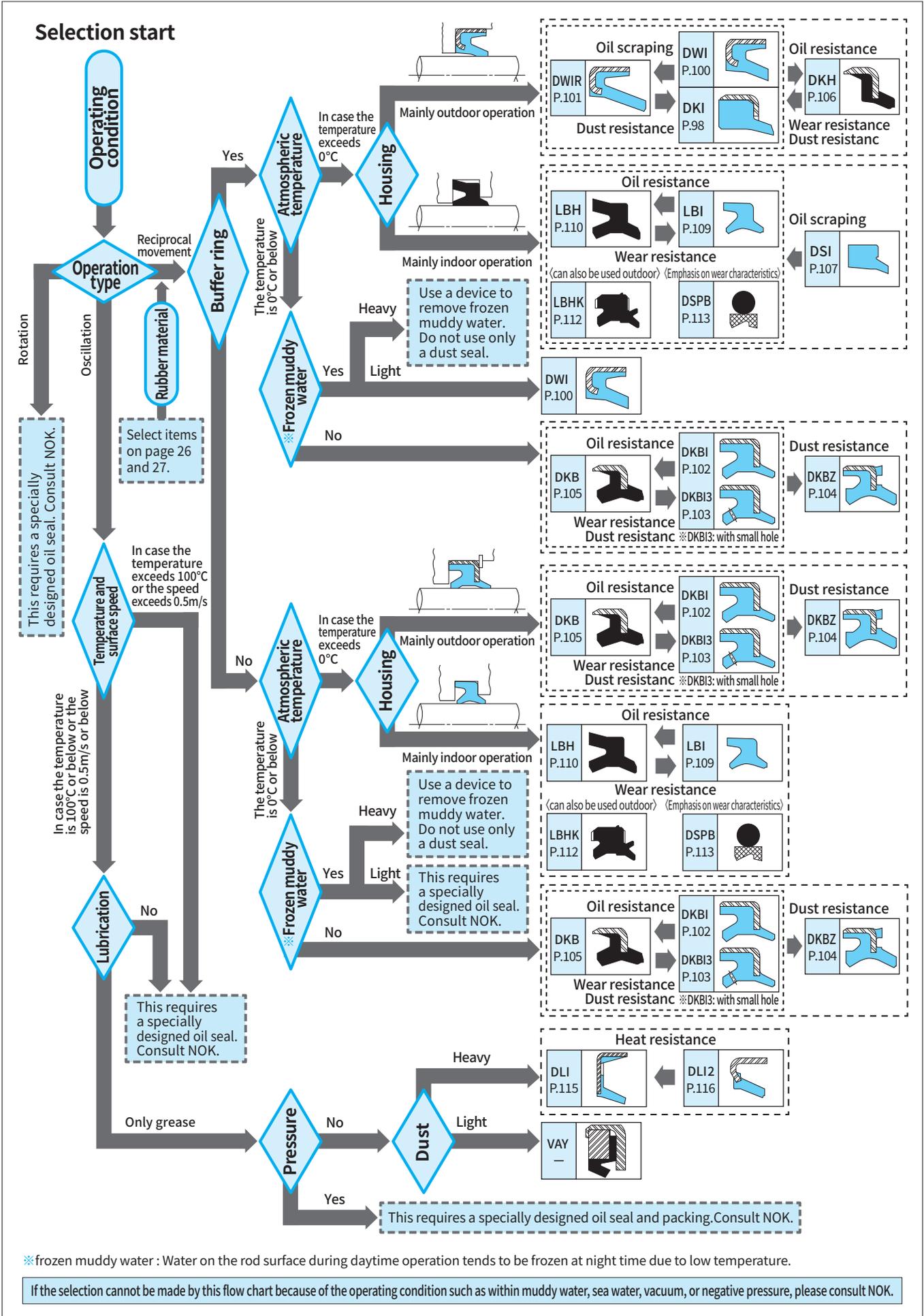
Example of sealing system using buffer rings



- ※1. When the minimum pressure that is applied is usually 3 MPa or larger, the life of the seal is decreased, so we recommend that the customer use the seal in combination with the buffer ring.
- ※2. In combination with the buffer ring, the customer can use the seal under high pressure. For example, in the case of IUH type packing, up to 34.3 MPa can be applied (see Hydraulic excavator, rod sealing system on page 34).

c. Dust seal

〈Fig. 2-13〉 Flow chart for selecting dust seal types



3. Types and Features of NOK Packings

NOK supplies several different types of packing materials to suit various applications. Table 3-1 shows the type and characteristics of rubber materials and Table 3-2 shows the type and characteristics of resin material. Standard materials are offered for items in this catalog to best meet the operating conditions. The standard materials for each model refer to page 6, chapter 2.

〈Table 3-1〉 Types and characteristics of NOK rubber material

Material	NOK material code	Property							Resistance								
		Hardness (Durometer A) (Instant value)	Tensile strength (MPa)	100% modulus (MPa)	Elongation (%)	Permanent compression set (%)	Hardness change by air oven aging test (point)	Low temperature brittleness TR ₁₀ (°C)	Lubricating oil (agent)								
									Test condition	Engine oil	Gear oil	Machine oil	Spindle oil	Refrigerator oil	Cup grease	Lithium grease	Silicon grease
Nitrile rubber [NBR]	A102 (Black)	60	17	2.6	470	32 (B)	+7 (B)	-22	○	○	○	○	○	○	○	○	○
	A103 (Black)	70	19	4.5	430	33 (B)	+5 (B)	-22	○	○	○	○	○	○	○	○	○
	A104 (Black)	80	19	7.3	340	31 (B)	+5 (B)	-21	○	○	○	○	○	○	○	○	○
	A305 (Black)	70	21	4.3	340	10 (B)	+2 (B)	-23	○	○	○	○	○	○	○	○	○
	A402 (Black)	60	13	2.3	440	13 (B)	+3 (B)	-26	○	○	○	○	○	○	○	○	○
	A505 (Black)	90	21	15	170	31 (B)	+2 (B)	-22	○	○	○	○	○	○	○	○	○
	A527 (Black)	85	20	12	160	18 (B)	+3 (B)	-57	○	○	○	○	○	○	○	○	○
	A566 (Black)	90	17	14	130	15 (B)	+3 (B)	-34	○	○	○	○	○	○	○	○	○
	A567 (Black)	82	17	16	130	20 (B)	+4 (B)	-55	○	○	○	○	○	○	○	○	○
	A626 (Black)	70	18	5	260	13 (B)	+7 (B)	-35	○	○	○	○	○	○	○	○	○
	A795 (Black)	80	20	7.8	400	48 (B)	+6 (B)	-11	○	○	○	○	○	○	○	○	○
	A980 (Black)	80	14	11	150	17 (B)	+3 (B)	-52	○	○	○	○	○	○	○	○	○
Hydrogenated nitrile rubber [H-NBR]	G869 (Black)	90	27	13	220	19 (C)	+2 (C)	-28	○	○	○	○	○	○	○	○	○
	G928 (Black)	85	20	13	200	9 (C)	+1 (C)	-22	○	○	○	○	○	○	○	○	○
Fluoro rubber [FKM]	F201 (Black)	70	14	5	230	7 (D)	0 (D)	-15	○	△	○	○	○	○	○	○	○
	F357 (Black)	90	17	12	140	18 (D)	+1 (D)	-15	○	△	○	○	○	○	○	○	○
	F975 (Brown)	80	11	7.9	220	33 (D)	0 (D)	-18	○	△	○	○	○	○	○	○	○
Silicon rubber [VMQ]	S813 (Brown)	70	7.2	5.4	150	16 (D)	+1 (D)	-49	○	△	○	△	△	△	△	△	×
Iron rubber [PUR]	U451 (Green)	92	43	11	500	30 (A)	0 (B)	-30	○	△	○	○	○	○	○	○	○
	U593 (Green)	92	29	17	200	28 (A)	0 (B)	-34	○	△	○	○	○	○	○	○	○
	U641 (Blue)	94	41	15	370	36 (A)	0 (B)	-18	○	△	○	○	○	○	○	○	○
	U652 (Blue)	96	47	17	380	35 (A)	0 (B)	-17	○	△	○	○	○	○	○	○	○
	U801 (Yellowish white)	94	52	13	500	32 (A)	0 (B)	-29	○	△	○	○	○	○	○	○	○
	UH08 (Brown)	90	37	9.5	340	29 (A)	0 (B)	-26	○	△	○	○	○	○	○	○	○
	UK807 (Navy blue)	94	44	12	470	34 (A)	+1 (B)	-27	○	△	○	○	○	○	○	○	○
	UH05 (Purple)	95	51	19	430	36 (A)	0 (B)	-27	○	△	○	○	○	○	○	○	○

Resistivity standards ○ : Very good

○ : Good for most applications*

△ : Fair, can be used if no other materials exist, otherwise not recommended*

*Please consult NOK before using these materials

× : Not recommended

— : No resistivity data available or the resistivity varies depending on the ingredient. Please consult NOK.

Resistance																	Features	Recommended NOK types								
Hydraulic fluid oil							Water and cutting oil				Chemical															
Turbine oil	Oil+water emulsion type	Water + glycol type	Water soluble hydraulic fluid oil	Raw resolution type hydraulic fluid oil	Phosphate ester type	Silicon oil	Brake fluid	Torque converter oil	Water	Steam and hot water	Water soluble cutting oil	Chloric cutting oil	Sulfuric cutting oil	20% hydrochloric acid solution	30% sulfuric acid solution	10% nitric acid solution			30% sodium hydroxide solution	Benzene	Alcohol	Acetone	Heat resistance	Cold-temperature resistance	Wear resistance	
○	○	○	○	○	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of C shaped packings	CPH
○	○	○	○	○	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of O ring (JIS B 2401 1 type A)	CPH
○	○	○	○	○	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of back ring for large diameter combination seals	CPH・DKH・VAY
○	○	○	○	○	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of nitrile rubber packings	SPGC・SPNC・SPNO・SPGO・SPNS・DSPB
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of back ring for large diameter combination seals	SPG
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Material of cold resistant packing (for general petroleum hydraulic fluid oil <small>Remark 2</small>)	IUH・UPH・OUHR・LBH・LBHK・V96H・USH・CPH
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Material of cold resistant packing (mainly for Low temperature petroleum hydraulic fluid oil <small>Remark 3</small>) ※Material for improved elongation compared to A903.	OUHR・IUH・USH・LBH・LBHK
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of OKH shaped packings	OKH
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of back ring (O ring) for buffer rings	OUHR・IUH・USH・LBH・LBHK
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Standard material of dust seals for reciprocal movement	HBTS
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	△	○	○	Standard material of back ring for combined seals	DKB・DKH
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Heat, water & water vapor resistant special nitrile rubber	SPG・SPGW・SPN・DKB
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Heat resistant material of back ring for combined seals	(Packings)
○	○	○	○	△	×	△	△	△	△	△	○	×	○	△	○	×	○	×	○	×	○	○	○	○	Special nitrile rubber for better heat and wear resistance	SPGW・IUH
○	△	△	△	○	○	△	△	△	△	△	○	○	○	△	×	△	○	×	○	×	○	△	○	○	Heat resistant material of dust seals for reciprocal movement	HBTS・SPG・SPGW・SPGC・SPNC・SPNO・SPN・SPNS・DSPB
○	△	△	△	○	○	△	△	△	△	△	○	○	○	△	×	△	○	×	○	×	○	△	○	○	Standard material for heat resistant packings	UPH・USH・LBH・V96H
○	△	△	△	○	○	△	△	△	△	△	○	○	○	△	×	△	○	×	○	×	○	△	○	○	Heat resistant material of dust seals for reciprocal movement	DKB・DKH
○	○	○	-	-	○	×	○	○	△	△	-	-	△	○	×	×	×	○	△	○	○	○	△	△	Material of back ring for U packings	UNI
○	×	×	×	○	×	○	○	△	△	△	×	×	×	×	×	×	×	△	×	○	○	○	○	○	Material of hinge pin dust seals	DLI2
○	×	×	×	○	×	○	○	△	△	△	×	×	×	×	×	×	×	△	×	○	○	○	○	○	Iron rubber improved for better cold resistance	USI・LBI・DLI
○	△	△	△	○	×	○	○	△	△	△	-	-	×	×	×	×	×	△	×	○	△	○	○	○	Iron rubber improved for better heat and water resistance	ISI・OUIS・IUIS・HBY
○	△	△	△	○	×	○	○	△	△	△	-	-	×	×	×	×	×	△	×	○	△	○	○	○	Material for center swivel seals	CSI
○	×	×	×	○	×	○	○	△	△	△	×	×	×	×	×	×	×	△	×	○	○	○	○	○	Standard material of Iron rubber packings	ODI・OSI・CPI・IDI・ISI・UNI・UPI・IUIS・DKI・DKBI・DKBZ・DWI・CSI・DSI・HBY・DWIR・DLI
○	△	△	△	○	×	○	○	△	△	△	-	-	×	×	×	×	×	△	×	○	○	○	○	○	Material for improving installation to the integrated groove	(Packings)
○	×	×	×	○	×	○	○	△	△	△	×	×	×	×	×	×	×	△	×	○	○	○	○	○	Heat & cold resistant wide-range iron rubber	(Packings)
○	△	△	△	○	×	○	○	△	△	△	-	-	×	×	×	×	×	△	×	○	○	○	○	○	Ultra heat & cold resistant wide-range iron rubber ※This material is the most heat-resistant among iron rubbers.	HBY

Remark 1 The property value is the measured value, not the guaranteed value.
Remark 2 A527 cannot be used for petroleum-derived work oil in low temperatures. (Rubber material may swell and soften, lowering the sealing performance.) When using petroleum-derived work oil in low temperatures, use A567.
Remark 3 A567 can be used for both general petroleum-derived work oil and petroleum-derived operating oil in low temperatures, however, when using general petroleum-derived work oil, we recommend using A527 which has superior oil-resistant properties. (Material for improving the extension of A903)

〈Table 3-2〉 Types and characteristics of NOK resin material

Material	NOK material code	Property					Resistance									
		Hardness	Tensile strength (MPa)	Elongation (%)	Compression strength (MPa)		Applicable temperature range (°C)	Lubricating oil (agent)								
					2.5% deformation	10% deformation		Engine oil	Gear oil	Machine oil	Spindle oil	Refrigerator oil	Cup grease	Lithium grease	Silicon grease	
Rareflon [PTFE]	10FF (White)	58 (Durometer D)	38	400	9	16	-200 ~ 260	○	○	○	○	○	○	○	○	○
	34WF (White)	65 (Durometer D)	27	390	12	19	-200 ~ 260	○	○	○	○	○	○	○	○	○
	19YF (Brown)	70 (Durometer D)	20	180	14	22	-200 ~ 260	○	○	○	○	○	○	○	○	○
	49YF (Brown)	70 (Durometer D)	18	140	16	25	-200 ~ 260	○	○	○	○	○	○	○	○	○
	55YF (Brown)	70 (Durometer D)	20	200	16	23	-200 ~ 260	○	○	○	○	○	○	○	○	○
	11YF (Black)	66 (Durometer D)	19	320	12	18	-200 ~ 260	○	○	○	○	○	○	○	○	○
	31BF (Black)	66 (Durometer D)	21	330	13	20	-200 ~ 260	○	○	○	○	○	○	○	○	○
	05ZF (Brown)	68 (Durometer D)	25	290	12	20	-200 ~ 260	○	○	○	○	○	○	○	○	○
	08GF (Black)	68 (Durometer D)	20	260	14	22	-200 ~ 260	○	○	○	○	○	○	○	○	○
Polyamide resin [PA]	63NP (Blue)	109 (Rockwell R)	42	200	20	49	-55 ~ 100	○	○	○	○	○	○	○	○	○
	80NP (Black)	120 (Rockwell R)	79	15	39	73	-55 ~ 120	○	○	○	○	○	○	○	○	○
	12NM (Navy blue)	123 (Rockwell R)	102	8	38	100	-55 ~ 140	○	○	○	○	○	○	○	○	○
	21NB (Gray)	122 (Rockwell R)	194	3	94	155	-55 ~ 130	○	○	○	○	○	○	○	○	○
Fabric reinforced phenolic resin	12RS (Dark brown)	105 (Rockwell M)	*105 *Flex strength	—	*207 *Destruction	—	-55 ~ 120	○	○	○	○	○	○	○	○	○
	15RS (Black)	105 (Rockwell M)	*112 *Flex strength	—	*234 *No destruction	—	-55 ~ 120	○	○	○	○	○	○	○	○	○
Resin fiber polyester	88RS (Light blue)	98 (Rockwell M)	*85 *Flex strength	—	*316 *No destruction	—	-55 ~ 120	○	○	○	○	○	○	○	○	○

Resistivity standards ○ : Very good

○ : Good for most applications※

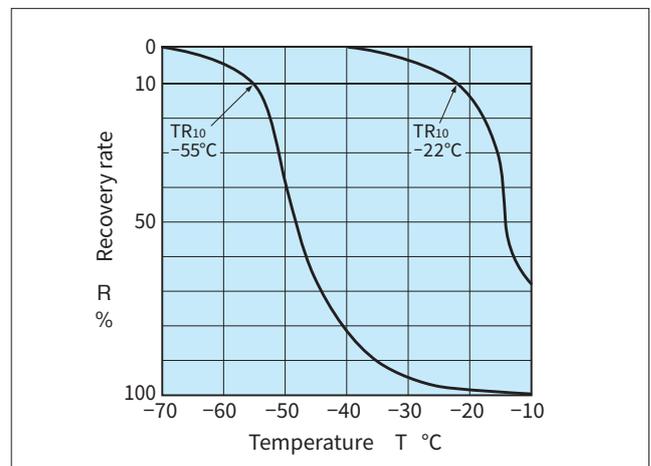
△ : Fair, can be used if no other materials exist, otherwise not recommended※

Remark) The property value is the measured value, not the guaranteed value.

Low temperature retraction of rubber material

Apply to TR₁₀ value

TR₁₀ value is used to judge low temperature capability of material. TR is an abbreviation for “Temperature-Retraction” as described by ASTM D 1329 and expresses the distortion recovery ability in low temperature. This is roughly the same as recovery of rubber-like elastomer. TR₁₀ value is the temperature where initial distortion has recovered by 10%. Fig. 3-1 shows an example of measuring this value.



〈Fig. 3-1〉 TR graph

TR₁₀ values can indicate allowable low temperature service range of rubber material for packings. For allowable low temperature service range of specific types of packings, refer to page 6 to 11.

※Please consult NOK before using these materials

Resistance																			Features	Recommended NOK types				
Hydraulic fluid oil						Water and cutting oil			Chemical						Heat resistance	Cold-temperature resistance	Wear resistance							
Turbine oil	Oil+water emulsion type	Water + glycol type	Water soluble hydraulic fluid	Raw resolution type hydraulic fluid	Phosphate ester type	Silicon oil	Brake fluid	Torque converter oil	Water	Steam and hot water	Water soluble cutting oil	Chloric cutting oil	Sulfuric cutting oil	20% hydrochloric acid solution				30% sulfuric acid solution			10% nitric acid solution	30% sodium hydroxide solution	Benzene	Alcohol
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	△	Pure PTFE. This material is the standard backup ring material for the O-ring.	(Backup ring)
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	This material is a rareflon material having better creep resistance than the pure PTFE.	(Backup ring)
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Rareflon material with high extrusion and wear resistance.	BRT2,3•SPG•SPGW•SPGO•SPN•SPNO
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Special material improving extrusion resistance of 19YF.	(Combined seals, backup ring)
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	This material is a special material that can be used in low lubrication areas.	SPGM•SPNS•HBTS
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	This material is a special material that can be used for water.	DSPB
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Rareflon material with better wear and creep resistance than with pure PTFE.	SPGC•SPNC•BRT2,3
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Bearing material containing bronze for high speed and light load.	KZT•RYT
○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	This material is a bearing material excellent in load resistance and abrasion resistance.	(Piston seal, wear ring)
○	○	○	○	○	○	○	○	○	△	△	△	○	○	○	○	○	○	○	○	△	○	○	Material of backup ring for special seals.	BRL
○	○	○	○	○	○	○	○	○	△	△	△	○	○	○	○	○	○	○	○	△	○	○	Material of high pressure backup ring with high-wear resistance and mechanical strength. Its cutting manufacturing process makes large diameter seals available.	BRN2,3•SPGW•HBY
○	○	○	○	○	○	○	○	○	△	△	△	○	○	○	○	○	○	○	○	△	○	○	Material for injection molding having the same performance as 80NP with smaller dimension changes by water absorption	HBY•SPGW
○	○	○	○	○	○	○	○	○	△	△	△	○	○	○	○	○	○	○	○	△	○	○	Seal ring material with special filling, offering excellent wear resistance and mechanical strength.	SPGN
○	△	○	△	○	○	○	△	○	△	△	△	○	○	○	○	○	○	○	○	○	○	○	Material for bearing with excellent wear resistance and mechanical strength	(Wear ring)
○	△	○	△	○	○	○	△	○	△	△	△	○	○	○	○	○	○	○	○	○	○	○	This material is a bearing material for improving the load resistance and abrasion resistance of 12RS.	(Wear ring)
○	△	○	△	○	○	○	△	○	△	△	△	○	○	○	○	○	○	○	○	○	△	○	Bearing material with improved load resistance and easier assembly than the 12RS and 15RS.	(Wear ring)

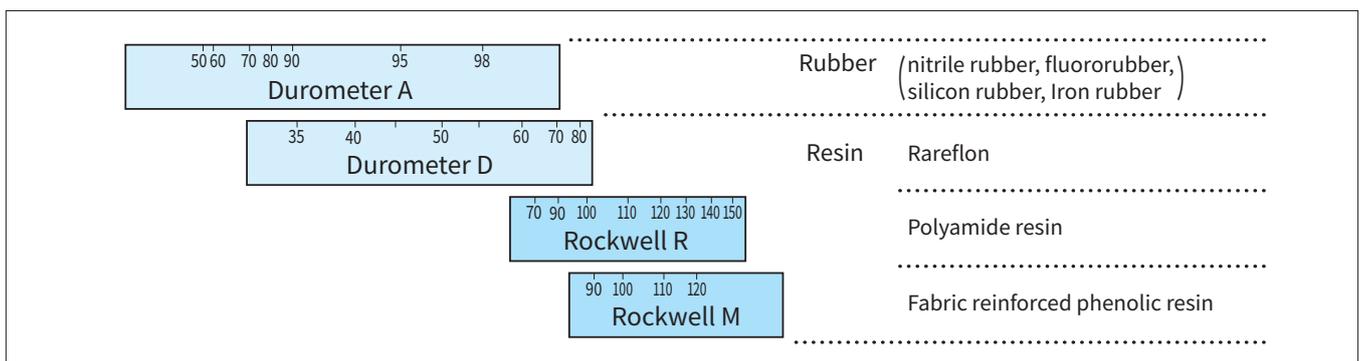
Hardness of the material

Hardness of the material indicates pressure resistance and strength of a seal, including tensile strength. For example, the pressure resistance of rubber for a packing (extrusion resistance) is indicated by the hardness of the rubber (refer to Fig. 2-7 on page 17).

The testing method for material hardness is expressed by the industrial standard for each material as shown in Table 3-3. In this catalog, rubber hardness is expressed by spring-type hardness (JIS A) of JIS K 6253. Fig. 3-2 shows the correlation of each material hardness.

〈Table 3-3〉 Testing method of material hardness

Vulcanized rubber	Rareflon (polytetrafluoroethylene resin)	Polyamide resin (thermoplastics resin)	Phenolic resin (thermosetting resin)
JIS K 6253	JIS K 7215	JIS K 7202	JIS K 6911

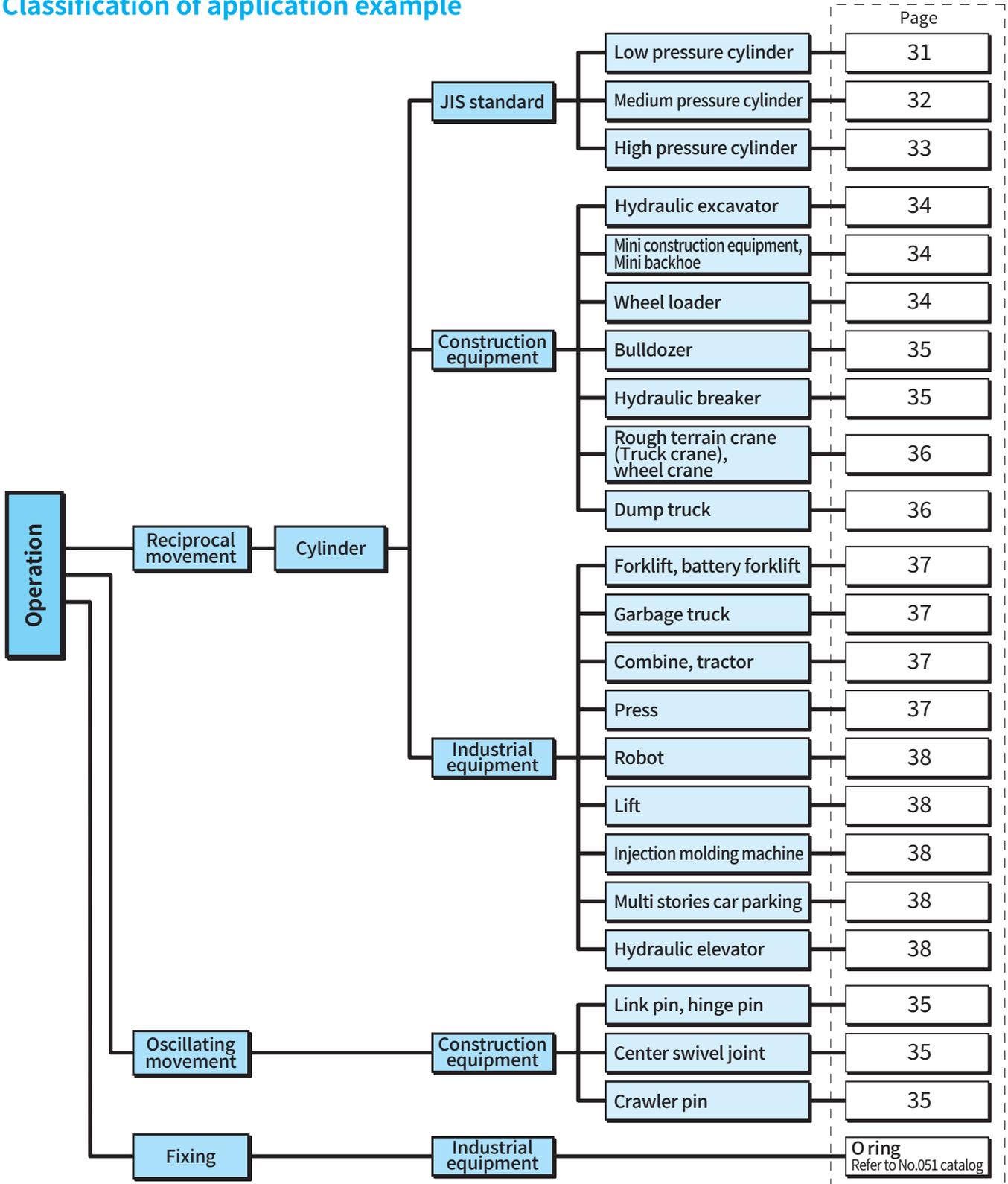


〈Fig. 3-2〉 Correlation of each material hardness

4. Application Examples of NOK Packing

The following classification shows typical application examples of various hydraulic equipment seals, including packings for reciprocal movement, dust seals for oscillating and rotating movement, and oil seals. These examples are NOK's recommended applications based on its significant experience in the market. Some special types without dimension tables are introduced here. If any types and materials with unique specifications are required, please consult NOK.

Classification of application example



JIS standard cylinder (Old JIS B 8354:1992)

Hydraulic cylinder for low pressure : 7 MPa or below

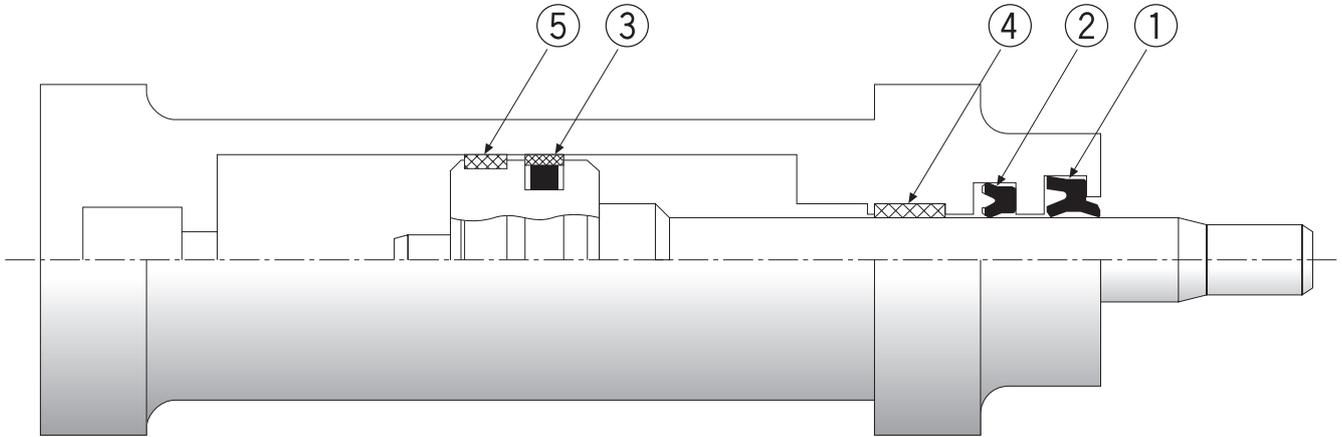
◆Applicable temperature range: Standard specifications -20~80°C
Heat resistant specifications -10~120°C
Low temperature specifications -55~60°C

※ Old JIS B 8354 : 1992, the ambient temperature range is prescribed from -5 to 80°C. NOK, however, provides packings applicable for a wider range of temperature.

Remark) Items having — sign in the column of dimension table indicate special specifications. If the data of such items are required, please consult NOK.

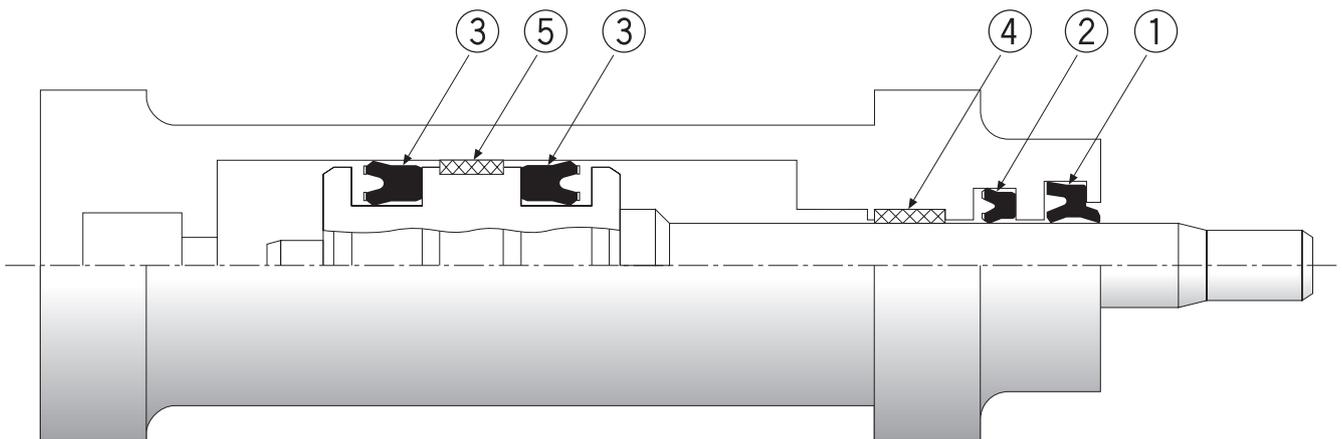
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Recommended example 1



Item	Standard specifications			Heat resistant specifications			Low temperature specifications			To reduce the sliding friction, The SPG is employed for the piston packing and small section U packing for rod packing. For the dust seal of low temperature application, instead of LBH, we recommend DKB with a metal case that has low shrinkage percentage of diameter at low temperature.
	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	
① Dust seal	LBH	A505	110	LBH	F357	110	DKB	A980 SPCC	—	
② Rod packing	IUH	A505	74	USH	F357	95	IUH	A567	74	
③ Piston packing	SPG	19YF A980	54	SPG	19YF F201	—	SPG	19YF A980	54	
④ Wear ring	RYT	05ZF	120	RYT	05ZF	120	RYT	05ZF	120	
⑤ Wear ring	RYT	05ZF	120	RYT	05ZF	120	RYT	05ZF	120	

Recommended example 2



Item	Standard specifications			Heat resistant specifications			Low temperature specifications			The U packings are employed to improve the sealing ability of piston. For the dust seal of low temperature application, instead of LBH, we recommend DKB with a metal case that has low shrinkage percentage of diameter at low temperature.
	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	
① Dust seal	LBH	A505	110	LBH	F357	110	DKB	A980 SPCC	—	
② Rod packing	IUH	A505	74	USH	F357	95	IUH	A567	74	
③ Piston packing	OUHR	A505	50	USH	F357	95	OUHR	A567	50	
④ Wear ring	RYT	05ZF	120	RYT	05ZF	120	RYT	05ZF	120	
⑤ Wear ring	RYT	05ZF	120	RYT	05ZF	120	RYT	05ZF	120	

JIS standard cylinder (Old JIS B 8354:1992)

4

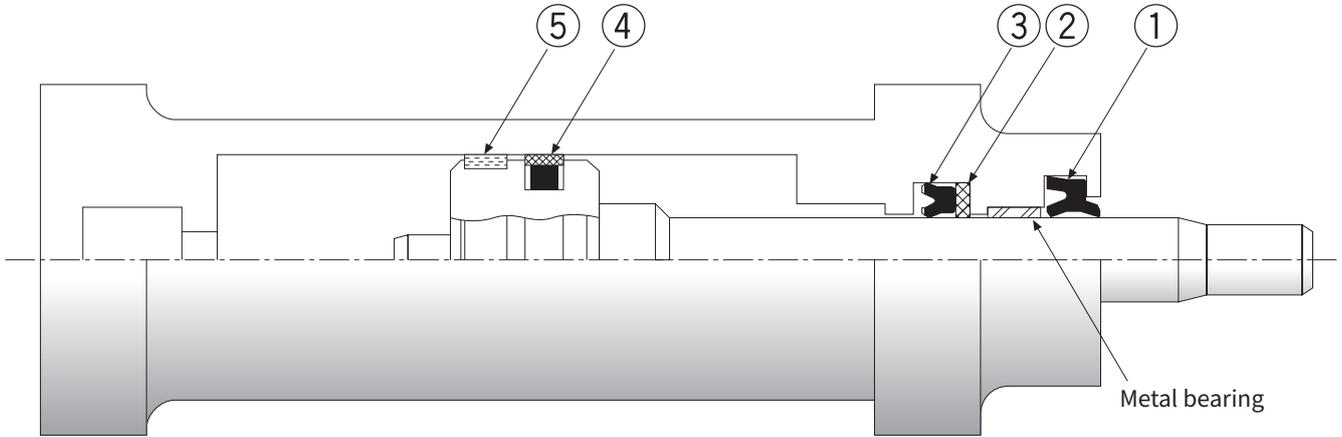
Hydraulic cylinder for medium pressure : **14 MPa or below**

◆Applicable temperature range: Standard specifications -20~80°C
Heat resistant specifications -10~120°C
Low temperature specifications -55~60°C

※ Old JIS B 8354 : 1992, the ambient temperature range is prescribed from -5 to 80°C. NOK, however, provides packings applicable for a wider range of temperature.

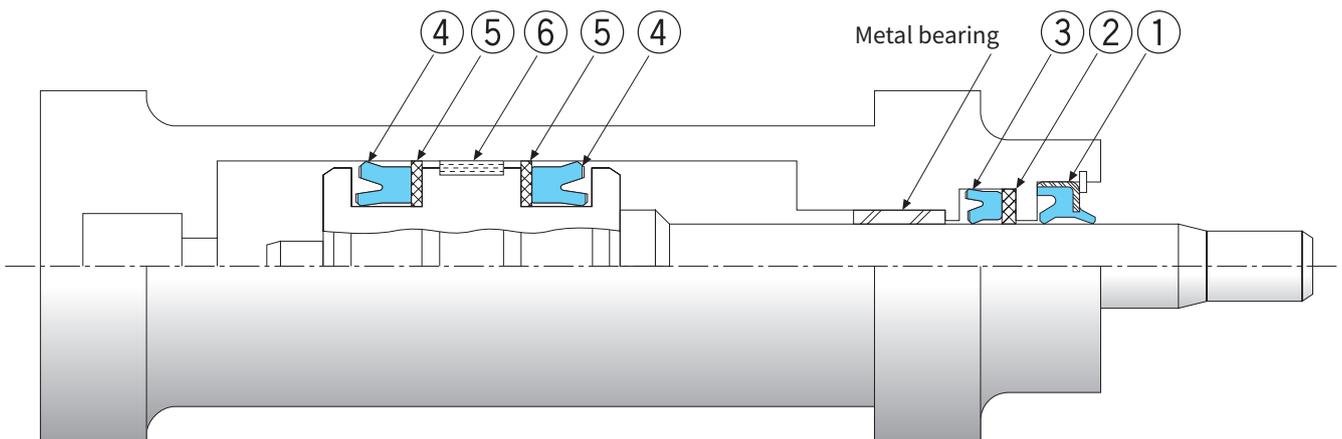
Remark) Items having — sign in the column of dimension table indicate special specifications. If the data of such items are required, please consult NOK.

Recommended example 3



	Item	Standard specifications			Heat resistant specifications			Low temperature specifications			The low friction SPG packing and high load durability wear ring are employed for the piston. For the dust seal of low temperature application, instead of LBH, we recommend DKB with a metal case that has low shrinkage percentage of diameter at low temperature.
		Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	
①	Dust seal	LBH	A505	110	LBH	F357	110	DKB	A980 SPCC	—	
②	Backup ring	BRT2	19YF	74	BRT2	19YF	95	BRT2	19YF	74	
③	Rod packing	IUH	A505	74	USH	F357	95	IUH	A567	74	
④	Piston packing	SPG	19YF A980	54	SPG	19YF F201	—	SPG	19YF A980	54	
⑤	Wear ring	WR	12RS	121	WR	12RS	121	WR	12RS	121	

Recommended example 4



	Item	Standard specifications			Heat resistant specifications			Low temperature specifications			The U packings are employed to improve the sealing ability of piston.
		Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	
①	Dust seal	DKBI	U801 SPCC	102	LBH	F357	110	DKB	A980 SPCC	—	
②	Backup ring	—	—	—	BRT2	19YF	95	BRT2	19YF	74	
③	Rod packing	IUIS	U801	73	USH	F357	95	IUH	A567	74	
④	Piston packing	OUIS	U801	49	USH	F357	95	OUHR	A567	50	
⑤	Backup ring	—	—	—	BRT2	19YF	95	BRT2	19YF	50	
⑥	Wear ring	WR	12RS	121	WR	12RS	121	WR	12RS	121	

JIS standard cylinder (Old JIS B 8354: 1992)

Hydraulic cylinder for high pressure : 21 MPa or below

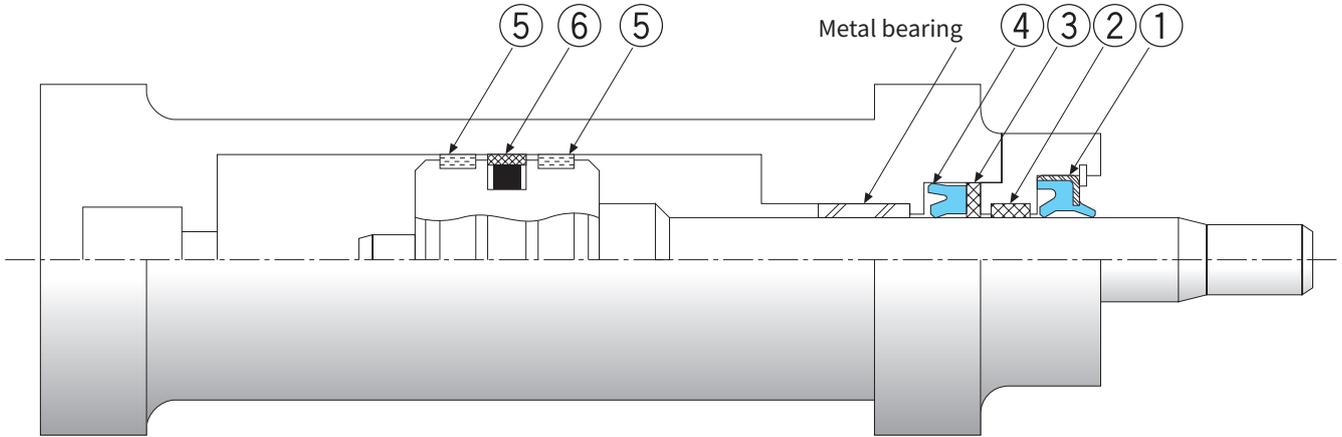
◆Applicable temperature range: Standard specifications -20~80°C
Heat resistant specifications -10~120°C
Low temperature specifications -55~60°C

※ Old JIS B 8354 : 1992, the ambient temperature range is prescribed from -5 to 80°C. NOK, however, provides packings applicable for a wider range of temperature.

Remark) Items having — sign in the column of dimension table indicate special specifications. If the data of such items are required, please consult NOK.

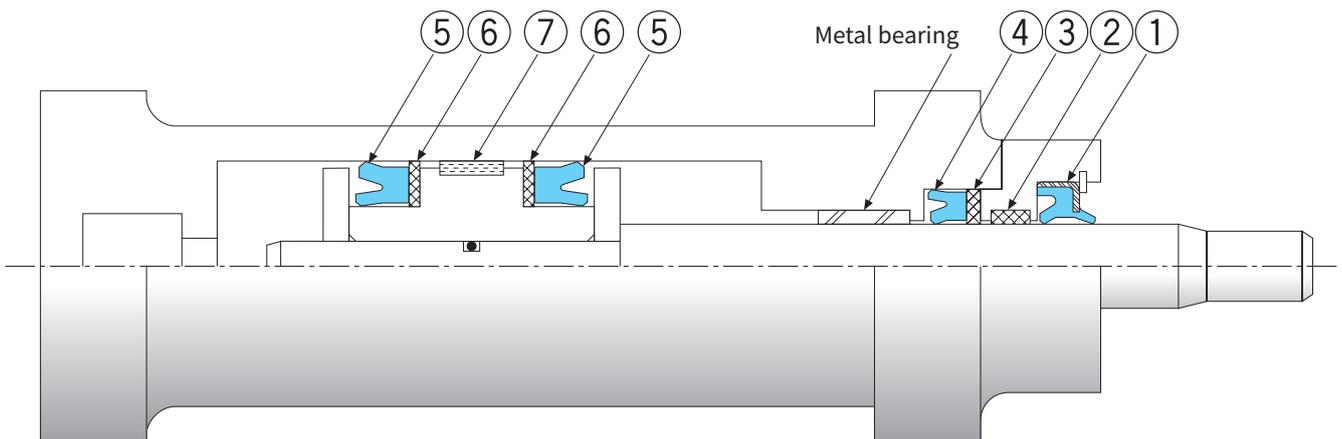
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Recommended example 5



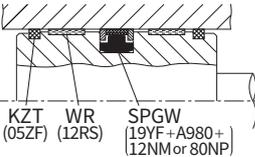
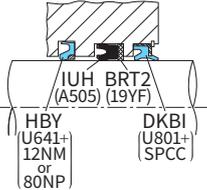
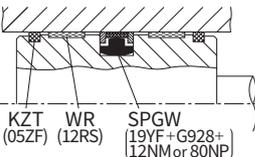
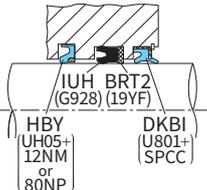
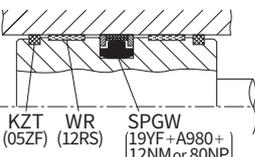
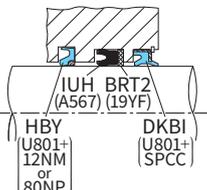
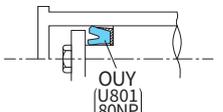
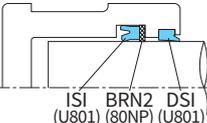
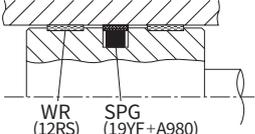
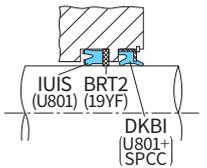
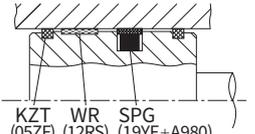
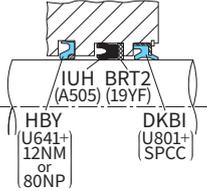
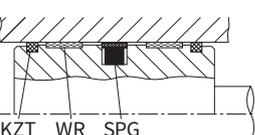
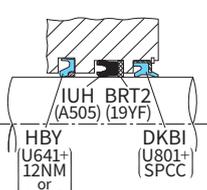
Item	Standard specifications			Heat resistant specifications			Low temperature specifications			The low friction SPG packing and high load durability wear ring are employed for the piston. The large section U packing are employed for the rod packing considering its high durability.
	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	
① Dust seal	DKBI	U801 SPCC	102	LBH	F357	110	DKBI	U801 SPCC	102	
② Wear ring	RYT	05ZF	120	RYT	05ZF	120	RYT	05ZF	120	
③ Backup ring	—	—	—	BRT2	19YF	90	BRT2	19YF	—	
④ Rod packing	IDI	U801	65	UPH	F357	90	UPH	A567	—	
⑤ Wear ring	WR	12RS	121	WR	12RS	121	WR	12RS	121	
⑥ Piston packing	SPG	19YF A980	54	SPG	19YF F201	—	SPG	19YF A980	54	

Recommended example 6

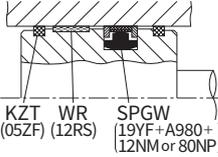
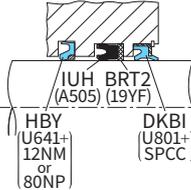


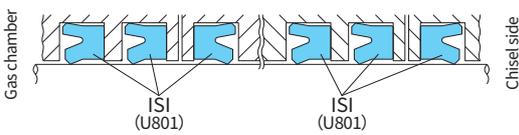
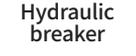
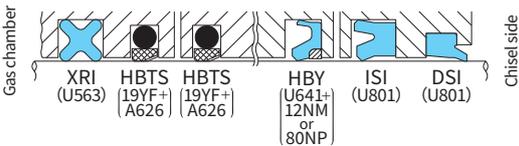
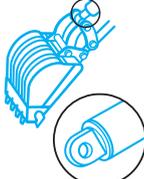
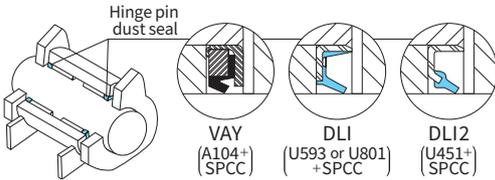
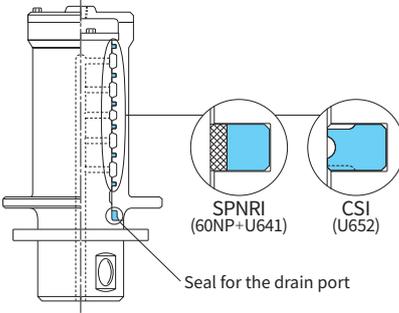
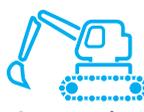
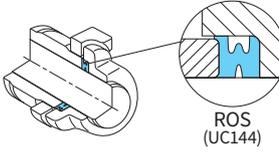
Item	Standard specifications			Heat resistant specifications			Low temperature specifications			The U packings are employed to improve the sealing ability of piston.
	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	
① Dust seal	DKBI	U801 SPCC	102	LBH	F357	110	DKBI	U801 SPCC	102	
② Wear ring	RYT	05ZF	120	RYT	05ZF	120	RYT	05ZF	120	
③ Backup ring	—	—	—	BRT2	19YF	90	BRT2	19YF	—	
④ Rod packing	IDI	U801	65	UPH	F357	90	UPH	A567	—	
⑤ Piston packing	ODI	U801	42	UPH	F357	90	UPH	A567	—	
⑥ Backup ring	—	—	—	BRT2	19YF	90	BRT2	19YF	—	
⑦ Wear ring	WR	12RS	121	WR	12RS	121	WR	12RS	121	

Application examples by equipment

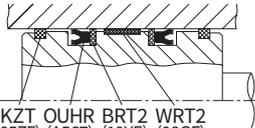
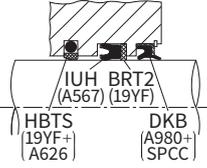
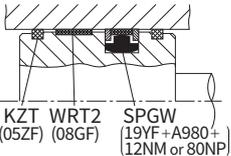
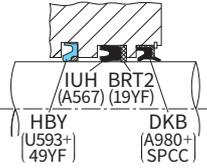
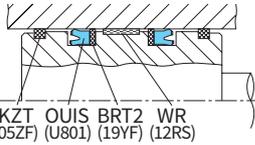
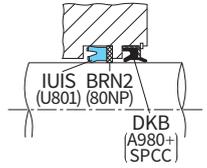
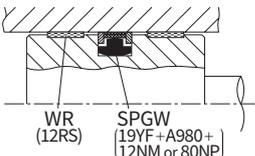
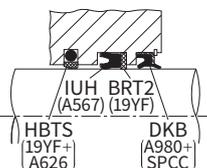
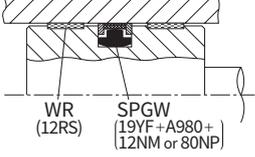
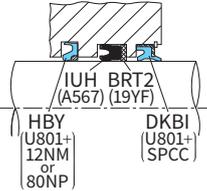
Equipment	Application	Operating condition	Piston sealing system	Feature	Rod sealing system	Feature
 <p>Hydraulic excavator</p>	<p>Boom cylinder Arm cylinder Bucket cylinder</p>	<p>Standard specifications 0~34MPa -30~100°C</p>	 <p>KZT (05ZF) WR (12RS) SPGW (19YF+A980+ 12NM or 80NP)</p>	<p>High durability for severe operating condition with the selected materials; SPGW that is applicable for high pressure and KZT that removes foreign objects in hydraulic fluid oil and prevents seal damages caused by adiabatic compression.</p>	 <p>IUH BRT2 (A505) (19YF) HBY (U641+ 12NM or 80NP) DKBI (U801+ SPCC)</p>	<p>HBY is used to prolong life of the rod seal, and nitrile rubber (A505) having good oil resistance and backup ring (19YF) are used for rod seals.</p>
		<p>Heat resistance specifications 0~34MPa -30~120°C</p>	 <p>KZT (05ZF) WR (12RS) SPGW (19YF+G928+ 12NM or 80NP)</p>	<p>Hydrogenated nitrile rubber (G928) is applied to the back ring of SPGW to enable high temperature operation.</p>	 <p>IUH BRT2 (G928) (19YF) HBY (UH05+ 12NM or 80NP) DKBI (U801+ SPCC)</p>	<p>Cold to heat resistant Iron rubber (UH05) is used for HBY and hydrogenated nitrile rubber (G928) for rod seals. Oil scraping can be prevented by using DKBI.</p>
		<p>Cold resistance specifications 0~34MPa -50~80°C</p>	 <p>KZT (05ZF) WR (12RS) SPGW (19YF+A980+ 12NM or 80NP)</p>	<p>Standard material for back ring of SPGW is low temperature resistant nitrile rubber.</p>	 <p>IUH BRT2 (A567) (19YF) HBY (U801+ 12NM or 80NP) DKBI (U801+ SPCC)</p>	<p>Low temperature resistant nitrile rubber (A567) is used for IUH.</p>
	<p>Adjust cylinder (grease cylinder)</p>	<p>0~79MPa -30~100°C</p>	 <p>OUY (U801 80NP)</p>	<p>Special seal for piston OUY is used to enable the operation of extremely short strokes under high pressure (under such operation, oil film can be broken with ordinary seals).</p>	 <p>ISI BRN2 DSI (U801) (80NP) (U801)</p>	<p>Because of small operation range of pressure, ISI is used in combination with backup ring of polyamide resin (80NP) of high extrusion proof characteristics.</p>
 <p>Mini construction equipment</p>  <p>Mini back hoe</p>	<p>Boom cylinder Arm cylinder Bucket cylinder Blade cylinder</p>	<p>0~21MPa -30~100°C</p>	 <p>WR (12RS) SPG (19YF+A980)</p>	<p>Compact SPG for medium pressure is used. Two WR are used to prevent scoring between the piston head and the cylinder tube that can be caused by high lateral load typical for such operating condition.</p>	 <p>IUIS BRT2 (U801) (19YF) DKBI (U801+ SPCC)</p>	<p>To prevent extrusion, the backup ring is used for IUIS. To prevent oil scrapeout, DKBI is used for dust seals.</p>
 <p>Wheel loader</p>	<p>Hoist cylinder Bucket cylinder</p>	<p>0~21MPa -30~100°C</p>	 <p>KZT (05ZF) WR (12RS) SPG (19YF+A980)</p>	<p>Compact SPG for medium pressure is used.</p>	 <p>IUH BRT2 (A505) (19YF) HBY (U641+ 12NM or 80NP) DKBI (U801+ SPCC)</p>	<p>HBY (U641 + 80NP) is used to prevent sliding heat increase at the packings. Nitrile rubber (A505) is used for IUH.</p>
	<p>Steering cylinder</p>	<p>0~21MPa -30~100°C</p>	 <p>KZT (05ZF) WR (12RS) SPG (19YF+A980)</p>		 <p>IUH BRT2 (A505) (19YF) HBY (U641+ 12NM or 80NP) DKBI (U801+ SPCC)</p>	<p>Because of wide operation range of pressure, HBY (U641 + 80NP) is used. Nitrile rubber (A505) is used for IUH.</p>

Application examples by equipment

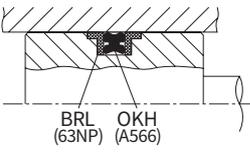
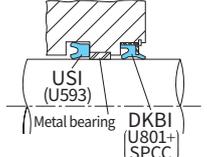
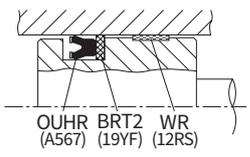
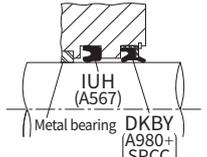
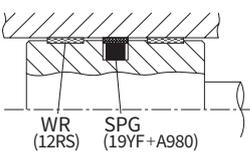
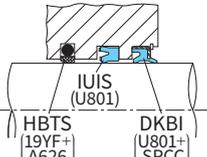
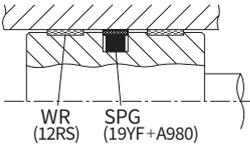
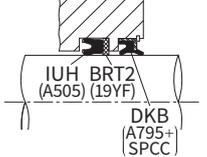
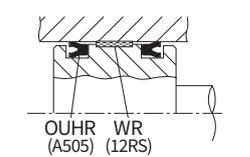
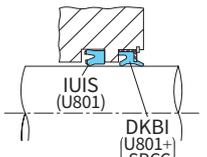
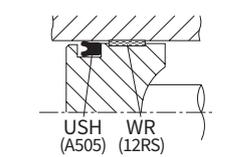
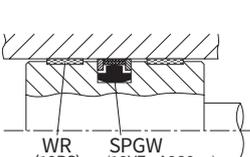
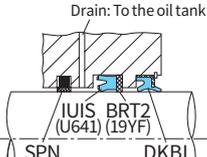
Equipment	Application	Operating condition	Piston sealing system	Feature	Rod sealing system	Feature
 Bulldozer	Hoist cylinder Blade cylinder	0~34MPa -30~100°C	 KZT (05ZF) WR (12RS) SPGW (19YF+A980+ 12NM or 80NP)	SPGW is used in high impact pressure. KZT is used for both ends to prevent heat damage of packings by adiabatic compression.	 IUH BRT2 (A505) (19YF) HBV (U641+ 12NM or 80NP) DKBI (U801+ SPCC)	HBV is used to improve durability of the rod seal. Nitrile rubber (A505, high oil resistance material) and backup ring (19YF) are used for rod seals.

Equipment	Application	Operating condition	Magnified view of sealing system	Feature
 Hydraulic breaker	—	0~17MPa -30~100°C	 ISI (U801)	ISI are used in parallel because of high speed and high pressure. Iron rubber is used for rubber material because of severe operating conditions.
 Hydraulic breaker	—	0~18MPa -30~100°C	 XRI (U563) HBTS (19YF+ A626) HBTS (19YF+ A626) HBV (U641+ 12NM or 80NP) ISI (U801) DSI (U801)	HBV is used for upper hydraulic seals to reduce the friction. HBTS is also used to absorb impact pressure and reduce the friction. XRI with high wear resistance characteristics is used for gas seals to prevent oil scraping off from the gas chamber.
 Construction equipment	Link pin Hinge pin	— -30~100°C	 VAY (A104+ SPCC) DLI (U593 or U801 +SPCC) DLI2 (U451+ SPCC)	DLI2, DLI or VAY is used to protect the bearings from dust. Grease draining mechanism should be provided for periodical grease replacement.
 Construction equipment	Center swivel joint	0~34MPa -30~100°C	 SPNRI (60NP+U641) CSI (U652) Seal for the drain port	The seal fitting groove is mainly provided on the rotor side. CSI or SPNRI is used for each oil port seal. These packings have high durability and sealing ability. For the sealing of drain ports, oil seal or o-ring for high pressure is mainly used. This seal is used also as a dust seal.
 Construction equipment	Crawler belt pin	— -30~80°C	 ROS (UC144)	ROS is used for this oscillating application, in order to retain lubricant oil and prevent entry of dust. The sealing characteristics are good due to excellent abrasion resistance, even under the severe condition that mud, earth and sand, etc. exist.

Application examples by equipment

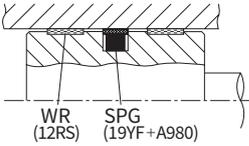
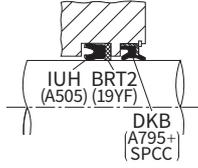
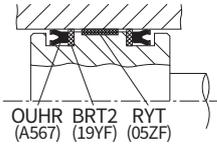
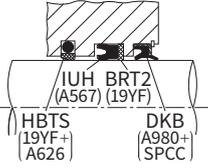
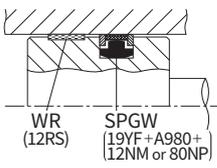
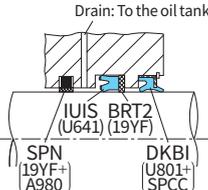
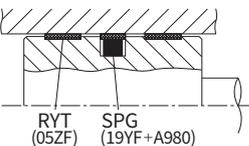
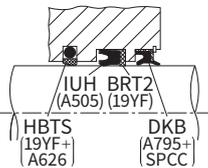
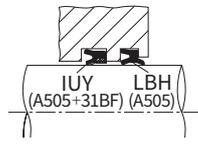
Equipment	Application	Operating condition	Piston sealing system	Feature	Rod sealing system	Feature
 Rough terrain crane (Truck crane)  Wheel crane	Derricking cylinder	0~21MPa -40~80°C	 KZT OUHR BRT2 WRT2 (05ZF) (A567) (19YF) (08GF)	OUHR with stick slip proof characteristics is used considering operating conditions that require keeping extended work pressure. 08GF having small friction resistance is used for wear ring material.	 IUH BRT2 (A567) (19YF) HBTS (19YF+) (A626) DKB (A980+) (SPCC)	HBTS is also used to prevent stick slip.
	Telescopic cylinder	0~31MPa -30~100°C	 KZT WRT2 SPGW (05ZF) (08GF) (19YF+A980+ 12NM or 80NP)	SPGW is used in high pressure operating conditions. 08GF having small friction resistance is used for wear ring material to prevent stick slip. KZT is used to prevent heat damage of the seals. By the combination of all above features, this system is excellent for severe operating condition.	 IUH BRT2 (A567) (19YF) HBYS (U593+) (49YF) DKB (A980+) (SPCC)	HBYS, specially designed, absorbs surge pressure for improving durability of the rod seal.
	Slide cylinder					
	Jack cylinder	0~31MPa -30~100°C	 KZT OUIS BRT2 WR (05ZF) (U801) (19YF) (12RS)	OUIS is used in combination with backup rings to improve sealing ability.	 IUIS BRN2 (U801) (80NP) DKB (A980+) (SPCC)	To prevent extrusion, backup rings are used for IUIS. DKB (A980) excellent in low temperature sealing characteristics and in scrape-out resistance is used for dust seals.
Hydraulic suspension cylinder	0~21MPa -30~100°C	 WR SPGW (12RS) (19YF+A980+ 12NM or 80NP)	SPGW is used to meet the operating condition that requires durability against impact pressure and extremely short strokes.	 IUH BRT2 (A567) (19YF) HBTS (19YF+) (A626) DKB (A980+) (SPCC)	To reduce the damage to rod seals, HBTS is used. IUH (A567) with high sealing ability in low temperature is also used.	
 Dump truck	Dump cylinder	0~41MPa -50~100°C	 WR SPGW (12RS) (19YF+A980+ 12NM or 80NP)	For the operating condition that requires extremely high pressure, SPGW is used. Two WR are used considering lateral load that is typical for such operating condition.	 IUH BRT2 (A567) (19YF) HBYS (U801+ 12NM or 80NP) DKB1 (U801+) (SPCC)	Considering the extremely high operating pressure, HBYS is used to reduce damage to rod seals. IUH (A567) with high sealing ability in low temperature is used.

Application examples by equipment

Equipment	Application	Operating condition	Piston sealing system	Feature	Rod sealing system	Feature
 Forklift  Battery forklift	Tilt cylinder	0~21MPa -30~100°C	 <p>BRL (63NP) OKH (A566)</p>	Compact OKH assures easy assembly and high sealing ability.	 <p>USI (U593) Metal bearing DKBI (U801+/SPCC)</p>	The combination of USI and DKBI is used to realize compact sealing system.
	Lift cylinder (low temperature specifications)	0~21MPa -55~80°C	 <p>OUHR BRT2 WR (A567) (19YF) (12RS)</p>	OUHR is used because maintaining oil film is important for such single acting cylinder.	 <p>Metal bearing IUH (A567) DKBY (A980+/SPCC)</p>	IUH is used in combination with DKBY because of the fluid filling type single acting cylinder. Dust seals are specially designed DKBY.
	Steering cylinder	0~21MPa -30~100°C	 <p>WR (12RS) SPG (19YF+A980)</p>	SPG is usable for operating condition requiring extremely short strokes. If there is a high frequency of pressurization, we recommend SPGY with slits on the Rareflon ring side to prevent venting leaks.	 <p>IUIS (U801) HBTS (19YF+/A626) DKBI (U801+/SPCC)</p>	HBTS is used for buffer rings because this system is used in sealed conditions.
 Garbage truck	—	0~21MPa -30~100°C	 <p>WR (12RS) SPG (19YF+A980)</p>	SPG with high durability is used. Two WR are used to prevent scoring between the piston head and the cylinder tube that can be caused by high lateral load typical for such operating condition.	 <p>IUH BRT2 (A505) (19YF) DKB (A795+/SPCC)</p>	Packing and dust seal of nitrile rubber are used.
 Combine  Farm tractor	Double acting cylinder	0~14MPa -30~100°C	 <p>OUHR WR (A505) (12RS)</p>	Packings of nitrile rubber are used.	 <p>IUIS (U801) DKBI (U801+/SPCC)</p>	DKBI with high dust proof characteristics is used for dust seals.
	Single acting cylinder	0~14MPa -30~100°C	 <p>USH WR (A505) (12RS)</p>	Because of less severe operating condition, O rings are mostly used, but USH packings are recommended to improve durability.	—	—
 Pressing machine	—	0~28MPa -10~80°C	 <p>WR (12RS) SPGW (19YF+A980+) (12NM or 80NP)</p>	SPGW is used in high impact pressure and for durability.	 <p>Drain: To the oil tank IUIS BRT2 (U641) (19YF) SPN (19YF+/A980) DKBI (U801+/SPCC)</p>	SPN is used for buffer rings to reduce high impact pressure. Return leaked oil (oil film) into the oil tank via the drain.

Application examples by equipment

4

Equipment	Application	Operating condition	Piston sealing system	Feature	Rod sealing system	Feature
 Robot	—	0~21MPa -10~80°C		High durability SPG is used. Two WR are used to prevent scoring between the piston head and the cylinder tube that can be caused by high lateral load typical for such operating condition.		Packing and dust seal of nitrile rubber are used.
 Lift	—	0~21MPa -30~80°C		OUHR with stick slip proof characteristics is used considering the operating condition that requires to keep working pressure for a long time. 05ZF having small friction resistance is used for wear ring material.		HBTS is used to prevent stick slip.
 Injection molding machine	—	0~31MPa -10~100°C		SPGW is used since such operating conditions mainly performed under high pressure require the durability. This packing has also excellent durability for the operations requiring extremely short strokes.		SPN is used for buffer rings to reduce high impact pressure. Return leaked oil (oil film) into the oil tank via the drain.
 Multi stories parking	—	0~14MPa -30~100°C		High durability SPG is used. 05ZF having small friction resistance is used for wear ring material.		HBTS is used to prevent stick slip.
 Hydraulic elevator	—	0~5MPa -20~80°C	—	—		IUY (of special shape) is used for packing to prevent stick slip. Rareflon is molded on to the IUY lip.

To Order Packings

- 1** Contact your nearest NOK packings office or agent.
When ordering, please indicate the NOK part number and the relevant dimensions.
(Specifying methods are described in each dimension table.)
- 2** Consult us when you need an packing not listed in this catalog, or if you are not sure which product to select for special working conditions.
- 3** [Special order]
A quote will be provided to you for packings not listed in the catalog, or when you require a standard-dimension seals made from non-standard materials (e.g., rubber, resin, metal case).

5. Dimension Tables for NOK Packings

Special Packings for Piston Seals

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WR(12RS)	121
WR(88RS)	124
KZT	126

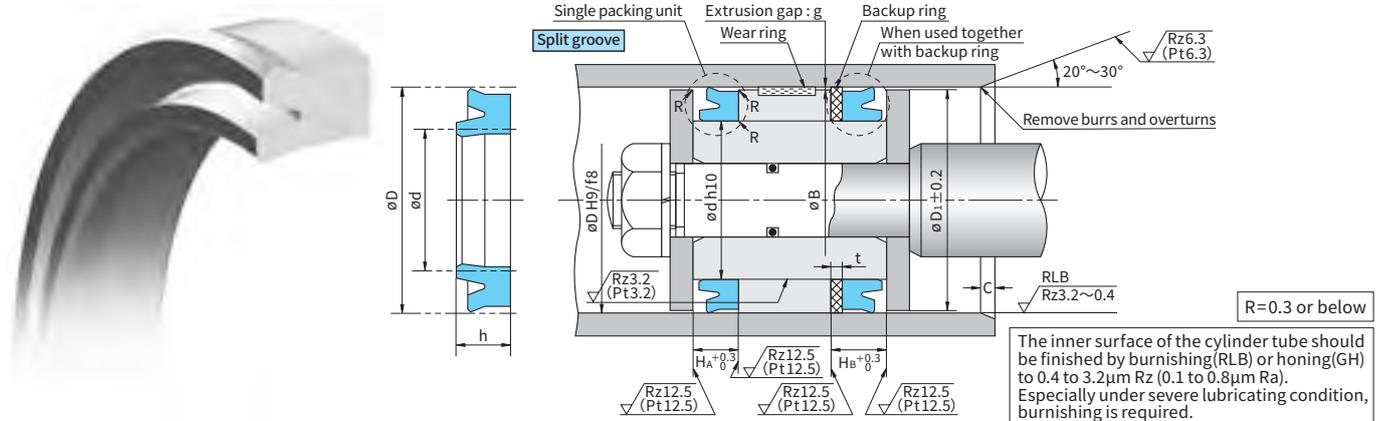
Special Packings for Piston Seals

ODI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU2150H0**
 Type: ODI, Outer diameter: 18, Inner diameter: 8, Height: 7.5
 Orders for backup rings used in combination with packing
 NOK part number: **GN0725V0**
 Type: BRT3, Inner diameter: 8, Outer diameter: 18, Thickness: 2

● Please check the application range on pages 6 and 7 before selecting the type.



How to determine B dimension

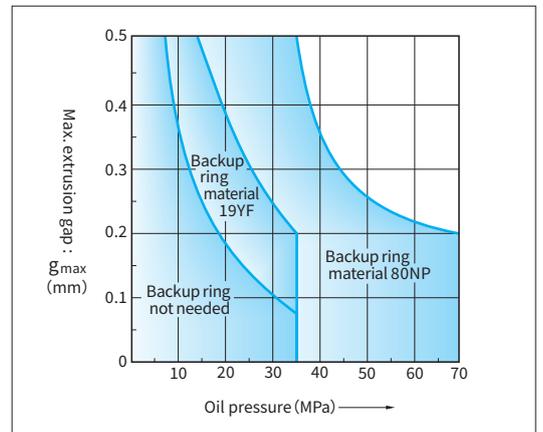
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	35MPa
Material of backup ring	19YF		
B dimension	$B \geq \phi D - 1.0$	$B \geq \phi D - 0.5$	$B \geq \phi D - 0.2$
Maximum service pressure	35MPa	42MPa	70MPa
Material of backup ring	80NP		
B dimension	$B \geq \phi D - 0.8$	$B \geq \phi D - 0.4$	$B \geq \phi D - 0.2$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal size of packing, and housing dimensions							Backup ring Thickness	Packing part number	Combination backup ring part number	
D (Outer diameter)	d (Inner diameter)	h (Height)	H _A	H _B	øD ₁	C			BRT3 (Endless)	BRN3 (Endless)
18	8	7.5	8.5	10.5	17	2.5	2	FU2150H0	GN0725V0	GN910101
19.2	11.2	5	5.7	7.7	18.2	2.5	2	※FU0202H0	GN7236V0	GN979200
20	10	6	7	9	19	2.5	2	※FU0205H0	GN0733V0	GN910201
20	10	7.5	8.5	10.5	19	2.5	2	FU0206H0	GN0733V0	GN910201
20	10	8	9	11	19	2.5	2	FU0207H0	GN0733V0	GN910201
20	12	5	5.7	7.7	19	2.5	2	※FU0208H0	GN7237V0	GN979300
22	14	5	5.7	7.7	21	2.5	2	※FU0242H0	GN7238V0	GN979400
24	14	7.5	8.5	10.5	23	3.5	2	FU2151H0	GN0745V0	GN910301
25	15	6	7	9	24	3.5	2	※FU0273H0	GN0749V0	GN973801
25	15	8	9	11	24	3.5	2	FU0274H0	GN0749V0	GN973801
25	17	5	5.7	7.7	24	3.5	2	※FU0275H0	GN7239V0	GN979500
26	16	7.5	8.5	10.5	25	3.5	2	FU2152H0	GN0751V0	GN910501
26	18	5	5.7	7.7	25	3.5	2	※FU0310H0	GN6377V0	GN910601
28	15	10	11	13	27	3.5	2	FU2153H0	GN6445V0	GN910401
28	20	5	5.7	7.7	27	2	2	※FU2138H0	GN6447V0	GN910801
30	20	5	5.7	7.7	29	3.5	2	※FU0351H0	GN0762V0	GN910901
30	20	6	7	9	29	3.5	2	※FU0352H0	GN0762V0	GN910901
30	20	8	9	11	29	3.5	2	FU0353H0	GN0762V0	GN910901
30	22.4	5	5.7	7.7	29	2	2	※FU2139H0	GN6450V0	GN911201
31	18	10	11	13	30	3.5	2	FU2154H0	GN6446V0	GN910701
31.5	18.5	8	9	11	30.5	3.5	2	FU0377H0	GN7240V0	GN979600
31.5	18.5	10	11	13	30.5	3.5	2	FU0378H0	GN7240V0	GN979600
31.5	21.5	8	9	11	30.5	3.5	2	FU0380H0	GN0767V0	GN979700
31.5	23.5	5	5.7	7.7	30.5	2	2	※FU0381H0	GN6452V0	GN911401
33	20	10	11	13	32	3.5	2	FU2155H0	GN6448V0	GN911001
33	25	5	5.7	7.7	32	2	2	※FU2140H0	GN6665V0	GN978601

※ The resisting pressure limit applies to the OSI type.

Special Packings for Piston Seals

ODI type

Material	NOK sign
Iron rubber (PUR)	U801

● Please check the application range on pages 6 and 7 before selecting the type.

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU2156H0**
 Type: ODI, Outer diameter: 35, Inner diameter: 22, Height: 10
 Orders for backup rings used in combination with packing
 NOK part number: **GN6449V0**
 Type: BRT3, Inner diameter: 22, Outer diameter: 35, Thickness: 2

Nominal size of packing, and housing dimensions							Backup ring Thickness	Packing part number	Combination backup ring part number	
D(Outer diameter)	d(Inner diameter)	h(Height)	H _A	H _B	øD ₁	C			BRT3 (Endless) 19YF	BRN3 (Endless) 80NP
35	22	10	11	13	34	3.5	2	FU2156H0	GN6449V0	GN9111O1
35	25	6	7	9	34	3.5	2	※FU0418H0	GN0781V0	GN9115O1
35	25	8	9	11	34	3.5	2	FU0419H0	GN0781V0	GN9115O1
35.5	25.5	6	7	9	34.5	3.5	2	※FU0448H0	GN6454V0	GN9117O1
35.5	25.5	8	9	11	34.5	3.5	2	FU0449H0	GN6454V0	GN9117O1
38	25	10	11	13	37	3.5	2	FU0466H0	GN6453V0	GN9116O1
40	25	9	10	12	39	3.5	2	FU0485H0	GN6591V0	GN9800O0
40	25	10	11	13	39	3.5	2	FU0486H0	GN6591V0	GN9800O0
40	27	8	9	12	39	3.5	3	FU0488H0	GN6455V0	GN9118O1
40	27	10	11	14	39	3.5	3	FU0489H0	GN6455V0	GN9118O1
40	30	8	9	12	39	3.5	3	FU0491H0	GN6361V0	GN9122O1
41	28	10	11	14	40	3.5	3	FU2158H0	GN6458V0	GN9121O1
43	30	10	11	14	42	3.5	3	FU2159H0	GN6459V0	GN9123O1
44.5	31.5	10	11	14	43.5	3.5	3	FU2160H0	GN6461V0	GN9125O1
45	30	9	10	13	44	3.5	3	FU0559H0	GN7061V0	GN9801O0
45	30	10	11	14	44	3.5	3	FU0560H0	GN7061V0	GN9801O0
45	32	8	9	12	44	3.5	3	FU0561H0	GN7242V0	GN9802O0
45	32	10	11	14	44	3.5	3	FU0562H0	GN7242V0	GN9802O0
45	35	8	9	12	44	3.5	3	FU0564H0	GN6463V0	GN9127O1
50	34	10	11	14	49	4	3	FU0608H0	GN6462V0	GN9126O1
50	34	12	13	16	49	4	3	FU0609H0	GN6462V0	GN9126O1
50	35	9	10	13	49	4	3	FU0610H0	GN0816V0	GN9128O1
50	35	10	11	14	49	4	3	FU0611H0	GN0816V0	GN9128O1
50	35	12	13	16	49	4	3	FU2161H0	GN0816V0	GN9128O1
50	40	8	9	12	49	4	3	FU0614H0	GN6465V0	GN9131O1
55	40	9	10	13	54	4	3	FU0689H0	GN6759V0	GN9948O0
55	40	10	11	14	54	4	3	FU0690H0	GN6759V0	GN9948O0
55	45	8	9	12	54	4	3	FU0693H0	GN6467V0	GN9133O1
56	40	10	11	14	55	4	3	FU0716H0	GN6466V0	GN9132O1
56	40	12	13	16	55	4	3	FU0717H0	GN6466V0	GN9132O1
56	41	9	10	13	55	4	3	FU0718H0	GN0835V0	GN9949O0
56	41	10	11	14	55	4	3	FU0719H0	GN0835V0	GN9949O0
56	46	8	9	12	55	4	3	FU0721H0	GN7243V0	GN9782O1
60	45	9	10	13	59	4	3	FU0740H0	GN0845V0	GN9950O0
60	45	10	11	14	59	4	3	FU0741H0	GN0845V0	GN9950O0
60	50	8	9	12	59	4	3	FU0743H0	GN6302V0	GN9138O1
61	45	12	13	16	60	4	3	FU2163H0	GN6469V0	GN9135O1
63	47	10	11	14	62	4	3	FU0779H0	GN6471V0	GN9137O1
63	47	12	13	16	62	4	3	FU0780H0	GN6471V0	GN9137O1
63	48	9	10	13	62	4	3	FU0781H0	GN0853V0	GN9951O0
63	48	10	11	14	62	4	3	FU0782H0	GN0853V0	GN9951O0
63	53	8	9	12	62	4	3	FU0785H0	GN6413V0	GN9140O1
65	50	9	10	13	64	4	3	FU0804H0	GN6439V0	GN9952O0
65	50	10	11	14	64	4	3	FU0805H0	GN6439V0	GN9952O0
65	55	8	9	12	64	4	3	FU0808H0	GN6472V0	GN9141O1
66	50	12	13	16	65	4	3	FU2164H0	GN6329V0	GN9139O1
69	53	12	13	16	68	4	3	FU0836H0	GN7008V0	GN9803O0
70	50	12	13	16	69	5	3	FU0842H0	GN6592V0	GN9529O0
70	55	9	10	13	69	5	3	FU0844H0	GN6408V0	GN9804O0
70	55	10	11	14	69	5	3	FU0845H0	GN6408V0	GN9804O0
70	60	8	9	12	69	5	3	FU0847H0	GN6444V0	GN9144O1
71	51	12	13	16	70	5	3	FU0872H0	GN0862V0	GN9805O0
71	55	10	11	14	70	5	3	FU0873H0	GN6473V0	GN9142O1
71	55	12	13	16	70	5	3	FU0874H0	GN6473V0	GN9142O1
71	56	9	10	13	70	5	3	FU0875H0	GN7247V0	GN9806O0
71	56	10	11	14	70	5	3	FU0876H0	GN7247V0	GN9806O0
71	61	8	9	12	70	5	3	FU0878H0	GN7248V0	GN9783O1

※ The resisting pressure limit applies to the OSI type.

Special Packings for Piston Seals

ODI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0894H0**
 Type: ODI, Outer diameter: 75, Inner diameter: 55, Height: 12
 Orders for backup rings used in combination with packing
 NOK part number: **GN7249V0**
 Type: BRT3, Inner diameter: 55, Outer diameter: 75, Thickness: 3

● Please check the application range on pages 6 and 7 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring Thickness	Packing part number	Combination backup ring part number	
D(Outer diameter)	d(Inner diameter)	h(Height)	H _A	H _B	øD ₁	C			BRT3 (Endless) 19YF	BRN3 (Endless) 80NP
75	55	12	13	16	74	5	3	FU0894H0	GN7249V0	GN9807O0
75	60	9	10	13	74	5	3	FU0895H0	GN6363V0	GN9808O0
75	60	10	11	14	74	5	3	FU0896H0	GN6363V0	GN9808O0
75	65	8	9	12	74	5	3	FU0898H0	GN6479V0	GN9149O1
76	60	12	13	16	75	5	3	FU2165H0	GN6476V0	GN9146O1
80	60	12	13	16	79	5	3	FU0929H0	GN0886V1	GN9953O0
80	64	10	11	14	79	5	3	FU0931H0	GN6478V0	GN9148O1
80	64	12	13	16	79	5	3	FU0932H0	GN6478V0	GN9148O1
80	65	9	10	13	79	5	3	FU0933H0	GN6364V0	GN9754O1
80	65	10	11	14	79	5	3	FU0934H0	GN6364V0	GN9754O1
80	70	8	9	12	79	5	3	FU0937H0	GN6362V1	GN9092O1
85	65	12	13	16	84	5	3	FU0974H0	GN0899V0	GN9810O0
85	70	9	10	13	84	5	3	FU0977H0	GN6442V0	GN9411O0
85	70	10	11	14	84	5	3	FU0978H0	GN6442V0	GN9411O0
85	75	8	9	12	84	5	3	FU0980H0	GN6729V0	GN9241O1
90	70	12	13	16	89	5	3	FU1014H0	GN0910V0	GN9151O1
90	70	15	16	19	89	5	3	FU1015H0	GN0910V0	GN9151O1
90	75	9	10	13	89	5	3	FU1017H0	GN6443V0	GN9757O1
90	75	10	11	14	89	5	3	FU1018H0	GN6443V0	GN9757O1
90	80	8	9	12	89	5	3	FU1020H0	GN6483V0	GN9155O1
95	75	12	13	16	94	5	3	FU1045H0	GN0920V0	GN9154O1
95	75	15	16	19	94	5	3	FU1046H0	GN0920V0	GN9154O1
95	80	9	10	13	94	5	3	FU1047H0	GN6898V0	GN9582O0
95	80	10	11	14	94	5	3	FU1048H0	GN6898V0	GN9582O0
100	80	12	13	16	98	5	3	FU1072H0	GN0927V0	GN9156O1
100	80	15	16	19	98	5	3	FU1074H0	GN0927V0	GN9156O1
100	85	10	11	14	98	5	3	FU1079H0	GN6484V0	GN9091O1
105	85	15	16	19	103	5	3	FU2166H0	GN0932V0	GN9157O1
110	90	12	13	16	108	5	3	FU1149H0	GN0939V0	GN9159O1
110	90	15	16	19	108	5	3	FU1150H0	GN0939V0	GN9159O1
110	95	10	11	14	108	5	3	FU1153H0	GN6486V0	GN9160O1
112	92	12	13	16	110	5	3	FU1174H0	GN0940V0	GN9811O0
112	92	15	16	19	110	5	3	FU1175H0	GN0940V0	GN9811O0
112	97	9	10	13	110	5	3	FU1176H0	GN7250V0	GN9812O0
112	97	10	11	14	110	5	3	FU1177H0	GN7250V0	GN9812O0
115	95	15	16	19	113	5	3	FU2167H0	GN0945V0	GN9161O1
120	100	12	13	16	118	5	3	FU1210H0	GN0952V0	GN9164O1
120	100	15	16	19	118	5	3	FU1211H0	GN0952V0	GN9164O1
120	105	10	11	14	118	5	3	FU1213H0	GN6684V0	GN9589O1
125	105	12	13	16	123	5	3	FU1243H0	GN0959V0	GN9165O1
125	105	15	16	19	123	5	3	FU1244H0	GN0959V0	GN9165O1
125	105	16	17	20	123	5	3	FU1245H0	GN0959V0	GN9165O1
125	110	9	10	13	123	5	3	FU1247H0	GN6761V0	GN9430O1
125	110	10	11	14	123	5	3	FU1248H0	GN6761V0	GN9430O1
130	110	12	13	16	128	5	3	FU1274H0	GN6790V0	GN9694O0
130	110	15	16	19	128	5	3	FU1275H0	GN6790V0	GN9694O0
130	110	16	17	20	128	5	3	FU1276H0	GN6790V0	GN9694O0
130	115	10	11	14	128	5	3	FU1279H0	GN6741V0	GN9274O1
132	112	15	16	19	130	5	3	FU2168H0	GN0970V0	GN9168O1
140	120	12	13	16	138	5	3	FU1316H0	GN0982V0	GN9169O1
140	120	15	16	19	138	5	3	FU1317H0	GN0982V0	GN9169O1
140	120	16	17	20	138	5	3	FU1318H0	GN0982V0	GN9169O1
140	125	10	11	14	138	5	3	FU1321H0	GN6491V0	GN9170O1
150	125	19	20	23	148	6.5	3	FU2169H0	GN6135V0	GN9171O1
150	125	20	21	24	148	6.5	3	FU1351H0	GN6135V0	GN9171O1
150	130	12	13	16	148	6.5	3	FU1352H0	GN6925V0	GN9335O1
150	130	16	17	20	148	6.5	3	FU1354H0	GN6925V0	GN9335O1

Special Packings for Piston Seals

ODI type

Material	NOK sign
Iron rubber (PUR)	U801

● Please check the application range on pages 6 and 7 before selecting the type.

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU1357H0**
 Type: ODI, Outer diameter: 150, Inner diameter: 135, Height: 10
 Orders for backup rings used in combination with packing
 NOK part number: **GN6666V0**
 Type: BRT3, Inner diameter: 135, Outer diameter: 150, Thickness: 3

Nominal size of packing, and housing dimensions							Backup ring Thickness	Packing part number	Combination backup ring part number	
D(Outer diameter)	d(Inner diameter)	h(Height)	H _A	H _B	øD ₁	C			t	BRT3 (Endless) 19YF
150	135	10	11	14	148	6.5	3	FU1357H0	GN6666V0	GN9539O1
160	135	19	20	23	158	6.5	3	FU2170H0	GN6492V0	GN9172O1
160	135	20	21	24	158	6.5	3	FU1398H0	GN6492V0	GN9172O1
160	140	12	13	16	158	6.5	3	FU1399H0	GN1002V0	GN9668O0
160	140	16	17	20	158	6.5	3	FU1402H0	GN1002V0	GN9668O0
160	145	10	11	14	158	6.5	3	FU1405H0	GN6495V0	GN9175O1
165	140	19	20	23	163	6.5	3	FU1426H0	GN6494V0	GN9174O1
170	145	19	20	23	168	6.5	3	FU1436H0	GN6496V0	GN9176O1
170	145	20	21	24	168	6.5	3	FU1437H0	GN6496V0	GN9176O1
170	150	12	13	16	168	6.5	3	FU1438H0	GN1011V0	GN9672O1
170	150	16	17	20	168	6.5	3	FU1440H0	GN1011V0	GN9672O1
170	155	10	11	15	168	6.5	4	FU1442H0	GN6498V0	GN9178O1
180	155	16	17	21	178	6.5	4	FU1475H0	GN1016V0	GN9179O1
180	155	19	20	24	178	6.5	4	FU2171H0	GN1016V0	GN9179O1
180	155	20	21	25	178	6.5	4	FU1476H0	GN1016V0	GN9179O1
180	160	12	13	17	178	6.5	4	FU1478H0	GN6905V0	GN9814O0
180	160	16	17	21	178	6.5	4	FU1479H0	GN6905V0	GN9814O0
180	165	10	11	15	178	6.5	4	FU1482H0	GN6500V0	GN9182O1
185	160	19	20	24	183	6.5	4	FU2172H0	GN1020V0	GN9181O1
185	160	20	21	25	183	6.5	4	FU2187H0	GN1020V0	GN9181O1
190	165	16	17	21	188	6.5	4	FU1507H0	GN1023V0	GN9815O0
190	165	20	21	25	188	6.5	4	FU1508H0	GN1023V0	GN9815O0
190	170	12	13	17	188	6.5	4	FU1509H0	GN6985V0	GN9816O0
190	170	16	17	21	188	6.5	4	FU1510H0	GN6985V0	GN9816O0
190	175	10	11	15	188	6.5	4	FU1512H0	GN6503V0	GN9185O1
200	175	16	17	21	198	6.5	4	FU1536H0	GN1031V0	GN9186O1
200	175	19	20	24	198	6.5	4	FU2173H0	GN1031V0	GN9186O1
200	175	20	21	25	198	6.5	4	FU1538H0	GN1031V0	GN9186O1
200	180	16	17	21	198	6.5	4	FU1540H0	GN6372V0	GN9187O1
205	180	19	20	24	203	6.5	4	FU2174H0	GN1035V0	GN9188O1
205	180	20	21	25	203	6.5	4	FU2188H0	GN1035V0	GN9188O1
210	185	16	17	21	208	6.5	4	FU1570H0	GN1039V0	GN9817O0
210	185	20	21	25	208	6.5	4	FU1571H0	GN1039V0	GN9817O0
210	190	16	17	21	208	6.5	4	FU1573H0	GN6505V0	GN9190O1
215	190	16	17	21	213	6.5	4	FU2260H0	GN1042V0	GN9818O0
220	195	16	17	21	218	6.5	4	FU1592H0	GN7253V0	GN9819O0
220	195	20	21	25	218	6.5	4	FU1593H0	GN7253V0	GN9819O0
220	200	16	17	21	218	6.5	4	FU1595H0	GN6276V0	GN9191O1
224	199	16	17	21	222	6.5	4	FU1604H0	GN1047V0	GN9820O0
224	199	20	21	25	222	6.5	4	FU1605H0	GN1047V0	GN9820O0
224	204	16	17	21	222	6.5	4	FU1607H0	GN6506V0	GN9193O1
225	200	16	17	21	223	6.5	4	FU1616H0	GN1050V0	GN9192O1
225	200	19	20	24	223	6.5	4	FU2175H0	GN1050V0	GN9192O1
225	200	20	21	25	223	6.5	4	FU1617H0	GN1050V0	GN9192O1
225	205	16	17	21	223	6.5	4	FU1619H0	GN7255V0	GN9784O1
230	205	16	17	21	228	6.5	4	FU1632H0	GN1053V0	GN9557O1
230	205	19	20	24	228	6.5	4	FU1633H0	GN1053V0	GN9557O1
230	205	20	21	25	228	6.5	4	FU1634H0	GN1053V0	GN9557O1
230	210	16	17	21	228	6.5	4	FU1636H0	GN6352V0	GN9195O1
240	215	16	17	21	238	6.5	4	FU1652H0	GN7256V0	GN9574O0
240	215	19	20	24	238	6.5	4	FU1653H0	GN7256V0	GN9574O0
240	215	20	21	25	238	6.5	4	FU1654H0	GN7256V0	GN9574O0
240	220	16	17	21	238	6.5	4	FU1656H0	GN6508V0	GN9196O1
250	225	16	17	21	248	6.5	4	FU1671H0	GN1065V0	GN9045O1
250	225	19	20	24	248	6.5	4	FU1672H0	GN1065V0	GN9045O1
250	225	20	21	25	248	6.5	4	FU1673H0	GN1065V0	GN9045O1
250	230	16	17	21	248	6.5	4	FU1676H0	GN6510V0	GN9047O1

Special Packings for Piston Seals

ODI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU1698H0**
 Type: ODI, Outer diameter: 260, Inner diameter: 235, Height: 16
 Orders for backup rings used in combination with packing
 NOK part number: **GN7257V0**
 Type: BRT3, Inner diameter: 235, Outer diameter: 260, Thickness: 4

● Please check the application range on pages 6 and 7 before selecting the type.

5 ODI for Piston

Nominal size of packing, and housing dimensions							Backup ring Thickness	Packing part number	Combination backup ring part number	
D(Outer diameter)	d(Inner diameter)	h(Height)	H _A	H _B	øD ₁	C			t	BRT3 (Endless) 19YF
260	235	16	17	21	258	6.5	4	FU1698H0	GN7257V0	GN982100
260	235	19	20	24	258	6.5	4	FU1699H0	GN7257V0	GN982100
260	240	16	17	21	258	6.5	4	FU1701H0	GN6511V0	GN919801
270	245	16	17	21	268	6.5	4	FU1715H0	GN7258V0	GN967500
270	245	19	20	24	268	6.5	4	FU1716H0	GN7258V0	GN967500
270	250	16	17	21	268	6.5	4	FU1718H0	GN6512V0	GN919901
275	250	19	20	24	273	6.5	4	FU2176H0	GN1078V0	GN920001
275	250	20	21	25	273	7.5	4	FU2189H0	GN1078V0	GN920001
280	250	19	20	24	278	7.5	4	FU1729H0	GN6197V0	GN943201
280	255	19	20	24	278	7.5	4	FU1731H0	GN6513V0	GN920101
290	260	19	20	24	288	7.5	4	FU1744H0	GN1083V0	GN943101
290	265	19	20	24	288	7.5	4	FU1746H0	GN6318V0	GN920301
297	265	24	25	29	295	7.5	4	FU2177H0	GN6515V0	GN920401
297	265	25	26	30	295	7.5	4	FU2190H0	GN6515V0	GN920401
300	270	19	20	24	298	7.5	4	FU1758H0	GN1089V0	GN920601
300	270	24	25	29	298	7.5	4	FU2178H0	GN1089V0	GN920601
300	270	25	26	30	298	7.5	4	FU1759H0	GN1089V0	GN920601
300	275	19	20	24	298	7.5	4	FU1761H0	GN6517V0	GN920701
312	280	24	25	29	310	7.5	4	FU2193H0	GN6519V0	GN920901
332	300	24	25	29	330	7.5	4	FU2194H0	GN6522V0	GN921201

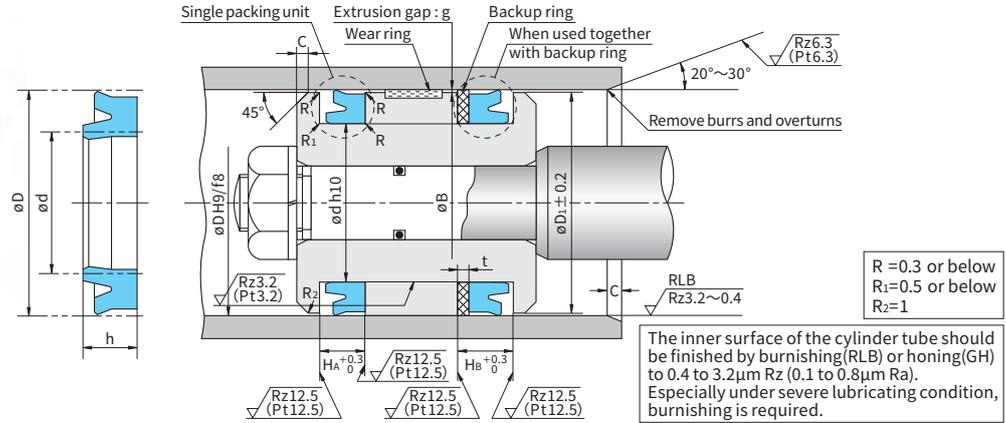
Special Packings for Piston Seals (Installed with internal groove)

OSI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0420L0**
 Type: OSI, Outer diameter: 35, Inner diameter: 27, Height: 5
 Orders for backup rings used in combination with packing
 NOK part number: **GN5707V0**
 Type: BRT2, Inner diameter: 27, Outer diameter: 35, Thickness: 3

● Please check the application range on pages 6 and 7 before selecting the type.



How to determine B dimension

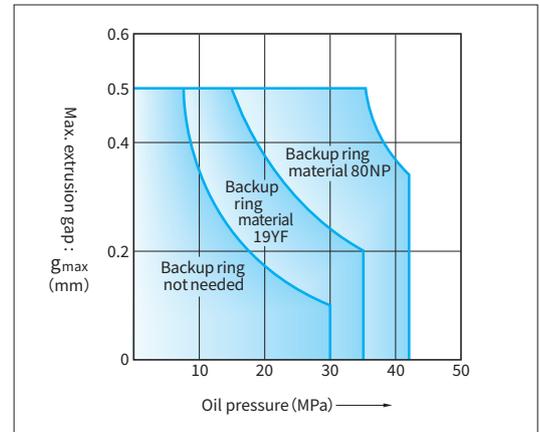
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	35MPa
Material of backup ring	19YF		
B dimension	$B \geq \phi D - 1.0$	$B \geq \phi D - 0.5$	$B \geq \phi D - 0.2$
Maximum service pressure	35MPa	42MPa	
Material of backup ring	80NP		
B dimension	$B \geq \phi D - 0.8$	$B \geq \phi D - 0.4$	

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal size of packing, and housing dimensions							Backup ring thickness	Packing part number	Combination backup ring part number	
D (Outer diameter)	d (Inner diameter)	h (Height)	H _A	H _B	øD ₁	C			t	BRT2 (Biascut) 19YF
35	27	5	5.7	8.7	34	2	3	FU0420L0	GN5707V0	GN978000
35.5	27.5	5	5.7	8.7	34.5	2	3	FU0450L0	GN5708V0	GN978100
35.5	28	5	5.7	8.7	34.5	2	3	FU2141L0	GN4791V0	GN911900
40	30	6	7	10	39	2.5	3	FU0490L0	GN4794V0	GN912200
41.5	31.5	6	7	10	40.5	2.5	3	FU2142L0	GN4796V0	GN912400
45	35	6	7	10	44	2.5	3	FU0563L0	GN4799V0	GN912700
45	35.5	6	7	10	44	2.5	3	FU2143L0	GN4801V0	GN912900
50	40	6	7	10	49	2.5	3	FU0613L0	GN4050V0	GN913100
55	45	6	7	10	54	2.5	3	FU0692L0	GN4804V0	GN913300
56	45	7	8	11	55	2.5	3	FU2144L0	GN4805V0	GN913400
56	46	6	7	10	55	2.5	3	FU0720L0	GN5709V0	GN978200
60	50	6	7	10	59	2.5	3	FU0742L0	GN4335V0	GN913800
63	53	6	7	10	62	2.5	3	FU0784L0	GN4693V0	GN914000
65	55	6	7	10	64	2.5	3	FU0807L0	GN4810V0	GN914100
66	56	6	7	10	65	2.5	3	FU0825L0	GN4766V0	GN914300
70	60	6	7	10	69	2.5	3	FU0846L0	GN4676V0	GN914400
71	60	7	8	11	70	2.5	3	FU2145L0	GN4812V0	GN914500
71	61	6	7	10	70	2.5	3	FU0877L0	GN4629V0	GN978300
73	63	6	7	10	72	2.5	3	FU0889L0	GN4814V0	GN914700
75	65	6	7	10	74	2.5	3	FU0897L0	GN4816V0	GN914900
77	67	6	7	10	76	2.5	3	FU0922L0	GN4697V0	GN915000
80	70	6	7	10	79	2.5	3	FU0936L0	GN4651V0	GN909200
80	71	6	7	10	79	2.5	3	FU2146L0	GN4818V0	GN915200
85	75	6	7	10	84	2.5	3	FU0979L0	GN4692V0	GN924100
90	80	6	7	10	89	2.5	3	FU1019L0	GN4820V0	GN915500
100	85	9	10	13	98	4	3	FU1078L0	GN4687V0	GN909100
105	90	9	10	13	103	4	3	FU1120L0	GN4698V0	GN915800

Special Packings for Piston Seals (Installed with internal groove)

OSI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.

Example Order for the packing as a single piece

NOK part number: **FU1152L0**

Type: OSI, Outer diameter: 110, Inner diameter: 95, Height: 9

Orders for backup rings used in combination with packing

NOK part number: **GN4822V0**

Type: BRT2, Inner diameter: 95, Outer diameter: 110, Thickness: 3

● Please check the application range on pages 6 and 7 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring Thickness	Packing part number	Combination backup ring part number	
D(Outer diameter)	d(Inner diameter)	h(Height)	H _A	H _B	øD ₁	C			BRT2 (Biascut) 19YF	BRN2 (Biascut) 80NP
110	95	9	10	13	108	4	3	FU1152L0	GN4822V0	GN916000
112	98	8.5	9.5	12.5	110	4	3	FU2147L0	GN4824V0	GN916200
115	100	9	10	13	113	4	3	FU1193L0	GN4512V0	GN916300
120	105	9	10	13	118	4	3	FU1212L0	GN5198V0	GN958900
120	106	8.5	9.5	12.5	118	4	3	FU2148L0	GN4826V0	GN916600
125	112	8.5	9.5	12.5	123	4	3	FU2847L0	GN4827V0	GN916700
125	112	9	10	13	123	4	3	FU1926L0	GN4827V0	GN916700
130	115	9	10	13	128	4	3	FU1278L0	GN4593V0	GN927400
140	125	9	10	13	138	4	3	FU1320L0	GN4481V0	GN917000
145	130	9	10	13	143	4	3	FU2405L0	GN4628V1	GN974201
150	135	9	10	13	148	4	3	FU1356L0	GN5025V0	GN953900
150	136	8.5	9.5	12.5	148	4	3	FU2149L0	GN4830V0	GN917300
155	140	9	10	13	153	4	3	FU1386L0	GN4526V0	GN941000
160	145	9	10	13	158	4	3	FU1404L0	GN4551V0	GN917500
170	155	9	10	14	168	4	4	FU1441L0	GN4834V0	GN917800
175	160	9	10	14	173	4	4	FU1458L0	GN4835V0	GN918000
180	165	9	10	14	178	4	4	FU1481L0	GN4836V0	GN918200
190	175	9	10	14	188	4	4	FU1511L0	GN4839V0	GN918500
200	180	12	13	17	198	5	4	FU1539L0	GN4470V0	GN918700
210	190	12	13	17	208	5	4	FU1572L0	GN4841V0	GN919000
220	200	12	13	17	218	5	4	FU1594L0	GN4385V0	GN919100
224	204	12	13	17	222	5	4	FU1606L0	GN4842V0	GN919300
225	205	12	13	17	223	5	4	FU1618L0	GN5710V0	GN978400
230	210	12	13	17	228	5	4	FU1635L0	GN4627V0	GN919500
240	220	12	13	17	238	5	4	FU1655L0	GN4444V0	GN919600
250	230	12	13	17	248	5	4	FU1675L0	GN4635V0	GN904700
260	240	12	13	17	258	5	4	FU1700L0	GN4845V0	GN919800
270	250	12	13	17	268	5	4	FU1717L0	GN4459V0	GN919900
280	255	16	17	21	278	6.5	4	FU1730L0	GN4846V0	GN920100
290	265	16	17	21	288	6.5	4	FU1745L0	GN4848V0	GN920300
300	275	16	17	21	298	6.5	4	FU1760L0	GN4852V0	GN920700

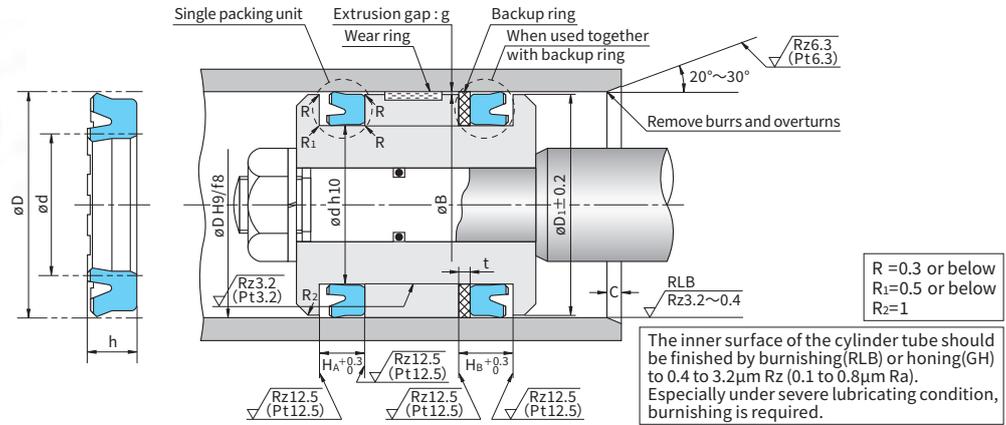
Special Packings for Piston Seals (Installed with internal groove)

OUIS_{type}

Material	NOK sign
Iron rubber (PUR)	Standard : U801
	Heat resistant type : U641

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number : **FU0490P1**
 Type : OUIS, Outer diameter : 40, Inner diameter : 30, Height : 6
 Orders for backup rings used in combination with packing
 NOK part number : **GN4794V0**
 Type : BRT2, Inner diameter : 30, Outer diameter : 40, Thickness : 3

● Please check the application range on pages 6 and 7 before selecting the type.



How to determine B dimension

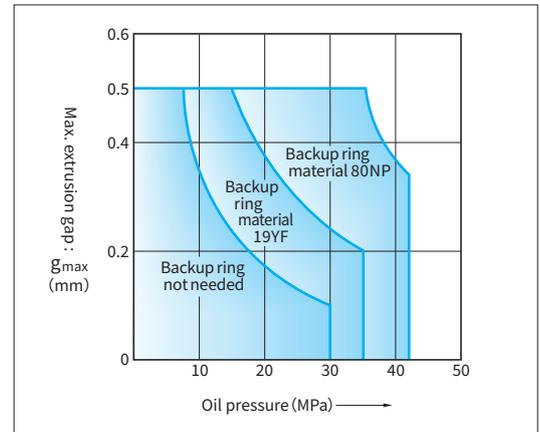
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	35MPa
Material of backup ring	19YF		
B dimension	$B \geq \phi D - 1.0$	$B \geq \phi D - 0.5$	$B \geq \phi D - 0.2$
Maximum service pressure	35MPa	42MPa	
Material of backup ring	80NP		
B dimension	$B \geq \phi D - 0.8$	$B \geq \phi D - 0.4$	

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal size of packing, and housing dimensions							Backup ring thickness	Packing part number		Combination backup ring part number	
D (Outer diameter)	d (Inner diameter)	h (Height)	H _A	H _B	øD ₁	C		t	Standard (U801)	Heat resistant (U641)	BRT2 (Biacsut) 19YF
40	30	6	7	10	39	2.5	3	FU0490P1	FU0490P0	GN4794V0	GN912200
45	35	6	7	10	44	2.5	3	FU0563P1	FU0563P0	GN4799V0	GN912700
50	40	6	7	10	49	2.5	3	FU0613P1	FU0613P0	GN4050V0	GN913100
60	50	6	7	10	59	2.5	3	FU0742P1	FU0742P0	GN4335V0	GN913800
63	53	6	7	10	62	2.5	3	FU0784P1	FU0784P0	GN4693V0	GN914000
65	55	6	7	10	64	2.5	3	FU0807P1	FU0807P0	GN4810V0	GN914100
70	60	6	7	10	69	2.5	3	FU0846P1	FU0846P0	GN4676V0	GN914400
75	65	6	7	10	74	2.5	3	FU0897P1	FU0897P0	GN4816V0	GN914900
80	70	6	7	10	79	2.5	3	FU0936P1	FU0936P0	GN4651V0	GN909200
80	71	6	7	10	79	2.5	3	FU2146P1	FU2146P0	GN4818V0	GN915200
85	75	6	7	10	84	2.5	3	FU0979P1	FU0979P0	GN4692V0	GN924100
90	80	6	7	10	89	2.5	3	FU1019P1	FU1019P0	GN4820V0	GN915500
100	85	9	10	13	98	4	3	FU1078P1	FU1078P0	GN4687V0	GN909100
105	90	9	10	13	103	4	3	FU1120P1	FU1120P0	GN4698V0	GN915800
110	95	9	10	13	108	4	3	FU1152P1	FU1152P0	GN4822V0	GN916000
115	100	9	10	13	113	4	3	FU1193P0	FU1193P1	GN4512V0	GN916300
120	105	9	10	13	118	4	3	FU1212P1	FU1212P0	GN5198V0	GN958900
125	112	8.5	9.5	12.5	123	4	3	FU2903P0	FU2903P1	GN4827V0	GN916700
125	112	9	10	13	123	4	3	FU1926P1	FU1926P0	GN4827V0	GN916700
130	115	9	10	13	128	4	3	FU1278P1	FU1278P0	GN4593V0	GN927400
140	125	9	10	13	138	4	3	FU1320P1	FU1320P0	GN4481V0	GN917000
150	135	9	10	13	148	4	3	FU1356P1	FU1356P0	GN5025V0	GN953900
150	136	8.5	9.5	12.5	148	4	3	FU2149P0	FU2149P1	GN4830V0	GN917300
160	145	9	10	13	158	4	3	FU1404P1	FU1404P0	GN4551V0	GN917500
170	155	9	10	14	168	4	4	FU1441P1	FU1441P0	GN4834V0	GN917800
175	160	9	10	14	173	4	4	FU1458P0	FU1458P1	GN4835V0	GN918000
180	165	9	10	14	178	4	4	FU1481P1	FU1481P0	GN4836V0	GN918200
190	175	9	10	14	188	4	4	FU1511P1	FU1511P0	GN4839V0	GN918500
200	180	12	13	17	198	5	4	FU1539P1	FU1539P0	GN4470V0	GN918700
224	204	12	13	17	222	5	4	FU1606P1	FU1606P0	GN4842V0	GN919300
250	230	12	13	17	248	5	4	FU1675P1	FU1675P0	GN4635V0	GN904700

Special Packings for Piston Seals (Installed with internal groove)

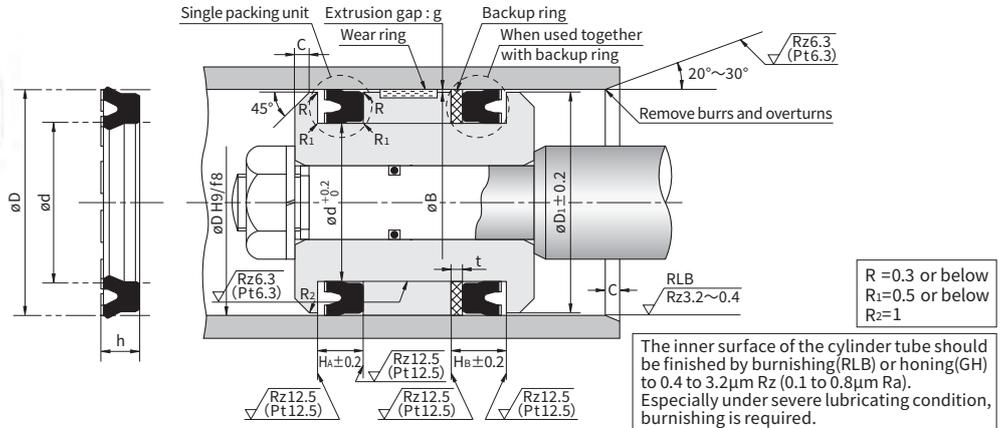
OUHR_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard: A505 Cold resistant type: A567

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **CU2683Q2**
 Type: OUHR, Outer diameter: 32, Inner diameter: 24, Height: 5
 Orders for backup rings used in combination with packing
 NOK part number: **GN5727V0**
 Type: BRT2, Inner diameter: 24, Outer diameter: 32, Thickness: 2

● Please check the application range on pages 6 and 7 before selecting the type.

RICO for Piston



How to determine B dimension

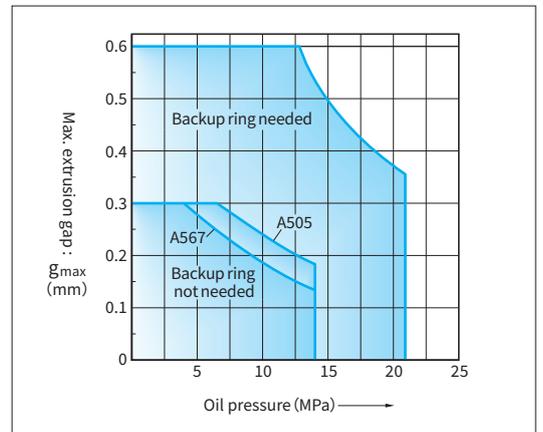
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa
Material of backup ring	19YF	
B dimension	$B \geq \phi D - 1.0$	$B \geq \phi D - 0.5$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal size of packing, and housing dimensions							Backup ring Thickness	Packing part number		Combination backup ring part number
D(Outer diameter)	d(Inner diameter)	h(Height)	H _A	H _B	øD ₁	C		t	Standard(A505)	Cold resistant(A567)
32	24	5	5.7	7.7	31	3.5	2	CU2683Q2	CU2683Q3	GN5727V0
40	30	6	7	10	39	3.5	3	CU2684Q3	CU2684Q5	GN4794V0
50	40	6	7	10	49	3.5	3	CU2604Q3	CU2604Q4	GN4050V0
55	45	6	7	10	54	3.5	3	CU2697Q1		GN4804V0
60	50	6	7	10	59	3.5	3	CU2696Q2	CU2696Q3	GN4335V0
63	53	6	7	10	62	3.5	3	CU2685Q0	CU2685Q4	GN4693V0
65	55	6	7	10	64	3.5	3	CU2930Q2	CU2930Q3	GN4810V0
70	60	6	7	10	69	3.5	3		CU2634Q2	GN4676V0
75	62	7.5	8.5	11.5	74	4.5	3	CU2943Q2	CU2943Q3	GN5712V0
80	65	9	10	13	79	4.5	3	CU2666Q2	CU2666Q3	GN4549V0
80	71	6	7	10	79	4.5	3	CU3238Q1		GN4818V0
85	70	9	10	13	84	4.5	3	CU0977Q2	CU0977Q3	GN4876V0
95	80	9	10	13	94	4.5	3	CU2605Q2	CU2605Q4	GN5023V0
100	85	9	10	13	98	4.5	3	CU2669Q2	CU2669Q3	GN4687V0
110	95	9	10	13	108	4.5	3	CU2607Q2	CU2607Q3	GN4822V0
115	100	9	10	13	113	4.5	3		CU3241Q2	GN4512V0
125	110	9	10	13	123	4.5	3		CU2670Q2	GN4480V0
125	112	8.5	9.5	12.5	123	4.5	3	CU3492Q0		GN4827V0
140	125	9	10	13	138	4.5	3	CU2647Q3	CU2647Q2	GN4481V0
150	136	8.5	9.5	12.5	148	4.5	3	CU3244Q1		GN4830V0
160	145	9	10	13	158	4.5	3	CU2687Q1		GN4551V0
180	165	9	10	14	178	4.5	4	CU2688Q1		GN4836V0
200	180	12	13	17	198	5.5	4	CU1539Q1	CU1539Q2	GN4470V0
224	204	12	13	17	222	5.5	4	CU3491Q0		GN4842V0
250	230	12	13	17	248	5.5	4	CU2691Q2	CU2691Q3	GN4635V0

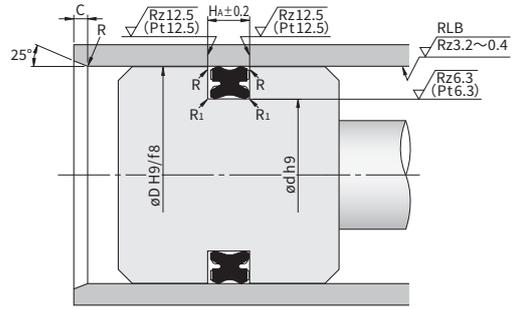
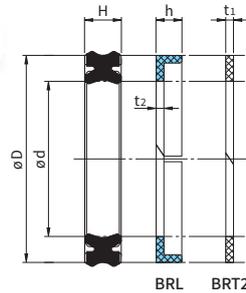
Special Packings for Piston Seals

OKH type + BRL type

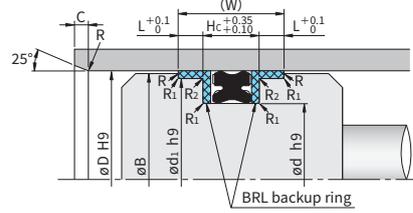
	Material	NOK sign
OKH	Nitrile rubber (NBR)	Standard: A566 Cold resistant type: A567
BRL	Polyamide resin (PA) Rarefalon (PTFE)	63NP 19FY

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **CQ0371C0**
 Type: OKH, Outer diameter: 40, Inner diameter: 32, Height: 6.5
 Orders for combined wear ring and backup ring
 NOK part number: **GN9965V0**
 Type: BRL, Inner diameter: 30, Outer diameter: 40, Height: 5.5

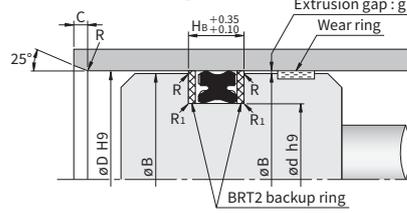
● Please check the application range on pages 6 and 7 before selecting the type.



● When used together with BRL



● When used together with BRT2

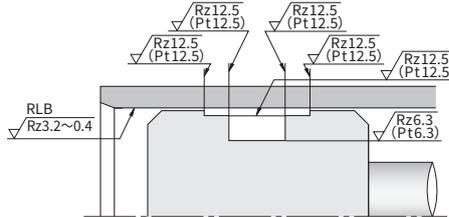


R = 0.3 or below
 R₁ = 0.4 or below
 R₂ = 0.2

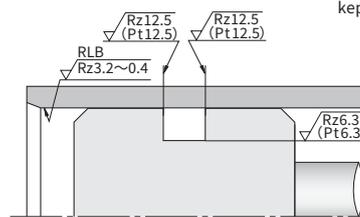
The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

Surface roughness of each part

● When used together with BRL



● Only OKH with BRT2



● The roughness is JIS B 0601: 2001. When regulation length cannot be kept, apply Pt.

How to determine B dimension

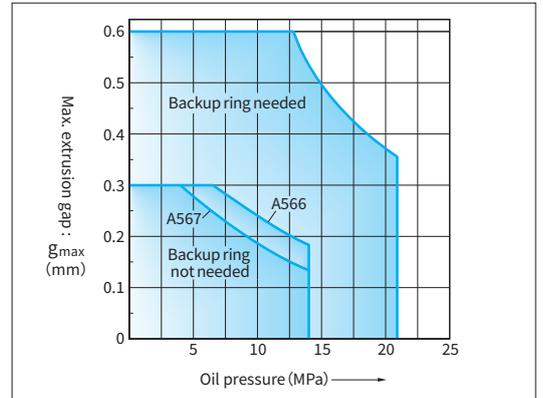
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa
Material of backup ring	63NP, 19FY	
B dimension	$B \geq \phi D - 1.0$	$B \geq \phi D - 0.5$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal number	Nominal size of packing, and housing dimensions													Packing part number		Combination backup ring part number BRL (also be used as wear ring) BRT2 (Biascut)	
	D (Outer diameter)	d (Inner diameter)	H (Height)	t ₁	t ₂	h (Height)	ød ₁	H _A	H _B	H _C	L	(W)	C	Standard (A566)	Cold resistant (A567)	63NP	19FY
OKH40	40	30	6.5	2	1.5	5.5	37	7	11	10	4	18	2.5	CQ0371C0	CQ0371C1	GN9965V0	GN4662V0
45	45	35	6.5	2	1.5	5.5	42	7	11	10	4	18	2.5	CQ0372C0	CQ0372C1	GN9966V0	GN5765V0
50	50	40	6.5	2	1.5	5.5	47	7	11	10	4	18	2.5	CQ0311C1	CQ0311C2	GN9967V0	GN4672V0
55	55	45	6.5	2	1.5	5.5	52	7	11	10	4	18	2.5	CQ0373C0	CQ0373C1	GN9968V0	GN5480V0
60	60	50	6.5	2	1.5	5.5	57	7	11	10	4	18	2.5	CQ0316C0	CQ0316C1	GN9969V1	GN4976V0
63	63	53	6.5	2	1.5	5.5	60	7	11	10	4	18	2.5	CQ0374C0	CQ0374C1	GN9969V0	GN5511V0
65	65	55	6.5	2.5	2	7	61	7	12	11	5	21	2.5	CQ0329C0	CQ0329C1	GN9730V1	GN5766V0
70	70	60	6.5	2.5	2	7	66	7	12	11	5	21	2.5	CQ0313C1	CQ0313C2	GN9695V1	GN5525V0
75	75	65	6.5	2.5	2	7	71	7	12	11	5	21	2.5	CQ0375C0	CQ0375C1	GN9970V0	GN5767V0
80	80	67	8	2.5	2	7	76	8.5	13.5	12.5	5	22.5	3	CQ0330C0	CQ0330C1	GN9731V1	GN5768V0
85	85	72	8	2.5	2	7	81	8.5	13.5	12.5	5	22.5	3	CQ0376C0	CQ0376C1	GN9971V0	GN5769V0
90	90	77	8	2.5	2	7	86	8.5	13.5	12.5	5	22.5	3	CQ0377C0	CQ0377C1	GN9972V0	GN5770V0
100	100	85	9	3	2	7	96	10	16	14	5	24	4	CQ0378C0	CQ0378C1	GN9973V0	GN4687V0

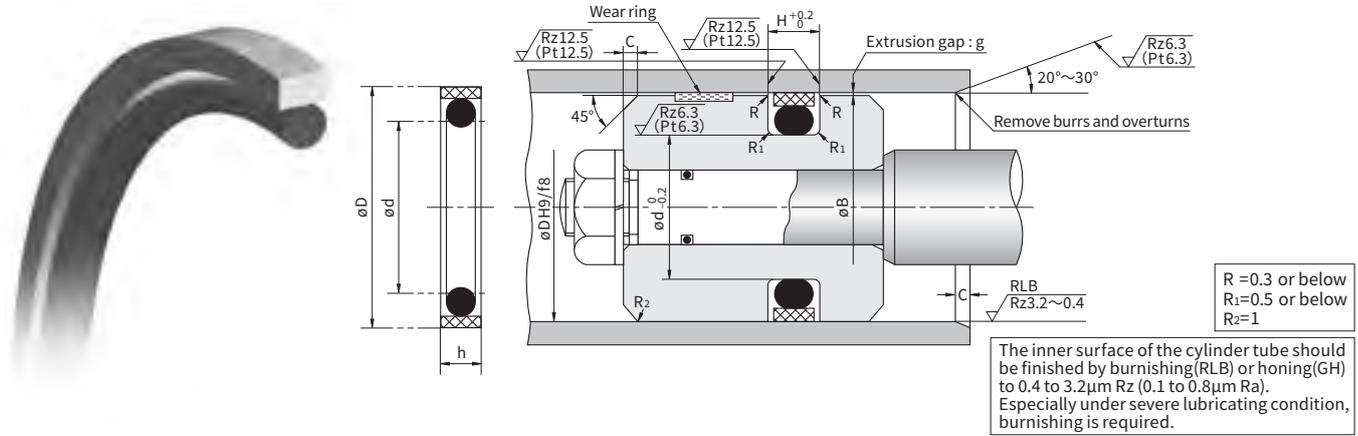
Special Packings for Piston Seals

SPGO_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	19YF + A305

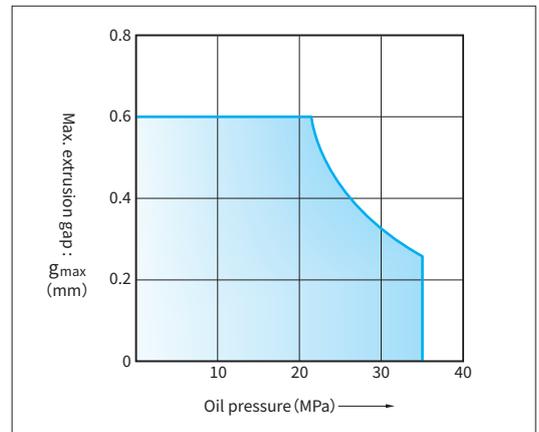
■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS1800V0
 Type: SPGO, Inner diameter: 14, Outer diameter: 20, Height: 3

● Please check the application range on pages 6 and 7 before selecting the type.



How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPGO 20	14	20	3	3.2	2	GS1800V0
25	19	25	3	3.2	2	GS1801V0
30	21.5	30	3.8	4	3.5	GS1802V0
31.5	23	31.5	3.8	4	3.5	GS1803V0
32	23.5	32	3.8	4	3.5	GS1804V0
35	26.5	35	3.8	4	3.5	GS1805V0
35.5	27	35.5	3.8	4	3.5	GS1806V0
40	31.5	40	3.8	4	3.5	GS1807V0
45	36.5	45	3.8	4	3.5	GS1808V0
50	41.5	50	3.8	4	4	GS1809V0
53	44.5	53	3.8	4	4	GS1810V0
55	46.5	55	3.8	4	4	GS1811V0
56	47.5	56	3.8	4	4	GS1812V0
60	51.5	60	3.8	4	4	GS1813V0
63	49	63	6.3	6.5	4	GS1814V0
65	51	65	6.3	6.5	4	GS1815V0
70	56	70	6.3	6.5	5	GS1816V0
71	57	71	6.3	6.5	5	GS1817V0
75	61	75	6.3	6.5	5	GS1818V0
80	66	80	6.3	6.5	5	GS1819V0
85	71	85	6.3	6.5	5	GS1820V0
90	76	90	6.3	6.5	5	GS1821V0
95	81	95	6.3	6.5	5	GS1822V0
100	86	100	6.3	6.5	5	GS1823V0
105	91	105	6.3	6.5	5	GS1824V0
110	96	110	6.3	6.5	5	GS1825V0
112	98	112	6.3	6.5	6.5	GS1826V0

Special Packings for Piston Seals

SPGO_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	19YF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS1827V0
 Type:SPGO, Inner diameter : 101, Outer diameter : 115,
 Height : 6.3

● Please check the application range on pages 6 and 7 before selecting the type.

Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPGO 115	101	115	6.3	6.5	6.5	GS1827V0
120	106	120	6.3	6.5	6.5	GS1828V0
125	111	125	6.3	6.5	6.5	GS1829V0
130	116	130	6.3	6.5	6.5	GS1830V0
135	121	135	6.3	6.5	6.5	GS1831V0
140	126	140	6.3	6.5	6.5	GS1832V0
150	136	150	6.3	6.5	6.5	GS1833V0
160	146	160	6.3	6.5	6.5	GS1834V0
170	150	170	9.8	10	6.5	GS1835V0
180	160	180	9.8	10	6.5	GS1836V0
190	170	190	9.8	10	6.5	GS1837V0
200	180	200	9.8	10	6.5	GS1838V0
210	190	210	9.8	10	6.5	GS1839V0
220	200	220	9.8	10	6.5	GS1840V0
224	204	224	9.8	10	6.5	GS1841V0
230	210	230	9.8	10	6.5	GS1842V0
240	220	240	9.8	10	6.5	GS1843V0
250	230	250	9.8	10	6.5	GS1844V0
260	240	260	9.8	10	7.5	GS1845V0
270	250	270	9.8	10	7.5	GS1846V0
280	260	280	9.8	10	7.5	GS1847V0
290	270	290	9.8	10	7.5	GS1848V0
300	280	300	9.8	10	7.5	GS1849V0
310	290	310	9.8	10	7.5	GS1850V0
320	300	320	9.8	10	7.5	GS1851V0
340	320	340	9.8	10	7.5	GS1852V0
350	330	350	9.8	10	7.5	GS1853V0
360	340	360	9.8	10	7.5	GS1854V0
375	355	375	9.8	10	7.5	GS1855V0
380	360	380	9.8	10	7.5	GS1856V0
400	380	400	9.8	10	7.5	GS1857V0

Special Packings for Piston Seals

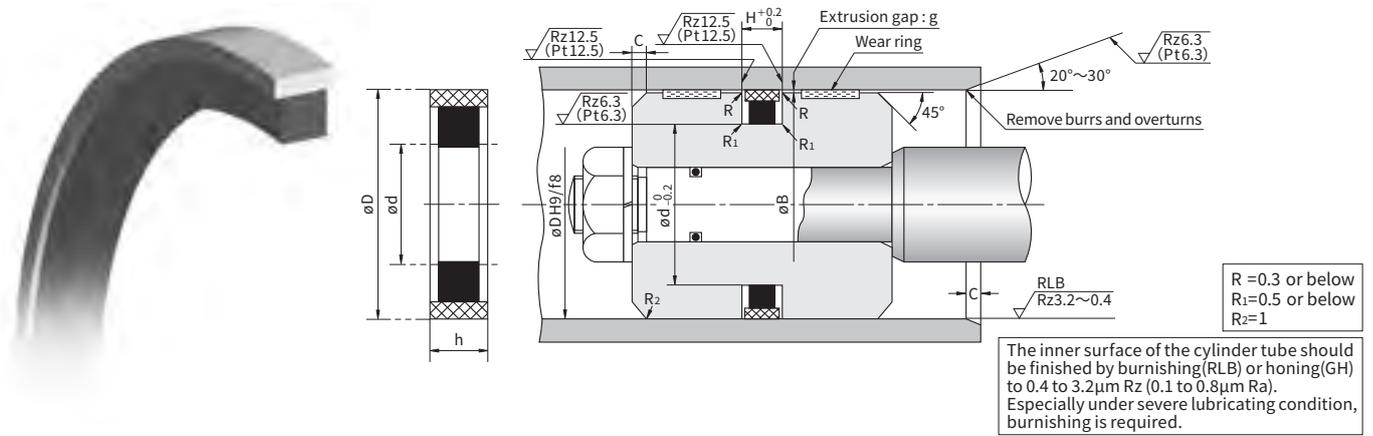
SPG_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	19YF +
	Outer diameter 950mm or below : A980 Outer diameter more than 950mm : A402

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS0327V0
 Type: SPG, Inner diameter: 20.5, Outer diameter: 30, Height: 4.3

● Please check the application range on pages 6 and 7 before selecting the type.

SPG for Piston

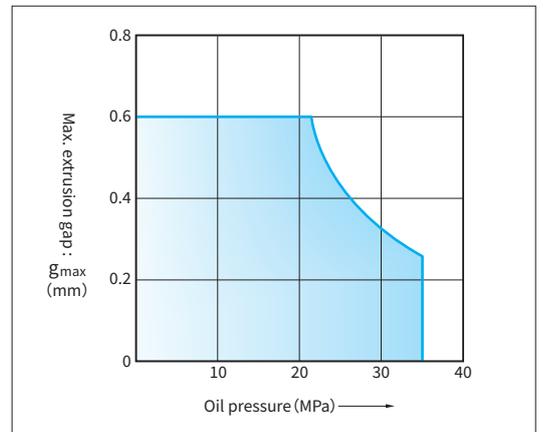


The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPG 30	20.5	30	4.3	4.5	2	GS0327V0
31.5	22	31.5	4.3	4.5	3.5	GS0328V0
32	22.5	32	4.3	4.5	3.5	GS0329V0
35	25.5	35	4.3	4.5	3.5	GS0330V0
35.5	26	35.5	4.3	4.5	3.5	GS0331V0
40	30	40	4.3	4.5	3.5	GS0332V0
45	35	45	4.3	4.5	3.5	GS0333V0
50	40	50	4.3	4.5	4	GS0334V0
55	45	55	4.3	4.5	4	GS0335V0
56	46	56	4.3	4.5	4	GS0336V0
60	50	60	4.3	4.5	4	GS0337V0
63	48	63	7.3	7.5	4	GS0338V0
65	50	65	7.3	7.5	4	GS0339V0
69	54	69	7.3	7.5	4	GS0340V0
70	55	70	7.3	7.5	5	GS0341V0
71	56	71	7.3	7.5	5	GS0342V0
75	60	75	7.3	7.5	5	GS0343V0
80	65	80	7.3	7.5	5	GS0344V0
85	70	85	7.3	7.5	5	GS0345V0
90	75	90	7.3	7.5	5	GS0310V0
95	80	95	7.3	7.5	5	GS0346V0
100	85	100	7.3	7.5	5	GS0347V0
105	90	105	7.3	7.5	5	GS3509V0
108	92	108	7.3	7.5	5	GS0348V0
110	94	110	7.3	7.5	5	GS0311V0
112	96	112	7.3	7.5	6.5	GS0349V0
120	104	120	7.3	7.5	6.5	GS0350V0

Special Packings for Piston Seals

SPG_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	19YF + Outer diameter 950mm or below : A980 Outer diameter more than 950mm : A402

■ Please designate NOK part number and type & size on your order.
Example NOK part number : GS0351V0
 Type : SPG, Inner diameter : 109, Outer diameter : 125, Height : 7.3

● Please check the application range on pages 6 and 7 before selecting the type.

Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPG 125	109	125	7.3	7.5	6.5	GS0351V0
130	114	130	7.3	7.5	6.5	GS0352V0
135	119	135	7.3	7.5	6.5	GS0806V1
140	124	140	7.3	7.5	6.5	GS0353V0
145	129	145	7.3	7.5	6.5	GS0885V0
150	134	150	7.3	7.5	6.5	GS0354V0
155	139	155	7.3	7.5	6.5	GS3133V1
160	144	160	7.3	7.5	6.5	GS0355V0
170	148	170	10.8	11	6.5	GS0356V0
180	158	180	10.8	11	6.5	GS0357V0
190	168	190	10.8	11	6.5	GS0358V0
200	178	200	10.8	11	6.5	GS0359V0
204	182	204	10.8	11	6.5	GS0360V0
210	188	210	10.8	11	6.5	GS0361V0
215	193	215	10.8	11	6.5	GS0548V0
220	198	220	10.8	11	6.5	GS0842V0
224	202	224	10.8	11	6.5	GS0362V0
225	203	225	10.8	11	6.5	GS0363V0
230	208	230	10.8	11	6.5	GS0364V0
240	218	240	10.8	11	6.5	GS0365V0
250	228	250	10.8	11	6.5	GS0366V0
260	236	260	11.7	12	7.5	GS0700V0
270	246	270	11.7	12	7.5	GS0701V0
280	256	280	11.7	12	7.5	GS0702V0
290	266	290	11.7	12	7.5	GS0703V0
300	276	300	11.7	12	7.5	GS0704V0
310	286	310	11.7	12	7.5	GS0705V0
320	296	320	11.7	12	7.5	GS0706V0
330	308	330	9.75	10	10	GS0408V0
360	336	360	11.7	12	10	GS0917V0
400	376	400	11.7	12	10	GS3361V0
485	455	485	14.8	15	10	GS0504V1
500	470	500	14.8	15	10	GS0261V2
550	515	550	17.2	17.5	10	GS0379V2
600	570	600	14.8	15	10	GS0324V2
650	620	650	14.8	15	15	GS0527V0
720	690	720	14.8	15	15	GS0492V0
800	785	800	12.7	13	15	GS0520V0
900	870	900	24.5	25	15	GS0407V2
930	890	930	19	20	15	GS0466V1
950	925	950	17.7	18	15	GS0285V2
1000	960	1000	19.7	20	20	GS0512V0
1060	1020	1060	19.7	20	20	GS0587V0
1150	1110	1150	19.7	20	20	GS3007V0
1180	1130	1180	19.7	20	20	GS0599V1
1210	1170	1210	19	20	20	GS0465V0
1250	1210	1250	19.7	20	20	GS0281V1
1260	1220	1260	19.7	20	20	GS0851V0
1400	1350	1400	19.7	20	20	GS0402V0
1500	1460	1500	19.7	20	20	GS0852V0
1650	1600	1650	24	25	20	GS0579V0

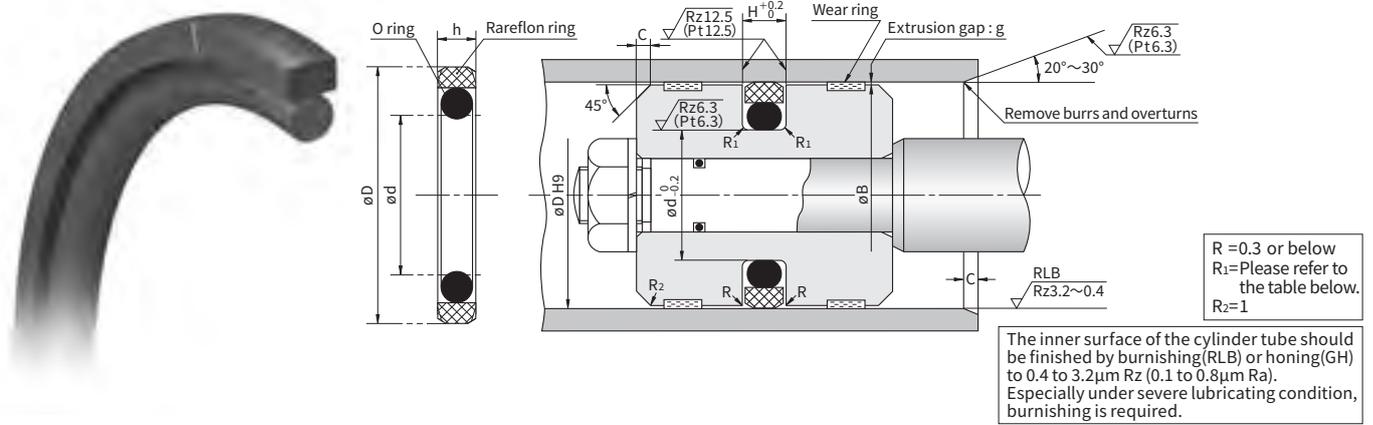
Special Packings for Piston Seals

SPGM_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	55YF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS4283V0
 Type: SPGM, Inner diameter: 24.5, Outer diameter: 32, Height: 3

● Please check the application range on pages 6 and 7 before selecting the type.



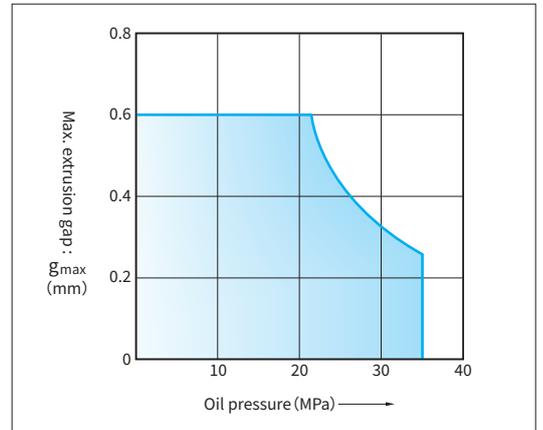
R = 0.3 or below
 R₁ = Please refer to the table below.
 R₂ = 1

The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2 μm Rz (0.1 to 0.8 μm Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal number	Nominal size of packing, and housing dimensions						NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	Bottom of groove R ₁	C	
SPGM 32 S	24.5	32	3	3.2	0.6以下	4	GS4283V0
40 S	29	40	4	4.2	1.0以下	4	GS4284V0
50 S	39	50	4	4.2	1.0以下	4	GS4285V0
63 S	52	63	4	4.2	1.0以下	4	GS4286V0
80 S	64.5	80	6.1	6.3	1.3以下	5	GS4288V0
100 S	84.5	100	6.1	6.3	1.3以下	5	GS3882V2
125 S	109.5	125	6.1	6.3	1.3以下	5	GS4289V0
140 S	119	140	7.7	8.1	1.8以下	6.5	GS3703V1
150 S	129	150	7.7	8.1	1.8以下	6.5	GS3683V2
160 S	139	160	7.7	8.1	1.8以下	6.5	GS3704V3
180 S	159	180	7.7	8.1	1.8以下	6.5	GS4088V1
200 S	179	200	7.7	8.1	1.8以下	6.5	GS3764V1
250 S	229	250	7.7	8.1	1.8以下	6.5	GS4291V0

Special Packings for Piston Seals

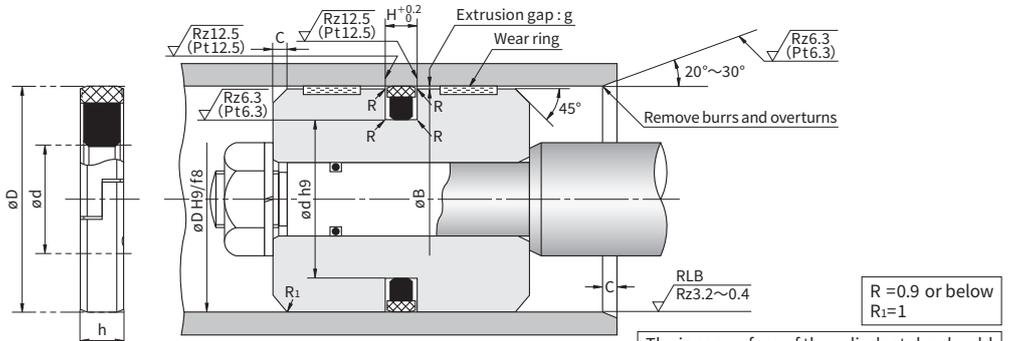
SPGN_{type}

Material	NOK sign
Polyamide resin (PA) + Nitrile rubber (NBR)	21NB + A626

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS4243V0
 Type: SPGN, Inner diameter : 54, Outer diameter : 75,
 Height : 7.8

5

● Please check the application range on pages 6 and 7 before selecting the type.

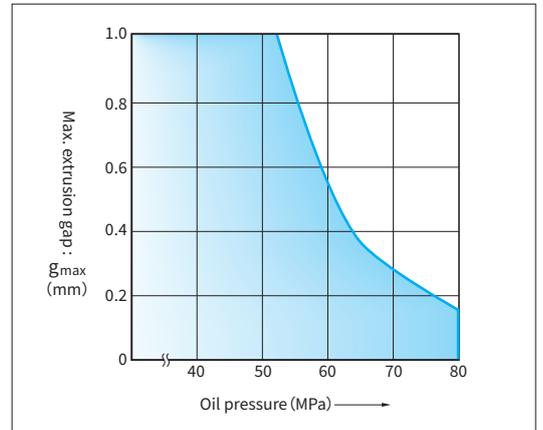


The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2 μ m Rz (0.1 to 0.8 μ m Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPGN 75	54	75	7.8	8.0	5.0	GS4243V0
80	59	80	7.8	8.0	5.0	GS4244V0
85	64	85	7.8	8.0	5.0	GS4245V0
90	69	90	7.8	8.0	5.0	GS4246V0
95	74	95	7.8	8.0	5.0	GS4247V0
100	79	100	7.8	8.0	5.0	GS4248V0
105	84	105	7.8	8.0	5.0	GS4249V0
110	89	110	7.8	8.0	5.0	GS4250V0
115	94	115	7.8	8.0	6.5	GS4251V0
120	99	120	7.8	8.0	6.5	GS4252V0
125	104	125	7.8	8.0	6.5	GS4253V0
130	109	130	7.8	8.0	6.5	GS4254V0
135	114	135	7.8	8.0	6.5	GS4255V0
140	119	140	7.8	8.0	6.5	GS4256V0
145	124	145	7.8	8.0	6.5	GS4257V0
150	129	150	7.8	8.0	6.5	GS4258V0
160	139	160	7.8	8.0	6.5	GS4259V0
170	149	170	7.8	8.0	6.5	GS4261V0
180	159	180	7.8	8.0	6.5	GS4263V0
190	169	190	7.8	8.0	6.5	GS4264V0
200	179	200	7.8	8.0	6.5	GS4266V0

SPGN for Piston

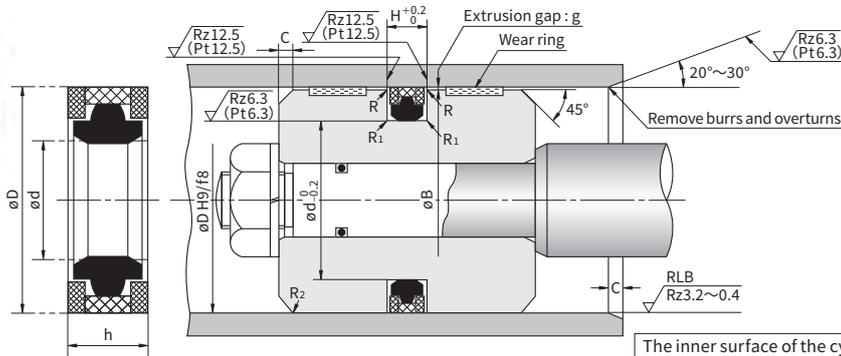
Special Packings for Piston Seals

SPGW_{type}

Material	NOK sign
Rareflon (PTFE) + Standard: Nitrile rubber (NBR) Heat resistant: Hydrogenated nitrile rubber (HNBR) + Polyamide resin (PA)	19YF + Standard: A980 Heat resistant: G928 + 80NP or 12NM

■ Please designate NOK part number and type & size on your order.
Example NOK part number: **GS0535V5**
 Type: SPGW, Inner diameter: 36,
 Outer diameter: 50, Height: 8.5

● Please check the application range on pages 6 and 7 before selecting the type.

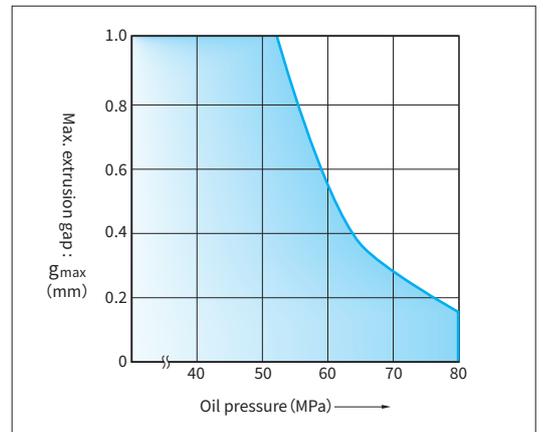


The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston.



Nominal number	Nominal size of packing, and housing dimensions					NOK part number	
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	Standard backup ring (A980)	Heat resistant backup ring (G928)
SPGW 50	36	50	8.5	9	4	GS0535V5	
60	46	60	8.5	9	4	GS0528V5	GS00528-V4A
65	50	65	10.5	11	5	GS3013V5	GS3013V6
70	55	70	10.5	11	5	GS0607V5	GS0607V7
75	60	75	10.5	11	5	GS0995V5	GS0995V6
80	65	80	10.5	11	5	GS0608V5	GS0608V8
85	70	85	10.5	11	5	GS0813V5	GS0813V6
90	75	90	10.5	11	5	GS0609V5	GS0609V7
95	80	95	10.5	11	5	GS0481V5	GS0481V6
100	85	100	12	12.5	5	GS0610V6	GS0610V8
105	90	105	12	12.5	5	GS0973V5	GS0973V7
110	95	110	12	12.5	5	GS0611V5	GS0611V6
115	100	115	12	12.5	6.5	GS0626V5	GS0626V6
120	105	120	12	12.5	6.5	GS0612V7	GS0612V8
125	102	125	15.5	16	6.5	GS0583V5	GS0583V6
130	107	130	15.5	16	6.5	GS0613V5	GS0613V7
135	112	135	15.5	16	6.5	GS0908V5	GS0908V6
140	117	140	15.5	16	6.5	GS0432V5	GS0432V7
145	122	145	15.5	16	6.5	GS0907V1	GS0907V2
150	127	150	15.5	16	6.5	GS0614V5	GS0614V7
160	137	160	15.5	16	6.5	GS0615V5	GS0615V8
170	147	170	15.5	16	6.5	GS0688V5	GS0688V6
180	157	180	15.5	16	6.5	GS0616V5	GS0616V7
185	162	185	15.5	16	6.5	GS0653V5	GS0653V6
190	167	190	15.5	16	6.5	GS0644V5	GS0644V6
200	177	200	15.5	16	6.5	GS0617V5	GS0617V7
210	187	210	15.5	16	6.5	GS0654V2	GS0654V4

Special Packings for Piston Seals

SPGW_{type}

Material	NOK sign
Rareflon (PTFE) +	19YF +
Standard: Nitrile rubber (NBR) Heat resistant: Hydrogenated nitrile rubber (HNBR) +	Standard: A980 Heat resistant: G928 +
Polyamide resin (PA)	80NP or 12NM

■ Please designate NOK part number and type & size on your order.
Example NOK part number: **GS0655V2**
 Type: SPGW, Inner diameter: 197,
 Outer diameter: 220, Height: 15.5

● Please check the application range on pages 6 and 7 before selecting the type.

Nominal number	Nominal size of packing, and housing dimensions					NOK part number	
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	Standard backup ring (A980)	Heat resistant backup ring (G928)
SPGW 220	197	220	15.5	16	6.5	GS0655V2	
225	202	225	15.5	16	6.5	GS0618V2	GS0618V8
230	207	230	15.5	16	6.5	GS0664V2	GS00664-V4A
240	217	240	15.5	16	6.5	GS0656V2	GS00656-V4A
250	222	250	17	17.5	6.5	GS0451V4	
260	232	260	17	17.5	7.5	GS0605V2	
270	242	270	17	17.5	7.5	GS0689V2	
280	252	280	17	17.5	7.5	GS0619V2	
300	272	300	17	17.5	7.5	GS0510V2	
320	292	320	17	17.5	7.5	GS0690V2	

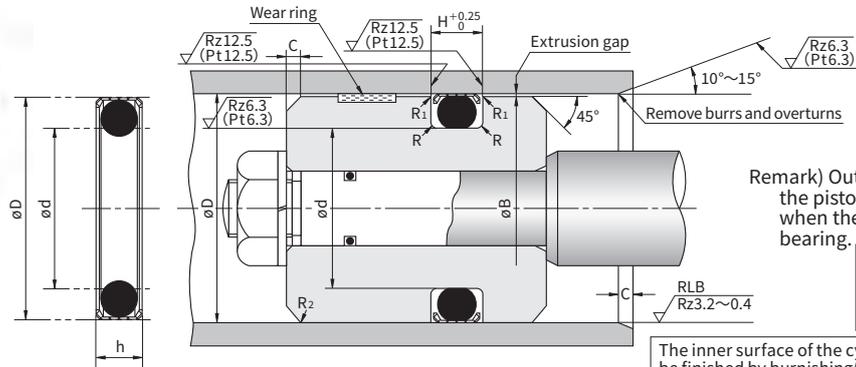
Special Packings for Piston Seals

SPGC_{type}

Material	NOK sign
Rarefion (PTFE) + Nitrile rubber (NBR)	31BF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS1000F0
 Type: SPGC, Inner diameter: 3, Outer diameter: 6, Height: 2.3

● Please check the application range on pages 6 and 7 before selecting the type.



Remark) Outer diameter of the piston should be ϕD_{f8} when the piston is used as bearing.

R₁=0.3 or below
 R₂=1
 R=Please refer to the table below.

The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2 μ m Rz (0.1 to 0.8 μ m Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please make the maximum extrusion gap 0.4mm or below considering the eccentricity of piston.

Nominal number	Nominal size of packing			Housing dimensions						NOK part number	
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R		C
				$\phi d_{-0.05}$	$\phi D_{+0.05}$	$\phi d_{-0.05}$	$\phi D_{+0.05}$				
SPGC 6	3	6	2.3	3	6	2.5	6	2.5	0.3 or below	3~4	●GS1000F0
7	4	7	2.3	4	7	3.5	7	2.5	0.3 or below	3~4	●GS1001F0
8	5	8	2.3	5	8	4.5	8	2.5	0.3 or below	3~4	●GS1002F0
9	6	9	2.3	6	9	5.5	9	2.5	0.3 or below	3~4	●GS1003F0
10	7	10	2.3	7	10	6.5	10	2.5	0.3 or below	3~4	●GS1004F0
11	8	11	2.3	8	11	7.5	11	2.5	0.3 or below	3~4	●GS1005F0
12	9	12	2.3	9	12	8.5	12	2.5	0.3 or below	3~4	●GS1006F0
13	10	13	2.3	10	13	9.5	13	2.5	0.3 or below	3~4	●GS1007F0
Nominal number	Nominal size of packing			Housing dimensions						NOK part number	
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R		C
				$\phi d_{-0.06}$	$\phi D_{+0.06}$	$\phi d_{-0.06}$	$\phi D_{+0.06}$				
SPGC 14	10	14	3	10	14	9.4	14	3.2	0.4 or below	4~5	●GS1008F0
15	11	15	3	11	15	10.4	15	3.2	0.4 or below	4~5	●GS1009F0
15.2	11.2	15.2	3	11.2	15.2	10.6	15.2	3.2	0.4 or below	4~5	●GS1010F0
16	12	16	3	12	16	11.4	16	3.2	0.4 or below	4~5	●GS1011F0
16.5	12.5	16.5	3	12.5	16.5	11.9	16.5	3.2	0.4 or below	4~5	●GS1012F0
18	14	18	3	14	18	13.4	18	3.2	0.4 or below	4~5	●GS1013F0
19	15	19	3	15	19	14.4	19	3.2	0.4 or below	4~5	●GS1014F0
20	16	20	3	16	20	15.4	20	3.2	0.4 or below	4~5	●GS1015F0
22	18	22	3	18	22	17.4	22	3.2	0.4 or below	4~5	●GS1016F0
24	20	24	3	20	24	19.4	24	3.2	0.4 or below	4~5	●GS1017F0
25	21	25	3	21	25	20.4	25	3.2	0.4 or below	4~5	●GS1018F0
26	22	26	3	22	26	21.4	26	3.2	0.4 or below	4~5	●GS1020F0
Nominal number	Nominal size of packing			Housing dimensions						NOK part number	
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R		C
				$\phi d_{-0.08}$	$\phi D_{+0.08}$	$\phi d_{-0.08}$	$\phi D_{+0.08}$				
SPGC 28	22	28	4.4	22	28	21.4	28	4.7	0.7 or below	5~6	●GS1019F0
28.4	22.4	28.4	4.4	22.4	28.4	21.8	28.4	4.7	0.7 or below	5~6	●GS1021F0
30	24	30	4.4	24	30	23.4	30	4.7	0.7 or below	5~6	●GS1022F0
31	25	31	4.4	25	31	24.4	31	4.7	0.7 or below	5~6	●GS1023F0
31.5	25.5	31.5	4.4	25.5	31.5	24.9	31.5	4.7	0.7 or below	5~6	●GS1024F0
32	26	32	4.4	26	32	25.4	32	4.7	0.7 or below	5~6	●GS1025F0
34	28	34	4.4	28	34	27.4	34	4.7	0.7 or below	5~6	●GS1026F0
35	29	35	4.4	29	35	28.4	35	4.7	0.7 or below	5~6	●GS1027F0
35.5	29.5	35.5	4.4	29.5	35.5	28.9	35.5	4.7	0.7 or below	5~6	●GS1028F0
36	30	36	4.4	30	36	29.4	36	4.7	0.7 or below	5~6	●GS1029F0
37	31	37	4.4	31	37	30.4	37	4.7	0.7 or below	5~6	●GS1030F0
37.5	31.5	37.5	4.4	31.5	37.5	30.9	37.5	4.7	0.7 or below	5~6	●GS1031F0
38	32	38	4.4	32	38	31.4	38	4.7	0.7 or below	5~6	●GS1032F0
40	34	40	4.4	34	40	33.4	40	4.7	0.7 or below	5~6	●GS1033F0
41	35	41	4.4	35	41	34.4	41	4.7	0.7 or below	5~6	●GS1034F0
41.5	35.5	41.5	4.4	35.5	41.5	34.9	41.5	4.7	0.7 or below	5~6	●GS1035F0
42	36	42	4.4	36	42	35.4	42	4.7	0.7 or below	5~6	●GS1036F0

Remark) When using the packing with ●, provide separate grooves.

Special Packings for Piston Seals

SPGC_{type}

Material	NOK sign
Rarefion (PTFE) + Nitrile rubber (NBR)	31BF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS1037F0
 Type: SPGC, Inner diameter: 38, Outer diameter: 44, Height: 4.4

● Please check the application range on pages 6 and 7 before selecting the type.

Nominal number	Nominal size of packing			Housing dimensions							NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R	C	
				$\varnothing d_{-0.08}^0$	$\varnothing D_{+0.08}^0$	$\varnothing d_{-0.08}^0$	$\varnothing D_{+0.08}^0$				
SPGC 44	38	44	4.4	38	44	37.4	44	4.7	0.7 or below	5~6	●GS1037F0
45	39	45	4.4	39	45	38.4	45	4.7	0.7 or below	5~6	●GS1038F0
46	40	46	4.4	40	46	39.4	46	4.7	0.7 or below	5~6	●GS1039F0
47	41	47	4.4	41	47	40.4	47	4.7	0.7 or below	5~6	●GS1040F0
48	42	48	4.4	42	48	41.4	48	4.7	0.7 or below	5~6	●GS1041F0
50	44	50	4.4	44	50	43.4	50	4.7	0.7 or below	5~6	GS1042F0
51	45	51	4.4	45	51	44.4	51	4.7	0.7 or below	5~6	GS1043F0
52	46	52	4.4	46	52	45.4	52	4.7	0.7 or below	5~6	GS1044F0
54	48	54	4.4	48	54	47.4	54	4.7	0.7 or below	5~6	GS1046F0
55	49	55	4.4	49	55	48.4	55	4.7	0.7 or below	5~6	GS1047F0
56	50	56	4.4	50	56	49.4	56	4.7	0.7 or below	5~6	GS1049F0
Nominal number	Nominal size of packing			Housing dimensions							NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R	C	
				$\varnothing d_{-0.10}^0$	$\varnothing D_{+0.10}^0$	$\varnothing d_{-0.10}^0$	$\varnothing D_{+0.10}^0$				
SPGC 58	48	58	7	48	58	47.4	58	7.5	0.8 or below	6~8	GS1045F0
60	50	60	7	50	60	49.4	60	7.5	0.8 or below	6~8	GS1048F0
62	52	62	7	52	62	51.4	62	7.5	0.8 or below	6~8	GS1050F0
63	53	63	7	53	63	52.4	63	7.5	0.8 or below	6~8	GS1051F0
65	55	65	7	55	65	54.4	65	7.5	0.8 or below	6~8	GS1052F0
66	56	66	7	56	66	55.4	66	7.5	0.8 or below	6~8	GS1053F0
68	58	68	7	58	68	57.4	68	7.5	0.8 or below	6~8	GS1054F0
70	60	70	7	60	70	59.4	70	7.5	0.8 or below	6~8	GS1055F0
72	62	72	7	62	72	61.4	72	7.5	0.8 or below	6~8	GS1056F0
73	63	73	7	63	73	62.4	73	7.5	0.8 or below	6~8	GS1057F0
75	65	75	7	65	75	64.4	75	7.5	0.8 or below	6~8	GS1058F0
77	67	77	7	67	77	66.4	77	7.5	0.8 or below	6~8	GS1059F0
80	70	80	7	70	80	69.4	80	7.5	0.8 or below	6~8	GS1060F0
81	71	81	7	71	81	70.4	81	7.5	0.8 or below	6~8	GS1061F0
85	75	85	7	75	85	74.4	85	7.5	0.8 or below	6~8	GS1062F0
90	80	90	7	80	90	79.4	90	7.5	0.8 or below	6~8	GS1063F0
95	85	95	7	85	95	84.4	95	7.5	0.8 or below	6~8	GS1064F0
100	90	100	7	90	100	89.4	100	7.5	0.8 or below	6~8	GS1065F0
105	95	105	7	95	105	94.4	105	7.5	0.8 or below	6~8	GS1066F0
110	100	110	7	100	110	99.4	110	7.5	0.8 or below	6~8	GS1067F0
112	102	112	7	102	112	101.4	112	7.5	0.8 or below	6~8	GS1068F0
115	105	115	7	105	115	104.4	115	7.5	0.8 or below	6~8	GS1069F0
120	110	120	7	110	120	109.4	120	7.5	0.8 or below	6~8	GS1070F0
122	112	122	7	112	122	111.4	122	7.5	0.8 or below	6~8	GS1071F0
125	115	125	7	115	125	114.4	125	7.5	0.8 or below	6~8	GS1072F0
130	120	130	7	120	130	119.4	130	7.5	0.8 or below	6~8	GS1073F0
135	125	135	7	125	135	124.4	135	7.5	0.8 or below	6~8	GS1074F0
140	130	140	7	130	140	129.4	140	7.5	0.8 or below	6~8	GS1075F0
142	132	142	7	132	142	131.4	142	7.5	0.8 or below	6~8	GS1076F0
145	135	145	7	135	145	134.4	145	7.5	0.8 or below	6~8	GS1077F0
150	140	150	7	140	150	139.4	150	7.5	0.8 or below	6~8	GS1078F0
155	145	155	7	145	155	144.4	155	7.5	0.8 or below	6~8	GS1079F0
160	150	160	7	150	160	149.4	160	7.5	0.8 or below	6~8	GS1081F0
165	150	165	10.5	150	165	149.4	165	11.0	0.8 or below	8~12	GS1080F0
170	155	170	10.5	155	170	154.4	170	11.0	0.8 or below	8~12	GS1082F0
175	160	175	10.5	160	175	159.4	175	11.0	0.8 or below	8~12	GS1083F0
180	165	180	10.5	165	180	164.4	180	11.0	0.8 or below	8~12	GS1084F0
185	170	185	10.5	170	185	169.4	185	11.0	0.8 or below	8~12	GS1085F0
190	175	190	10.5	175	190	174.4	190	11.0	0.8 or below	8~12	GS1086F0
195	180	195	10.5	180	195	179.4	195	11.0	0.8 or below	8~12	GS1087F0
200	185	200	10.5	185	200	184.4	200	11.0	0.8 or below	8~12	GS1088F0
205	190	205	10.5	190	205	189.4	205	11.0	0.8 or below	8~12	GS1089F0
210	195	210	10.5	195	210	194.4	210	11.0	0.8 or below	8~12	GS1090F0

Remark) When using the packing with ●, provide separate grooves.

Special Packings for Piston Seals

SPGC_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	31BF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS1091F0
 Type: SPGC, Inner diameter: 200, Outer diameter: 215,
 Height: 10.5

● Please check the application range on pages 6 and 7 before selecting the type.

SPGC for Piston

Nominal number	Nominal size of packing			Housing dimensions							NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R	C	
				$\varnothing d_{-0.08}$	$\varnothing D_{+0.08}$	$\varnothing d_{-0.08}$	$\varnothing D_{+0.08}$				
SPGC 215	200	215	10.5	200	215	199.4	215	11.0	0.8 or below	8~12	GS1091F0
220	205	220	10.5	205	220	204.4	220	11.0	0.8 or below	8~12	GS1092F0
224	209	224	10.5	209	224	208.4	224	11.0	0.8 or below	8~12	GS1093F0
225	210	225	10.5	210	225	209.4	225	11.0	0.8 or below	8~12	GS1094F0
230	215	230	10.5	215	230	214.4	230	11.0	0.8 or below	8~12	GS1095F0
235	220	235	10.5	220	235	219.4	235	11.0	0.8 or below	8~12	GS1096F0
240	225	240	10.5	225	240	224.4	240	11.0	0.8 or below	8~12	GS1097F0
245	230	245	10.5	230	245	229.4	245	11.0	0.8 or below	8~12	GS1098F0
250	235	250	10.5	235	250	234.4	250	11.0	0.8 or below	8~12	GS1099F0
255	240	255	10.5	240	255	239.4	255	11.0	0.8 or below	8~12	GS1100F0
260	245	260	10.5	245	260	244.4	260	11.0	0.8 or below	8~12	GS1101F0
265	250	265	10.5	250	265	249.4	265	11.0	0.8 or below	8~12	GS1102F0
270	255	270	10.5	255	270	254.4	270	11.0	0.8 or below	8~12	GS1103F0
275	260	275	10.5	260	275	259.4	275	11.0	0.8 or below	8~12	GS1104F0
280	265	280	10.5	265	280	264.4	280	11.0	0.8 or below	8~12	GS1105F0
285	270	285	10.5	270	285	269.4	285	11.0	0.8 or below	8~12	GS1106F0
290	275	290	10.5	275	290	274.4	290	11.0	0.8 or below	8~12	GS1107F0
295	280	295	10.5	280	295	279.4	295	11.0	0.8 or below	8~12	GS1108F0
300	285	300	10.5	285	300	284.4	300	11.0	0.8 or below	8~12	GS1109F0
305	290	305	10.5	290	305	289.4	305	11.0	0.8 or below	8~12	GS1110F0
310	295	310	10.5	295	310	294.4	310	11.0	0.8 or below	8~12	GS1111F0
315	300	315	10.5	300	315	299.4	315	11.0	0.8 or below	8~12	GS1112F0
330	315	330	10.5	315	330	314.4	330	11.0	0.8 or below	8~12	GS1113F0
335	320	335	10.5	320	335	319.4	335	11.0	0.8 or below	8~12	GS1114F0
350	335	350	10.5	335	350	334.4	350	11.0	0.8 or below	8~12	GS1115F0
355	340	355	10.5	340	355	339.4	355	11.0	0.8 or below	8~12	GS1116F0
370	355	370	10.5	355	370	354.4	370	11.0	0.8 or below	8~12	GS1117F0
375	360	375	10.5	360	375	359.4	375	11.0	0.8 or below	8~12	GS1118F0
390	375	390	10.5	375	390	374.4	390	11.0	0.8 or below	8~12	GS1119F0
400	385	400	10.5	385	400	384.4	400	11.0	0.8 or below	8~12	GS1120F0

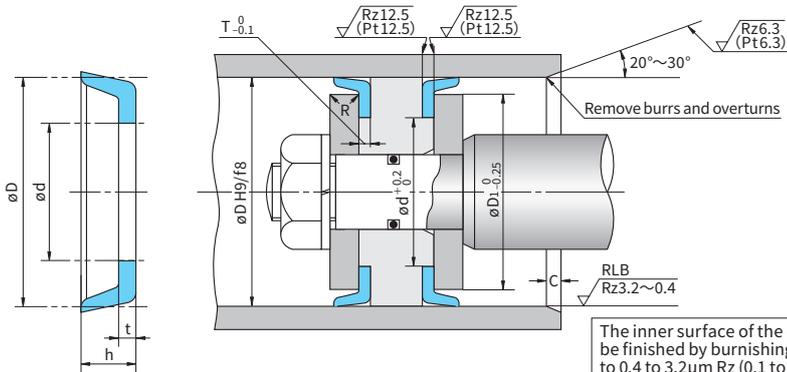
Special Packings for Piston Seals

CPI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example NOK part number: **FC0013C0**
 Type: CPI, Outer diameter: 25, Height: 10, Thickness: 2.5, Inner diameter: 10

● Please check the application range on pages 6 and 7 before selecting the type.



The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to $3.2 \mu m$ Rz (0.1 to $0.8 \mu m$ Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001. When regulation length cannot be kept, apply Pt.

Nominal size of packing, and housing dimensions								NOK part number
D(Outer diameter)	h(Height)	t(Thickness)	d(Inner diameter)	ϕD	T	R	C	
25	10	2.5	10	17	2.4	1.5	3	FC0013C0
28	10	2.5	10	20	2.4	1.5	3	FC0015C0
30	10	2.5	12	22	2.4	1.5	3	FC0020C0
31.5	10	2.5	14	23.5	2.4	1.5	3	FC0022C0
35	10	2.5	16	27	2.4	1.5	3	FC0026C0
35.5	10	2.5	16	27.5	2.4	1.5	3	FC0398C0
40	10	2.5	20	32	2.4	1.5	3	FC0035C0
45	12	3	20	36	2.9	2	3	FC0046C0
50	12	3	22	41	2.9	2	3	FC0055C0
53	12	3	25	44	2.9	2	3	FC0064C0
55	12	3	25	46	2.9	2	3	FC0068C0
56	12	3	25	47	2.9	2	3	FC0070C0
60	12	3	30	51	2.9	2	3	FC0077C0
63	12	3	35	54	2.9	2	3	FC0090C0
65	12	3	35	56	2.9	2	3.5	FC0095C0
67	12	3	38	58	2.9	2	3.5	FC0102C1
70	12	3	38	61	2.9	2	3.5	FC0106C0
71	12	3	40	62	2.9	2	3.5	FC0114C0
75	12	3	40	66	2.9	2	3.5	FC0117C0
80	16	4	40	69	3.8	3	4	FC0134C0
85	16	4	45	74	3.8	3	4	FC0142C0
90	16	4	50	79	3.8	3	4	FC0157C0
95	16	4	55	84	3.8	3	4	FC0164C0
100	16	4	55	89	3.8	3	4	FC0174C0
105	16	4	60	94	3.8	3	4	FC0187C0
106	16	4	60	95	3.8	3	4	FC0189C0
110	16	4	60	99	3.8	3	4	FC0195C0
112	16	4	65	101	3.8	3	4	FC0199C0
118	16	4	70	107	3.8	3	4	FC0205C0
120	16	4	70	109	3.8	3	4	FC0207C0
125	20	5	75	111	4.8	4	5.5	FC0222C0
130	20	5	80	116	4.8	4	5.5	FC0230C0
132	20	5	85	118	4.8	4	5.5	FC0233C1
140	20	5	90	126	4.8	4	5.5	FC0245C1
150	20	5	100	136	4.8	4	5.5	FC0255C1
160	20	5	110	146	4.8	4	5.5	FC0275C0
170	20	5	120	156	4.8	4	5.5	FC0279C0
180	20	5	130	166	4.8	4	5.5	FC0282C1
190	20	5	140	176	4.8	4	5.5	FC0289C0
200	20	5	150	186	4.8	4	5.5	FC0293C0
224	20	5	180	210	4.8	4	5.5	FC0314C0
250	20	5	200	236	4.8	4	5.5	FC0321C0
280	20	5	230	266	4.8	4	6.5	FC0337C0
300	20	5	250	286	4.8	4	7	FC0344C1

Special Packings for Piston Seals

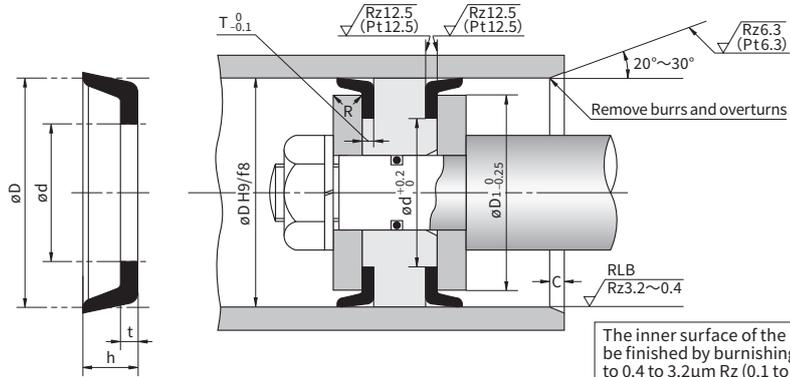
CPH_{type}

Material	NOK sign
Nitrile rubber (NBR)	A102, A103, A104, A505

■ Please designate NOK part number and type & size on your order.

Example NOK part number: **CC0019C3**
 Type: CPH, Outer diameter: 30, Height: 8, Thickness: 2.5, Inner diameter: 13

● Please check the application range on pages 6 and 7 before selecting the type.



The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of packing, and housing dimensions

D(Outer diameter)	h(Height)	t(Thickness)	d(Inner diameter)	øD	T	R	C	NOK part number	NOK rubber material Sign
30	8	2.5	13	23	2.5	1.5	7	CC0019C3	A104
30	10	2.5	12	23.5	2.5	1.5	7	CC0020C0	A103
30	10	2.5	15	23	2.5	1.5	7	CC0020C1	A102
35	10	2.5	18	28.5	2.5	1.5	7	CC0026C0	A102
40	8	2.5	16	33	2.5	1.5	7	CC0034C1	A104
40	10	2.5	20	33.5	2.5	1.5	7	CC0035C0	A102
42	12	3	23	34	3	2	7	CC0040C0	A505
45	10	2.5	25	38.5	2.5	2	7	CC0044C0	A102
50	12	3	25	41.5	3	2	7	CC0055C1	A104
55	10	3	40	48	3	2	7	CC0067C0	A103
60	8	2.5	40.5	54	2.5	2	7	CC0074C0	A103
60	12	3	30	51	3	2	7	CC0077C0	A505
65	13	3.5	34.5	56	3.5	2	7	CC0096C0	A104
70	12	3	38	62	3	2	7	CC0106C2	A505
75	12	3	38	66	3	2	7	CC0117C1	A104
80	15	4	40	70	4	3	7	CC0132C0	A505
80	16	4	40	69	4	3	7	CC0134C0	A102
90	15	4.3	38	80	4.3	3	8	CC0156C0	A505
90	16	4	45	79.5	4	3	8	CC0157C0	A102
90	17	5	50	77	5	3	8	CC0159C0	A104
100	15	4.3	38	88	4.3	3	8	CC0171C0	A104
100	16	4	50	89	4	3	8	CC0174C5	A104
100	16	4	55	89	4	3	8	CC0174C4	A505
120	16	4	60	109	4	3	8	CC0207C0	A102
120	16	4	70	109	4	3	8	CC0207C1	A104
125	16	5	75	115	5	4	8	CC0219C0	A104
130	20	5	80	116	5	4	8	CC0230C1	A104
150	20	5	75	136	5	4	11	CC0255C0	A102
150	20	5	100	138	5	4	11	CC0255C2	A505
180	20	5	90	166.5	5	4	11	CC0282C0	A102
180	25	5	80	166	5	4	11	CC0285C0	A104
200	20	5	150	187	5	4	11	CC0293C5	A505
205	23	4	134	190	4	4	11	CC0303C1	A103
257	22	5.5	192	245	5.5	4	14	CC0328C1	A103

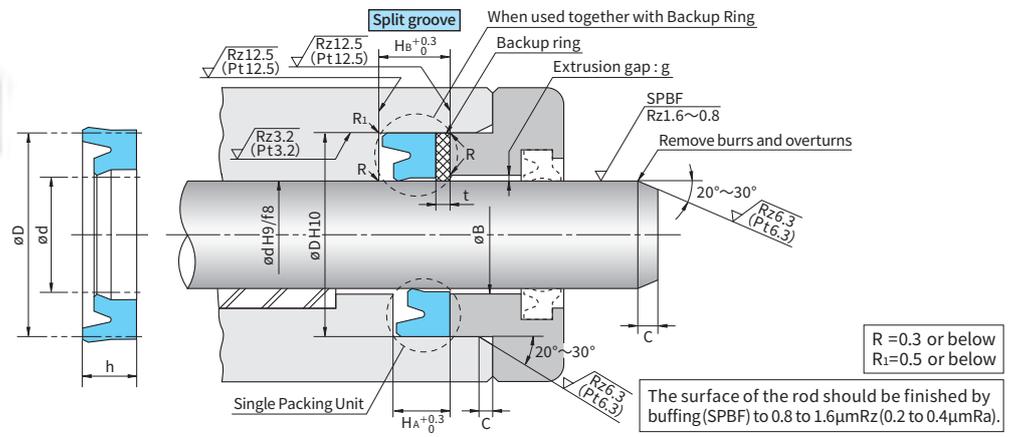
Special Packings for Rod Seals

IDI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0021F0**
 Type: IDI, Inner diameter: 6.3, Outer diameter: 14.3, Height: 5
 Orders for backup rings used in combination with packing
 NOK part number: **GN7259V0**
 Type: BRT3, Inner diameter: 6.3, Outer diameter: 14.3, Thickness: 2

● Please check the application range on pages 8 and 9 before selecting the type.



How to determine B dimension

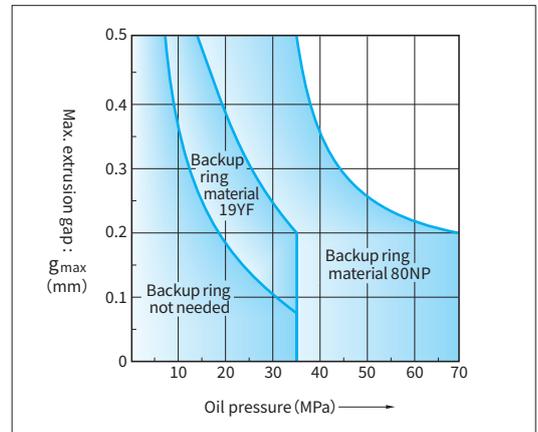
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	35MPa
Material of backup ring	19YF		
B dimension	$B \leq \phi d + 1.0$	$B \leq \phi d + 0.5$	$B \leq \phi d + 0.2$
Maximum service pressure	35MPa	42MPa	70MPa
Material of backup ring	80NP		
B dimension	$B \leq \phi d + 0.8$	$B \leq \phi d + 0.4$	$B \leq \phi d + 0.2$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



Nominal size of packing, and housing dimensions						Backup ring Thickness	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	HA	HB	C			BRT3 (Endless)	BRN3 (Endless)
6.3	14.3	5	5.7	7.7	2.5	2	※FU0021F0	GN7259V0	GN982200
6.3	16.3	6	7	9	2.5	2	※FU0022F0	GN0720V0	GN982300
6.3	16.3	7.5	8.5	10.5	2.5	2	FU0023F0	GN0720V0	GN982300
6.3	16.3	8	9	11	2.5	2	FU0024F0	GN0720V0	GN982300
8	16	5	5.7	7.7	2.5	2	※FU0039F0	GN7260V0	GN982400
8	18	6	7	9	2.5	2	※FU0041F0	GN0725V0	GN910101
8	18	7.5	8.5	10.5	2.5	2	FU0042F0	GN0725V0	GN910101
8	18	8	9	11	2.5	2	FU0043F0	GN0725V0	GN910101
9	17	5	5.7	7.7	2.5	2	※FU0051F0	GN7261V0	GN982500
9	19	6	7	9	2.5	2	※FU0052F0	GN0728V0	GN982600
9	19	7.5	8.5	10.5	2.5	2	FU0053F0	GN0728V0	GN982600
9	19	8	9	11	2.5	2	FU0054F0	GN0728V0	GN982600
10	18	5	5.7	7.7	2.5	2	※FU0064F0	GN7262V0	GN982700
10	20	6	7	9	2.5	2	※FU0066F0	GN0733V0	GN910201
10	20	7.5	8.5	10.5	2.5	2	FU0068F0	GN0733V0	GN910201
10	20	8	9	11	2.5	2	FU0069F0	GN0733V0	GN910201
11.2	19.2	5	5.7	7.7	2.5	2	※FU0078F0	GN7236V0	GN979200
11.2	21.2	6	7	9	2.5	2	※FU0079F0	GN0736V0	GN982800
11.2	21.2	7.5	8.5	10.5	2.5	2	FU0080F0	GN0736V0	GN982800
11.2	21.2	8	9	11	2.5	2	FU0081F0	GN0736V0	GN982800
12.5	20.5	5	5.7	7.7	2.5	2	※FU0098F0	GN7263V0	GN982900
12.5	22.5	6	7	9	2.5	2	※FU0100F0	GN0741V0	GN983000
12.5	22.5	7.5	8.5	10.5	2.5	2	FU0101F0	GN0741V0	GN983000
12.5	22.5	8	9	11	2.5	2	FU0102F0	GN0741V0	GN983000
14	22	5	5.7	7.7	2.5	2	※FU0116F0	GN7238V0	GN979400
14	24	6	7	9	2.5	2	※FU0120F0	GN0745V0	GN910301

※ The resisting pressure limit applies to the ISI type.

Special Packings for Rod Seals

IDI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0121F0**
 Type: IDI, Inner diameter: 14, Outer diameter: 24, Height: 7.5
 Orders for backup rings used in combination with packing
 NOK part number: **GN0745V0**
 Type: BRT3, Inner diameter: 14, Outer diameter: 24, Thickness: 2

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal size of packing, and housing dimensions						Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C			BRT3 (Endless)	BRN3 (Endless)
								19YF	80NP
14	24	7.5	8.5	10.5	2.5	2	FU0121F0	GN0745V0	GN9103O1
14	24	8	9	11	2.5	2	FU0122F0	GN0745V0	GN9103O1
15	23	5	5.7	7.7	2.5	2	※FU0131F0	GN7264V0	GN9831O0
15	25	6	7	9	2.5	2	※FU0134F0	GN0749V0	GN9738O1
15	25	8	9	11	2.5	2	FU0135F0	GN0749V0	GN9738O1
15	28	8	9	11	3.5	2	FU0136F0	GN6445V0	GN9104O1
15	28	10	11	13	3.5	2	FU0137F0	GN6445V0	GN9104O1
16	24	5	5.7	7.7	2.5	2	※FU0150F0	GN7265V0	GN9832O0
16	26	6	7	9	2.5	2	※FU0155F0	GN0751V0	GN9105O1
16	26	7.5	8.5	10.5	2.5	2	FU0156F0	GN0751V0	GN9105O1
16	26	8	9	11	2.5	2	FU0157F0	GN0751V0	GN9105O1
18	28	6	7	9	2.5	2	※FU0181F0	GN0757V0	GN9833O0
18	28	8	9	11	2.5	2	FU0182F0	GN0757V0	GN9833O0
18	31	8	9	11	3.5	2	FU0185F0	GN6446V0	GN9107O1
18	31	10	11	13	3.5	2	FU0186F0	GN6446V0	GN9107O1
20	30	6	7	9	3.5	2	※FU0214F0	GN0762V0	GN9109O1
20	30	8	9	11	3.5	2	FU0215F0	GN0762V0	GN9109O1
20	33	8	9	11	3.5	2	FU0220F0	GN6448V0	GN9110O1
20	33	10	11	13	3.5	2	FU0221F0	GN6448V0	GN9110O1
22	35	10	11	13	3.5	2	FU0249F0	GN6449V0	GN9111O1
22.4	32.4	6	7	9	3.5	2	※FU0262F0	GN0771V0	GN9834O0
22.4	32.4	8	9	11	3.5	2	FU0263F0	GN0771V0	GN9834O0
22.4	35.4	8	9	11	3.5	2	FU0264F0	GN6017V0	GN9798O0
22.4	35.4	10	11	13	3.5	2	FU0265F0	GN6017V0	GN9798O0
25	35	6	7	9	3.5	2	※FU0279F0	GN0781V0	GN9115O1
25	35	8	9	11	3.5	2	FU0282F0	GN0781V0	GN9115O1
25	38	8	9	11	3.5	2	FU0287F0	GN6453V0	GN9116O1
25	38	10	11	13	3.5	2	FU0288F0	GN6453V0	GN9116O1
25	40	9	10	12	4	2	FU0291F0	GN6591V0	GN9800O0
25	40	10	11	13	4	2	FU0292F0	GN6591V0	GN9800O0
27	40	10	11	14	4	3	FU2130F0	GN6455V0	GN9118O1
28	38	6	7	10	4	3	※FU0322F0	GN7268V0	GN9835O0
28	38	8	9	12	4	3	FU0323F0	GN7268V0	GN9835O0
28	41	8	9	12	4	3	FU0334F0	GN6458V0	GN9121O1
28	41	10	11	14	4	3	FU0335F0	GN6458V0	GN9121O1
28	43	9	10	13	4	3	FU0339F0	GN0791V0	GN9836O0
28	43	10	11	14	4	3	FU0340F0	GN0791V0	GN9836O0
30	40	8	9	12	4	3	FU0359F0	GN6361V0	GN9122O1
30	43	10	11	14	4	3	FU0364F0	GN6459V0	GN9123O1
30	45	9	10	13	4	3	FU0367F0	GN7061V0	GN9801O0
30	45	10	11	14	4	3	FU0368F0	GN7061V0	GN9801O0
31.5	41.5	8	9	12	4	3	FU0383F0	GN6460V0	GN9124O1
31.5	44.5	8	9	12	4	3	FU0384F0	GN6461V0	GN9125O1
31.5	44.5	10	11	14	4	3	FU0385F0	GN6461V0	GN9125O1
31.5	46.5	9	10	13	4	3	FU0386F0	GN0805V0	GN9837O0
31.5	46.5	10	11	14	4	3	FU0387F0	GN0805V0	GN9837O0
34	50	12	13	16	4	3	FU0408F0	GN6462V0	GN9126O1
35	45	8	9	12	4	3	FU0427F0	GN6463V0	GN9127O1
35	50	9	10	13	4	3	FU0436F0	GN0816V0	GN9128O1
35	50	10	11	14	4	3	FU0437F0	GN0816V0	GN9128O1
35	50	12	13	16	4	3	FU0438F0	GN0816V0	GN9128O1
35.5	45.5	8	9	12	4	3	FU0453F0	GN7271V0	GN9788O1
35.5	50.5	9	10	13	4	3	FU0455F0	GN0820V0	GN9954O0
35.5	50.5	10	11	14	4	3	FU0456F0	GN0820V0	GN9954O0
35.5	51.5	10	11	14	4	3	FU0457F0	GN6330V0	GN9130O1
35.5	51.5	12	13	16	4	3	FU0458F0	GN6330V0	GN9130O1

※ The resisting pressure limit applies to the ISI type.

Special Packings for Rod Seals

IDI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0498F0**
 Type: IDI, Inner diameter: 40, Outer diameter: 50, Height: 8
 Orders for backup rings used in combination with packing
 NOK part number: **GN6465V0**
 Type: BRT3, Inner diameter: 40, Outer diameter: 50, Thickness: 3

5

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal size of packing, and housing dimensions						Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C			BRT3 (Endless)	BRN3 (Endless)
								19YF	80NP
40	50	8	9	12	4	3	FU0498F0	GN6465V0	GN9131O1
40	55	9	10	13	4	3	FU0504F0	GN6759V0	GN9948O0
40	55	10	11	14	4	3	FU0505F0	GN6759V0	GN9948O0
40	56	10	11	14	4	3	FU0508F0	GN6466V0	GN9132O1
40	56	12	13	16	4	3	FU0509F0	GN6466V0	GN9132O1
45	55	8	9	12	4	3	FU0569F0	GN6467V0	GN9133O1
45	60	9	10	13	4	3	FU0575F0	GN0845V0	GN9950O0
45	60	10	11	14	4	3	FU0577F0	GN0845V0	GN9950O0
45	61	10	11	14	4	3	FU0579F0	GN6469V0	GN9135O1
45	61	12	13	16	4	3	FU0580F0	GN6469V0	GN9135O1
47	63	12	13	16	4	3	FU0591F0	GN6471V0	GN9137O1
50	60	8	9	12	4	3	FU0620F0	GN6302V0	GN9138O1
50	65	9	10	13	4	3	FU0630F0	GN6439V0	GN9952O0
50	65	10	11	14	4	3	FU0631F0	GN6439V0	GN9952O0
50	66	10	11	14	4	3	FU0634F0	GN6329V0	GN9139O1
50	66	12	13	16	4	3	FU0635F0	GN6329V0	GN9139O1
50	70	12	13	16	4	3	FU0639F0	GN6592V0	GN9529O0
55	65	8	9	12	4	3	FU0696F0	GN6472V0	GN9141O1
55	70	9	10	13	4	3	FU0700F0	GN6408V0	GN9804O0
55	70	10	11	14	4	3	FU0701F0	GN6408V0	GN9804O0
55	71	10	11	14	4	3	FU0703F0	GN6473V0	GN9142O1
55	71	12	13	16	4	3	FU0704F0	GN6473V0	GN9142O1
55	75	12	13	16	4	3	FU0708F0	GN7249V0	GN9807O0
56	66	8	9	12	4	3	FU0723F0	GN6474V0	GN9143O1
56	71	9	10	13	4	3	FU0724F0	GN7247V0	GN9806O0
56	71	10	11	14	4	3	FU0725F0	GN7247V0	GN9806O0
56	72	10	11	14	4	3	FU0726F0	GN7009V0	GN9838O0
56	72	12	13	16	4	3	FU0727F0	GN7009V0	GN9838O0
56	76	12	13	16	4	3	FU0728F0	GN0877V0	GN9839O0
60	70	8	9	12	4	3	FU0747F0	GN6444V0	GN9144O1
60	75	9	10	13	4	3	FU0753F0	GN6363V0	GN9808O0
60	75	10	11	14	4	3	FU0754F0	GN6363V0	GN9808O0
60	76	10	11	14	4	3	FU0756F0	GN6476V0	GN9146O1
60	76	12	13	16	4	3	FU0757F0	GN6476V0	GN9146O1
60	80	12	13	16	4	3	FU0761F0	GN0886V1	GN9953O0
63	73	8	9	12	4	3	FU0787F0	GN6477V0	GN9147O1
63	78	9	10	13	4	3	FU0788F0	GN6304V0	GN9840O0
63	78	10	11	14	4	3	FU0789F0	GN6304V0	GN9840O0
63	79	10	11	14	4	3	FU0790F0	GN7010V0	GN9841O0
63	79	12	13	16	4	3	FU0791F0	GN7010V0	GN9841O0
63	83	12	13	16	4	3	FU0793F0	GN0893V1	GN9842O0
64	80	12	13	16	4	3	FU2131F0	GN6478V0	GN9148O1
65	75	8	9	12	5	3	FU0810F0	GN6479V0	GN9149O1
65	80	9	10	13	5	3	FU0815F0	GN6364V0	GN9754O1
65	80	12	13	16	5	3	FU0816F0	GN6364V0	GN9754O1
65	85	12	13	16	5	3	FU0819F0	GN0899V0	GN9810O0
67	82	9	10	13	5	3	FU0830F0	GN7273V0	GN9843O0
67	87	15	16	19	5	3	FU0832F0	GN0904V0	GN9844O0
70	80	8	9	12	5	3	FU0850F0	GN6362V1	GN9092O1
70	85	9	10	13	5	3	FU0857F0	GN6442V0	GN9411O0
70	85	10	11	14	5	3	FU0858F0	GN6442V0	GN9411O0
70	90	12	13	16	5	3	FU0862F0	GN0910V0	GN9151O1
70	90	15	16	19	5	3	FU0864F0	GN0910V0	GN9151O1
71	81	8	9	12	5	3	FU0881F0	GN6482V0	GN9153O1
71	86	9	10	13	5	3	FU0882F0	GN6603V0	GN9845O0
71	86	10	11	14	5	3	FU0883F0	GN6603V0	GN9845O0

IDI for Rod

Special Packings for Rod Seals

IDI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0884F0**
 Type: IDI, Inner diameter: 71, Outer diameter: 91, Height: 12
 Orders for backup rings used in combination with packing
 NOK part number: **GN0914V0**
 Type: BRT3, Inner diameter: 71, Outer diameter: 91, Thickness: 3

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal size of packing, and housing dimensions						Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C			BRT3 (Endless)	BRN3 (Endless)
								19YF	80NP
71	91	12	13	16	5	3	FU0884F0	GN0914V0	GN984600
71	91	15	16	19	5	3	FU0885F0	GN0914V0	GN984600
75	85	8	9	12	5	3	FU0903F0	GN6729V0	GN924101
75	90	9	10	13	5	3	FU0906F0	GN6443V0	GN975701
75	90	10	11	14	5	3	FU0907F0	GN6443V0	GN975701
75	95	12	13	16	5	3	FU0910F0	GN0920V0	GN915401
75	95	15	16	19	5	3	FU0911F0	GN0920V0	GN915401
80	90	8	9	12	5	3	FU0940F0	GN6483V0	GN915501
80	95	9	10	13	5	3	FU0942F0	GN6898V0	GN958200
80	95	10	11	14	5	3	FU0943F0	GN6898V0	GN958200
80	100	12	13	16	5	3	FU0948F0	GN0927V0	GN915601
80	100	15	16	19	5	3	FU0949F0	GN0927V0	GN915601
85	100	10	11	14	5	3	FU0985F0	GN6484V0	GN909101
85	105	12	13	16	5	3	FU0989F0	GN0932V0	GN915701
85	105	15	16	19	5	3	FU0990F0	GN0932V0	GN915701
90	105	10	11	14	5	3	FU1025F0	GN6485V0	GN915801
90	110	12	13	16	5	3	FU1030F1	GN0939V0	GN915901
90	110	15	16	19	5	3	FU1031F0	GN0939V0	GN915901
95	110	10	11	14	5	3	FU1052F0	GN6486V0	GN916001
95	115	12	13	16	5	3	FU1056F0	GN0945V0	GN916101
95	115	15	16	19	5	3	FU1057F0	GN0945V0	GN916101
100	115	10	11	14	5	3	FU1083F0	GN6488V0	GN916301
100	120	12	13	16	5	3	FU1089F0	GN0952V0	GN916401
100	120	15	16	19	5	3	FU1091F0	GN0952V0	GN916401
105	120	10	11	14	5	3	FU1126F0	GN6684V0	GN958901
105	125	15	16	19	5	3	FU1129F0	GN0959V0	GN916501
105	125	16	17	20	5	3	FU1130F0	GN0959V0	GN916501
106	121	10	11	14	5	3	FU1137F0	GN7274V0	GN978901
106	126	15	16	19	5	3	FU1138F0	GN0961V0	GN984700
106	126	16	17	20	5	3	FU1139F0	GN0961V0	GN984700
110	125	10	11	14	5	3	FU1158F0	GN6761V0	GN943001
110	130	15	16	19	5	3	FU1165F0	GN6790V0	GN969400
110	130	16	17	20	5	3	FU1166F0	GN6790V0	GN969400
112	127	9	10	13	5	3	FU1180F0	GN7275V0	GN984800
112	127	10	11	14	5	3	FU1181F0	GN7275V0	GN984800
112	132	15	16	19	5	3	FU1182F0	GN0970V0	GN916801
112	132	16	17	20	5	3	FU1183F0	GN0970V0	GN916801
118	133	10	11	14	5	3	FU1206F0	GN7276V0	GN979001
118	138	15	16	19	5	3	FU1207F0	GN0978V0	GN984900
118	138	16	17	20	5	3	FU1208F0	GN0978V0	GN984900
120	135	10	11	14	5	3	FU1221F0	GN6374V0	GN976800
120	140	15	16	19	5	3	FU1224F0	GN0982V0	GN916901
120	140	16	17	20	5	3	FU1225F0	GN0982V0	GN916901
125	140	10	11	14	6.5	3	FU1253F0	GN6491V0	GN917001
125	145	12	13	16	6.5	3	FU1256F0	GN0986V0	GN985000
125	145	16	17	20	6.5	3	FU1258F0	GN0986V0	GN985000
125	150	19	20	23	6.5	3	FU2132F0	GN6135V0	GN917101
130	145	10	11	14	6.5	3	FU1281F0	GN6954V0	GN974200
130	150	12	13	16	6.5	3	FU1283F0	GN6925V0	GN933501
130	150	16	17	20	6.5	3	FU1285F0	GN6925V0	GN933501
132	157	20	21	24	6.5	3	FU1295F0	GN7013V0	GN981300
135	160	19	20	23	6.5	3	FU2133F0	GN6492V0	GN917201
140	155	10	11	14	6.5	3	FU1324F0	GN6728V1	GN941001
140	160	12	13	16	6.5	3	FU1325F0	GN1002V0	GN966800
140	160	16	17	20	6.5	3	FU1328F0	GN1002V0	GN966800
140	165	19	20	23	6.5	3	FU1332F0	GN6494V0	GN917401

IDI for Rod

Special Packings for Rod Seals

IDI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU2134F0**
 Type: IDI, Inner diameter: 145, Outer diameter: 170, Height: 19
 Orders for backup rings used in combination with packing
 NOK part number: **GN6496V0**
 Type: BRT3, Inner diameter: 145, Outer diameter: 170, Thickness: 3

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● Please check the application range on pages 8 and 9 before selecting the type.

Nominal size of packing, and housing dimensions						Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C			BRT3 (Endless)	BRN3 (Endless)
								19YF	80NP
145	170	19	20	23	6.5	3	FU2134F0	GN6496V0	GN9176O1
150	165	10	11	14	6.5	3	FU1360F0	GN6497V0	GN9177O1
150	170	12	13	16	6.5	3	FU1361F0	GN1011V0	GN9672O1
150	170	16	17	20	6.5	3	FU1364F0	GN1011V0	GN9672O1
150	175	16	17	20	6.5	3	FU1366F0	GN7014V0	GN9645O1
150	175	20	21	24	6.5	3	FU1368F0	GN7014V0	GN9645O1
155	180	19	20	24	6.5	4	FU1393F0	GN1016V0	GN9179O1
155	180	20	21	25	6.5	4	FU2181F0	GN1016V0	GN9179O1
160	175	10	11	15	6.5	4	FU1407F0	GN6499V0	GN9180O1
160	180	12	13	17	6.5	4	FU1409F0	GN6905V0	GN9814O0
160	180	16	17	21	6.5	4	FU1412F0	GN6905V0	GN9814O0
160	185	16	17	21	6.5	4	FU1414F0	GN1020V0	GN9181O1
160	185	19	20	24	6.5	4	FU2076F0	GN1020V0	GN9181O1
160	185	20	21	25	6.5	4	FU1416F0	GN1020V0	GN9181O1
170	185	10	11	15	6.5	4	FU1444F0	GN7064V0	GN9791O1
170	190	12	13	17	6.5	4	FU1445F0	GN6985V0	GN9816O0
170	190	16	17	21	6.5	4	FU1447F0	GN6985V0	GN9816O0
170	195	16	17	21	6.5	4	FU1449F0	GN1027V0	GN9852O0
170	195	20	21	25	6.5	4	FU1450F0	GN1027V0	GN9852O0
175	200	19	20	24	6.5	4	FU1463F0	GN1031V0	GN9186O1
175	200	20	21	25	6.5	4	FU2182F0	GN1031V0	GN9186O1
180	200	16	17	21	6.5	4	FU1486F0	GN6372V0	GN9187O1
180	205	16	17	21	6.5	4	FU1491F0	GN1035V0	GN9188O1
180	205	19	20	24	6.5	4	FU1492F0	GN1035V0	GN9188O1
180	205	20	21	25	6.5	4	FU1493F0	GN1035V0	GN9188O1
190	210	16	17	21	6.5	4	FU1518F0	GN6505V0	GN9190O1
190	215	16	17	21	6.5	4	FU1520F0	GN1042V0	GN9818O0
190	215	20	21	25	6.5	4	FU1521F0	GN1042V0	GN9818O0
199	219	11	12	16	6.5	4	FU1530F0	GN7279V0	GN9853O0
199	219	15	16	20	6.5	4	FU1531F0	GN7279V0	GN9853O0
199	224	16	17	21	6.5	4	FU1533F0	GN1047V0	GN9820O0
199	224	19	20	24	6.5	4	FU1535F0	GN1047V0	GN9820O0
200	220	16	17	21	6.5	4	FU1545F0	GN6276V0	GN9191O1
200	225	16	17	21	6.5	4	FU1548F0	GN1050V0	GN9192O1
200	225	19	20	24	6.5	4	FU2135F0	GN1050V0	GN9192O1
200	225	20	21	25	6.5	4	FU1550F0	GN1050V0	GN9192O1
210	230	16	17	21	6.5	4	FU1576F0	GN6352V0	GN9195O1
210	235	16	17	21	6.5	4	FU1578F0	GN1057V0	GN9854O0
210	235	19	20	24	6.5	4	FU1580F0	GN1057V0	GN9854O0
210	235	20	21	25	6.5	4	FU1581F0	GN1057V0	GN9854O0
220	240	16	17	21	6.5	4	FU1597F0	GN6508V0	GN9196O1
220	245	16	17	21	6.5	4	FU1598F0	GN1063V0	GN9670O0
220	245	19	20	24	6.5	4	FU1600F0	GN1063V0	GN9670O0
220	245	20	21	25	6.5	4	FU1601F0	GN1063V0	GN9670O0
224	244	11	12	16	6.5	4	FU1608F0	GN7281V0	GN9855O0
224	244	15	16	20	6.5	4	FU1610F0	GN7281V0	GN9855O0
224	249	15	16	20	6.5	4	FU1611F0	GN7282V0	GN9856O0
224	249	18	19	23	6.5	4	FU1612F0	GN7282V0	GN9856O0
224	249	19	20	24	6.5	4	FU1613F0	GN7282V0	GN9856O0
225	245	16	17	21	6.5	4	FU1622F0	GN6509V0	GN9197O1
225	250	16	17	21	6.5	4	FU1624F0	GN1065V0	GN9045O1
225	250	19	20	24	6.5	4	FU1626F0	GN1065V0	GN9045O1
225	250	20	21	25	6.5	4	FU1627F0	GN1065V0	GN9045O1
230	250	16	17	21	6.5	4	FU1638F0	GN6510V0	GN9047O1
230	255	16	17	21	6.5	4	FU1640F0	GN1069V0	GN9857O0
230	255	19	20	24	6.5	4	FU1642F0	GN1069V0	GN9857O0

IDI for Rod

Special Packings for Rod Seals

IDI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU1643F0**
 Type: IDI, Inner diameter: 230, Outer diameter: 255, Height: 20
 Orders for backup rings used in combination with packing
 NOK part number: **GN1069V0**
 Type: BRT3, Inner diameter: 230, Outer diameter: 255, Thickness: 4

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal size of packing, and housing dimensions						Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C			BRT3 (Endless) 19YF	BRN3 (Endless) 80NP
230	255	20	21	25	6.5	4	FU1643F0	GN1069V0	GN985700
240	260	16	17	21	6.5	4	FU1658F0	GN6511V0	GN919801
240	265	16	17	21	6.5	4	FU1661F0	GN1073V0	GN985800
240	265	19	20	24	6.5	4	FU1663F0	GN1073V0	GN985800
240	265	20	21	25	6.5	4	FU1664F0	GN1073V0	GN985800
250	270	16	17	21	6.5	4	FU1679F0	GN6512V0	GN919901
250	275	16	17	21	6.5	4	FU1681F0	GN1078V0	GN920001
250	275	19	20	24	6.5	4	FU1683F0	GN1078V0	GN920001
250	275	20	21	25	6.5	4	FU1684F0	GN1078V0	GN920001
260	285	19	20	24	8	4	FU1705F0	GN6514V0	GN920201
260	290	19	20	24	8	4	FU1707F0	GN1083V0	GN943101
265	297	24	25	29	8	4	FU1714F0	GN6515V0	GN920401
265	297	25	26	30	8	4	FU2183F0	GN6515V0	GN920401
270	295	19	20	24	8	4	FU1721F0	GN6516V0	GN920501
270	300	19	20	24	8	4	FU1723F0	GN1089V0	GN920601
270	300	24	25	29	8	4	FU1725F0	GN1089V0	GN920601
270	300	25	26	30	8	4	FU1726F0	GN1089V0	GN920601
280	305	19	20	24	8	4	FU1734F0	GN6518V0	GN920801
280	310	19	20	24	8	4	FU1736F0	GN1093V0	GN985900
280	312	24	25	29	8	4	FU2136F0	GN6519V0	GN920901
280	312	25	26	30	8	4	FU2184F0	GN6519V0	GN920901
290	315	19	20	24	8	4	FU1749F0	GN6520V0	GN921001
290	320	19	20	24	8	4	FU1751F0	GN1098V0	GN986000
300	325	19	20	24	8	4	FU1763F0	GN6521V0	GN921101
300	330	19	20	24	8	4	FU1765F0	GN1103V0	GN923501
300	332	24	25	29	8	4	FU2137F0	GN6522V0	GN921201
300	332	25	26	30	8	4	FU2185F0	GN6522V0	GN921201

— D — for Rod

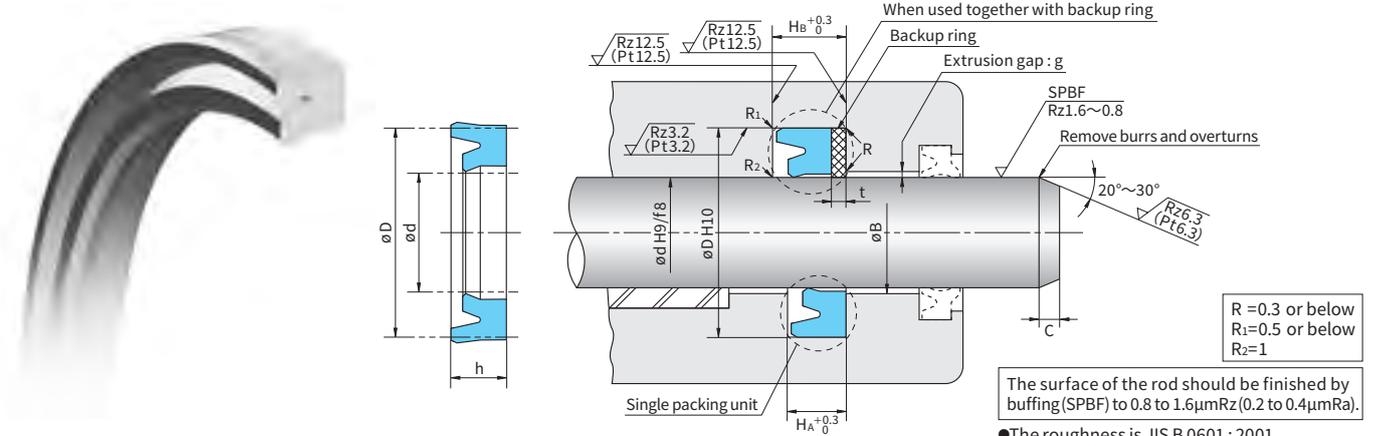
Special Packings for Rod Seals (Installed with internal groove)

ISI type

Material	NOK sign
Iron rubber (PUR)	Standard : U801 Heat resistant type : U641

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number : **FU0180K0**
 Type: ISI, Inner diameter: 18, Outer diameter: 26, Height: 5
 Orders for backup rings used in combination with packing
 NOK part number : **GN4778V0**
 Type: BRT2, Inner diameter: 18, Outer diameter: 26, Thickness: 2

● Please check the application range on pages 8 and 9 before selecting the type.



How to determine B dimension

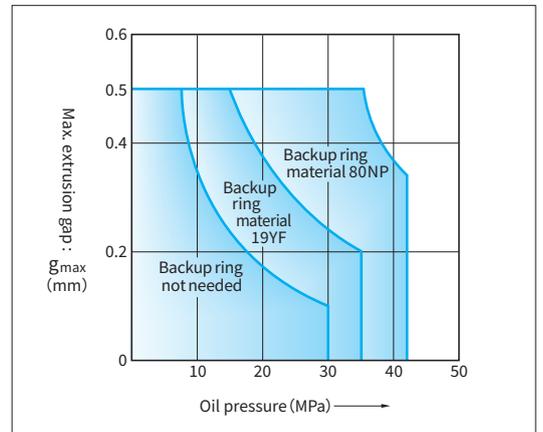
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	35MPa
Material of backup ring	19YF		
B dimension	$B \leq \phi d + 1.0$	$B \leq \phi d + 0.5$	$B \leq \phi d + 0.2$
Maximum service pressure	35MPa	42MPa	
Material of backup ring	80NP		
B dimension	$B \leq \phi d + 0.8$	$B \leq \phi d + 0.4$	

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



Nominal size of packing, and housing dimensions						Backup ring Thickness	Packing part number		Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	HA	HB	C		Standard (U801)	Heat resistant (U641)	BRT2 (Biascut) 19YF	BRN2 (Biascut) 80NP
18	26	5	5.7	7.7	2	2	FU0180K0	FU0180K2	GN4778V0	GN910600
20	28	5	5.7	7.7	2	2	FU0212K0	FU0212K1	GN4780V0	GN910800
22.4	30	5	5.7	7.7	2	2	FU0260K0	FU0260K1	GN4784V0	GN911200
22.4	30.4	5	5.7	7.7	2	2	FU0261K0	FU0261K1	GN5714V0	GN978500
23.5	31.5	5	5.7	7.7	2	2	FU0267K0	FU0267K1	GN4786V0	GN911400
25	33	5	5.7	7.7	2.5	2	FU0276K0	FU0276K2	GN5019V1	GN978600
25	35	5	5.7	7.7	2.5	2	FU0278K0	FU0278K2	GN4787V0	GN911500
28	35.5	5	5.7	8.7	2.5	3	FU0320K0	FU0320K1	GN4791V0	GN911900
28	36	5	5.7	8.7	2.5	3	FU0321K0	FU0321K1	GN5715V0	GN978700
30	40	6	7	10	2.5	3	FU0357K0	FU0357K3	GN4794V0	GN912200
31.5	41.5	6	7	10	2.5	3	FU0382K0	FU0382K1	GN4796V0	GN912400
35	45	6	7	10	2.5	3	FU0424K0	FU0424K7	GN4799V0	GN912700
35.5	45	6	7	10	2.5	3	FU0451K0	FU0451K1	GN4801V0	GN912900
35.5	45.5	6	7	10	2.5	3	FU0452K0	FU0452K1	GN5716V0	GN978800
36	46	6	7	10	2.5	3	FU2921K1	FU2921K0	GN5733V0	GN303300
40	50	6	7	10	2.5	3	FU0497K0	FU0497K5	GN4050V0	GN913100
45	55	6	7	10	2.5	3	FU0567K0	FU0567K6	GN4804V0	GN913300
45	56	7	8	11	2.5	3	FU0572K0	FU0572K1	GN4805V0	GN913400
50	60	6	7	10	2.5	3	FU0619K0	FU0619K3	GN4335V0	GN913800
53	63	6	7	10	2.5	3	FU0679K0	FU0679K2	GN4693V0	GN914000
55	65	6	7	10	2.5	3	FU0694K0	FU0694K2	GN4810V0	GN914100
56	66	6	7	10	2.5	3	FU0722K0	FU0722K1	GN4766V0	GN914300
60	70	6	7	10	2.5	3	FU0746K0	FU0746K5	GN4676V0	GN914400
60	71	7	8	11	2.5	3	FU0750K0	FU0750K1	GN4812V0	GN914500
63	73	6	7	10	2.5	3	FU0786K0	FU0786K3	GN4814V0	GN914700
65	75	6	7	10	2.5	3	FU0809K0	FU0809K1	GN4816V0	GN914900

Special Packings for Rod Seals (Installed with internal groove)

ISI type

Material	NOK sign
Iron rubber (PUR)	Standard : U801 Heat resistant type : U641

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number : **FU0828K0**
 Type: ISI, Inner diameter: 67, Outer diameter: 77, Height: 6
 Orders for backup rings used in combination with packing
 NOK part number : **GN4697V0**
 Type: BRT2, Inner diameter: 67, Outer diameter: 77, Thickness: 3

● Please check the application range on pages 8 and 9 before selecting the type.

S for Rod

Nominal size of packing, and housing dimensions						Backup ring Thickness	Packing part number		Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C		t	Standard (U801)	Heat resistant (U641)	BRT2 (Biascut) 19YF
67	77	6	7	10	2.5	3	FU0828K0	FU0828K1	GN4697V0	GN915000
70	80	6	7	10	2.5	3	FU0849K0	FU0849K5	GN4651V0	GN909200
71	81	6	7	10	2.5	3	FU0880K0	FU0880K1	GN4819V0	GN915300
75	85	6	7	10	2.5	3	FU0901K0	FU0901K1	GN4692V0	GN924100
80	90	6	7	10	2.5	3	FU0939K0	FU0939K1	GN4820V0	GN915500
85	100	9	10	13	4	3	FU0984K0	FU0984K2	GN4687V0	GN909100
90	105	9	10	13	4	3	FU1024K0	FU1024K3	GN4698V0	GN915800
95	110	9	10	13	4	3	FU1051K0	FU1051K2	GN4822V0	GN916000
98	112	8.5	9.5	12.5	4	3	FU1067K0	FU1067K1	GN4824V0	GN916200
100	115	9	10	13	4	3	FU1082K0	FU1082K1	GN4512V0	GN916300
105	120	9	10	13	4	3	FU1125K0	FU1125K1	GN5198V0	GN958900
106	120	8.5	9.5	12.5	4	3	FU1135K0	FU1135K1	GN4826V0	GN916600
106	121	9	10	13	4	3	FU1136K0	FU1136K1	GN5717V0	GN978900
110	125	9	10	13	4	3	FU1157K0	FU1157K2	GN4480V0	GN943000
112	125	9	10	13	4	3	FU1179K0	FU1179K1	GN4827V0	GN916700
115	130	9	10	13	4	3	FU1195K1	FU1195K2	GN4593V0	GN927400
118	133	9	10	13	4	3	FU1205K0	FU1205K1	GN5718V0	GN979000
120	135	9	10	13	4	3	FU1220K0	FU1220K1	GN5036V0	GN967900
125	140	9	10	13	4	3	FU1252K0	FU1252K1	GN4481V0	GN917000
130	145	9	10	13	4	3	FU1280K0	FU1280K1	GN4628V1	GN974201
136	150	8.5	9.5	12.5	4	3	FU1306K0	FU1306K1	GN4830V0	GN917300
140	155	9	10	13	4	3	FU1323K0	FU1323K2	GN4526V0	GN941000
145	160	9	10	13	4	3	FU1343K0	FU1343K1	GN4551V0	GN917500
150	165	9	10	13	4	3	FU1359K0	FU1359K1	GN4833V0	GN917700
155	170	9	10	14	4	4	FU1388K0	FU1388K2	GN4834V0	GN917800
160	175	9	10	14	4	4	FU1406K0	FU1406K1	GN4835V0	GN918000
165	180	9	10	14	4	4	FU1429K0	FU1429K1	GN4836V0	GN918200
170	185	9	10	14	4	4	FU1443K0	FU1443K2	GN5464V0	GN979100
175	190	9	10	14	4	4	FU1459K0	FU1459K1	GN4839V0	GN918500
180	200	12	13	17	5	4	FU1483K0	FU1483K1	GN4470V0	GN918700
190	210	12	13	17	5	4	FU1516K0	FU1516K1	GN4841V0	GN919000
200	220	12	13	17	5	4	FU1543K0	FU1543K1	GN4385V0	GN919100
204	224	12	13	17	5	4	FU1563K0	FU1563K1	GN4842V0	GN919300
210	230	12	13	17	5	4	FU1575K0	FU1575K1	GN4627V0	GN919500
220	240	12	13	17	5	4	FU1596K0	FU1596K1	GN4444V0	GN919600
225	245	12	13	17	5	4	FU1621K0	FU1621K1	GN4844V0	GN919700
230	250	12	13	17	5	4	FU1637K0	FU1637K1	GN4635V0	GN904700
240	260	12	13	17	5	4	FU1657K0	FU1657K1	GN4845V0	GN919800
250	270	12	13	17	5	4	FU1678K0	FU1678K1	GN4459V0	GN919900
260	285	16	17	21	6.5	4	FU1704K0	FU1704K1	GN4847V0	GN920200
270	295	16	17	21	6.5	4	FU1720K0	FU1720K1	GN4850V0	GN920500
280	305	16	17	21	6.5	4	FU1733K0	FU1733K1	GN4410V0	GN920800
290	315	16	17	21	6.5	4	FU1748K0	FU1748K1	GN4854V0	GN921000
300	325	16	17	21	6.5	4	FU1762K0	FU1762K1	GN4855V0	GN921100

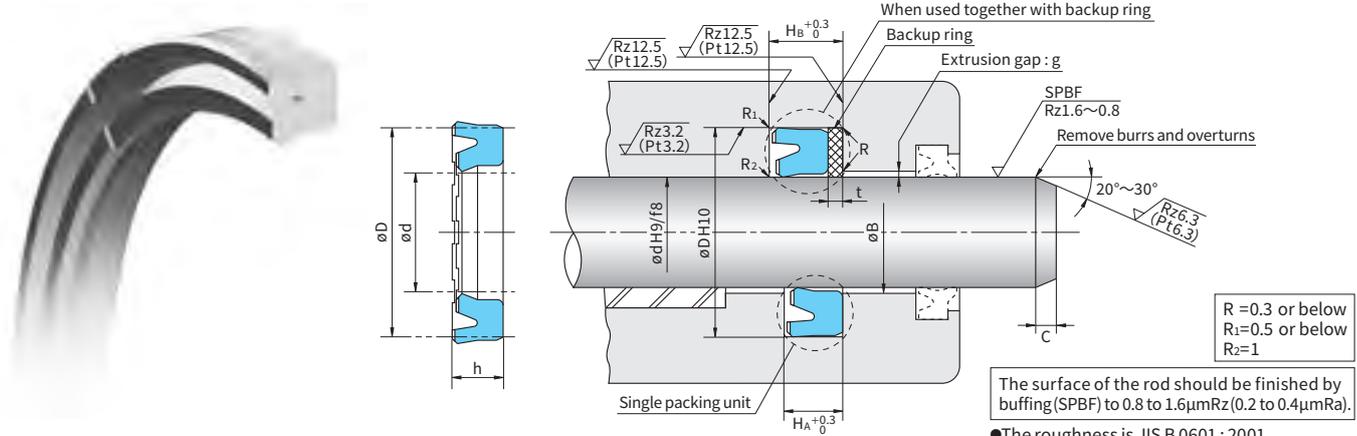
Special Packings for Rod Seals (Installed with internal groove)

IUIS type

Material	NOK sign
Iron rubber (PUR)	Standard : U801 Heat resistant type : U641

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number : **FU0180R0**
 Type : IUIS, Inner diameter : 18, Outer diameter : 26, Height : 5
 Orders for backup rings used in combination with packing
 NOK part number : **GN4778V0**
 Type : BRT2, Inner diameter : 18, Outer diameter : 26, Thickness : 2

● Please check the application range on pages 8 and 9 before selecting the type.



R = 0.3 or below
 R₁ = 0.5 or below
 R₂ = 1

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

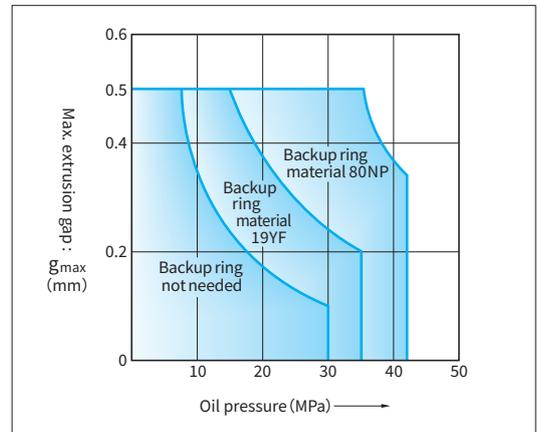
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	35MPa
Material of backup ring	19YF		
B dimension	$B \leq \phi d + 1.0$	$B \leq \phi d + 0.5$	$B \leq \phi d + 0.2$
Maximum service pressure	35MPa	42MPa	
Material of backup ring	80NP		
B dimension	$B \leq \phi d + 0.8$	$B \leq \phi d + 0.4$	

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



Nominal size of packing, and housing dimensions						Backup ring Thickness	Packing part number		Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C		Standard (U801)	Heat resistant (U641)	BRT2 (Biascut) 19YF	BRN2 (Biascut) 80NP
18	26	5	5.7	7.7	2	2	FU0180R0	FU0180R1	GN4778V0	GN910600
22.4	30	5	5.7	7.7	2	2	FU0260R0	FU0260R1	GN4784V0	GN911200
28	35.5	5	5.7	8.7	2.5	3	FU0320R0	FU0320R1	GN4791V0	GN911900
30	40	6	7	10	2.5	3	FU0357R0	FU0357R1	GN4794V0	GN912200
35	45	6	7	10	2.5	3	FU0424R1	FU0424R2	GN4799V0	GN912700
35.5	45	6	7	10	2.5	3	FU0451R0	FU0451R1	GN4801V0	GN912900
40	50	6	7	10	2.5	3	FU0497R0	FU0497R1	GN4050V0	GN913100
45	55	6	7	10	2.5	3	FU0567R1	FU0567R2	GN4804V0	GN913300
45	56	7	8	11	2.5	3	FU0572R0	FU0572R1	GN4805V0	GN913400
50	60	6	7	10	2.5	3	FU0619R0	FU0619R1	GN4335V0	GN913800
55	65	6	7	10	2.5	3	FU0694R1	FU0694R2	GN4810V0	GN914100
56	66	6	7	10	2.5	3	FU0722R0	FU0722R1	GN4766V0	GN914300
70	80	6	7	10	2.5	3	FU0849R1	FU0849R0	GN4651V0	GN909200
80	90	6	7	10	2.5	3	FU0939R0	FU0939R1	GN4820V0	GN915500
85	100	9	10	13	4	3	FU0984R0	FU0984R1	GN4687V0	GN909100
90	105	9	10	13	4	3	FU1024R0	FU1024R1	GN4698V0	GN915800
95	110	9	10	13	4	3	FU1051R0	FU1051R1	GN4822V0	GN916000
100	115	9	10	13	4	3	FU1082R0	FU1082R1	GN4512V0	GN916300
125	140	9	10	13	4	3	FU1252R0	FU1252R1	GN4481V0	GN917000
130	145	9	10	13	4	3	FU1280R1	FU1280R0	GN4628V1	GN974201
140	155	9	10	13	4	3	FU1323R0	FU1323R1	GN4526V0	GN941000
160	175	9	10	14	4	4	FU1406R0	FU1406R1	GN4835V0	GN918000
170	185	9	10	14	4	4	FU1443R2	FU1443R0	GN5464V0	GN979100
175	190	9	10	14	4	4	FU1459R1	FU1459R0	GN4839V0	GN918500
180	200	12	13	17	5	4	FU1483R0	FU1483R1	GN4470V0	GN918700

Special Packings for Rod Seals (Installed with internal groove)

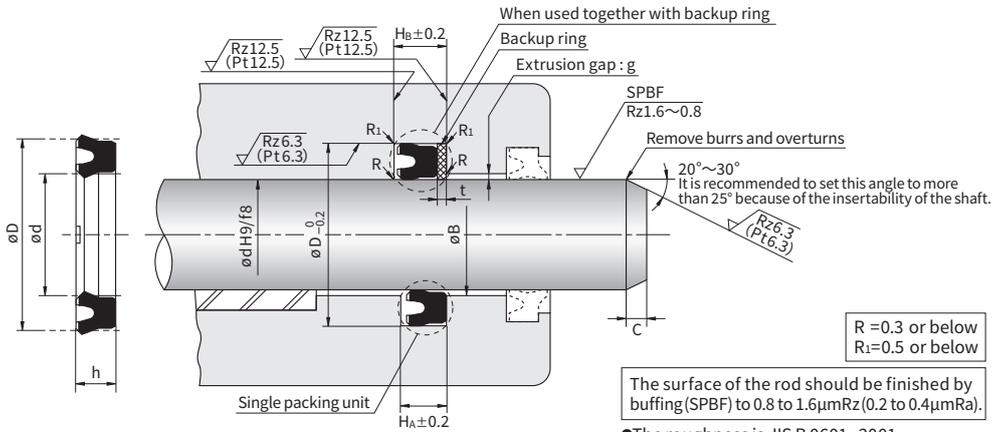
IUH type

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505 Cold resistant type : A567
Hydrogenated nitrile rubber (H-NBR)	Heat resistant type : G928

■ Please designate NOK part number and type & size on your order.

Example Order for the packing as a single piece
 NOK part number : **CU2692N1**
 Type : IUH, Inner diameter : 14, Outer diameter : 22, Height : 5
 Orders for backup rings used in combination with packing
 NOK part number : **GN5719V0**
 Type : BRT2, Inner diameter : 14, Outer diameter : 22, Thickness : 2

● Please check the application range on pages 8 and 9 before selecting the type.



How to determine B dimension

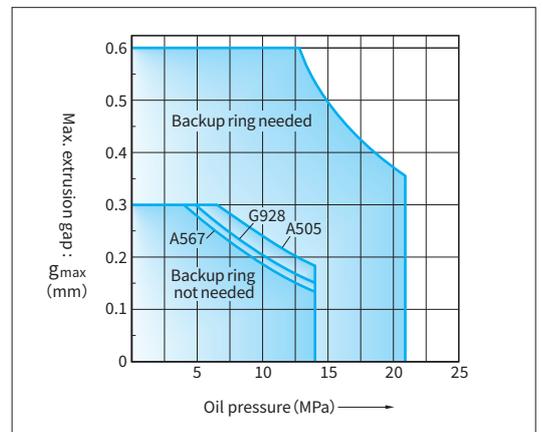
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa
Material of backup ring	19YF	
B dimension	$B \leq \phi d + 1.0$	$B \leq \phi d + 0.5$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



Nominal size of packing, and housing dimensions						Backup ring Thickness	Packing part number			Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C		t	Standard (A505)	Cold resistant (A567)	Heat resistant (G928)	BRT2 (Biasecut) 19YF
14	22	5	5.7	7.7	2.5	2	●CU2692N1				GN5719V0
16	24	5	5.7	7.7	2.5	2	●CU2548N0				GN5720V0
18	26	5	5.7	7.7	2.5	2	CU0180N2				GN4778V0
20	28	5	5.7	7.7	2.5	2	CU0212N3	CU0212N5			GN4780V0
22.4	30	5	5.7	7.7	2.5	2	CU3488N0				GN4784V0
25	33	5	5.7	7.7	2.5	2	CU0276N3	CU0276N5			GN5019V1
28	35.5	5	5.7	8.7	2.5	3	CU0320N0				GN4791V0
30	40	6	7	10	3	3	CU0357N3	CU0357N5			GN4794V0
35	45	6	7	10	3	3	CU0424N3	CU0424N5			GN4799V0
35.5	45	6	7	10	3	3	CU0451N2				GN4801V0
36	46	6	7	10	3	3	CU3040N0				GN5733V0
40	50	6	7	10	3	3	CU0497N4	CU0497N6			GN4050V0
45	55	6	7	10	3	3	CU0567N4	CU0567N6			GN4804V0
45	56	7	8	11	3	3	CU0572N1				GN4805V0
50	60	6	7	10	3	3	CU0619N3	CU0619N5	CU0619N6		GN4335V0
53	63	6	7	10	3	3			CU0679N0		GN4693V0
55	65	6	7	10	3	3	CU0694N3	CU0694N5	CU0694N6		GN4810V0
56	66	6	7	10	3	3	CU0722N2				GN4766V0
60	70	6	7	10	3	3	CU0746N3	CU0746N6	CU0746N8		GN4676V0
63	73	6	7	10	3	3	CU0786N2				GN4814V0
65	75	6	7	10	3	3	CU0809N2	CU0809N4	CU0809N6		GN4816V0
65	80	9	10	13	4	3			CU3615N0		GN4549V0
67	77	6	7	10	3	3	CU0828N0				GN4697V0
70	80	6	7	10	4	3	CU0849N0		CU0849N2		GN4651V0
70	85	9	10	13	4	3	CU0857N2	CU0857N3	CU0857N4		GN4876V0

Remark 1) In some products the part number and the one stamped on the product might be different.

Remark 2) When using the packing with ●, provide separate grooves.

Special Packings for Rod Seals (Installed with internal groove)

IUH type

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505 Cold resistant type : A567
Hydrogenated nitrile rubber (H-NBR)	Heat resistant type : G928

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number : **CU0879N0**
 Type : IUH, Inner diameter : 71, Outer diameter : 80, Height : 6
 Orders for backup rings used in combination with packing
 NOK part number : **GN4818V0**
 Type : BRT2, Inner diameter : 71, Outer diameter : 80, Thickness : 3

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal size of packing, and housing dimensions						Backup ring Thickness	Packing part number			Combination backup ring part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	C		t	Standard (A505)	Cold resistant (A567)	Heat resistant (G928)
71	80	6	7	10	4	3	CU0879N0			GN4818V0
75	85	6	7	10	4	3	CU0901N4	CU0901N6	CU0901N8	GN4692V0
75	90	9	10	13	4	3	CU3090N2		CU3090N4	GN4971V0
80	90	6	7	10	4	3	CU0939N3	CU0939N4	CU0939N6	GN4820V0
80	95	9	10	13	4	3	CU3091N2		CU3091N4	GN5023V0
85	100	9	10	13	4	3	CU0984N1		CU0984N3	GN4687V0
85	105	12	13	16	5.5	3			CU0989N0	GN4821V0
90	105	9	10	13	4	3	CU1024N3	CU1024N5	CU1024N6	GN4698V0
90	110	12	13	16	5.5	3			CU1030N0	GN4109V0
95	110	9	10	13	4	3	CU1051N2	CU1051N5	CU1051N7	GN4822V0
95	115	12	13	16	5.5	3			CU1056N0	GN4823V0
100	115	9	10	13	4	3	CU1082N3	CU1082N5	CU1082N7	GN4512V0
100	120	12	13	16	5.5	3	CU1089N1		CU1089N2	GN4119V0
105	120	9	10	13	4	3	CU1125N1	CU1125N2	CU1125N4	GN5198V0
105	125	12	13	16	5.5	3	CU1128N0			GN4825V0
105	125	15	16	19	5.5	3			CU1129N0	GN4825V0
110	125	9	10	13	4	3	CU1157N3	CU1157N5	CU1157N6	GN4480V0
110	130	15	16	19	5.5	3			CU1165N0	GN4280V1
112	125	8.5	9.5	12.5	4	3	CU1178N0			GN4827V0
115	130	9	10	13	4	3	CU1195N0	CU1195N1	CU1195N2	GN4593V0
115	135	16	17	20	5.5	3			CU1184N0	GN4574V0
120	135	9	10	13	4	3	CU1220N3	CU1220N2	CU1220N4	GN5036V0
120	140	15	16	19	5.5	3			CU1224N0	GN4132V0
125	140	9	10	13	4	3	CU1252N3	CU1252N5	CU01252-N7A	GN4481V0
130	145	9	10	13	4	3	CU1280N0	CU1280N1	CU1280N2	GN4628V1
130	150	16	17	20	5.5	3			CU2771N0	GN4142V0
135	150	9	10	13	4	3	CU2264N2	CU2264N0		GN5025V0
140	155	9	10	13	4	3	CU1323N2	CU1323N3	CU01323-N5A	GN4526V0
145	160	9	10	13	4	3	CU1343N0			GN4551V0
150	165	9	10	13	4	3	CU1359N2	CU1359N4	CU01359-N5A	GN4833V0
160	175	9	10	14	4	4	CU1406N1			GN4835V0
170	190	12	13	17	5.5	4	CU3494N1	CU3494N0	CU3494N2	GN4529V0
180	200	12	13	17	5.5	4	CU1483N2	CU1483N3		GN4470V0
190	215	16	17	21	7	4	CU3523N0	CU3523N2		GN4577V0
200	225	16	17	21	7	4	CU1548N1			GN4560V0
210	235	16	17	21	7	4	CU3640N0			GN5758V0
220	245	16	17	21	7	4	CU3630N0		CU3630N1	GN5754V0
240	265	19	20	24	7	4	CU3335N1			GN4428V1

Remark) In some products the part number and the one stamped on the product might be different.

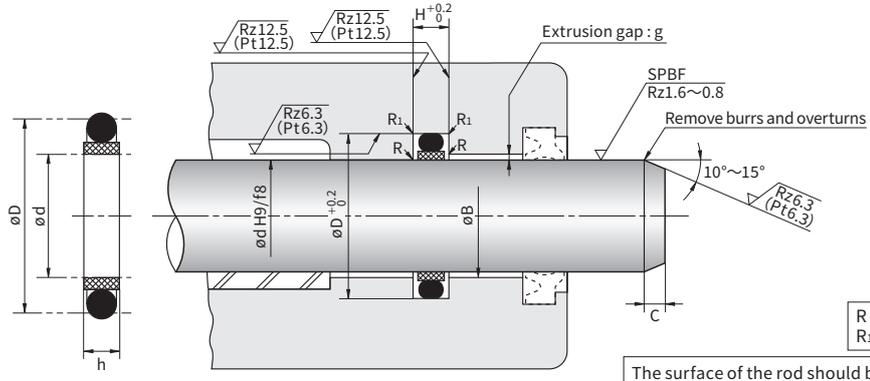
Special Packings for Rod Seals

SPNO_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	19YF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS2800V0
 Type: SPNO, Inner diameter: 12, Outer diameter: 18, Height: 3

● Please check the application range on pages 8 and 9 before selecting the type.



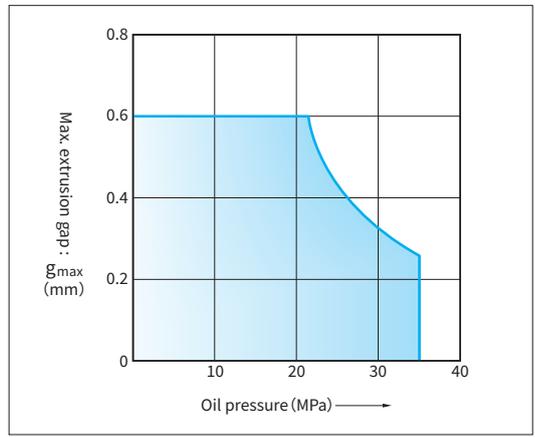
R = 0.3 or below
R_i = 0.5 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6 μm Rz (0.2 to 0.4 μm Ra).

● The roughness is JIS B 0601 : 2001.
When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



SPNO for Rod

Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPNO 12	12	18	3	3.2	2	● GS2800V0
14	14	20	3	3.2	2	● GS2801V0
16	16	22	3	3.2	2	● GS2802V0
18	18	24	3	3.2	2	● GS2803V0
20	20	26	3	3.2	2	● GS2804V0
22	22	31	3.8	4	3.5	● GS2805V0
25	25	34	3.8	4	3.5	● GS2806V0
28	28	37	3.8	4	3.5	● GS2807V0
30	30	39	3.8	4	3.5	● GS2808V0
32	32	41	3.8	4	3.5	● GS2809V0
36	36	45	3.8	4	3.5	● GS2810V0
40	40	49	3.8	4	3.5	● GS2811V0
45	45	54	3.8	4	3.5	● GS2812V0
50	50	65	6.3	6.5	4	● GS2813V0
56	56	71	6.3	6.5	4	GS2814V0
60	60	75	6.3	6.5	4	GS2815V0
63	63	78	6.3	6.5	4	GS2816V0
70	70	85	6.3	6.5	5	GS2817V0
75	75	90	6.3	6.5	5	GS2818V0
80	80	95	6.3	6.5	5	GS2819V0
85	85	100	6.3	6.5	5	GS2820V0
90	90	105	6.3	6.5	5	GS2821V0
95	95	110	6.3	6.5	5	GS2822V0
100	100	115	6.3	6.5	5	GS2823V0
105	105	120	6.3	6.5	5	GS2824V0
110	110	125	6.3	6.5	5	GS2825V0

Remark) When using the packing with ●, provide separate grooves.

Special Packings for Rod Seals

SPNO_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	19YF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS2826V0
 Type: SPNO, Inner diameter: 115, Outer diameter: 130,
 Height: 6.3

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPNO 115	115	130	6.3	6.5	6.5	GS2826V0
120	120	135	6.3	6.5	6.5	GS2827V0
125	125	140	6.3	6.5	6.5	GS2828V0
130	130	145	6.3	6.5	6.5	GS2829V0
135	135	150	6.3	6.5	6.5	GS2830V0
140	140	155	6.3	6.5	6.5	GS2831V0
145	145	160	6.3	6.5	6.5	GS2832V0
150	150	170	9.8	10	6.5	GS2833V0
160	160	180	9.8	10	6.5	GS2834V0
170	170	190	9.8	10	6.5	GS2835V0
180	180	200	9.8	10	6.5	GS2836V0
190	190	210	9.8	10	6.5	GS2837V0
200	200	220	9.8	10	6.5	GS2838V0
210	210	230	9.8	10	6.5	GS2839V0
220	220	240	9.8	10	6.5	GS2840V0
224	224	244	9.8	10	6.5	GS2841V0
230	230	250	9.8	10	6.5	GS2842V0
240	240	260	9.8	10	6.5	GS2843V0
250	250	270	9.8	10	6.5	GS2844V0
260	260	280	9.8	10	7.5	GS2845V0
270	270	290	9.8	10	7.5	GS2846V0
280	280	300	9.8	10	7.5	GS2847V0
290	290	310	9.8	10	7.5	GS2848V0
300	300	320	9.8	10	7.5	GS2849V0
310	310	330	9.8	10	7.5	GS2850V0
320	320	340	9.8	10	7.5	GS2851V0
330	330	350	9.8	10	7.5	GS2852V0
340	340	360	9.8	10	7.5	GS2853V0
350	350	370	9.8	10	7.5	GS2854V0
360	360	380	9.8	10	7.5	GS2855V0
370	370	390	9.8	10	7.5	GS2856V0
380	380	400	9.8	10	7.5	GS2857V0

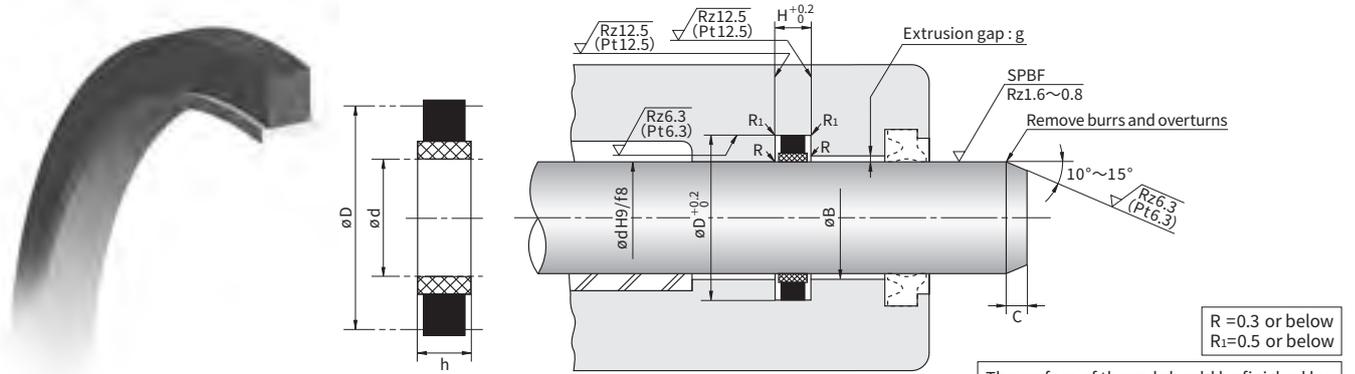
Special Packings for Rod Seals

SPN_{type}

Material	NOK sign
Rarefion (PTFE) + Nitrile rubber (NBR)	19YF + A980

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS2301V0
 Type: SPN, Inner diameter: 18, Outer diameter: 27, Height: 4.3

● Please check the application range on pages 8 and 9 before selecting the type.



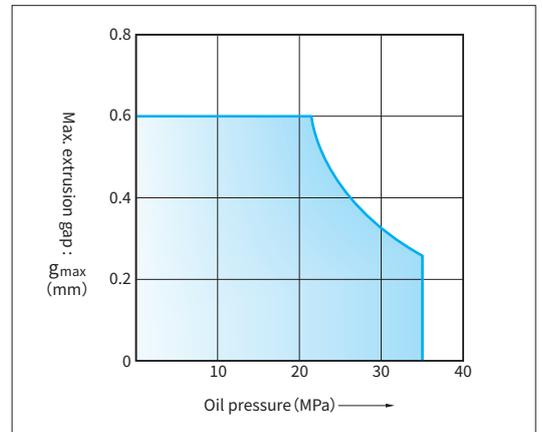
R = 0.3 or below
R_i = 0.5 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPN 18	18	27	4.3	4.5	3.5	● GS2301V0
20	20	29	4.3	4.5	3.5	● GS2302V0
22	22	31	4.3	4.5	3.5	● GS2303V0
27	27	36	4.3	4.5	4	● GS2304V0
31.5	31.5	40.5	4.3	4.5	4	● GS2305V0
47	47	60	7.3	7.5	4	● GS2306V0
53	53	66	7.3	7.5	4	GS2307V0
60	60	73	7.3	7.5	4	GS2308V0
65	65	78	7.3	7.5	5	GS2309V0
70	70	83	7.3	7.5	5	GS2310V0
75	75	88	7.3	7.5	5	GS2311V0
80	80	93	7.3	7.5	5	GS2312V0
90	90	103.4	7.3	7.5	5	GS2313V0
100	100	113.4	7.3	7.5	5	GS2314V0
105	105	118.4	7.3	7.5	5	GS2315V0
110	110	123.4	7.3	7.5	5	GS2316V0
120	120	133.4	7.3	7.5	5	GS2317V0
130	130	143.4	7.3	7.5	6.5	GS2318V0
140	140	153.4	7.3	7.5	6.5	GS2319V0

Remark) When using the packing with ●, provide separate grooves.

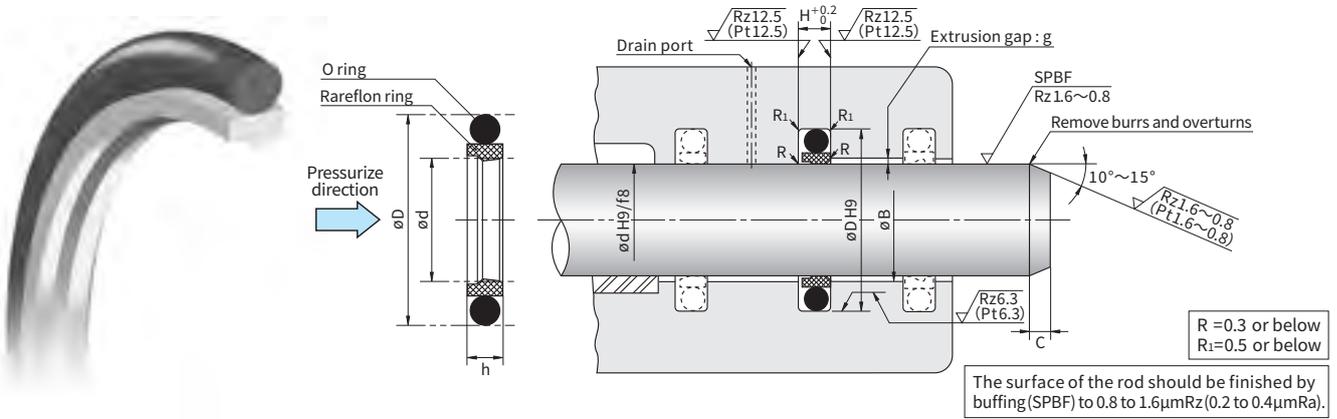
Special Packings for Rod Seals

SPNS_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	55YF + A305

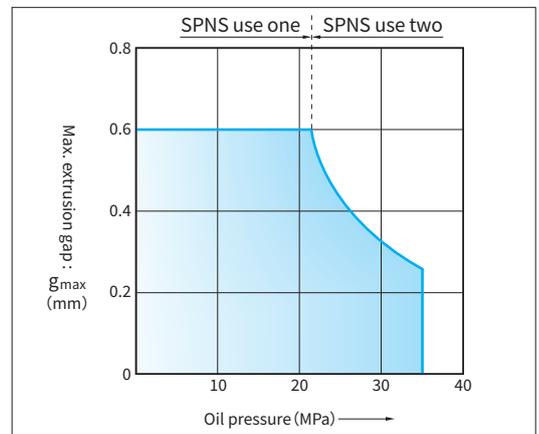
■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS5000V5
 Type: SPNS, Inner diameter: 4, Outer diameter: 8.9, Height: 2

● Please check the application range on pages 8 and 9 before selecting the type.



How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPNS 4	4	8.9	2	2.2	3.5	● GS5000V5
5	5	9.9	2	2.2	3.5	● GS5001V5
6	6	10.9	2	2.2	3.5	● GS5002V5
7	7	11.9	2	2.2	3.5	● GS5003V5
8S	8	12.9	2	2.2	3.5	● GS5004V5
8	8	15.3	2.9	3.2	3.5	● GS5005V5
10S	10	14.9	2	2.2	3.5	● GS5006V5
10	10	17.3	2.9	3.2	3.5	● GS5007V5
12S	12	16.9	2	2.2	4.5	● GS5008V5
12	12	19.3	2.9	3.2	4.5	● GS5009V5
14S	14	18.9	2	2.2	4.5	● GS5010V5
14	14	21.3	2.9	3.2	4.5	● GS5011V5
15S	15	19.9	2	2.2	4.5	● GS5012V5
15	15	22.3	2.9	3.2	4.5	● GS5013V5
16S	16	20.9	2	2.2	4.5	● GS5014V5
16	16	23.3	2.9	3.2	4.5	● GS5015V5
18S	18	22.9	2	2.2	4.5	● GS5016V5
18	18	25.3	2.9	3.2	4.5	● GS5017V5
20S	20	27.3	2.9	3.2	4.5	● GS5018V5
20	20	30.7	3.9	4.2	4.5	● GS5019V5
22S	22	29.3	2.9	3.2	4.5	● GS5020V5
22	22	32.7	3.9	4.2	4.5	● GS5021V5
22.4S	22.4	29.7	2.9	3.2	4.5	● GS5022V5
22.4	22.4	33.1	3.9	4.2	4.5	● GS5023V5
25S	25	32.3	2.9	3.2	5.5	● GS5024V5
25	25	35.7	3.9	4.2	5.5	● GS5025V5

Remark) When using the packing with ●, provide separate grooves.

Special Packings for Rod Seals

SPNS_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	55YF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS5026V5
 Type: SPNS, Inner diameter: 28, Outer diameter: 35.3, Height: 2.9

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal number	Nominal size of packing, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
SPNS 28S	28	35.3	2.9	3.2	5.5	● GS5026V5
28	28	38.7	3.9	4.2	5.5	● GS5027V5
30S	30	37.3	2.9	3.2	5.5	● GS5028V5
30	30	40.7	3.9	4.2	5.5	● GS5029V5
32S	32	39.3	2.9	3.2	5.5	GS5030V5
32	32	42.7	3.9	4.2	5.5	GS5031V5
35S	35	42.3	2.9	3.2	5.5	GS5032V5
35	35	45.7	3.9	4.2	5.5	GS5033V5
35.5S	35.5	42.8	2.9	3.2	5.5	GS5034V5
35.5	35.5	46.2	3.9	4.2	5.5	GS5035V5
36S	36	43.3	2.9	3.2	5.5	GS5036V5
36	36	46.7	3.9	4.2	5.5	GS5037V5
38S	38	48.7	3.9	4.2	5.5	GS5038V5
38	38	53.1	5.9	6.3	5.5	GS5039V5
40S	40	50.7	3.9	4.2	5.5	GS5040V5
40	40	55.1	5.9	6.3	5.5	GS5041V5
42S	42	52.7	3.9	4.2	5.5	GS5042V5
42	42	57.1	5.9	6.3	5.5	GS5043V5
45S	45	55.7	3.9	4.2	5.5	GS5044V5
45	45	60.1	5.9	6.3	5.5	GS5045V5
50S	50	60.7	3.9	4.2	5.5	GS5046V5
50	50	65.1	5.9	6.3	5.5	GS5047V5
56S	56	66.7	3.9	4.2	7	GS5048V5
56	56	71.1	5.9	6.3	7	GS5049V5
60S	60	70.7	3.9	4.2	7	GS5050V5
60	60	75.1	5.9	6.3	7	GS5051V5
63	63	78.1	5.9	6.3	7	GS5052V5
65	65	80.1	5.9	6.3	7	GS5053V5
67	67	82.1	5.9	6.3	7	GS5054V5
70	70	85.1	5.9	6.3	7	GS5055V5
71	71	86.1	5.9	6.3	7	GS5056V5
75	75	90.1	5.9	6.3	7	GS5057V5
80	80	95.1	5.9	6.3	7	GS5058V5
85	85	100.1	5.9	6.3	7	GS5059V5
90	90	105.1	5.9	6.3	7	GS5060V5
95	95	110.1	5.9	6.3	7	GS5061V5
100	100	115.1	5.9	6.3	7	GS5062V5
105	105	120.1	5.9	6.3	7	GS5063V5
110	110	125.1	5.9	6.3	7	GS5064V5
112	112	127.1	5.9	6.3	7	GS5065V5
115	115	130.1	5.9	6.3	7	GS5066V5
120	120	135.1	5.9	6.3	7	GS5067V5
125	125	140.1	5.9	6.3	7	GS5068V5
130	130	145.1	5.9	6.3	7	GS5069V5
135	135	150.1	5.9	6.3	7	GS5070V5
140	140	155.1	5.9	6.3	7	GS5071V5
150	150	165.1	5.9	6.3	7	GS5072V5
160	160	175.1	5.9	6.3	7	GS5073V5
170	170	185.1	5.9	6.3	7	GS5074V5
180	180	195.1	5.9	6.3	7	GS5075V5

Remark) When using the packing with ●, provide separate grooves.

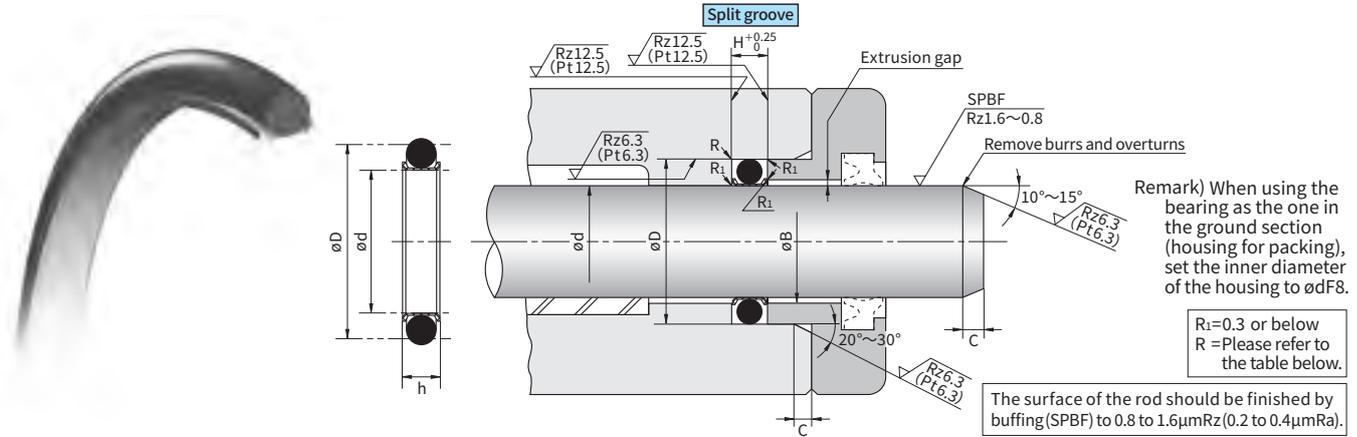
Special Packings for Rod Seals

SPNC_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	31BF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS2000F0
 Type: SPNC, Inner diameter: 3, Outer diameter: 6, Height: 2.3

● Please check the application range on pages 8 and 9 before selecting the type.



Remark) When using the bearing as the one in the ground section (housing for packing), set the inner diameter of the housing to ødF8.

R₁=0.3 or below
 R = Please refer to the table below.

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

To determine B dimension, please make the maximum extrusion gap 0.4mm or below considering the eccentricity of piston.

Nominal number	Nominal size of packing			Housing dimensions				H	R	C	NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications					
				ød _{-0.05}	øD ^{+0.05}	ød _{-0.05}	øD ^{+0.05}				
SPNC 3	3	6	2.3	3	6	3	6.5	2.5	0.3 or below	3~4	GS2000F0
4	4	7	2.3	4	7	4	7.5	2.5	0.3 or below	3~4	GS2001F0
5	5	8	2.3	5	8	5	8.5	2.5	0.3 or below	3~4	GS2002F0
6	6	9	2.3	6	9	6	9.5	2.5	0.3 or below	3~4	GS2003F0
7	7	10	2.3	7	10	7	10.5	2.5	0.3 or below	3~4	GS2004F0
8	8	11	2.3	8	11	8	11.5	2.5	0.3 or below	3~4	GS2005F0
9	9	12	2.3	9	12	9	12.5	2.5	0.3 or below	3~4	GS2006F0
10	10	13	2.3	10	13	10	13.5	2.5	0.3 or below	3~4	GS2007F0
Nominal number	Nominal size of packing			Housing dimensions				H	R	C	NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications					
				ød _{-0.06}	øD ^{+0.06}	ød _{-0.06}	øD ^{+0.06}				
SPNC 10A	10	14	3	10	14	10	14.6	3.2	0.4 or below	4~5	GS2008F0
11	11	15	3	11	15	11	15.6	3.2	0.4 or below	4~5	GS2009F0
11.2	11.2	15.2	3	11.2	15.2	11.2	15.8	3.2	0.4 or below	4~5	GS2010F0
12	12	16	3	12	16	12	16.6	3.2	0.4 or below	4~5	GS2011F0
12.5	12.5	16.5	3	12.5	16.5	12.5	17.1	3.2	0.4 or below	4~5	GS2012F0
14	14	18	3	14	18	14	18.6	3.2	0.4 or below	4~5	GS2013F0
15	15	19	3	15	19	15	19.6	3.2	0.4 or below	4~5	GS2014F0
16	16	20	3	16	20	16	20.6	3.2	0.4 or below	4~5	GS2015F0
18	18	22	3	18	22	18	22.6	3.2	0.4 or below	4~5	GS2016F0
20	20	24	3	20	24	20	24.6	3.2	0.4 or below	4~5	GS2017F0
21	21	25	3	21	25	21	25.6	3.2	0.4 or below	4~5	GS2018F0
22	22	26	3	22	26	22	26.6	3.2	0.4 or below	4~5	GS2020F0
Nominal number	Nominal size of packing			Housing dimensions				H	R	C	NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications					
				ød _{-0.08}	øD ^{+0.08}	ød _{-0.08}	øD ^{+0.08}				
SPNC 22A	22	28	4.4	22	28	22	28.6	4.7	0.7 or below	5~6	GS2019F0
22.4	22.4	28.4	4.4	22.4	28.4	22.4	29	4.7	0.7 or below	5~6	GS2021F0
24	24	30	4.4	24	30	24	30.6	4.7	0.7 or below	5~6	GS2022F0
25	25	31	4.4	25	31	25	31.6	4.7	0.7 or below	5~6	GS2023F0
25.5	25.5	31.5	4.4	25.5	31.5	25.5	32.1	4.7	0.7 or below	5~6	GS2024F0
26	26	32	4.4	26	32	26	32.6	4.7	0.7 or below	5~6	GS2025F0
28	28	34	4.4	28	34	28	34.6	4.7	0.7 or below	5~6	GS2026F0
29	29	35	4.4	29	35	29	35.6	4.7	0.7 or below	5~6	GS2027F0
29.5	29.5	35.5	4.4	29.5	35.5	29.5	36.1	4.7	0.7 or below	5~6	GS2028F0
30	30	36	4.4	30	36	30	36.6	4.7	0.7 or below	5~6	GS2029F0
31	31	37	4.4	31	37	31	37.6	4.7	0.7 or below	5~6	GS2030F0
31.5	31.5	37.5	4.4	31.5	37.5	31.5	38.1	4.7	0.7 or below	5~6	GS2031F0

Special Packings for Rod Seals

SPNC_{type}

Material	NOK sign
Rarefion (PTFE) + Nitrile rubber (NBR)	31BF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS2032F0
 Type: SPNC, Inner diameter: 32, Outer diameter: 38, Height: 4.4

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal number	Nominal size of packing			Housing dimensions				NOK part number			
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications					
				$\varnothing d_{-0.08}$	$\varnothing D_{+0.08}$	$\varnothing d_{-0.08}$	$\varnothing D_{+0.08}$		H	R	C
SPNC 32	32	38	4.4	32	38	32	38.6	4.7	0.7 or below	5~6	GS2032F0
34	34	40	4.4	34	40	34	40.6	4.7	0.7 or below	5~6	GS2033F0
35	35	41	4.4	35	41	35	41.6	4.7	0.7 or below	5~6	GS2034F0
35.5	35.5	41.5	4.4	35.5	41.5	35.5	42.1	4.7	0.7 or below	5~6	GS2035F0
36	36	42	4.4	36	42	36	42.6	4.7	0.7 or below	5~6	GS2036F0
38	38	44	4.4	38	44	38	44.6	4.7	0.7 or below	5~6	GS2037F0
39	39	45	4.4	39	45	39	45.6	4.7	0.7 or below	5~6	GS2038F0
40	40	46	4.4	40	46	40	46.6	4.7	0.7 or below	5~6	GS2039F0
41	41	47	4.4	41	47	41	47.6	4.7	0.7 or below	5~6	GS2040F0
42	42	48	4.4	42	48	42	48.6	4.7	0.7 or below	5~6	GS2041F0
44	44	50	4.4	44	50	44	50.6	4.7	0.7 or below	5~6	GS2042F0
45	45	51	4.4	45	51	45	51.6	4.7	0.7 or below	5~6	GS2043F0
46	46	52	4.4	46	52	46	52.6	4.7	0.7 or below	5~6	GS2044F0
48	48	54	4.4	48	54	48	54.6	4.7	0.7 or below	5~6	GS2046F0
49	49	55	4.4	49	55	49	55.6	4.7	0.7 or below	5~6	GS2047F0
50	50	56	4.4	50	56	50	56.6	4.7	0.7 or below	5~6	GS2049F0
Nominal number	Nominal size of packing			Housing dimensions				NOK part number			
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications					
				$\varnothing d_{-0.10}$	$\varnothing D_{+0.10}$	$\varnothing d_{-0.10}$	$\varnothing D_{+0.10}$		H	R	C
SPNC 48A	48	58	7	48	58	48	58.6	7.5	0.8 or below	6~8	GS2045F0
50A	50	60	7	50	60	50	60.6	7.5	0.8 or below	6~8	GS2048F0
52	52	62	7	52	62	52	62.6	7.5	0.8 or below	6~8	GS2050F0
53	53	63	7	53	63	53	63.6	7.5	0.8 or below	6~8	GS2051F0
55	55	65	7	55	65	55	65.6	7.5	0.8 or below	6~8	GS2052F0
56	56	66	7	56	66	56	66.6	7.5	0.8 or below	6~8	GS2053F0
58	58	68	7	58	68	58	68.6	7.5	0.8 or below	6~8	GS2054F0
60	60	70	7	60	70	60	70.6	7.5	0.8 or below	6~8	GS2055F0
62	62	72	7	62	72	62	72.6	7.5	0.8 or below	6~8	GS2056F0
63	63	73	7	63	73	63	73.6	7.5	0.8 or below	6~8	GS2057F0
65	65	75	7	65	75	65	75.6	7.5	0.8 or below	6~8	GS2058F0
67	67	77	7	67	77	67	77.6	7.5	0.8 or below	6~8	GS2059F0
70	70	80	7	70	80	70	80.6	7.5	0.8 or below	6~8	GS2060F0
71	71	81	7	71	81	71	81.6	7.5	0.8 or below	6~8	GS2061F0
75	75	85	7	75	85	75	85.6	7.5	0.8 or below	6~8	GS2062F0
80	80	90	7	80	90	80	90.6	7.5	0.8 or below	6~8	GS2063F0
85	85	95	7	85	95	85	95.6	7.5	0.8 or below	6~8	GS2064F0
90	90	100	7	90	100	90	100.6	7.5	0.8 or below	6~8	GS2065F0
95	95	105	7	95	105	95	105.6	7.5	0.8 or below	6~8	GS2066F0
100	100	110	7	100	110	100	110.6	7.5	0.8 or below	6~8	GS2067F0
102	102	112	7	102	112	102	112.6	7.5	0.8 or below	6~8	GS2068F0
105	105	115	7	105	115	105	115.6	7.5	0.8 or below	6~8	GS2069F0
110	110	120	7	110	120	110	120.6	7.5	0.8 or below	6~8	GS2070F0
112	112	122	7	112	122	112	122.6	7.5	0.8 or below	6~8	GS2071F0
115	115	125	7	115	125	115	125.6	7.5	0.8 or below	6~8	GS2072F0
120	120	130	7	120	130	120	130.6	7.5	0.8 or below	6~8	GS2073F0
125	125	135	7	125	135	125	135.6	7.5	0.8 or below	6~8	GS2074F0
130	130	140	7	130	140	130	140.6	7.5	0.8 or below	6~8	GS2075F0
132	132	142	7	132	142	132	142.6	7.5	0.8 or below	6~8	GS2076F0
135	135	145	7	135	145	135	145.6	7.5	0.8 or below	6~8	GS2077F0
140	140	150	7	140	150	140	150.6	7.5	0.8 or below	6~8	GS2078F0
145	145	155	7	145	155	145	155.6	7.5	0.8 or below	6~8	GS2079F0
150	150	160	7	150	160	150	160.6	7.5	0.8 or below	6~8	GS2081F0
150A	150	165	10.5	150	165	150	165.6	11.0	0.8 or below	8~12	GS2080F0
155	155	170	10.5	155	170	155	170.6	11.0	0.8 or below	8~12	GS2082F0
160	160	175	10.5	160	175	160	175.6	11.0	0.8 or below	8~12	GS2083F0
165	165	180	10.5	165	180	165	180.6	11.0	0.8 or below	8~12	GS2084F0

Special Packings for Rod Seals

SPNC_{type}

Material	NOK sign
Rarefion (PTFE) + Nitrile rubber (NBR)	31BF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS2085F0
 Type: SPNC, Inner diameter: 170, Outer diameter: 185,
 Height: 10.5

● Please check the application range on pages 8 and 9 before selecting the type.

Nominal number	Nominal size of packing			Housing dimensions							NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R	C	
				$\varnothing d_{-0.10}^0$	$\varnothing D_{+0.10}^0$	$\varnothing d_{-0.10}^0$	$\varnothing D_{+0.10}^0$				
SPNC 170	170	185	10.5	170	185	170	185.6	11.0	0.8 or below	8~12	GS2085F0
175	175	190	10.5	175	190	175	190.6	11.0	0.8 or below	8~12	GS2086F0
180	180	195	10.5	180	195	180	195.6	11.0	0.8 or below	8~12	GS2087F0
185	185	200	10.5	185	200	185	200.6	11.0	0.8 or below	8~12	GS2088F0
190	190	205	10.5	190	205	190	205.6	11.0	0.8 or below	8~12	GS2089F0
195	195	210	10.5	195	210	195	210.6	11.0	0.8 or below	8~12	GS2090F0
200	200	215	10.5	200	215	200	215.6	11.0	0.8 or below	8~12	GS2091F0
205	205	220	10.5	205	220	205	220.6	11.0	0.8 or below	8~12	GS2092F0
209	209	224	10.5	209	224	209	224.6	11.0	0.8 or below	8~12	GS2093F0
210	210	225	10.5	210	225	210	225.6	11.0	0.8 or below	8~12	GS2094F0
215	215	230	10.5	215	230	215	230.6	11.0	0.8 or below	8~12	GS2095F0
220	220	235	10.5	220	235	220	235.6	11.0	0.8 or below	8~12	GS2096F0
225	225	240	10.5	225	240	225	240.6	11.0	0.8 or below	8~12	GS2097F0
230	230	245	10.5	230	245	230	245.6	11.0	0.8 or below	8~12	GS2098F0
235	235	250	10.5	235	250	235	250.6	11.0	0.8 or below	8~12	GS2099F0
240	240	255	10.5	240	255	240	255.6	11.0	0.8 or below	8~12	GS2100F0
245	245	260	10.5	245	260	245	260.6	11.0	0.8 or below	8~12	GS2101F0
250	250	265	10.5	250	265	250	265.6	11.0	0.8 or below	8~12	GS2102F0
255	255	270	10.5	255	270	255	270.6	11.0	0.8 or below	8~12	GS2103F0
260	260	275	10.5	260	275	260	275.6	11.0	0.8 or below	8~12	GS2104F0
265	265	280	10.5	265	280	265	280.6	11.0	0.8 or below	8~12	GS2105F0
270	270	285	10.5	270	285	270	285.6	11.0	0.8 or below	8~12	GS2106F0
275	275	290	10.5	275	290	275	290.6	11.0	0.8 or below	8~12	GS2107F0
280	280	295	10.5	280	295	280	295.6	11.0	0.8 or below	8~12	GS2108F0
285	285	300	10.5	285	300	285	300.6	11.0	0.8 or below	8~12	GS2109F0
290	290	305	10.5	290	305	290	305.6	11.0	0.8 or below	8~12	GS2110F0
295	295	310	10.5	295	310	295	310.6	11.0	0.8 or below	8~12	GS2111F0
300	300	315	10.5	300	315	300	315.6	11.0	0.8 or below	8~12	GS2112F0
315	315	330	10.5	315	330	315	330.6	11.0	0.8 or below	8~12	GS2113F0
320	320	335	10.5	320	335	320	335.6	11.0	0.8 or below	8~12	GS2114F0
335	335	350	10.5	335	350	335	350.6	11.0	0.8 or below	8~12	GS2115F0
340	340	355	10.5	340	355	340	355.6	11.0	0.8 or below	8~12	GS2116F0
355	355	370	10.5	355	370	355	370.6	11.0	0.8 or below	8~12	GS2117F0
360	360	375	10.5	360	375	360	375.6	11.0	0.8 or below	8~12	GS2118F0
375	375	390	10.5	375	390	375	390.6	11.0	0.8 or below	8~12	GS2119F0
385	385	400	10.5	385	400	385	400.6	11.0	0.8 or below	8~12	GS2120F0

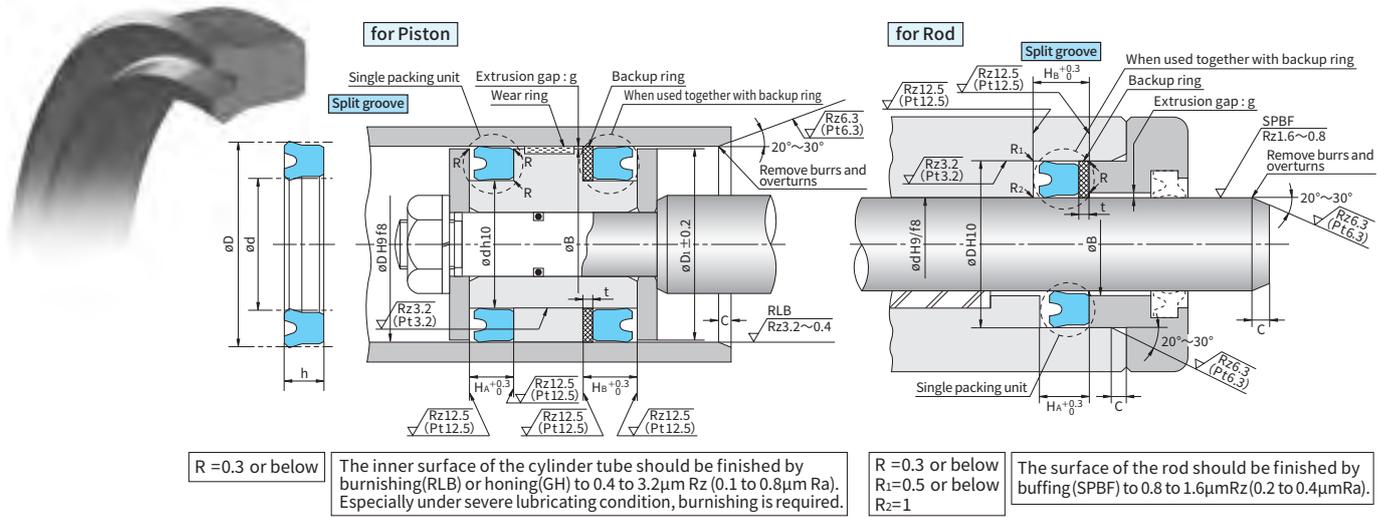
Packings for Both Piston and Rod Seals

UPI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0024D0**
 Type: UPI, Inner diameter: 6.3, Outer diameter: 16.3, Height: 8
 Orders for backup rings used in combination with packing
 NOK part number: **GN0720V0**
 Type: BRT3, Inner diameter: 6.3, Outer diameter: 16.3, Thickness: 2

● Please check the application range on pages 10 and 11 before selecting the type.



● The roughness is JIS B 0601 : 2001. When regulation length cannot be kept, apply Pt.

How to determine B dimension

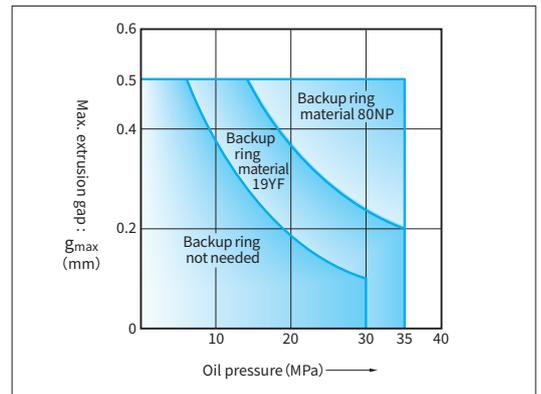
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension (in case of piston seals) or larger B dimension (in case of rod seals) because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	35MPa	35MPa
Material of backup ring	19YF			80NP
For rod	$B \geq \phi d + 1.0$	$B \geq \phi d + 0.5$	$B \geq \phi d + 0.2$	$B \geq \phi d + 0.8$
For piston	$B \geq \phi D - 1.0$	$B \geq \phi D - 0.5$	$B \geq \phi D - 0.2$	$B \geq \phi D - 0.8$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston or rod.



Nominal size of packing, and housing dimensions							Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C			BRT3 (Endless) 19YF	BRN3 (Endless) 80NP
6.3	16.3	8	9	11	15.3	2.5	2	FU0024D0	GN0720V0	GN982300
7.1	17.1	8	9	11	16.1	2.5	2	FU0030D0	GN0723V0	GN986800
8	18	8	9	11	17	2.5	2	FU0043D0	GN0725V0	GN910101
9	19	8	9	11	18	2.5	2	FU0054D0	GN0728V0	GN982600
10	20	8	9	11	19	2.5	2	FU0069D0	GN0733V0	GN910201
11.2	21.2	8	9	11	20.2	2.5	2	FU0081D0	GN0736V0	GN982800
12	25	8	9	11	24	2.5	2	FU0093D0	GN6005V0	GN986900
12.5	22.5	8	9	11	21.5	2.5	2	FU0102D0	GN0741V0	GN983000
14	24	8	9	11	23	2.5	2	FU0122D0	GN0745V0	GN910301
15	25	8	9	11	24	2.5	2	FU0135D0	GN0749V0	GN973801
16	26	8	9	11	25	2.5	2	FU0157D0	GN0751V0	GN910501
16	32	10	11	13	31	2.5	2	FU0161D0	GN7288V0	GN987000
18	28	8	9	11	27	3.5	2	FU0182D0	GN0757V0	GN983300
18	31	10	11	13	30	3.5	2	FU0186D0	GN6446V0	GN910701
20	30	8	9	11	29	3.5	2	FU0215D0	GN0762V0	GN910901
20	33	10	11	13	32	3.5	2	FU0221D0	GN6448V0	GN911001
20	35	10	11	13	34	3.5	2	FU0224D0	GN7289V0	GN987100
22	32	8	9	11	31	3.5	2	FU0246D0	GN7290V0	GN987200
22	35	10	11	13	34	3.5	2	FU0249D0	GN6449V0	GN911101
22.4	30	5	5.7	7.7	29	3.5	2	FU0260D0	GN6450V0	GN911201
22.4	32.4	8	9	11	31.4	3.5	2	FU0263D0	GN0771V0	GN983400
25	35	8	9	11	34	3.5	2	FU0282D0	GN0781V0	GN911501
25	38	8	9	11	37	3.5	2	FU0287D0	GN6453V0	GN911601
25	40	10	11	13	39	3.5	2	FU0292D0	GN6591V0	GN980000

Packings for Both Piston and Rod Seals

UPI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please check the application range on pages 10 and 11 before selecting the type.

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0301D0**
 Type: UPI, Inner diameter: 25, Outer diameter: 45, Height: 12
 Orders for backup rings used in combination with packing
 NOK part number: **GN7291V0**
 Type: BRT3, Inner diameter: 25, Outer diameter: 45, Thickness: 2

Nominal size of packing, and housing dimensions							Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C			BRT3 (Endless) 19YF	BRN3 (Endless) 80NP
25	45	12	13	15	44	3.5	2	FU0301D0	GN7291V0	GN987300
25.5	35.5	8	9	11	34.5	3.5	2	FU0309D1	GN6454V0	GN911701
28	35.5	5	5.7	8.7	34.5	3.5	3	FU0320D1	GN6456V0	GN911901
28	40	10	11	14	39	3.5	3	FU0330D0	GN6457V0	GN912001
28	43	10	11	14	42	3.5	3	FU0340D0	GN0791V0	GN983600
30	45	10	11	14	44	3.5	3	FU0368D0	GN7061V0	GN980100
30	46	10	11	14	45	3.5	3	FU0369D0	GN7292V0	GN987400
31.5	46.5	10	11	14	45.5	3.5	3	FU0387D0	GN0805V0	GN983700
32	46	10	11	14	45	4	3	FU0403D0	GN6035V0	GN987500
35	50	10	11	14	49	4	3	FU0437D0	GN0816V0	GN912801
35.5	45	6	7	10	44	4	3	FU0451D0	GN6464V0	GN912901
35.5	50.5	10	11	14	49.5	4	3	FU0456D0	GN0820V0	GN995400
38	52	10	11	14	51	4	3	FU0470D0	GN6046V0	GN987600
40	55	10	11	14	54	4	3	FU0505D0	GN6759V0	GN994800
40	56	10	11	14	55	4	3	FU0508D0	GN6466V0	GN913201
40	60	12	13	16	59	4	3	FU0514D0	GN7293V0	GN987700
41	56	10	11	14	55	4	3	FU0523D0	GN0835V0	GN994900
45	56	7	8	11	55	4	3	FU0572D1	GN6468V0	GN913401
45	60	10	11	14	59	4	3	FU0577D0	GN0845V0	GN995000
45	61	10	11	14	60	4	3	FU0579D0	GN6469V0	GN913501
46	60	10	11	14	59	4	3	FU0588D0	GN7294V0	GN987800
48	63	10	11	14	62	4	3	FU0601D0	GN0853V0	GN995100
50	65	10	11	14	64	4	3	FU0631D0	GN6439V0	GN995200
50	66	12	13	16	65	4	3	FU0635D0	GN6329V0	GN913901
50	70	12	13	16	69	4	3	FU0639D0	GN6592V0	GN952900
51	71	12	13	16	70	4	3	FU0669D0	GN0862V0	GN980500
53	73	12	13	16	72	4	3	FU0683D0	GN0869V0	GN987900
55	71	12	13	16	70	4	3	FU0704D0	GN6473V0	GN914201
55	75	12	13	16	74	4	3	FU0708D0	GN7249V0	GN980700
55	80	15	16	19	79	4	3	FU0712D0	GN6072V0	GN988000
56	72	12	13	16	71	4	3	FU0727D0	GN7009V0	GN983800
56	76	12	13	16	75	4	3	FU0728D0	GN0877V0	GN983900
58	78	12	13	16	77	4	3	FU0736D0	GN7296V0	GN988100
60	71	7	8	11	70	4	3	FU0750D0	GN6475V0	GN914501
60	80	12	13	16	79	4	3	FU0761D0	GN0886V1	GN995300
62	82	12	13	16	81	4	3	FU0777D0	GN6371V0	GN988200
63	83	12	13	16	82	4	3	FU0793D0	GN0893V1	GN984200
65	85	12	13	16	84	5	3	FU0819D0	GN0899V0	GN981000
67	87	12	13	16	86	5	3	FU0831D0	GN0904V0	GN984400
70	90	12	13	16	89	5	3	FU0862D0	GN0910V0	GN915101
71	80	6	7	10	79	5	3	FU0879D1	GN6481V0	GN915201
71	91	12	13	16	90	5	3	FU0884D0	GN0914V0	GN984600
75	95	12	13	16	94	5	3	FU0910D0	GN0920V0	GN915401
80	100	12	13	16	98	5	3	FU0948D0	GN0927V0	GN915601
80	100	15	16	19	98	5	3	FU0949D0	GN0927V0	GN915601
85	100	9	10	13	98	5	3	FU0984D1	GN6484V0	GN909101
85	105	12	13	16	103	5	3	FU0989D0	GN0932V0	GN915701
90	110	12	13	16	108	5	3	FU1030D0	GN0939V0	GN915901
95	115	12	13	16	113	5	3	FU1056D0	GN0945V0	GN916101
95	120	15	16	19	118	5	3	FU1061D0	GN6716V0	GN988300
98	112	9	10	13	110	5	3	FU1068D0	GN6487V0	GN916201
100	120	12	13	16	118	5	3	FU1089D0	GN0952V0	GN916401
100	125	15	17	20	123	5	3	FU1096D0	GN7297V0	GN988400
105	125	15	17	20	123	5	3	FU1129D0	GN0959V0	GN916501
106	120	8.5	9.5	12.5	118	5	3	FU1135D1	GN6489V0	GN916601
106	126	15	17	20	124	5	3	FU1138D0	GN0961V0	GN984700

Packings for Both Piston and Rod Seals

UPI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU1165D0**
 Type: UPI, Inner diameter: 110, Outer diameter: 130, Height: 15
 Orders for backup rings used in combination with packing
 NOK part number: **GN6790V0**
 Type: BRT3, Inner diameter: 110, Outer diameter: 130, Thickness: 3

● Please check the application range on pages 10 and 11 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C			BRT3 (Endless) 19YF	BRN3 (Endless) 80NP
110	130	15	17	20	128	5	3	FU1165D0	GN6790V0	GN969400
112	132	15	17	20	130	5	3	FU1182D0	GN0970V0	GN916801
115	135	15	17	20	133	5	3	FU1198D0	GN0974V0	GN977801
118	132	9	10	13	130	5	3	FU1932D0	GN7298V0	GN988500
118	138	15	17	20	136	5	3	FU1207D0	GN0978V0	GN984900
120	140	15	17	20	138	5	3	FU1224D0	GN0982V0	GN916901
125	145	15	17	20	143	5	3	FU1257D0	GN0986V0	GN985000
130	150	15	17	20	148	6.5	3	FU1284D0	GN6925V0	GN933501
132	152	15	17	20	150	6.5	3	FU1292D0	GN0994V0	GN988600
135	155	15	17	20	153	6.5	3	FU1305D0	GN0998V0	GN976900
136	150	9	10	13	148	6.5	3	FU1933D0	GN6493V0	GN917301
140	160	15	17	20	158	6.5	3	FU1327D0	GN1002V0	GN966800
140	165	15	17	20	163	6.5	3	FU1330D0	GN6494V0	GN917401
145	165	15	17	20	163	6.5	3	FU1344D0	GN1007V0	GN988700
150	170	15	17	20	168	6.5	3	FU1363D0	GN1011V0	GN967201
150	175	15	17	20	173	6.5	3	FU1365D0	GN7014V0	GN964501
155	180	15	17	21	178	6.5	4	FU1391D0	GN1016V0	GN917901
160	185	15	17	21	183	6.5	4	FU1413D0	GN1020V0	GN918101
165	190	15	17	21	188	6.5	4	FU1431D0	GN1023V0	GN981500
170	195	15	17	21	193	6.5	4	FU1448D0	GN1027V0	GN985200
175	200	15	17	21	198	6.5	4	FU1461D0	GN1031V0	GN918601
180	205	15	17	21	203	6.5	4	FU1490D0	GN1035V0	GN918801
185	210	15	17	21	208	6.5	4	FU1504D0	GN1039V0	GN981700
190	215	15	17	21	213	6.5	4	FU1519D0	GN1042V0	GN981800
199	224	15	17	21	222	6.5	4	FU1532D0	GN1047V0	GN982000
200	225	15	17	21	223	6.5	4	FU1547D0	GN1050V0	GN919201
200	225	18	20	24	223	6.5	4	FU1549D0	GN1050V0	GN919201
205	235	18	20	24	233	6.5	4	FU1565D0	GN7302V0	GN988800
210	235	18	20	24	233	6.5	4	FU1579D0	GN1057V0	GN985400
212	237	18	20	24	235	6.5	4	FU1584D0	GN1058V0	GN966501
220	245	18	20	24	243	6.5	4	FU1599D0	GN1063V0	GN967000
224	249	18	20	24	247	6.5	4	FU1612D0	GN7282V0	GN985600
225	250	18	20	24	248	6.5	4	FU1625D0	GN1065V0	GN904501
230	254	18	20	24	252	6.5	4	FU1639D0	GN7304V0	GN989000
230	255	18	20	24	253	6.5	4	FU1641D0	GN1069V0	GN985700
236	261	18	20	24	259	6.5	4	FU1648D0	GN6191V0	GN989100
240	265	18	20	24	263	6.5	4	FU1662D0	GN1073V0	GN985800
250	275	18	20	24	273	6.5	4	FU1682D0	GN1078V0	GN920001
260	290	18	20	24	288	8	4	FU1706D0	GN1083V0	GN943101
265	295	18	20	24	293	8	4	FU1713D0	GN1085V0	GN989200
270	300	18	20	24	298	8	4	FU1722D0	GN1089V0	GN920601
280	310	18	20	24	308	8	4	FU1735D0	GN1093V0	GN985900
290	320	18	20	24	318	8	4	FU1750D0	GN1098V0	GN986000
300	330	18	20	24	328	8	4	FU1764D0	GN1103V0	GN923501

[Large size dimension table] ● When using packings on this large size, please consult NOK.

310	340	22	24	28	338	10		FU1773D0		
315	345	22	24	28	343	10		FU1775D0		
320	350	15	17	21	348	10		FU1778D0		
320	350	18	20	24	348	10		FU1779D0		
320	350	22	24	28	348	10		FU1780D0		
320	360	25	27	31	358	10		FU1781D0		
323	355	24	26	30	353	10		FU1784D0		
330	360	20	22	26	358	10		FU1788D0		
330	360	22	24	28	358	10		FU1789D0		
330	370	28	30	34	368	10		FU1791D0		

Remark) When placing orders for backup ring on this large size (the inner diameter(d) exceeding classification 300mm), please consult NOK.

Packings for Both Piston and Rod Seals

[Large size dimension table]

UPI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU1795D0**
 Type: UPI, Inner diameter: 340, Outer diameter: 370, Height: 22

● Please check the application range on pages 10 and 11 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C			BRT3 (Endless) 19YF	BRN3 (Endless) 80NP
340	370	22	24	28	368	10	FU1795D0			
350	380	22	24	28	378	10	FU1799D0			
350	390	28	30	34	388	10	FU2016D0			
355	385	22	24	28	383	10	FU1801D0			
370	400	22	24	28	398	10	FU1809D0			
375	405	22	24	28	403	10	FU1812D0			
380	410	22	24	28	408	10	FU1816D0			
385	415	22	24	28	413	10	FU1993D0			
390	420	22	24	28	418	10	FU1818D0			
400	425	22	24	28	423	10	FU1822D0			
400	430	22	24	28	428	10	FU1823D0			
405	440	25	27	32	438	15	FU1827D0			
410	445	25	27	32	443	15	FU1829D0			
410	460	35	37	42	458	15	FU1830D0			
415	450	25	27	32	448	15	FU1831D0			
420	455	25	27	32	453	15	FU1833D0			
425	460	25	27	32	458	15	FU2223D0			
430	460	22	24	29	458	15	FU1977D0			
430	465	25	27	32	463	15	FU2013D0			
431	457.2	18	20	25	455	15	FU1839D1			
435	470	25	27	32	468	15	FU1841D0			
440	470	19	21	26	468	15	FU1842D0			
440	475	28	30	35	473	15	FU1976D0			
445	480	25	27	32	478	15	FU2428D0			
450	485	25	27	32	483	15	FU1845D0			
456	490	30	32	37	488	15	FU1847D1			
460	495	25	27	32	493	15	FU1849D0			
465	500	26.5	28.5	33.5	498	15	FU2648D0			
470	505	25	27	32	503	15	FU1851D0			
475	510	25	27	32	508	15	FU1854D0			
480	515	25	27	32	513	15	FU2025D0			
490	530	25	27	32	528	15	FU1855D0			
500	535	25	27	32	533	20	FU1856D0			
500	540	25	27	32	538	20	FU1857D0			
507	547	28	30	35	545	20	FU1858D0			
525	565	28	30	35	563	20	FU2743D0			
530	570	25	27	32	568	20	FU2718D0			
540	575	23	25	30	573	20	FU2376D0			
560	600	28	30	35	598	20	FU1865D0			
595	640	28	30	35	638	20	FU1986D0			
600	650	32	34	39	648	20	FU2017D0			
650	690	25	27	32	688	20	FU2003D0			
660	700	32	34	39	698	20	FU1870D0			
680	720	32	34	39	718	20	FU1871D0			
695	745	32	34	39	743	20	FU2398D0			
700	750	35	37	42	748	20	FU1874D0			
755	800	32	34	39	798	20	FU1876D0			
800	830	20	22	27	828	20	FU1978D0			
800	850	35	37	42	848	20	FU1881D0			
850	900	35	37	42	898	20	FU2219D0			
870	900	20	22	27	898	20	FU1979D0			
920	970	35	37	42	968	20	FU1888D1			
1050	1100	30	32	37	1098	20	FU2391D0			
1096	1146	30	32	37	1144	20	FU2558D0			
1150	1200	30	32	37	1198	20	FU2229D0			

Remark 1) When using packings on this large size, please consult NOK.
 Remark 2) When placing orders for backup ring on this large size (the inner diameter(d) exceeding classification 300mm), please consult NOK.

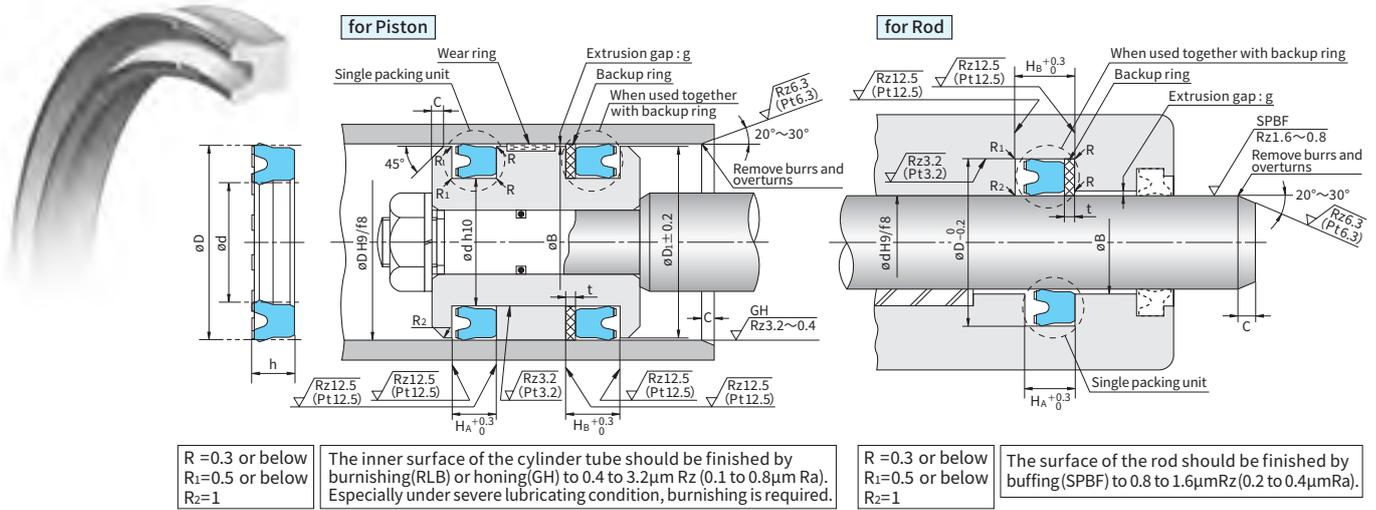
Packings for Both Piston and Rod Seals (Installed with internal groove)

USI type

Material	NOK sign
Iron rubber (PUR)	U593

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU0064S0**
 Type: USI, Inner diameter: 10, Outer diameter: 18, Height: 5
 Orders for backup rings used in combination with packing
 NOK part number: **GN5418V0**
 Type: BRT2, Inner diameter: 10, Outer diameter: 18, Thickness: 2

● Please check the application range on pages 10 and 11 before selecting the type.



● The roughness is JIS B 0601 : 2001. When regulation length cannot be kept, apply Pt.

How to determine B dimension

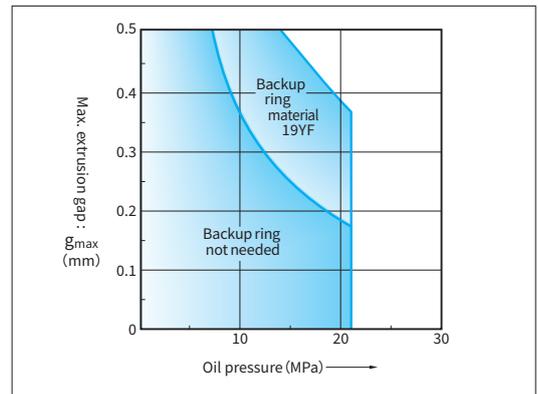
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension (in case of piston seals) or larger B dimension (in case of rod seals) because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa
Material of backup ring	19YF	
For rod	$B \leq \phi d + 1.0$	$B \leq \phi d + 0.5$
For piston	$B \leq \phi D - 1.0$	$B \leq \phi D - 0.5$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston or rod.



Nominal size of packing, and housing dimensions							Backup ring Thickness t	Packing part number	Combination backup ring part number	
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	φD ₁	C			BRT2 (Biascut)	19YF
10	18	5	5.7	7.7	17	2	2	● FU0064S0	GN5418V0	
12	20	5	5.7	7.7	19	2	2	● FU2464S0	GN5723V0	
12.5	20	5	5.7	7.7	19	2	2	● FU2465S0	GN5724V0	
14	22	5	5.7	7.7	21	2	2	○ FU0116S0	GN5719V0	
16	24	5	5.7	7.7	23	2	2	○ FU0150S0	GN5720V0	
17	25	5	5.7	7.7	24	2	2	○ FU2466S0	GN5725V0	
18	26	5	5.7	7.7	25	2	2	○ FU0180S0	GN4778V0	
20	28	5	5.7	7.7	27	2	2	○ FU0212S0	GN4780V0	
20	30	6	7	9	29	2	2	○ FU0214S0	GN4781V0	
22	30	5	5.7	7.7	29	2	2	○ FU2467S0	GN5726V0	
22.4	30	5	5.7	7.7	29	2	2	○ FU0260S0	GN4784V0	
23.5	31.5	5	5.7	7.7	30.5	2	2	○ FU0267S0	GN4786V0	
24	32	5	5.7	7.7	31	2	2	○ FU2468S0	GN5727V0	
25	33	5	5.7	7.7	32	2.5	2	○ FU0276S0	GN5019V1	
25	35	6	7	9	34	2.5	2	○ FU0279S0	GN4787V0	
26	34	5	5.7	8.7	33	2.5	3	○ FU2469S0	GN5728V0	
27	35	5	5.7	8.7	34	2.5	3	FU2470S0	GN5707V0	
28	35.5	5	5.7	8.7	34.5	2.5	3	FU0320S0	GN4791V0	
28	36	5	5.7	8.7	35	2.5	3	FU0321S0	GN5715V0	
30	38	5	5.7	8.7	37	2.5	3	FU0355S0	GN5729V0	
30	40	6	7	10	39	2.5	3	FU0357S0	GN4794V0	
31.5	41.5	6	7	10	40.5	2.5	3	FU0382S0	GN4796V0	
32	42	6	7	10	41	2.5	3	FU2055S0	GN5730V0	
33	43	6	7	10	42	2.5	3	FU2471S0	GN5731V0	

Remark) When using packings with mark ● as rod packing, provide separate grooves.
 When using packings with marks ●○ as piston packing, provide separate grooves.

Packings for Both Piston and Rod Seals (Installed with internal groove)

USI type

Material	NOK sign
Iron rubber (PUR)	U593

● Please check the application range on pages 10 and 11 before selecting the type.

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **FU2263S0**
 Type: USI, Inner diameter: 34, Outer diameter: 44, Height: 6
 Orders for backup rings used in combination with packing
 NOK part number: **GN5732V0**
 Type: BRT2, Inner diameter: 34, Outer diameter: 44, Thickness: 3

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Nominal size of packing, and housing dimensions							Backup ring Thickness t	Packing part number	Combination backup ring part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C			BRT2 (Biascut) 19YF
34	44	6	7	10	43	2.5	3	FU2263S0	GN5732V0
35	45	6	7	10	44	2.5	3	FU0424S0	GN4799V0
35.5	45	6	7	10	44	2.5	3	FU0451S0	GN4801V0
35.5	45.5	6	7	10	44.5	2.5	3	FU0452S0	GN5716V0
36	46	6	7	10	45	2.5	3	FU2472S0	GN5733V0
38	48	6	7	10	47	2.5	3	FU2240S0	GN5365V0
40	50	6	7	10	49	2.5	3	FU0497S0	GN4050V0
45	55	6	7	10	54	2.5	3	FU0567S0	GN4804V0
45	56	7	8	11	55	2.5	3	FU0572S0	GN4805V0
46	56	6	7	10	55	2.5	3	FU2662S0	GN5709V0
50	60	6	7	10	59	2.5	3	FU0619S0	GN4335V0
53	63	6	7	10	62	2.5	3	FU0679S0	GN4693V0
55	65	6	7	10	64	2.5	3	FU0694S0	GN4810V0
56	66	6	7	10	65	2.5	3	FU0722S0	GN4766V0
58	68	6	7	10	67	2.5	3	FU2473S0	GN5641V0
60	70	6	7	10	69	2.5	3	FU0746S0	GN4676V0
60	71	7	8	11	70	2.5	3	FU0750S0	GN4812V0
61	71	6	7	10	70	2.5	3	FU2474S0	GN4629V0
63	73	6	7	10	72	2.5	3	FU0786S0	GN4814V0
65	75	6	7	10	74	2.5	3	FU0809S0	GN4816V0
67	77	6	7	10	76	2.5	3	FU0828S0	GN4697V0
70	80	6	7	10	79	2.5	3	FU0849S0	GN4651V0
71	80	6	7	10	79	2.5	3	FU0879S0	GN4818V0
75	85	6	7	10	84	2.5	3	FU0901S0	GN4692V0
80	90	6	7	10	89	2.5	3	FU0939S0	GN4820V0
80	95	9	10	13	94	4	3	FU0942S0	GN5023V0
85	95	6	7	10	94	4	3	FU2475S0	GN4757V0
85	100	9	10	13	99	4	3	FU0984S0	GN4687V0
86	100	8.5	9.5	12.5	99	4	3	FU2476S0	GN4982V1
89	104	9	10	13	103	4	3	FU2372S0	GN5734V0
90	100	6	7	10	99	4	3	FU1021S0	GN5735V0
90	105	9	10	13	104	4	3	FU1024S0	GN4698V0
95	110	9	10	13	109	4	3	FU1051S0	GN4822V0
96	111	9	10	13	110	4	3	FU2477S0	GN5736V0
98	112	8.5	9.5	12.5	111	4	3	FU1067S0	GN4824V0
100	115	9	10	13	113	4	3	FU1082S0	GN4512V0
105	120	9	10	13	118	4	3	FU1125S0	GN5198V0
106	120	8.5	9.5	12.5	118	4	3	FU1135S0	GN4826V0
110	125	9	10	13	123	4	3	FU1157S0	GN4480V0
112	125	9	10	13	123	4	3	FU1179S0	GN4827V0
115	130	9	10	13	128	4	3	FU1195S0	GN4593V0
118	132	8.5	9.5	12.5	130	4	3	FU1204S0	GN5414V0
125	140	9	10	13	138	4	3	FU1252S0	GN4481V0
132	145	8.5	9.5	12.5	143	4	3	FU1291S0	GN5737V0
136	150	8.5	9.5	12.5	148	4	3	FU1306S0	GN4830V0
145	160	9	10	13	158	4	3	FU1343S0	GN4551V0

USI for Both Piston and Rod

Packings for Both Piston and Rod Seals

UPH_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

● Please check the application range on pages 10 and 11 before selecting the type.

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **CU2196D0**
 Type: UPH, Inner diameter: 18, Outer diameter: 33, Height: 10
 Orders for backup rings used in combination with packing
 NOK part number: **GN7354V0**
 Type: BRT3, Inner diameter: 18, Outer diameter: 33, Thickness: 2

Nominal size of packing, and housing dimensions							Backup ring Thickness t	Standard (A505)		Heat resistant (F357)		Combination backup ring part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C		Packing part number	Nominal number	Packing part number	Nominal number	BRT3 (Endless) 19YF
18	33	10	11	13	32	3.5	2	CU2196D0	UPH-18B			GN7354V0
18.5	31.5	10	11	13	30.5	3.5	2	CU3313D0	UPH-18.5	CU3313D1	UPH-18.5F	GN7240V0
20	30	8	9	11	29	3.5	2	CU0215D1	UPH-20A	CU0215D2	UPH-20AF	GN0762V0
20	33	10	11	13	32	3.5	2	CU0221D0	UPH-20			GN6448V0
20	35	10	11	13	34	3.5	2	CU0224D0	UPH-20B			GN7289V0
21.5	31.5	8	9	11	30.5	3.5	2	CU0239D0	UPH-21.5			GN0767V0
22	35	10	11	13	34	3.5	2	CU0249D0	UPH-22			GN6449V0
22.4	32.4	8	9	11	31.4	3.5	2	CU0263D0	UPH-22.4A	CU0263D3	UPH-22.4AF	GN0771V0
22.4	35.4	10	11	13	34.4	3.5	2	CU0265D1	UPH-22.4			GN6017V0
25	35	8	9	11	34	3.5	2	CU0282D2	UPH-25A	CU0282D3	UPH-25AF	GN0781V0
25	38	10	11	13	37	3.5	2	CU0288D0	UPH-25			GN6453V0
25	40	10	11	13	39	3.5	2	CU0292D0	UPH-25B	CU0292D4	UPH-25BF	GN6591V0
25	45	12	13	15	44	3.5	2	CU0301D0	UPH-25C			GN7291V0
25.5	35.5	8	9	11	34.5	3.5	2	CU0309D0	UPH-25.5			GN6454V0
27	40	10	11	14	39	3.5	3	CU2347D0	UPH-27			GN6455V0
28	40	10	11	14	39	3.5	3	CU0330D2	UPH-28A	CU0330D6	UPH-28AF	GN6457V0
28	41	10	11	14	40	3.5	3	CU0335D0	UPH-28			GN6458V0
28	43	10	11	14	42	3.5	3	CU0340D0	UPH-28B			GN0791V0
30	43	10	11	14	42	3.5	3	CU0364D0	UPH-30	CU0364D2	UPH-30F	GN6459V0
30	45	10	11	14	44	3.5	3	CU0368D2	UPH-30A	CU0368D8	UPH-30AF	GN7061V0
31.5	44.5	10	11	14	43.5	3.5	3	CU0385D0	UPH-31.5			GN6461V0
31.5	46.5	10	11	14	45.5	3.5	3	CU0387D1	UPH-31.5A			GN0805V0
32	45	10	11	14	44	3.5	3	CU2451D0	UPH-32			GN7242V0
32	46	10	11	14	45	3.5	3	CU0403D0	UPH-32A			GN6035V0
32	48	10	11	14	47	3.5	3	CU0404D0	UPH-32B			GN7356V0
34	50	12	13	16	49	3.5	3	CU0408D0	UPH-34			GN6462V0
35	50	10	11	14	49	4	3	CU0437D4	UPH-35B	CU0437D5	UPH-35BF	GN0816V0
35	50	12	13	16	49	4	3	CU0438D0	UPH-35			GN0816V0
35	51	12	13	16	50	4	3	CU0441D0	UPH-35A			GN7006V0
35.5	50.5	10	11	14	49.5	4	3	CU0456D2	UPH-35.5A	CU0456D6	UPH-35.5AF	GN0820V0
35.5	51.5	12	13	16	50.5	4	3	CU0458D0	UPH-35.5	CU0458D2	UPH-35.5F	GN6330V0
38	52	10	11	14	51	4	3	CU0470D1	UPH-38			GN6046V0
40	55	10	11	14	54	4	3	CU0505D3	UPH-40A	CU0505D2	UPH-40AF	GN6759V0
40	56	10	11	14	55	4	3	CU0508D0	UPH-40B			GN6466V0
40	56	12	13	16	55	4	3	CU0509D0	UPH-40			GN6466V0
40	60	12	13	16	59	4	3	CU0514D0	UPH-40C			GN7293V0
41	56	10	11	14	55	4	3	CU0523D0	UPH-41			GN0835V0
45	60	10	11	14	59	4	3	CU0577D5	UPH-45A	CU0577D9	UPH-45AF	GN0845V0
45	60	12	13	16	59	4	3	CU0578D0	UPH-45B			GN0845V0
45	61	12	13	16	60	4	3	CU0580D0	UPH-45	CU0580D3	UPH-45F	GN6469V0
47	63	12	13	16	62	4	3	CU0591D0	UPH-47			GN6471V0
48	63	10	11	14	62	4	3	CU0601D1	UPH-48	CU0601D4	UPH-48F	GN0853V0
50	65	10	11	14	64	4	3	CU0631D2	UPH-50A	CU0631D7	UPH-50AF	GN6439V0
50	66	12	13	16	65	4	3	CU0635D0	UPH-50	CU0635D3	UPH-50F	GN6329V0
50	70	12	13	16	69	4	3	CU0639D3	UPH-50B	CU0639D4	UPH-50BF	GN6592V0
51	71	12	13	16	70	4	3	CU0669D0	UPH-51			GN0862V0
53	69	12	13	16	68	4	3	CU3317D0	UPH-53			GN7008V0
53	73	12	13	16	72	4	3	CU0683D0	UPH-53A			GN0869V0
55	71	12	13	16	70	4	3	CU0704D1	UPH-55			GN6473V0
55	75	12	13	16	74	4	3	CU0708D2	UPH-55A	CU0708D6	UPH-55AF	GN7249V0
55	80	15	16	19	79	4	3	CU0712D0	UPH-55B			GN6072V0
56	72	12	13	16	71	4	3	CU0727D0	UPH-56	CU0727D2	UPH-56F	GN7009V0
56	76	12	13	16	75	4	3	CU0728D1	UPH-56A	CU0728D4	UPH-56AF	GN0877V0
60	76	12	13	16	75	4	3	CU0757D1	UPH-60			GN6476V0
60	80	12	13	16	79	4	3	CU0761D1	UPH-60A	CU0761D6	UPH-60AF	GN0886V1
63	79	12	13	16	78	4	3	CU0791D0	UPH-63			GN7010V0

Remark) In some products the part number and the one stamped on the product might be different.

Packings for Both Piston and Rod Seals

UPH_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **CU0793D1**
 Type: UPH, Inner diameter: 63, Outer diameter: 83, Height: 12
 Orders for backup rings used in combination with packing
 NOK part number: **GN0893V1**
 Type: BRT3, Inner diameter: 63, Outer diameter: 83, Thickness: 3

● Please check the application range on pages 10 and 11 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring Thickness t	Standard (A505)		Heat resistant (F357)		Combination backup ring part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C		Packing part number	Nominal number	Packing part number	Nominal number	BRT3 (Endless) 19YF
63	83	12	13	16	82	4	3	CU0793D1	UPH-63A	CU0793D3	UPH-63AF	GN0893V1
64	80	12	13	16	79	4	3	CU2123D1	UPH-64	CU2123D2	UPH-64F	GN6478V0
65	81	12	13	16	80	5	3	CU3318D0	UPH-65			GN7011V0
65	85	12	13	16	84	5	3	CU0819D1	UPH-65A	CU0819D2	UPH-65AF	GN0899V0
67	87	12	13	16	86	5	3	CU0831D0	UPH-67A	CU0831D3	UPH-67AF	GN0904V0
67	87	15	16	19	86	5	3	CU3319D0	UPH-67			GN0904V0
70	90	12	13	16	89	5	3	CU0862D1	UPH-70A	CU0862D4	UPH-70AF	GN0910V0
70	90	15	16	19	89	5	3	CU0864D0	UPH-70	CU0864D2	UPH-70F	GN0910V0
71	91	12	13	16	90	5	3	CU0884D1	UPH-71A	CU0884D3	UPH-71AF	GN0914V0
71	91	15	16	19	90	5	3	CU0885D0	UPH-71			GN0914V0
75	95	12	13	16	94	5	3	CU0910D1	UPH-75A			GN0920V0
75	95	15	16	19	94	5	3	CU0911D1	UPH-75	CU0911D2	UPH-75F	GN0920V0
80	100	12	13	16	99	5	3	CU0948D1	UPH-80A	CU0948D9	UPH-80AF	GN0927V0
80	100	15	16	19	99	5	3	CU0949D2	UPH-80	CU0949D3	UPH-80F	GN0927V0
85	105	12	13	16	104	5	3	CU0989D1	UPH-85A	CU0989D3	UPH-85AF	GN0932V0
85	105	15	16	19	104	5	3	CU0990D0	UPH-85			GN0932V0
90	110	12	13	16	109	5	3	CU1030D3	UPH-90A	CU1030D7	UPH-90AF	GN0939V0
90	110	15	16	19	109	5	3	CU1031D0	UPH-90	CU1031D3	UPH-90F	GN0939V0
92	112	12	13	16	111	5	3	CU1042D1	UPH-92A			GN0940V0
92	112	15	16	19	111	5	3	CU2132D1	UPH-92	CU2132D2	UPH-92F	GN0940V0
95	115	12	13	16	114	5	3	CU1056D0	UPH-95A	CU1056D4	UPH-95AF	GN0945V0
95	115	15	16	19	114	5	3	CU1057D1	UPH-95	CU1057D3	UPH-95F	GN0945V0
95	120	15	16	19	118	5	3	CU1061D0	UPH-95B			GN6716V0
100	120	12	13	16	118	5	3	CU1089D3	UPH-100A	CU1089D7	UPH-100AF	GN0952V0
100	120	15	16	19	118	5	3	CU1091D0	UPH-100	CU1091D3	UPH-100F	GN0952V0
100	125	15	16	19	123	5	3	CU1096D0	UPH-100B	CU1096D3	UPH-100BF	GN7297V0
105	125	15	16	19	123	5	3	CU1129D2	UPH-105	CU1129D4	UPH-105F	GN0959V0
106	126	15	16	19	124	5	3	CU1138D0	UPH-106			GN0961V0
110	130	15	16	19	128	5	3	CU1165D1	UPH-110	CU1165D4	UPH-110F	GN6790V0
112	132	15	16	19	130	5	3	CU1182D0	UPH-112	CU1182D3	UPH-112F	GN0970V0
115	135	15	16	19	133	5	3	CU1198D0	UPH-115			GN0974V0
118	138	15	16	19	136	5	3	CU1207D0	UPH-118	CU1207D2	UPH-118F	GN0978V0
120	140	15	16	19	138	5	3	CU1224D2	UPH-120	CU1224D1	UPH-120F	GN0982V0
125	145	15	16	19	143	6.5	3	CU1257D0	UPH-125A			GN0986V0
125	150	19	20	23	148	6.5	3	CU1933D0	UPH-125	CU1933D2	UPH-125F	GN6135V0
130	150	15	16	19	148	6.5	3	CU1284D2	UPH-130A	CU1284D4	UPH-130AF	GN6925V0
130	155	19	20	23	153	6.5	3	CU3320D0	UPH-130			GN7012V0
132	152	15	16	19	150	6.5	3	CU1292D0	UPH-132A			GN0994V0
132	157	19	20	23	155	6.5	3	CU2703D1	UPH-132	CU2703D2	UPH-132F	GN7013V0
135	155	15	16	19	153	6.5	3	CU1305D0	UPH-135B			GN0998V0
135	160	15.7	17	20	158	6.5	3	CU3322D0	UPH-135A			GN6492V0
135	160	19	20	23	158	6.5	3	CU1960D0	UPH-135			GN6492V0
140	160	15	16	19	158	6.5	3	CU1327D1	UPH-140A	CU1327D4	UPH-140AF	GN1002V0
140	165	19	20	23	163	6.5	3	CU1332D2	UPH-140			GN6494V0
145	165	15	16	19	163	6.5	3	CU1344D0	UPH-145A			GN1007V0
145	170	19	20	23	168	6.5	3	CU2348D0	UPH-145	CU2348D1	UPH-145F	GN6496V0
150	170	15	16	19	168	6.5	3	CU1363D2	UPH-150A	CU1363D3	UPH-150AF	GN1011V0
150	175	19	20	23	173	6.5	3	CU1367D0	UPH-150			GN7014V0
155	180	15	16	20	178	6.5	4	CU1391D2	UPH-155B	CU1391D4	UPH-155BF	GN1016V0
155	180	15.7	17	21	178	6.5	4	CU3323D0	UPH-155A			GN1016V0
155	180	19	20	24	178	6.5	4	CU1393D0	UPH-155			GN1016V0
160	185	15	16	20	183	6.5	4	CU1413D0	UPH-160A	CU1413D3	UPH-160AF	GN1020V0
160	185	19	20	24	183	6.5	4	CU2349D0	UPH-160			GN1020V0
165	190	15	16	20	188	6.5	4	CU1431D0	UPH-165A			GN1023V0
165	190	19	20	24	188	6.5	4	CU3324D0	UPH-165			GN1023V0
170	195	15	16	20	193	6.5	4	CU1448D1	UPH-170A	CU1448D3	UPH-170AF	GN1027V0

Remark) In some products the part number and the one stamped on the product might be different.

Packings for Both Piston and Rod Seals

UPH_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **CU3325D0**
 Type: UPH, Inner diameter: 170, Outer diameter: 195, Height: 19
 Orders for backup rings used in combination with packing
 NOK part number: **GN1027V0**
 Type: BRT3, Inner diameter: 170, Outer diameter: 195, Thickness: 4

● Please check the application range on pages 10 and 11 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring Thickness t	Standard (A505)		Heat resistant (F357)		Combination backup ring part number BRT3 (Endless) 19YF
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C		Packing part number	Nominal number	Packing part number	Nominal number	
170	195	19	20	24	193	6.5	4	CU3325D0	UPH-170			GN1027V0
175	200	15	16	20	198	6.5	4	CU1461D2	UPH-175B	CU1461D3	UPH-175BF	GN1031V0
175	200	15.7	17	21	198	6.5	4	CU3326D0	UPH-175A			GN1031V0
175	200	19	20	24	198	6.5	4	CU1463D1	UPH-175			GN1031V0
180	205	15	16	20	203	6.5	4	CU1490D0	UPH-180A			GN1035V0
180	205	19	20	24	203	6.5	4	CU1492D0	UPH-180			GN1035V0
185	210	15	16	20	208	6.5	4	CU1504D0	UPH-185			GN1039V0
190	215	15	16	20	213	6.5	4	CU1519D0	UPH-190A	CU1519D2	UPH-190AF	GN1042V0
190	215	19	20	24	213	6.5	4	CU3327D0	UPH-190			GN1042V0
199	224	15	16	20	222	6.5	4	CU1532D0	UPH-199B			GN1047V0
199	224	15.7	17	21	222	6.5	4	CU3329D0	UPH-199A			GN1047V0
199	224	19	20	24	222	6.5	4	CU1535D0	UPH-199			GN1047V0
200	225	15	16	20	223	6.5	4	CU1547D0	UPH-200A	CU1547D4	UPH-200AF	GN1050V0
200	225	19	20	24	223	6.5	4	CU2350D0	UPH-200			GN1050V0
210	235	18	19	23	233	6.5	4	CU1579D0	UPH-210			GN1057V0
212	237	19	20	24	235	6.5	4	CU1585D0	UPH-212			GN1058V0
215	240	19	20	24	238	6.5	4	CU3331D0	UPH-215			GN7256V0
224	249	19	20	24	247	6.5	4	CU2926D0	UPH-224	CU2926D1	UPH-224F	GN7282V0
225	250	18	19	23	248	6.5	4	CU1625D0	UPH-225A			GN1065V0
225	250	19	20	24	248	6.5	4	CU1626D0	UPH-225	CU1626D1	UPH-225F	GN1065V0
236	261	19	20	24	259	6.5	4	CU1649D1	UPH-236			GN6191V0
250	275	19	20	24	273	6.5	4	CU1683D1	UPH-250			GN1078V0
255	280	19	20	24	278	8	4	CU1694D0	UPH-255	CU1694D3	UPH-255F	GN6513V0
265	297	24	26	30	295	8	4	CU1714D0	UPH-265			GN6515V0
270	300	18	19	23	298	8	4	CU1722D0	UPH-270A			GN1089V0
270	300	24	26	30	298	8	4	CU1725D0	UPH-270	CU1725D1	UPH-270F	GN1089V0
280	310	22	24	28	308	8	4	CU2774D0	UPH-280A			GN1093V0
280	312	24	26	30	310	8	4	CU2166D0	UPH-280	CU2166D1	UPH-280F	GN6519V0
283	315	24	26	30	313	8	4	CU1918D0	UPH-283			GN7358V0
290	320	18	19	23	318	8	4	CU1750D0	UPH-290A			GN1098V0
290	320	22	24	28	318	8	4	CU1752D0	UPH-290			GN1098V0
300	332	24	26	30	330	8	4	CU2351D0	UPH-300			GN6522V0

[Large size dimension table] ● When using packings on this large size, please consult NOK.

310	340	18	19	23	338	10		CU1772D0	UPH-310A			
310	340	22	24	28	338	10		CU1773D0	UPH-310	CU1773D2	UPH-310F	
315	347	24	26	30	345	10		CU3064D0	UPH-315			
320	340	12	13	17	338	10		CU2101D0	UPH-320A			
320	350	22	24	28	348	10		CU1780D0	UPH-320			
323	355	24	26	30	353	10		CU1784D0	UPH-323			
330	355	16	17	21	353	10		CU1786D0	UPH-330A			
330	356	20	22	26	354	10		CU1787D0	UPH-330B			
330	360	22	24	28	358	10		CU1789D0	UPH-330			
335	355	14	15	19	353	10		CU1793D1	UPH-335A			
335	367	24	26	30	365	10		CU2197D0	UPH-335			
340	370	22	24	28	368	10		CU1795D0	UPH-340			
345	365	14	15	19	363	10		CU2243D0	UPH-345			
348	380	24	26	30	378	10		CU2087D1	UPH-348			
350	370	14	15	19	368	10		CU2302D0	UPH-350A			
350	380	22	24	28	378	10		CU1799D2	UPH-350			
355	385	22	24	28	383	10		CU1801D0	UPH-355A			
355	387	24	26	30	385	10		CU1916D0	UPH-355			
360	390	22	24	28	388	10		CU1803D0	UPH-360	CU1803D2	UPH-360F	

Remark 1) In addition to the standard material A505, A104 (rubber hardness 80°) and A606 (rubber hardness 80°) are also used for large diameter dimensions.
 Remark 2) When placing orders for backup ring on this large size (the inner diameter (d) exceeding classification 300mm), please consult NOK.
 Remark 3) In some products the part number and the one stamped on the product might be different.

Packings for Both Piston and Rod Seals

[Large size dimension table]

UPH_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number: **CU1805D0**
 Type: UPH, Inner diameter: 365, Outer diameter: 395, Height: 22

● Please check the application range on pages 10 and 11 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring thickness t	Standard (A505)		Heat resistant (F357)		Combination backup ring part number BRT3 (Endless) 19YF
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C		Packing part number	Nominal number	Packing part number	Nominal number	
365	395	22	24	28	393	10		CU1805D0	UPH-365			
368	400	24	26	30	398	10		CU1807D0	UPH-368	CU1807D1	UPH-368F	
370	400	23	25	29	398	10		CU1810D0	UPH-370A			
370	400	25	27	31	398	10		CU1811D0	UPH-370			
371	396	16	17	21	394	10		CU2303D0	UPH-371			
375	407	24	26	30	405	10		CU3357D0	UPH-375			
380	400	15	16	20	398	10		CU1813D0	UPH-380A			
380	410	15	16	20	408	10		CU1815D0	UPH-380B			
380	420	30	32	36	418	10		CU2162D0	UPH-380			
390	420	22	24	28	418	10		CU1818D0	UPH-390			
395	425	22	24	28	423	10		CU1819D0	UPH-395			
400	430	22	24	28	428	10		CU1823D0	UPH-400A			
400	430	25	27	31	428	10		CU2007D0	UPH-400B			
400	432	24	26	30	430	10		CU3358D0	UPH-400			
420	455	25	27	32	453	10		CU1833D0	UPH-420			
425	457	24	26	31	455	10		CU1917D0	UPH-425			
430	470	20	22	27	468	10		CU1837D0	UPH-430			
435	470	25	27	32	468	10		CU1841D0	UPH-435			
440	480	35	37	42	478	10		CU1843D0	UPH-440			
445	470	18	19	24	468	10		CU2244D0	UPH-445			
450	480	22	24	29	478	10		CU1844D0	UPH-450A			
450	482	24	26	31	480	10		CU3359D0	UPH-450			
460	500	20	22	27	498	10		CU1850D0	UPH-460			
475	507	24	26	31	505	10		CU1853D0	UPH-475			
480	505	18	19	24	503	10		CU2245D0	UPH-480A			
490	530	25	27	32	528	10		CU1855D0	UPH-490			
520	550	17	18	23	548	10		CU2189D0	UPH-520A			
525	555	15	16	21	553	10		CU1860D0	UPH-525			
530	570	20	22	27	568	10		CU2084D0	UPH-530A			
540	560	14	15	20	558	10		CU2037D0	UPH-540			
570	600	17	18	23	598	10		CU2190D0	UPH-570A			
600	630	20	22	27	628	10		CU2160D0	UPH-600A			
600	630	28	30	35	628	10		CU2036D0	UPH-600B			
600	640	30	32	37	638	10		CU1868D0	UPH-600			
640	685	25	27	32	683	12		CU2284D0	UPH-640			
700	730	15	16	21	728	12		CU1873D0	UPH-700A			
760	800	34	36	41	798	12		CU1877D0	UPH-760			
768	800	30	32	37	798	12		CU1878D0	UPH-768			
818	850	24	26	31	848	12		CU1882D1	UPH-818			
825	850	15.5	16.5	21.5	848	12		CU1883D0	UPH-825A			
825	860	27	29	34	858	12		CU2124D0	UPH-825			
925	950	14	15	20	948	12		CU2325D0	UPH-925			
950	980	20	22	27	978	12		CU1892D0	UPH-950			
1020	1050	18	19	24	1048	12		CU1894D0	UPH-1020A			
1025	1055	15	16	21	1053	12		CU1895D0	UPH-1025			
1100	1140	20	22	27	1138	12		CU2192D0	UPH-1100			
1220	1280	30	32	37	1278	12		CU1899D0	UPH-1220			
1560	1600	20	22	27	1598	12		CU2191D0	UPH-1560			
1620	1680	30	32	37	1678	12		CU1904D0	UPH-1620			

Remark 1) When using packings on this large size, please consult NOK.
 Remark 2) In addition to the standard material A505, A104 (rubber hardness 80°) and A606 (rubber hardness 80°) are also used for large diameter dimensions.
 Remark 3) When placing orders for backup ring on this large size (the inner diameter (d) exceeding classification 300mm), please consult NOK.
 Remark 4) In some products the part number and the one stamped on the product might be different.

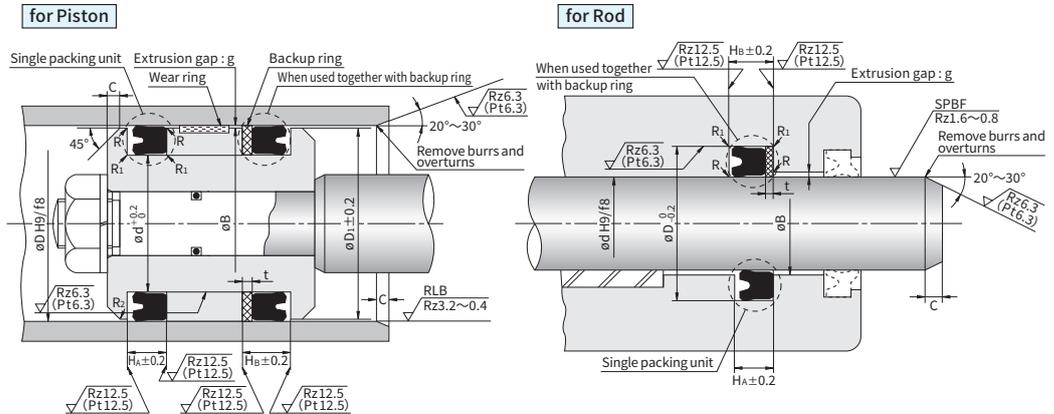
Packings for Both Piston and Rod Seals (Installed with internal groove)

USH_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number : **CU3248K0**
 Type:USH, Inner diameter:12, Outer diameter:20, Height:5
 Orders for backup rings used in combination with packing
 NOK part number : **GN5723V0**
 Type:BRT2, Inner diameter:12, Outer diameter:20, Thickness:2

● Please check the application range on pages 10 and 11 before selecting the type.



R = 0.3 or below
 R₁ = 0.5 or below
 R₂ = 1

The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

R = 0.3 or below
 R₁ = 0.5 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µm Rz (0.2 to 0.4µm Ra).

● The roughness is JIS B 0601 : 2001. When regulation length cannot be kept, apply Pt.

How to determine B dimension

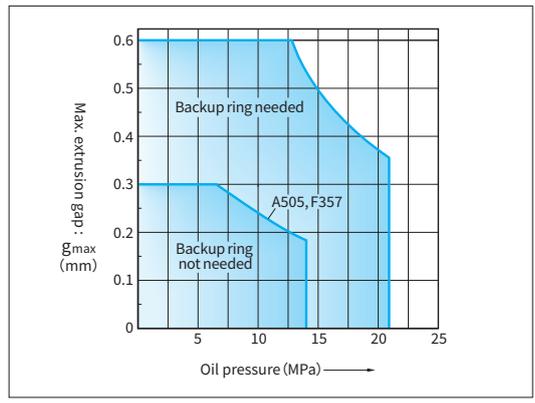
■ When using backup ring

Please determine B dimension according to the table below. If you require smaller B dimension (in case of piston seals) or larger B dimension (in case of rod seals) because of the cylinder configuration, please consult NOK.

Maximum service pressure	14MPa	21MPa	
Material of backup ring	19YF		
dimension	For rod	$B \leq \phi d + 1.0$	$B \leq \phi d + 0.5$
	For piston	$B \geq \phi D - 1.0$	$B \geq \phi D - 0.5$

■ When not using backup ring

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the piston or rod.



Nominal size of packing, and housing dimensions							Backup ring Thickness t	Standard (A505)		Heat resistant (F357)		Combination backup ring part number BRT2 (Biасcut) 19YF
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	φD ₁	C		Packing part number	Nominal number	Packing part number	Nominal number	
12	20	5	5.7	7.7	19	2	●CU3248K0	USH-12			GN5723V0	
14	22	5	5.7	7.7	21	2	●CU2692K0	USH-14			GN5719V0	
16	24	5	5.7	7.7	23	2	●CU2548K0	USH-16	●CU2548K2	USH-16F	GN5720V0	
18	26	5	5.7	7.7	25	2	CU0180K0	USH-18	CU0180K6	USH-18F	GN4778V0	
20	28	5	5.7	7.7	27	2	CU0212K0	USH-20	CU0212K4	USH-20F	GN4780V0	
22	30	5	5.7	7.7	29	2	CU3017K0	USH-22	CU3017K3	USH-22F	GN5726V0	
22.4	30	5	5.7	7.7	29	2	CU0260K0	USH-22.4	CU0260K3	USH-22.4F	GN4784V0	
23.5	31.5	5	5.7	7.7	30.5	2	CU0267K0	USH-23.5			GN4786V0	
24	32	5	5.7	7.7	31	2	CU2971K0	USH-24	CU2971K1	USH-24F	GN5727V0	
25	33	5	5.7	7.7	32	2.5	CU0276K0	USH-25	CU0276K3	USH-25F	GN5019V1	
27	35	5	5.7	8.7	34	2.5	CU3187K0	USH-27			GN5707V0	
28	35.5	5	5.7	8.7	34.5	2.5	CU0320K0	USH-28	CU0320K2	USH-28F	GN4791V0	
28	36	5	5.7	8.7	35	2.5	CU2536K0	USH-28A			GN5715V0	
30	40	6	7	10	39	2.5	CU0357K0	USH-30	CU0357K6	USH-30F	GN4794V0	
31.5	41.5	6	7	10	40.5	2.5	CU0382K0	USH-31.5	CU0382K1	USH-31.5F	GN4796V0	
32	42	6	7	10	41	2.5	CU2819K0	USH-32			GN5730V0	
35	45	6	7	10	44	2.5	CU0424K0	USH-35	CU0424K3	USH-35F	GN4799V0	
35.5	45	6	7	10	44	2.5	CU0451K0	USH-35.5	CU0451K1	USH-35.5F	GN4801V0	
35.5	45.5	6	7	10	44.5	2.5	CU3253K0	USH-35.5A			GN5716V0	
36	46	6	7	10	45	2.5	CU3040K1	USH-36			GN5733V0	
40	50	6	7	10	49	2.5	CU0497K0	USH-40	CU0497K3	USH-40F	GN4050V0	
45	55	6	7	10	54	2.5	CU0567K0	USH-45	CU0567K4	USH-45F	GN4804V0	
45	56	7	8	11	55	2.5	CU0572K0	USH-45A	CU0572K1	USH-45AF	GN4805V0	

Remark 1) When using the packing with ●, provide separate grooves.
 Remark 2) In some products the part number and the one stamped on the product might be different.

Packings for Both Piston and Rod Seals (Installed with internal groove)

USH^{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

■ Please designate NOK part number and type & size on your order.
Example Order for the packing as a single piece
 NOK part number : **CU0619K0**
 Type : USH, Inner diameter : 50, Outer diameter : 60, Height : 6
 Orders for backup rings used in combination with packing
 NOK part number : **GN4335V0**
 Type : BRT2, Inner diameter : 50, Outer diameter : 60, Thickness : 3

● Please check the application range on pages 10 and 11 before selecting the type.

Nominal size of packing, and housing dimensions							Backup ring Thickness t	Standard (A505)		Heat resistant (F357)		Combination backup ring part number BRT2 (Biascut) 19YF
d (Inner diameter)	D (Outer diameter)	h (Height)	H _A	H _B	øD ₁	C		Packing part number	Nominal number	Packing part number	Nominal number	
50	60	6	7	10	59	2.5	3	CU0619K0	USH-50	CU0619K4	USH-50F	GN4335V0
53	63	6	7	10	62	2.5	3	CU0679K0	USH-53	CU0679K4	USH-53F	GN4693V0
55	65	6	7	10	64	2.5	3	CU0694K0	USH-55			GN4810V0
56	66	6	7	10	65	2.5	3	CU0722K0	USH-56	CU0722K2	USH-56F	GN4766V0
58	68	6	7	10	67	2.5	3	CU3255K0	USH-58			GN5641V0
60	70	6	7	10	69	2.5	3	CU0746K0	USH-60	CU0746K3	USH-60F	GN4676V0
60	71	7	8	11	70	2.5	3	CU0750K0	USH-60A			GN4812V0
63	73	6	7	10	72	2.5	3	CU0786K0	USH-63	CU0786K2	USH-63F	GN4814V0
65	75	6	7	10	74	2.5	3	CU0809K0	USH-65	CU0809K2	USH-65F	GN4816V0
67	77	6	7	10	76	2.5	3	CU0828K0	USH-67	CU0828K1	USH-67F	GN4697V0
70	80	6	7	10	79	2.5	3	CU0849K0	USH-70	CU0849K4	USH-70F	GN4651V0
71	80	6	7	10	79	2.5	3	CU0879K0	USH-71	CU0879K1	USH-71F	GN4818V0
75	85	6	7	10	84	2.5	3	CU0901K0	USH-75			GN4692V0
80	90	6	7	10	89	2.5	3	CU0939K0	USH-80	CU0939K3	USH-80F	GN4820V0
85	95	6	7	10	94	4	3	CU1959K0	USH-85A			GN4757V0
85	100	9	10	13	98	4	3	CU0984K0	USH-85	CU0984K4	USH-85F	GN4687V0
90	100	6	7	10	99	4	3	CU1021K0	USH-90A			GN5735V0
90	105	9	10	13	103	4	3	CU1024K0	USH-90	CU1024K4	USH-90F	GN4698V0
95	110	9	10	13	108	4	3	CU1051K0	USH-95	CU1051K3	USH-95F	GN4822V0
98	112	8.5	9.5	12.5	110	4	3	CU1067K0	USH-98	CU1067K2	USH-98F	GN4824V0
100	115	9	10	13	113	4	3	CU1082K0	USH-100	CU1082K3	USH-100F	GN4512V0
106	120	8.5	9.5	12.5	118	4	3	CU1135K0	USH-106	CU1135K1	USH-106F	GN4826V0
110	125	9	10	13	123	4	3	CU1157K0	USH-110			GN4480V0
112	125	8.5	9.5	12.5	123	4	3	CU1178K0	USH-112	CU1178K1	USH-112F	GN4827V0
112	125	9	10	13	123	4	3	CU1179K0	USH-112A			GN4827V0
115	130	8.5	9.5	12.5	128	4	3	CU3259K0	USH-115			GN4593V0
118	132	8.5	9.5	12.5	130	4	3	CU1204K0	USH-118			GN5414V0
125	140	9	10	13	138	4	3	CU1252K0	USH-125	CU1252K2	USH-125F	GN4481V0
130	145	9	10	13	143	4	3	CU1280K0	USH-130			GN4628V1
132	145	8.5	9.5	12.5	143	4	3	CU1291K0	USH-132			GN5737V0
136	150	8.5	9.5	12.5	148	4	3	CU1306K0	USH-136	CU1306K3	USH-136F	GN4830V0
140	155	9	10	13	153	4	3	CU1323K0	USH-140	CU1323K1	USH-140F	GN4526V0
145	160	9	10	13	158	4	3	CU1343K0	USH-145	CU1343K2	USH-145F	GN4551V0
150	165	9	10	13	163	4	3	CU1359K0	USH-150	CU1359K1	USH-150F	GN4833V0
155	170	9	10	14	168	4	4	CU3261K0	USH-155			GN4834V0
160	175	9	10	14	173	4	4	CU1406K0	USH-160	CU1406K2	USH-160F	GN4835V0
165	180	9	10	14	178	4	4	CU1429K0	USH-165	CU1429K2	USH-165F	GN4836V0
170	185	9	10	14	183	4	4	CU3262K0	USH-170			GN5464V0
175	190	9	10	14	188	4	4	CU3038K0	USH-175			GN4839V0
180	200	12	13	17	198	5	4	CU1483K0	USH-180	CU1483K2	USH-180F	GN4470V0
190	210	12	13	17	208	5	4	CU2516K0	USH-190	CU2516K1	USH-190F	GN4841V0
195	215	12	13	17	213	5	4	CU3263K0	USH-195			GN5746V0
200	220	12	13	17	218	5	4	CU1543K0	USH-200	CU1543K1	USH-200F	GN4385V0
204	224	12	13	17	222	5	4	CU1563K0	USH-204	CU1563K1	USH-204F	GN4842V0
220	240	12	13	17	238	5	4	CU1596K0	USH-220			GN4444V0
224	244	12	13	17	242	5	4	CU1609K0	USH-224			GN5132V0
230	250	12	13	17	248	5	4	CU1637K0	USH-230	CU1637K1	USH-230F	GN4635V0
240	260	12	13	17	258	5	4	CU1657K0	USH-240			GN4845V0
250	270	12	13	17	268	5	4	CU1678K0	USH-250			GN4459V0
260	280	14	15	19	278	5	4	CU1702K0	USH-260	CU1702K1	USH-260F	GN5563V0
280	300	14	15	19	298	5	4	CU1962K0	USH-280			GN5459V0
295	315	14	15	19	313	5	4	CU1756K0	USH-295			GN5738V0
300	320	12	13	17	318	5	4	CU3267K0	USH-300			GN5581V0

Remark) In some products the part number and the one stamped on the product might be different.

Dust Seals for Reciprocal Movement

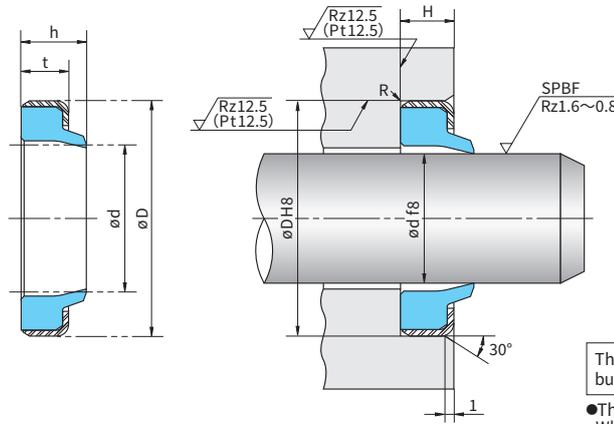
DKI type

5

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	U801 +

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD0064A0
 Type:DKI, Inner diameter:6.3, Outer diameter:16,
 Thickness:5, Height:7

● Please check the application range on pages 12 and 13 before selecting the type.



The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).
 ● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.5} _{-0.3}	
6.3	16	5	7	5	FD0064A0
7.1	17	5	7	5	FD0095A0
8	18	5	7	5	FD0142A0
9	19	5	7	5	FD0199A0
10	20	5	7	5	FD0258A0
11.2	21	5	7	5	FD0332A0
12.5	23	5	7	5	FD0412A0
14	24	5	7	5	FD0513A0
15	25	5	7	5	FD0586A0
16	26	5	7	5	FD0677A0
18	30	6	9	6	FD0815A0
20	32	6	9	6	FD0995A0
22.4	34.4	6	9	6	FD1203A0
25	37	6	9	6	FD1301A0
27	39	6	9	6	FD1503A0
28	40	6	9	6	FD1536A0
30	42	6	9	6	FD1664A0
31.5	44	7	10	7	FD1803A0
32	44	7	10	7	FD1870A0
35	47	7	10	7	FD2041A0
35.5	47.5	7	10	7	FD2149A0
38	50	7	10	7	FD2217A0
40	52	7	10	7	FD2342A0
45	57	7	10	7	FD2633A0
47	59	7	10	7	FD2729A0
50	62	7	10	7	FD2831A0
Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.6} _{-0.4}	
53	67	8	11	8	FD2985A0
55	69	8	11	8	FD3033A0
56	70	8	11	8	FD3089A0
60	74	8	11	8	FD3187A0
63	77	8	11	8	FD3313A0
64	78	8	11	8	FD3366A0
65	79	8	11	8	FD3381A0
67	81	8	11	8	FD3447A0
70	84	8	11	8	FD3493A0
71	85	8	11	8	FD3546A0
75	89	8	11	8	FD3596A0
80	94	8	11	8	FD3720A0
85	99	8	11	8	FD3828A0
90	104	8	11	8	FD3913A0

DKI Dust Seals

Dust Seals for Reciprocal Movement

DKI type

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	U801 +

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD3957A0
 Type:DKI, Inner diameter:92, Outer diameter:106,
 Thickness:8, Height:11

● Please check the application range on pages 12 and 13 before selecting the type.

Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.6} ^{+0.4}	
92	106	8	11	8	FD3957A0
95	109	8	11	8	FD3976A0
100	114	8	11	8	FD4046A0
105	121	9	12	9	FD4142A0
106	122	9	12	9	FD4168A0
108	125	9	12	9	FD4187E0
110	126	9	12	9	FD4196A0
112	128	9	12	9	FD4232A0
115	131	9	12	9	FD4272E0
118	134	9	12	9	FD4317A0
120	136	9	12	9	FD4326A0
125	141	9	12	9	FD4393A0
130	146	9	12	9	FD4438A0
132	148	9	12	9	FD4476A0
135	155	10	14	10	FD4492A0
140	160	10	14	10	FD4533A0
145	165	10	14	10	FD4578A0
150	170	10	14	10	FD4615A0
155	175	10	14	10	FD4663E0
160	180	10	14	10	FD4704A0
165	185	10	14	10	FD4733A0
170	190	10	14	10	FD4785A0
175	195	10	14	10	FD4839A0
Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.7} ^{+0.5}	
180	205	12	17	12	FD4890A0
185	210	12	17	12	FD4941E0
190	215	12	17	12	FD4969A0
200	225	12	17	12	FD5048A0
210	235	12	17	12	FD5129E0
212	237	12	17	12	FD5151A0
220	245	12	17	12	FD5200A0
224	249	12	17	12	FD5237A0
225	250	12	17	12	FD5245F0
230	255	12	17	12	FD5277A0
236	261	12	17	12	FD5326A0
240	265	12	17	12	FD5336A0
245	270	12	17	12	FD5379E0
250	275	12	17	12	FD5396A0
260	285	12	17	12	FD5451E0
265	290	12	17	12	FD5480A0
280	310	16	22	16	FD5556A0
290	320	16	22	16	FD5584E0
300	330	16	22	16	FD5622A0

Dust Seals for Reciprocal Movement

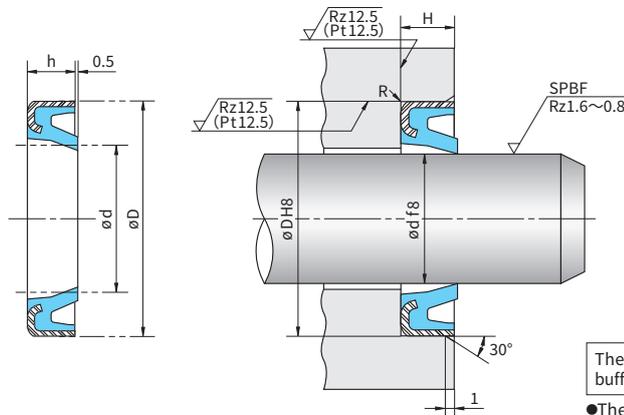
DWI type

5

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	U801 +

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD2342G0
 Type:DWI, Inner diameter:40, Outer diameter:52,
 Height:7

● Please check the application range on pages 12 and 13 before selecting the type.



R = 0.3 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions				NOK part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H ^{+0.5} / _{+0.3}	
40	52	7	7	FD2342G0
45	57	7	7	FD2633H0
50	62	7	7	FD2831F0
Nominal size of dust seal, and housing dimensions				NOK part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H ^{+0.6} / _{+0.4}	
55	69	8	8	FD3033F0
60	74	8	8	FD3187H0
61	74	8	8	FD6782E0
63	77	8	8	FD3313E0
65	79	8	8	FD338110
70	84	8	8	FD349310
75	89	8	8	FD3596F0
80	94	8	8	FD3720G0
85	99	8	8	FD3828H0
90	104	8	8	FD3913F0
95	109	8	8	FD3976L0
100	114	8	8	FD4046F0
105	121	9	9	FD414210
110	126	9	9	FD4196F0
120	136	9	9	FD4326F0
130	146	9	9	FD4438G0
140	160	10	10	FD4533G0

DWI Dust Seals

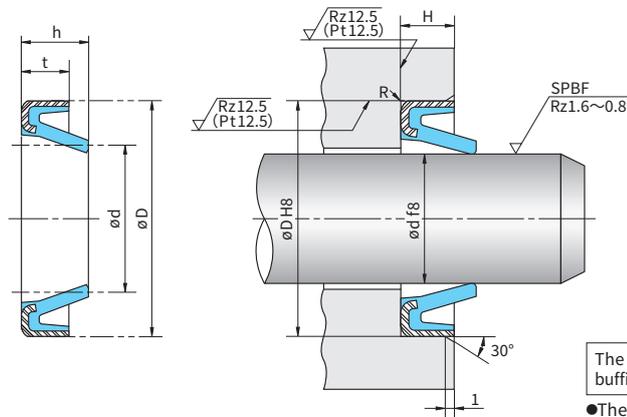
Dust Seals for Reciprocal Movement

DWIR_{type}

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	U801 +

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD1301G0
 Type: DWIR, Inner diameter: 25, Outer diameter: 37,
 Thickness: 6, Height: 6.9

● Please check the application range on pages 12 and 13 before selecting the type.



R = 0.3 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.5} _{-0.3}	
25	37	6	6.9	6	FD1301G0
30	42	6	6.9	6	FD1664I0
35	47	7	7.9	7	FD2041J0
40	52	7	10	7	FD2342H0
45	57	7	10	7	FD2633J0
Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.6} _{-0.4}	
55	69	8	11.3	8	FD3033I0
60	74	8	11.3	8	FD3187G0
65	79	8	11.3	8	FD3381G0
70	84	8	11.3	8	FD3493K0
75	89	8	11.3	8	FD3596I0
80	94	8	11.3	8	FD3720K0
85	99	8	11.3	8	FD3828M0
90	104	8	11.3	8	FD3913G0
95	109	8	11.3	8	FD3976K0
100	114	8	11.3	8	FD4046G0
105	121	9	12.3	9	FD4142H0
110	126	9	12.3	9	FD4196G0
120	136	9	12.3	9	FD4326G0
130	146	9	12.3	9	FD4438H0
140	160	10	13.3	10	FD4533H0

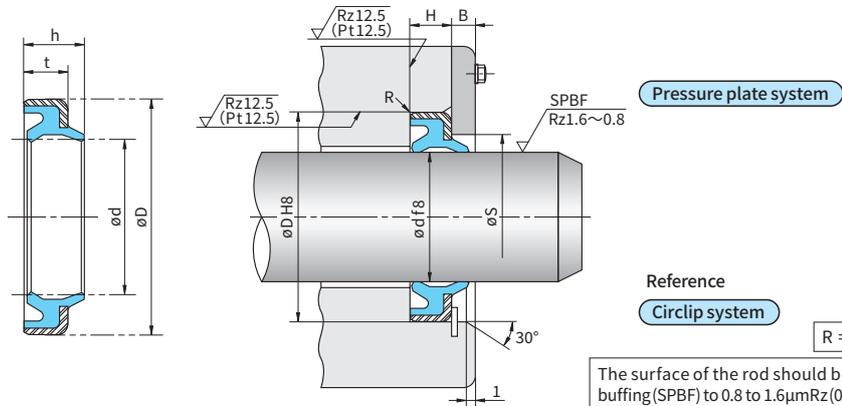
Dust Seals for Reciprocal Movement

DKBI_{type}

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	Standard : U801 Heat resistant type : U641 + -

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD0995F0
 Type: DKBI, Inner diameter: 20, Outer diameter: 32, Thickness: 6, Height: 9

● Please check the application range on pages 12 and 13 before selecting the type.



Reference
 Circlip system
 R = 0.3 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).
 ● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions							NOK part number	
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.5} _{+0.3}	øS	B	Standard (U801)	Heat resistant (U641)
20	32	6	9	6	27	4	FD0995F0	FD0995F4
25	37	6	9	6	32	4	FD1301E0	FD1301E3
30	42	6	9	6	37	4	FD1664E0	FD1664E3
32	44	7	10	7	39	4	FD1870E0	FD1870E3
35	47	7	10	7	42	4	FD2041E1	FD2041E4
40	52	7	10	7	47	4	FD2342F0	FD2342F3
45	57	7	10	7	52	4	FD2633G0	FD2633G3
50	62	7	10	7	57	4	FD2831E0	FD2831E3
Nominal size of dust seal, and housing dimensions							NOK part number	
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.6} _{+0.4}	øS	B	Standard (U801)	Heat resistant (U641)
55	69	8	11	8	62	4	FD3033E1	FD3033E5
60	74	8	11	8	67	4	FD3187E0	FD3187E3
65	79	8	11	8	72	4	FD3381E0	FD3381E3
70	84	8	11	8	77	4	FD3493E0	FD3493E2
75	89	8	11	8	82	4	FD3596E0	FD3596E1
80	94	8	12	8	87	4	FD3720E0	FD3720N0
85	99	8	11	8	92	4	FD3828G0	FD3828G1
90	104	8	11	8	97	4	FD3913E0	FD3913E1
95	109	8	11	8	102	4	FD3976E0	FD3976E3
100	114	8	11	8	107	4	FD4046E1	FD4046E2
105	121	9	12	9	113	5	FD6722E0	FD6722E1
110	126	9	12	9	118	5	FD4196E0	FD4196E3
115	131	9	12	9	123	5	FD4272I0	FD4272I1
120	136	9	12	9	128	5	FD4326E0	FD4326E1
130	146	9	12	9	138	5	FD4438F0	FD4438F3
140	160	10	14	10	150	5	FD4533E0	FD4533E3

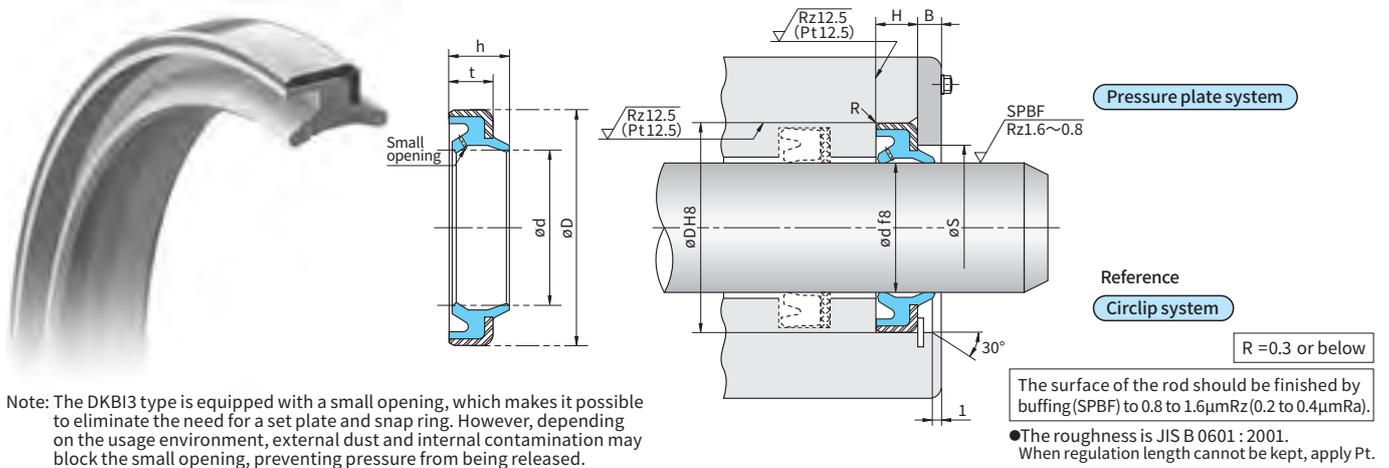
Dust Seals for Reciprocal Movement

DKBI3_{type}

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	Standard : U801 Heat resistant type : U641 + —

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD0995F1
 Type: DKBI3, Inner diameter: 20, Outer diameter: 32, Thickness: 6, Height: 9

● Please check the application range on pages 12 and 13 before selecting the type.



Note: The DKBI3 type is equipped with a small opening, which makes it possible to eliminate the need for a set plate and snap ring. However, depending on the usage environment, external dust and internal contamination may block the small opening, preventing pressure from being released.

Nominal number	Nominal size of dust seal, and housing dimensions							NOK part number	
	d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.5} _{+0.3}	øS	B	Standard (U801)	Heat resistant (U641)
DKBI3 20	20	32	6	9	6	27	4	FD0995F1	FD0995F2
25	25	37	6	9	6	32	4	FD1301E1	FD1301E2
30	30	42	6	9	6	37	4	FD1664E1	FD1664E2
32	32	44	7	10	7	39	4	FD1870E1	FD1870E2
35	35	47	7	10	7	42	4	FD2041E2	FD2041E3
40	40	52	7	10	7	47	4	FD2342F1	FD2342F2
45	45	57	7	10	7	52	4	FD2633G1	FD2633G2
50	50	62	7	10	7	57	4	FD2831E1	FD2831E2
Nominal number	Nominal size of dust seal, and housing dimensions							NOK part number	
	d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.6} _{+0.4}	øS	B	Standard (U801)	Heat resistant (U641)
DKBI3 55	55	69	8	11	8	62	4	FD3033E4	FD3033E3
60	60	74	8	11	8	67	4	FD3187E1	FD3187E2
65	65	79	8	11	8	72	4	FD3381E2	FD3381E1
70	70	84	8	11	8	77	4	FD3493E5	FD3493E3
75	75	89	8	11	8	82	4	FD3596E3	FD3596E2
80	80	94	8	12	8	87	4	FD3720E2	FD3720E1
85	85	99	8	11	8	92	4	FD3828G2	FD3828G3
90	90	104	8	11	8	97	4	FD3913E2	FD3913E3
95	95	109	8	11	8	102	4	FD3976E1	FD3976E2
100	100	114	8	11	8	107	4	FD4046E4	FD4046E3
105	105	121	9	12	9	113	5	FD6722E2	FD6722E3
110	110	126	9	12	9	118	5	FD4196E1	FD4196E2
115	115	131	9	12	9	123	5	FD4272I3	FD4272I2
120	120	136	9	12	9	128	5	FD4326E2	FD4326E3
130	130	146	9	12	9	138	5	FD4438F1	FD4438F2
140	140	160	10	14	10	150	5	FD4533E1	FD4533E2

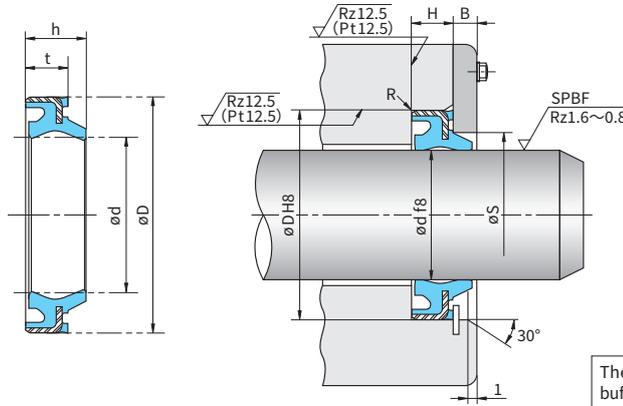
Dust Seals for Reciprocal Movement

DKBZ type

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	U801 + —

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD0995B0
 Type:DKBZ, Inner diameter:20, Outer diameter:32,
 Thickness:6, Height:9

● Please check the application range on pages 12 and 13 before selecting the type.



Pressure plate system

Reference
Circlip system

R = 0.3 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal number	Nominal size of dust seal, and housing dimensions							NOK part number
	d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.5} / _{+0.3}	øS	B	
DKBZ 20	20	32	6	9	6	27	4	FD0995B0
25	25	37	6	9	6	32	4	FD1301B0
30	30	42	6	9	6	37	4	FD1664B0
35	35	47	7	10	7	42	4	FD2041B0
40	40	52	7	10	7	47	4	FD2342B0
45	45	57	7	10	7	52	4	FD2633B0
50	50	62	7	10	7	57	4	FD2831B0
Nominal number	Nominal size of dust seal, and housing dimensions							NOK part number
	d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H ^{+0.6} / _{+0.4}	øS	B	
DKBZ 55	55	69	8	11.5	8	62	4	FD3033B0
60	60	74	8	11.5	8	67	4	FD3187B0
65	65	79	8	11.5	8	72	4	FD3381B0
70	70	84	8	11.5	8	77	4	FD3493B0
75	75	89	8	11.5	8	82	4	FD3596B0
80	80	94	8	11.5	8	87	4	FD3720B0
85	85	99	8	11.5	8	92	4	FD3828B0
90	90	104	8	11.5	8	97	4	FD3913B0
95	95	109	8	11.5	8	102	4	FD3976B0
100	100	114	8	11.5	8	107	4	FD4046B0
105	105	121	9	13	9	113	5	FD6722B0
110	110	126	9	13	9	118	5	FD4196B0
115	115	131	9	13	9	123	5	FD4272B0
120	120	136	9	13	9	128	5	FD4326B0
130	130	146	9	13	9	138	5	FD4438B0
140	140	160	10	15	10	150	5	FD4533B0
160	160	180	10	15	10	170	5	FD4704B0
170	170	190	10	15	10	180	5	FD4785B0

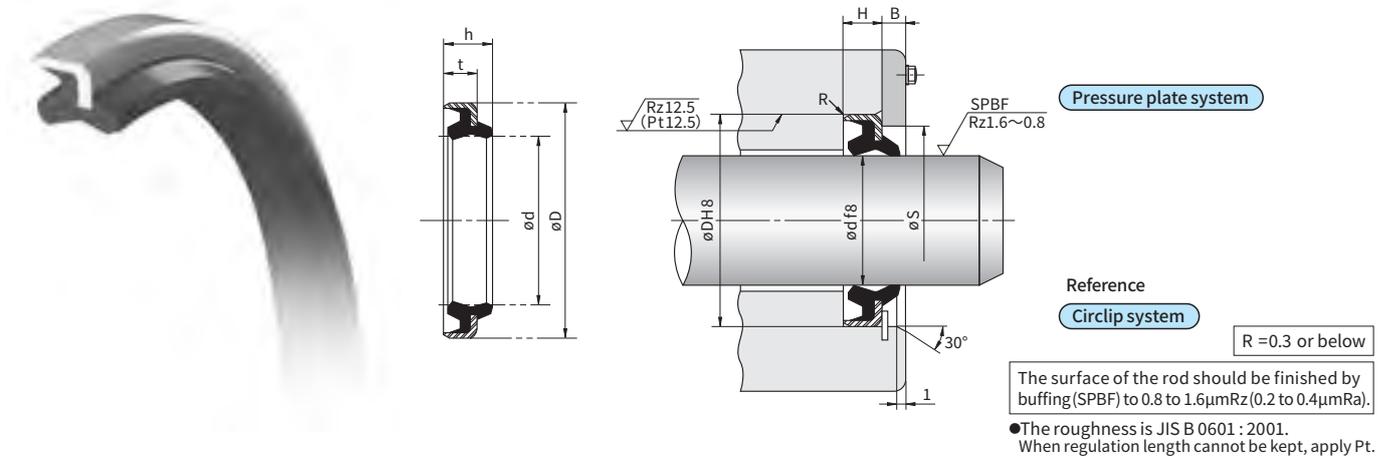
Dust Seals for Reciprocal Movement

DKB_{type}

Material	NOK sign
Nitrile rubber (NBR) + Metal case (SPCC)	A795 + —

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD2342G0
 Type:DKB, Inner diameter:14, Outer diameter:24, Thickness:5, Height:7

● Please check the application range on pages 12 and 13 before selecting the type.



Nominal size of dust seal, and housing dimensions							NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.3} ^{+0.5}	øS	B	
14	24	5	7	5	19	4	AR0513F5
16	26	5	7	5	21	4	AR0677E5
18	30	6	9	6	25	4	AR0815F5
20	32	6	9	6	27	4	AR0995E1
22	34	6	9	6	29	4	AR1121F5
22.4	34.4	6	9	6	29	4	AR1203F5
25	37	6	9	6	32	4	AR1301H5
28	40	6	9	6	35	4	AR1536F5
30	42	6	9	6	37	4	AR1664F5
31.5	44	7	10	7	38.5	4	AR1803G5
32	44	7	10	7	39	4	AR1870F5
35	47	7	10	7	42	4	AR2041E5
35.5	47.5	7	10	7	42.5	4	AR2149F5
36	48	7	10	7	43	4	BR1418E5
40	52	7	10	7	47	4	AR2342E5
45	57	7	10	7	52	4	AR2633G5
50	62	7	10	7	57	4	AR2831F5
Nominal size of dust seal, and housing dimensions							NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.4} ^{+0.6}	øS	B	
55	69	8	11	8	62	4	AR3033F5
56	70	8	11	8	63	4	AR3089G5
60	74	8	11	8	67	4	AR3187G5
63	77	8	11	8	70	4	AR3313F5
65	79	8	11	8	72	4	AR3381F5
70	84	8	11	8	77	4	AR3493F5
75	89	8	11	8	82	4	AR3596G5
80	94	8	11	8	87	4	AR3720I5
85	99	8	11	8	92	4	AR3828F5
90	104	8	11	8	97	4	AR3913E0
95	109	8	11	8	102	4	AR3976G5
100	114	8	11	8	107	4	AR4046G5
105	121	9	12	9	113	5	AR4142F5
110	126	9	12	9	118	5	AR4196F5
112	128	9	12	9	120	5	AR4232F5
120	136	9	12	9	128	5	AR4326E5
125	141	9	12	9	133	5	AR4393F5
140	160	10	14	10	150	5	AR4533G5
145	165	10	14	10	155	5	AR4578E5
150	170	10	14	10	160	5	AR4615E5
155	175	10	14	10	165	5	AR4663E5
160	180	10	14	10	170	5	AR4704G5
170	190	10	14	10	180	5	AR4785E5
175	195	10	14	10	185	5	AR4839F5
Nominal size of dust seal, and housing dimensions							NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.5} ^{+0.7}	øS	B	
180	205	12	17	12	191	5	AR4890G5
200	225	12	17	12	212	6	AR5048G5
225	250	12	17	12	237	6	AR5245F5
250	275	12	17	12	262	6	AR5396F5

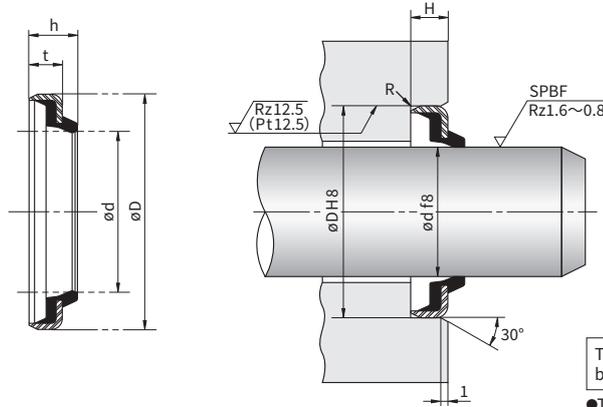
Dust Seals for Reciprocal Movement

DKH type

Material	NOK sign
Nitrile rubber (NBR) + Metal case (SPCC)	Outer diameter (D) 300mm or below: A795 more than 300mm: A104 + —

■ Please designate NOK part number and type & size on your order.
Example NOK part number: AR0258E5
 Type: DKH, Inner diameter: 10, Outer diameter: 20, Thickness: 5, Height: 7

● Please check the application range on pages 12 and 13 before selecting the type.



R = 0.3 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.5} ^{+0.3}	
10	20	5	7	5	AR0258E5
15	25	5	7	5	AR0586E5
20	32	6	9	6	AR0995F5
22.4	34.4	6	9	6	AR1203G5
25	37	6	9	6	AR1301F5
28	40	6	9	6	AR1536G5
30	42	6	9	6	AR1664G5
35	47	7	10	7	AR2041F5
35.5	47.5	7	10	7	AR2149J5
40	52	7	10	7	AR2342F5
45	57	7	10	7	AR2633I5
50	62	7	10	7	AR2831H5
Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.4} ^{+0.6}	
55	69	8	11	8	AR3033G5
60	74	8	11	8	AR3187J5
65	79	8	11	8	AR3381G5
80	94	8	11	8	AR3720H5
85	99	8	11	8	AR3828G5
90	104	8	11	8	AR3913F5
95	109	8	11	8	AR3976H5
100	114	8	11	8	AR4046E5
105	121	9	12	9	AR4142E5
120	136	9	12	9	AR4326H5
130	146	9	12	9	AR4438E5
155	175	10	14	10	AR4663F5
Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.5} ^{+0.7}	
210	235	12	17	12	AR5129E5
230	255	12	17	12	AR5277E5
240	265	12	17	12	AR5336E5
265	290	12	17	12	AR5480E5
300	330	16	22	16	AR5622B5
310	340	16	22	16	AR5668B5
315	345	16	22	16	AR5685B5
330	360	16	22	16	AR5741B5
335	365	16	22	16	AR5761B5
440	480	18	24	18	AR6021B5
Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.6} ^{+0.8}	
460	490	20	25	20	AR6073B5
470	510	20	25	20	AR6094B5
Nominal size of dust seal, and housing dimensions					NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H _{+0.5} ^{+0.7}	
500	530	16	22	16	AR6140B5

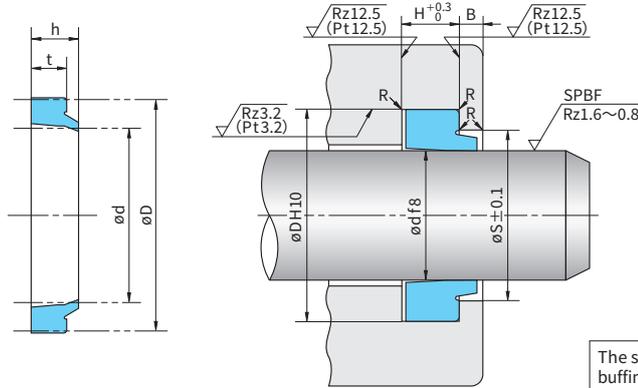
Dust Seals for Reciprocal Movement (Installed with internal groove)

DSI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FQ0000D0
 Type: DSI, Inner diameter: 6.3, Outer diameter: 14.3, Thickness: 4.5, Height: 6

● Please check the application range on pages 12 and 13 before selecting the type.



R = 0.3 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001. When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions

d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H	øS	B	NOK part number
6.3	14.3	4.5	6	5	10.3	2	FQ0000D0
8	16	4.5	6	5	12	2	FQ0002D0
9	17	4.5	6	5	13	2	FQ0003D0
10	18	4.5	6	5	14	2	FQ0004D0
11.2	19.2	4.5	6	5	15.2	2	FQ0005D0
12.5	20.5	4.5	6	5	16.5	2	FQ0006D0
14	22	4.5	6	5	18	2	FQ0007D0
15	23	4.5	6	5	19	2	FQ0008D0
16	24	4.5	6	5	20.3	2	FQ0011D0
18	26	4.5	6	5	22.3	2	FQ0013D0
20	28	4.5	6	5	24	2	FQ0014D0
22.4	30.4	4.5	6	5	26.4	2	FQ0016D0
23.5	31.5	4.5	6	5	27.5	2	FQ0017D0
25	33	4.5	6	5	29	2	FQ0018D0
28	36	4.5	6	5	32	2	FQ0023D0
30	38	5	6.5	6	34	2	FQ0025D0
31.5	39.5	5	6.5	6	35.5	2	FQ0027D0
35	43	5	6.5	6	39	2	FQ0031D0
35.5	43.5	5	6.5	6	39.5	2	FQ0034D0
40	48	5	6.5	6	44	2	FQ0035D0
45	53	5	6.5	6	49	2	FQ0039D0
45.5	53.5	5	6.5	6	49.5	2	FQ0864D0
50	58	5	6.5	6	54	2	FQ0041D0
53	61	5	6.5	6	57	2	FQ0044D0
54.5	62.5	5	6.5	6	58.5	2	FQ0857D0
55	63	5	6.5	6	59	2	FQ0045D0
56	64	5	6.5	6	60	2	FQ0048D0
60	68	5	6.5	6	64	2	FQ0049D0
62	70	5	6.5	6	66	2	FQ0856D0
63	71	5	6.5	6	67	2	FQ0054D0
65	73	5	6.5	6	69	2	FQ0057D0
67	75	5	6.5	6	71	2	FQ0058D0
70	80	6	8	7	75	3	FQ0059D0
71	81	6	8	7	76	3	FQ0062D0
75	85	6	8	7	80	3	FQ0063D0
76	86	6	8	7	81	3	FQ0250D0
80	90	6	8	7	85	3	FQ0064D0
85	95	6	8	7	90	3	FQ0066D0
90	100	6	8	7	95	3	FQ0070D0
95	105	6	8	7	100	3	FQ0071D0
97	107	6	8	7	102	3	FQ0251D0
100	110	6	8	7	105	3	FQ0072D0

Dust Seals for Reciprocal Movement (Installed with internal groove)

DSI type

Material	NOK sign
Iron rubber (PUR)	U801

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FQ0075D0
 Type: DSI, Inner diameter: 105, Outer diameter: 115, Thickness: 6, Height: 8

● Please check the application range on pages 12 and 13 before selecting the type.

Nominal size of dust seal, and housing dimensions							NOK part number
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H	øS	B	
105	115	6	8	7	110	3	FQ0075D0
106	116	6	8	7	111	3	FQ0078D0
110	120	6	8	7	115	3	FQ0079D0
112	122	6	8	7	117	4	FQ0082D0
118	128	6	8	7	123	4	FQ0085D0
120	130	6	8	7	125	4	FQ0087D0
125	138	7	9.5	8	132	4	FQ0091D0
130	143	7	9.5	8	137	4	FQ0093D0
132	145	7	9.5	8	139	4	FQ0095D0
140	153	7	9.5	8	147	4	FQ0097D0
145	158	7	9.5	8	152	4	FQ0099D0
150	163	7	9.5	8	157	4	FQ0101D0
155	168	7	9.5	8	162	4	FQ0103D0
160	173	7	9.5	8	167	4	FQ0105D0
170	183	7	9.5	8	177	4	FQ0106D0
175	188	7	9.5	8	182	4	FQ0108D0
180	193	7	9.5	8	187	4	FQ0111D0
185	198	7	9.5	8	192	5	FQ0114D0
190	203	7	9.5	8	197	5	FQ0115D0
199	212	7	9.5	8	206	5	FQ0116D0
200	213	7	9.5	8	207	5	FQ0117D0
204	217	7	9.5	8	211	5	FQ0119D0
210	223	7	9.5	8	217	5	FQ0120D0
215	228	7	9.5	8	222	5	FQ0408D1
220	233	7	9.5	8	227	5	FQ0123D0
224	237	7	9.5	8	231	5	FQ0124D0
225	238	7	9.5	8	232	5	FQ0125D0
230	243	7	9.5	8	237	5	FQ0127D0
240	253	7	9.5	8	247	5	FQ0129D0
250	263	7	9.5	8	257	5	FQ0130D0
260	275	9	12	10	268	5	FQ0134D0
270	285	9	12	10	278	5	FQ0135D0
280	295	9	12	10	288	5	FQ0136D0
290	305	9	12	10	298	5	FQ0138D0
300	315	9	12	10	308	5	FQ0139D0

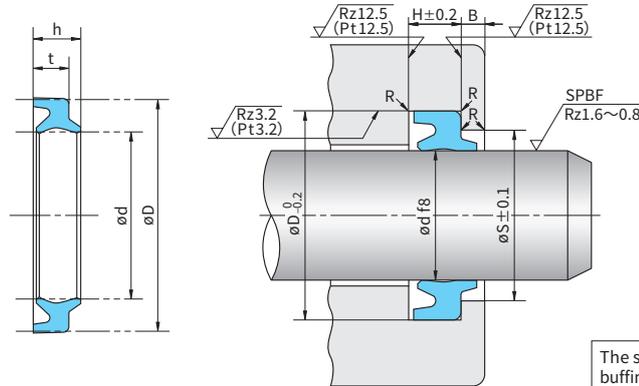
Dust Seals for Reciprocal Movement (Installed with internal groove)

LBI type

Material	NOK sign
Iron rubber (PUR)	U593

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FQ0013C0
 Type:LBI, Inner diameter:18, Outer diameter:26, Thickness:4.5, Height:6

● Please check the application range on pages 12 and 13 before selecting the type.



R = 0.3 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions

d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H	øS	B	NOK part number
18	26	4.5	6	5	22.3	2	FQ0013C0
20	28	4.5	6	5	24.3	2	FQ0014C0
22	30	4.5	6	5	26.3	2	FQ0651C0
22.4	30.4	4.5	6.5	5	26.7	2	FQ0016C0
25	33	4.5	6	5	29.3	2	FQ0018C0
26	34	4.5	6	5	30.3	2	FQ0841C0
28	36	4.5	6	5	32.3	2	FQ0023C0
30	38	5	6.5	6	34	2	FQ0025C1
31.5	39.5	5	6.5	6	35.5	2	FQ0027C0
32	40	5	6.5	6	36	2	FQ0568C1
34	42	5	6.5	6	38	2	FQ0285C0
35	43	5	6.5	6	39	2	FQ0031C1
35.5	43.5	5	6.5	6	39.5	2	FQ0034C0
38	46	5	6.5	6	42	2	FQ0281C1
40	48	5	6.5	6	44	2	FQ0035C1
45	53	5	6.5	6	49	2	FQ0039C1
48	56	5	6.5	6	52	2	FQ0272C0
50	58	5	6.5	6	54	2	FQ0041C0
55	63	5	6.5	6	59	2	FQ0045C1
56	64	5	6.5	6	60	2	FQ0048C1
58	66	5	6.5	6	62	2	FQ0286C0
60	68	5	6.5	6	64	2	FQ0049C1
63	71	5	6.5	6	67	2	FQ0054C0
65	73	5	6.5	6	69	2	FQ0057C1
70	80	6	8	7	75	3	FQ0059C0
71	81	6	8	7	76	3	FQ0062C0
75	85	6	8	7	80	3	FQ0063C0
80	90	6	8	7	85	3	FQ0064C0
85	95	6	8	7	90	3	FQ0066C0
90	100	6	8	7	95	3	FQ0070C0
95	105	6	8	7	100	3	FQ0071C0
100	110	6	8	7	105	3	FQ0072C0
105	115	6	8	7	110	3	FQ0075C0
110	120	6	8	7	115	3	FQ0079C1
112	122	6	8	7	117	3	FQ0082C0
125	138	7	9.5	8	132	3	FQ0091C0
140	153	7	9.5	8	147	3	FQ0097C0
150	163	7	9.5	8	157	3	FQ0101C0
160	173	7	9.5	8	167	3	FQ0105C2
180	193	7	9.5	8	187	3	FQ0111C0
185	198	7	9.5	8	192	3	FQ0114C0
200	213	7	9.5	8	207	3	FQ0117C0
210	223	7	9.5	8	217	3	FQ0120C0
250	265	9	11.5	10	258	3	FQ0131C0

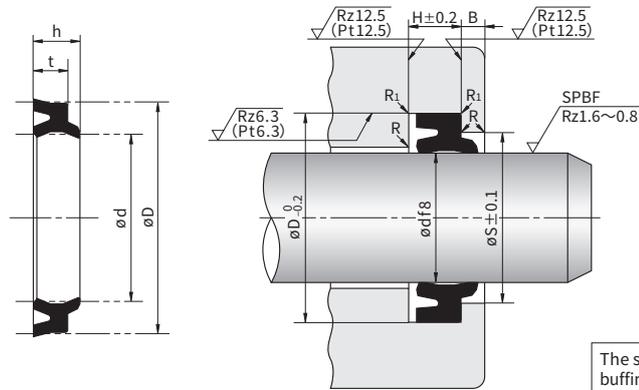
Dust Seals (Installed with internal groove)

LBH type

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

■ Please designate NOK part number and type & size on your order.
Example NOK part number: CL0480C0
 Type: LBH, Inner diameter: 12, Outer diameter: 20, Thickness: 4.5, Height: 6

● Please check the application range on pages 12 and 13 before selecting the type.



The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).
 ● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions							Standard (A505)		Heat resistant (F357)	
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H	øS	B	NOK part number	Nominal number	NOK part number	Nominal number
12	20	4.5	6	5	16.3	2	CL0480C0	LBH-12		
12.5	20.5	4.5	6	5	16.8	2	CL0447C1	LBH-12.5		
14	22	4.5	6	5	18.3	2	CL0432C0	LBH-14		
16	24	4.5	6	5	20.3	2	CL0293C0	LBH-16	CL0293C3	LBH-16F
18	26	4.5	6	5	22.3	2	CL0011C0	LBH-18	CL0011C6	LBH-18F
20	28	4.5	6	5	24.3	2	CL0017C0	LBH-20	CL0017C4	LBH-20F
22	30	4.5	6	5	26.3	2	CL0240C0	LBH-22	CL0240C3	LBH-22F
22.4	30.4	4.5	6	5	26.7	2	CL0026C3	LBH-22.4	CL0026C6	LBH-22.4F
25	33	4.5	6	5	29.3	2	CL0031C0	LBH-25	CL0031C2	LBH-25F
28	36	4.5	6	5	32.3	2	CL0042C0	LBH-28	CL0042C4	LBH-28F
30	38	5	6.5	6	34	2	CL0050C0	LBH-30	CL0050C3	LBH-30F
31.5	39.5	5	6.5	6	35.5	2	CL0054C0	LBH-31.5	CL0054C3	LBH-31.5F
32	40	5	6.5	6	36	2	CL0363C0	LBH-32	CL0363C3	LBH-32F
35	43	5	6.5	6	39	2	CL0066C1	LBH-35	CL0066C4	LBH-35F
35.5	43.5	5	6.5	6	39.5	2	CL0072C0	LBH-35.5	CL0072C4	LBH-35.5F
36	44	5	6.5	6	40	2	CL0335C1	LBH-36		
40	48	5	6.5	6	44	2	CL0077C2	LBH-40	CL0077C4	LBH-40F
45	53	5	6.5	6	49	2	CL0085C0	LBH-45	CL0085C4	LBH-45F
50	58	5	6.5	6	54	2	CL0087C3	LBH-50	CL0087C5	LBH-50F
53	61	5	6.5	6	57	2	CL0100C0	LBH-53	CL0100C2	LBH-53F
55	63	5	6.5	6	59	2	CL0104C0	LBH-55	CL0104C2	LBH-55F
56	64	5	6.5	6	60	2	CL0105C1	LBH-56	CL0105C4	LBH-56F
60	68	5	6.5	6	64	2	CL0107C0	LBH-60	CL0107C2	LBH-60F
63	71	5	6.5	6	67	2	CL0109C1	LBH-63	CL0109C3	LBH-63F
65	73	5	6.5	6	69	2	CL0115C0	LBH-65	CL0115C2	LBH-65F
67	75	5	6.5	6	71	2	CL0118C1	LBH-67	CL0118C2	LBH-67F
70	80	6	8	7	75	3	CL0121C0	LBH-70	CL0121C3	LBH-70F
71	81	6	8	7	76	3	CL0125C0	LBH-71	CL0125C2	LBH-71F
75	85	6	8	7	80	3	CL0127C0	LBH-75	CL0127C2	LBH-75F
80	90	6	8	7	85	3	CL0138C1	LBH-80	CL0138C3	LBH-80F
85	95	6	8	7	90	3	CL0142C0	LBH-85	CL0142C3	LBH-85F
90	100	6	8	7	95	3	CL0149C0	LBH-90	CL0149C4	LBH-90F
95	105	6	8	7	100	3	CL0152C0	LBH-95	CL0152C3	LBH-95F
100	110	6	8	7	105	3	CL0154C2	LBH-100	CL0154C4	LBH-100F
105	115	6	8	7	110	3	CL0476C0	LBH-105		
106	116	6	8	7	111	3	CL0162C0	LBH-106		
110	120	6	8	7	115	3	CL0448C0	LBH-110	CL0448C2	LBH-110F
112	122	6	8	7	117	3	CL0166C2	LBH-112	CL0166C3	LBH-112F
115	125	6	8	7	120	3	CL0478C0	LBH-115		
118	128	6	8	7	123	3	CL0466C0	LBH-118		
120	133	7	9.5	8	127	3	CL0245C1	LBH-120		
125	138	7	9.5	8	132	3	CL0171C0	LBH-125	CL0171C3	LBH-125F

Remark) In some products the part number and the one stamped on the product might be different.

Dust Seals (Installed with internal groove)

LBH_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505
Fluororubber (FKM)	Heat resistant type : F357

■ Please designate NOK part number and type & size on your order.
Example NOK part number: CL0174C0
 Type:LBH, Inner diameter:132, Outer diameter:145, Thickness:7, Height:9.5

● Please check the application range on pages 12 and 13 before selecting the type.

Nominal size of dust seal, and housing dimensions							Standard (A505)		Heat resistant (F357)	
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H	øS	B	NOK part number	Nominal number	NOK part number	Nominal number
132	145	7	9.5	8	139	3	CL0174C0	LBH-132		
140	153	7	9.5	8	147	3	CL0179C1	LBH-140	CL0179C4	LBH-140F
145	158	7	9.5	8	152	3	CL0182C0	LBH-145	CL0182C1	LBH-145F
150	163	7	9.5	8	157	3	CL0185C0	LBH-150	CL0185C1	LBH-150F
155	168	7	9.5	8	162	3	CL0486C0	LBH-155		
160	173	7	9.5	8	167	3	CL0188C1	LBH-160	CL0188C3	LBH-160F
160	174	7	9.5	8	167	3	CL0487C0	LBH-160A		
165	178	7	9.5	8	172	3	CL0190C0	LBH-165		
170	183	7	9.5	8	177	3	CL0488C0	LBH-170		
170	185	11	14	12	178	5	CL0191C0	LBH-170A		
175	188	7	9.5	8	182	3	CL0193C0	LBH-175		
180	193	7	9.5	8	187	3	CL0196C1	LBH-180	CL0196C4	LBH-180F
180	194	7	9.5	8	187	3	CL0489C0	LBH-180A		
190	203	7	9.5	8	197	3	CL0490C0	LBH-190		
200	213	7	9.5	8	207	3	CL0199C1	LBH-200	CL0199C3	LBH-200F
205	218	7	9.5	8	212	3	CL0446C0	LBH-205		
210	223	7	9.5	8	217	3	CL0324C1	LBH-210		
224	237	7	9.5	8	231	3	CL0204C1	LBH-224	CL0204C2	LBH-224F
240	256	10	13	11	248	4	CL0300C0	LBH-240		
250	266	9	12	10	258	4	CL0207C0	LBH-250A		
250	266	10	13	11	258	4	CL0267C0	LBH-250		
280	296	9	12	10	288	4	CL0212C0	LBH-280A	CL0212C2	LBH-280AF
355	371	10	13	11	363	4	CL0532C0	LBH-355		
355	375	10	14	11	365	5	CL0301C0	LBH-355A		
400	416	10	13	11	408	4	CL0529C0	LBH-400		
500	520	11.5	15.5	12.5	510	5	CL0460C0	LBH-500		

Remark) In some products the part number and the one stamped on the product might be different.

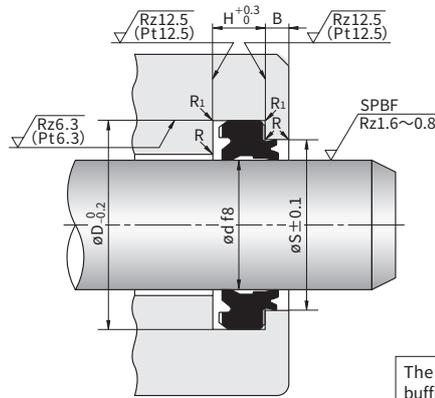
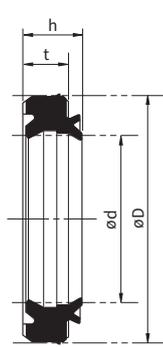
Dust Seals (Installed with internal groove)

LBHK_{type}

Material	NOK sign
Nitrile rubber (NBR)	Standard : A505 Cold resistant type : A567

■ Please designate NOK part number and type & size on your order.
Example NOK part number: CL0533C0
 Type:LBHK, Inner diameter:14, Outer diameter:24, Thickness:4.8, Height:6.7

● Please check the application range on pages 12 and 13 before selecting the type.



R = 0.3 or below
R₁ = 0.5 or below

The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions							NOK part number	
d (Inner diameter)	D (Outer diameter)	t (Thickness)	h (Height)	H	øS	B	Standard (A505)	Cold resistant (A567)
14	24	4.8	6.7	5	19	3	CL0533C0	CL0533C1
18	30	5.8	7.8	6	24	3	CL0534C0	CL0534C1
20	32	5.8	7.8	6	26	3	CL0535C0	CL0535C1
25	37	5.8	7.8	6	31	3	CL0536C0	CL0536C1
28	40	5.8	7.8	6	34	3	CL0537C0	CL0537C1
30	42	5.8	7.8	6	36	3	CL0531C1	CL0531C0
31.5	44	6.8	8.8	7	38	3	CL0538C0	CL0538C1
35	47	6.8	8.8	7	41	3	CL0527C0	CL0527C1
35.5	47.5	6.8	8.8	7	41.5	3	CL0539C0	CL0539C1
40	52	6.8	8.8	7	46	3	CL0540C0	CL0540C1
45	57	6.8	8.8	7	51	3	CL0541C0	CL0541C1
50	62	6.8	8.8	7	56	3	CL0542C0	CL0542C1
55	69	7.7	10	8	62	3	CL0543C0	CL0543C1
56	70	7.7	10	8	63	3	CL0544C0	CL0544C1
60	74	7.7	10	8	67	3	CL0518C1	CL0518C2
63	77	7.7	10	8	70	3	CL0545C0	CL0545C1
65	79	7.7	10	8	72	3	CL0546C0	CL0546C1
70	84	7.7	10	8	77	3	CL0547C0	CL0547C1
71	85	7.7	10	8	78	3	CL0548C0	CL0548C1
75	89	7.7	10	8	82	3	CL0549C0	CL0549C1
80	94	7.7	10	8	87	3	CL0519C1	CL0519C2
85	99	7.7	10	8	92	3	CL0550C0	CL0550C1
90	104	7.7	10	8	97	3	CL0551C0	CL0551C1
95	109	7.7	10	8	102	3	CL0552C0	CL0552C1
100	114	7.7	10	8	107	3	CL0553C0	CL0553C1
105	121	8.7	11.4	9	113	4	CL0554C0	CL0554C1
106	120	7.7	10	8	113	3	CL0555C0	CL0555C1
110	126	8.7	11.4	9	118	4	CL0556C0	CL0556C1
112	128	8.7	11.4	9	120	4	CL0557C0	CL0557C1
115	131	8.7	11.4	9	123	4	CL0558C0	CL0558C1
118	134	8.7	11.4	9	126	4	CL0559C0	CL0559C1
120	136	8.7	11.4	9	128	4	CL0560C0	CL0560C1

Remark) In some products the part number and the one stamped on the product might be different.

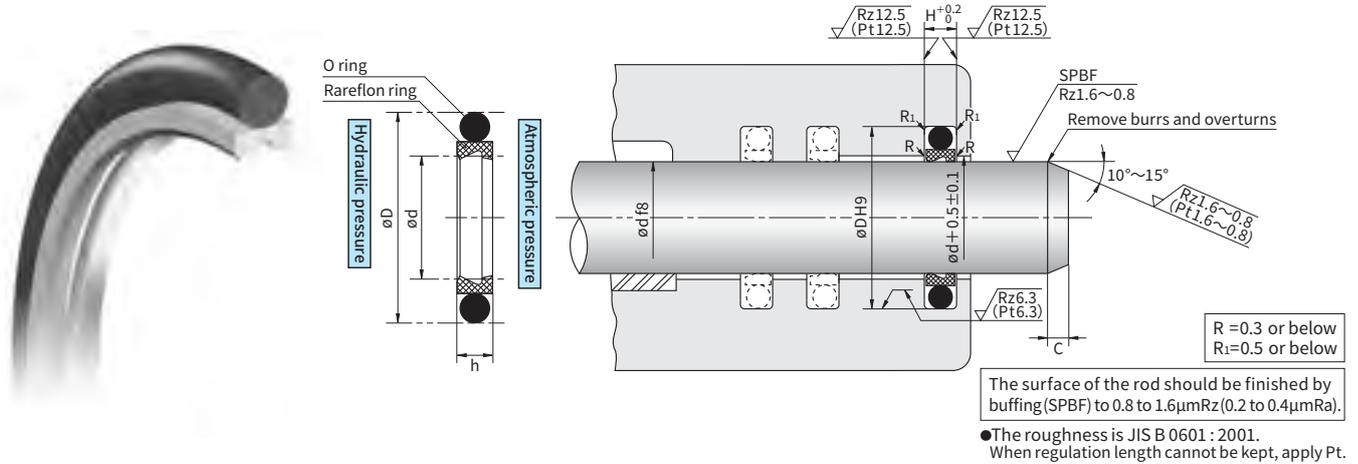
Special Packings for Dust Seals

DSPB_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	11YF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS5500V0
 Type: DSPB, Inner diameter: 4, Outer diameter: 8.9, Height: 2.1

● Please check the application range on pages 12 and 13 before selecting the type.



Nominal number	Nominal size of dust seal, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
DSPB 4	4	8.9	2.1	2.2	3.5	● GS5500V0
5	5	9.9	2.1	2.2	3.5	● GS5501V0
6	6	10.9	2.1	2.2	3.5	● GS5502V0
7	7	11.9	2.1	2.2	3.5	● GS5503V0
8S	8	12.9	2.1	2.2	3.5	● GS5504V0
8	8	15.3	3.1	3.2	3.5	● GS5505V0
10S	10	14.9	2.1	2.2	3.5	● GS5506V0
10	10	17.3	3.1	3.2	3.5	● GS5507V0
12S	12	16.9	2.1	2.2	4.5	● GS5508V0
12	12	19.3	3.1	3.2	4.5	● GS5509V0
14S	14	18.9	2.1	2.2	4.5	● GS5510V0
14	14	21.3	3.1	3.2	4.5	● GS5511V0
15S	15	19.9	2.1	2.2	4.5	● GS5512V0
15	15	22.3	3.1	3.2	4.5	● GS5513V0
16S	16	20.9	2.1	2.2	4.5	● GS5514V0
16	16	23.3	3.1	3.2	4.5	● GS5515V0
18S	18	22.9	2.1	2.2	4.5	● GS5516V0
18	18	25.3	3.1	3.2	4.5	● GS5517V0
20S	20	27.3	3.1	3.2	4.5	● GS5518V0
20	20	30.7	4.1	4.2	4.5	● GS5519V0
22S	22	29.3	3.1	3.2	4.5	● GS5520V0
22	22	32.7	4.1	4.2	4.5	● GS5521V0
22.4S	22.4	29.7	3.1	3.2	4.5	● GS5522V0
22.4	22.4	33.1	4.1	4.2	4.5	● GS5523V0
25S	25	32.3	3.1	3.2	5.5	● GS5524V0
25	25	35.7	4.1	4.2	5.5	● GS5525V0
28S	28	35.3	3.1	3.2	5.5	● GS5526V0
28	28	38.7	4.1	4.2	5.5	● GS5527V0
30S	30	37.3	3.1	3.2	5.5	● GS5528V0
30	30	40.7	4.1	4.2	5.5	● GS5529V0
32S	32	39.3	3.1	3.2	5.5	GS5530V0
32	32	42.7	4.1	4.2	5.5	GS5531V0
35S	35	42.3	3.1	3.2	5.5	GS5532V0
35	35	45.7	4.1	4.2	5.5	GS5533V0
35.5S	35.5	42.8	3.1	3.2	5.5	GS5534V0
35.5	35.5	46.2	4.1	4.2	5.5	GS5535V0
36S	36	43.3	3.1	3.2	5.5	GS5536V0
36	36	46.7	4.1	4.2	5.5	GS5537V0
38S	38	48.7	4.1	4.2	5.5	GS5538V0
38	38	53.1	6.1	6.3	5.5	GS5539V0
40S	40	50.7	4.1	4.2	5.5	GS5540V0
40	40	55.1	6.1	6.3	5.5	GS5541V0

Remark) When using the packing with ●, provide separate grooves.

Special Packings for Dust Seals

DSPB_{type}

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	11YF + A305

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS5500V0
 Type: DSPB, Inner diameter: 42, Outer diameter: 52.7,
 Height: 4.1

5

● Please check the application range on pages 12 and 13 before selecting the type.

Nominal number	Nominal size of dust seal, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	C	
DSPB 42S	42	52.7	4.1	4.2	5.5	GS5542V0
42	42	57.1	6.1	6.3	5.5	GS5543V0
45S	45	55.7	4.1	4.2	5.5	GS5544V0
45	45	60.1	6.1	6.3	5.5	GS5545V0
50S	50	60.7	4.1	4.2	5.5	GS5546V0
50	50	65.1	6.1	6.3	5.5	GS5547V0
56S	56	66.7	4.1	4.2	7	GS5548V0
56	56	71.1	6.1	6.3	7	GS5549V0
60S	60	70.7	4.1	4.2	7	GS5550V0
60	60	75.1	6.1	6.3	7	GS5551V0
63	63	78.1	6.1	6.3	7	GS5552V0
65	65	80.1	6.1	6.3	7	GS5553V0
67	67	82.1	6.1	6.3	7	GS5554V0
70	70	85.1	6.1	6.3	7	GS5555V0
71	71	86.1	6.1	6.3	7	GS5556V0
75	75	90.1	6.1	6.3	7	GS5557V0
80	80	95.1	6.1	6.3	7	GS5558V0
85	85	100.1	6.1	6.3	7	GS5559V0
90	90	105.1	6.1	6.3	7	GS5560V0
95	95	110.1	6.1	6.3	7	GS5561V0
100	100	115.1	6.1	6.3	7	GS5562V0
105	105	120.1	6.1	6.3	7	GS5563V0
110	110	125.1	6.1	6.3	7	GS5564V0
112	112	127.1	6.1	6.3	7	GS5565V0
115	115	130.1	6.1	6.3	7	GS5566V0
120	120	135.1	6.1	6.3	7	GS5567V0
125	125	140.1	6.1	6.3	7	GS5568V0
130	130	145.1	6.1	6.3	7	GS5569V0
135	135	150.1	6.1	6.3	7	GS5570V0
140	140	155.1	6.1	6.3	7	GS5571V0
150	150	165.1	6.1	6.3	7	GS5572V0
160	160	175.1	6.1	6.3	7	GS5573V0
170	170	185.1	6.1	6.3	7	GS5574V0
180	180	195.1	6.1	6.3	7	GS5575V0

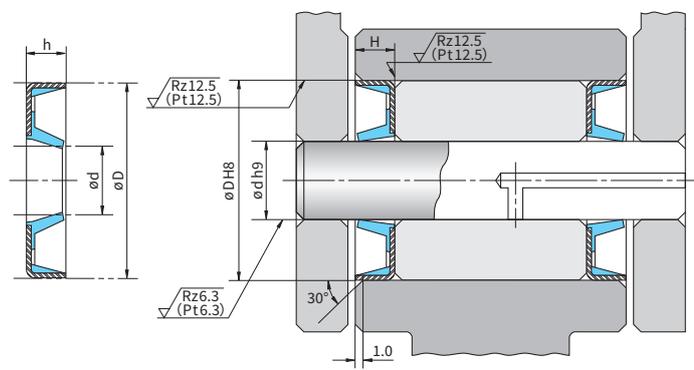
Dust Seals for Reciprocal Movement

DLI type

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	Outer diameter (D) 160mm or below: U801 more than 160mm: U593 + -

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD9991E0
 Type: DLI, Inner diameter: 40, Outer diameter: 50, Height: 5

● Please check the application range on pages 14 and 15 before selecting the type.



● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions				NOK part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H ^{+0.5} / _{+0.3}	
40	50	5	5	FD9991E0
50	60	5	5	FD9990E0
55	68	6	6	FD9996E0
60	75	6	6	FD3191F0
Nominal size of dust seal, and housing dimensions				NOK part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H ^{+0.6} / _{+0.4}	
65	80	8	8	FD9994E0
70	85	8	8	FD9922E0
75	90	8	8	FD3598E0
90	105	8	8	FD3916E0
95	110	8	8	FD3978F0
100	115	8	8	FD6715E0
105	120	8	8	FD4141F0
110	125	8	8	FD9993E0
115	130	8	8	FD9984E0
120	135	8	8	FD9938E0
125	140	8	8	FD9995E0
140	170	10	10	FD9969E0
145	160	8	8	FD6713E0
150	180	11	11	FD9956E0
160	180	8	8	FD6712E0
160	190	8	8	FD6710E0
160	190	13	13	FD4710E0
170	200	13	13	FD4792E0
175	205	8	8	FD6711E0
180	200	8	8	FD6727E0
180	210	13	13	FD6759E0
190	210	8	8	FD6728E0
200	220	8	8	FD6729E0
200	230	8	8	FD6730E0
200	230	13	13	FD6723E0
220	250	13	13	FD9975E0
220	255	14	14	FD6774E0
230	255	14	14	FD6793E0
240	270	13	13	FD6724E0
240	275	14	14	FD6763E0
250	280	13	13	FD6725E0

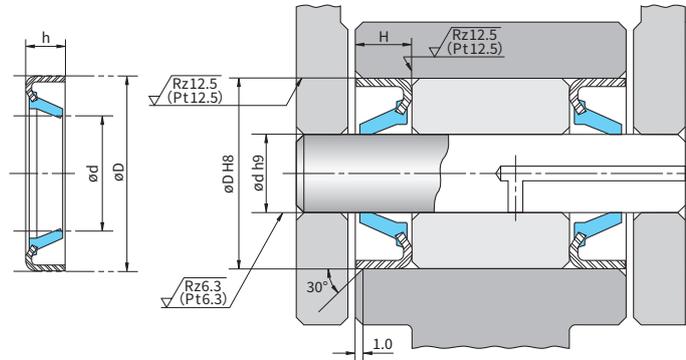
Dust Seals for Reciprocal Movement

DLI2_{type}

Material	NOK sign
Iron rubber (PUR) + Metal case (SPCC)	U451 + —

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FD2032G0
 Type: DLI2, Inner diameter: 35, Outer diameter: 45, Height: 4

● Please check the application range on pages 14 and 15 before selecting the type.



● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal size of dust seal, and housing dimensions				NOK part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H ^{+0.5} / _{+0.3}	
35	45	4	4	FD2032G0
40	50	5	5	FD9991E1
50	60	5	5	FD9990E1
55	68	6	6	FD9996E1
Nominal size of dust seal, and housing dimensions				NOK part number
d (Inner diameter)	D (Outer diameter)	h (Height)	H ^{+0.6} / _{+0.4}	
60	75	8	8	FD3192E1
65	80	8	8	FD9994E1
70	85	8	8	FD9922E1
75	90	8	8	FD3598E1
85	100	8	8	FD9989E1
95	110	8	8	FD3978F1
110	125	8	8	FD9993E1
120	135	8	8	FD9938E1
125	140	8	8	FD9995E1
140	155	8	8	FD6714E1
145	160	8	8	FD6713E1

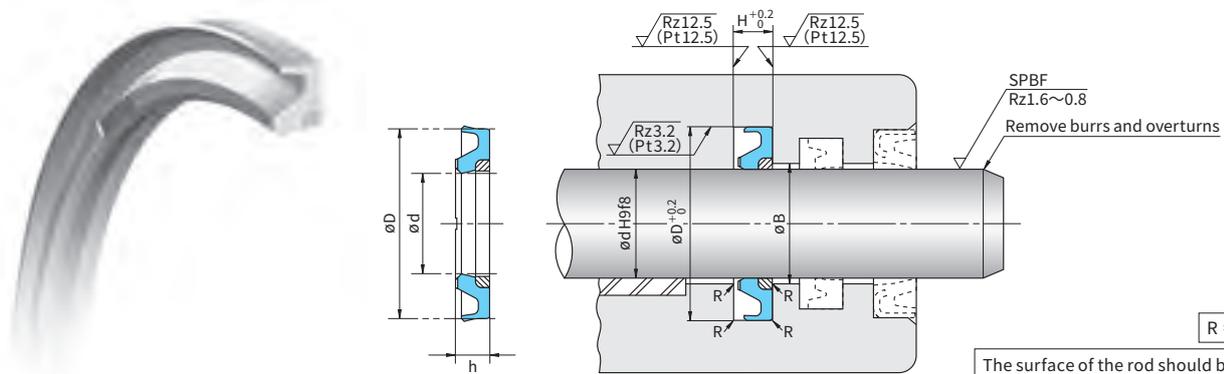
Buffer Ring

HB Y type

Material	NOK sign
Iron rubber (PUR) + Polyamide resin (PA)	Standard: U801 Heat resistant: U641 Super heat resistant: UH05 + Inner diameter (d) 160mm or below: 12NM more than 160mm: 80NP

■ Please designate NOK part number and type & size on your order.
Example NOK part number: FQ0253F3
 Type: HB Y, Inner diameter: 40, Outer diameter: 55.5, Height: 6

● Please check the application range on pages 14 and 15 before selecting the type.



The surface of the rod should be finished by buffing (SPBF) to 0.8 to 1.6µmRz (0.2 to 0.4µmRa).

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

How to determine B dimension

Please determine B dimension according to the table below. If you require smaller B dimension because of the cylinder configuration, please consult NOK.

Maximum service pressure	35MPa	42MPa	50MPa
B dimension	$B \leq \varnothing d + 0.8$	$B \leq \varnothing d + 0.4$	$B \leq \varnothing d + 0.25$

Nominal size of buffer ring, and housing dimensions				NOK part number		
d (Inner diameter)	D (Outer diameter)	h (Height)	H	Standard (U801)	Heat resistant (U641)	Super heat resistant (UH05)
40	55.5	6	6.3	FQ0253F3	FQ0253F4	
45	60.5	6	6.3	FQ0254F5	FQ0254F6	
50	65.5	6	6.3	FQ0255F4	FQ0255F3	FQ0255F7
55	70.5	6	6.3	FQ0256F4	FQ0256F5	FQ0256F7
60	75.5	6	6.3	FQ0257F4	FQ0257F5	FQ0257F6
65	80.5	6	6.3	FQ0258F4	FQ0258F3	FQ0258F7
70	85.5	6	6.3	FQ0244F5	FQ0244F4	FQ0244F8
75	90.5	6	6.3	FQ0245F5	FQ0245F4	FQ0245F8
80	95.5	6	6.3	FQ0246F6	FQ0246F5	FQ0246F9
85	100.5	6	6.3	FQ0259F5	FQ0259F6	FQ1226F0
90	105.5	6	6.3	FQ0260F6	FQ0260F5	FQ0260F9
95	110.5	6	6.3	FQ0575F6	FQ0575F4	FQ1225F0
100	115.5	6	6.3	FQ0261F7	FQ0261F5	FQ1214F1
105	120.5	6	6.3	FQ0629F6	FQ0629F5	FQ1244F0
110	125.5	6	6.3	FQ0262F6	FQ0262F4	FQ1220F0
115	130.5	6	6.3	FQ0868F5	FQ0868F4	FQ0868F7
120	135.5	6	6.3	FQ0263F4	FQ0263F5	FQ0263F8
125	140.5	6	6.3	FQ0842F3	FQ0842F4	FQ0842F7
130	145.5	6	6.3	FQ0264F5	FQ0264F4	FQ0264F8
132	147.5	6	6.3	FQ0784F2	FQ0784F3	
135	150.5	6	6.3	FQ0904F2	FQ0904F3	
140	155.5	6	6.3	FQ0265F5	FQ0265F4	FQ0265F6
150	165.5	6	6.3	FQ0871F3	FQ0871F4	FQ0871F6
160	175.5	6	6.3	FQ0433F4	FQ0433F5	FQ0433F6
170	185.5	6	6.3	FQ0603F0	FQ0603F1	FQ00603-F6A
180	195.5	6	6.3	FQ0451F0	FQ0451F1	FQ0451F3
190	205.5	6	6.3	FQ0646F0	FQ0646F1	
200	221	7.7	8	FQ0830F0	FQ0830F2	FQ0830F3
210	231	7.7	8	FQ0824F0	FQ0824F2	FQ0824F3

Buffer Ring

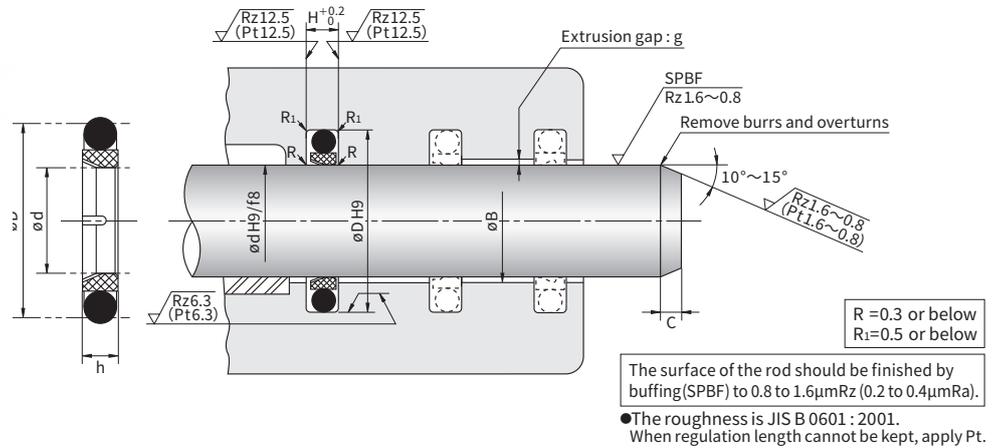
HBTS_{type}

5

Material	NOK sign
Rareflon (PTFE) + Nitrile rubber (NBR)	55YF + A305

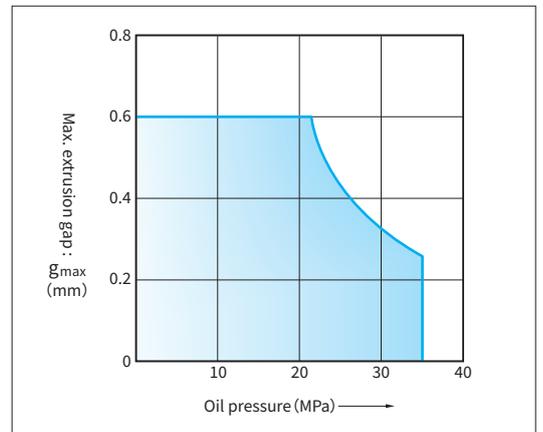
■ Please designate NOK part number and type & size on your order.
Example NOK part number: GS5000V6
 Type: HBTS, Inner diameter: 4, Outer diameter: 8.9, Height: 2

● Please check the application range on pages 14 and 15 before selecting the type.



How to determine B dimension

To determine B dimension, please refer to the graph in the right for the maximum extrusion gap (one side) considering the eccentricity of operating condition of the rod.



Nominal number	Nominal size of buffer ring, and housing dimensions				NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	
HBTS 4	4	8.9	2	2.2	● GS5000V6
5	5	9.9	2	2.2	● GS5001V6
6	6	10.9	2	2.2	● GS5002V6
7	7	11.9	2	2.2	● GS5003V6
8	8	15.3	2.9	3.2	● GS5005V6
10	10	17.3	2.9	3.2	● GS5007V6
12	12	19.3	2.9	3.2	● GS5009V6
14	14	21.3	2.9	3.2	● GS5011V6
15	15	22.3	2.9	3.2	● GS5013V6
16	16	23.3	2.9	3.2	● GS5015V6
18	18	25.3	2.9	3.2	● GS5017V6
20	20	30.7	3.9	4.2	● GS5019V6
22	22	32.7	3.9	4.2	● GS5021V6
22.4	22.4	33.1	3.9	4.2	● GS5023V6
25	25	35.7	3.9	4.2	● GS5025V6
28	28	38.7	3.9	4.2	● GS5027V6
30	30	40.7	3.9	4.2	● GS5029V6
32	32	42.7	3.9	4.2	GS5031V6
35	35	45.7	3.9	4.2	GS5033V6
35.5	35.5	46.2	3.9	4.2	GS5035V6
36	36	46.7	3.9	4.2	GS5037V6
38	38	53.1	5.9	6.3	GS5039V6
40	40	55.1	5.9	6.3	GS5041V6
42	42	57.1	5.9	6.3	GS5043V6
45	45	60.1	5.9	6.3	GS5045V6
50	50	65.1	5.9	6.3	GS5047V6

Remark) When using the packing with ●, provide separate grooves.

Wear Ring

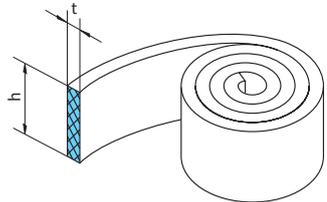
RYT type

5

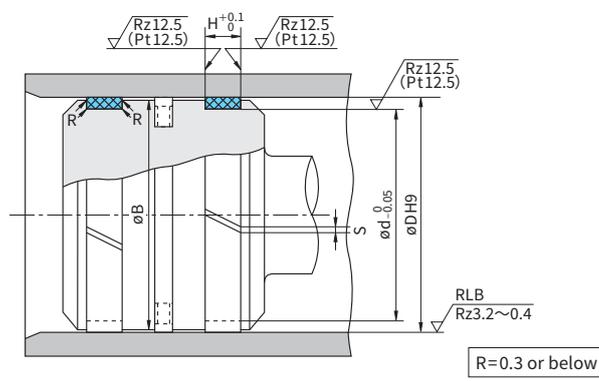
Material	NOK sign
Rareflon (PTFE)	05ZF

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GZ1291V0
 Type: RYT, Thickness: 2, Height: 8

● Please check the application range on pages 14 and 15 before selecting the type.



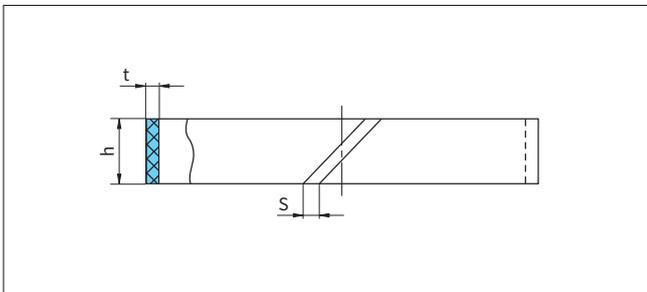
※ One roll length is 10 m.



Remark) B dimension should be determined according to the packing used.

The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.



Remark) Determine the length of wear ring = L according to the formula below.

$$L = \pi \cdot (D - t) - S$$

Nominal number	Nominal size of wear ring			Housing dimensions			NOK part number
	t (Thickness)	h (Height)	S	øD	ød	H	
RYT 8	2	8	1 ~ 1.5	18~63	D-4	8	GZ1291V0
10	2	10	1 ~ 2	33~80	D-4	10	GZ1292V0
15	2.5	15	1.5 ~ 3	41~130	D-5	15	GZ1293V0
20	2.5	20	2 ~ 4	65~160	D-5	20	GZ1294V0
25	2.5	25	2 ~ 6	85~225	D-5	25	GZ1295V0
30	2.5	30	3 ~ 6.5	112~250	D-5	30	GZ1296V0
35	2.5	35	3.5 ~ 8	132~300	D-5	35	GZ1297V0
40	2.5	40	4 ~ 9	150~350	D-5	40	GZ1298V0
45	2.5	45	4 ~ 10	165~400	D-5	45	GZ1299V0
50	3	50	5 ~ 11	205~450	D-6	50	GZ1300V0
55	3	55	6 ~ 13	230~500	D-6	55	GZ1301V0
60	3	60	7 ~ 15	260~600	D-6	60	GZ1302V0
70	3	70	8 ~ 28	290~1000	D-6	70	GZ1303V0

Remark) RYT type wear ring of other dimensions than the above can be available on demand, please consult NOK.

R
Y
T

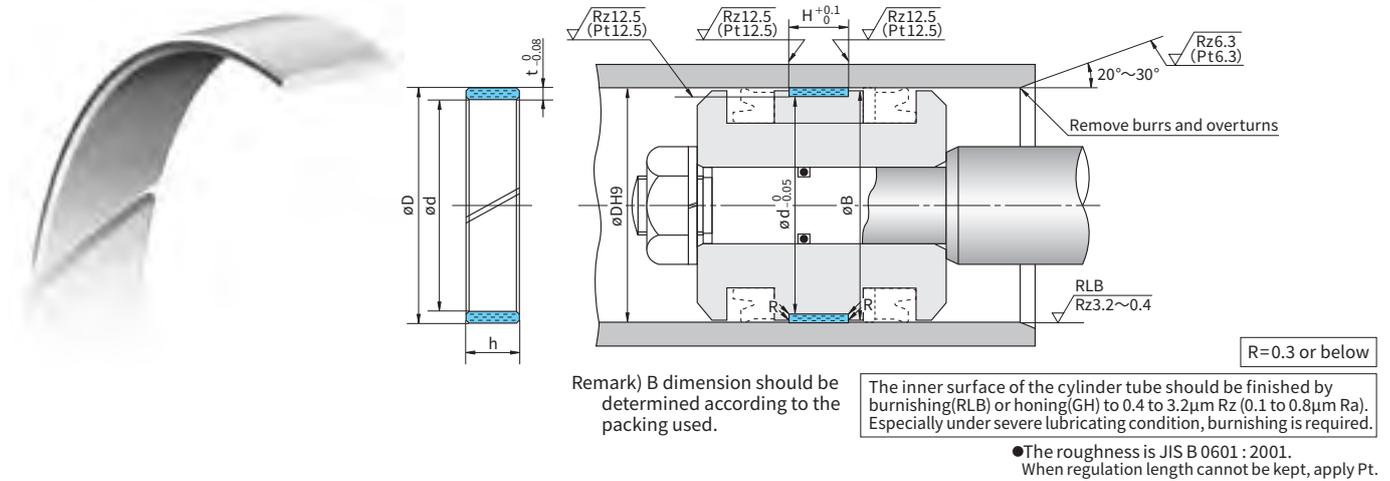
Wear Ring (for U type packings)

WRtype

Material	NOK sign
Fabric reinforced phenolic resin	12RS

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GW0241P0
 Type:WR, Inner diameter:14, Outer diameter:18, Height:8

● Please check the application range on pages 14 and 15 before selecting the type.



Nominal number	Nominal size of wear ring, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	t (Thickness)	H	
WR 18	14	18	8	2	8	GW0241P0
19.2	15.2	19.2	8	2	8	GW0242P0
20	16	20	8	2	8	GW0243P0
22	18	22	8	2	8	GW0244P0
24	20	24	8	2	8	GW0245P0
25	21	25	8	2	8	GW0246P0
26	22	26	8	2	8	GW0247P0
28	24	28	8	2	8	GW0248P0
30	26	30	8	2	8	GW0249P0
31	27	31	8	2	8	GW0250P0
31.5	27.5	31.5	8	2	8	GW0251P0
33	29	33	10	2	10	GW0252P0
35	31	35	10	2	10	GW0253P0
35.5	31.5	35.5	10	2	10	GW0255P0
38	34	38	10	2	10	GW0256P0
40	36	40	10	2	10	GW0257P0
41	37	41	15	2	15	GW0258P0
43	38	43	15	2.5	15	GW0259P0
44.5	39.5	44.5	15	2.5	15	GW0260P0
45	40	45	15	2.5	15	GW0261P0
50	45	50	15	2.5	15	GW0006P1
55	50	55	15	2.5	15	GW0264P0
56	51	56	15	2.5	15	GW0010P1
60	55	60	15	2.5	15	GW0012P1
61	56	61	15	2.5	15	GW0267P0
63	58	63	15	2.5	15	GW0268P0
65	60	65	20	2.5	20	GW0269P0
66	61	66	20	2.5	20	GW0270P0
69	64	69	20	2.5	20	GW0271P0
70	65	70	20	2.5	20	GW0019P1
71	66	71	20	2.5	20	GW0192P1
75	70	75	20	2.5	20	GW0021P1
76	71	76	20	2.5	20	GW0746P0
80	75	80	20	2.5	20	GW0027P1
85	79	85	25	3	25	GW0030P1
90	84	90	25	3	25	GW0036P1
95	89	95	25	3	25	GW0167P1
100	94	100	25	3	25	GW0041P3
105	99	105	25	3	25	GW0278P0
110	104	110	25	3	25	GW0051P1

Wear Ring (for U type packings)

WR type

5

Material	NOK sign
Fabric reinforced phenolic resin	12RS

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GW0280P0
 Type:WR, Inner diameter:106, Outer diameter:112, Height:30

● Please check the application range on pages 14 and 15 before selecting the type.

Nominal number	Nominal size of wear ring, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	t (Thickness)	H	
WR 112	106	112	30	3	30	GW0280P0
115	109	115	30	3	30	GW0055P2
120	114	120	30	3	30	GW0059P1
125	119	125	30	3	30	GW0283P0
130	123	130	30	3.5	30	GW0065P1
132	125	132	35	3.5	35	GW0285P0
140	133	140	35	3.5	35	GW0075P1
150	143	150	35	3.5	35	GW0086P1
157	150	157	40	3.5	40	GW0287P0
160	153	160	40	3.5	40	GW0093P2
165	157	165	45	4	45	GW0289P0
170	162	170	45	4	45	GW0290P0
180	172	180	45	4	45	GW0104P1
185	177	185	45	4	45	GW0292P0
190	182	190	45	4	45	GW0293P0
200	192	200	45	4	45	GW0109P1
205	197	205	50	4	50	GW0181P1
210	202	210	50	4	50	GW0296P0
220	212	220	50	4	50	GW0297P0
224	216	224	50	4	50	GW0298P0
225	217	225	50	4	50	GW0115P1
230	222	230	55	4	55	GW0300P0
240	232	240	55	4	55	GW0301P0
250	242	250	55	4	55	GW0122P1
260	252	260	60	4	60	GW0303P0
270	262	270	60	4	60	GW0304P0
275	267	275	60	4	60	GW0305P0
290	282	290	70	4	70	GW0307P0
297	289	297	70	4	70	GW0308P0
300	292	300	70	4	70	GW0309P0
312	304	312	70	4	70	GW0310P0
332	324	332	70	4	70	GW0311P0

WR

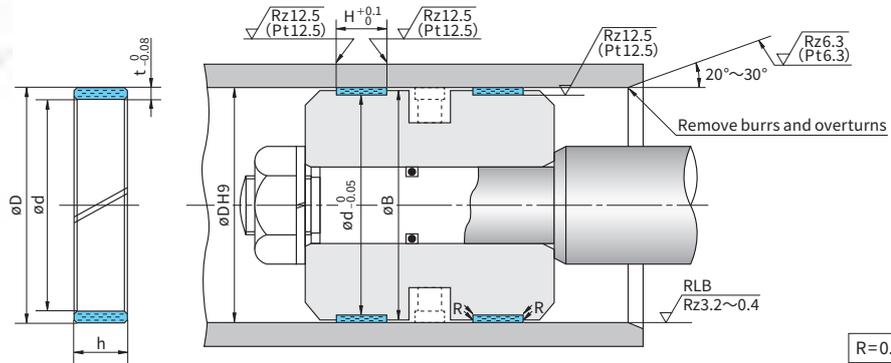
Wear Ring (for packings of SPG and SPGW type)

WR_{type}

Material	NOK sign
Fabric reinforced phenolic resin	12RS

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GW0249P0
 Type:WR, Inner diameter:26, Outer diameter:30, Height:8

● Please check the application range on pages 14 and 15 before selecting the type.



Remark) B dimension should be determined according to the packing used.

The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal number	Nominal size of wear ring, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	t (Thickness)	H	
WR 30W	26	30	8	2	8	GW0249P0
31.5W	27.5	31.5	8	2	8	GW0251P0
32W	28	32	8	2	8	GW0314P0
35W	31	35	8	2	8	GW0315P0
35.5W	31.5	35.5	8	2	8	GW0316P0
40W	36	40	8	2	8	GW0317P0
45W	40	45	8	2.5	8	GW0318P0
50W	45	50	8	2.5	8	GW0279P0
55W	50	55	8	2.5	8	GW0319P0
56W	51	56	8	2.5	8	GW0320P0
60W	55	60	8	2.5	8	GW0321P0
63W	58	63	8	2.5	8	GW0322P0
65W	60	65	10	2.5	10	GW0323P0
69W	64	69	10	2.5	10	GW0324P0
70W	65	70	10	2.5	10	GW0018P1
71W	66	71	10	2.5	10	GW0326P0
75W	70	75	10	2.5	10	GW0327P0
80W	75	80	10	2.5	10	GW0025P1
85W	79	85	15	3	15	GW0329P0
90W	84	90	15	3	15	GW0330P0
95W	89	95	15	3	15	GW0331P0
100W	94	100	15	3	15	GW0332P0
108W	102	108	15	3	15	GW0333P0
110W	104	110	15	3	15	GW0334P0
112W	106	112	15	3	15	GW0335P0
120W	114	120	15	3	15	GW0336P0
125W	119	125	15	3	15	GW0337P0
130W	123	130	15	3.5	15	GW0338P0
140W	133	140	20	3.5	20	GW0339P0
150W	143	150	20	3.5	20	GW0340P0
160W	153	160	20	3.5	20	GW0341P0
170W	162	170	25	4	25	GW0342P0
180W	172	180	25	4	25	GW0343P0
190W	182	190	25	4	25	GW0344P0
200W	192	200	25	4	25	GW0345P0
204W	196	204	25	4	25	GW0346P0
210W	202	210	25	4	25	GW0347P0
224W	216	224	25	4	25	GW0348P0
225W	217	225	25	4	25	GW0349P0
230W	222	230	30	4	30	GW0350P0
240W	232	240	30	4	30	GW0351P0
250W	242	250	30	4	30	GW0352P0

Wear Ring (Combined piston/rod)

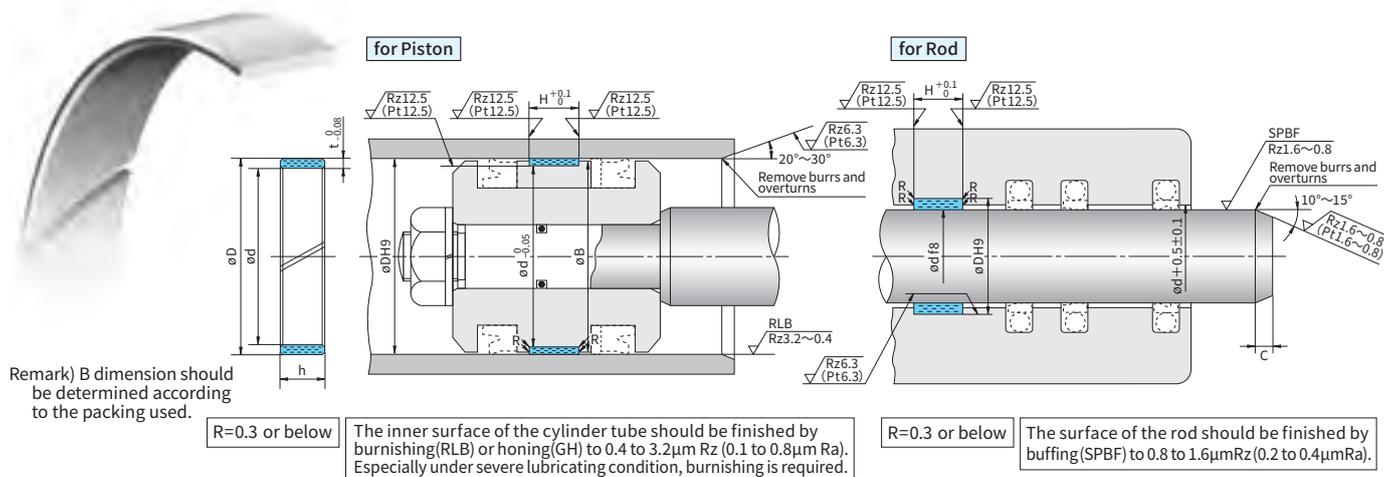
WR type

5

Material	NOK sign
Resin fiber polyester	88RS

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GW1375V0
 Type: WR, Inner diameter: 18, Outer diameter: 21.1, Height: 3.9

● Please check the application range on pages 14 and 15 before selecting the type.



●The roughness is JIS B 0601 : 2001. When regulation length cannot be kept, apply Pt.

Nominal number	Nominal size of wear ring, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	t (Thickness)	H	
WR 18 -21.1LC	18	21.1	3.9	1.55	4	GW1375V0
22.4-25.5LC	22.4	25.5	3.9	1.55	4	GW1376V0
22.4-27.4LD	22.4	27.4	5.5	2.5	5.6	GW1279V0
28 -31.1LC	28	31.1	3.9	1.55	4	GW1377V0
28 -33 LD	28	33	5.5	2.5	5.6	GW1280V0
35 -40 LD	35	40	5.5	2.5	5.6	GW1281V0
35.5-40.5LD	35.5	40.5	5.5	2.5	5.6	GW1355V0
35.5-40.5LA	35.5	40.5	9.5	2.5	9.7	GW1282V0
45 -50 LD	45	50	5.5	2.5	5.6	GW1283V0
45 -50 LA	45	50	9.5	2.5	9.7	GW1284V0
56 -61 LD	56	61	5.5	2.5	5.6	GW1356V0
56 -61 LA	56	61	9.5	2.5	9.7	GW1285V0
58 -63 LD	58	63	5.5	2.5	5.6	GW1345V0
58 -63 LA	58	63	9.5	2.5	9.7	GW1286V0
63 -68 LD	63	68	5.5	2.5	5.6	GW1357V0
63 -68 LA	63	68	9.5	2.5	9.7	GW1287V0
67 -72 LD	67	72	5.5	2.5	5.6	GW1358V0
67 -72 LA	67	72	9.5	2.5	9.7	GW1288V0
71 -76 LD	71	76	5.5	2.5	5.6	GW1359V0
71 -76 LA	71	76	9.5	2.5	9.7	GW1289V0
75 -80 LD	75	80	5.5	2.5	5.6	GW1335V0
75 -80 LA	75	80	9.5	2.5	9.7	GW1290V0
80 -85 LA	80	85	9.5	2.5	9.7	GW1360V0
80 -85 LB	80	85	14.8	2.5	15.0	GW1291V0
85 -90 LA	85	90	9.5	2.5	9.7	GW1320V0
85 -90 LB	85	90	14.8	2.5	15.0	GW1292V0
90 -95 LA	90	95	9.5	2.5	9.7	GW1361V0
90 -95 LB	90	95	14.8	2.5	15.0	GW1293V0
95 -100 LD	95	100	5.5	2.5	5.6	GW1346V0
95 -100 LA	95	100	9.5	2.5	9.7	GW1294V0
100 -105 LA	100	105	9.5	2.5	9.7	GW1362V0
100 -105 LB	100	105	14.8	2.5	15.0	GW1295V0
112 -117LA	112	117	9.5	2.5	9.7	GW1363V0
112 -117LB	112	117	14.8	2.5	15.0	GW1296V0
120 -125 LA	120	125	9.5	2.5	9.7	GW1347V0
120 -125 LB	120	125	14.8	2.5	15.0	GW1297V0
125 -130 LA	125	130	9.5	2.5	9.7	GW1364V0
125 -130 LB	125	130	14.8	2.5	15.0	GW1298V0
135 -140 LA	135	140	9.5	2.5	9.7	GW1348V0
135 -140 LB	135	140	14.8	2.5	15.0	GW1299V0

WR

Wear Ring (Combined piston/rod)

WR_{type}

Material	NOK sign
Resin fiber polyester	88RS

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GW1365V0
 Type:WR, Inner diameter:140, Outer diameter:145,
 Height:14.8

● Please check the application range on pages 14 and 15 before selecting the type.

Nominal number	Nominal size of wear ring, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	t (Thickness)	H	
WR 140 - 145 LB	140	145	14.8	2.5	15.0	GW1365V0
140 - 145 LE	140	145	24.5	2.5	25.0	GW1300V0
145 - 150 LA	145	150	9.5	2.5	9.7	GW1349V0
145 - 150 LB	145	150	14.8	2.5	15.0	GW1301V0
155 - 160 LA	155	160	9.5	2.5	9.7	GW1350V0
155 - 160 LB	155	160	14.8	2.5	15.0	GW1302V0
160 - 165 LB	160	165	14.8	2.5	15.0	GW1366V0
160 - 165 LE	160	165	24.5	2.5	25.0	GW1303V0
175 - 180 LB	175	180	14.8	2.5	15.0	GW1351V0
175 - 180 LE	175	180	24.5	2.5	25.0	GW1304V0
180 - 185 LB	180	185	14.8	2.5	15.0	GW1367V0
180 - 185 LE	180	185	24.5	2.5	25.0	GW1305V0
195 - 200 LB	195	200	14.8	2.5	15.0	GW1352V0
195 - 200 LE	195	200	24.5	2.5	25.0	GW1306V0
219 - 224 LB	219	224	14.8	2.5	15.0	GW1353V0
219 - 224 LE	219	224	24.5	2.5	25.0	GW1307V0
245 - 250 LB	245	250	14.8	2.5	15.0	GW1354V0
245 - 250 LE	245	250	24.5	2.5	25.0	GW1308V0

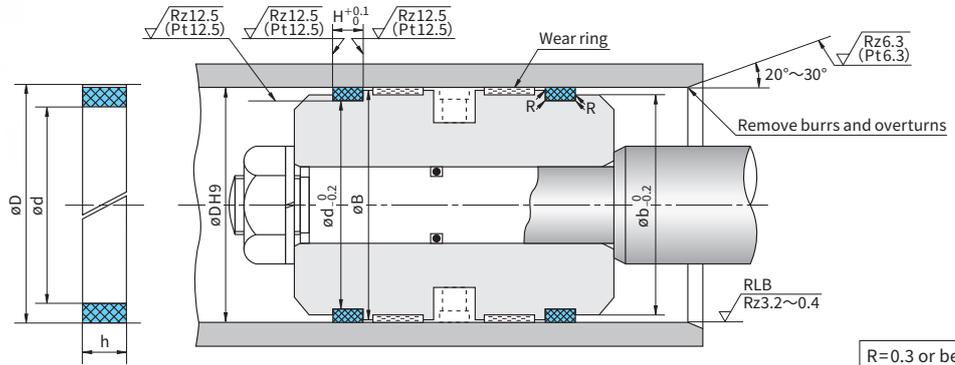
KZT type

5

Material	NOK sign
Rareflon (PTFE)	05ZF

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GZ3000V0
 Type: KZT, Inner diameter: 14, Outer diameter: 20, Height: 5

● Please check the application range on pages 14 and 15 before selecting the type.



Remark) B dimension should be determined according to the packing used.

The inner surface of the cylinder tube should be finished by burnishing (RLB) or honing (GH) to 0.4 to 3.2µm Rz (0.1 to 0.8µm Ra). Especially under severe lubricating condition, burnishing is required.

● The roughness is JIS B 0601 : 2001.
 When regulation length cannot be kept, apply Pt.

Nominal number	Nominal size of contami seal, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	øb	
KZT 20	14	20	5	5.2	18	GZ3000V0
25	19	25	5	5.2	23	GZ3001V0
30	24	30	5	5.2	28	GZ3002V0
31.5	25.5	31.5	5	5.2	29.5	GZ3003V0
32	26	32	5	5.2	30	GZ3004V0
35	29	35	5	5.2	33	GZ3005V0
35.5	29.5	35.5	5	5.2	33.5	GZ3006V0
40	34	40	5	5.2	38	GZ3007V0
45	39	45	5	5.2	43	GZ3008V0
50	44	50	5	5.2	48	GZ3009V0
53	47	53	5	5.2	51	GZ3010V0
55	49	55	5	5.2	53	GZ3011V0
56	50	56	5	5.2	54	GZ3012V0
60	54	60	5	5.2	58	GZ3013V0
63	55	63	6	6.2	61	GZ3014V0
65	57	65	6	6.2	63	GZ3015V0
70	62	70	6	6.2	68	GZ3016V0
71	63	71	6	6.2	69	GZ3017V0
75	67	75	6	6.2	73	GZ3018V0
80	72	80	6	6.2	78	GZ3019V0
85	77	85	6	6.2	83	GZ3020V0
90	82	90	6	6.2	88	GZ3021V0
95	87	95	6	6.2	93	GZ3022V0
100	92	100	6	6.2	98	GZ3023V0
105	97	105	6	6.2	103	GZ3024V0
110	102	110	6	6.2	108	GZ3025V0
112	104	112	6	6.2	110	GZ3026V0
115	107	115	6	6.2	113	GZ3027V0
120	112	120	6	6.2	118	GZ3028V0
125	117	125	6	6.2	123	GZ3029V0
130	122	130	6	6.2	128	GZ3030V0
135	127	135	6	6.2	133	GZ3031V0
140	132	140	6	6.2	138	GZ3032V0
150	142	150	6	6.2	148	GZ3033V0
160	152	160	6	6.2	158	GZ3034V0
170	162	170	8	8.2	168	GZ3035V0
180	172	180	8	8.2	178	GZ3036V0
190	182	190	8	8.2	188	GZ3037V0
200	192	200	8	8.2	198	GZ3038V0
210	202	210	8	8.2	208	GZ3039V0
220	212	220	8	8.2	218	GZ3040V0

KZT

Contami Seals

KZT type

Material	NOK sign
Rareflon (PTFE)	05ZF

■ Please designate NOK part number and type & size on your order.
Example NOK part number: GZ3041V0
 Type: KZT, Inner diameter: 216, Outer diameter: 224, Height: 8

● Please check the application range on pages 14 and 15 before selecting the type.

Nominal number	Nominal size of contami seal, and housing dimensions					NOK part number
	d (Inner diameter)	D (Outer diameter)	h (Height)	H	øb	
KZT 224	216	224	8	8.2	222	GZ3041V0
230	222	230	8	8.2	228	GZ3042V0
240	232	240	8	8.2	238	GZ3043V0
250	242	250	8	8.2	248	GZ3044V0
260	252	260	8	8.2	258	GZ3045V0
270	262	270	8	8.2	268	GZ3046V0
280	272	280	8	8.2	278	GZ3047V0
290	282	290	8	8.2	288	GZ3048V0
300	292	300	8	8.2	298	GZ3049V0
310	302	310	8	8.2	308	GZ3050V0
320	312	320	8	8.2	318	GZ3051V0
340	332	340	8	8.2	338	GZ3052V0
350	342	350	8	8.2	348	GZ3053V0
360	352	360	8	8.2	358	GZ3054V0

6. Handling and Installation of NOK Packings

(1) Remarks for designing cylinders

a. Cylinder tube material

The materials described in Table 6-1 are generally used for cylinders. Aluminum alloy, bronze, brass, Monel metal and soft stainless steel may be used for low-pressure applications depending on circumstances. They are not recommended for use over long periods of time due to poor wear resistance. The following table shows the materials specified by JIS.

<Table 6-1>

Type	Material
Material for tubes	JIS G 3473 (Carbon steel pipe for cylinder tubes) JIS G 3445 (Carbon steel pipe for mechanical structures)
Material for rods	JIS G 4051 (Carbon steel material for mechanical structures)

b. Inside cylinder face finish and roughness

Generally, a honed finish and a burnishing finish are recommended for the inside face of the cylinder tube. Avoid finishing the face with a pattern aligned in a lateral direction. Specially, under severe lubricating application, burnishing is required. NOK uses 0.4 - 3.2 μ m Rz (0.1 - 0.8 μ m Ra) as the inside face finish on a cylinder tube as standard.

c. Rod surface and roughness

0.8 ~ 1.6 μ m Rz (0.2 ~ 0.4 μ m Ra) with buff finish, after heat treatment, plating the steel with hard chrome is recommended for rod surface. Never use decorative nickel plating or chrome. Cylinder rod used for construction machinery is likely to be scored by sands or pebbles, so minimum hardness should be 60 (HRC).

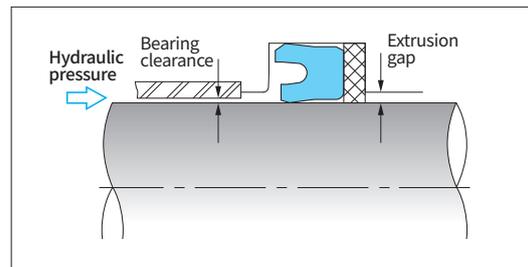
d. Roughness of inside face of fitting groove

Since a rough inside face of the fitting groove affects the sealing of a packing, use a finish value mentioned on the Dimensional Table. In fitting the packing, it is easily scratched, so finish the top end of the groove completely removing any burrs, sharp edges and scars.

e. Bearing clearance and extrusion gap

Since sealing performance is greatly affected by extrusion gap and bearing clearance, design should be set as small as possible. (See Dimensional Table for bearing clearance and extrusion gap)

Never use a packing in such a way that the packing replaces a bearing.



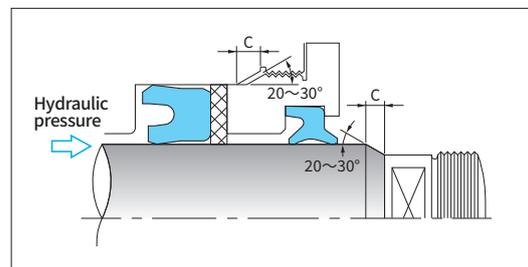
<Fig. 6-1>

f. Design of packing insertion port

There is an interference on the I.D. and O.D. of the packing to achieve sealing performance. When installing a packing in a cylinder, the lip of the packing, its most important part, is easily damaged, if the size and construction of the chamfered edge of the insertion port are poor^{*}.

Especially, apply stepped design to any threaded part as shown in Fig. 6-2. (See Dimensional Table for size).

^{*}Key grooves, splines, etc.



<Fig. 6-2>

(2) Installation of Packings

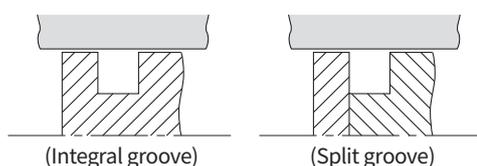
When installing packings, fitting construction differs from one to another depending on the type of packing. The installation method will also vary. It is possible to install a packing with a small profile design and a combination

seal in an integral groove, but in other cases, it is necessary to use a split groove construction, the detail of which is mentioned in each page shown in Table 6-2. See Dimensional Table for construction of the fitting groove.

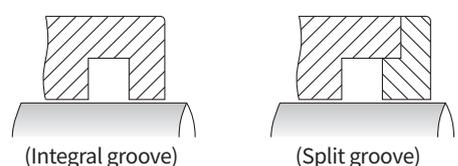
<Table 6-2> List of installation methods

Type	Construction of groove	Iron rubber U packing	Nitrile rubber U packing	Combined seal	Other packing
Packings for piston seals (Installation example (2)-1)	Integral groove ^(Note)	Installation method A (Page 129)	Installation method B (Page 129)	Installation method C (Page 129~131)	C packing: Installation example (2)-3 (Page 133)
	Split groove	A packing can be installed easily. Installation method D (Page 131)			
Packings for rod seals (Installation example (2)-2)	Integral groove ^(Note)	Installation method E (Page 132)	Installation method F (Page 132)	Installation method G (Page 132~133)	Buffer ring: Installation example (2)-4 (Page 134)
	Split groove	A packing can be installed easily. Installation method H (Page 133)			

(Example of structure of fitting groove for piston packing)



(Example of structure of fitting groove for rod packing)



Note 1) Some of the parts with a small diameter cannot be installed in an integral groove. Kindly check with Dimensional Table.

Note 2) Install the U packing in such a direction that its lip comes to oil pressure side as it is shown on Fig. 6-1 and Fig. 6-2.

Note 3) If difficult to assemble, soak the rubber in oil (the oil you normally use) at around 60°C for around ten minutes and soak the Rareflon in either hot water or oil at around 60°C for around ten minutes. This will make it easier to assemble.

Installation example (2)-1 Packings for piston seals

Method A. Installation of iron rubber U packing into integral groove

(Main applicable types: OSI, OUIS, USI)

Some of the parts with a small diameter cannot be installed in an integral groove. Refer to the Dimension Table.

Installation method

- ① Prepare a pivot with an arm which corresponds to the diameter of the piston rod.
- ② First of all, be sure to apply hydraulic oil to ensure easy installation of the packing on the piston rod.
- ③ Fit part of a packing into the installation groove as shown in Fig. 6-3.
- ④ Hold the packing with the thumb, then install the pivot into the hole as shown in Fig. 6-4.
- ⑤ Rotate the packing once pressing down the arm handle as shown in Fig. 6-5.



<Fig. 6-3>



<Fig. 6-4>



<Fig. 6-5>

Method B. Installation of a nitrile rubber U packing in an integral groove

(Main applicable types: OUHR, USH)

Some of the parts with a small diameter cannot be installed in an integral groove. Refer to the Dimension Table.

Installation method

The packing can be easily installed by inserting it in one side of the groove and stretching the other side of the packing to fit in place. (Fig. 6-6)



<Fig. 6-6>

Method C. Installation of combination seals in an integral groove

(Main applicable types: SPG, SPGO, SPGW)

In case of combined seals, correction of Rareflon ring is necessary after installing the back ring and the Rareflon ring into the integral groove.

Installation method and correction method are explained below.

Installation method



<Fig. 6-7>



<Fig. 6-8>

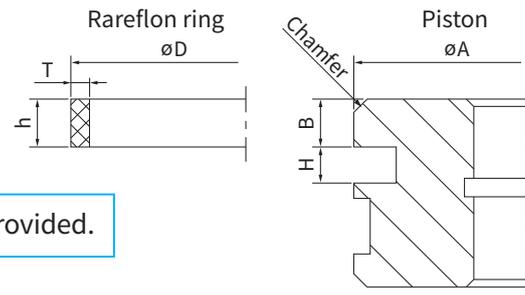


<Fig. 6-9>

- ① Prepare a slide tool and push-in tools shown in the figure. Flush clean the inside face of the cylinder and the fitting groove before installation.
- ② Install the back ring into the fitting groove. Never over stretch or over bend the back ring when installing it.
- ③ Fit the slide tool in the piston. Then quickly push in the Rareflon ring using push-in tool.

[Installation tools for rareflon ring]

Shapes of tools used for installation and correction of the Rareflon ring are as follows. Sizes for each part of the push-in and slide tools are according to the sizes of the Rareflon ring (D, T, h) and the piston (ϕA , B, H, chamfer).

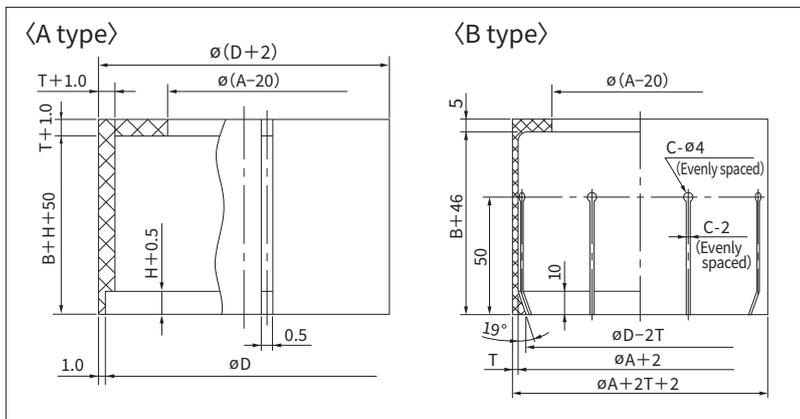


NOK could supply Gigs if ϕA , B, H and chamfer dimension are provided.

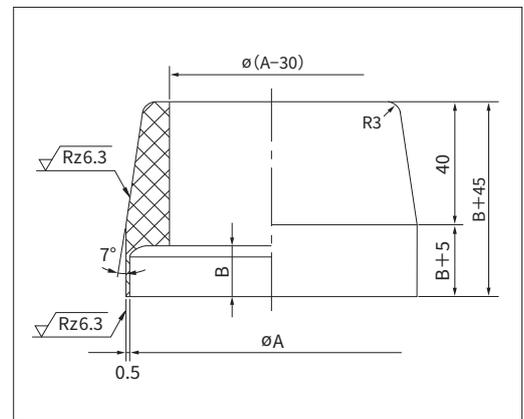
<Table 6-3>

SPG packing*		SPGO packing		SPGW packing	
ϕD	T	ϕD	T	ϕD	T
30~35.5	1.6	20~25	1.0	50~60	2.3
36~60	1.9	30~60	1.25	61~120	2.5
61~100	2.4	61~160	2.0	121~200	3.5
101~160	2.9	161~200	2.5	—	—
161~200	3.5	—	—	—	—

*For installation tools with packing greater than $\phi 200$, consult NOK separately.



<Fig. 6-10> Push-in tool (Made of resin)



<Fig. 6-11> Slide tool (Made of metallic)

- ※A type is the standard article.
- ※B type is easier to assemble.
- ※Guide to number of slits on B type is provided below.

ϕD	Slits (Evenly spaced)
Up to 50	4
Over 50 to 100	6
Over 100 to 200	8

a. Correction method of rareflon ring

Correction method 1.

For combination seals, correct the Rareflon ring after installing the back ring and the Rareflon ring in the fitting groove. For SPGW packings, carry out the correction. Where correction

method 1 is insufficient, use correction method 2. On the other hand, carry out correction according to the correction method 2 for packings whose nominal numbers exceed 400.



<Fig. 6-12>



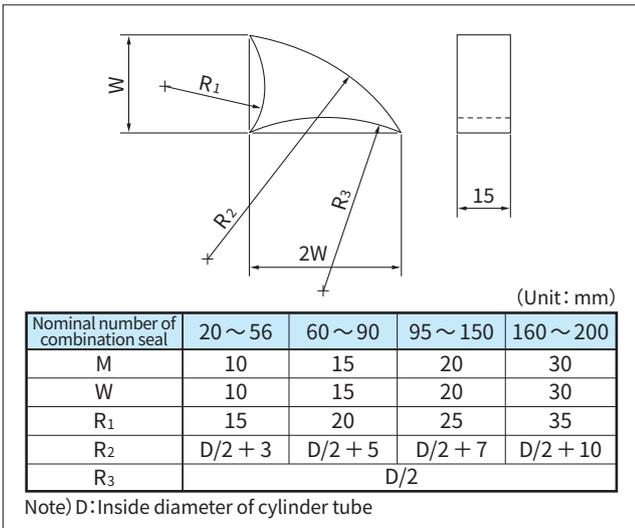
<Fig. 6-13>



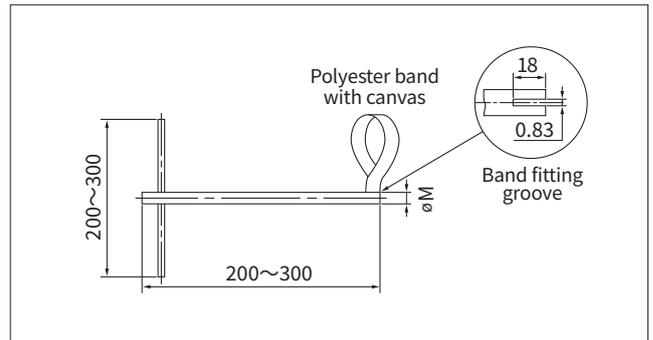
<Fig. 6-14>

- ① Prepare a twist bar and adapter as shown in the figure. Set the twist bar and adapter as shown, then set the Rareflon ring in the center of the band.
- ② Hold for 10 seconds or more.
- ③ Installation is completed by the above steps. The internal and external circumference faces of the Rareflon ring affect sealing performance, so be careful not to scratch the ring.

[JIG for correction method 1]



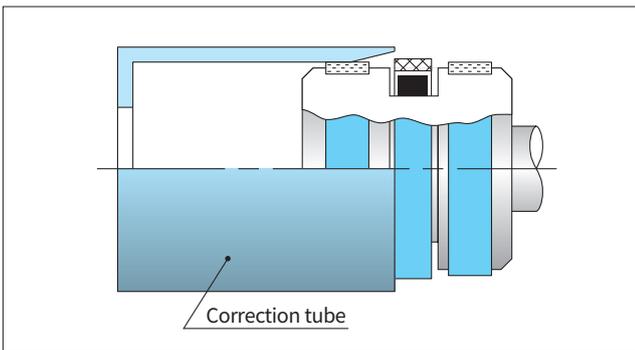
〈Fig. 6-15〉 Adapter (Rareflon)



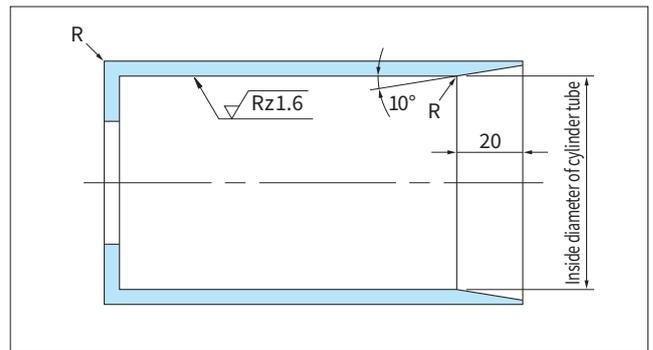
〈Fig. 6-16〉 Twist bar (Metal and Polyester band with canvas)

Push-in jig, slide jig, adapter, twist bar, and correction tube are manufactured by NOK. Order with us.

Correction method 2.



〈Fig. 6-17〉



〈Fig. 6-18〉 Correction tube (metal)

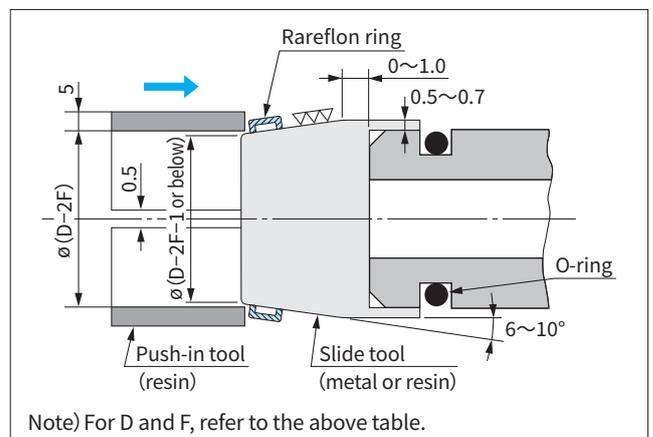
- ① Prepare a correction tube shown in Fig. 6-17.
- ② Insert a piston after applying hydraulic oil (oil actually used) and pull the piston mount after having left it there for about 10 seconds.

b.SPGC type packings

For SPGC packings having inside diameter below $\phi 50$, use divided grooves generally. When the divided groove is not available or for inside diameter of the cylinder tube $\phi 50$ or more, first install O-ring in the fitting groove and then install the Rareflon ring with a tool shown in the figure.

D	F
~ Below 56	1.3
58 ~ 160	1.5
165 ~ 400	2.0

If cannot be installed in a split groove, please consult NOK.



Note) For D and F, refer to the above table.

〈Fig. 6-19〉

Method D. Installation into divided groove

(Applicable to packings for piston seals in general)

No special tool is required for installation into a divided groove. Packings can be easily installed by hand.

Be careful not to scratch the packing by the fitting groove or angle.

Installation example (2)-2 Packings for rod seals

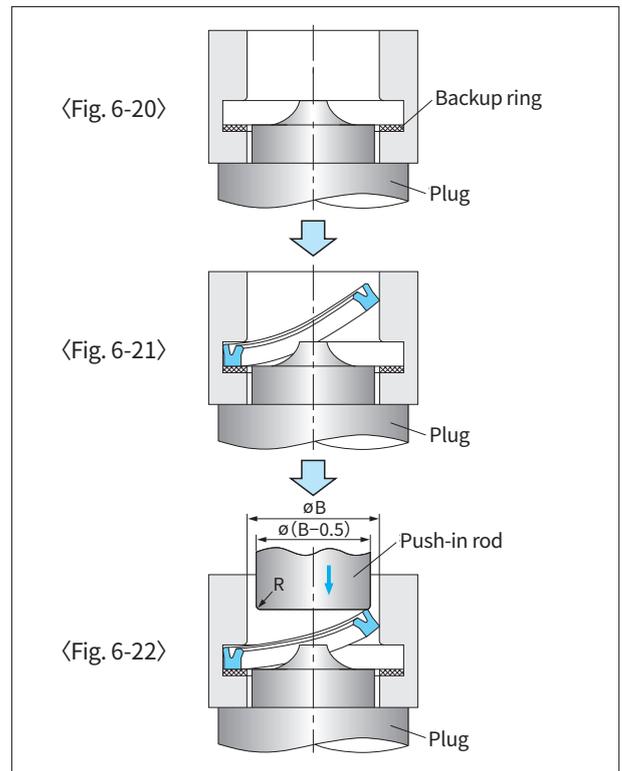
Method E. Installation of iron rubber U packing into integral groove (Main applicable types: ISI, IUIS, USI)

Some of the parts with a small diameter cannot be installed in an integral groove. Refer to the Dimension Table.

Installation method

- ① When using a backup ring together, first install the buffer ring into the fitting groove as shown in Fig. 6-20.
- ② Prepare special plugs and push-in rods suitable for respective diameters. Use soft resin for material and it is necessary to make the upper parts of the tools slide into the packings smoothly. Fit the packing by hand as shown on Fig. 6-21.
- ③ When the uppermost part of the packing is pushed in with a special push-in rod, the packing can be installed easily in the fitting groove, making a "Click" noise.

Processes shown in Fig. 6-21 and Fig. 6-22 should be completed as quickly as possible in order to prevent a permanent deformation of the packing. Be careful not to stop or interrupt the operation in the middle.



Method F. Installation of nitrile rubber U packing into integral groove (Main applicable types: IUH, USH)

Some of the parts with a small diameter cannot be installed in an integral groove. Refer to the Dimension Table.

Installation method

- ① Deform the packing into a heart-shape with the fingers as shown in Fig. 6-23. At this moment, be careful not to "scratch" the packing with "nails".

Install the packing as quickly as possible in order to prevent permanent deformation.

- ② The packing inserted in the fitting groove may get a little warped, so correct it with a finger or spatula.



<Fig. 6-23>

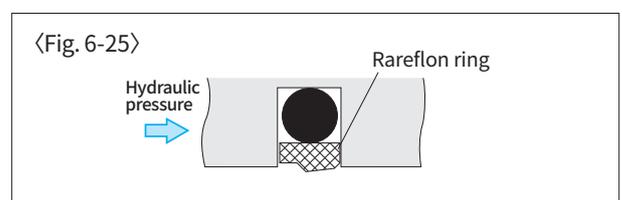
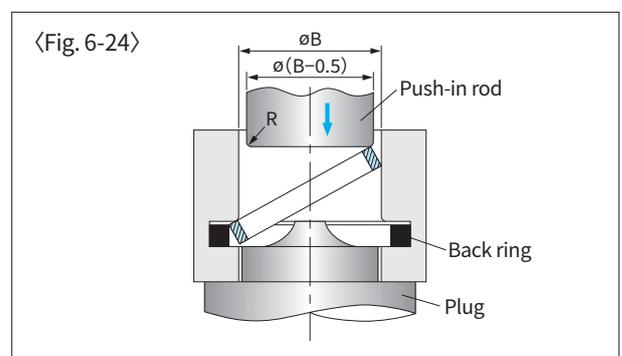
Method G. Installation of combination seal into integral fitting groove (Main applicable types: SPN, SPNO, SPNS)

Combination seals cannot be installed into an integral groove on a rod having a rod diameter below $\phi 50$ (SPNS, rod diameter under $\phi 30$). In the case where the rod diameter exceeds $\phi 50$ (SPNS, the rod diameter exceeds $\phi 30$), take the following steps to install the combination seal.

Installation method 1.

- ① Insert the back ring into the fitting groove.
- ② Prepare special plugs and push-in rods suitable for respective diameters.
- ③ Install the Rareflon ring into one side of the fitting groove as shown in the Fig. 6-24 and push it in with the push-in rod.

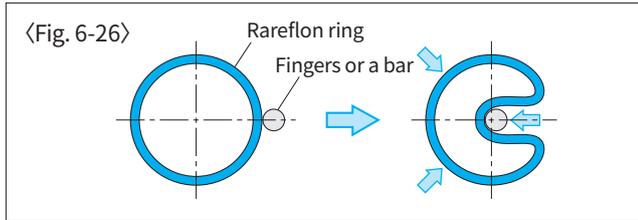
Since SPNS has the directional property, pay attention to the direction in which the rareflon ring is installed. (Fig. 6-25)



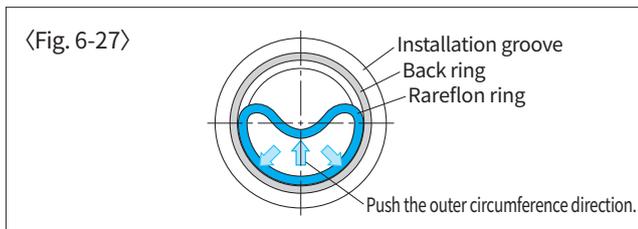
Installation method 2.

When installing the rareflon ring after squeezing it, install it in the following manner. However, minimize any deformations because it affects the sealing characteristics.

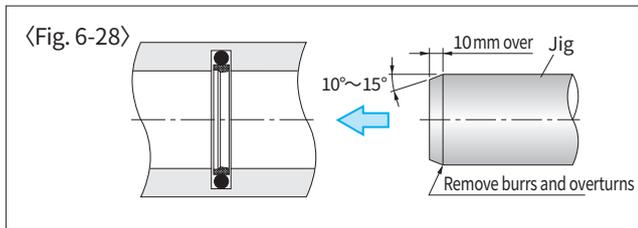
- ① Install the back ring in the mounting groove.
- ② Squeeze the rareflon ring into a heart shape as shown in Fig. 6-26, using fingers or a bar. At this time, be careful not to bend the rareflon ring sharply.



- ③ Insert the rareflon ring into the groove and then push it from the inside in the outer circumference direction so that it returns to the original shape.



- ④ Insert the jig (or the rod) several times to correct the deformation of the inner circumference of the rareflon ring.



Installation example (2)-3 C-shape packings (Applicable types: CPI, CPH)

Design fitting groove of C-shape packing so that the packing is tightened properly as shown in the Figs. 6-30-1 (a), (b) and (c).

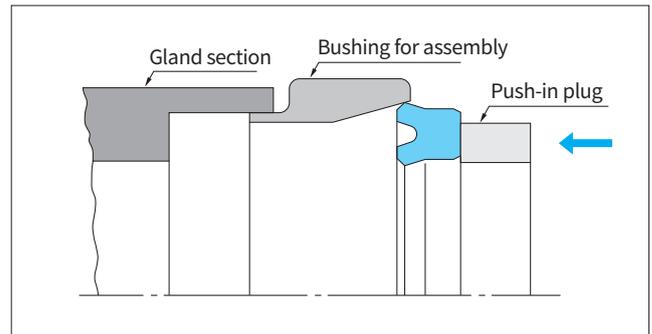
Deformation as shown in Fig. 6-30-2 occurs when the packing is over tightened.

Method H. Installation in split groove

(Applicable to packings for rod seals in general)

a. U packings

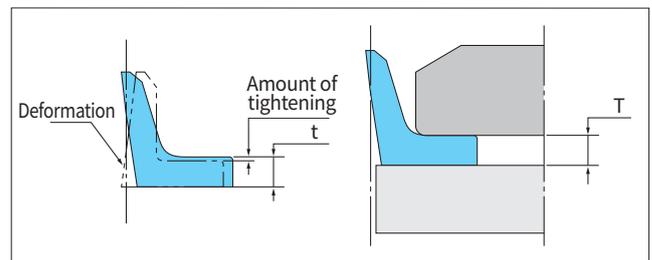
No special tools are required to install U packings from the heel. All packings are easily inserted. When installing U packings from the lip, be particularly careful not to scratch them with the top end of the fitting groove. U packing can be installed by another method using a bushing for assembly and a push-in rod as shown in the Fig. 6-29.



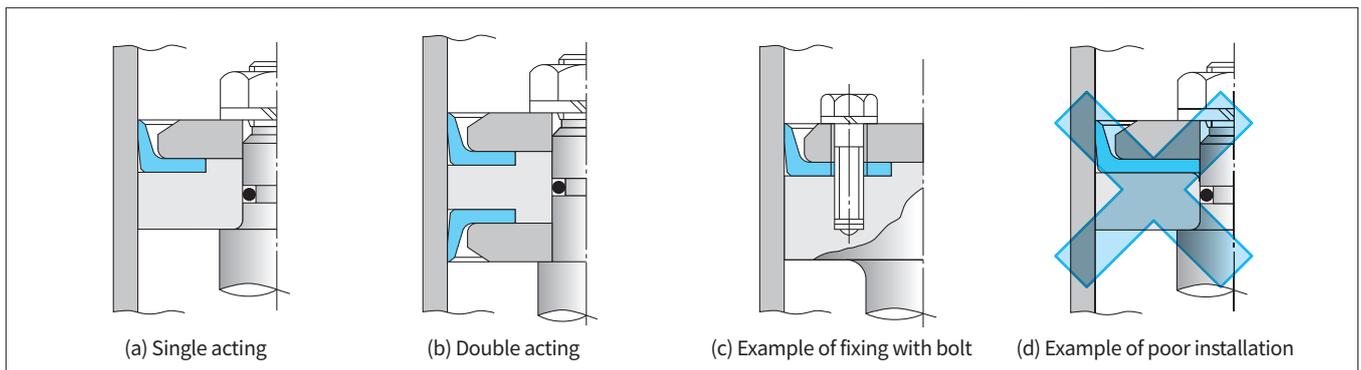
<Fig. 6-29>

b. Installation of combination seal

For installation of SPNC packing, pre-assemble the back ring (O-ring) and Rareflon ring before installation. The back ring and rareflon ring can be installed separately with SPN, SPNO and SPNS types.



<Fig. 6-30-2>



<Fig. 6-30-1>

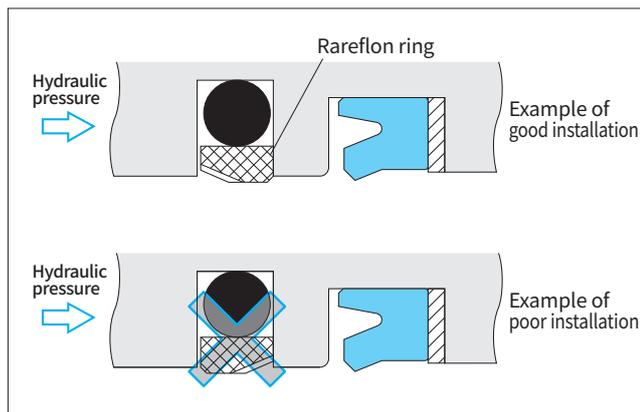
Installation example (2)-4 Buffer rings (Applicable types: HBTS, HBY)

Buffer rings can be installed into integral grooves.

a. HBTS

Install the packing in the same manner as SPN packing, referring to installation method G on pages 132 and 133.

Pay attention to the direction of the Rareflon ring as shown in Fig. 6-31.

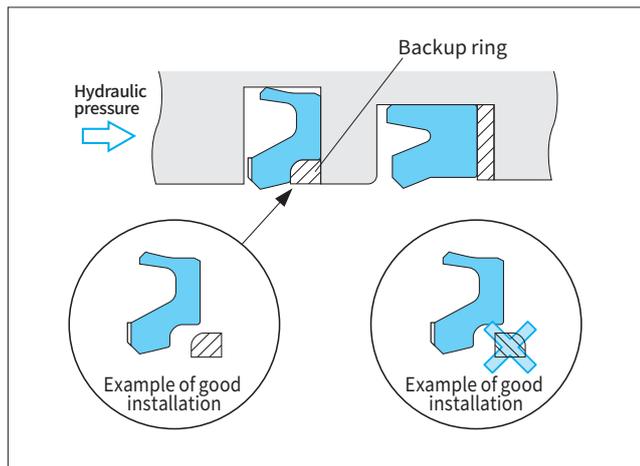


<Fig. 6-31>

b. HBY

Install the packing as deforming into a heart-shape with fingers. Then assembled the back ring.

Pay attention to the direction of the Rareflon backup ring as shown in Fig. 6-32.



<Fig. 6-32>

(3) Installation of dust seals

(Applicable to dust seals in general)

a. DSI, LBI, LBH, LBHK

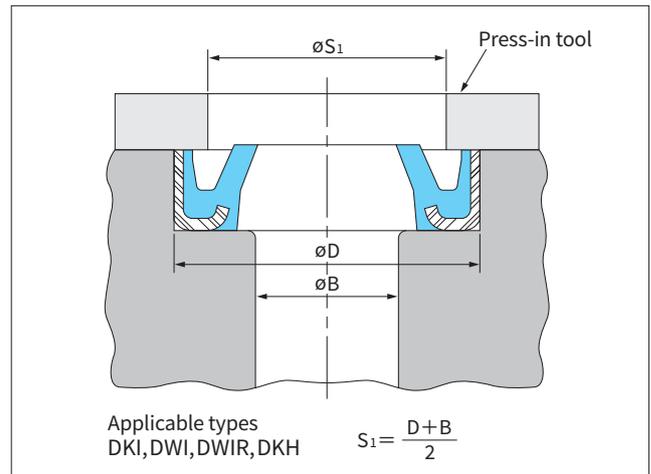
As a dust seal is a single part, squeeze it into a heart shape and install it carefully being careful not to "scratch" it with "fingers". When using LBHK outdoor, apply grease sufficiently to the inside of the installation groove, to prevent rust.

b. DKI, DWI, DWIR, DKBI, DKBI3, DKBZ, DKH, DKB

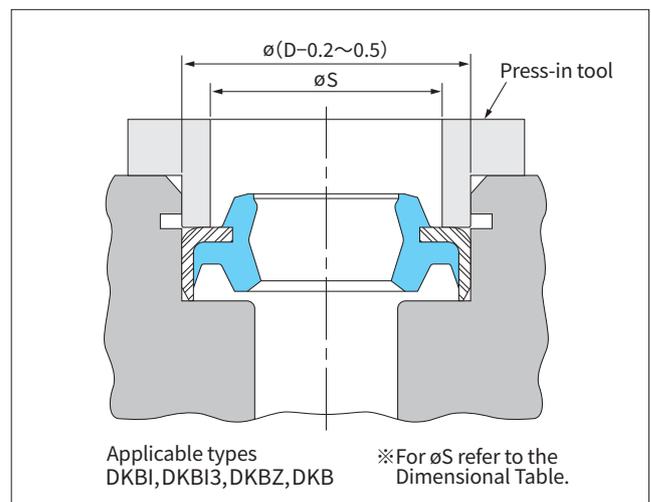
Dust seals are pressed in a fitting groove. Prepare press-in tools as shown in the following figure.

Installation method

- ① Set the dust seal horizontally to the housing hole.
- ② With a press, carefully push in the dust seal using installation tools so as not to deform the dust seal lip nor to incline the dust seal.



<Fig. 6-33>

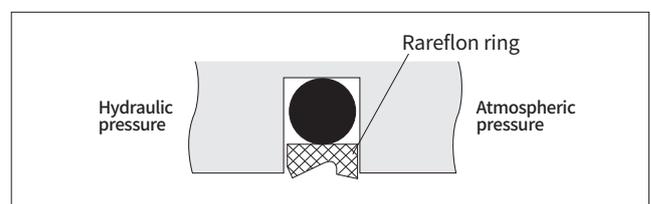


<Fig. 6-34>

c. DSPB

Install the packing in the same manner as SPN packing, referring to installation method G on pages 132 and 133.

Be careful of the direction in which the rareflon ring is installed, as shown in Fig. 6-35.

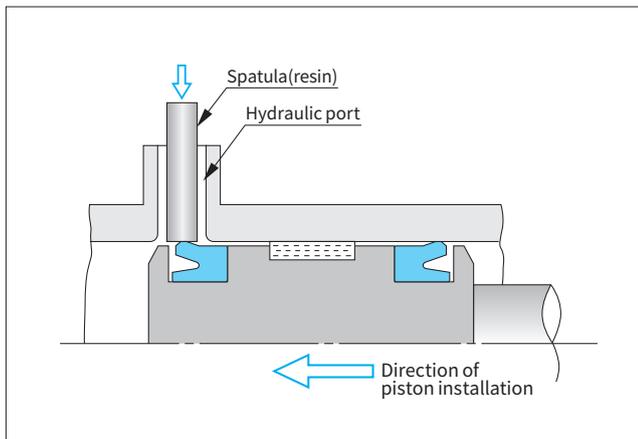


<Fig. 6-35>

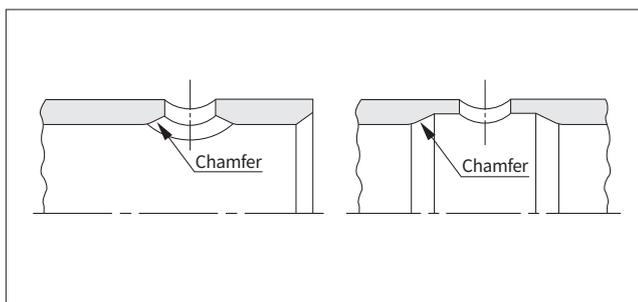
(4) Remarks on assembling cylinders

Sealing performance of a packing is greatly influenced by the method of assembling a cylinder. Please check the following points.

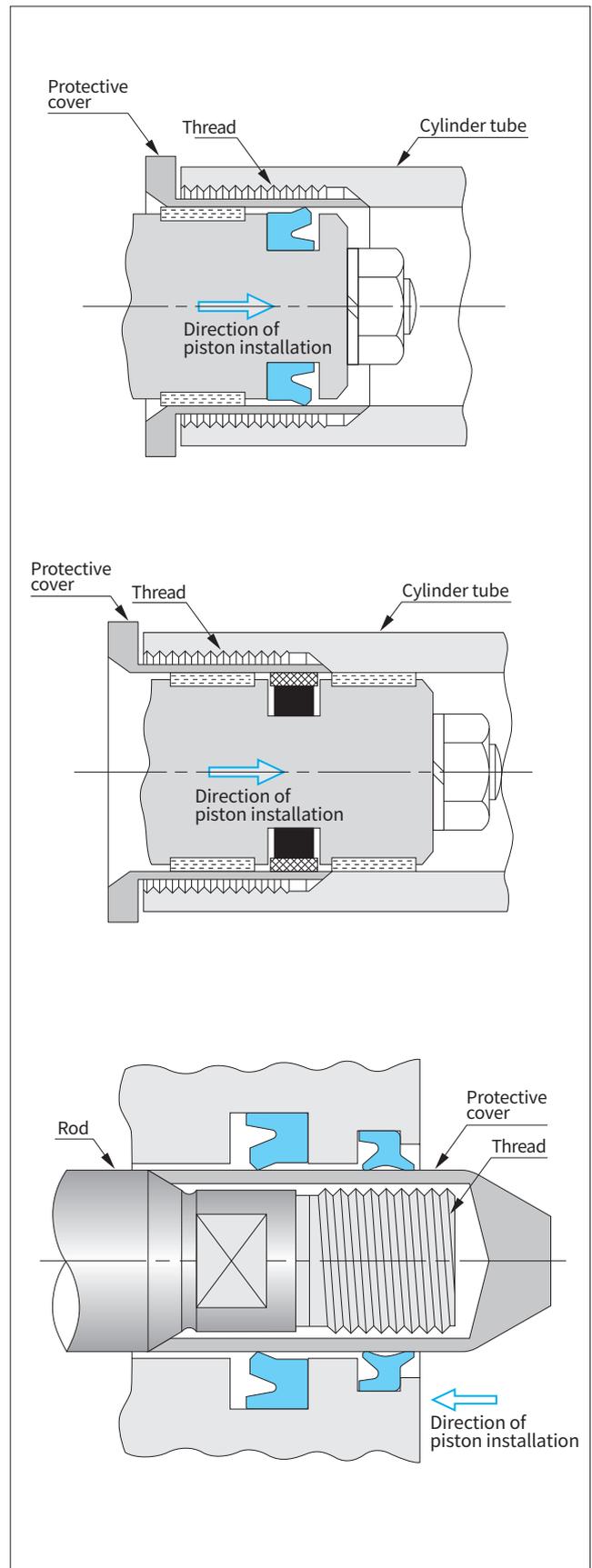
1. Eliminate foreign materials from the internal surface of the cylinder tube and interior of pipes.
 2. When using packings from storage, do not use those that have foreign material such as dust, sand, etc., as this will cause leakage.
 3. Apply hydraulic oil (the same oil used in the machine) to the packing, gland, rod surface and internal face of the cylinder, then assemble the cylinder.
 4. Put a protective cover over the lip of the packing so that it does not directly contact the "thread" and steps. (Fig. 6-36)
 5. When it is necessary to let the lip of the packing pass through a hydraulic pressure port as in Fig. 6-37, lightly push the lip with a spatula (resin). This prevents damage to the lip of the packing by the chamfer of the port.
- Chamfer as shown in Fig. 6-38 when drilling a hole directly on the cylinder for a hydraulic port.



<Fig. 6-37>



<Fig. 6-38>



<Fig. 6-36>

7. When Leakage Occurs

(1) Cause of leakage

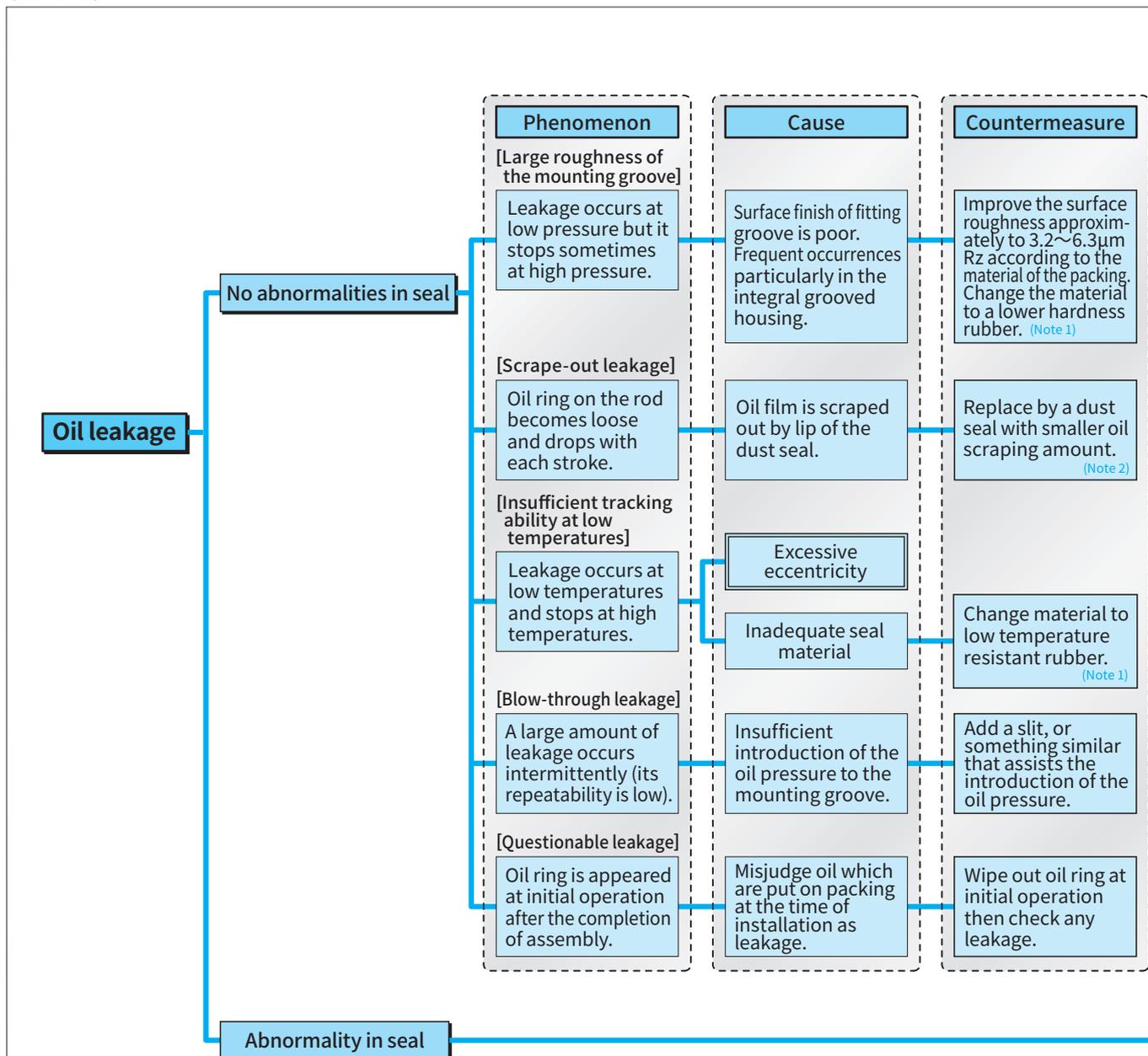
In this chapter, we will introduce the main causes of oil leakage from the sealing and examples of countermeasures. When oil leakage is observed, first check the source of the leakage.

Sometimes a deposit of grease is mistaken for oil leakage. If leakage from the seal is confirmed, see if there are any abnormalities with the seal contact area.

The following examples of leakage are classified into two groups: Check cases where there are no abnormalities with the seal contact area.

And cases where abnormalities are observed with the seal contact area.

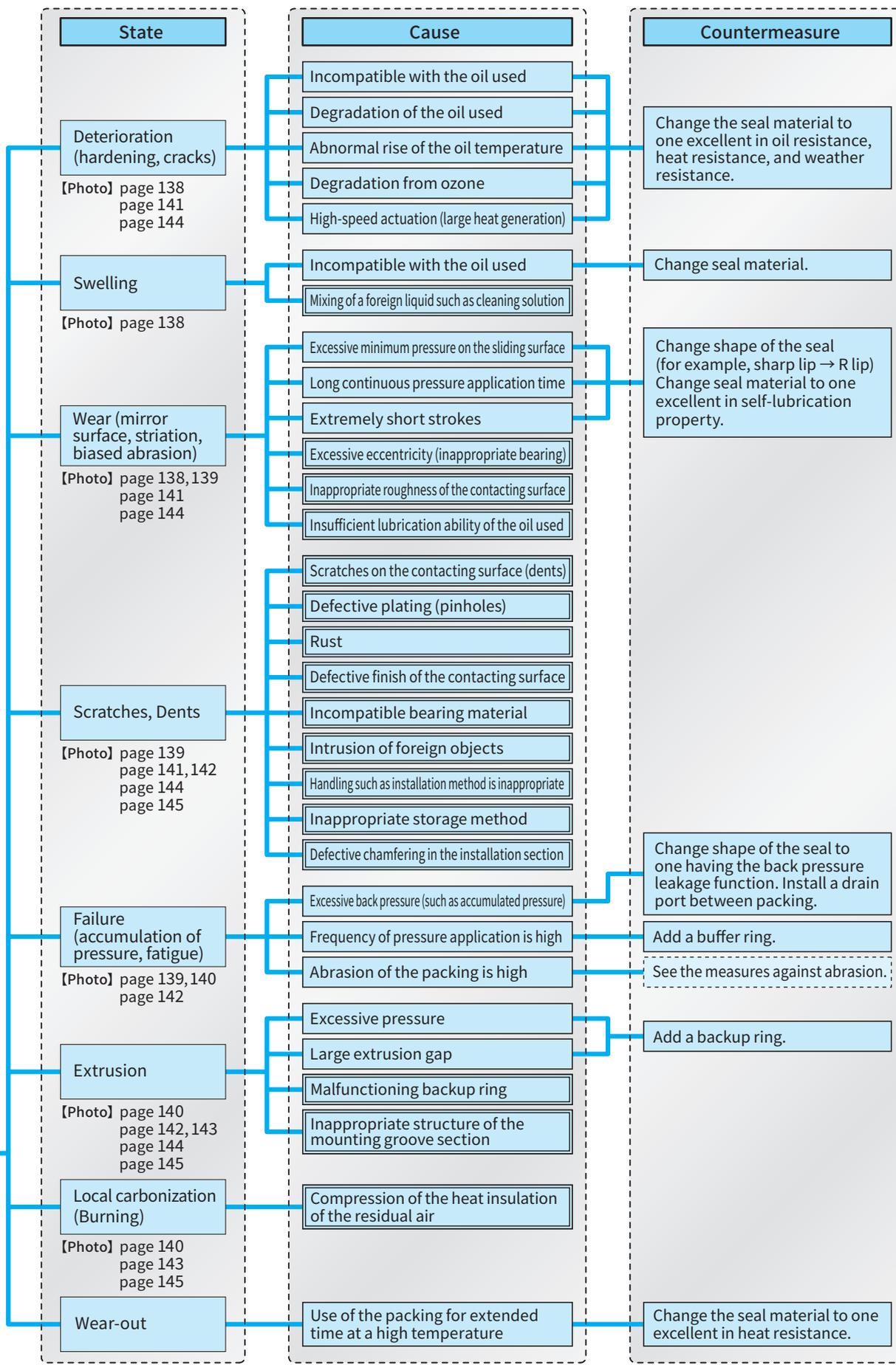
<Table 7-1>



Note 1) When changing the seal material, consult NOK because other conditions must be considered.

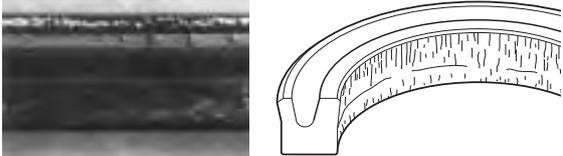
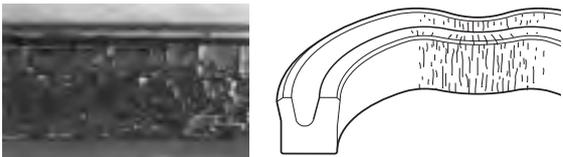
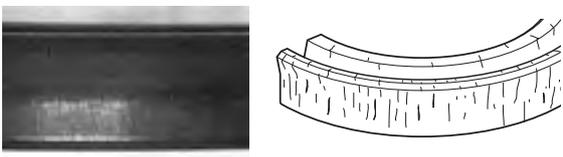
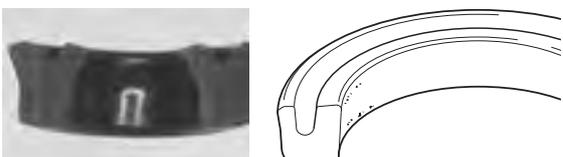
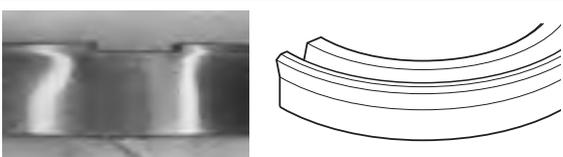
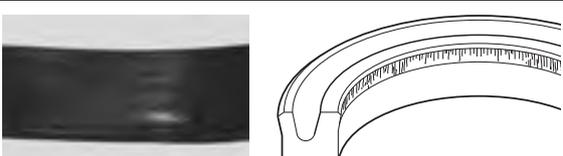
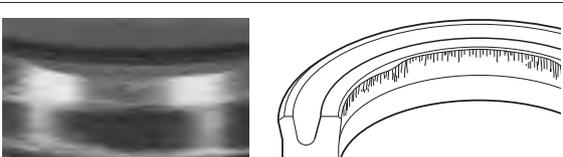
Note 2) Dust resistance and seal performance are conflicting properties, so it is important to balance them.

Note 3) , is difficult to take countermeasures for seal abnormalities by improving the seal, so improve the usage conditions.



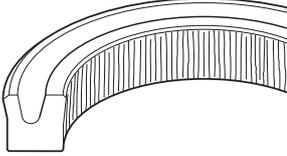
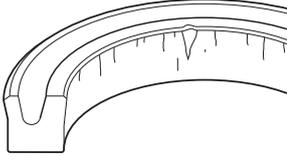
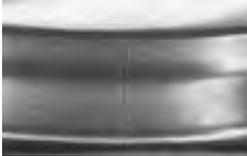
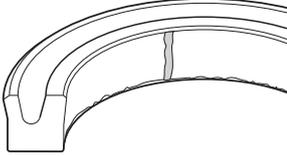
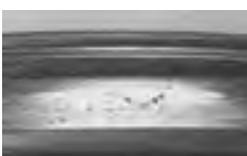
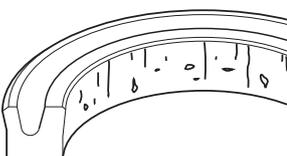
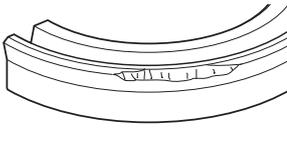
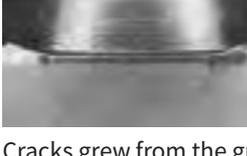
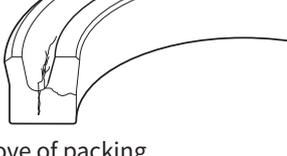
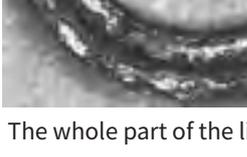
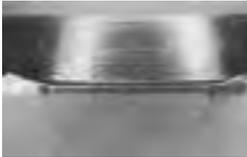
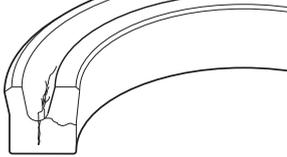
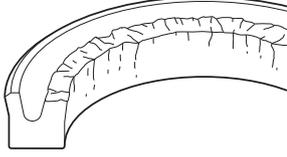
(2) Failure mode and countermeasures

a. Nitrile rubber packings

Appearance		Cause	Countermeasure
Fact	Condition		
Deterioration	 <p>Hardening of the whole sliding face. Glazing and cracks on the surface. Push with a finger and cracks appear.</p>	<ul style="list-style-type: none"> ● Heat generation by high speed or excessive internal pressure 	<ul style="list-style-type: none"> ● In case of a piston, change to SPG (SPGW). ● In case of rod, use buffer ring together.
	 <p>The whole packing hardens and lip deflects greatly and when bent with a finger, cracks appear.</p>	<ul style="list-style-type: none"> ● High oil temperature ● Influence of oil <ul style="list-style-type: none"> ● Incompatibility of oil and rubber material ● Deterioration of oil 	<ul style="list-style-type: none"> ● Lower oil temperature or change to heat resistant material (fluorine rubber) ● Change to oil resistant rubber material ● Renew oil
	 <p>Fine cracks all over the packing surface.</p>	<ul style="list-style-type: none"> ● Ozone cracks from exposing packing to air too long. ● Ozone cracks from leaving it installed with piston. 	<ul style="list-style-type: none"> ● Do not open package unnecessarily but store it in a cold place as sealed. ● Do not leave packing installed with piston but assemble into cylinder as quickly as possible.
Swelling	 <p>Whole packing is softened.</p>	<ul style="list-style-type: none"> ● Oil and rubber material are incompatible. ● Influence of cleaning liquid 	<ul style="list-style-type: none"> ● Change to oil resistant material. ● Change cleaning liquid. ● Remove cleaning liquid.
	 <p>The sliding surface shows wear with gloss.</p>	<ul style="list-style-type: none"> ● Sliding stroke was extremely short and caused insufficient lubrication. ● Roughness of sliding surface is inappropriate (too good) 	<ul style="list-style-type: none"> ● In case of a piston, change to SPG (SPGW). ● In case of rod, use buffer ring together. ● Change to recommended roughness.
Wear	 <p>The lip contact width continuously differs on the circumference, and the position of maximum and minimum width are roughly symmetrical.</p>	<ul style="list-style-type: none"> ● Eccentricity of rod and cylinder head and cylinder and piston head. 	<ul style="list-style-type: none"> ● Make eccentricity of installation within the tolerance of packings.
	 <p>Abnormal wear observed at one portion of the circumference of the sliding lip (matching the direction of lateral load).</p>	<ul style="list-style-type: none"> ● Abnormal wear of wear ring (piston) and bearing by excessive lateral load. 	<ul style="list-style-type: none"> ● Change wear ring and bearing material to those which can withstand a heavy load.

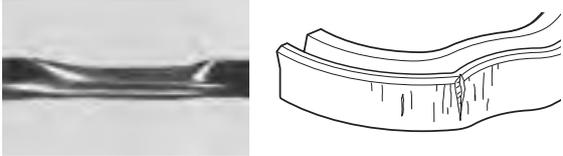
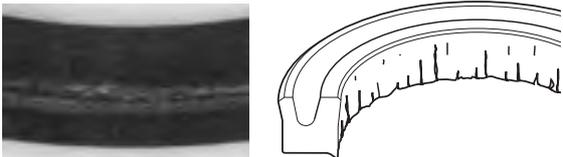
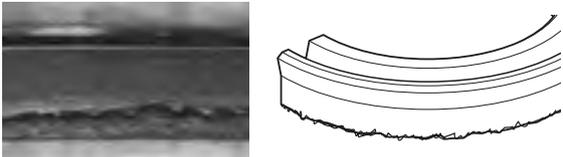
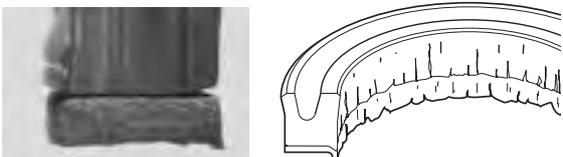
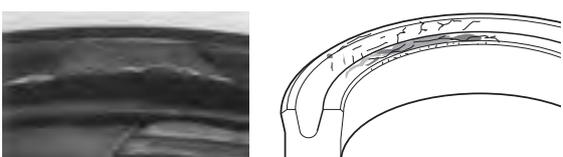
(2) Failure mode and countermeasures

a. Nitrile rubber packings

Appearance		Cause	Countermeasure
Fact	Condition		
Grooved Wear	  <p>The sliding surface has worn in a striation pattern.</p>	<ul style="list-style-type: none"> ● The seal slides at an extremely short stroke, and the shape of the lubricating oil film is inadequate. ● Severe pressure conditions (high pressurization frequency, long pressurization duration, and high pressure). 	<ul style="list-style-type: none"> ● Change a sharp lip to an R-lip type. ● Change the seal to a combination seal with excellent self-lubricating properties. ● For a rod packing, add a buffer ring.
	Scratch	  <p>Partial cut, dent on the edge of the lip.</p>	<ul style="list-style-type: none"> ● By external force such as by hanging on a nail or wire for storage. ● Insufficient chamfering of the mating material when fitting.
  <p>Scratch on sliding face.</p>		<ul style="list-style-type: none"> ● By driver, etc. when fitting 	<ul style="list-style-type: none"> ● Use fitting tool.
		  <p>There was a scar on the mating sliding face.</p>	<ul style="list-style-type: none"> ● Due to "overturn" of chamfered part of the mating material at the time of fitting
  <p>By embedded foreign material</p>		<ul style="list-style-type: none"> ● Remove foreign matter. 	
Dents	  <p>Small dents on sliding face.</p>	<ul style="list-style-type: none"> ● Dust and cuttings embedded in the sliding face due to poor cleaning. ● Embedded foreign material or embedded oxidized products due to oxidization. 	<ul style="list-style-type: none"> ● Remove foreign materials sticking to the equipment. ● Renew oil.
	Failure	  <p>A part of the packing lip is torn in an arc shape (piston seal).</p>	<ul style="list-style-type: none"> ● Excessive back pressure occurs.
  <p>Cracks grew from the groove of packing.</p>		<ul style="list-style-type: none"> ● Fatigue failure due to frequent impulse pressure. ● Breaking due to starting at low temperature. 	<ul style="list-style-type: none"> ● In case of a rod, use buffer ring together. ● In case of a piston, change to SPG (SPGW). ● Change to packing of low temperature resistant material.
  <p>The whole part of the lip of the sliding part is broken.</p>		<ul style="list-style-type: none"> ● Deterioration of the packing material. ● Deterioration of oil 	<ul style="list-style-type: none"> ● Change to heat resistant and oil resistant rubber material. ● Renew oil.

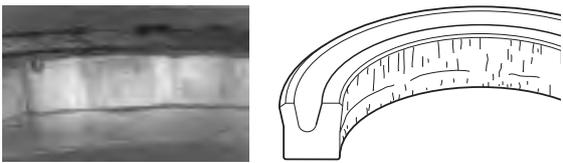
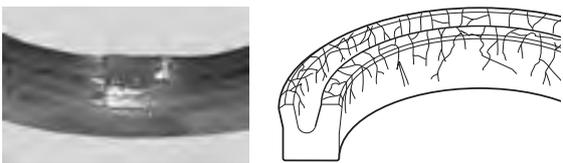
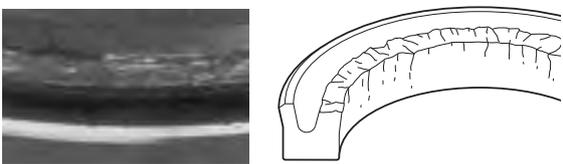
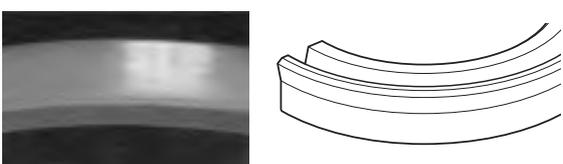
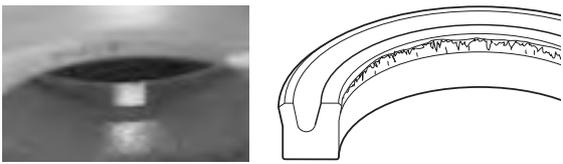
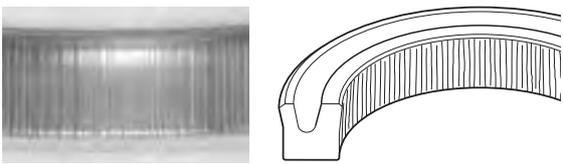
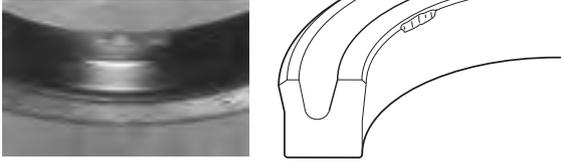
(2) Failure mode and countermeasures

a. Nitrile rubber packings

Appearance		Cause	Countermeasure
Fact	Condition		
Failure	 <p>Broken at one or two places on the circumference of the packing.</p>	<ul style="list-style-type: none"> ● Packing installed as twisted. ● Assembled with improper packing installation. 	<ul style="list-style-type: none"> ● Improve the method and tools of installation.
Extrusion	 <p>The packing heel on the sliding side is torn off.</p>	<ul style="list-style-type: none"> ● Extrusion gap was too big. ● Bearing worn too much causing a large gap. ● Too much pressure. 	<ul style="list-style-type: none"> ● Reduce extrusion gap ● Use backup ring together. ● Change bearing material to an appropriate material. ● Use backup ring together and re-select packing. ● Use buffer ring together.
	 <p>The packing heel at static side is torn off.</p>	<ul style="list-style-type: none"> ● The construction of installation part is inappropriate ● Gap generated due to insufficient rigidity of support plate. ● Inappropriate backup ring. 	<ul style="list-style-type: none"> ● Correct chamfering ● Improve rigidity of support plate ● Correct the size of backup ring. ● Change backup ring material to appropriate one.
	 <p>Extrusion at both the packing heel and the backup ring.</p>	<ul style="list-style-type: none"> ● Excessive extrusion gap ● Inappropriate backup ring 	<ul style="list-style-type: none"> ● Reduce extrusion gap ● Change backup ring to that of a more rigid material. ● Make thickness of the backup ring thicker. ● Use buffer ring together.
Burning	 <p>The lip and groove are partly carbonized or melted.</p>	<ul style="list-style-type: none"> ● Burning by adiabatic compression of the residual air. 	<ul style="list-style-type: none"> ● Countermeasures shown on pages 152 and 153.

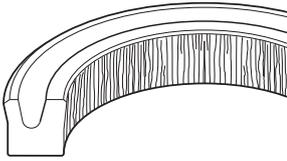
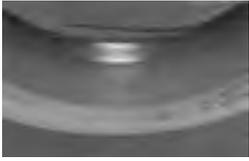
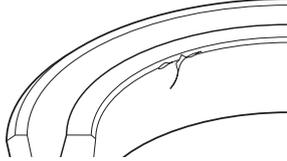
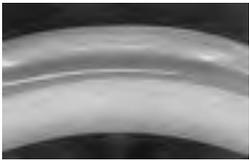
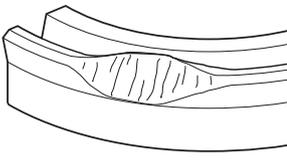
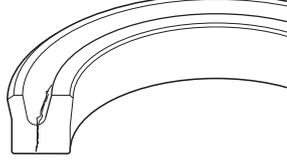
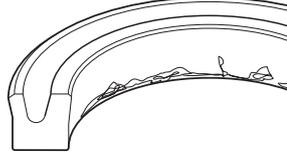
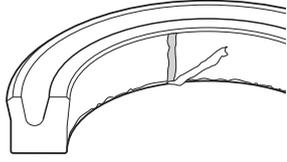
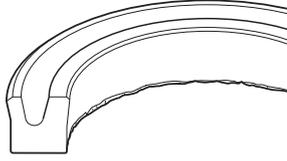
(2) Failure mode and countermeasures

b. Iron rubber packings

Appearance		Cause	Countermeasure	
Fact	Condition			
Deterioration	 <p>Gloss and cracks on the surface. Push with a finger and cracks appear.</p>	<ul style="list-style-type: none"> ● Excessive rise of oil temperature. ● Incompatibility of oil and rubber material. ● Deterioration of oil 	<ul style="list-style-type: none"> ● Lower oil temperature or change to heat resistant material (fluorine rubber) ● Check oil resistance of the packing and change the material of the packing or the hydraulic oil. ● Renew oil. 	
	 <p>Rubber loses elasticity and breaking off.</p>	<ul style="list-style-type: none"> ● Excessive rise of oil temperature. ● Incompatibility of oil and rubber material. ● Deterioration of oil. 	<ul style="list-style-type: none"> ● Change to rubber material with better heat and oil resistance. ● Check oil resistance of the packing and change the material of the packing or the hydraulic oil. ● Renew oil 	
	 <p>The whole part of the lip of the sliding part is torn off.</p>	<ul style="list-style-type: none"> ● Excessive rise of oil temperature. ● Incompatibility of oil and rubber material ● Deterioration of oil. ● Deterioration of oil. 	<ul style="list-style-type: none"> ● Change rubber material to the one with better heat resistance. ● Check oil resistance of the packing and change the material of the packing or the hydraulic oil. ● Renew oil. 	
	Wear	 <p>Wear with gloss on the sliding surface.</p>	<ul style="list-style-type: none"> ● Sliding was extremely short stroke and caused insufficient lubrication. ● Pressure higher than 3MPa is always exerted. 	<ul style="list-style-type: none"> ● In case of a piston, change to SPG (SPGW). ● In case of a rod, use buffer ring together. ● In case of a piston, change to SPG (SPGW). ● In case of a rod, use buffer ring together. ● Check the piping resistance and change the piping structure to lower the pressure.
		 <p>Abnormal wear at part of the circumference of the sliding lip (matching the direction of lateral load).</p>	<ul style="list-style-type: none"> ● Abnormal wear of wear ring (piston) and bearing by excessive lateral load. 	<ul style="list-style-type: none"> ● Change wear ring and bearing material to those which can withstand a heavy load.
		 <p>The sliding surface has worn in a striation pattern.</p>	<ul style="list-style-type: none"> ● The seal slides at an extremely short stroke, and the shape of the lubricating oil film is inadequate. ● Large sliding heat is generated, and the oil film is thin. 	<ul style="list-style-type: none"> ● Change a sharp lip to an R-lip type. ● Change the seal to a combination seal with excellent self-lubricating properties. ● For a rod packing, add a buffer ring.
Scratch	 <p>Partial cut, dent on the edge of the lip</p>	<ul style="list-style-type: none"> ● By external force such as by hanging on a nail or wire for storage. ● Cut and dent due to "overturn" of the mating material when fitting. ● Cut and dent by driver, etc. when fitting 	<ul style="list-style-type: none"> ● Improvement to storage method ● Increase chamfering of the mating material and make it smooth so as not to cause "overturn". ● Use fitting tool. 	

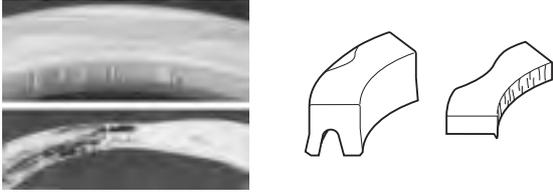
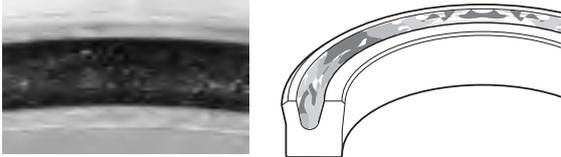
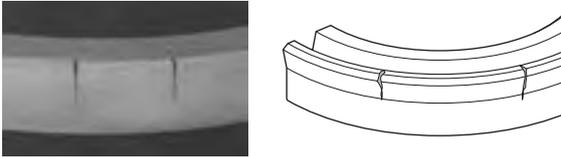
(2) Failure mode and countermeasures

b. Iron rubber packings

Appearance		Cause	Countermeasure
Fact	Condition		
Scratch	  <p>Scratches on sliding face.</p>	<ul style="list-style-type: none"> ● There was a “scar” on the mating sliding face. ● Due to “overturn” of chamfered part of the mating material at the time of fitting ● By embedded foreign material 	<ul style="list-style-type: none"> ● Check fully before fitting. ● Increase chamfering of the mating material and make it smooth so as not to cause “overturn”. ● Remove foreign matter.
	  <p>Generation of “scratches” at edge of the lip.</p>	<ul style="list-style-type: none"> ● Due to “overturn” of chamfered part of the mating material at the time of fitting 	<ul style="list-style-type: none"> ● Chamfer the mating material according to the Dimensional Table and make it smooth so as not to cause “overturn”.
Failure	  <p>The sliding lip of packing is extruded in an arc shape or torn off. (piston seal)</p>	<ul style="list-style-type: none"> ● Generation of excessive back pressure. 	<ul style="list-style-type: none"> ● In case of Iron rubber packing, change to OUIS. ● Change to combination seal (SPG, SPGW).
	  <p>Generation of cracks starting from the groove of U packing.</p>	<ul style="list-style-type: none"> ● Fatigue failure due to frequent shock pressure. 	<ul style="list-style-type: none"> ● In case of a rod packing, use buffer ring together. ● In case of a piston, change to SPG (SPGW).
Extrusion	  <p>Heel part on sliding side is torn off.</p>	<ul style="list-style-type: none"> ● Excessive extrusion gap. ● Increase of bearing gap due to great wear of bearing. ● Excessive pressure. 	<ul style="list-style-type: none"> ● Reduce the gap. ● Use backup ring together. ● Change bearing material to an appropriate one. ● Use backup ring together and re-select packing. ● Use buffer ring together.
	  <p>Trace of small dent exists from the heel side of the sliding surface to the edge of the lip and a thin film like extrusion fraction is left on the heel part.</p>	<ul style="list-style-type: none"> ● Excessive extrusion gap ● Excessive pressure 	<ul style="list-style-type: none"> ● Reduce the gap. ● Use backup ring together. ● Use backup ring together and re-select packing. ● Use buffer ring together
	  <p>The heel part of the sliding side shows extrusion and change of color into red all over.</p>	<ul style="list-style-type: none"> ● Excessive extrusion gap ● Increase of bearing gap due to a significant wear of bearing. ● Excessive pressure 	<ul style="list-style-type: none"> ● Reduce the extrusion gap. ● Use backup ring together. ● Change bearing material to an appropriate one. ● Use backup ring together and re-select packing. ● Use buffer ring together.

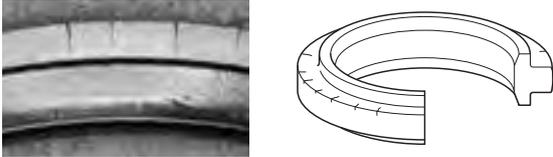
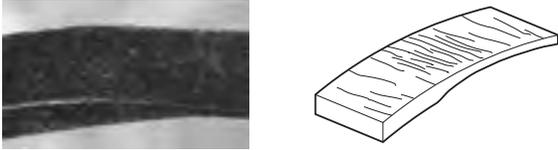
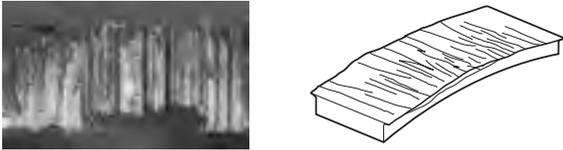
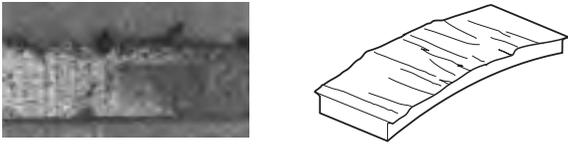
(2) Failure mode and countermeasures

b. Iron rubber packings

Appearance		Cause	Countermeasure
Fact	Condition		
Extrusion	 <p>The out side of the pure PTFE backup ring is partially torn off, from where packing has extruded and deformed.</p>	<ul style="list-style-type: none"> ● Insufficient strength and wear resistance of the backup ring. 	<ul style="list-style-type: none"> ● Change material of backup ring to 19YF or 80NP.
Burning	 <p>Groove of U packing is partially burned and carbonized.</p>	<ul style="list-style-type: none"> ● Burning by adiabatic compression of the residual air. 	<ul style="list-style-type: none"> ● Countermeasures shown on pages 152 and 153.
Deformation	 <p>Deformation and cuts at 2 places on the out side of the packing.</p>	<ul style="list-style-type: none"> ● Poor installation in the integrated groove 	<ul style="list-style-type: none"> ● Shown on page 132.

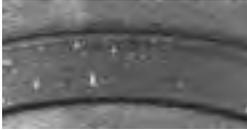
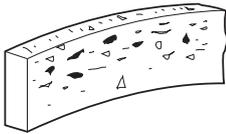
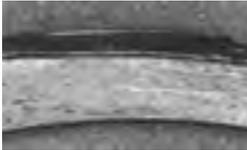
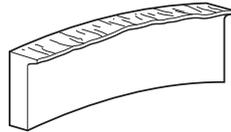
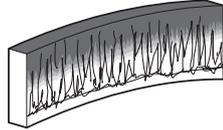
(2) Failure mode and countermeasures

c. Combination seals

Appearance		Cause	Countermeasure
Fact	Condition		
Deterioration	 <p>Cracking has occurred in the back ring.</p>	<ul style="list-style-type: none"> ● The back ring has been used at a high temperature 	<ul style="list-style-type: none"> ● Change the back ring material to one with excellent heat resistance.
Wear	 <p>A part of circumference of the seal is abnormally worn (matching with the direction of lateral load)</p>	<ul style="list-style-type: none"> ● Eccentricity due to abnormal wear of wear ring and bearing caused by an excessive lateral load. 	<ul style="list-style-type: none"> ● Change the material of wear ring and of bearing to the one that can resist against the lateral load.
		<ul style="list-style-type: none"> ● Sliding face of the mating material is partly rough. 	<ul style="list-style-type: none"> ● Finish roughness uniformly (Recommended value: 0.4 ~ 3.2 μm Rz).
Scratch	 <p>Heavy scratches on sliding surface.</p>	<ul style="list-style-type: none"> ● There was a "scar" on the mating sliding face. 	<ul style="list-style-type: none"> ● Check fully before fitting.
		<ul style="list-style-type: none"> ● Due to "burr" and "overturn" of chamfered part of the mating material at the time of fitting. 	<ul style="list-style-type: none"> ● Increase chamfering of the mating material according to Dimensional Table and make it smooth so as not to cause "bur" and "overturn".
		<ul style="list-style-type: none"> ● By embedded foreign material such as metal powder, etc. 	<ul style="list-style-type: none"> ● Remove foreign materials. ● Provide contamination seals (KZT) on both sides of the packing.
Extrusion (Rarefion ring)	 <p>Film-like extrusion on the sliding surface of the seal.</p>	<ul style="list-style-type: none"> ● Excessive extrusion gap 	<ul style="list-style-type: none"> ● Reduce extrusion gap ● Change material to the one with higher rigidity ● Change to SPGW with backup ring.

(2) Failure mode and countermeasures

d. Parts connected with seals

Appearance		Cause	Countermeasure
Fact	Condition		
Dents (Burying of foreign material)	  <p>Foreign material is embedded in seal and backup ring.</p>	<ul style="list-style-type: none"> ● Existence of foreign material in oil and in pipings. 	<ul style="list-style-type: none"> ● Remove foreign matter. ● Provide contamination seals (KZT) on both sides of the packing.
			<ul style="list-style-type: none"> ● Production of metal powder as a result of seizure of piston and cylinder.
Extrusion (Backup ring)	  <p>Extrusion has occurred in the backup ring.</p>	<ul style="list-style-type: none"> ● Excessive extrusion gap ● High pressure 	<ul style="list-style-type: none"> ● Reduce extrusion gap ● Change the material of the backup ring to the one with higher rigidity.
Burning	  <p>One side of the wear ring is carbonized.</p>	<ul style="list-style-type: none"> ● Burning by adiabatic compression of the residual air. 	<ul style="list-style-type: none"> ● Countermeasures shown on pages 152 and 153.

8. Technical Data

(1) JIS standards for leakage amount (old JIS B 8354:1992)

a. Piston packing (internal oil leakage)

Old JIS B 8354 : 1992 states that, when the maximum pressure is applied to one side of an immobilized piston, the amount of oil leakage to the other side of the piston must be less than those listed in the Table 8-1, under the test condition shown in the right. With combined seals (SPG, SPGW), the amount of the internal oil leakage must be less than twice the figures in Table 8-1.

Testing Conditions

Oil used for test : Hydraulic oil, unless specified, shall be equivalent to JIS K 2213 class 2 (additive turbine oil) with viscosity grade VG32 or VG46.
Oil temperature : $50 \pm 5^\circ\text{C}$ unless specified otherwise.
Piston speed : 0

<Table 8-1> Acceptable amount of internal oil leakage for piston packings

Unit: ml/10min

I.D. (mm)	Amount of oil leakage	I.D. (mm)	Amount of oil leakage	I.D. (mm)	Amount of oil leakage
32 (31.5)	0.2	100	2.0	200	7.8
40	0.3	125	2.8	220 (224)	10.0
50	0.5	140	3.0	250	11.0
63	0.8	160	5.0		
80	1.3	180	6.3		

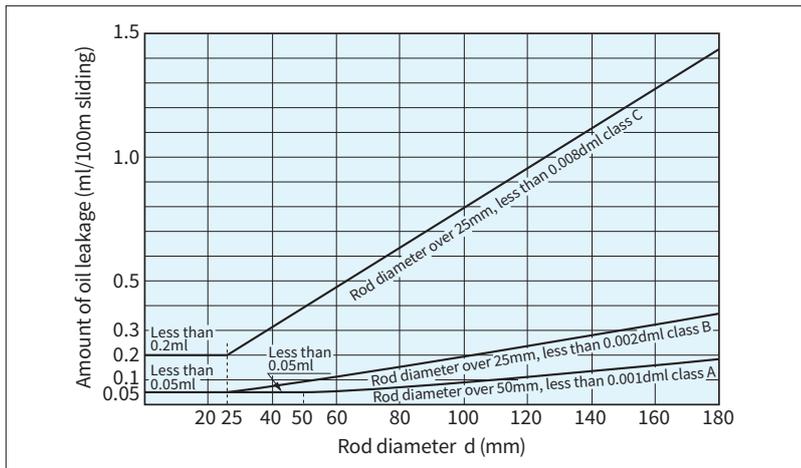
※Acceptable leakage amount for combined seal is double of the listed value.

b. Rod packing (external oil leakage)

Old JIS B 8354:1992 states “that there should be no leakage, except from the rod, under any operating condition, when piston makes reciprocating motion under the test condition as described below with regard to external oil leakage of hydraulic cylinder.” Oil leakage from rod is classified into Type A, Type B and Type C as given in Fig. 8-1.

<Table 8-2> Piston speed

Cylinder tube I.D. (mm)	Piston speed (mm/s)
32 40 50 63	8~400
80 100 125	8~300
140 160 180 200 220 250	8~200



<Fig. 8-1> Acceptable external oil leakage

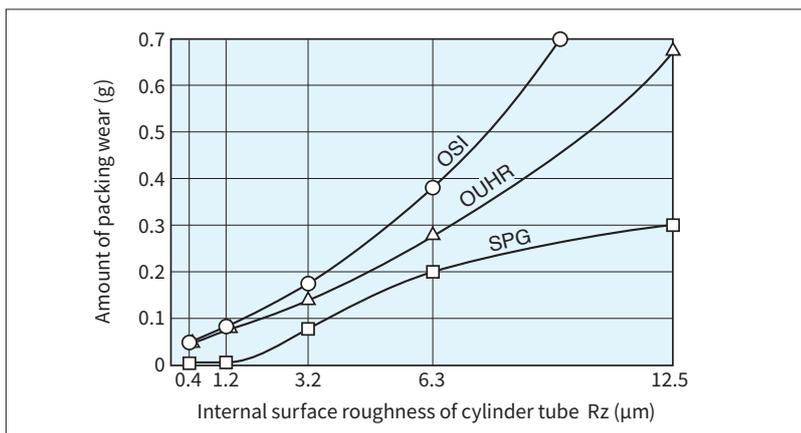
Testing Conditions

Oil used for test : Hydraulic oil, unless specified, shall be equivalent to JIS K 2213 class 2 (additive turbine oil) with viscosity grade VG32 or VG46.
Oil temperature : $50 \pm 5^\circ\text{C}$ unless otherwise specified
Piston speed : To be decided according to the inside diameter of the cylinder tube. (Table 8-2)
Internal pressure : internal pressure generated in the cylinder shall not exceed, at any moment during the test, the maximum operating pressure except hydraulic pressure test.

(2) Amount of wear and oil leakage of piston packings

a. Relationship between internal surface roughness of the cylinder tube and amount of wear

Fig. 8-2 shows the relationship between internal surface roughness of the cylinder tube and the amount of wear for piston packings (SPG, OSI, and OUHR).



<Fig. 8-2> Internal surface roughness of the cylinder tube and amount of wear

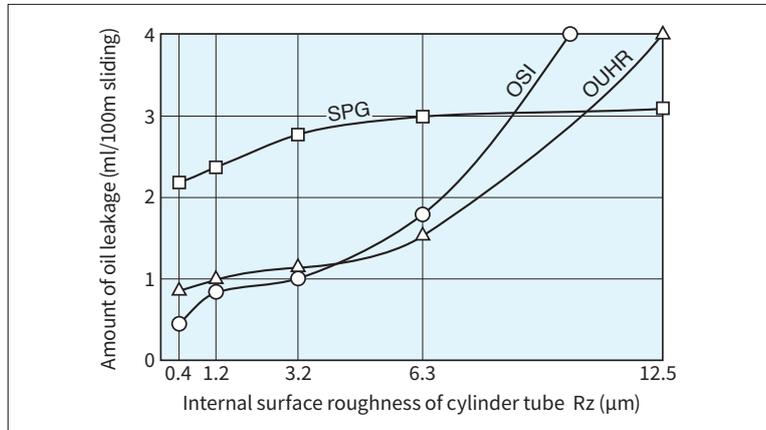
Testing Conditions

Pressure : 17.7MPa {180kgf/cm²} (Constant)
Stroke : 100mm
Piston speed : 100mm/s
Oil used for test : Turbine oil grade 2
Oil temperature : 60~70°C (In the tank)
Tube inside diameter : $\phi 100$
Sliding distance : After sliding 80km

- Packings for high wear resistance such as SPG are suitable for use with the types of hydraulic cylinders which can allow some internal oil leakage.
- It is recommended to finish the internal surface of cylinder tube at 0.4-3.2 μm Rmax.

b. Relationship between internal surface roughness of the cylinder tube and amount of oil leakage

Fig. 8-3 shows the relationship between internal surface roughness of the cylinder tube and the amount of oil leakage for piston packings (SPG, OSI, and OUHR).



〈Fig. 8-3〉 Internal surface roughness of the cylinder tube and amount of oil leakage while sliding

Testing Conditions

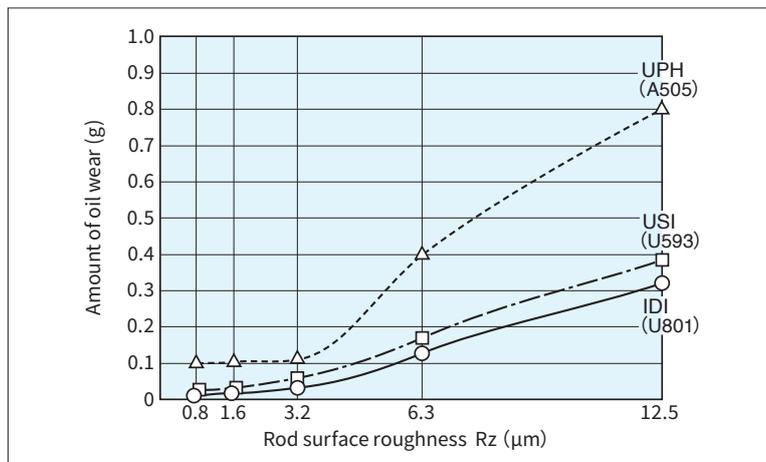
Pressure : 17.7MPa {180kgf/cm²}
(Constant)
Stroke : 100mm
Piston speed : 100mm/s
Oil used for test : Turbine oil grade 2
Oil temperature : 60~70°C (In the tank)
Tube inside diameter : ø100
Sliding distance : After sliding 80km

- Old JIS B 8354 : 1992 allows the internal oil leakage at static condition as shown in the Table 8-1, but no internal oil leakage has been found on any packings with this test.

(3) Amount of wear and oil leakage of rod packings

a. Relation between rod surface roughness and amount of wear

Fig. 8-4 shows the relationship between rod surface roughness and amount of wear of U packings (UPH, USI and IDI) .



〈Fig. 8-4〉 Rod surface roughness and amount of wear

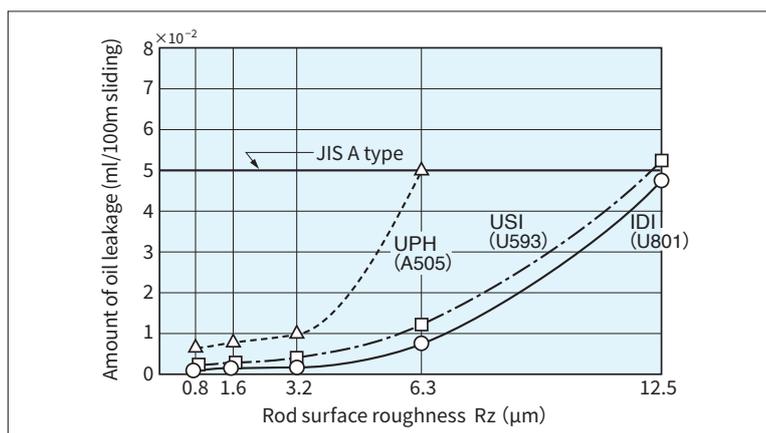
Testing Conditions

Pressure : 0~13.7MPa
{0~140kgf/cm²}
Stroke : 200mm
Rod speed : 500mm/s
Oil used for test : Turbine oil grade 2
Oil temperature : 100°C
Rod diameter : ø50
Sliding distance : After sliding 1000km

- When the rod surface is too rough, the amount of wear of rod packing will increase. Therefore, it is suggested to finish it to 0.8~1.6μm Rz

b. Relationship between rod surface roughness and amount of oil leakage

Fig. 8-5 shows the relationship between rod surface roughness and the amount of oil leakage for U packings (UPH, USI, and IDI).



〈Fig. 8-5〉 Rod surface roughness and amount of oil leakage

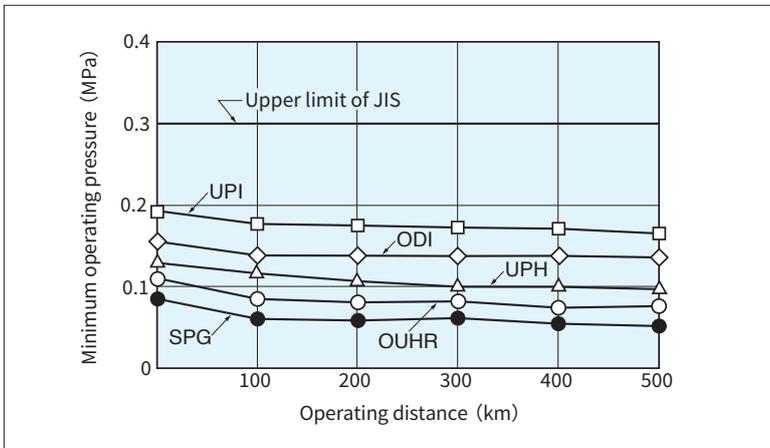
Testing Conditions

Pressure : 0~13.7MPa
{0~140kgf/cm²}
Stroke : 200mm
Rod speed : 500mm/s
Oil used for test : Turbine oil grade 2
Oil temperature : 100°C
Rod diameter : ø50
Sliding distance : After sliding 1000km

- As the rod surface roughness affects the oil leakage, it is suggested to finish to 0.8~1.6 μm Rz

(4) Minimum operating pressure

Fig. 8-6 shows an example of actual measurement of the minimum operating pressure of piston packings (ODI, UPI, UPH, OUHR and SPG).



〈Fig. 8-6〉 Example of actual measurement of the minimum operating pressure

Testing Conditions

Cylinder tube I.D. : $\phi 100$
 Rod diameter : $\phi 70$
 Rod packing : UPH $70 \times 90 \times 15$
 Dust seal : DKB $70 \times 84 \times 8 \times 11$
 Pressurizing board : Cylinder head side

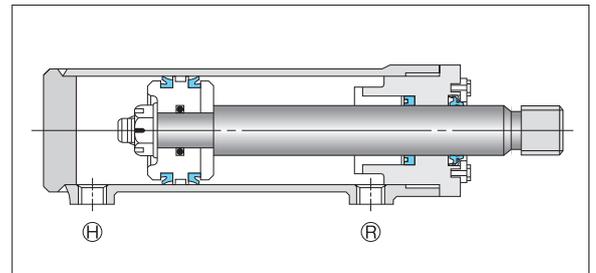
Cylinder operating conditions

Pressure : $0 \sim 16.7 \text{ MPa}$ $\{0 \sim 170 \text{ kgf/cm}^2\}$
 Stroke : 650mm
 Speed : 650mm/s (Average)
 Oil used for test : Turbine oil grade 2
 Oil temperature : 80°C (Maximum)

- As NOK Rareflon is used for sliding material of SPG packing, and self-lubrication property of OUHR packing is improved, the operating pressure for the both shows low values.

What is minimum operating pressure

The minimum pressure is required to ensure the operation of the cylinder. When the pressure is applied from the head side (H) or the rod side (R) of the cylinder without any load as shown in the Fig. 8-7, the minimum pressure required to allow a smooth operation of the piston at the minimum speed (8mm/sec) shown in the Table 8-2 is called the minimum operating pressure. Old JIS B 8354 : 1992 (Hydraulic cylinder) prescribes this minimum operating pressure. Table 8-3 shows the minimum operating pressure in the case when the pressure is applied from the cylinder head side. According to Old JIS B8354 : 1992, "When the minimum operating pressure is required lower than specified below, the said value can be modified under an agreement between the parties concerned for delivery".



〈Fig. 8-7〉 Example of cylinder used for measuring the minimum operating pressure.

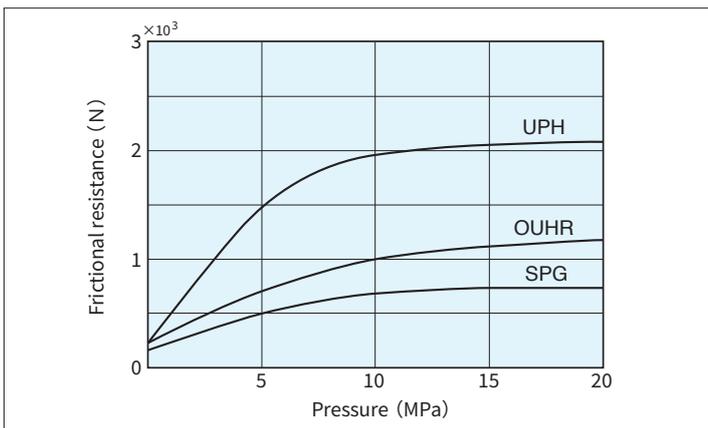
〈Table 8-3〉 Example of JIS Minimum Operating Pressure (when the pressure is applied from the cylinder head side).

Unit: MPa

Shape of piston packing	Nominal pressure	Shape of rod packing		Remark
		Other than V packing	V packing	
V packing	3.5, 7	0.5	0.75	The minimum operating pressure when the pressure, is applied from the rod side, is defined by the classification of rod diameter.
	14, 21	Nominal pressure $\times 6\%$	Nominal pressure $\times 9\%$	
U, L Packing, X ring, O ring, combination seal	3.5, 7	0.3	0.45	
	14, 21	Nominal pressure $\times 4\%$	Nominal pressure $\times 6\%$	
Piston ring	3.5, 7	0.1	0.15	
	14, 21	Nominal pressure $\times 1.5\%$	Nominal pressure $\times 2.5\%$	

(5) Frictional resistance

Fig. 8-8 shows an example of actual measurement of frictional resistance of piston packings (SPG, UPH, and OUHR).

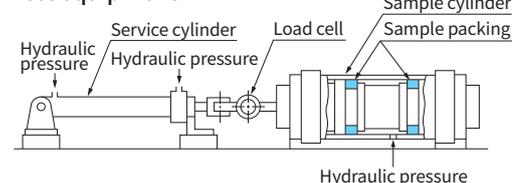


〈Fig. 8-8〉 Frictional resistance and Pressure

Testing Conditions

I.D. of cylinder tube : $\phi 100$
 Piston speed : 300mm/s
 Oil used for test : Turbine oil grade 2 (ISO VG46)
 Oil temperature : 60°C

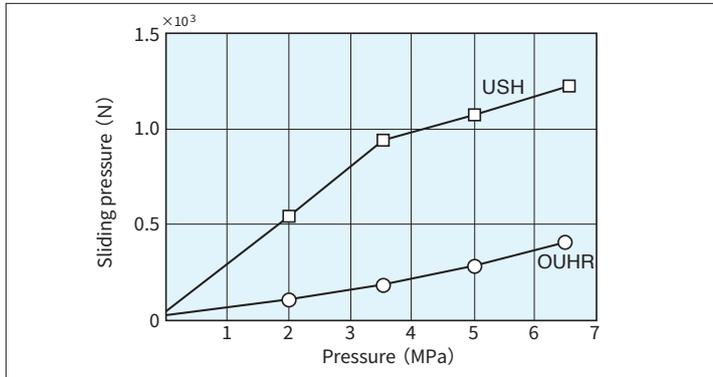
Test equipment



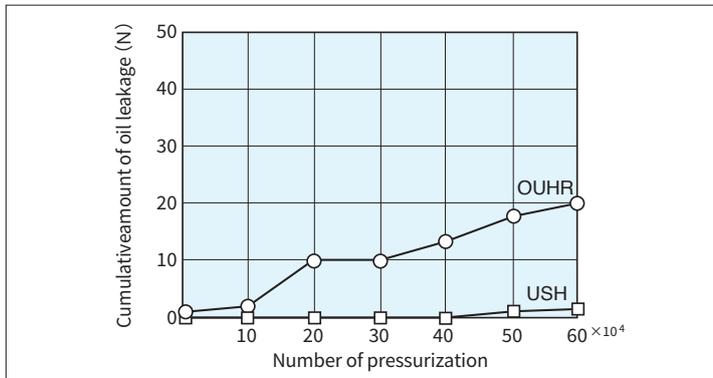
- Use SPG or SPGW for piston packing for low friction.

a. Shape of lip edge with U packing that affects frictional resistance and sealing performance

Frictional resistance and sealing performance vary with the lip shape of U packings as shown in Fig. 8-9 and Fig. 8-10.



〈Fig. 8-9〉 Frictional resistance and pressure



〈Fig. 8-10〉 Number of pressurization and amount of oil leakage

	OUHR (ø120) packing	USH (ø120) packing
Sample packing		

Measuring conditions of frictional resistance

Temperature : 80°C constant
 Pressure : 0, 2, 3.4, 4.9, 6.4MPa
 {0, 20, 35, 50, 65kgf/cm²}
 Speed : 75mm/s
 Stroke : 20mm
 Oil used for test : Turbine oil grade 2 (ISO VG46)

Impulse endurance test conditions

Temperature : 100°C
 Pressure : 0~24.5~36.8MPa
 {0~250~375kgf/cm²}
 Frequency of pressurization : 70c.p.m.
 Number of pressurization : 60万回
 Speed : 150mm/s
 Stroke : 150mm
 Oil used for test : Turbine oil grade 2 (ISO VG46)

- Recommend to use OUHR packing with improved self-lubrication property as the piston U packing for low friction.

b. How to calculate frictional resistance of packings

Frictional resistance can be calculated from the following formula.

$$F = f \times Pr \quad \dots\dots\dots (5)$$

Where,

- F : Frictional resistance (N)
- f : Frictional coefficient
- Pr : Packing radial force (N)

Therefore, in order to find the frictional resistance, it is necessary to know the values of frictional coefficient and packing radial force. To obtain the friction coefficient f, use the nondimensional characteristic diagram in Fig. 8-11, G in accordance with operating condition and read the value f.

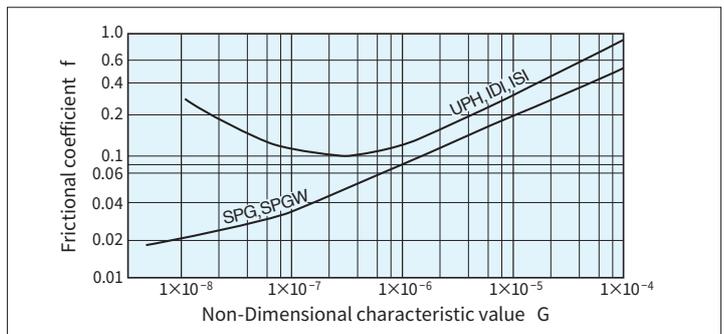
Use Formula (6) to find out the radial force of a packing when pressure is applied.

$$Pr = \pi dbp + Pro \quad \dots\dots\dots (6)$$

Where,

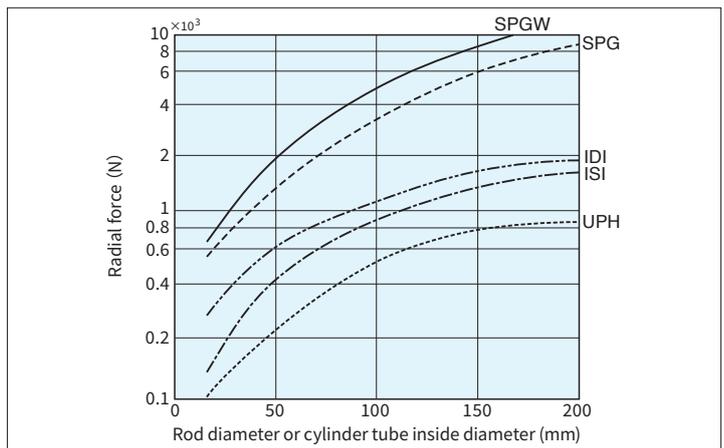
- d : Rod diameter (m)
- b : Contact width (m)
- p : Applied pressure (Pa)
- Pro : Radial force of packing under ambient pressure (N)

(The value Pro varies with the shape and material of packings. Fig. 8-12 shows, for your reference, an example of actual measurement of radial force of representative packings. As the applied pressure becomes higher, Pro becomes a negligible value in function to πdbp in the formula (6).)



〈Fig. 8-11〉 Dimensionless characteristic diagram

- Please refer to Page 5 for calculating method of the dimensionless characteristic number G.



〈Fig. 8-12〉 Radial force of packing (Under ambient pressure)

(6) Low temperature resistance packings

The standard rubber material for NOK packings (material code A505, U801) aims at about -30°C as limit temperature for low temperature usage. In low temperature areas, the rubber packing material's elasticity decreases and its sealing performance becomes unstable. As the packing lip's ability to follow the eccentricity of the rod decreases, it becomes important to reduce the amount of eccentricity of the rod. When using packings in a low temperature area, minimize rod eccentricity, and apply a low temperature resistance packing.

a. Effect of eccentricity on sealing performance at a low temperature

Table 8-4 and Table 8-5 show an example of test results with low temperature resistant U packings and standard U packings.

<Table 8-4> Cold resistant U packings

Sample packing	IUH 75 85 6 (A567) Low temperature resistant nitrile rubber					UNI 75 88 10 (①U801 ②S813)				
	-40	-45	-50	-55	-60	-40	-45	-50	-55	-60
Amount of eccentricity (TIR)										
0.15mm	○	○	○	○	△	○	○	○	○	△
0.30mm	○	○	○	○	△	○	○	△	△	●
0.45mm	○	○	△	△	●	△	△	△	●	●

○...No oil leakage △...Oil leakage while sliding ●...Oil leakage at static

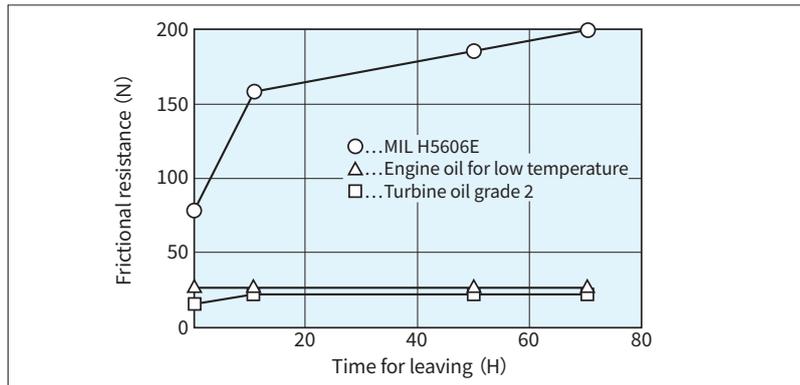
As the eccentricity affects sealing performance at low temperature, use H9/f8 fit for bush or bearing.

<Table 8-5> Standard U packings

Sample packing	IUH 75 85 6 (A505)			ISI 75 85 6 (U801)	
	-15	-20	-25	-30	-35
Amount of eccentricity (TIR)					
0.15mm	○	○	○	○	△
0.30mm	○	○	○	○	△
0.45mm	○	○	△	△	●

b. Effect of low temperature hydraulic oil for initial frictional resistance

Some low temperature hydraulic oil increase the frictional resistance of packings. This is caused by remaining dried additives in oil. Fig. 8-13 shows an example of measuring the initial frictional resistance with low temperature oil.



<Fig. 8-13> Result of measurement of initial frictional resistance

Sample packing: IUH type packing (Material: A567)

Test conditions

Temperature: 25°C
 Pressure: Ambient pressure
 Speed: 250mm/s
 Stroke: 50mm
 Oil used: ① MIL H 5606E
 ② Engine oil for low temperature
 ③ Turbine oil grade 2 (ISO VG32)
 Time for leaving sample: 0, 12, 48, 72 (H)

Leaving conditions

By making rod to perform several stroke, let the oil film deposited on the rod surface and leave the packing as it is at room temperature.

(7) Buffer rings

Buffer rings (HBY and HBTS) are inserted in the pressure side of rod packings to protect and improve packing durability. Also, under extremely short stroke conditions, they help prevent abnormal wear of rod packings.

3 effects of buffer rings

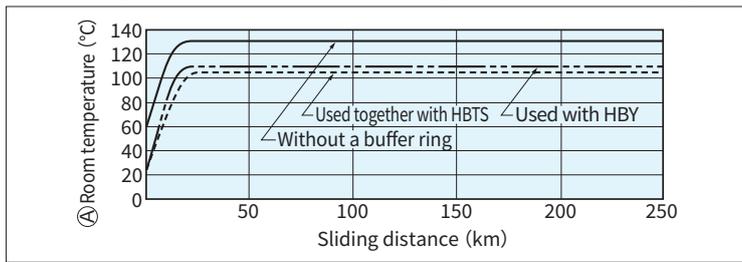
- (1) To buffer the impact pressure generated on the rod side of a hydraulic cylinder.
- (2) To inhibit transmission of oil temperature to rod packings.
- (3) To reduce frictional resistance and generation of sliding heat of rod packings.

a. Example of buffering effect on impact pressure <Table 8-6>

Buffer ring does not generate accumulated pressure between rod packings, because of back pressure relief property.

Test conditions	Construction (rod sealing system)	Conditions after test
Rod diameter: $\phi 70$ Pressure: 0~41.2MPa {0~420kgf/cm ² } Speed: 530mm/s Stroke: 900mm Oil used: Turbine oil grade 2 (ISO VG46) Oil temperature: 90±5°C (in the tank) Sliding distance: After sliding 250km	With a buffer ring 	
	With a buffer ring 	
	Without a buffer ring 	

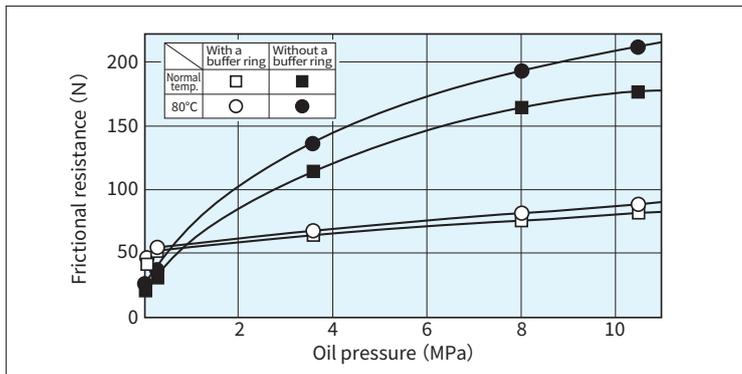
b. Example of reduction of temperature at sliding area



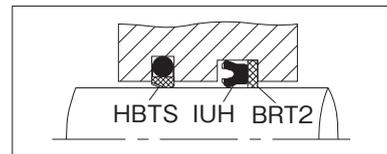
〈Fig. 8-14〉An example of measurement of temperature at sliding area
(For test conditions and temperature at (A), refer to the test condition.)

- When the impact pressure and the oil temperature are high, reduction of pressure and temperature of sliding part can be obtained by using a buffer ring.
- It is recommended to use packing and buffering together.

c. Example of reduction of frictional resistance



〈Fig. 8-15〉Relation between hydraulic pressure and frictional resistance



Construction (Rod sealing system)

Test conditions
 Pressure : 0~9.8MPa
 {0~100kgf/cm²}
 Speed : 30mm/s
 Stroke : 100mm
 Oil used : General purpose hydraulic oil
 Temperature : Constant temperature at 80°C

(8) Packings for extremely short stroke

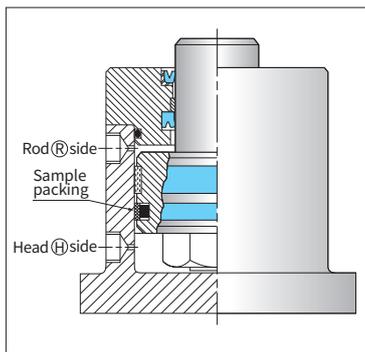
When packings are used with extremely short strokes, breaking of oil film (out of lubricant) occurs, and abnormal wear of the packing may occur. To prevent this, the packing must be designed to allow an easy formation of the lubricant film and to use material with better wear resistance.

Extremely short stroke roughly means a stroke below “the minimum stroke of 25 mm” defined in the old JIS B 8354 : 1992.

a. Piston packings

Test method

In order to investigate the internal oil leakage amount, test was conducted with the condition below. The oil leakage was measured at 250,000, 500,000, 750,000 and 1,000,000 cycles. The amount of oil leakage inside the test sample packing is measured by measuring the amount of oil leakage from the head-side (H) port when a given pressure of 34.3 MPa {350kgf/cm²} is applied from the rod-side (R) port for 10 minutes as shown in Fig. 8-16.



〈Fig. 8-16〉 Test equipment

Sample packing

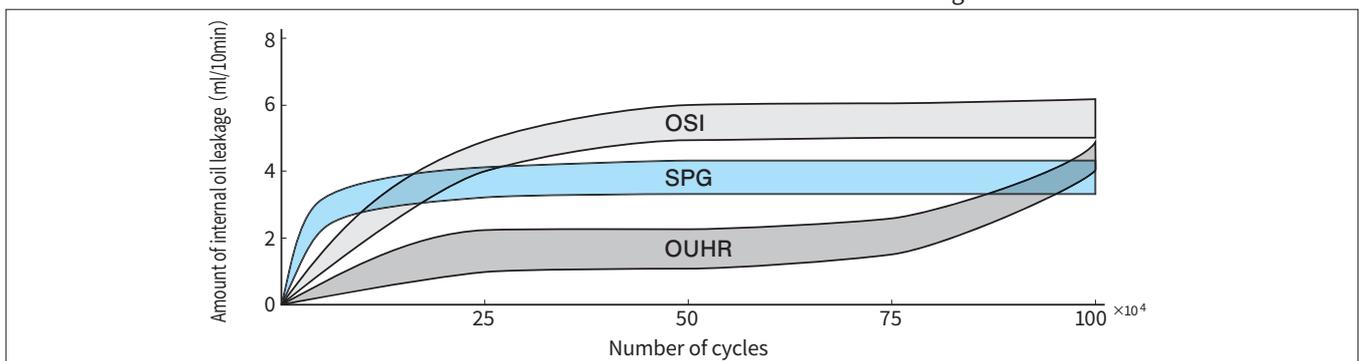
Cross section of seal	Type and size	Material
	SPG 94 110 7.3	①19YF ②A980
	OSI 110 95 9	U801
	OUHR 110 95 9 BRT2 95 110 3	①A567 ②19YF

Test condition

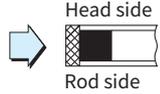
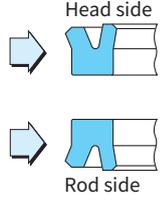
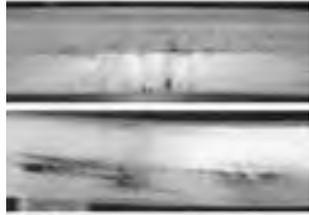
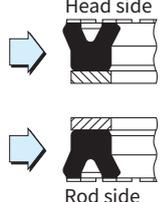
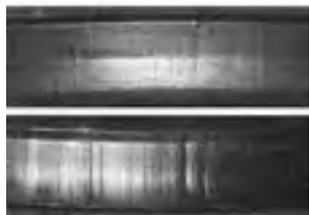
Oil used : General purpose hydraulic oil
 Pressure : Rod (R) side
 0 ~ 34.3MPa {0~350kgf/cm²}
 Head (H) side
 0 ~ 2MPa {0~20kgf/cm²}
 Stroke : 2mm
 Cycle : 16 c.p.m (Average speed 4mm/s)
 Sliding cycle : 100 × 10⁴ times
 Temperature : 95 ± 5°C (at cylinder internal surface)
 Roughness of cylinder internal surface : 3.2μm Rmax

Test results

※The amount of internal oil leakage for SPGW is almost the same as SPG.



〈Fig. 8-17〉 Change in amount of internal oil leakage

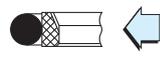
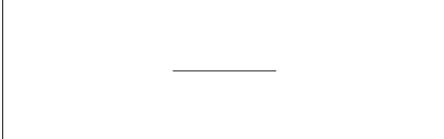
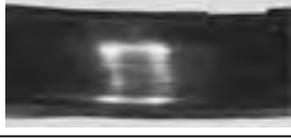
Type & size	Direction of photo	Surface condition	Remarks
SPG 94 110 7.3			No abnormalities are observed on the sliding face.
OSI 110 95 9			Wear and “sliding trace” are observed on the sliding face.
OUHR 110 95 9			Wear and “heavy sliding trace” are observed on the sliding face.

〈Fig. 8-18〉 Sliding surface condition after test

- For extremely short stroke, it is recommended to use combination seal (SPG or SPGW), using NOK Rareflon as the sliding material.

b. Rod packings

Fig. 8-19 shows the condition of sliding surface after the extremely short stroke test.

Type & size (Material)	Direction of photo	Surface condition	
		When buffer ring is used together.	When buffer ring is not used together.
〈Buffer ring〉 HBTS 75 90.5 5.9 (19YF, A626)			
〈Rod packing〉 IUH 75 85 6 (A505)			

〈Fig. 8-19〉 Condition of sliding surface after test

- It is recommended to use the buffer ring (HBTS or HBY) as a part of the sealing system along with the packings, when extremely short stroke condition is expected. Abnormal wear of rod packing may occur due to breakage of oil film without the buffer ring.

(9) Phenomenon of burning

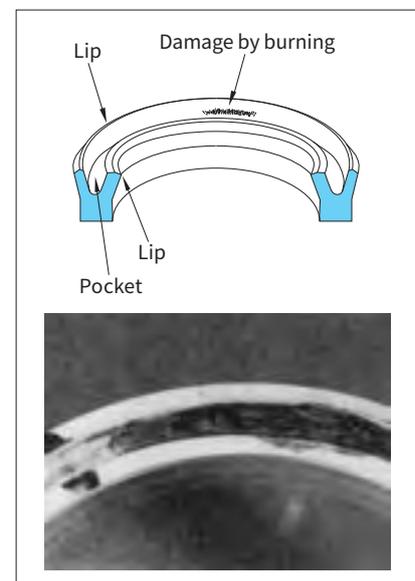
In some cases, piston packings or wear rings are burned and carbonized or melted. This is due to the high temperature resulting from sudden compression when air inside the hydraulic cylinder has not been completely exhausted.

For example, when a U packing is used as a piston packing, air tends to be accumulated in the pocket part of the U packing. When this air is not replaced by oil at starting movement, the air will be compressed quickly, resulting in high heat generation, at the U packing’s pocket, as shown in Fig. 8-20.

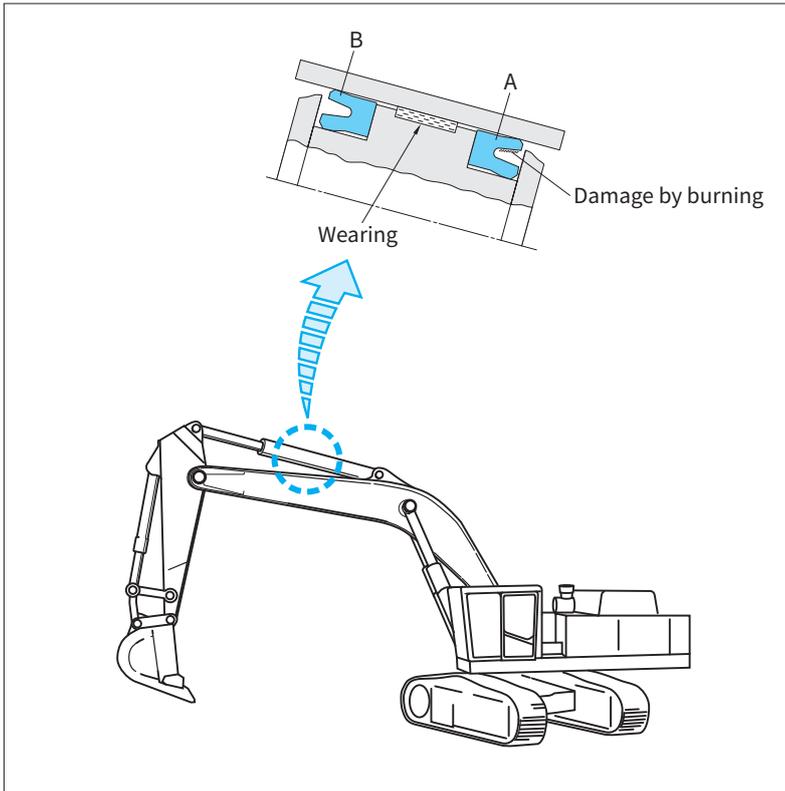
The packing may result in partially burned and carbonized. Some material may actually melt.

When the rod is directed upward, air is accumulated at the pocket part of U packing A on the head side, and “damage by burning” can be seen in Fig. 8-21. Also, the wear ring may be burnt, as shown in Fig. 8-22.

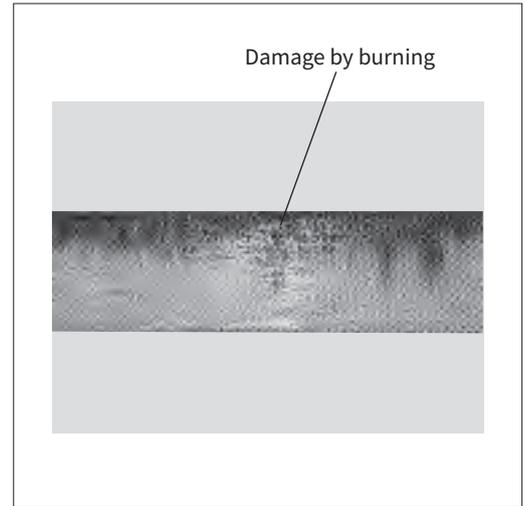
The phenomenon of burning tends to occur when starting a hydraulic cylinder, but seldom occurs during operation. The heat generation due to adiabatic compression may reach 600 to 800°C for a short period of time and instantaneously exceeds the heat resistant limit of packing material.



〈Fig. 8-20〉 Example of damage by burning of U packing



〈Fig. 8-21〉 Example of locations of damage by burning



〈Fig. 8-22〉 Example of damage by burning of wearing

a. Formula for calculating rise of temperature by adiabatic compression

Although, in the case of an actual hydraulic cylinder, it cannot be said to be a perfect adiabatic compression due to the existence of heat conduction and dispersion, etc. from the rod surface or tube wall face, the rise of temperature can be calculated from the formula (7).

$$T_2 = T_1 \times \frac{P_2 \cdot V_2}{P_1 \cdot V_1} = T_1 \left(\frac{P_2}{P_1} \right)^{\frac{\kappa-1}{\kappa}} \dots\dots\dots (7)$$

- T₁: Absolute temperature before compression (°K)
- T₂: Absolute temperature after compression (°K)
- P₁: Pressure before compression (MPa)
- P₂: Pressure after compression (MPa)
- V₁: Volume of air before compression (cm³)
- V₂: Volume of air after compression (cm³)
- κ : Adiabatic index (In case of air, κ = 1.4)

Now, let's calculate the heat generation by adiabatic compression by using this formula. Suppose the pressure in the hydraulic cylinder varies between 1 and 42MPa. For example, suppose the oil temperature is 80°C when the pressure is 1MPa, then the absolute temperature T₂ by the adiabatic compression is

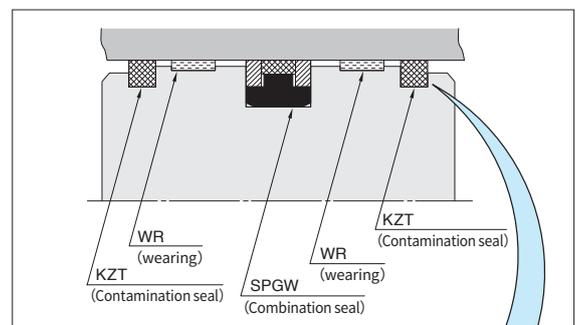
$$T_2 = (273 + 80) \times \left(\frac{42}{1} \right)^{\frac{1.4-1}{1.4}} \cong 1027 \text{ (°K)}$$

This temperature is equivalent to 754°C . The value neglects the adiabatic efficiency and other loss in its calculation. Even if this were taken into consideration, the packing is instantaneously exposed to a high temperature.

b. Prevention of damage by burning

Remark the following points to prevent the damage of burning due to such adiabatic compression.

- (1) Bleed air from the hydraulic cylinder sufficiently before starting the hydraulic cylinder.
- (2) When starting the hydraulic cylinder, do not operate it quickly to its full stroke.
- (3) When using U packings, fill the pocket with grease to minimize the accumulation of air.
- (4) Design the construction of piston as shown in the Fig. 8-23 and use Rareflon seal (Type KZT, contamination seal) having a good heat resistance at the outside of the wearing (WR).



〈Fig.8-23〉 Example of countermeasure against damage by burning



● Fig. 8-23 shows the most effective piston sealing system as a countermeasure against the damage by burning.

(10) Stick-slip

a. Phenomenon

Stick-slip is a phenomenon that a sliding surface has sticking and slipping condition periodically. In the case of packings, the stick-slip occurs at a contact face between a packing, an elastic body, and metal mating face, sometimes resulting in vibration and generating sound. The stick-slip phenomenon in hydraulic cylinders is caused by complex factors including types of bearings, types of packings, fixing method of cylinder, amount of load, etc. Also, the sound generated by stick-slip varies from low to high frequency tones.

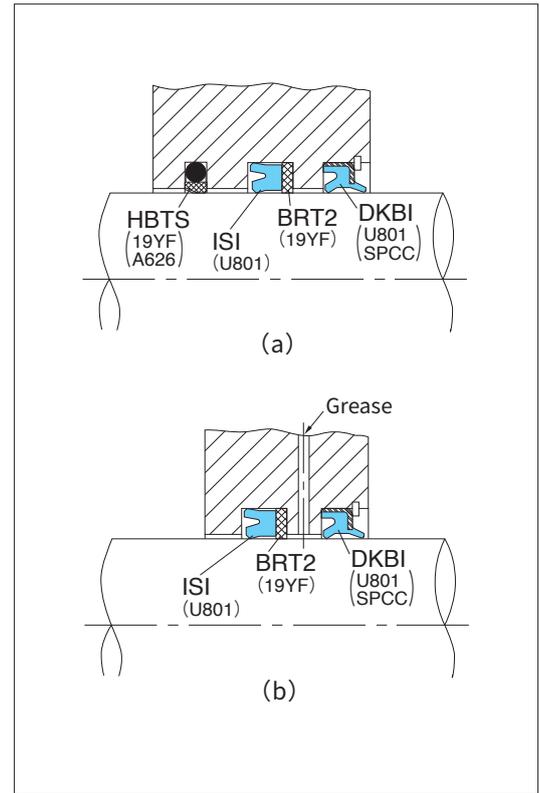
b. Conditions cause the phenomenon

Vibrations and sound generation due to the stick-slip of a hydraulic cylinder have not been quantitatively clarified yet. It is qualitatively known, however, that they occur under the following conditions.

- (1) When a static friction coefficient of a packing or bearing material is high.
- (2) When the roughness of metallic surface is not appropriate.
- (3) When the quality of oil used is poor (when the additive to oil is not appropriate).
- (4) When the lubricant film on the sliding face is liable to be broken due to a high pressure, high temperature or operation in a low speed.
- (5) When using a cylinder tube or a hollow rod which thickness is extremely thin or when using a hydraulic hose with a low rigidity.

c. Countermeasures

As previously mentioned, it is not possible to make perfect countermeasures for stick-slip solely by a packing itself. However, use of a combination seal (SPG or SPGW) made from low-friction material such as Rareflon or use of the U packing (OUHR) improved self lubrication. Also, additional use of a buffer ring with good lubricating characteristic (HBTS) as shown in Fig. 8-24(a) and/or filling grease between a rod packing and a dust seal as shown in Fig. 8-24(b) will be effective in preventing oil film breakage due to high pressure.



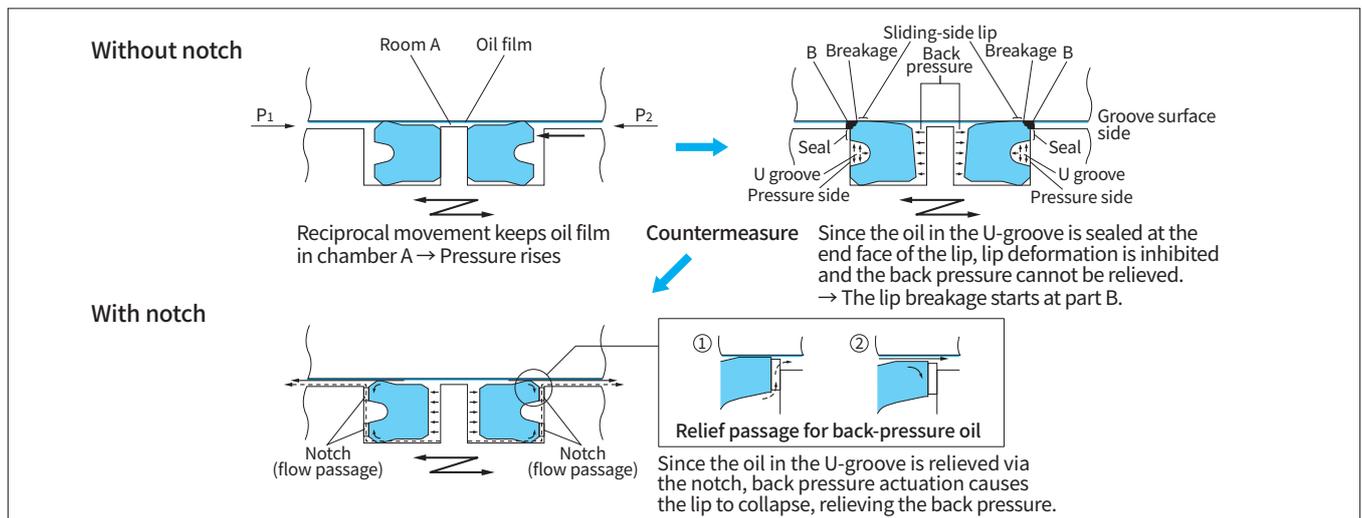
〈Fig. 8-24〉 Example of countermeasure against stick-slip

(11) Breakage due to pressure build-up

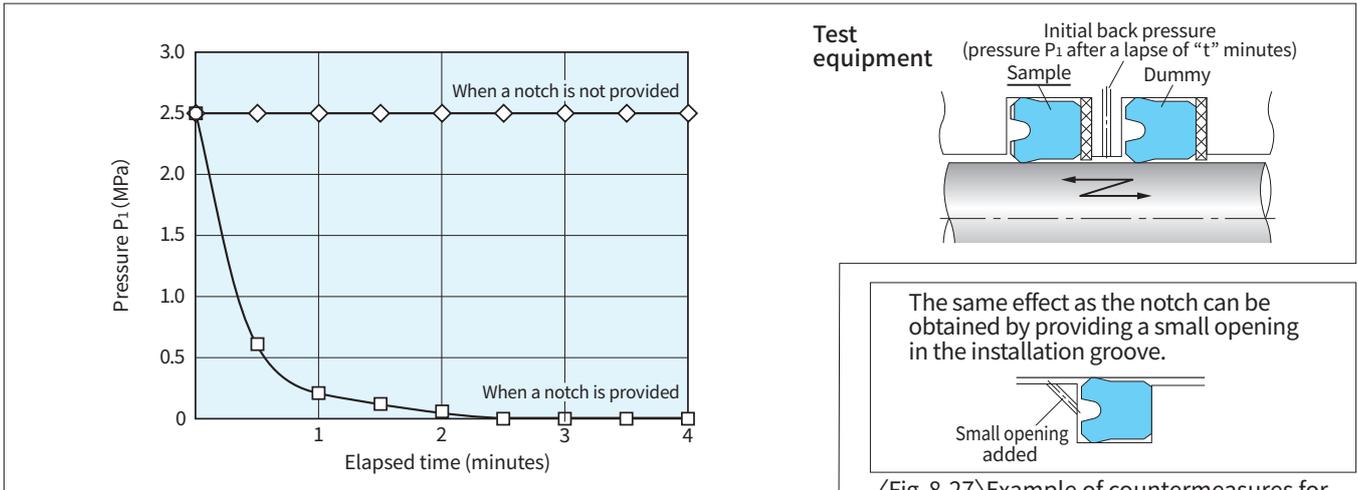
When two lip packings are used back-to-back for the piston, the packings fail due to pressure build-up between them. The failure occurs because the oil film passing through the packings remains between the packings due to reciprocal movement, gradually increasing the pressure (Fig. 8-25). Also, when using multiple packings, it is necessary to consider the possibility of pressure build-up. Using a packing with a notch (relief passage) at the tip of the lip is an effective countermeasure to pressure build-up. If there is no notch, the lip end surface and installed groove surface side touch each other due to back pressure, so pressure in the U-groove is not released, forcing the sliding-side lip into close contact with the sliding surface. As a result, because back pressure is not released, the packing is pressed to the pressure-side groove surface

side, breaking the lip starting from the point touching the corner of the groove. However, when a notch is provided, since the pressure in the U-groove is released via the notch, the sliding-side lip easily collapses at back-pressure actuation, relieving the back pressure. For reference, Fig. 8-26 shows the difference in back-pressure relief performance when a notch is and is not provided.

※ For rod packings, it is also necessary to consider pressure build-up when using multiple packings. For example, pressure build-up may occur when using a double-lip dust seal and a rod seal together. The most reliable countermeasure to pressure build-up is a drain between the packings (returning oil to oil tank). Using a DKBI3 dust seal with small holes on the oil lip allows pressure build-up oil to escape.



〈Fig. 8-25〉 Mechanism of package failure due to pressure build-up and countermeasures



〈Fig. 8-26〉 Back pressure leakage performance is different with and without a notch

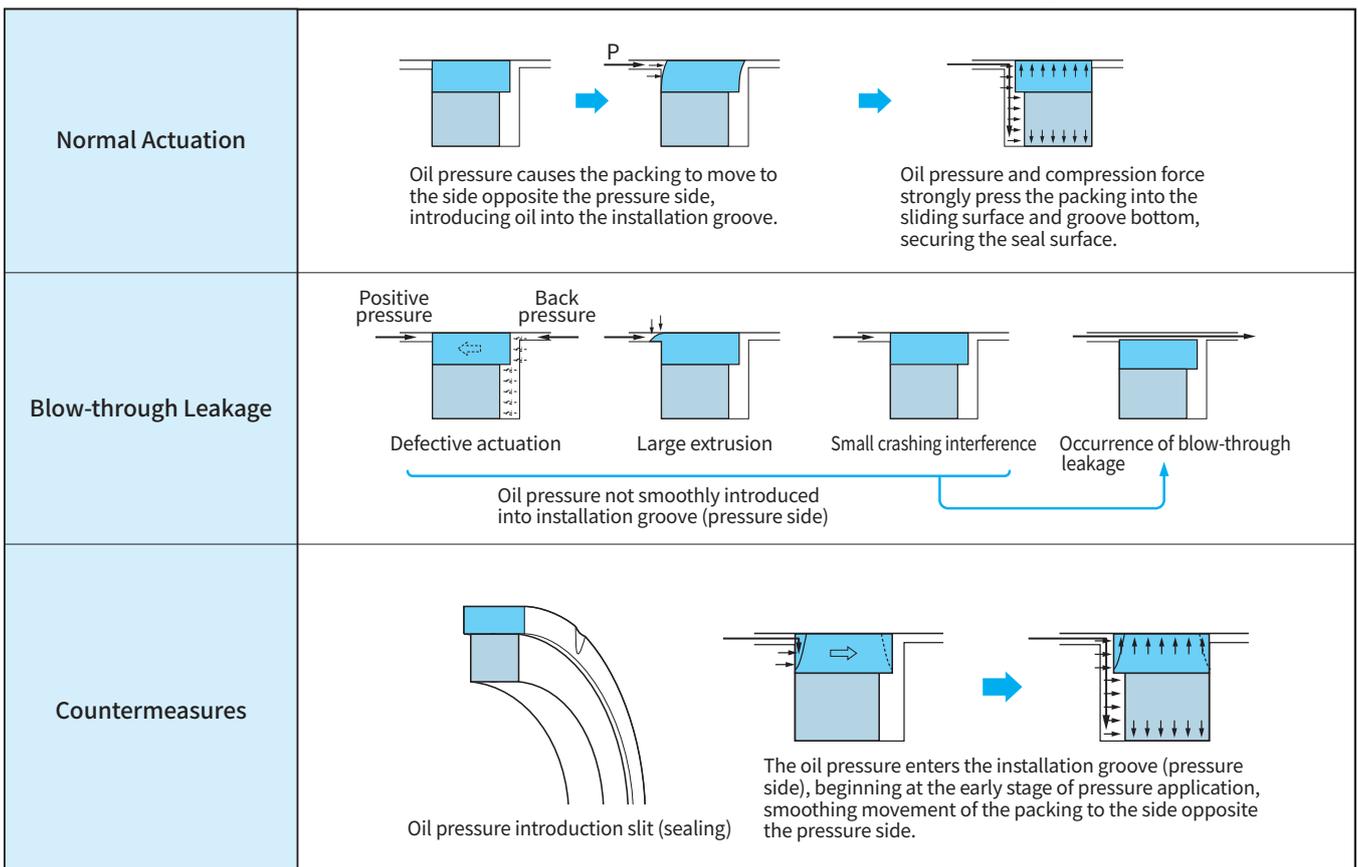
〈Fig. 8-27〉 Example of countermeasures for pressure build-up without packing

(12) Blow-through leakage (passing)

A packing initially seals oil under its own compression force. After application of pressure, it also seals high oil pressure by further extension due to oil pressure. Therefore, for the packing to maintain its sealing performance, it is important to introduce the oil pressure into the installation groove and to obtain the extension force due to oil pressure. Blow-through leakage (passing) occurs infrequently when the oil pressure is not introduced smoothly into the installation groove in the above state. Once blow-through leakage has occurred, a great amount of leakage may continue for a long time, yet at the same time, blow-through leakage does not always reoccur when investigating the cause. This makes blow-through leakage a very troublesome phenomenon. Such leakage typically occurs when pressure acts in both directions of the combination seal for a piston packing on a power steering cylinder. For example, as shown in Fig. H-28, blow-through

leakage occurs when the positive pressure acts from the left and back pressure acts from the right. Since the packing is pressed into the left-hand groove side by the back pressure, it is difficult for positive pressure from the left to enter the groove. As a result, extension force due to oil pressure is not obtained, causing blowthrough leakage. A countermeasure for blow-through leakage is to smooth the introduction of oil pressure into the installation groove by installing “an oil pressure introduction slit” in the side of the seal ring. Also, blow-through leakage tends to occur when the pressure causes extrusion of the seal ring or lowers the interference. A slit is effective in these cases and the packing becomes more reliable and has prolonged life.

※ A combination seal with a slit is a special product and is not described in this catalog; consult NOK for details.



〈Fig. 8-28〉 Blow-through leakage in combination seals and countermeasures for blow-through leakage

(13) Swelling mechanism

Swelling is the state in which equilibrium is attained between the force of oil molecules entering the polymer molecules and spreading the spacing between polymer molecules and the elasticity of the crosslinked meshes. Whether the swelling is large or small depends directly

〈Example 1〉 EPDM and mineral oil (high affinity) → Large swelling

EPDM SP value: 8 (small polarity) $[CH_2-CH_2]_n[CH(CH_3)-CH_2]_m$	Mineral oil SP value: 6 to 8 (small polarity) C_nH_{2n+2}
---	--

→EPDM and mineral oil are similar in structure (only C and H have no polar group) and their affinity is high, so the swelling is large.

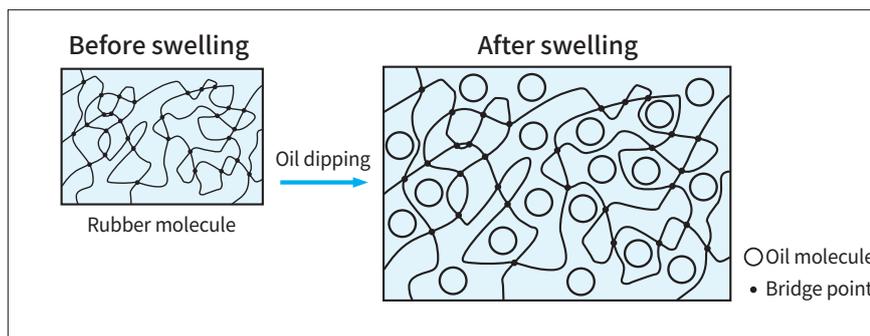
on the affinity between the oil and polymer, the larger the affinity, the larger the swelling.

The SP (Solubility Parameter) value is often used as an index of affinity. Two materials with similar molecular structures have larger affinity (the closer the polarity, the larger the affinity).

〈Example 1〉 NBR and mineral oil (poor affinity) → Small swelling

NBR SP value: 9 to 10 (large polarity) $[CH_2-CH=CH-CH_2]_n[CH(CH_2)-C(=N)]_m$	Mineral oil SP value: 6 to 8 (large polarity) C_nH_{2n+2}
---	--

→NBR and mineral oil are dissimilar (NBR has a polar group) and their affinity is poor, so the swelling is small.



〈Fig. 8-29〉 Swelling advancement

Oil tries to get between rubber molecules, spreading the clearance between the rubber molecules (swelling phenomenon). The clearance between the rubber molecules is spread by oil swelling, but because of bridges, clearance swelling does not occur beyond a point (called equilibrium swelling).

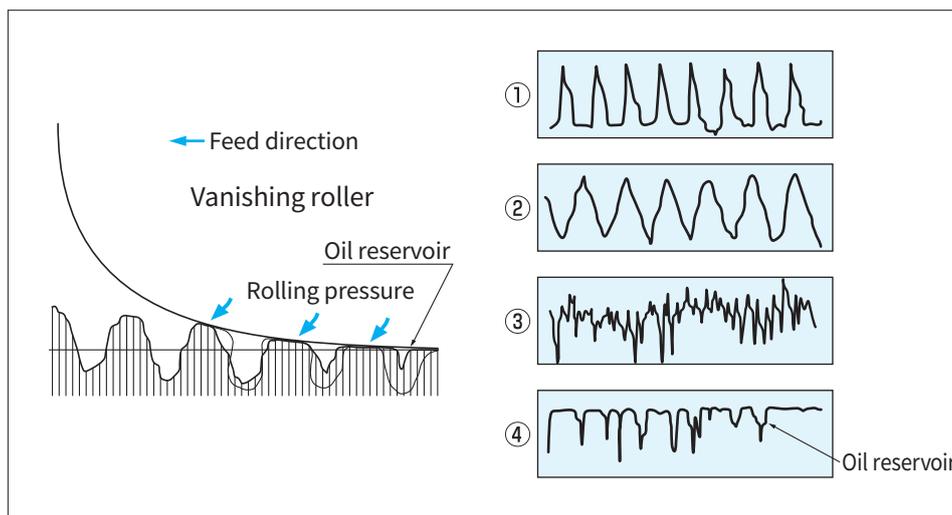
〈Reference: With non-bridged rubbers, swelling becomes bigger and bigger until dissolution finally occurs (such as rubber adhesive material and spray glue).〉

(14) Roughness of contacting object

a. Roughness of sliding surface

Surface roughness greatly affects seal performance, efficiency and life, and both the size and form of the roughness are very important. When a surface has convexities, the seal wears quickly.

Conversely, seal durability is improved when a surface has concavities that form oil reservoirs, reducing seal abrasion. For this reason, we recommend using a roller vanishing finish (RLB) for the inside surface of the cylinder tube and a buff finish (SPBF) for the rod surface to flatten convexities.



〈Fig. 8-30〉 Roughness example

①~④ are examples of surface roughness.

④ is the figure of roughness when the roller vanishing finish is used. Using the roller vanishing finish, convexities are flattened by plastic deformation, and an oil reservoir is formed in concavities, reducing the seal's abrasion and improving its durability.

b. Roughness of groove bottom

Generally, the packing installation groove is machined by a lathe, so it has a spiral continuous machining track (roughness), but since the packing material has flexibility, the machining track does not become an oil relief passage due to filling-in of concavities in the rough area. However, when the roughness is large, concavities in the rough area cannot be filled in, forming an oil relief passage and causing oil leakage. The sliding surface of the packing is often managed because of packing friction problems. When the roughness of the bottom of the installation groove cannot be

reduced sufficiently due to high machining difficulties, oil leakage may occur. The permissible roughness of the bottom of the groove is 6.3 mmRz or smaller for rubbers, such as nitrile rubber, with high flexibility, and 3.2 mmRz or smaller for iron rubber with relatively high rigidity. However, since the ability to match the roughness of the contact object is affected by both the rubber material and the pressing force (compression force), the ability may differ due to the shape of the packing even when the material is the same.

※ The roughness index is based on JIS B 0601: 2001.

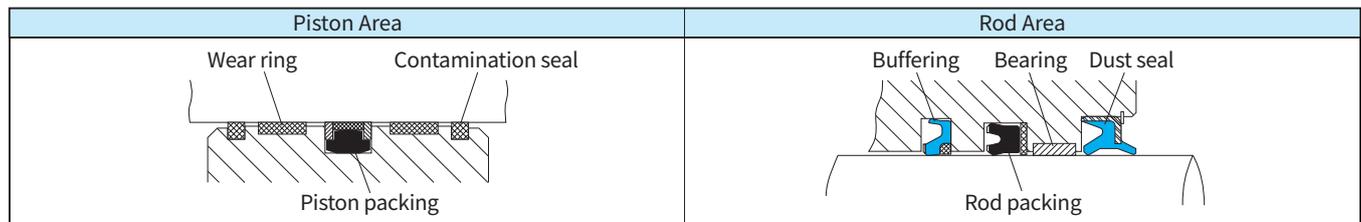
(15) Sealing system (combination effect)

a. Example of long-life system for construction machines

Among hydraulic cylinders, the cylinders of construction machines are subject to harsh usage conditions, such as high pressure and temperature.

Since the sealing system is used outdoors, external contamination is severe and the sealing system must cope with harsh use. The traditional mainstream rod sealing system used a combination of buffer rings, rod seals and dust seals made of high-strength iron rubber. However, recently, nitrile rubber is increasingly being used as the rod packing material to improve performance and prolong life. Compared to iron rubber,

nitrile rubber has excellent ability to follow low-temperature eccentricity, so increasing use of nitrile rubber for rod seals improves low-temperature sealing performance and low-temperature durability. However, use of nitrile rubber assumes use of a buffer ring with the rod packing, because the strength of nitrile rubber is lower than iron rubber (Fig. 8-31, Fig. 8-32). As shown in this example, to achieve excellent long-term seal performance, it is necessary to examine not only the selection of each packing, but also the system configuration.



〈Fig. 8-31〉 Example of sealing system for hydraulic cylinder of a construction machine

	Shape	Material	Main function	Feature
Piston Area	Piston packing	①PTFE: Rareflon ②PA: Polyamide ③NBR:nitrile rubber	Retention of oil pressure	A PTFE seal ring ① with excellent friction and abrasion characteristics is used. Also, to augment PTFE's creep characteristics and pressure resistance, a combination of a buffer ring ③ made of NBR and a backup ring ② made of PA is used.
	Contamination seal	PTFE: Rareflon	Elimination of foreign objects in oil	Intrusion of foreign objects into the piston packing is inhibited by burying and capturing the foreign objects not only by scraping off foreign objects in the oil but also using PTFE's plastic deformability.
	Wear ring	PTFE: Rareflon	Bearing	Stick-slip is prevented by using PTFE's excellent friction characteristics. Fabric phenol resin with high elasticity is used for applications requiring large lateral load.
Rod Area	Buffering	①PUR: Iron rubber ②PA: Polyamide	Buffering of impact pressure applied to rod packing	Since there are high pressures, a PTFE seal ring ① is used in combination with a PA backup ring ②, to use PUR with a combination of strength and flexibility so that the pressure resistance is supplemented.
	Rod packing	①NBR:nitrile rubber ②PTFE: Rareflon	Prevention of external oil leaks	Long life is achieved by using NBR with excellent creep characteristics. Supplementing pressure resistance using a PTFE backup ring ② with ② made of PA is inappropriate due to the large strength difference between ② and ① causing extrusion breakage in ①.
	Dust seal	①PUR: Iron rubber ②SPCC	Prevention of intrusion of foreign objects	To cope with the harsh external contaminant conditions, high-strength PUR is used to resist plastic deformation

〈Fig. 8-32〉 Features of each packing material

(16) Blisters

a. Phenomenon

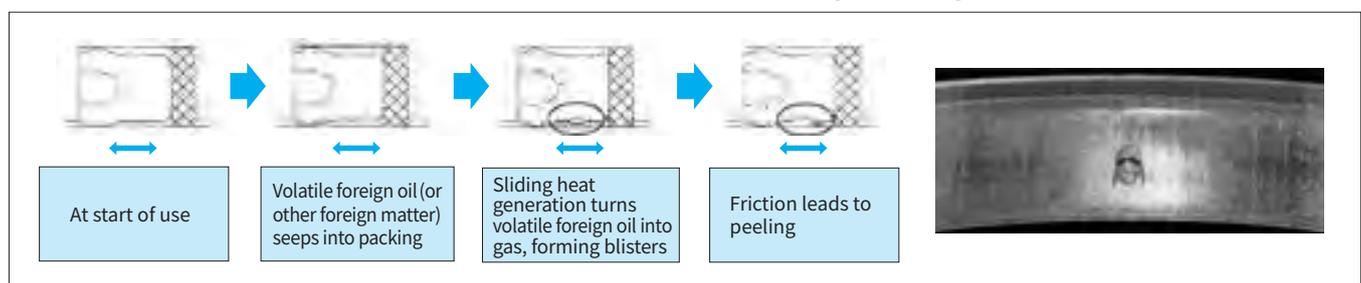
Blister refers to foam or bubbles formed in the vicinity of sliding sections of the seal when liquid absorbed into the seal is converted to gas form by sliding heat generation. Since packing is used at high pressures, blisters in the vicinity of the sliding face of the seal can cause peeling due to friction caused by sliding movement in the vicinity (Fig. 8-33).

b. Conditions conducive to blisters

Where volatile oils are used, blisters may form in a high-temperature operating environment (high temperature, high speed, high pressure). In some cases this is caused by the presence of a volatile foreign oil in the oil being used.

c. Response

Blister are caused by certain combinations of oils and operating conditions. Although the problem cannot be solved by packing alone, it is possible to reduce sliding heat generation through the use of low-friction materials such as combined seals made from Rareflon and self-lubricating U-packing such as OUHR.



〈Fig. 8-33〉 Packing example (blister formation ⇒ peeling)

9. Reference Material

Shaft tolerances and dimensions

Unit:0.001mm

Classification of nominal dimension (mm)	IT 5										IT 6										IT 7										IT 8										IT 9										IT 10		IT 11		IT 12																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
	m5	k5	j5	h5	IT	r6	p6	n6	m6	k6	j6	h6	g6	f6	IT	s7	r7	p7	n7	m7	k7	j7	h7	g7	f7	e7	IT	h8	f8	e8	d8	IT	h9	e9	d9	c9	b9	IT	h10	f10	e10	d10	c10	b10	IT	h11	f11	e11	d11	c11	b11	IT	h12	f12	e12	d12	c12	b12	IT	h13	f13	e13	d13	c13	b13	IT	h14	f14	e14	d14	c14	b14	IT	h15	f15	e15	d15	c15	b15	IT	h16	f16	e16	d16	c16	b16	IT	h17	f17	e17	d17	c17	b17	IT	h18	f18	e18	d18	c18	b18	IT	h19	f19	e19	d19	c19	b19	IT	h20	f20	e20	d20	c20	b20	IT	h21	f21	e21	d21	c21	b21	IT	h22	f22	e22	d22	c22	b22	IT	h23	f23	e23	d23	c23	b23	IT	h24	f24	e24	d24	c24	b24	IT	h25	f25	e25	d25	c25	b25	IT	h26	f26	e26	d26	c26	b26	IT	h27	f27	e27	d27	c27	b27	IT	h28	f28	e28	d28	c28	b28	IT	h29	f29	e29	d29	c29	b29	IT	h30	f30	e30	d30	c30	b30	IT	h31	f31	e31	d31	c31	b31	IT	h32	f32	e32	d32	c32	b32	IT	h33	f33	e33	d33	c33	b33	IT	h34	f34	e34	d34	c34	b34	IT	h35	f35	e35	d35	c35	b35	IT	h36	f36	e36	d36	c36	b36	IT	h37	f37	e37	d37	c37	b37	IT	h38	f38	e38	d38	c38	b38	IT	h39	f39	e39	d39	c39	b39	IT	h40	f40	e40	d40	c40	b40	IT	h41	f41	e41	d41	c41	b41	IT	h42	f42	e42	d42	c42	b42	IT	h43	f43	e43	d43	c43	b43	IT	h44	f44	e44	d44	c44	b44	IT	h45	f45	e45	d45	c45	b45	IT	h46	f46	e46	d46	c46	b46	IT	h47	f47	e47	d47	c47	b47	IT	h48	f48	e48	d48	c48	b48	IT	h49	f49	e49	d49	c49	b49	IT	h50	f50	e50	d50	c50	b50	IT	h51	f51	e51	d51	c51	b51	IT	h52	f52	e52	d52	c52	b52	IT	h53	f53	e53	d53	c53	b53	IT	h54	f54	e54	d54	c54	b54	IT	h55	f55	e55	d55	c55	b55	IT	h56	f56	e56	d56	c56	b56	IT	h57	f57	e57	d57	c57	b57	IT	h58	f58	e58	d58	c58	b58	IT	h59	f59	e59	d59	c59	b59	IT	h60	f60	e60	d60	c60	b60	IT	h61	f61	e61	d61	c61	b61	IT	h62	f62	e62	d62	c62	b62	IT	h63	f63	e63	d63	c63	b63	IT	h64	f64	e64	d64	c64	b64	IT	h65	f65	e65	d65	c65	b65	IT	h66	f66	e66	d66	c66	b66	IT	h67	f67	e67	d67	c67	b67	IT	h68	f68	e68	d68	c68	b68	IT	h69	f69	e69	d69	c69	b69	IT	h70	f70	e70	d70	c70	b70	IT	h71	f71	e71	d71	c71	b71	IT	h72	f72	e72	d72	c72	b72	IT	h73	f73	e73	d73	c73	b73	IT	h74	f74	e74	d74	c74	b74	IT	h75	f75	e75	d75	c75	b75	IT	h76	f76	e76	d76	c76	b76	IT	h77	f77	e77	d77	c77	b77	IT	h78	f78	e78	d78	c78	b78	IT	h79	f79	e79	d79	c79	b79	IT	h80	f80	e80	d80	c80	b80	IT	h81	f81	e81	d81	c81	b81	IT	h82	f82	e82	d82	c82	b82	IT	h83	f83	e83	d83	c83	b83	IT	h84	f84	e84	d84	c84	b84	IT	h85	f85	e85	d85	c85	b85	IT	h86	f86	e86	d86	c86	b86	IT	h87	f87	e87	d87	c87	b87	IT	h88	f88	e88	d88	c88	b88	IT	h89	f89	e89	d89	c89	b89	IT	h90	f90	e90	d90	c90	b90	IT	h91	f91	e91	d91	c91	b91	IT	h92	f92	e92	d92	c92	b92	IT	h93	f93	e93	d93	c93	b93	IT	h94	f94	e94	d94	c94	b94	IT	h95	f95	e95	d95	c95	b95	IT	h96	f96	e96	d96	c96	b96	IT	h97	f97	e97	d97	c97	b97	IT	h98	f98	e98	d98	c98	b98	IT	h99	f99	e99	d99	c99	b99	IT	h100	f100	e100	d100	c100	b100	IT	h101	f101	e101	d101	c101	b101	IT	h102	f102	e102	d102	c102	b102	IT	h103	f103	e103	d103	c103	b103	IT	h104	f104	e104	d104	c104	b104	IT	h105	f105	e105	d105	c105	b105	IT	h106	f106	e106	d106	c106	b106	IT	h107	f107	e107	d107	c107	b107	IT	h108	f108	e108	d108	c108	b108	IT	h109	f109	e109	d109	c109	b109	IT	h110	f110	e110	d110	c110	b110	IT	h111	f111	e111	d111	c111	b111	IT	h112	f112	e112	d112	c112	b112	IT	h113	f113	e113	d113	c113	b113	IT	h114	f114	e114	d114	c114	b114	IT	h115	f115	e115	d115	c115	b115	IT	h116	f116	e116	d116	c116	b116	IT	h117	f117	e117	d117	c117	b117	IT	h118	f118	e118	d118	c118	b118	IT	h119	f119	e119	d119	c119	b119	IT	h120	f120	e120	d120	c120	b120	IT	h121	f121	e121	d121	c121	b121	IT	h122	f122	e122	d122	c122	b122	IT	h123	f123	e123	d123	c123	b123	IT	h124	f124	e124	d124	c124	b124	IT	h125	f125	e125	d125	c125	b125	IT	h126	f126	e126	d126	c126	b126	IT	h127	f127	e127	d127	c127	b127	IT	h128	f128	e128	d128	c128	b128	IT	h129	f129	e129	d129	c129	b129	IT	h130	f130	e130	d130	c130	b130	IT	h131	f131	e131	d131	c131	b131	IT	h132	f132	e132	d132	c132	b132	IT	h133	f133	e133	d133	c133	b133	IT	h134	f134	e134	d134	c134	b134	IT	h135	f135	e135	d135	c135	b135	IT	h136	f136	e136	d136	c136	b136	IT	h137	f137	e137	d137	c137	b137	IT	h138	f138	e138	d138	c138	b138	IT	h139	f139	e139	d139	c139	b139	IT	h140	f140	e140	d140	c140	b140	IT	h141	f141	e141	d141	c141	b141	IT	h142	f142	e142	d142	c142	b142	IT	h143	f143	e143	d143	c143	b143	IT	h144	f144	e144	d144	c144	b144	IT	h145	f145	e145	d145	c145	b145	IT	h146	f146	e146	d146	c146	b146	IT	h147	f147	e147	d147	c147	b147	IT	h148	f148	e148	d148	c148	b148	IT	h149	f149	e149	d149	c149	b149	IT	h150	f150	e150	d150	c150	b150	IT	h151	f151	e151	d151	c151	b151	IT	h152	f152	e152	d152	c152	b152	IT	h153	f153	e153	d153	c153	b153	IT	h154	f154	e154	d154	c154	b154	IT	h155	f155	e155	d155	c155	b155	IT	h156	f156	e156	d156	c156	b156	IT	h157	f157	e157	d157	c157	b157	IT	h158	f158	e158	d158	c158	b158	IT	h159	f159	e159	d159	c159	b159	IT	h160	f160	e160	d160	c160	b160	IT	h161	f161	e161	d161	c161	b161	IT	h162	f162	e162	d162	c162	b162	IT	h163	f163	e163	d163	c163	b163	IT	h164	f164	e164	d164	c164	b164	IT	h165	f165	e165	d165	c165	b165	IT	h166	f166	e166	d166	c166	b166	IT	h167	f167	e167	d167	c167	b167	IT	h168	f168	e168	d168	c168	b168	IT	h169	f169	e169	d169	c169	b169	IT	h170	f170	e170	d170	c170	b170	IT	h171	f171	e171	d171	c171	b171	IT	h172	f172	e172	d172	c172	b172	IT	h173	f173	e173	d173	c173	b173	IT	h174	f174	e174	d174	c174	b174	IT	h175	f175	e175	d175	c175	b175	IT	h176	f176	e176	d176	c176	b176	IT	h177	f177	e177	d177	c177	b177	IT	h178	f178	e178	d178	c178	b178	IT	h179	f179	e179	d179	c179	b179	IT	h180	f180	e180	d180	c180	b180	IT	h181	f181	e181	d181	c181	b181	IT	h182	f182	e182	d182	c182	b182	IT	h183	f183	e183	d183	c183	b183	IT	h184	f184	e184	d184	c184	b184	IT	h185	f185	e185	d185	c185	b185	IT	h186	f186	e186	d186	c186	b186	IT	h187	f187	e187	d187	c187	b187	IT	h188	f188	e188	d188	c188	b188	IT	h189	f189	e189	d189	c189	b189	IT	h190	f190	e190	d190	c190	b190	IT	h191	f191	e191	d191	c191	b191	IT	h192	f192	e192	d192	c192	b192	IT	h193	f193	e193	d193	c193	b193	IT	h194	f194	e194	d194	c194	b194	IT	h195	f195	e195	d195	c195	b195	IT	h196	f196	e196	d196	c196	b196	IT	h197	f197	e197	d197	c197	b197	IT	h198	f198	e198	d198	c198	b198	IT	h199	f199	e199	d199	c199	b199	IT	h200	f200	e200	d200	c200	b200	IT	h201	f201	e201	d201	c201	b201	IT	h202	f202	e202	d202	c202	b202	IT	h203	f203	e203	d203	c203	b203	IT	h204	f204	e204	d204	c204	b204	IT	h205	f205	e205	d205	c205	b205	IT	h206	f206	e206	d206	c206	b206	IT	h207	f207	e207	d207	c207	b207	IT	h208	f208	e208	d208	c208	b208	IT	h209	f209	e209	d209	c209	b209	IT	h210	f210	e210	d210	c210	b210	IT	h211	f211	e211	d211	c211	b211	IT	h212	f212	e212	d212	c212	b212	IT	h213	f213	e213	d213	c213	b213	IT	h214	f214	e214	d214	c214	b214	IT	h215	f215	e215	d215	c215	b215	IT	h216	f216	e216	d216	c216	b216	IT	h217	f217	e217	d217	c217	b217	IT	h218	f218	e218	d218	c218	b218	IT	h219	f219	e219	d219	c219	b219	IT	h220	f220	e220	d220	c220	b220	IT	h221	f221	e221	d221	c221	b221	IT	h222	f222	e222	d222	c222	b222	IT	h223	f223	e223	d223	c223	b223	IT	h224	f224	e224	d224	c224	b224	IT	h225	f225	e225	d225	c225	b225	IT	h226	f226	e226	d226	c226	b226	IT	h227	f227	e227	d227	c227	b227	IT	h228	f228	e228	d228	c228	b228	IT	h229	f229	e229	d229	c229	b229	IT	h230	f230	e230	d230	c230	b230	IT	h231	f231	e231	d231	c231	b231	IT	h232	f232	e232	d232	c232	b232	IT	h233	f233	e233	d233	c233	b233	IT	h234	f234	e234	d234	c234	b234	IT	h235

Basic tolerances for large applications (JIS B 0401)

Unut : 0.001mm

Nominal Size Size Group (mm)		Shaft Tolerances			Bore Tolerances			
		h9	h10	f8	H7	H8	H9	H10
Over	Up to	Upper tolerance Lower tolerance			Upper tolerance Lower tolerance			
500	630	0 -175	0 -280	-76 -186	+70 0	+110 0	+175 0	+280 0
630	800	0 -200	0 -320	-80 -205	+80 0	+125 0	+200 0	+320 0
800	1000	0 -230	0 -360	-86 -226	+90 0	+140 0	+230 0	+360 0
1000	1250	0 -260	0 -420	-98 -263	+105 0	+165 0	+260 0	+420 0
1250	1600	0 -310	0 -500	-110 -305	+125 0	+195 0	+310 0	+500 0
1600	2000	0 -370	0 -600	-120 -350	+150 0	+230 0	+370 0	+600 0

Conversion table for SI units

The enclosed sections show the SI unit conversions.

Force	N	dyn	kgf
	1	1×10^5	1.01972×10^{-1}
	1×10^{-5}	1	1.01972×10^{-6}
	9.80665	9.80665×10^5	1

Viscosity	Pa·s	cp	P
	1	1×10^3	1×10
	1×10^{-3}	1	1×10^{-2}
	1×10^{-1}	1×10^2	1

Note: $1P = 1\text{dyn}\cdot\text{s}/\text{cm}^2 = 1\text{g}/\text{cm}\cdot\text{s}$, $1\text{Pa}\cdot\text{s} = 1\text{N}\cdot\text{s}/\text{m}^2$, $1\text{cP} = 1\text{mPa}\cdot\text{s}$

Pressure	Pa	kPa	MPa	bar	kgf/cm ²	atm	mmH ₂ O	mmHg または Torr
	1	1×10^{-3}	1×10^{-6}	1×10^{-5}	1.01972×10^{-5}	9.86923×10^{-6}	1.01972×10^{-1}	7.50062×10^3
	1×10^3	1	1×10^{-3}	1×10^{-2}	1.01972×10^{-2}	9.86923×10^{-3}	1.01972×10^2	7.50062
	1×10^6	1×10^3	1	1×10	1.01972×10	9.86923	1.01972×10^5	7.50062×10^3
	1×10^5	1×10^2	1×10^{-1}	1	1.01972	9.86923×10^{-1}	1.01972×10^4	7.50062×10^2
	9.80665×10^4	9.80665×10	9.80665×10^{-2}	9.80665×10^{-1}	1	9.67841×10^{-1}	1×10^4	7.35559×10^2
	1.01325×10^5	1.01325×10^2	1.01325×10^{-1}	1.01325	1.03323	1	1.03323×10^4	7.6000×10^2
	9.80665	9.80665×10^{-3}	9.80665×10^{-6}	9.80665×10^{-5}	1×10^{-4}	9.67841×10^{-5}	1	7.35559×10^{-2}
	1.33322×10^2	1.33322×10^{-1}	1.33322×10^{-4}	1.33322×10^{-3}	1.35951×10^{-3}	1.31579×10^{-3}	1.35951×10	1

Note: $1\text{Pa} = 1\text{N}/\text{m}^2$

Stress	Pa または N/m^2	MPa または N/mm^2	kgf	kgf/cm ²
	1	1×10^{-6}	1.01972×10^{-7}	1.01972×10^{-5}
	1×10^6	1	1.01972×10^{-1}	1.01972×10
	9.80665×10^6	9.80665	1	1×10^2
	9.80665×10^4	9.80665×10^{-2}	1×10^{-2}	1

Note: $1\text{Pa} = 1\text{N}/\text{m}^2$, $1\text{MPa} = 1\text{N}/\text{mm}^2$

Dynamic viscosity	m ² /s	cSt	St
	1	1×10^6	1×10^4
	1×10^{-6}	1	1×10^2
	1×10^{-4}	1×10^2	1

Note: $1\text{St} = 1\text{cm}^2/\text{s}$, $1\text{cSt} = 1\text{mm}^2/\text{s}$

Hardness conversion table

Approximate conversion value for Rockwell ASTM hardness C of steel					
Hardness by Rockwell C scale	Vickers hardness	Brinell hardness 300kg Standard ball	Rockwell hardness B scale Load 100kg Dia. of ball: 1/16 in.	Shore hardness	Hardness by Rockwell C scale
68	940	—	—	97	68
67	900	—	—	95	67
66	865	—	—	92	66
65	832	—	—	91	65
64	800	—	—	88	64
63	772	—	—	87	63
62	746	—	—	85	62
61	720	—	—	83	61
60	697	—	—	81	60
59	674	—	—	80	59
58	653	—	—	78	58
57	633	—	—	76	57
56	613	—	—	75	56
55	595	—	—	74	55
54	577	—	—	72	54
53	560	—	—	71	53
52	544	500	—	69	52
51	528	487	—	68	51
50	513	475	—	67	50
49	498	464	—	66	49
48	484	451	—	64	48
47	471	442	—	63	47
46	458	432	—	62	46
45	446	421	—	60	45
44	434	409	—	58	44
43	423	400	—	57	43
42	412	390	—	56	42
41	402	381	—	55	41
40	392	371	—	54	40
39	382	362	—	52	39
38	372	358	—	51	38
37	363	344	—	50	37
36	354	336	(109.0)	49	36
35	345	327	(108.5)	48	35
34	336	319	(108.0)	47	34
33	327	311	(107.5)	46	33
32	318	301	(107.0)	44	32
31	310	294	(106.0)	43	31
30	302	286	(105.5)	42	30
29	294	279	(104.5)	41	29
28	286	271	(104.0)	41	28
27	279	264	(103.0)	40	27
26	272	258	(102.5)	38	26
25	266	253	(101.5)	38	25
24	260	247	(101.0)	37	24
23	254	243	(100.0)	36	23
22	248	237	(99.0)	35	22
21	243	231	(98.5)	35	21
20	238	226	97.8	34	20
(18)	230	219	96.7	33	(18)
(16)	222	212	95.5	32	(16)
(14)	213	203	93.9	31	(14)
(12)	204	194	92.3	29	(12)
(10)	196	187	90.7	28	(10)
(8)	188	179	89.5	27	(8)
(6)	180	171	87.1	26	(6)
(4)	173	165	85.5	25	(4)
(2)	166	158	83.5	24	(2)
(0)	160	152	81.7	24	(0)

Surface roughness vs machining methods

Method of processing	Range of roughness Rz μm	0.1 or less	0.2 or less	0.4 or less	0.8 or less	1.5 or less	3 or less	6 or less	12 or less	25 or less	50 or less	100 or less	200 or less	400 or less
		No symbols or ~												
Forging	FG													
Casting	C									Precision				
Die casting	DC													
Hot rolling	HR													
Cold rolling	CR													
Drawing	DW													
Extrusion	EX													
Tumbling	TU													
Sand-blasting	SB													
Roll lining	RL													
Face milling	FM									Precision				
Planing	P													
Slotting	SL													
Milling	M									Precision				
Fine boring	FB													
Filing finish	FF									Precision				
Turning	T									Precision	Fine	Medium		Rough
Boring	B									Precision				
Drilling	D													
Reaming	DR									Precision				
Broaching	BR									Precision				
Shaving	SV													
Grinding	G									Precision	Fine	Medium		Rough
Honing finish	GH									Precision				
Super finish	GSP									Precision				
Buffing finish	SPBF													
Paper finish	FCA									Precision				
Lapping finish	FL									Precision				
Liquid honing	SPLH									Precision				
Burnishing	RLB													
Roller finish	RF													
Chemical polishing	SPC									Precision				
Electrolytic polishing	SPE									Precision				

Change of surface roughness JIS standard

Standard No.	JIS B 0601 : 1982	JIS B 0601 : 1994	JIS B 0601 : 2001
Comparison and use	JIS B 0031 : 1982	JIS B 0031 : 1994	JIS B 0601 : 2001
Profile curve	Without filter	Without filter	λc filter
Evaluation length	1 Reference length	—	Length of shape
Maximum height	R max	—	Pt
Average roughness of 10 points	Rz	—	—
Roughness curve	2Rc λc filter	Phase compensation λc filter	Phase compensation λc filter + λs filter
Evaluation length	1 Reference length	5 Reference length	5 Reference length
Maximum height	—	Maximum height: Ry	Maximum height: Rz
Average roughness of 10 points	—	Rz	Rz JIS
Average roughness of center point	Ra	Ra 75	Ra 75
Arithmetic average roughness	—	Ra	Ra
Average interval between convexities and concavities	—	Average interval between concavities and convexities: Sm	Average length of roughness curve element: RSm
Local peak interval	—	Local peak average interval: S	—
Load length rate	—	tp (on per-reference-length basis)	Rmr (entire evaluation length)
Other height parameters	—	—	Rp, Rv, Rt, Rc, Rq
Height feature parameter	—	—	Rsk, Rku
Composite parameter and others	—	—	RΔq, Rσc, Rmr

Table of viscosity conversion

Seyboldt SUS (sec)	Red wood R (sec)	Engler E (sec)	Centi-stokes cSt
35	32.2	1.18	2.7
40	36.2	1.32	4.3
45	40.6	1.46	5.9
50	44.9	1.60	7.4
55	49.1	1.75	8.9
60	53.5	1.88	10.4
65	57.9	2.02	11.8
70	62.3	2.15	13.1
75	67.6	2.31	14.5
80	71.0	2.42	15.8
85	75.1	2.55	17.0
90	79.6	2.68	18.2
95	84.2	2.81	19.4
100	88.4	2.95	20.6
110	97.1	3.21	23.0
120	105.9	3.49	25.0
130	114.8	3.77	27.5
140	123.6	4.04	29.8
150	132.4	4.32	32.1
160	141.1	4.59	34.3
170	150.0	4.88	36.5
180	158.8	5.15	38.8
190	167.5	5.44	41.0
200	176.4	5.72	43.2
220	194	6.28	47.5
240	212	6.85	51.9
260	229	7.38	56.5
280	247	7.95	60.5
300	265	8.51	64.9
325	287	9.24	70.3
350	309	9.95	75.8
375	331	10.7	81.2
400	353	11.4	86.8
425	375	12.1	92.0
450	397	12.8	97.4

Seyboldt SUS (sec)	Red wood R (sec)	Engler E (sec)	Centi-stokes cSt
475	419	13.5	103
500	441	14.2	108
550	485	15.6	119
600	529	17.0	130
650	573	18.5	141
700	617	19.9	152
750	661	21.3	163
800	705	22.7	173
850	749	24.2	184
900	793	25.6	195
950	837	27.0	206
1000	882	28.4	217
1200	1058	34.1	260
1400	1234	39.8	302
1600	1411	45.5	347
1800	1587	51	390
2000	1763	57	433
2500	2204	71	542
3000	2646	85	650
3500	3087	99	758
4000	3526	114	867
4500	3967	128	974
5000	4408	142	1082
5500	4849	156	1150
6000	5290	170	1300
6500	5730	185	1400
7000	6171	199	1510
7500	6612	213	1630
8000	7053	227	1740
8500	7494	242	1850
9000	7943	256	1960
9500	8375	270	2070
10000	8816	284	2200

Table of temperature conversion

How to read the Table:

For example, when converting 38°C into °F, find out 38 from the 2nd row of the table (10th position from the top) at the center column and then read the figure in the column °F on the right side. You will thus find out 100.4°F. To the contrary, you can convert 38° F into °C by reading the figure in the column °C on the left side and then you can know that it correspond to 33°C.

$$C = \frac{5}{9}(F - 32) \quad F = \frac{9}{5}C + 32$$

°C ← °F	°C → °F										
-73	-100	-148	-1.6	29	84.2	17.7	64	147.2	37.1	99	210.2
-62	- 80	-112	-1.1	30	86.0	18.2	65	149.0	37.7	100	212.0
-51	- 60	- 76	-0.6	31	87.8	18.8	66	150.8	38	100	212
-40	- 40	- 40	0	32	89.6	19.3	67	152.6	43	110	230
-29	- 20	- 4	0.5	33	91.4	19.9	68	154.4	49	120	248
-23.3	- 10	14	1.1	34	93.2	20.4	69	156.2	54	130	266
-17.7	0	32	1.6	35	95.0	21.0	70	158.0	60	140	284
-17.2	1	33.8	2.2	36	96.8	21.5	71	159.8	65	150	302
-16.6	2	35.6	2.7	37	98.6	22.2	72	161.8	71	160	320
-16.1	3	37.4	3.3	38	100.4	22.7	73	163.4	76	170	338
-15.5	4	39.2	3.8	39	102.2	23.3	74	165.2	83	180	356
-15.0	5	41.0	4.4	40	104.0	23.8	75	167.0	88	190	374
-14.4	6	42.8	4.9	41	105.8	24.4	76	168.8	93	200	392
-13.9	7	44.6	5.5	42	107.6	25.0	77	170.6	121	250	482
-13.3	8	46.4	6.0	43	109.4	25.5	78	172.4	149	300	572
-12.7	9	48.2	6.6	44	111.2	26.2	79	174.2	177	350	662
-12.2	10	50.0	7.1	45	113.0	26.8	80	176.0	204	400	752
-11.6	11	51.8	7.7	46	114.8	27.3	81	177.8	232	450	842
-11.1	12	53.6	8.2	47	116.6	27.7	82	179.6	260	500	932
-10.5	13	55.4	8.8	48	118.4	28.2	83	181.4	288	550	1022
-10.0	14	57.2	9.3	49	120.2	28.8	84	183.2	315	600	1112
- 9.4	15	59.0	9.9	50	122.0	29.3	85	185.0	343	650	1202
- 8.8	16	61.8	10.4	51	123.8	29.9	86	186.8	371	700	1292
- 8.3	17	63.6	11.1	52	125.6	30.4	87	188.6	399	750	1382
- 7.7	18	65.4	11.5	53	127.4	31.0	88	190.4	426	800	1472
- 7.2	19	67.2	12.1	54	129.2	31.5	89	192.2	454	850	1562
- 6.6	20	68.0	12.6	55	131.0	32.1	90	194.0	482	900	1652
- 6.1	21	69.8	13.2	56	132.8	32.6	91	195.8	510	950	1742
- 5.5	22	71.6	13.7	57	134.6	33.3	92	197.6	538	1000	1832
- 5.0	23	73.4	14.3	58	136.4	33.8	93	199.4	566	1050	1922
- 4.4	24	75.2	14.8	59	138.2	34.4	94	201.2	593	1100	2012
- 3.9	25	77.0	15.6	60	140.0	34.9	95	203.0	648	1200	2192
- 3.3	26	78.8	16.1	61	141.8	35.5	96	204.8	704	1300	2372
- 2.8	27	80.6	16.8	62	143.6	36.1	97	206.6	760	1400	2552
- 2.2	28	82.4	17.1	63	145.4	36.6	98	208.4	815	1500	2732

Klüber Lubricants for Sealing

Together with Klüber Lubrication München GmbH & Co. KG, a German company with 100 years of history as a supplier of specialty lubricants, NOK has established NOK KLÜBER CO., LTD. as a joint venture for providing Klüber lubricants for use in sealing applications.

NOK KLÜBER CO., LTD. carries on the technologies passed down through generations by both companies, and it leverages its proven track record and broad range of knowledge obtained through its extensive testing to provide a wide range of lubrication solutions.

Based on its abundant wealth of knowledge on a multitude of lubricants that it has built up throughout the years, NOK KLÜBER CO., LTD. is ready to meet the needs of its customers for the most demanding of conditions, such as for high-temperature, low-temperature, high-speed, and high-load bearing applications.

Types and applications of NOK KLÜBER lubricants

- **Types of lubricants**
Oil, Grease, Paste, Wax, Spray, Coating
- **Applications**
Rolling bearings, Sliding bearings, Chains, Gears, Valves, etc.
- **Special applications**
For Food, Vacuum, Electronic devices, sealing lubricants

List of Klüber lubricants for sealing

Application	Name of grease	Compatible with Rubbers ^{*1}					Usage temperature range (°C)	Consistency (NLGI grade)	Usage examples	Features
		Nitrile rubber	Acrylic rubber	Silicone rubber	Fluororubber	Ethylene polypropylene rubber				
General use	SEALUB S-1	○	○	△	△	×	-30 - 120	2	Automobiles, construction machinery, agricultural machinery, etc.	General-purpose lubricants for rubber
Water resistance	SEALUB S-8	△	△	×	○	○	-45 - 160	3	Automobiles, household goods/equipment, etc.	Excellent water and steam resistance
Low temp./high-speed	SEALUB S-14	○	○	△	○	×	-50 - 150	2	Automobiles, household electrical appliances, industrial machinery, etc.	Can widely be used for low to high temp. applications
Assembly (Spray)	SEALUB L101	○	○	○	○	△	-30 - 90	Wax	Assembly and insertion of various sealed parts, etc.	Quick-drying wax and spray products for assembly
Adhesion prevention (Spray)	KLÜBER L604	○	○	○	○	○	-25 - 260	Oil	Assembly and adhesion prevention treatment of various sealed parts, etc. Lubrication of electrical contacts and plastic parts, high-temperature sliding parts	Fluorinated oil for high-temperature use, adhesion prevention oil, spray products
Food processing machinery	Klübersynth UH1 64-2403	○	○	○	○	×	-10 - 140	3	Manufacturing equipment for food and beverages	Excellent water and steam resistance NSF H1 ^{*2} registered
	PARALIQ GTE 703	○	○	×	○	○	-50 - 150	3		
High temp., solvent and chemical resistance	SEALUB 502	○	○	○	○	○	-35 - 260	2	Assembly for seals, Fuel cell etc.	Highly superior thermal stability, solvent and chemical resistance

*1: Compatible with Rubbers

- : Compatible (Recommend to test by actual conditions before use)
- △: Consult with NOK before use
- ×: Not compatible

*2: NSF H1 lubricants

These lubricants can be used in locations for which incidental contact with food products is unavoidable.

Le-μ's: Low Friction(μ) Seals

DESIGN
TECHNOLOGY

SURFACE
TECHNOLOGY

Le-μ's

Low emission μ seal

MATERIAL
TECHNOLOGY

GREASE
TECHNOLOGY

High-performance seal brand

which contributes to the sustainable society by low friction technology.



Oil Seal

Reduce friction loss for rotary-shaft seals like a motor while maintaining the sealing performance.

DESIGN Tech. -45%

Downsized or thinner lip achieves low radial load.

SURFACE Tech. -30%

Contact surface is covered with low friction coating which has lip-wear resistance.

MATERIAL Tech. -20%

Control oil film by optimized roughness of contact surface.

GREASE Tech. -30%

Apply grease with low viscosity which is compatible with seal rubber.



Seal Ring

Reduce friction loss for rotary seal of the hydraulic circuit while maintaining the oil pressure.

SURFACE Tech. -80%

(TS-Ring)Textures to the sliding surface are applied.

DESIGN Tech. -70%

(CT-Ring)A sliding surface is changed from a side to an outer.

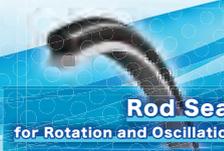


O-Ring with SP Coating

Reduce insertion force of O-ring during assembly. Also, measures for temporary stop of a production process like parts feeder.

SURFACE Tech. -70%

Low friction and non-adhesion surface are formed by very thin film.



Rod Seal for Rotation and Oscillation

Reduce friction loss for rotary- or oscillating-rod seals under the high pressure while maintaining the sealing performance.

DESIGN Tech. -40%

Pressure receiving areas are reduced by seal deformation in the groove.

MATERIAL Tech. -30%

A special resin is applied to the contact surface which improves pressure resistance and sliding properties.



Oval-Ring with CNT

Maintaining sealing performance with less friction under high pressure hydric reciprocation.

DESIGN Tech. -20%

Improving sliding performance with less seal reaction force design.

MATERIAL Tech. +40%

Improving wear resistance and pressure resistance by adding CNT.

*Reduction of friction and improvement of pressure resistance ratios are compared to the conventional technology.

Since these are specially designed parts, we ask that you please contact us for more details.

NOK Product Lineup

Sealing products



Oil seals

- Oil seals
- Packings
- O-rings
- Metal gaskets "SOFTMETAL"
- Seal washers
- Mechanical seals
- Lip seals
- Segment seals
- Brush seals
- Static metal packings actiseals
- Perfluoroelastomer "KALREZ"
- Magnetic fluid seals

Industrial rubber & resin products



Polyurethane rubber "IRON RUBBER" products

- Industrial rubber products
- Iron rubber products
- Iron rubber belts
- Traffic signs & Safety devices
- Engineering plastic products
- Synthetic rubber "NOXTITE"
- Industrial chemical products "CHEMINOX"
- Phenolic molding material

Vibration damping products Sound isolator products



Anti-vibration rubber

- Vibration damping products
- Sound isolator products

Fluid power equipment



Accumulators

- Accumulators
- Housing and related equipments

Plant equipment



Metal bellows (Welding bellows)

- Metal bellows
- Couplings

Electronics products



Flexible circuits

- Flexible printed circuit
- Precision rubber / resin parts

Industrial function parts & special parts



Special lubricant

- Polymer hollow fiber membrane modules
- Solenoids
- Actuators
- Special lubricant
- Fluorine base coating material "GLEITPAN"
- Fluorine base water repellent & oil repellent agents "NOXBARRIER"
- Compressor valves
- Recoil starters

OA equipment products



OA equipment products

- OA equipment products

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Overseas Sales & Marketing Department Sales & Marketing Division

1-12-15 Shiba Daimon Minato-ku, Tokyo, Japan. Zipcord 105-8585.

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A selected standard design from this catalogue may not conform to the actual use of an application, due to unknown factors in the application.

Please confirm the actual compatibility of a selected product with your application before using it.