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PACKINGS

HYDRAULIC SEALING SYSTEMS

NOK CORPORATION

HYDRAULIC SEALING SYSTEMS

CONTENTS

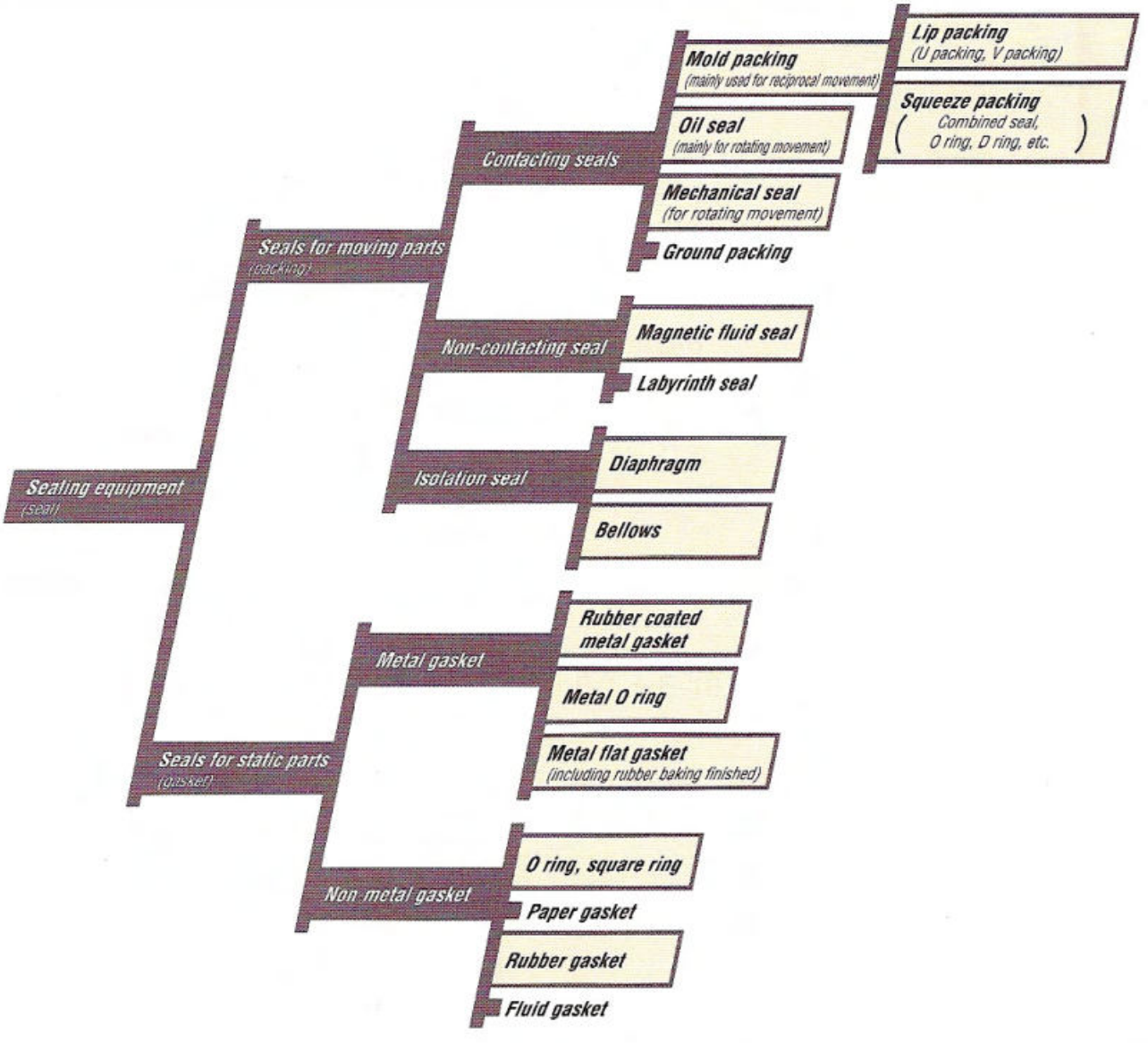
A. WHAT ARE NOK HYDRAULIC SEALING SYSTEMS?

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. A-1.



The products of NOK or its group companies are shown in colored squares.

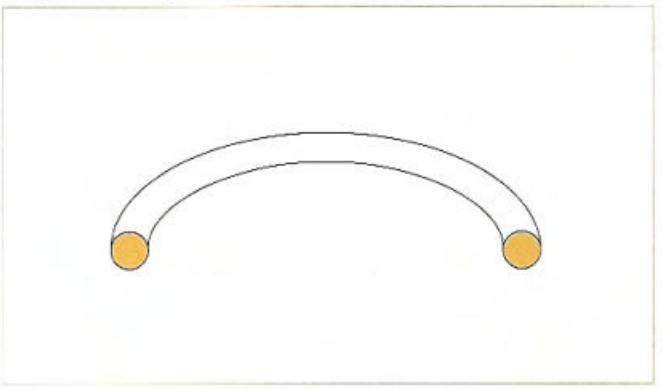
In this catalogue

Wide application examples of seals for hydraulic equipment, especially mold packings including oil seals and related products, are introduced. Separate catalogs are available for oil seals and O-rings. Please ask for more information.

What are squeeze packings?

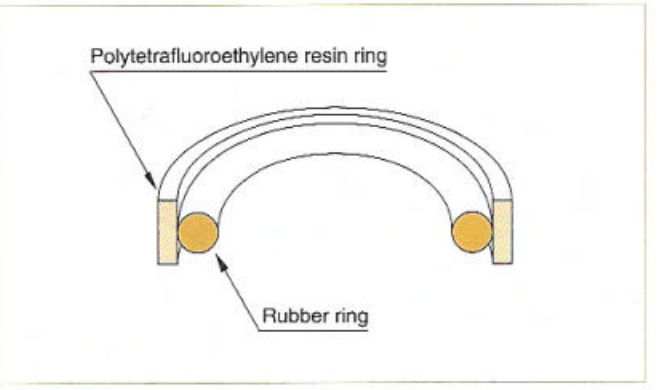
This type of packing applies a rubber-like elastic object onto the sealed surface.

<Fig. A-4> O ring



An O-ring (Fig. A-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. A-5> Example of combined seal



To decrease friction, a combined seal (called a slipper seal) has been developed with low-friction polytetra-fluoro-ethylene resin (PTFE) on the sliding surface (Fig. A-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.

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

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.

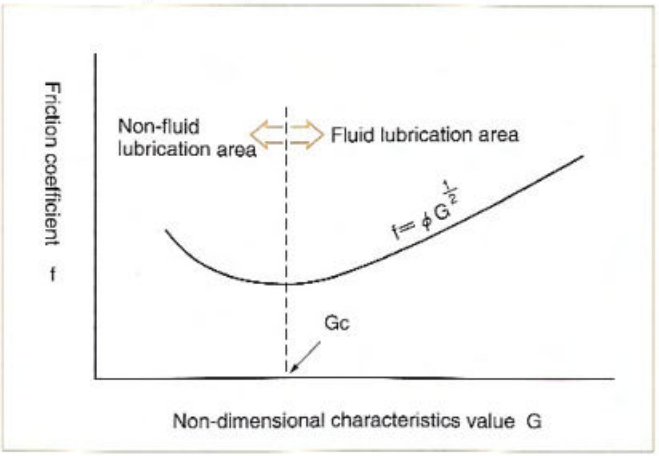
To reduce friction, proper lubricant (oil film) is necessary for the sliding surface of the packing for reciprocal movement. How do lubrication characteristics change according to operating conditions?

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 exsample of a U packing for a hydraulic cylinder rod helps explain this. The relationship between non-dimensional characteristics value G, that is determined by the form of U packings and its operating condition and the friction coefficient f, is determined in figure A-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.

<Figure A-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 ($=\mu dU/Pr$)

Pr : Compression force of packing (N {kgf})

μ : Viscosity of fluid oil (Pa·s {kgf·s/cm²})

d : Rod diameter (cm)

U : Speed (cm/s)

Switching point Gc 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.

$$Gc=\frac{9}{8\pi}\left(\frac{b}{\bar{p}}\right)\left|\frac{dp}{dx}\right|_{max}\left(\frac{Rmax}{b}\right)^2 \quad \cdots\cdots (4)$$

Where,

b : Contacting width of the packing (cm)

$\bar{p}$: Average contacting pressure of the packing (Pa {kgf/cm²})

Rmax : Maximum surface roughness of the rod (cm)

About compression force and extension force

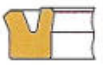
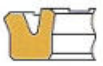
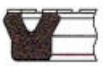
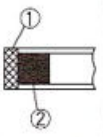
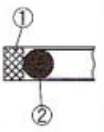
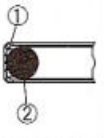
The forces created by rod or piston packings that are fitted on the mounting groove and in contact with the contacting surface (the surface of the rod or the inner surface of the cylinder) is called compression force and extension force, respectively.

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 enough to judge the sealing ability of a packing for reciprocal movement.

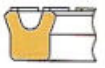
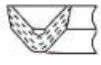
B. TYPES AND MAIN FEATURES OF NOK PACKINGS

- NOK provides various types of hydraulic seals, buffer rings, dust seals, and related products for reciprocating movement; rotating oil seals for high pressure; and seals for oscillating and rotating movement.
- Standard materials are offered for items in this catalog according to operating conditions.

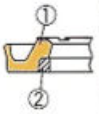
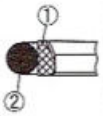
(1) Hydraulic seals for reciprocal movement -1

Type	NOK type	Cross section	Standard material	Main applicable fluid		Feature		Dimension table (page)
Special packing for piston seals	ODI		Noxlan (U801)	・General petroleum hydraulic fluid		・Designed for large section, applicable for wide pressure range	・Material, noxlan U801, has excellent wear resistance and sealing ability.	F-3 ~F-10
	OSI		Noxlan (U801)			・Designed for smaller section, and able to be fitted into integrated groove	・Packings with a smaller section than ODI	F-11 ~F-13
	OUIS		Noxlan (U641)				・Heat resistant material is employed, also has a good water resistance and durability. ・Improvement has been made to prevent damages caused by back pressure.	F-14 ~F-15
	OUHR		Nitrile rubber (A903)	・General petroleum hydraulic fluid ・Petroleum hydraulic fluid for low temperature			・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).	F-16 ~F-18
	SPG	 (Combination)	①Sliding material Rareflon, PTFE (19YF) ②Back ring material Nitrile rubber (A980) Fluoro rubber (F201)	A980	・General petroleum hydraulic fluid oil ・Water-glycol type hydraulic fluid oil ・Oil-water emulsion type hydraulic fluid oil	・Rareflon (NOK product name of polytetrafluoro ethylene resin) 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 bi-directional sealing ability by single packing.	・This is a standard type of combination seal for wide range of application.	F-19 ~F-22
				F201	・General petroleum hydraulic fluid oil ・Phosphate ester type hydraulic fluid oil			—
	SPGW	 (Combination)	①Sliding material Rareflon, PTFE (19YF) ②Backup ring material Polyamide resin (80NP) ③Back ring material Nitrile rubber (A980) Fluoro rubber (F201)	A980	・General petroleum hydraulic fluid oil ・Water-glycol type hydraulic fluid oil ・Oil-water emulsion type hydraulic fluid oil		・This is a seal for high pressure operation with improved ability of SPG for oil scraping off. ・Backup ring material of polyamide resin assures high longevity.	F-23 ~F-26
				F201	・General petroleum hydraulic fluid oil ・Phosphate ester type hydraulic fluid oil			—
	SPGO	 (Combination)	①Sliding material Rareflon, PTFE (19YF) ②Back ring material Nitrile rubber (A305) Fluoro rubber (F201)	A305	・General petroleum hydraulic fluid oil ・Water-glycol type hydraulic fluid oil ・Oil-water emulsion type hydraulic fluid oil		・This has the same performance as that of SPG. Installation space is saved because of JIS standard O ring.	F-27 ~F-30
				F201	・General petroleum hydraulic fluid oil ・Phosphate ester type hydraulic fluid oil			—
	SPGC	 (Combination)	①Sliding material Rareflon, PTFE (31BF) ②Back ring material Nitrile rubber (A305) Fluoro rubber (F201)	A305	・General petroleum hydraulic fluid oil ・Water-glycol type hydraulic fluid oil ・Oil-water emulsion type hydraulic fluid oil		・This packing can be fitted on to O ring groove (JIS B 2406 P series). ・This has less sliding friction than O ring to assure high longevity. ・This can also be used for pneumatic equipment.	F-31 ~F-34
				F201	・General petroleum hydraulic fluid oil			—

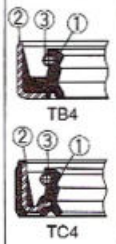
(1) Hydraulic seals for reciprocal movement - 3

Type	NOK type	Cross section	Standard material	Main applicable fluid		Feature		Dimension table (page)
Special packing for rod seals	SPNC	 (Combination)	①Sliding material Rareflon, PTFE (31BF) ②Back ring material Nitrile rubber (A305) Fluoro rubber (F201)	A305	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil	• Rareflon (NOK product name of polytetrafluoro ethylene resin) 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 assure high longevity. • This can also be used for pneumatic equipment.	F-63 ~F-66
				F201	• General petroleum hydraulic fluid oil • Phosphate ester type hydraulic fluid oil			—
Packing for both piston and rod seals	UPI		Noxlan (U801)	• General petroleum hydraulic fluid oil		• This can be used both for piston and rod seals. • This packing has large section and can be used for wide range of operations.	• Material, noxlan U801, has excellent wear resistance and sealing ability.	F-67 ~F-72
	USI		Noxlan (U593)			• This can be used both for piston and rod seals. • This packing has small section and can be fitted in integrated groove.	• This is a type with smaller section of UPI. • Improvement has been made to prevent damages caused by back pressure.	F-73 ~F-76
	UPH		Nitrile rubber (A505) Fluoro rubber (F357)	A505	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil	• This can be used both for piston and rod seals. • This packing has large section and can be used for wide range of operations.	• Nitrile rubber and fluoro rubber are available for material to assure wide range of operating temperature. • Wide variation of size is available.	F-77 ~F-84
				F357	• General petroleum hydraulic fluid oil • Phosphate ester type hydraulic fluid oil			
	USH		Nitrile rubber (A505) (A903) Fluoro rubber (F357)	A505	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil	• This can be used both for piston and rod seals. • This packing has small section and can be fitted in integrated groove.	• This is a type with a smaller section of UPH.	F-85 ~F-88
				A903	• General petroleum hydraulic fluid oil • Low temperature petroleum hydraulic fluid oil			—
				F357	• General petroleum hydraulic fluid oil • Phosphate ester type hydraulic fluid oil			F-85 ~F-88
	USHR		Nitrile rubber (A505)	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil			• This is interchangeable with USH, suitable for operation handling less lubricity fluid, and also effective to prevent stick slip.	—
	V99F		Fabric reinforced nitrile rubber (21AG) Fabric reinforced fluoro rubber (34BG)	21AG	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil • water	• 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.	• This is a standard type of V packing.	F-89 ~F-94
				34BG	• General petroleum hydraulic fluid oil • Phosphate ester type hydraulic fluid oil • Agricultural chemicals			—
	V96H		Nitrile rubber (A505) Fluoro rubber (F357)	A505	• General petroleum hydraulic fluid oil • Water-glycol type hydraulic fluid oil • Oil-water emulsion type hydraulic fluid oil • water		• Compared with V99F, this is selected in case the sealing performance is more important. • We recommend to use this in combination with V99F.	F-95 ~F-100
				F357	• General petroleum hydraulic fluid oil • Phosphate ester type hydraulic fluid oil • Agricultural chemicals			—

(3) Buffer rings for reciprocal movement

Type	NOK type	Cross section	Standard material	Main applicable fluid		Feature		Dimension table (page)
Buffer ring	HBY	 (Combination)	①Packing material Noxlan (U801) ②Backup ring material Polyamide resin (80NP)	・General petroleum hydraulic fluid oil		・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.	・Special shaped slit at the sliding lip that can leak back pressure eliminates the pressure between the rod packing and buffer ring.	F-125 ~F-126
	HBTS	 (Combination)	①Sliding material Rareflon (19BF) ②Back ring material Nitrile rubber (A626) Fluoro rubber (F201)	A626	・General petroleum hydraulic fluid oil ・Water-glycol type hydraulic fluid oil ・Oil-water emulsion type hydraulic fluid oil		・This has the same function as that of HBY. ・This has small friction resistance and suits for high speed,extremely short stroke operation. ・A slit on the tapered surface (non-sliding surface) can leak back pressure.	F-127 ~F-128
				F201	・General petroleum hydraulic fluid oil ・Phosphate ester type hydraulic fluid oil			—

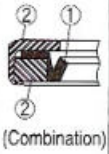
(4) Oil seals for reciprocal movement

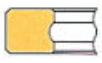
Type	NOK type	Cross section	Standard material	Main applicable fluid	Feature	Dimension table (page)
Oil seals for reciprocal movement	TB4 TC4	 TB4 TC4	①Lip material Nitrile rubber (A795) ②Metal case material Cold rolled steel plate sheet (SPCC) ③Spring material Piano wires (SWP)	・General petroleum hydraulic fluid oil ・Water-glycol type hydraulic fluid oil ・Oil-water emulsion type hydraulic fluid oil	・This is a seal for low friction used under the condition of low pressure and high speed. ・This can also be used as dust seal for hydraulic cylinder. ・Rubber and metal are available for seal O.D. which will be selected according to the housing material.	Refer to oil seal catalogue.
Seals for operation valve	SVY		①Lip material Nitrile rubber (A216) ②Metal case material Cold rolled steel plate sheet (SPCC) ③Spring material Piano wires (SWP)	・General petroleum hydraulic fluid oil	・This is a special seal mainly used for valve unit of industrial equipment. ・This has an excellent sealing ability and low friction.	—
Power steering seals	SCJY	 (Combination)	①Lip material Nitrile rubbe (A297) ②Metal case material Cold rolled steel plate sheet (SPCC) ③Spring material Stainless steel (SUS) ④Backup ring Polyamide resin (60NP)	・General power steering fluid oil	・This is a special seal mainly used for automobile power steering. ・Backup ring of resin material is used to minimize lip deformation under high pressure. ・Stainless steel is used for spring to maintain required interference and compression force of lip for long duration and high speed operation.	—

(6) Rotating oil seals for high pressure

Type	NOK type	Cross section	Standard material	Main applicable fluid		Feature		Dimension table (page)
Oil seals for rotating pressure	TCV		①Lip material Nitrile rubber (A795) Fluoro rubber (F584) ②Metal case material Cold rolled steel plate sheet (SPCC) ③Spring material Piano wires (SWP)	A795	· General petroleum hydraulic fluid oil	· This is a standard type of oil seals for rotating pressure.	· This is used for relatively small diameter and medium pressure operation.	Refer to oil seal catalogue.
				F548	· General petroleum hydraulic fluid oil · Phosphate ester type hydraulic fluid oil			
	TCN	 (Combination)	①Lip material Nitrile rubber (A795) Fluoro rubber (F584) ②Metal case material Cold rolled steel plate sheet (SPCC) ③Spring material Piano wires (SWP)	A795	· General petroleum hydraulic fluid oil		· This is used for relatively large diameter and high pressure operation.	
				F548	· General petroleum hydraulic fluid oil · Phosphate ester type hydraulic fluid oil			

(7) Seals for oscillating and rotating movement

Type	NOK type	Cross section	Standard material	Main applicable fluid	Feature		Dimension table (page)
Hinge pin dust seals	DLI 2		①Lip material Noxlan (U451) ②Metal case material Cold rolled steel plate sheet (SPCC)	· Outer dust	· 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. · Relief effect makes easy to drain used grease when filling up new grease.	· This can be applied to the housing diameter ϕ 160 or less.	F-142 ~ F-143
	DLI		①Lip material Noxlan (U593) ②Metal case material Cold rolled steel plate sheet (SPCC)			· This is mainly used to the housing diameter exceeding ϕ 160.	F-144 ~ F-145
	VAY	 (Combination)	①Lip material Nitrile rubber (A104) ②Metal case material Cold rolled steel plate sheet (SPCC)			· Lip shape is specially designed to reduce the torque. · Lip wear is reduced because of metallic protection plate.	—

Type	NOK type	Cross section	Standard material	Main applicable fluid	Feature	Dimension table (page)
Center swivel seals	ROI		Noxlan (U801) (U652)	· General petroleum hydraulic fluid oil	· This is a special seal for center swivel with excellent wear resistance and extrusion proof ability. · Since perfect sealing cannot be expected, please provide a drain at end and use oil seals for rotating pressure with it.	—

Remark: Items with a "-" mark in the dimension table column have unique specifications. Please consult NOK before ordering since there is no dimension description.

C. COMPOSITION OF NOK PACKINGS

NOK supplies several different types of packing materials to suit various applications. Table C-1 shows the type and characteristics of rubber materials and Table C-2 shows the type and characteristics of resin material. Standard materials are offered for items in this catalog to best meet the operating conditions. Refer to chapter B for the types and features of each type of packing. Compatibility in the following tables indicates general tendencies. Refer to the resistivity data in chapter J for resistivity to specific brands of oil.

Table C-1 Types and characteristics of NOK rubber material

Material		NOK material code	Material							Resistivity									
			Hardness (JIS A)	Tensile strength MPa {kgf/cm²}	100% modulus MPa {kgf/cm²}	Elongation (%)	Permanent compression set (%) Test condition A: 80℃ 70h B: 100℃ 70h C: 175℃ 70h	Hardness change by air oven aging test (point)	Low temperature brittleness TR_{10} (℃)	Lubricating oil (agent) Engine oil	Gear oil	Machine oil	Spindle oil	Refrigerator oil	Cup grease	Lithium grease	Silicon grease	Turbine oil	Oil + water emulsion type
Rubber material	Nitrile rubber	A102	60	17.1 {174}	2.6 {27}	470	32 (B)	+7 (B)	−22	◎	◎	◎	◎	○	◎	◎	◎	◎	◎
		A103	70	19.3 {197}	4.5 {46}	430	33 (B)	+5 (B)	−22	◎	◎	◎	◎	○	◎	◎	◎	◎	◎
		A104	80	19.0 {194}	7.3 {74}	340	31 (B)	+5 (B)	−21	◎	◎	◎	◎	○	◎	◎	◎	◎	◎
		A216	85	19.2 {196}	11.2 {114}	190	26 (B)	+5 (B)	−36	○	○	○	○	○	○	○	○	○	○
		A297	75	21.5 {219}	4.8 {49}	260	18 (B)	+5 (B)	−34	◎	◎	◎	◎	○	◎	◎	◎	◎	○
		A305	70	20.5 {209}	4.3 {44}	340	10 (B)	+2 (B)	−23	◎	◎	◎	◎	○	◎	◎	◎	◎	○
		A402	60	12.8 {130}	2.3 {24}	440	13 (B)	+3 (B)	−26	◎	◎	◎	◎	○	◎	◎	◎	◎	○
		A505	90	20.5 {209}	15.4 {157}	170	31 (B)	+2 (B)	−22	◎	◎	◎	◎	○	◎	◎	◎	◎	◎
		A626	70	17.6 {180}	5.0 {51}	260	13 (B)	+7 (B)	−35	○	○	○	○	○	○	○	○	○	○
		A795	80	20.4 {208}	7.8 {80}	400	48 (B)	+6 (B)	−11	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
		A903	85	14.4 {147}	13.5 {138}	110	20 (B)	+4 (B)	−51	◎	◎	◎	◎	○	◎	◎	◎	◎	○
		A980	80	13.6 {139}	10.5 {107}	150	17 (B)	+3 (B)	−52	◎	○	○	○	○	◎	◎	○	○	○
	Fluoro rubber	F201	70	14.2 {145}	5.0 {51}	230	7 (C)	0 (C)	−15	○	△	◎	◎	◎	◎	◎	◎	○	△
		F268	90	18.5 {189}	15.5 {158}	150	20 (C)	+1 (C)	+ 4	◎	◎	◎	◎	◎	◎	◎	◎	○	◎
		F357	90	17.4 {178}	12.3 {126}	140	18 (C)	+1 (C)	−15	○	△	◎	◎	◎	◎	◎	◎	○	△
		F384	80	11.6 {118}	10.8 {110}	200	70 (C)	+1 (C)	−12	◎	△	◎	◎	◎	◎	◎	◎	○	○
		F548	85	10.6 {108}	7.7 {79}	230	22 (C)	+1 (C)	−16	○	△	◎	◎	◎	◎	◎	◎	○	△
	Silicon rubber	S813	70	7.2 {73}	5.4 {55}	150	16 (C)	+1 (C)	−49	○	△	○	△	△	△	△	×	○	○
	Noxlan (Polyurethane rubber)	U451	93	40.8 {416}	10.5 {107}	580	28 (A)	0 (B)	−30	○	△	◎	◎	◎	○	○	◎	◎	×
		U593	92	27.3 {279}	12.5 {128}	280	25 (A)	0 (B)	−34	○	△	◎	◎	◎	○	○	◎	◎	×
		U641	94	43.2 {441}	11.5 {117}	420	30 (A)	0 (B)	−18	◎	△	◎	◎	◎	○	◎	◎	◎	△
		U652	96	43.2 {441}	12.5 {128}	440	30 (A)	0 (B)	−17	◎	△	◎	◎	◎	○	◎	◎	◎	△
		U695	96	44.2 {451}	14.7 {150}	450	35 (A)	0 (B)	−18	◎	△	◎	◎	◎	◎	◎	◎	◎	△
		U801	94	43.2 {441}	12.5 {128}	480	30 (A)	0 (B)	−29	○	△	◎	◎	◎	○	○	◎	◎	×
	Fabric reinforced rubber	21AG	—	—	—	—	—	—	—	◎	◎	◎	◎	○	◎	◎	◎	◎	○
		34BG	—	—	—	—	—	—	—	◎	◎	◎	◎	◎	◎	◎	◎	◎	○
	Hydrogeneted nitrile rubber	G506	90	26.9 {274}	16.5 {168}	170	12 (B)	+1 (B)	−24	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎

Resistivity standards ◎ : Very good × : Not recommended

○ : Good for most applications※

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

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

※ Please consult NOK before using these materials.

Table C-2 Types and characteristics of NOK resin material

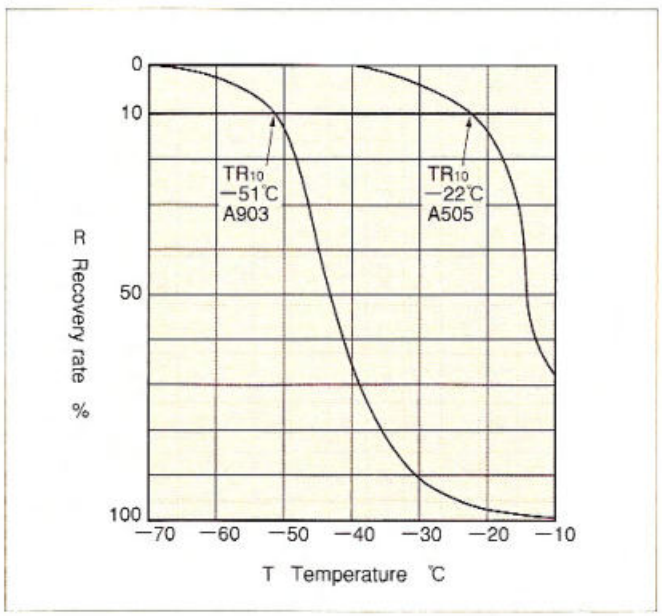
Material		NOK material code	Material: Hardness	Material: Tensile strength MPa {kgf/cm²}	Material: Elongation (%)	Material: Compression strength (MPa {kgf/cm²}) 2.5% deformation	Material: Compression strength (MPa {kgf/cm²}) 10% deformation	Applicable temperature range (℃)	Resistivity: Lubricating oil (agent) Engine oil	Gear oil	Machine oil	Spindle oil	Refrigerator oil	Cup grease	Lithium grease	Silicon grease	Turbine oil	Oil + water emulsion type
Resin material	Rareflon (polytetrafluoro ethylene, PTFE, resin)	19YF	70 (Durometer D)	19.6 {200}	120	12.8 {131}	23.1 {236}	−55～220	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
		49YF	70 (Durometer D)	17.7 {181}	140	16.0 {163}	25.0 {255}		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
		31BF	65 (Durometer D)	18.6 {190}	330	11.8 {120}	20.1 {205}		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
		05ZF	62 (Durometer D)	19.6 {200}	220	12.1 {123}	19.6 {200}		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
	Polyamide resin	60NP	109 (Rockwell R)	52.0 {531}	300	19.6 {200}	49.1 {501}	−55～100	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
		80NP	120 (Rockwell R)	78.5 {801}	15	39.2 {400}	72.6 {741}	−55～120	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
		12NM	123 (Rockwell R)	102.0 {1040}	8	38.0 {388}	100.0 {1020}	−55～140	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎
	Fabric reinforced phenolic resin	12RS	105 (Rockwell M)	137.4 {1402} * Flex strength	—	242 {2470} * Destruction	—	−55～120	◎	◎	◎	◎	◎	◎	◎	◎	◎	◎

Resistivity standards ◎ : Very good
○ : Good for most applications※
△ : Fair, can be used if no other materials but otherwise not recommended※
※ Please consult NOK before using these materials.

Low temperature retraction of rubber material

TR_{10} 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. TR_{10} value is the temperature where initial distortion has recovered by 10%. Graph C-1 shows an example of measuring this value.

Graph C-1 TR graph



TR_{10} 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 D-2 to 4.

D.SELECTING NOK PACKINGS

Application Range

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. Tables D-1, D-2, D-3, and D-4 show the application range of hydraulic seals for reciprocating motion, dust

1. Application Range of Hydraulic Seals for Reciprocating Application

Select NOK packing taking the following four conditions into consideration:1. Pressure 2. Temperature 3. Speed 4. Stroke

<Table D-1> Application Range of Hydraulic Seals for Reciprocating Motion

Kind	Special packings for piston seals										
Classification	U				S					L	
Item / Type	ODI	OSI	OUIS	OUHR	SPG	SPGW	SPGO	SPGC	SPGI	CPI	CPH
Shape											
Pressure (MPa) (Remark 1)	70 (*30)	42 (*30)	42 (*30)	21 (*14)	35	50	35	2	21	7	3.5
Temperature (℃) (Remark 2)	100 / −35	100 / −30	110 / −10	80 / −55	100 / 160 / −20 / −40	100 / 120 / −20 / −40	100 / 160 / −20 / −30	100 / 160 / −20 / −30	80 / −40	100 / −35	100 / −25
Speed (m/s)	0.5 / 0.03	0.5 / 0.03	0.5 / 0.03	1.0 / 0.01	1.5 / 0.005	1.5 / 0.005	1.5 / 0.005	1.5 / 0.005	1.0 / 0.03	0.3 / 0.01	0.3 / 0.01
Stroke (mm)	2,000 or less										
Fitting space	Medium	Small	Small	Small	Small	Small	Small	Very small	Small	Medium	Medium
Sliding resistance	Medium	Medium	Small	Small	Very small	Very small	Very small	Very small	Small	Small	Small
Installation with integrated groove	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Dimension table (page)	F-3	F-11	F-14	F-16	F-19	F-23	F-27	F-31	F-35	F-37	F-39

2. Application Range of Dust Seals

(1) Dust seals for reciprocating application

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. Since these two features (dust elimination and oil scraping) conflict with each other, it is important to clarify the priority required for each aplication before selecting the dust seals. 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.

<Table D-2> Application range of dust seals for reciprocating motion

Classification	Dust seals		
Item / Type	DKI	DWI	DWIR
Shape			
Temperature (℃)	100 / −35	100 / −55	100 / −55
Dust proof performance	◎	◎	○
Oil scraping proof performance	Medium	Small	Very small
Requirement of stopper	No	No	No
Installation with integrated groove	No	No	No
Dimension table (page)	F-101	F-104	F-106

(2) Application range of 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> D-3 Application range of dust seals for oscillating motion

Item \ Kind / Type	Dust seals for sliding movement DLI2	DLI
Shape		
Temperature(℃) Remark 2	220, 100, 80, 0, −20, −40, −50; 100, −35	100, −35
Dimension table (page)	F-142	F-144

3. Application Range 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 D-4> Application range of relating product for hydraulic equipment

Item \ Kind / Classification / Type	Special packings for rod seals: Buffer ring HBY	Special packings for rod seals: Buffer ring HBTS	Related products for reciprocating motion: Wear ring RYT	Wear ring WR	Contami seals KZT	Backup ring BRT2	Backup ring BRT3	Backup ring BRN2	Backup ring BRN3
Shape									
Pressure(MPa)	70, 50, 35, 30, 21, 14, 7, 3, 0; 50	35	—	—	—	—		—	
Temperature(℃) Remark 2	220, 100, 80, 0, −20, −40, −50; 100, −55	160, 100, −20, −55	220, −55	120, −55	220, −55	220, −55		120, −55	
Speed(m/s)	1.5, 1.0, 0.5, 0; 1.0, 0.03	1.5, 0.005	1.5, Remark 1), 0.005	1.0, Remark 1), 0.005	1.5, 0.005	—		—	
Dimension table (page)	F-125	F-127	F-129	F-131	F-135	F-138			

Remark 1) The permissible speed is determined by the relationship wit the load. Refer to PV limit curve on page D-7.

Remark 2) Permissible temperature ranges for packings and dust seals are indicated by colors for each rubber material.

- Nitrile rubber for low temperature
- Fluororubber
- Noxlan (polyurethane rubber)

<Table D-6> Material code and characteristics of backup ring

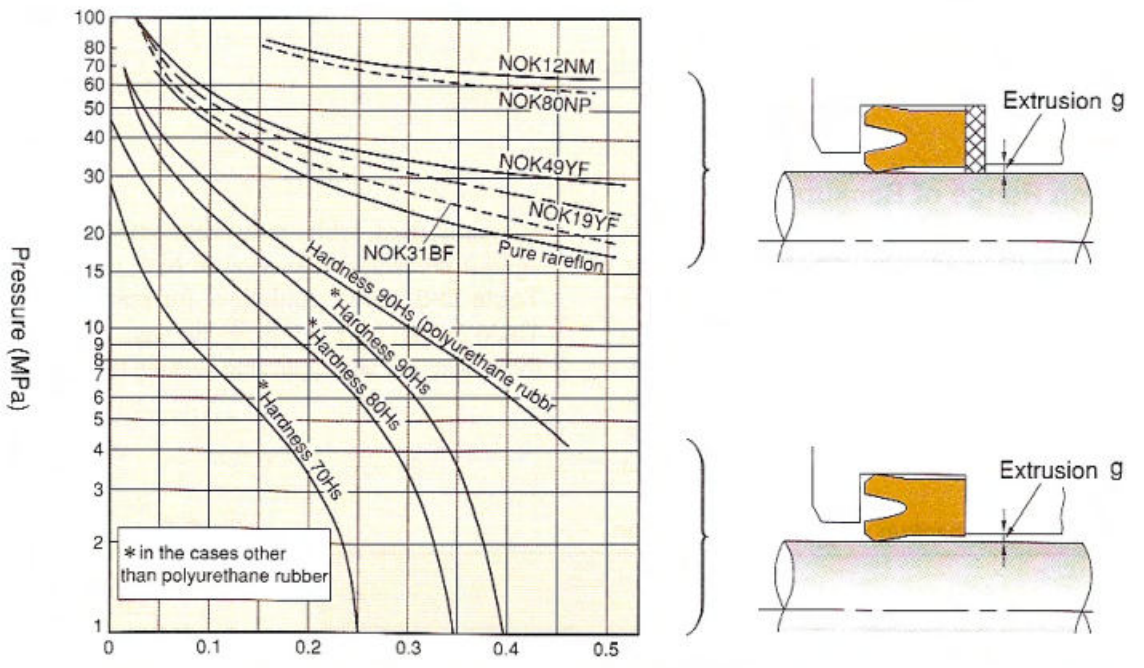
Material	NOK material code	Features	Durability	Applicable packing type sign
Rareflon (polytetrafluoro ethylene,PTFE, resin)	31BF	Low frictional resistance material with improved frictional and creep resistance against pure PTFE	Low ⇕ High	OUHR UPH、USH USHR IUH
	19YF	Standard material of backup ring with 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 backup ring. Its machining manufacturing process makes large diameter seals available		ODI、OSI、OUIS UPI、USI IDI、ISI、UNI
	12NM	Material for injection molding having the same performance as 80NP with smaller dimension changes by water absorption		

D

4) Extrusion limit

Fig. D-6 is extrusion limit curves prescribed by JOHS 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. D-6> Extrusion limit curves



Note: Extrusion gap "g" is the amount of radius gap and calculated by a diameter clearance / 2. g max indicates a maximum extrusion gap at maximum eccentricity of operating condition.

※ Extrusion limit may vary depending on the temperature, pressure, and operating time. Therefore, please consult NOK when using under exessive high temperature and high pressure condition for long term use.

(3) Dimension set up of wear rings

Various diameters and widths are available for WR (NOK 12RS) to meet different cylinder diameters and groove sizes. For further details, refer to the dimension table F-131 to 134. Please set up the width h by the formula below.

$$h\ min \geqq \frac{F \cdot So}{2.05 \cdot Dc} + 2.4$$

①In case no lateral loads exist

$$F = (\text{Piston weight}) + \frac{1}{2}(\text{Rod weight}) + \frac{1}{200} \times \frac{\pi \cdot Dc^2}{4} \times P\ max$$

$So = 1$

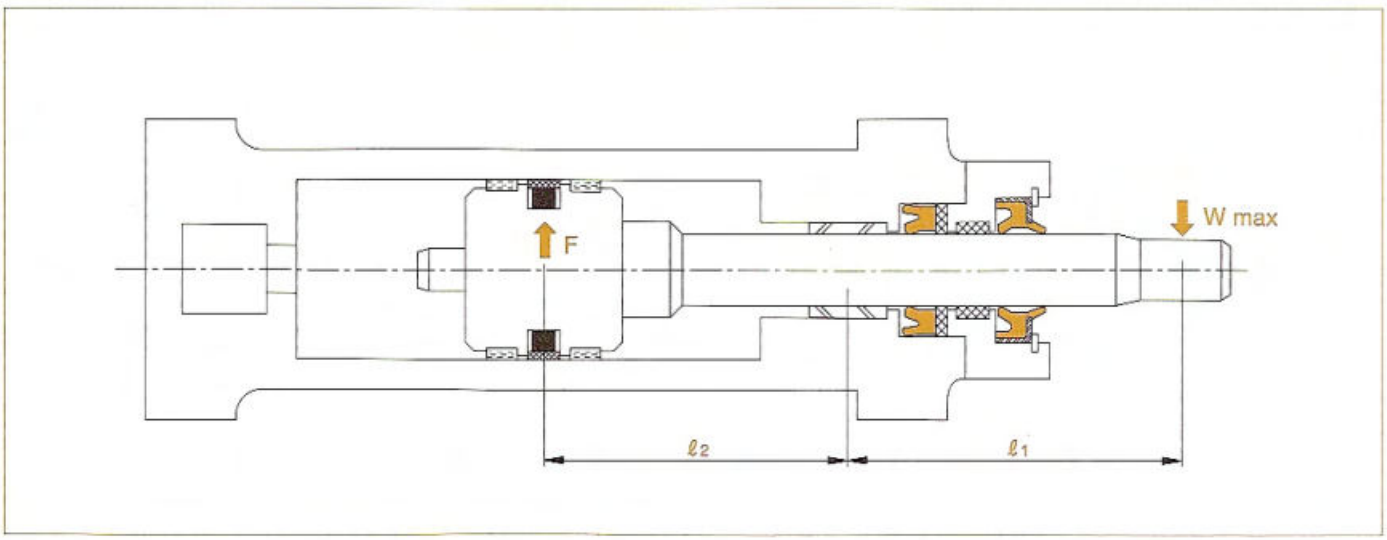
②In case lateral loads exist

$$F = \frac{\ell_1}{\ell_2}\left(\frac{1}{2}\text{Rod weight} + W\ max\right) - (\text{Piston weigh})$$

So { In case lateral impact loads exist : 1.5
In case no lateral impact loads exist : 4

h min : Minimum wear ring width size (mm)
F : Load charged on wear ring (N)
So : Safety coefficient
Dc : Inner diameter of cylinder tube (mm)
P max : Maximum pressure (MPa)
W max : Maximum lateral load (N)

<Fig.D-7>



For example, if the calculation result of ø 100mm diameter shows hmin 17.5mm, use two GW0332PO (WR94 × 100 × 15) in dimension table on page F-134 or one GW0041P3 (WR94 × 100 × 25) in dimension table on page F-132. Sizes other than those in the dimension table are also available upon request. Please consult NOK. (Outer diameters up to ø 800mm can be supplied.)

Selecting Type

1. Correlation of Packing Types

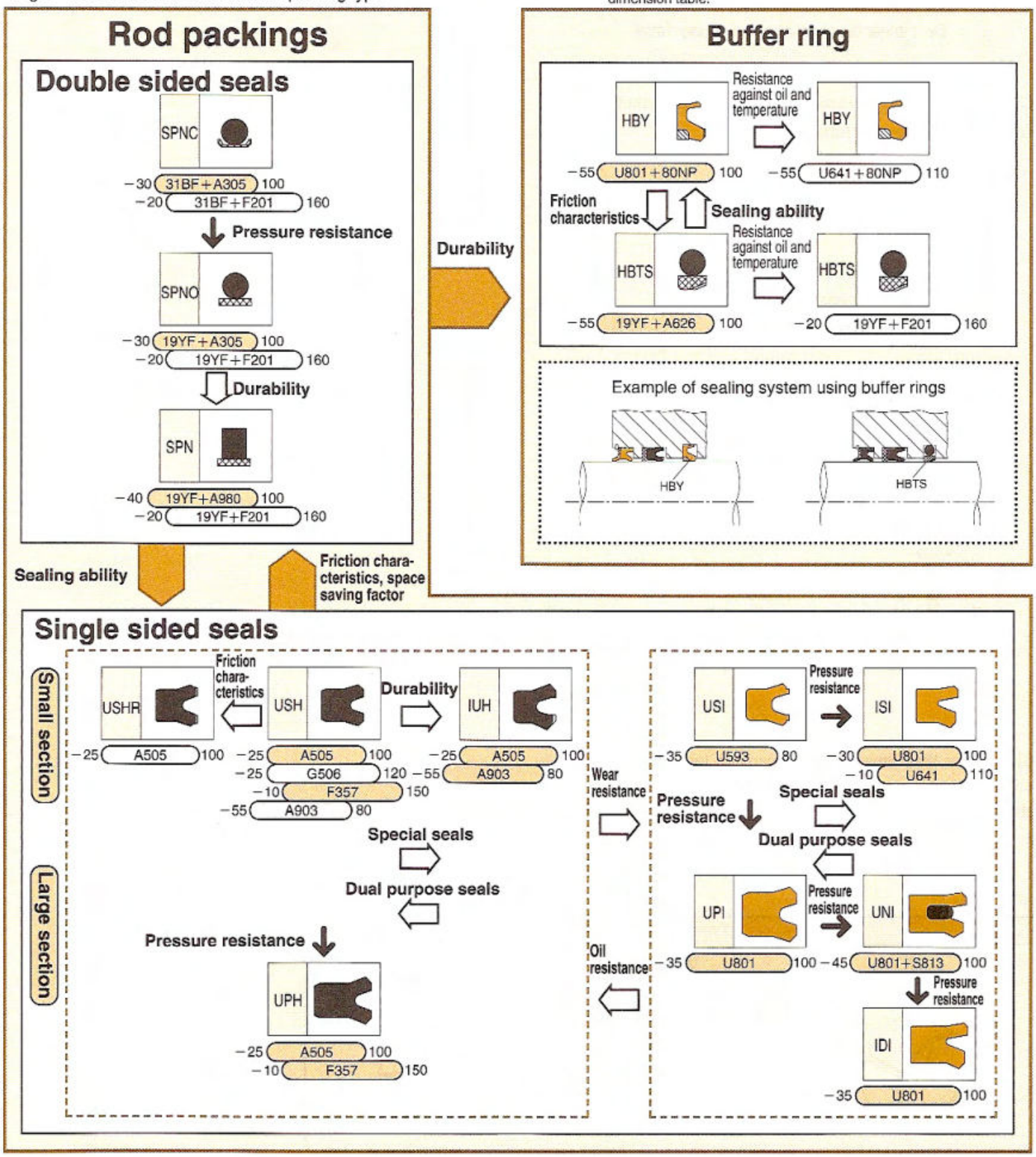
NOK provides a wide variety of seals to meet various operating conditions. The following charts will assist in selection of appropriate packings and seals. To meet a wide variety of our customer's needs, we have developed a sealing system using a

(1) Rod seals

Using buffer ring to the rod seal is effective to buffer impact pressure, suppress oil temperature transmission, and reduce sliding heat, which results in improved durability of the packings.

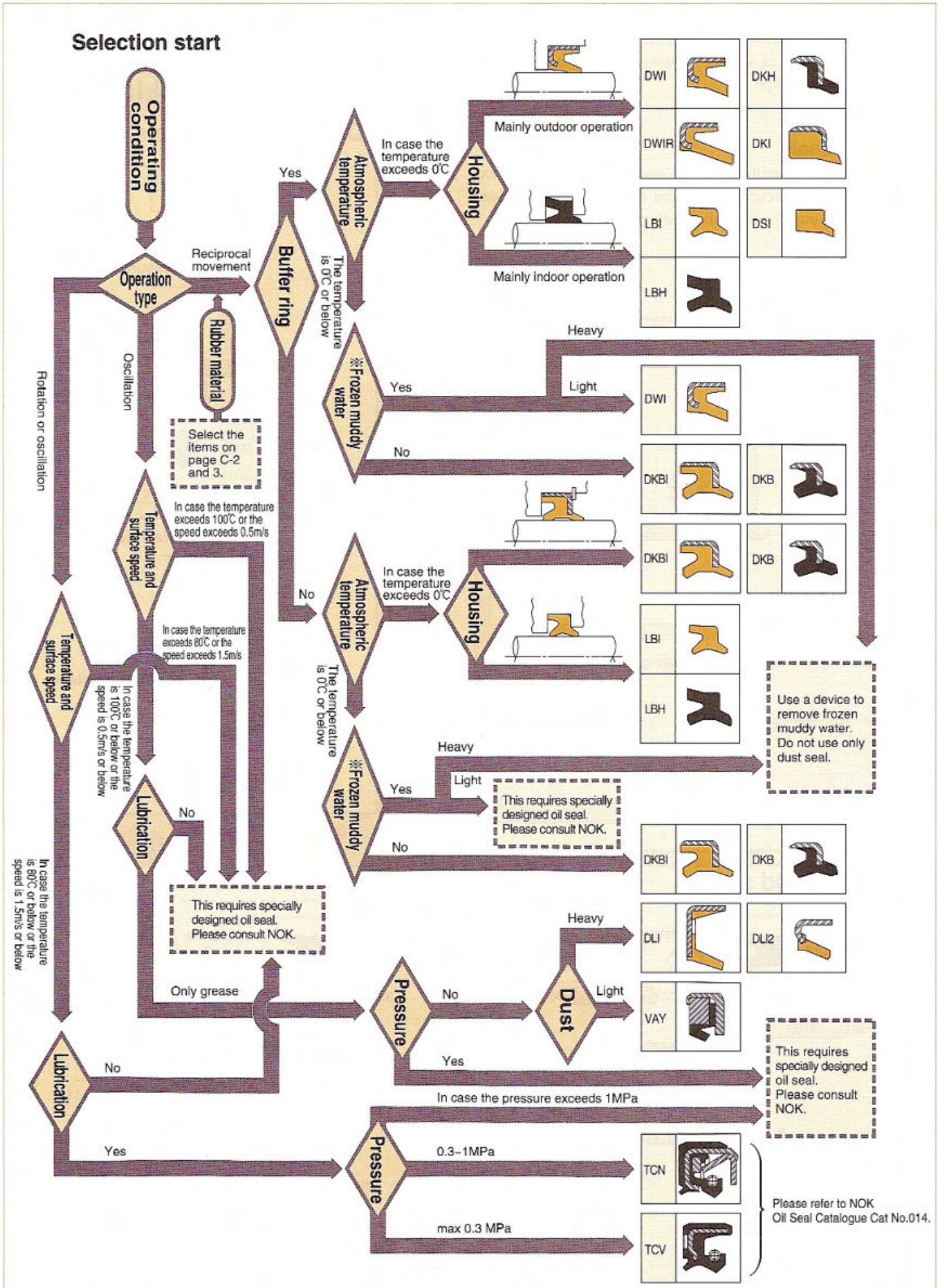
Remarks) About horizontal bar graphs beneath the type sign
- The values on both ends represent applicable temperature range.
- The items in ( ) are of special specifications and not listed on the dimension table.

<Fig. D-10> Correlation chart of each packing type



2. Selecting Dust Seal Types

<Fig. D-11> Flow chart for selecting dust seal types



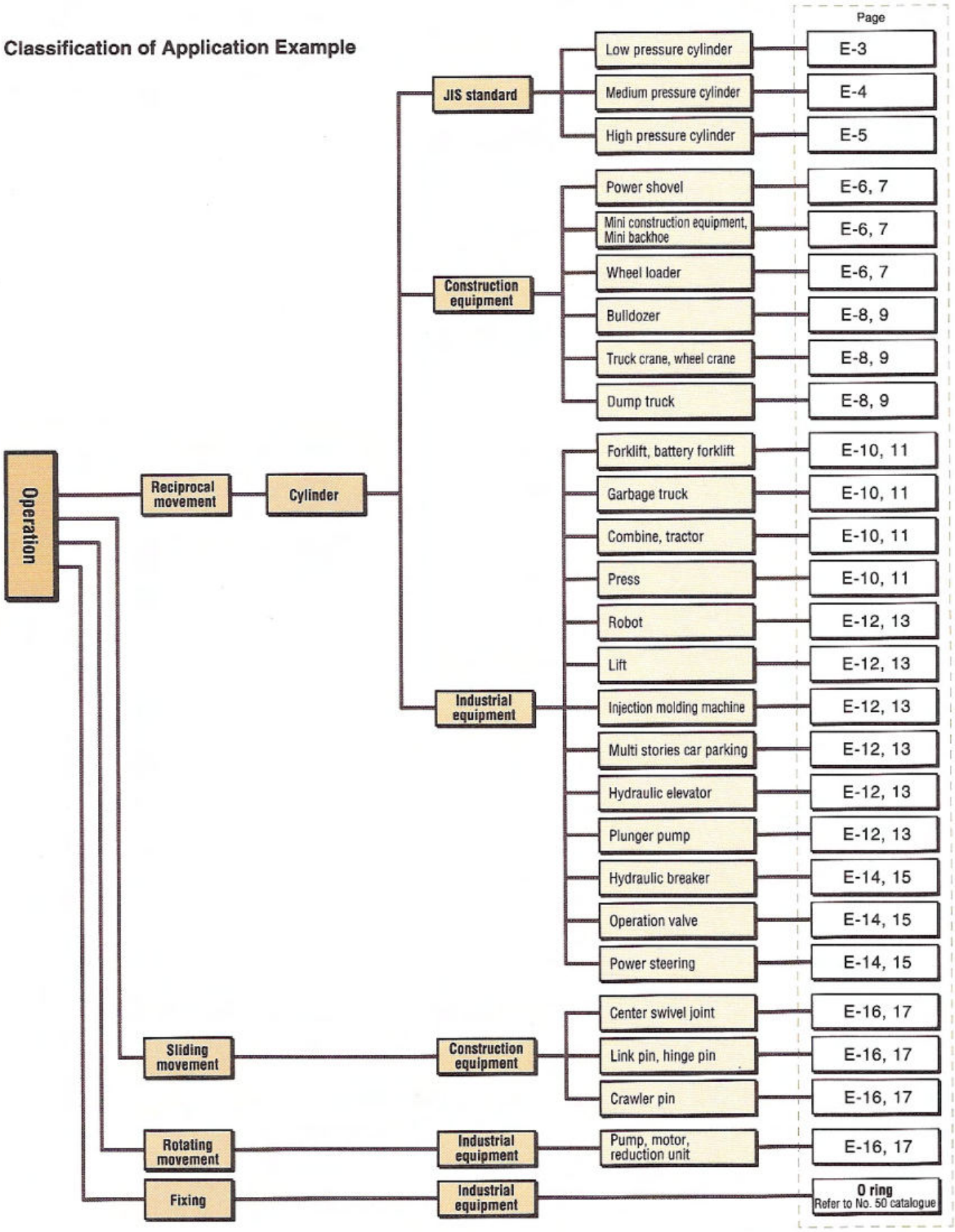
※frozen muddy water : This is a condition where water on the rod surface has frozen. (It is the case that water is put on the rod during daytime operation and it has frozen in night time low temperature.)

If the selection cannot be made by this flow chart because of the operating condition such as within muddy water, sea water, vacuum, or negative pressure, please consult NOK.

E. 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 sliding 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 (JIS B 8354)

Hydraulic cylinder for medium pressure : 14 MPa or less

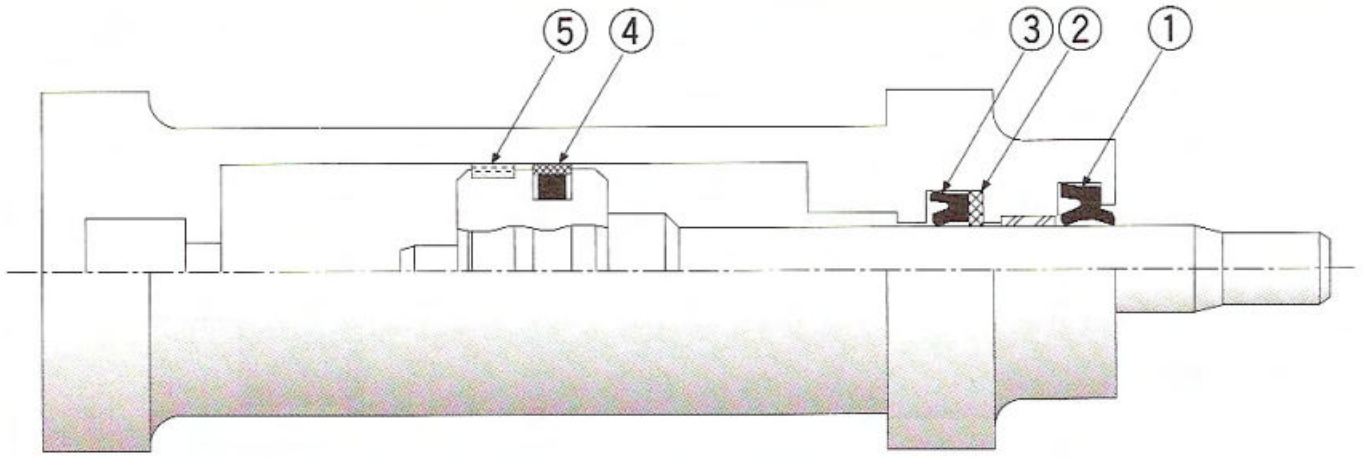
◆ **Applicable temperature range of the cylinder :**

Standard specifications	−20 ~ 80 ℃
Heat resistant specifications	−10 ~ 120 ℃
Low temperature specifications	−55 ~ 60 ℃

※ According to JIS B 8354, the ambient temperature range is prescibed 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.

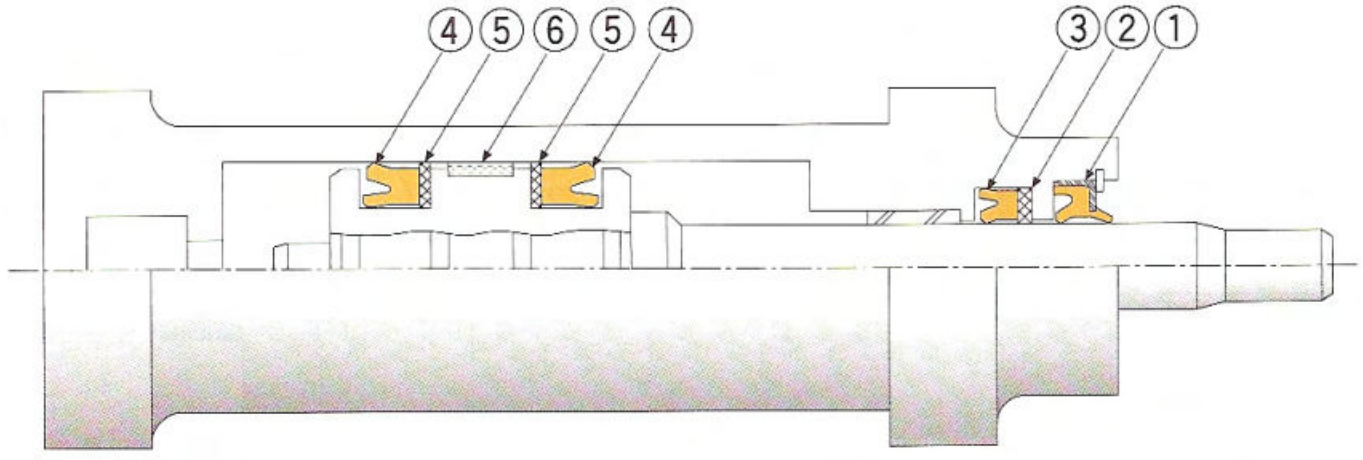
Recommended example 3



	Item	Standard specifications			Heat resistant specifications			Low temperature specifications		
		Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)
①	Dust seal	LBH	A505	F-121	LBH	F357	F-121	DKB	A980 SPCC	—
②	Backup ring	BRT2	19YF	F-138	BRT2	19YF	F-138	BRT2	19YF	F-138
③	Rod packing	USH	A505	F-85	USH	F357	F-85	IUH	A903	F-52
④	Piston packing	SPG	19YF A980	F-19	SPG	19YF F201	—	SPG	19YF A980	F-19
⑤	Wear ring	WR	12RS	F-131	WR	12RS	F-131	WR	12RS	F-131

The low friction SPG packing and high load durability wear ring are em-ployed for the piston. For the dust seal of low tem-perature application, instead of LBH, we recommend DKB with a metal case that has low shrinkage percentage of diameter at low temperature.

Recommended example 4



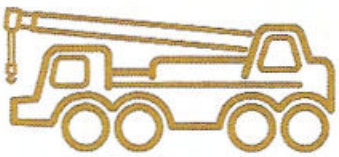
	Item	Standard specifications			Heat resistant specifications			Low temperature specifications		
		Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)	Type	Material code	Dimension table (page)
①	Dust seal	DKBI	U801 SPCC	F-108	LBH	F357	F-121	DKB	A980 SPCC	—
②	Backup ring	—	—	—	BRT2	19YF	F-138	BRT2	19YF	F-138
③	Rod packing	ISI	U801	F-49	USH	F357	F-85	IUH	A903	F-52
④	Piston packing	OSI	U801	F-11	USH	F357	F-85	OUHR	A903	F-16
⑤	Backup ring	—	—	—	BRT2	19YF	F-138	BRT2	19YF	F-138
⑥	Wear ring	WR	12RS	F-131	WR	12RS	F-131	WR	12RS	F-131

The U packings are employed to improve the sealing ability of piston.

Application Examples by Equipment

Equipment	Application	Operating condition
 Power shovel	Boom cylinder Arm cylinder Bucket cylinder	Standard specifications 0～31.4MPa {0～320kgf/cm²} −30～100℃
		Heat resistance specifications 0～31.4MPa {0～320kgf/cm²} −30～120℃
		Cold resistance specifications 0～31.4MPa {0～320kgf/cm²} −50～80℃
	Adjust cylinder (grease cylinder)	0～78.5MPa {0～800kgf/cm²} −30～100℃
 Mini construction equipment Mini back hoe	Boom cylinder Arm cylinder Bucket cylinder Blade cylinder	0～20.6MPa {0～210kgf/cm²} −30～100℃
 Wheel loader	Hoist cylinder Bucket cylinder	0～20.6MPa {0～210kgf/cm²} −30～110℃
	Steering cylinder	0～20.6MPa {0～210kgf/cm²} −30～110℃

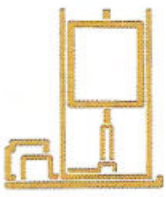
E

Equipment	Application	Operating condition
 Bulldozer	Hoist cylinder Blade cylinder	0～20.6MPa {0～210kgf/cm²} −30～100℃
 Truck crane	Derricking cylinder Telescopic cylinder Slide cylinder	0～20.6MPa {0～210kgf/cm²} −40～80℃
		0～31.4MPa {0～320kgf/cm²} −30～100℃
 Wheel crane	Jack cylinder	0～31.4MPa {0～320kgf/cm²} −30～100℃
	Hydraulic suspension cylinder	0～20.6MPa {0～210kgf/cm²} −30～100℃
 Dump truck	Dump cylinder	0～41.2MPa {0～420kgf/cm²} −50～100℃

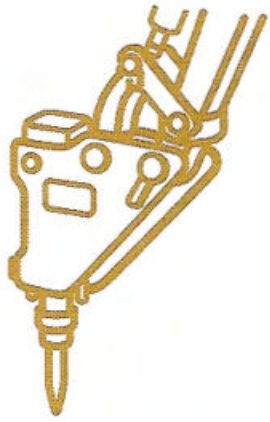
E

Equipment	Application	Operating condition
 Forklift  Battery forklift	Tilt cylinder	0～20.6MPa {0～210kgf/cm²} −30～100℃
	Lift cylinder (low temperature specifications)	0～9.8MPa {0～100kgf/cm²} −55～80℃
	Steering cylinder	0～20.6MPa {0～210kgf/cm²} −30～100℃
 Garbage truck	—	0～20.6MPa {0～210kgf/cm²} −30～100℃
 Combine  Farm tractor	Double acting cylinder	0～13.7MPa {0～140kgf/cm²} −30～100℃
	Single acting cylinder	0～13.7MPa {0～140kgf/cm²} −30～100℃
 Pressing machine	—	0～27.5MPa {0～280kgf/cm²} −10～80℃

E

Equipment	Application	Operating condition
 Robot	—	0～20.6MPa {0～210kgf/cm²} −10～80℃
 Lift	—	0～20.6MPa {0～210kgf/cm²} −30～80℃
 Injection molding machine	—	0～31.4MPa {0～320kgf/cm²} −10～100℃
 Multi stories parking	—	0～13.7MPa {0～140kgf/cm²} −30～100℃
 Hydraulic elevator	—	0～4.9MPa {0～50kgf/cm²} −20～80℃
 Plunger pump	—	0～13.7MPa {0～140kgf/cm²} −10～80℃

E

Equipment	Application	Operating condition
 Hydraulic breaker	—	0～16.7MPa {0～170kgf/cm²} −30～100℃
	—	0～17.7MPa {0～180kgf/cm²} −30～100℃
 Operation valve	—	0～0.3MPa {0～3kgf/cm²} −30～100℃
 Power steering	—	0～8.3MPa {0～85kgf/cm²} −30～100℃

E

Equipment	Application	Operating condition
 Construction equipment	Center spindle (center joint)	0～34.3MPa {0～350kgf/cm²} −30～100℃
 Construction equipment	Link pin Hinge pin	— −30～100℃
 Construction equipment	Crawler belt pin	— −30～80℃
 Industrial equipment	Pump Motor Reduction unit	−0.03～0.2MPa {−0.3～2kgf/cm²} −15～110℃

E

About ordering NOK packing

Please place your order with the nearest NOK branch, sales office, or agent for NOK packing.

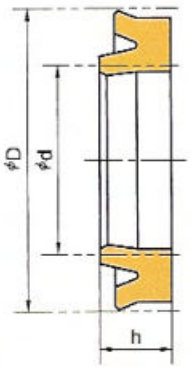
1 Please designate the NOK part number, type and size with your order. (Specifying methods are described in each dimension table.)

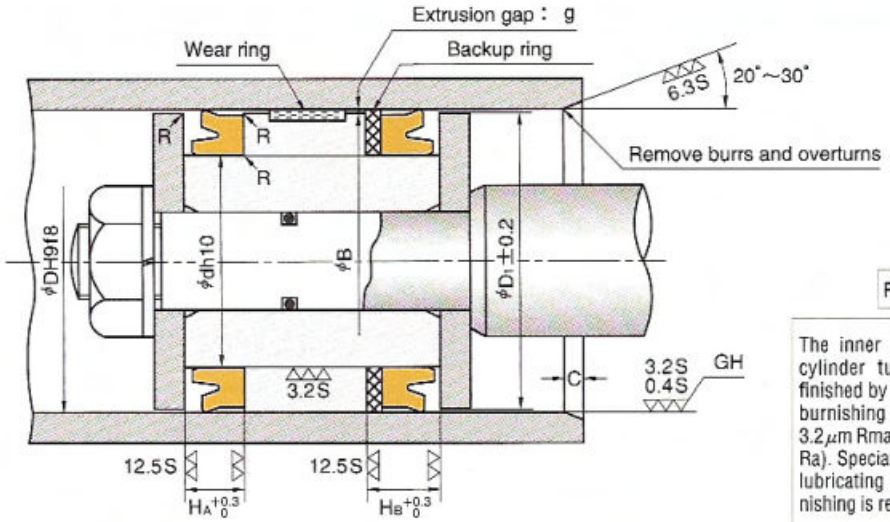
2 If you require packings that are not listed in the dimension tables, or have any difficulty selecting packings because of special operating condition, consult with NOK branch, sales office, or agent.

3 If you require type and size that are not listed in the dimension tables or material (rubber, plastic or metal case) other than standard materials for each type, new molding tool may be necessary.

4 Please inquire about availablity and price at your nearest NOK branch, sales office, or agent.

ODI TYPE SPECIAL PACKINGS FOR PISTON SEALS





R=0.3 or below

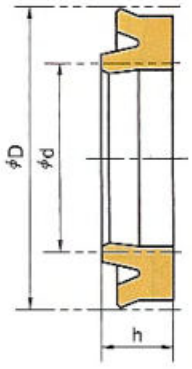
The inner surface of the cylinder tube should be finished by honing (GH) or burnishing (RLB) to 0.4 to 3.2 μm Rmax (0.1 to 0.8 μm Ra). Specially under severe lubricating condition, burnishing is required.

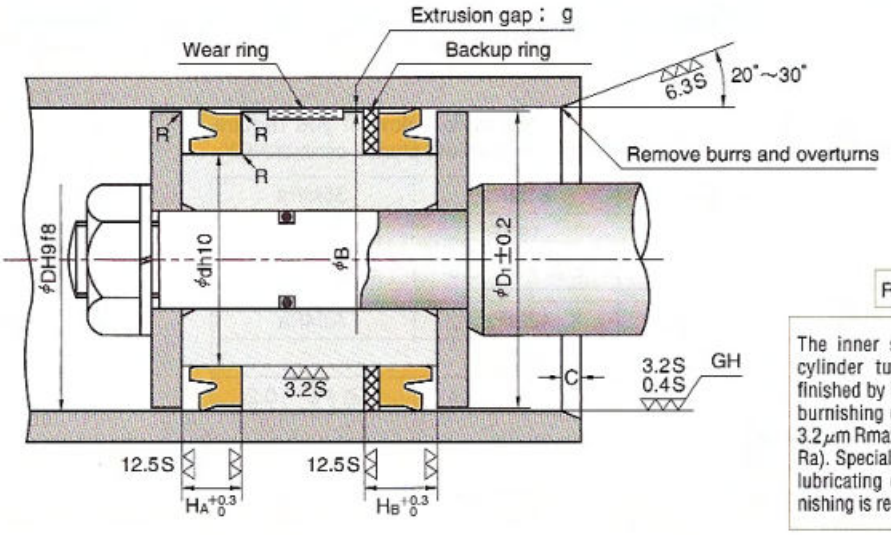
Nominal Size of Packing			Housing dimensions						NOK Part Number
D	d	h	φD	φd	φD1	HA	HB	C	
18	8	7.5	18	8	17	8.5	10.5		FU2150H0
19.2	11.2	5	19.2	11.2	18.2	5.7	7.7		※ FU0202H0
20	10	6	20	10	19	7	9		※ FU0205H0
	10	7.5	20	10	19	8.5	10.5	2.5	FU0206H0
	10	8	20	10	19	9	11		FU0207H0
	12	5	20	12	19	5.7	7.7		※ FU0208H0
22	14	5	22	14	21	5.7	7.7		※ FU0242H0
24	14	7.5	24	14	23	8.5	10.5		FU2151H0
25	15	6	25	15	24	7	9		※ FU0273H0
	15	8	25	15	24	9	11		FU0274H0
	17	5	25	17	24	5.7	7.7	3.5	※ FU0275H0
26	16	7.5	26	16	25	8.5	10.5		FU2152H0
	18	5	26	18	25	5.7	7.7		※ FU0310H0
28	15	10	28	15	27	11	13		FU2153H0
	20	5	28	20	27	5.7	7.7	2	※ FU2138H0
30	20	5	30	20	29	5.7	7.7		※ FU0351H0
	20	6	30	20	29	7	9	3.5	※ FU0352H0
	20	8	30	20	29	9	11		FU0353H0
	22.4	5	30	22.4	29	5.7	7.7	2	※ FU2139H0
31	18	10	31	18	30	11	13		FU2154H0
31.5	18.5	8	31.5	18.5	30.5	9	11		FU0377H0
	18.5	10	31.5	18.5	30.5	11	13	3.5	FU0378H0
	21.5	6	31.5	21.5	30.5	7	9		※ FU0379H0
	21.5	8	31.5	21.5	30.5	9	11		FU0380H0
	23.5	5	31.5	23.5	30.5	5.7	7.7	2	※ FU0381H0
33	20	10	33	20	32	11	13	3.5	FU2155H0
	25	5	33	25	32	5.7	7.7	2	※ FU2140H0
35	22	10	35	22	34	11	13		FU2156H0
	25	6	35	25	34	7	9		※ FU0418H0
	25	8	35	25	34	9	11		FU0419H0
35.4	22.4	10	35.4	22.4	34.4	11	13		FU2157H0
35.5	22.5	8	35.5	22.5	34.5	9	11		FU0446H0
	22.5	10	35.5	22.5	34.5	11	13		FU0447H0
	25.5	6	35.5	25.5	34.5	7	9		※ FU0448H0
	25.5	8	35.5	25.5	34.5	9	11		FU0449H0
38	25	10	38	25	37	11	13	3.5	FU0466H0
40	25	9	40	25	39	10	12		FU0485H0
	25	10	40	25	39	11	13		FU0486H0
	27	8	40	27	39	9	12		FU0488H0
	27	10	40	27	39	11	14		FU0489H0
	30	8	40	30	39	9	12		FU0491H0
41	28	10	41	28	40	11	14		FU2158H0
43	30	10	43	30	42	11	14		FU2159H0

The dimensions and pressure limit with ※ should be the same as OSI TYPE.

F

ODI TYPE SPECIAL PACKINGS FOR PISTON SEALS





R=0.3 or below

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

Nominal Size of Packing			Housing dimensions						NOK
D	d	h	φD	φd	φD1	HA	HB	C	Part Number
71	51	12	71	51	70	13	16		FU0872H0
	55	10	71	55	70	11	14		FU0873H0
	55	12	71	55	70	13	16		FU0874H0
	56	9	71	56	70	10	13		FU0875H0
	56	10	71	56	70	11	14		FU0876H0
	61	8	71	61	70	9	12		FU0878H0
75	55	12	75	55	74	13	16		FU0894H0
	60	9	75	60	74	10	13		FU0895H0
	60	10	75	60	74	11	14		FU0896H0
	65	8	75	65	74	9	12		FU0898H0
76	60	12	76	60	75	13	16		FU2165H0
80	60	12	80	60	79	13	16		FU0929H0
	64	10	80	64	79	11	14		FU0931H0
	64	12	80	64	79	13	16		FU0932H0
	65	9	80	65	79	10	13		FU0933H0
	65	10	80	65	79	11	14		FU0934H0
	70	8	80	70	79	9	12		FU0937H0
85	65	12	85	65	84	13	16		FU0974H0
	70	9	85	70	84	10	13		FU0977H0
	70	10	85	70	84	11	14		FU0978H0
	75	8	85	75	84	9	12	5	FU0980H0
90	70	12	90	70	89	13	16		FU1014H0
	70	15	90	70	89	16	19		FU1015H0
	75	9	90	75	89	10	13		FU1017H0
	75	10	90	75	89	11	14		FU1018H0
	80	8	90	80	89	9	12		FU1020H0
95	75	12	95	75	94	13	16		FU1045H0
	75	15	95	75	94	16	19		FU1046H0
	80	9	95	80	94	10	13		FU1047H0
	80	10	95	80	94	11	14		FU1048H0
100	80	12	100	80	98	13	16		FU1072H0
	80	15	100	80	98	16	19		FU1074H0
	85	10	100	85	98	11	14		FU1079H0
105	85	15	105	85	103	16	19		FU2166H0
110	90	12	110	90	108	13	16		FU1149H0
	90	15	110	90	108	16	19		FU1150H0
	95	10	110	95	108	11	14		FU1153H0
112	92	12	112	92	110	13	16		FU1174H0
	92	15	112	92	110	16	19		FU1175H0
	97	9	112	97	110	10	13		FU1176H0
	97	10	112	97	110	11	14		FU1177H0

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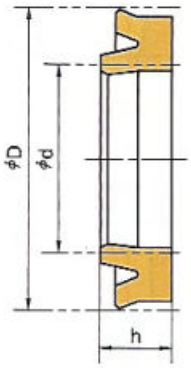
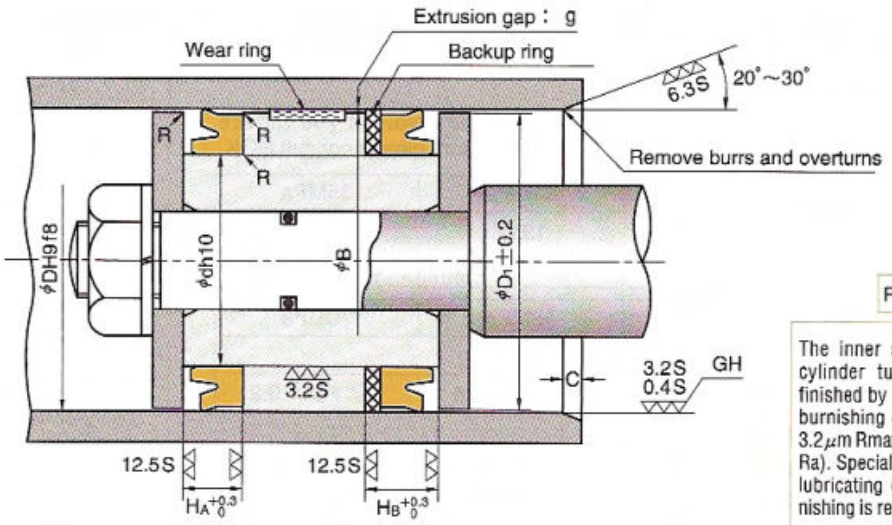
ODI TYPE SPECIAL PACKINGS FOR PISTON SEALS





R=0.3 or below

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

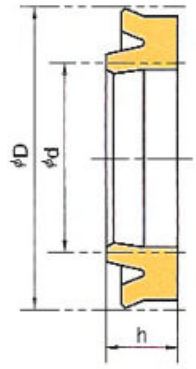
Nominal Size of Packing			Housing dimensions						NOK Part Number
D	d	h	φD	φd	φD1	HA	HB	C	
185	160	19	185	160	183	20	24		FU2172H0
	160	20	185	160	183	21	25		FU2187H0
190	165	16	190	165	188	17	21		FU1507H0
	165	20	190	165	188	21	25		FU1508H0
	170	12	190	170	188	13	17		FU1509H0
	170	16	190	170	188	17	21		FU1510H0
	175	10	190	175	188	11	15		FU1512H0
200	175	16	200	175	198	17	21		FU1536H0
	175	19	200	175	198	20	24		FU2173H0
	175	20	200	175	198	21	25		FU1538H0
	180	16	200	180	198	17	21		FU1540H0
205	180	19	205	180	203	20	24		FU2174H0
	180	20	205	180	203	21	25		FU2188H0
210	185	16	210	185	208	17	21		FU1570H0
	185	20	210	185	208	21	25		FU1571H0
	190	16	210	190	208	17	21		FU1573H0
215	190	16	215	190	213	17	21		FU2260H0
220	195	16	220	195	218	17	21		FU1592H0
	195	20	220	195	218	21	25		FU1593H0
	200	16	220	200	218	17	21		FU1595H0
224	199	16	224	199	222	17	21	6.5	FU1604H0
	199	20	224	199	222	21	25		FU1605H0
	204	16	224	204	222	17	21		FU1607H0
225	200	16	225	200	223	17	21		FU1616H0
	200	19	225	200	223	20	24		FU2175H0
	200	20	225	200	223	21	25		FU1617H0
	205	16	225	205	223	17	21		FU1619H0
230	205	16	230	205	228	17	21		FU1632H0
	205	19	230	205	228	20	24		FU1633H0
	205	20	230	205	228	21	25		FU1634H0
	210	16	230	210	228	17	21		FU1636H0
240	215	16	240	215	238	17	21		FU1652H0
	215	19	240	215	238	20	24		FU1653H0
	215	20	240	215	238	21	25		FU1654H0
	220	16	240	220	238	17	21		FU1656H0
250	225	16	250	225	248	17	21		FU1671H0
	225	19	250	225	248	20	24		FU1672H0
	225	20	250	225	248	21	25		FU1673H0
	230	16	250	230	248	17	21		FU1676H0
260	235	16	260	235	258	17	21		FU1698H0
	235	19	260	235	258	20	24		FU1699H0
	240	16	260	240	258	17	21		FU1701H0

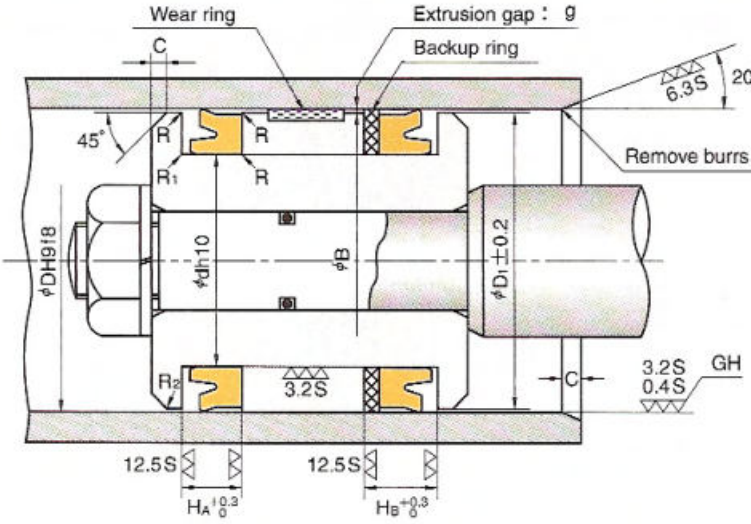
F

F

OSI TYPE

SPECIAL PACKINGS FOR PISTON SEALS (INSTALLED WITH INTERNAL GROOVE)





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

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

Nominal Size of Packing			Housing dimensions						NOK Part Number
D	d	h	φD	φd	φD1	HA	HB	C	
35	27	5	35	27	34	5.7	8.7	2	FU0420L0
35.5	27.5	5	35.5	27.5	34.5				FU0450L0
	28	5	35.5	28	34.5				FU2141L0
40	30	6	40	30	39	7	10	2.5	FU0490L0
41.5	31.5	6	41.5	31.5	40.5				FU2142L0
45	35	6	45	35	44				FU0563L0
	35.5	6	45	35.5	44				FU2143L0
50	40	6	50	40	49				FU0613L0
55	45	6	55	45	54				FU0692L0
56	45	7	56	45	55	8	11		FU2144L0
	46	6	56	46	55	7	10		FU0720L0
60	50	6	60	50	59				FU0742L0
63	53	6	63	53	62				FU0784L0
65	55	6	65	55	64				FU0807L0
66	56	6	66	56	65				FU0825L0
70	60	6	70	60	69				FU0846L0
71	60	7	71	60	70	8	11		FU2145L0
	61	6	71	61	70	7	10		FU0877L0
73	63	6	73	63	72				FU0889L0
75	65	6	75	65	74				FU0897L0
77	67	6	77	67	76				FU0922L0
80	70	6	80	70	79				FU0936L0
	71	6	80	71	79				FU2146L0
85	75	6	85	75	84				FU0979L0
90	80	6	90	80	89				FU1019L0
100	85	9	100	85	98	10	13	4	FU1078L0
105	90	9	105	90	103				FU1120L0
110	95	9	110	95	108				FU1152L0
112	98	8.5	112	98	110	9.5	12.5		FU2147L0
115	100	9	115	100	113	10	13		FU1193L0
120	105	9	120	105	118				FU1212L0
	106	8.5	120	106	118	9.5	12.5		FU2148L0
125	112	9	125	112	123	10	13		FU1926L0
130	115	9	130	115	128				FU1278L0
140	125	9	140	125	138				FU1320L0
150	135	9	150	135	148				FU1356L0
	136	8.5	150	136	148	9.5	12.5		FU2149L0

F

OUIS TYPE

SPECIAL PACKINGS FOR PISTON SEALS
NOXLAN (AU)

F

● Please designate NOK Part number and type & size on your order.

(Example) · Type Dimensions OUIS 40 30 6

OUIS — Type Sign

40 30 6 — Nominal Size of Packing described in order of outer diameter(D), inner diameter(d), and height(h)

· Part Number FU0490P0

● Please check the application range on pages D-2 and 3 before selecting the type.

Material	NOK U641

OUHR TYPE

SPECIAL PACKINGS FOR PISTON SEAL
NITRILE RUBBER (NBR)

F

● Please designate NOK Part number and type & size on your order.

(Example) • Type Dimensions OUHR 40 30 6

OUHR — Type Sign

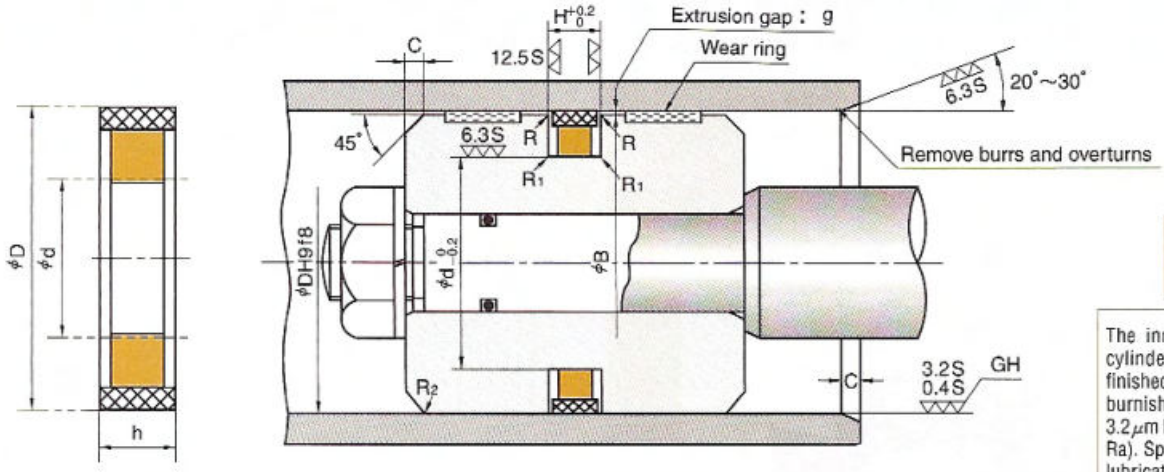
40 30 6 — Nominal Size of Packing described in order of outer diameter(D), inner diameter(d), and height(h)

• Part Number CU2684Q0

● Please check the application range on pages D-2 and 3 before selecting the type.

Material	NOK A903

SPG TYPE SPECIAL PACKINGS FOR PISTON SEALS



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

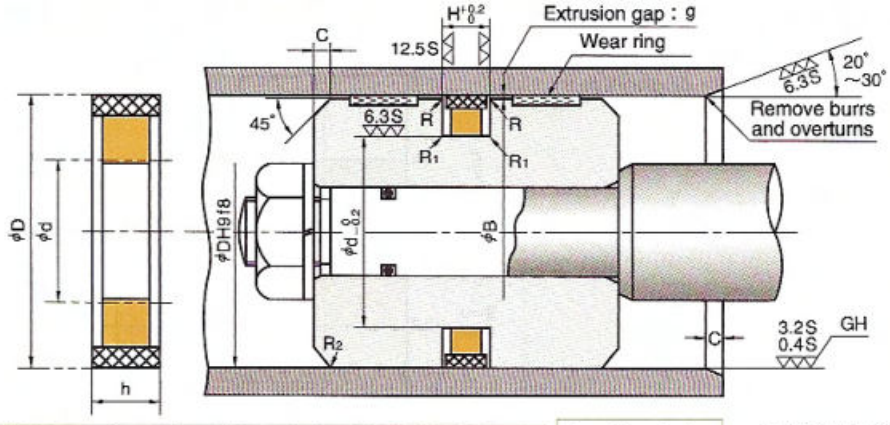
The inner surface of the cylinder tube should be finished by honing (GH) or burnishing (RLB) to 0.4 to 3.2 μm Rmax (0.1 to 0.8 μm Ra). Specially under severe lubricating condition, burnishing is required.

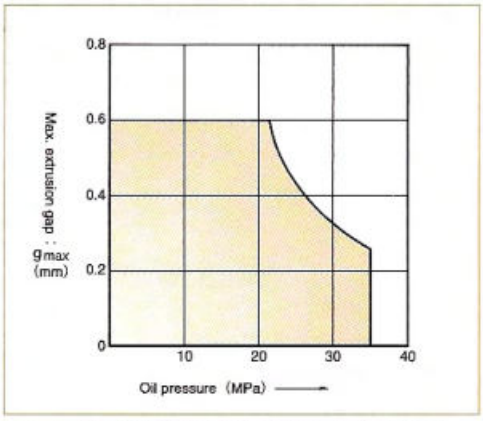
Nominal Number	Nominal Size of Packing			Housing dimensions				NOK Part Number
	d	D	h	φd	φD	H	C	
SPG 30	20.5	30	4.3	20.5	30	4.5	2	GS0327V0
31.5	22	31.5		22	31.5		3.5	GS0328V0
32	22.5	32		22.5	32			GS0329V0
35	25.5	35		25.5	35			GS0330V0
35.5	26	35.5		26	35.5			GS0331V0
40	30	40		30	40			GS0332V0
45	35	45		35	45			GS0333V0
50	40	50		40	50		4	GS0334V0
55	45	55		45	55			GS0335V0
56	46	56		46	56			GS0336V0
60	50	60		50	60			GS0337V0
63	48	63	7.3	48	63	7.5		GS0338V0
65	50	65		50	65			GS0339V0
69	54	69		54	69			GS0340V0
70	55	70		55	70		5	GS0341V0
71	56	71		56	71			GS0342V0
75	60	75		60	75			GS0343V0
80	65	80		65	80			GS0344V0
85	70	85		70	85			GS0345V0
90	75	90		75	90			GS0310V0
95	80	95		80	95			GS0346V0
100	85	100		85	100			GS0347V0
108	92	108		92	108			GS0348V0
110	94	110		94	110			GS0311V0
112	96	112		96	112		6.5	GS0349V0

F

SPG TYPE

SPECIAL PACKINGS FOR PISTON SEALS (LARGE DIMENSION)





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

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

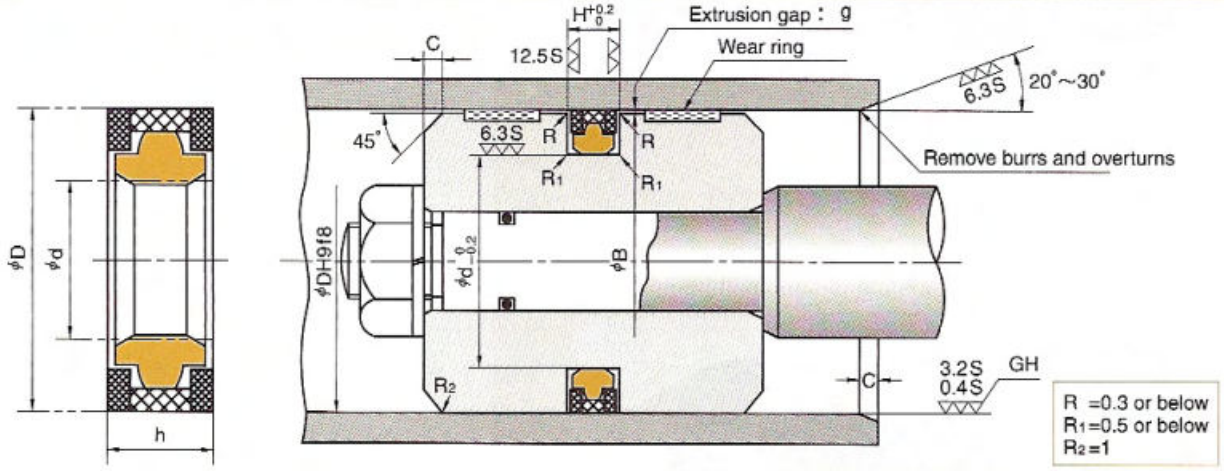
HOW TO DETERMINE B DIMENSION

To determine φB dimension, please refer to the graph in the right for the maximum extrusion gap (also refer page 26) considering the eccentricity of operating condition.

Nominal Number	Nominal Size of Packing			Housing dimensions				NOK Part Number
	d	D	h	φd	φD	H	C	
SPG 330	308	330	9.75	308	330	10	10	GS0408V0
360	336	360	11.7	336	360	12		GS0917V0
485	455	485	14.8	455	485	15		GS0504V1
500	470	500	14.8	470	500	15		GS0261V2
550	515	550	17.2	515	550	17.5		GS0379V2
600	570	600	14.8	570	600	15		GS0324V2
650	620	650	14.8	620	650	15	15	GS0527V0
720	690	720	14.8	690	720	15		GS0492V0
800	785	800	12.7	785	800	13		GS0520V0
900	870	900	24.5	870	900	25		GS0407V2
930	890	930	19	890	930	20		GS0466V1
935	920	935	12.7	920	935	13		GS0521V0
950	925	950	17.7	925	950	18		GS0285V2
1000	960	1000	19.7	960	1000	20	20	GS0512V0
1060	1020	1060	19.7	1020	1060	20		GS0587V0
1120	1080	1120	19.7	1080	1120	20		GS0584V0
1150	1110	1150	19.7	1110	1150	20		GS3007V0
1180	1130	1180	19.7	1130	1180	20		GS0599V1
1210	1170	1210	19	1170	1210	20		GS0465V0
1250	1210	1250	19.7	1210	1250	20		GS0281V0
1260	1220	1260	19.7	1220	1260	20		GS0851V0
1400	1350	1400	19.7	1350	1400	20		GS0402V0
1500	1460	1500	19.7	1460	1500	20		GS0852V0
1650	1600	1650	24	1600	1650	25		GS0579V0

F

SPGW TYPE SPECIAL PACKINGS FOR PISTON SEALS



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

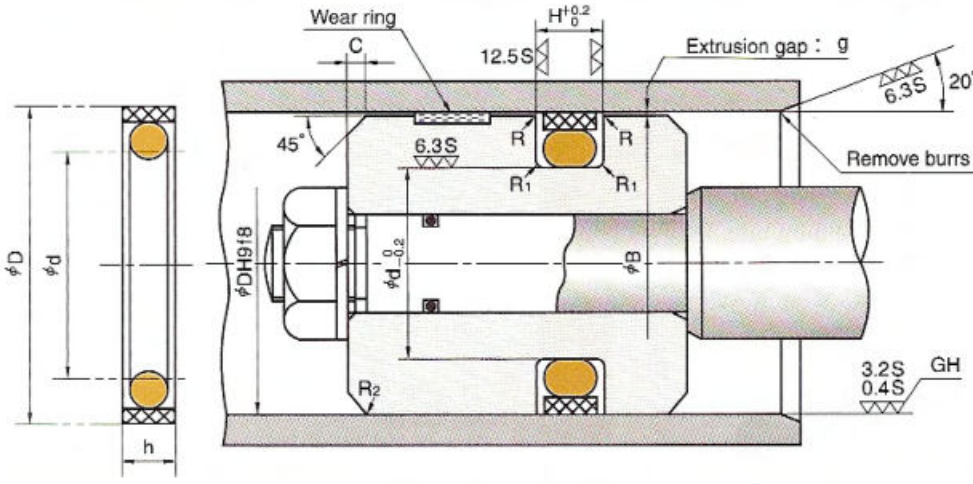
The inner surface of the cylinder tube should be finished by honing (GH) or burnishing (RLB) to 0.4 to 3.2 μm Rmax (0.1 to 0.8 μm Ra). Specially under severe lubricating condition, burnishing is required.

Nominal Number	Nominal Size of Packing			Housing dimensions				NOK Part Number
	d	D	h	φd	φD	H	C	
SPGW 50	36	50	8.5	36	50	9	4	GS0535V2
60	46	60	8.5	46	60			GS0528V2
63	48	63	10.5	48	63	11	5	GS3347V2
65	50	65	10.5	50	65			GS3013V2
70	55	70	10.5	55	70			GS0607V2
75	60	75	10.5	60	75			GS0995V2
80	65	80	10.5	65	80			GS0608V2
85	70	85	10.5	70	85			GS0813V2
90	75	90	10.5	75	90			GS0609V2
95	80	95	10.5	80	95			GS0481V4
100	85	100	12	85	100	12.5		GS0610V2
105	90	105	12	90	105			GS0973V2
110	95	110	12	95	110			GS0611V2
115	100	115	12	100	115		6.5	GS0626V2
120	105	120	12	105	120			GS0612V4
125	102	125	15.5	102	125	16		GS0583V2
130	107	130	15.5	107	130			GS0613V4
135	112	135	15.5	112	135			GS0908V4
140	117	140	15.5	117	140			GS0432V4
150	127	150	15.5	127	150			GS0614V4

F

F

SPGO TYPE SPECIAL PACKINGS FOR PISTON SEALS



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

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

Nominal Number	Nominal Size of Packing			Housing dimensions				NOK Part Number
	d	D	h	φd	φD	H	C	
SPGO20	14	20	3	14	20	3.2	2	GS1800V0
25	19	25		19	25			GS1801V0
30	21.5	30	3.8	21.5	30	4	3.5	GS1802V0
31.5	23	31.5		23	31.5			GS1803V0
32	23.5	32		23.5	32			GS1804V0
35	26.5	35		26.5	35			GS1805V0
35.5	27	35.5		27	35.5			GS1806V0
40	31.5	40		31.5	40			GS1807V0
45	36.5	45		36.5	45			GS1808V0
50	41.5	50		41.5	50		4	GS1809V0
53	44.5	53		44.5	53			GS1810V0
55	46.5	55		46.5	55			GS1811V0
56	47.5	56		47.5	56			GS1812V0
60	51.5	60		51.5	60			GS1813V0
63	49	63	6.3	49	63	6.5		GS1814V0
65	51	65		51	65			GS1815V0
70	56	70		56	70		5	GS1816V0
71	57	71		57	71			GS1817V0
75	61	75		61	75			GS1818V0
80	66	80		66	80			GS1819V0
85	71	85		71	85			GS1820V0
90	76	90		76	90			GS1821V0
95	81	95		81	95			GS1822V0
100	86	100		86	100			GS1823V0
105	91	105		91	105			GS1824V0
110	96	110		96	110			GS1825V0

F

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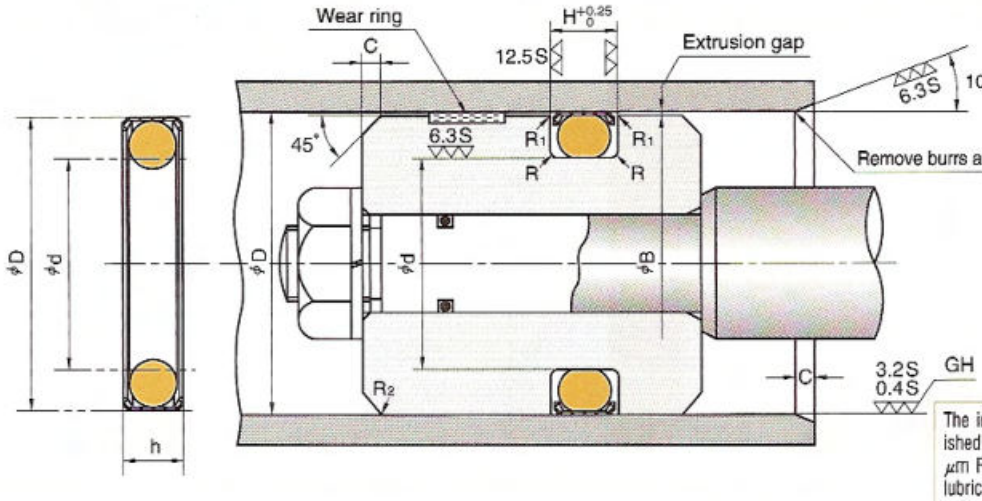
SPGC TYPE SPECIAL PACKINGS FOR PISTON SEALS



Remark 1) To determine φB dimension, please make the maximum extrusion gap (also refer page 26) 0.4mm or below considering the eccentricity of piston.

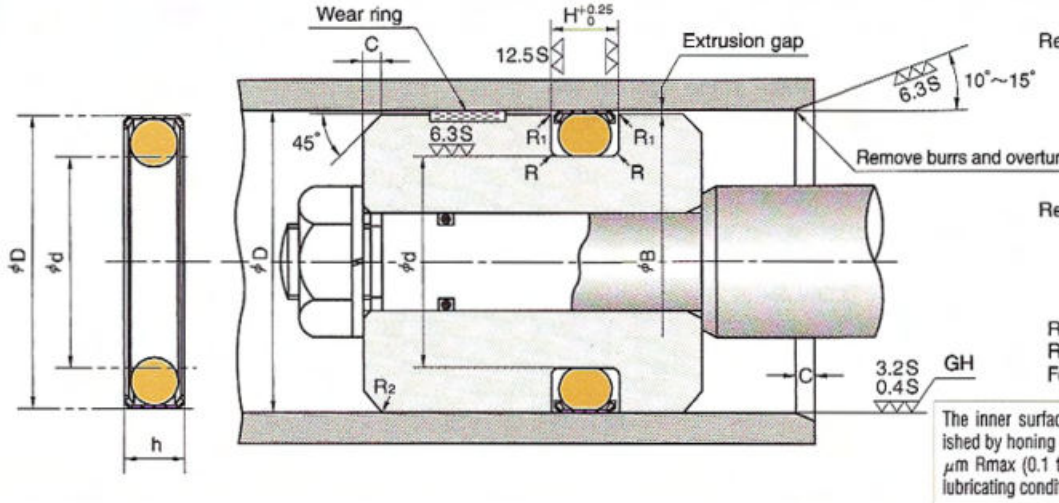
The inner surface of the cylinder tube should be finished by honing (GH) or burnishing (RLB) to 0.4 to 3.2 μm Rmax (0.1 to 0.8 μm Ra). Specially under severe lubricating condition, burnishing is required.

Nominal Number	Nominal Size of Packing			Housing dimensions								NOK Part Number
				For general hydraulic use				For pneumatic and hydraulic low-friction applications				
	d	D	h	φd		φD		φd		φD	H	R	C	
SPGC 6	3	6	2.3	3	0 −0.05	6	+0.05 0	2.5	0 −0.05	6	2.5	0.3 or less	3～4	●GS1000F0
7	4	7		4		7		3.5		7				●GS1001F0
8	5	8		5		8		4.5		8				●GS1002F0
9	6	9		6		9		5.5		9				●GS1003F0
10	7	10		7		10		6.5		10				●GS1004F0
11	8	11		8		11		7.5		11				●GS1005F0
12	9	12		9		12		8.5		12				●GS1006F0
13	10	13		10		13		9.5		13				●GS1007F0
14	10	14	3	10	0 −0.06	14	+0.06 0	9.4	0 −0.06	14	3.2	0.4 or less	4～5	●GS1008F0
15	11	15		11		15		10.4		15				●GS1009F0
15.2	11.2	15.2		11.2		15.2		10.6		15.2				●GS1010F0
16	12	16		12		16		11.4		16				●GS1011F0
16.5	12.5	16.5		12.5		16.5		11.9		16.5				●GS1012F0
18	14	18		14		18		13.4		18				●GS1013F0
19	15	19		15		19		14.4		19				●GS1014F0
20	16	20		16		20		15.4		20				●GS1015F0
22	18	22		18		22		17.4		22				●GS1016F0
24	20	24		20		24		19.4		24				●GS1017F0
25	21	25		21		25		20.4		25				●GS1018F0
26	22	26		22		26		21.4		26				●GS1020F0
28	22	28	4.4	22	0 −0.08	28	+0.08 0	21.4	0 −0.08	28	4.7	0.7 or less	5～6	●GS1019F0
28.4	22.4	28.4		22.4		28.4		21.8		28.4				●GS1021F0
30	24	30		24		30		23.4		30				●GS1022F0
31	25	31		25		31		24.4		31				●GS1023F0
31.5	25.5	31.5		25.5		31.5		24.9		31.5				●GS1024F0
32	26	32		26		32		25.4		32				●GS1025F0
34	28	34		28		34		27.4		34				●GS1026F0
35	29	35		29		35		28.4		35				●GS1027F0
35.5	29.5	35.5		29.5		35.5		28.9		35.5				●GS1028F0
36	30	36		30		36		29.4		36				●GS1029F0
37	31	37		31		37		30.4		37				●GS1030F0
37.5	31.5	37.5		31.5		37.5		30.9		37.5				●GS1031F0
38	32	38		32		38		31.4		38				●GS1032F0
40	34	40		34		40		33.4		40				●GS1033F0
41	35	41		35		41		34.4		41				●GS1034F0
41.5	35.5	41.5		35.5		41.5		34.9		41.5				●GS1035F0
42	36	42		36		42		35.4		42				●GS1036F0
44	38	44		38		44		37.4		44				●GS1037F0
45	39	45		39		45		38.4		45				●GS1038F0
46	40	46		40		46		39.4		46				●GS1039F0

Remarks: When using packings with mark ●, provide separate grooves.

F

SPGC TYPE SPECIAL PACKINGS FOR PISTON SEALS



Remark 1) To determine φB dimension, please make the maximum extrusion gap (also refer page 26) 0.4mm or below considering the eccentricity of piston.

Remark 2) Outer diameter of the piston should be φDf8 when the piston is used as bearing.

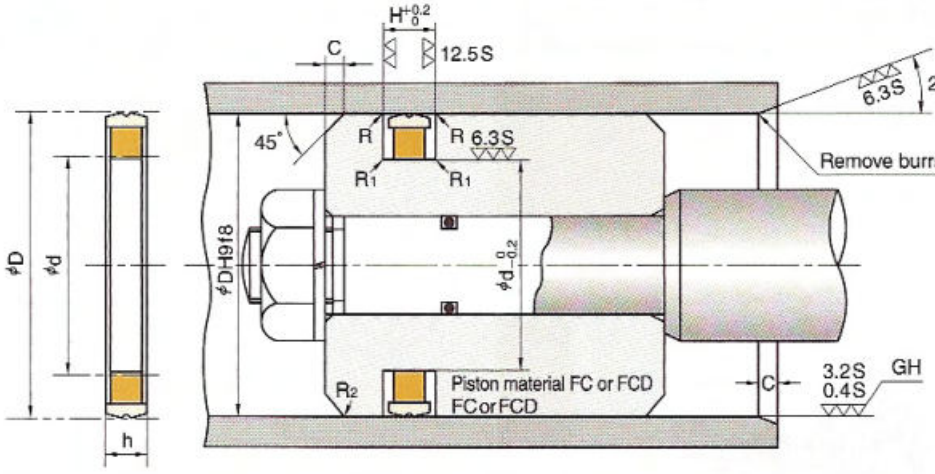
R_1 =0.3 or less
R_2 =1
For R, please refer to the table below.

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

Nominal Number	Nominal Size of Packing			Housing dimensions							NOK Part Number
				For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R	C	
	d	D	h	φd	φD	φd	φD				
SPGC 165	150	165		150	165	149.4	165				GS1080F0
170	155	170		155	170	154.4	170				GS1082F0
175	160	175		160	175	159.4	175				GS1083F0
180	165	180		165	180	164.4	180				GS1084F0
185	170	185		170	185	169.4	185				GS1085F0
190	175	190		175	190	174.4	190				GS1086F0
195	180	195		180	195	179.4	195				GS1087F0
200	185	200		185	200	184.4	200				GS1088F0
205	190	205		190	205	189.4	205				GS1089F0
210	195	210		195	210	194.4	210				GS1090F0
215	200	215		200	215	199.4	215				GS1091F0
220	205	220		205	220	204.4	220				GS1092F0
224	209	224		209	224	208.4	224				GS1093F0
225	210	225		210	225	209.4	225				GS1094F0
230	215	230		215	230	214.4	230				GS1095F0
235	220	235		220	235	219.4	235				GS1096F0
240	225	240		225	240	224.4	240				GS1097F0
245	230	245		230	245	229.4	245				GS1098F0
250	235	250		235	250	234.4	250				GS1099F0
255	240	255	10.5	240 $^{0}_{-0.10}$	255 $^{+0.10}_{0}$	239.4 $^{0}_{-0.10}$	255 $^{+0.10}_{0}$	11.0	0.8以下	8～12	GS1100F0
260	245	260		245	260	244.4	260				GS1101F0
265	250	265		250	265	249.4	265				GS1102F0
270	255	270		255	270	254.4	270				GS1103F0
275	260	275		260	275	259.4	275				GS1104F0
280	265	280		265	280	264.4	280				GS1105F0
285	270	285		270	285	269.4	285				GS1106F0
290	275	290		275	290	274.4	290				GS1107F0
295	280	295		280	295	279.4	295				GS1108F0
300	285	300		285	300	284.4	300				GS1109F0
305	290	305		290	305	289.4	305				GS1110F0
310	295	310		295	310	294.4	310				GS1111F0
315	300	315		300	315	299.4	315				GS1112F0
330	315	330		315	330	314.4	330				GS1113F0
335	320	335		320	335	319.4	335				GS1114F0
350	335	350		335	350	334.4	350				GS1115F0
355	340	355		340	355	339.4	355				GS1116F0
370	355	370		355	370	354.4	370				GS1117F0
375	360	375		360	375	359.4	375				GS1118F0
390	375	390		375	390	374.4	390				GS1119F0
400	385	400		385	400	384.4	400				GS1120F0

F

SPGI TYPE SPECIAL PACKINGS FOR PISTON SEALS



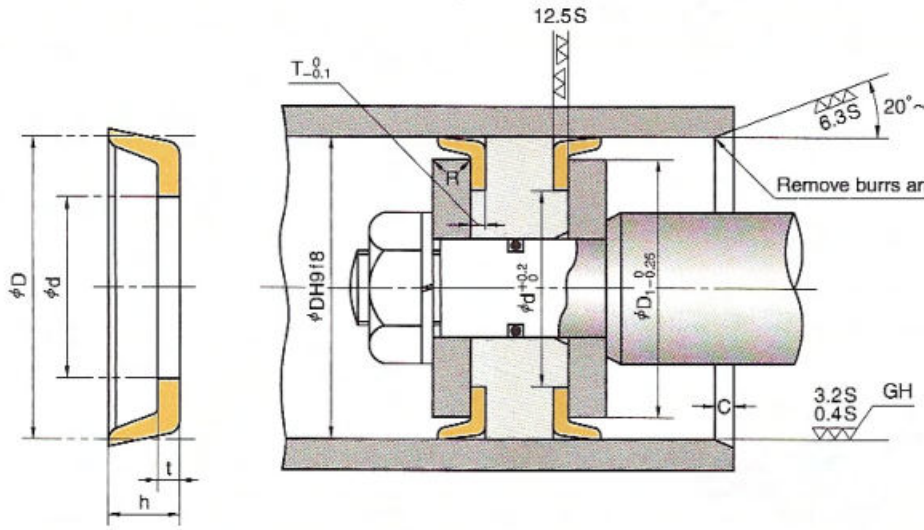
R =0.3 or less
R1 =0.5 or less
R2 =1

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

Nominal Number	Nominal Size of Packing			Housing dimensions				NOK Part Number
	D	d	h	φD	φd	H	C	
SPGI 30	30	20.5	4.3	30	20.5	4.5	2	FQ0497G0
31.5	31.5	22		31.5	22		3.5	FQ0498G0
32	32	22.5		32	22.5			FQ0499G0
40	40	30		40	30			FQ0500G0
50	50	40		50	40		4	FQ0501G0
63	63	48	7.3	63	48	7.5		FQ0502G0
80	80	65		80	65		5	FQ0503G0
100	100	85		100	85			FQ0504G0
125	125	109		125	109		6.5	FQ0505G0
140	140	124		140	124			FQ0506G0
160	160	144		160	144			FQ0507G0
180	180	158	10.8	180	158	11		FQ0508G0
200	200	178		200	178			FQ0509G0
220	220	198		220	198			FQ0510G0
224	224	202		224	202			FQ0511G0
250	250	228		250	228			FQ0512G0

F

CPI TYPE SPECIAL PACKINGS FOR PISTON SEALS

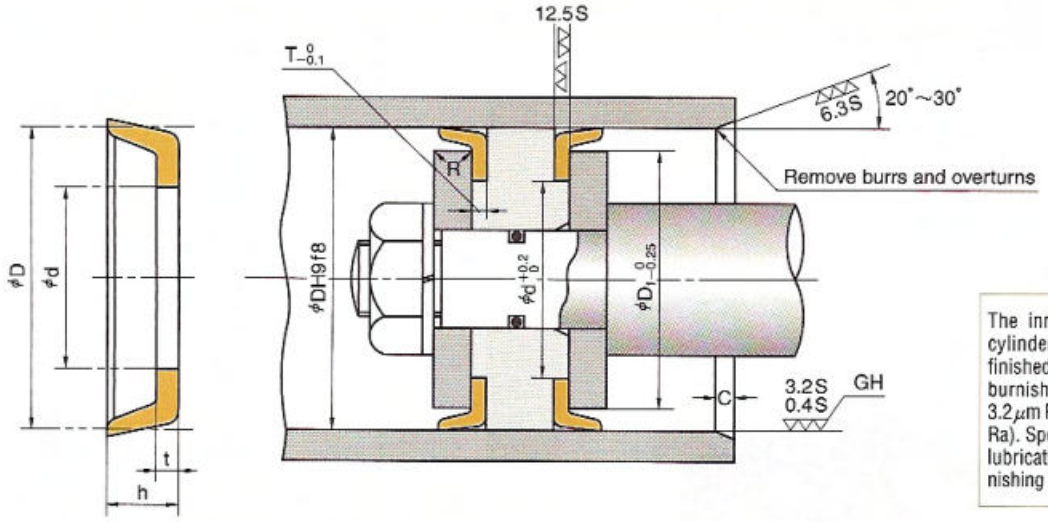


The inner surface of the cylinder tube should be finished by honing (GH) or burnishing (RLB) to 0.4 to 3.2 μm Rmax (0.1 to 0.8 μm Ra). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing				Housing dimensions						NOK Part Number
D	h	t	d	φD	φD1	T	φd	R	C	
25	10	2.5	10	25	17	2.4	10	1.5	3	FC0013C0
28	10	2.5	10	28	20		10			FC0015C0
30	10	2.5	12	30	22		12			FC0020C0
31.5	10	2.5	14	31.5	23.5		14			FC0022C0
35	10	2.5	16	35	27		16			FC0026C0
35.5	10	2.5	16	35.5	27.5		16			FC0398C0
40	10	2.5	20	40	32		20			FC0035C0
45	12	3	20	45	36	2.9	20	2		FC0046C0
50	12	3	22	50	41		22			FC0055C0
53	12	3	25	53	44		25			FC0064C0
55	12	3	25	55	46		25			FC0068C0
56	12	3	25	56	47		25			FC0070C0
60	12	3	30	60	51		30			FC0077C0
63	12	3	35	63	54		35			FC0090C0
65	12	3	35	65	56		35		3.5	FC0095C0
67	12	3	38	67	58		38			FC0102C1
70	12	3	38	70	61		38			FC0106C0
71	12	3	40	71	62		40			FC0114C0
75	12	3	40	75	66		40			FC0117C0
80	16	4	40	80	69	3.8	40	3	4	FC0134C0
85	16	4	45	85	74		45			FC0142C0
90	16	4	50	90	79		50			FC0157C0
95	16	4	55	95	84		55			FC0164C0
100	16	4	55	100	89		55			FC0174C0
105	16	4	60	105	94		60			FC0187C0
106	16	4	60	106	95		60			FC0189C0
110	16	4	60	110	99		60			FC0195C0
112	16	4	65	112	101		65			FC0199C0
118	16	4	70	118	107		70			FC0205C0
120	16	4	70	120	109		70			FC0207C0
125	20	5	75	125	111	4.8	75	4	5.5	FC0222C0
130	20	5	80	130	116		80			FC0230C0
132	20	5	85	132	118		85			FC0233C1
140	20	5	90	140	126		90			FC0245C1
150	20	5	100	150	136		100			FC0255C1
160	20	5	110	160	146		110			FC0275C0
170	20	5	120	170	156		120			FC0279C0
180	20	5	130	180	166		130			FC0282C1
190	20	5	140	190	176		140			FC0289C0
200	20	5	150	200	186		150			FC0293C0
224	20	5	180	224	210		180			FC0314C0
250	20	5	200	250	236		200			FC0321C0
280	20	5	230	280	266		230		6.5	FC0337C0
300	20	5	250	300	286		250		7	FC0344C1

F

CPH TYPE SPECIAL PACKINGS FOR PISTON SEALS

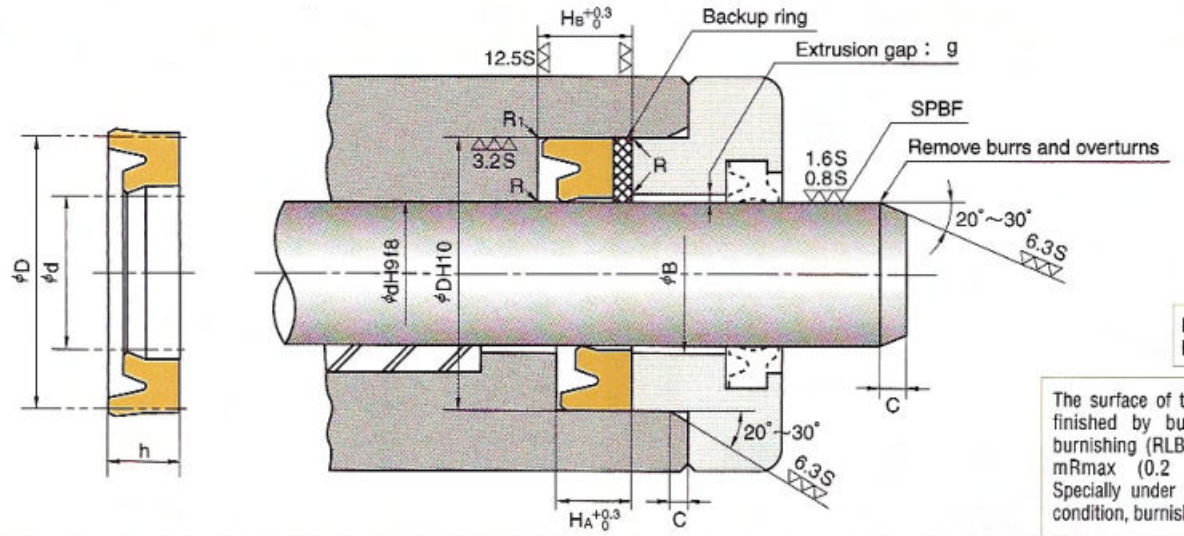


The inner surface of the cylinder tube should be finished by honing (GH) or burnishing (RLB) to 0.4 to 3.2 μm Rmax (0.1 to 0.8 μm Ra). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing				Housing dimensions						NOK Part Number	NOK rubber material Sign
D	h	t	d	φD	φD1	T	φd	R	C		
30	8	2.5	13	30	23	2.5	13	1.5	7	CC0019C3	A104
	10	2.5	12	30	23.5	2.5	12			CC0020C0	A103
	10	2.5	15	30	23	2.5	15			CC0020C1	A102
35	10	2.5	18	35	28.5	2.5	18			CC0026C0	A102
40	8	2.5	16	40	33	2.5	16			CC0034C1	A104
	10	2.5	20	40	33.5	2.5	20			CC0035C0	A102
42	12	3	23	42	34	3	23	2		CC0040C0	A505
45	10	2.5	25	45	38.5	2.5	25			CC0044C0	A102
50	12	3	25	50	41.5	3	25			CC0055C1	A104
55	10	3	40	55	48	3	40			CC0067C0	A103
60	8	2.5	40.5	60	54	2.5	40.5			CC0074C0	A103
	12	3	30	60	51	3	30			CC0077C0	A505
65	13	3.5	34.5	65	56	3.5	34.5			CC0096C0	A104
70	12	3	38	70	62	3	38			CC0106C2	A505
75	12	3	38	75	66	3	38			CC0117C1	A104
80	15	4	40	80	70	4	40	3		CC0132C0	A505
	16	4	40	80	69	4	40			CC0134C0	A102
90	15	4.3	38	90	80	4.3	38		8	CC0156C0	A505
	16	4	45	90	79.5	4	45			CC0157C0	A102
	17	5	50	90	77	5	50			CC0159C0	A104
100	15	4.3	38	100	88	4.3	38			CC0171C0	A104
	16	4	50	100	89	4	50			CC0174C5	A104
	16	4	55	100	89	4	55			CC0174C4	A505
120	16	4	60	120	109	4	60			CC0207C0	A102
	16	4	70	120	109	4	70			CC0207C1	A104
125	16	5	75	125	115	5	75	4		CC0219C0	A104
130	20	5	80	130	116	5	80			CC0230C1	A104
150	20	5	75	150	136	5	75		11	CC0255C0	A102
	20	5	100	150	138	5	100			CC0255C2	A505
180	20	5	90	180	166.5	5	90			CC0282C0	A102
	25	5	80	180	166	5	80			CC0285C0	A104
200	20	5	150	200	187	5	150			CC0293C5	A505
205	23	4	134	205	190	4	134			CC0303C1	A103
257	22	5.5	192	257	245	5.5	192		14	CC0328C1	A103

F

IDI TYPE SPECIAL PACKINGS FOR ROD SEALS



R =0.3 or below
R_1 =0.5 or below

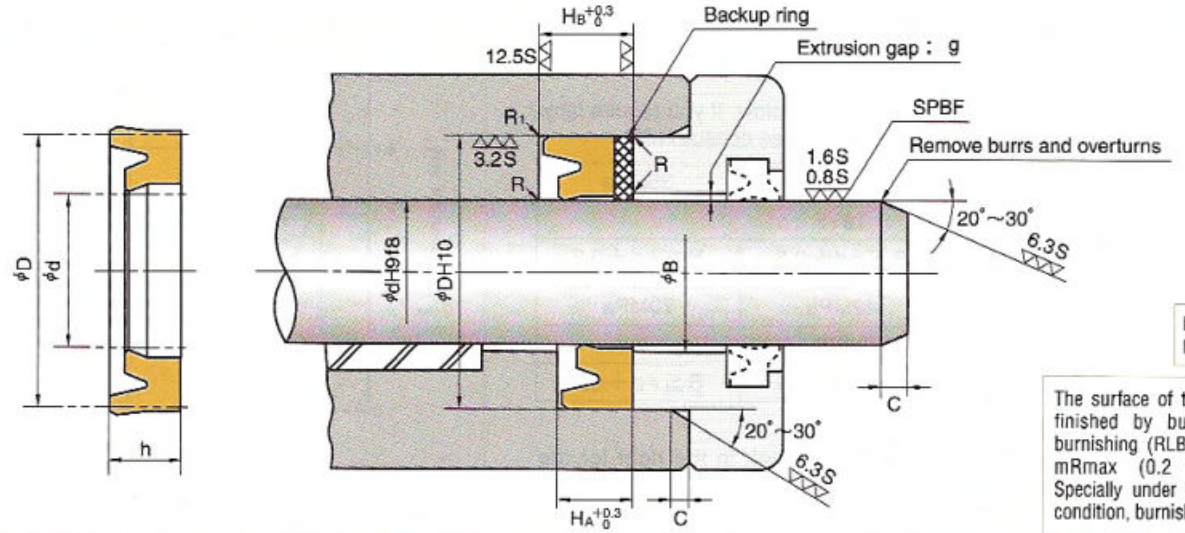
The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing			Housing dimensions					NOK
d	D	h	φd	φD	H_A	H_B	C	Part Number
6.3	14.3	5	6.3	14.3	5.7	7.7		※FU0021F0
	16.3	6	6.3	16.3	7	9		※FU0022F0
	16.3	7.5	6.3	16.3	8.5	10.5		FU0023F0
	16.3	8	6.3	16.3	9	11		FU0024F0
8	16	5	8	16	5.7	7.7		※FU0039F0
	18	6	8	18	7	9		※FU0041F0
	18	7.5	8	18	8.5	10.5		FU0042F0
	18	8	8	18	9	11		FU0043F0
9	17	5	9	17	5.7	7.7		※FU0051F0
	19	6	9	19	7	9		※FU0052F0
	19	7.5	9	19	8.5	10.5		FU0053F0
	19	8	9	19	9	11		FU0054F0
10	18	5	10	18	5.7	7.7		※FU0064F0
	20	6	10	20	7	9		※FU0066F0
	20	7.5	10	20	8.5	10.5		FU0068F0
	20	8	10	20	9	11	2.5	FU0069F0
11.2	19.2	5	11.2	19.2	5.7	7.7		※FU0078F0
	21.2	6	11.2	21.2	7	9		※FU0079F0
	21.2	7.5	11.2	21.2	8.5	10.5		FU0080F0
	21.2	8	11.2	21.2	9	11		FU0081F0
12.5	20.5	5	12.5	20.5	5.7	7.7		※FU0098F0
	22.5	6	12.5	22.5	7	9		※FU0100F0
	22.5	7.5	12.5	22.5	8.5	10.5		FU0101F0
	22.5	8	12.5	22.5	9	11		FU0102F0
14	22	5	14	22	5.7	7.7		※FU0116F0
	24	6	14	24	7	9		※FU0120F0
	24	7.5	14	24	8.5	10.5		FU0121F0
	24	8	14	24	9	11		FU0122F0
15	23	5	15	23	5.7	7.7		※FU0131F0
	25	6	15	25	7	9		※FU0134F0
	25	8	15	25	9	11		FU0135F0
	28	8	15	28	9	11	3.5	FU0136F0
	28	10	15	28	11	13		FU0137F0
16	24	5	16	24	5.7	7.7		※FU0150F0
	26	6	16	26	7	9		※FU0155F0
	26	7.5	16	26	8.5	10.5	2.5	FU0156F0
	26	8	16	26	9	11		FU0157F0
18	28	6	18	28	7	9		※FU0181F0
	28	8	18	28	9	11		FU0182F0
	31	8	18	31	9	11	3.5	FU0185F0
	31	10	18	31	11	13		FU0186F0

The dimensions and pressure limits with ※ are the same as those of ISI type.

F

IDI TYPE SPECIAL PACKINGS FOR ROD SEALS



R =0.3 or below
R_1=0.5 or below

The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing			Housing dimensions					NOK
d	D	h	φd	φD	H_A	H_B	C	Part Number
40	50	8	40	50	9	12		FU0498F0
	55	9	40	55	10	13		FU0504F0
	55	10	40	55	11	14		FU0505F0
	56	10	40	56	11	14		FU0508F0
	56	12	40	56	13	16		FU0509F0
45	55	8	45	55	9	12		FU0569F0
	60	9	45	60	10	13		FU0575F0
	60	10	45	60	11	14		FU0577F0
	61	10	45	61	11	14		FU0579F0
	61	12	45	61	13	16		FU0580F0
47	63	12	47	63	13	16		FU0591F0
50	60	8	50	60	9	12		FU0620F0
	65	9	50	65	10	13		FU0630F0
	65	10	50	65	11	14		FU0631F0
	66	10	50	66	11	14		FU0634F0
	66	12	50	66	13	16		FU0635F0
	70	12	50	70	13	16		FU0639F0
53	69	12	53	69	13	16		FU0682F0
55	65	8	55	65	9	12		FU0696F0
	70	9	55	70	10	13		FU0700F0
	70	10	55	70	11	14	4	FU0701F0
	71	10	55	71	11	14		FU0703F0
	71	12	55	71	13	16		FU0704F0
	75	12	55	75	13	16		FU0708F0
56	66	8	56	66	9	12		FU0723F0
	71	9	56	71	10	13		FU0724F0
	71	10	56	71	11	14		FU0725F0
	72	10	56	72	11	14		FU0726F0
	72	12	56	72	13	16		FU0727F0
	76	12	56	76	13	16		FU0728F0
60	70	8	60	70	9	12		FU0747F0
	75	9	60	75	10	13		FU0753F0
	75	10	60	75	11	14		FU0754F0
	76	10	60	76	11	14		FU0756F0
	76	12	60	76	13	16		FU0757F0
	80	12	60	80	13	16		FU0761F0
63	73	8	63	73	9	12		FU0787F0
	78	9	63	78	10	13		FU0788F0
	78	10	63	78	11	14		FU0789F0
	79	10	63	79	11	14		FU0790F0
	79	12	63	79	13	16		FU0791F0
	83	12	63	83	13	16		FU0793F0

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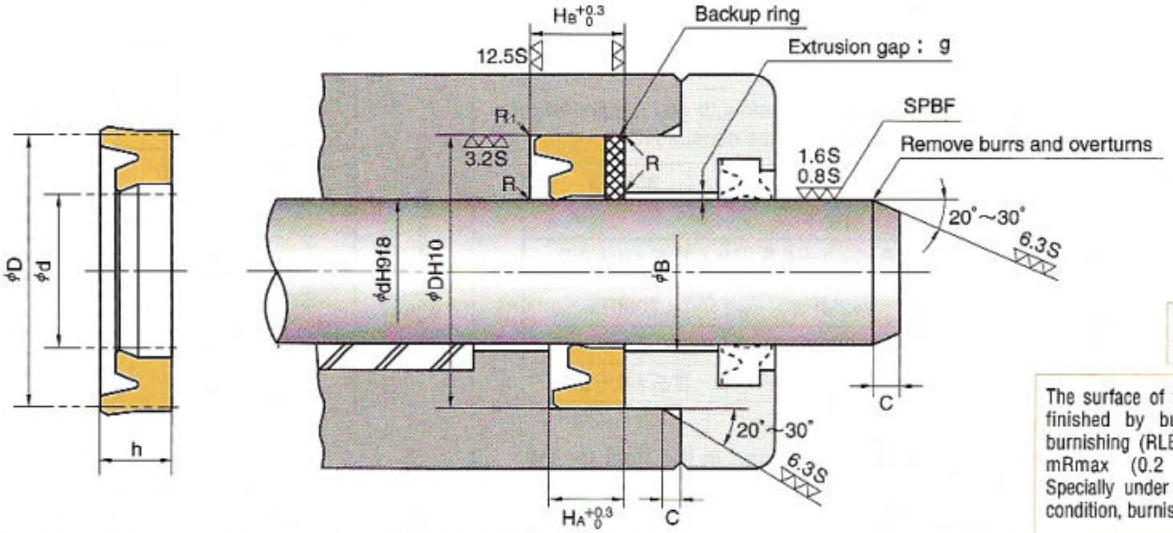
IDI TYPE SPECIAL PACKINGS FOR ROD SEALS



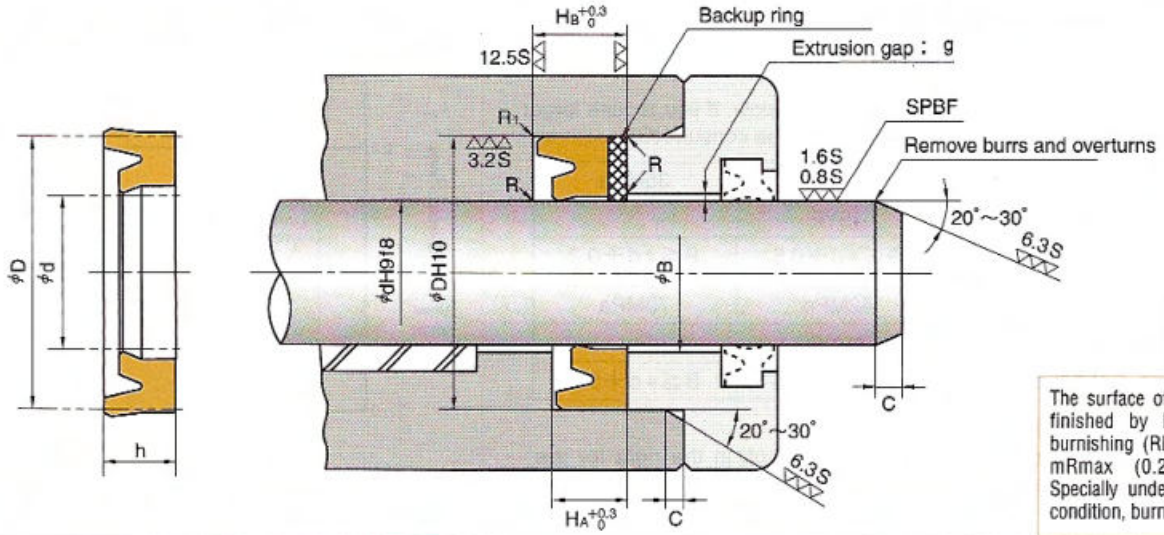
R =0.3 or below
R_1=0.5 or below

The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing			Housing dimensions					NOK
d	D	h	φd	φD	H_A	H_B	C	Part Number
100	115	10	100	115	11	14		FU1083F0
	120	12	100	120	13	16		FU1089F0
	120	15	100	120	16	19		FU1091F0
105	120	10	105	120	11	14		FU1126F0
	125	15	105	125	16	19		FU1129F0
	125	16	105	125	17	20		FU1130F0
106	121	10	106	121	11	14		FU1137F0
	126	15	106	126	16	19		FU1138F0
	126	16	106	126	17	20		FU1139F0
110	125	10	110	125	11	14		FU1158F0
	130	15	110	130	16	19		FU1165F0
	130	16	110	130	17	20	5	FU1166F0
112	127	9	112	127	10	13		FU1180F0
	127	10	112	127	11	14		FU1181F0
	132	15	112	132	16	19		FU1182F0
	132	16	112	132	17	20		FU1183F0
118	133	10	118	133	11	14		FU1206F0
	138	15	118	138	16	19		FU1207F0
	138	16	118	138	17	20		FU1208F0
120	135	10	120	135	11	14		FU1221F0
	140	15	120	140	16	19		FU1224F0
	140	16	120	140	17	20		FU1225F0
125	140	10	125	140	11	14		FU1253F0
	145	12	125	145	13	16		FU1256F0
	145	16	125	145	17	20		FU1258F0
	150	19	125	150	20	23		FU2132F0
	150	20	125	150	21	24		FU1260F0
130	145	10	130	145	11	14		FU1281F0
	150	12	130	150	13	16		FU1283F0
	150	16	130	150	17	20		FU1285F0
132	157	20	132	157	21	24		FU1295F0
135	160	19	135	160	20	23	6.5	FU2133F0
	160	20	135	160	21	24		FU2179F0
140	155	10	140	155	11	14		FU1324F0
	160	12	140	160	13	16		FU1325F0
	160	16	140	160	17	20		FU1328F0
	165	19	140	165	20	23		FU1332F0
	165	20	140	165	21	24		FU1333F0
145	170	19	145	170	20	23		FU2134F0
	170	20	145	170	21	24		FU2180F0

F

IDI TYPE SPECIAL PACKINGS FOR ROD SEALS



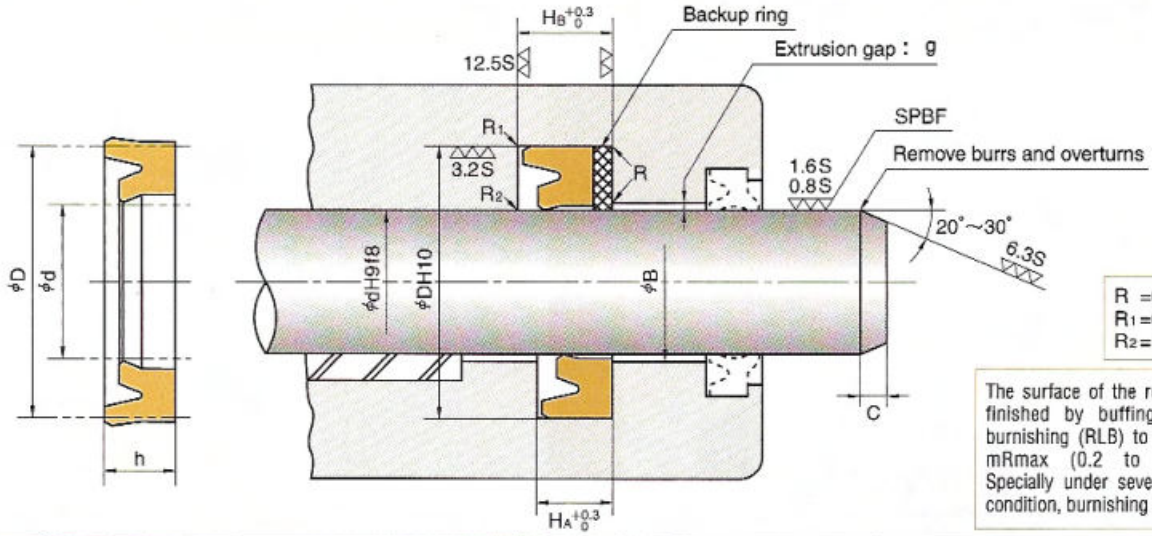
R =0.3 or below
R_1=0.5 or below

The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing			Housing dimensions					NOK
d	D	h	φd	φD	H_A	H_B	C	Part Number
224	244	11	224	244	12	16		FU1608F0
	244	15	224	244	16	20		FU1610F0
	249	15	224	249	16	20		FU1611F0
	249	18	224	249	19	23		FU1612F0
	249	19	224	249	20	24		FU1613F0
225	245	16	225	245	17	21		FU1622F0
	250	16	225	250	17	21		FU1624F0
	250	19	225	250	20	24		FU1626F0
	250	20	225	250	21	25		FU1627F0
230	250	16	230	250	17	21		FU1638F0
	255	16	230	255	17	21	6.5	FU1640F0
	255	19	230	255	20	24		FU1642F0
	255	20	230	255	21	25		FU1643F0
240	260	16	240	260	17	21		FU1658F0
	265	16	240	265	17	21		FU1661F0
	265	19	240	265	20	24		FU1663F0
	265	20	240	265	21	25		FU1664F0
250	270	16	250	270	17	21		FU1679F0
	275	16	250	275	17	21		FU1681F0
	275	19	250	275	20	24		FU1683F0
	275	20	250	275	21	25		FU1684F0
260	285	19	260	285	20	24		FU1705F0
	290	19	260	290	20	24		FU1707F0
265	297	24	265	297	25	29		FU1714F0
	297	25	265	297	26	30		FU2183F0
270	295	19	270	295	20	24		FU1721F0
	300	19	270	300	20	24		FU1723F0
	300	24	270	300	25	29		FU1725F0
	300	25	270	300	26	30		FU1726F0
280	305	19	280	305	20	24		FU1734F0
	310	19	280	310	20	24	8	FU1736F0
	312	24	280	312	25	29		FU2136F0
	312	25	280	312	26	30		FU2184F0
290	315	19	290	315	20	24		FU1749F0
	320	19	290	320	20	24		FU1751F0
300	325	19	300	325	20	24		FU1763F0
	330	19	300	330	20	24		FU1765F0
	332	24	300	332	25	29		FU2137F0
	332	25	300	332	26	30		FU2185F0

F

ISI TYPE SPECIAL PACKINGS FOR ROD SEALS (INSTALLED IN INTERNAL GROOVE)



R =0.3 or below
R_1 =0.5 or below
R_2 =1

The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing			Housing dimensions					NOK Part Number	
d	D	h	φd	φD	H_A	H_B	C	Standard (U801)	Heat resistant type (U641)
18	26	5	18	26	5.7	7.7	2	FU0180K0	FU0180K2
20	28	5	20	28				FU0212K0	FU0212K1
22.4	30	5	22.4	30				FU0260K0	FU0260K1
	30.4	5	22.4	30.4				FU0261K0	FU0261K1
23.5	31.5	5	23.5	31.5				FU0267K0	FU0267K1
25	33	5	25	33			2.5	FU0276K0	FU0276K2
	35	5	25	35				FU0278K0	FU0278K2
28	35.5	5	28	35.5				FU0320K0	FU0320K1
	36	5	28	36		8.7		FU0321K0	FU0321K1
30	40	6	30	40	7	10		FU0357K0	FU0357K3
31.5	41.5	6	31.5	41.5				FU0382K0	FU0382K1
35	45	6	35	45				FU0424K0	FU0424K7
35.5	45	6	35.5	45				FU0451K0	FU0451K1
	45.5	6	35.5	45.5				FU0452K0	FU0452K1
40	50	6	40	50				FU0497K0	FU0497K5
45	55	6	45	55				FU0567K0	FU0567K6
	56	7	45	56	8	11		FU0572K0	FU0572K1
50	60	6	50	60	7	10		FU0619K0	FU0619K3
53	63	6	53	63				FU0679K0	FU0679K2
55	65	6	55	65				FU0694K0	FU0694K2
56	66	6	56	66				FU0722K0	FU0722K1
60	70	6	60	70				FU0746K0	FU0746K5
	71	7	60	71	8	11		FU0750K0	FU0750K1
63	73	6	63	73	7	10		FU0786K0	FU0786K3
65	75	6	65	75				FU0809K0	FU0809K1
67	77	6	67	77				FU0828K0	FU0828K1
70	80	6	70	80				FU0849K0	FU0849K5
71	81	6	71	81				FU0880K0	FU0880K1
75	85	6	75	85				FU0901K0	FU0901K1
80	90	6	80	90				FU0939K0	FU0939K1
85	100	9	85	100	10	13	4	FU0984K0	FU0984K2
90	105	9	90	105				FU1024K0	FU1024K3
95	110	9	95	110				FU1051K0	FU1051K2
98	112	8.5	98	112	9.5	12.5		FU1067K0	FU1067K1
100	115	9	100	115	10	13		FU1082K0	FU1082K1
105	120	9	105	120				FU1125K0	FU1125K1
106	120	8.5	106	120	9.5	12.5		FU1135K0	FU1135K1
	121	9	106	121	10	13		FU1136K0	FU1136K1
110	125	9	110	125				FU1157K0	FU1157K2
112	125	9	112	125				FU1179K0	FU1179K1

F

IUH TYPE

SPECIAL PACKINGS FOR ROD SEALS
NITRILE RUBBER (NBR)

F

● Please designate NOK Part number and type & size on your order.

(Example) · Type Dimensions IUH 20 28 5

IUH — Type Sign

20 28 5 — Nominal Size of Packing described in order of inner diameter(d), outer diameter(D), and height(h)

· Part Number CU0212N2

● Please check the application range on pages D-2 and 3 before selecting the type.

Material	Standard : NOK A505 Low temperature resistant type : NOK A903

UNI TYPE

SPECIAL PACKINGS FOR ROD SEALS
NOXLAN (AU) + SILICON RUBBER (VMQ)

● Please designate NOK Part number and type & size on your order.

(Example) • Type Dimensions UNI 40 50 7

UNI — Type Sign

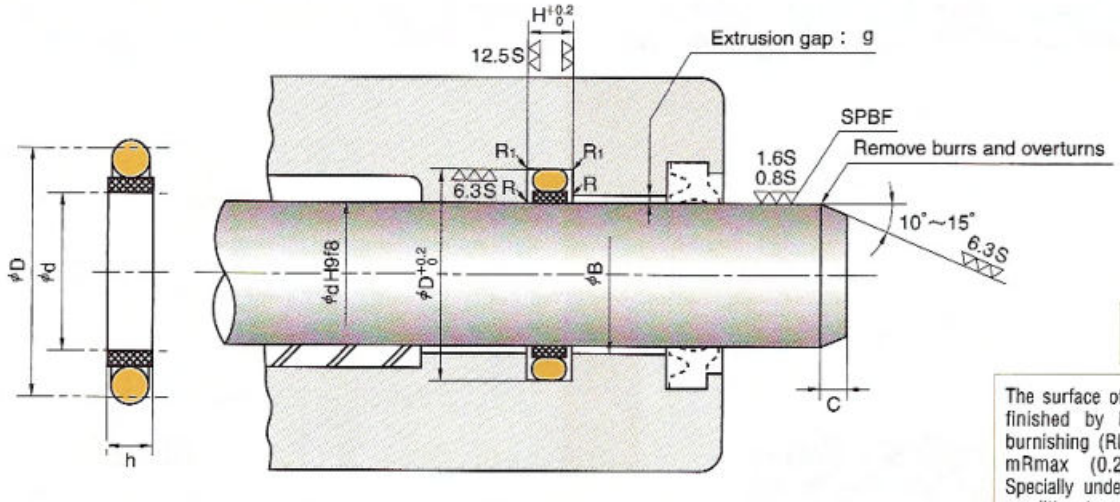
40 50 7 — Nominal Size of Packing described in order of inner diameter(d), outer diameter(D), and height(h)

• Part Number FU2002M1

● Please check the application range on pages D-2 and 3 before selecting the type.

Material	NOK U801 + NOK S813

SPNO TYPE SPECIAL PACKINGS FOR ROD SEALS



R =0.3 or below
R1 =0.5 or below

The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

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

Remarks: When using the packing with ●, provide separate grooves.

F

SPN TYPE

SPECIAL PACKINGS FOR ROD SEALS
RAREFLON (PTFE) + NITRILE RUBBER (NBR)

F

● Please designate NOK Part number and type & size on your order.

(Example) • Type Dimensions SPN 18 27 4.3

SPN — Type Sign

18 27 4.3 — Nominal Size of Packing described in order of inner diameter(d), outer diameter(D), and height(h)

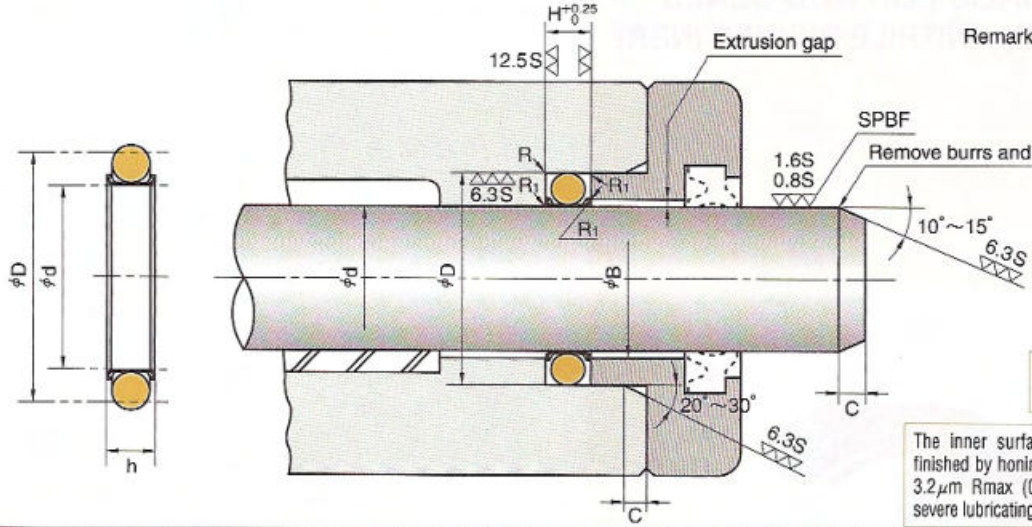
• Part Number GS2301V0

● Please check the application range on pages D-2 and 3 before selecting the type.

Material	NOK 19YF + NOK A980

F

SPNC TYPE SPECIAL PACKINGS FOR ROD SEALS



Remarks) Inner diameter of the housing should be φdF8 when the ground (housing for packing) is used as bearing.

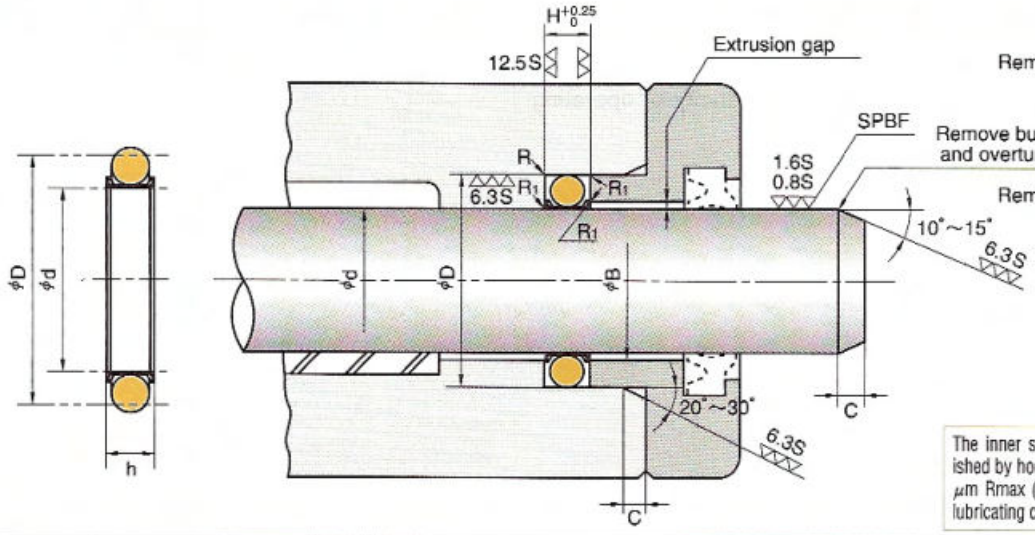
R1=0.3 or below
For R, refer to the table below.

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

Nominal Number	Nominal Size of Packing			Housing dimensions								NOK Part Number
				For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R	C		
	d	D	h	φd	φD	φd	φD					
SPNC 3	3	6	2.3	3 $^{0}_{-0.05}$	6 $^{+0.05}_{0}$	3 $^{0}_{-0.05}$	6.5 $^{+0.05}_{0}$	2.5	0.3以下	3～4		GS2000F0
4	4	7		4	7	4	7.5					GS2001F0
5	5	8		5	8	5	8.5					GS2002F0
6	6	9		6	9	6	9.5					GS2003F0
7	7	10		7	10	7	10.5					GS2004F0
8	8	11		8	11	8	11.5					GS2005F0
9	9	12		9	12	9	12.5					GS2006F0
10	10	13		10	13	10	13.5					GS2007F0
10A	10	14	3	10 $^{0}_{-0.05}$	14 $^{+0.06}_{0}$	10 $^{0}_{-0.06}$	14.6 $^{+0.06}_{0}$	3.2	0.4以下	4～5		GS2008F0
11	11	15		11	15	11	15.6					GS2009F0
11.2	11.2	15.2		11.2	15.2	11.2	15.8					GS2010F0
12	12	16		12	16	12	16.6					GS2011F0
12.5	12.5	16.5		12.5	16.5	12.5	17.1					GS2012F0
14	14	18		14	18	14	18.6					GS2013F0
15	15	19		15	19	15	19.6					GS2014F0
16	16	20		16	20	16	20.6					GS2015F0
18	18	22		18	22	18	22.6					GS2016F0
20	20	24		20	24	20	24.6					GS2017F0
21	21	25		21	25	21	25.6					GS2018F0
22	22	26		22	26	22	26.6					GS2020F0
22A	22	28	4.4	22 $^{0}_{-0.06}$	28 $^{+0.06}_{0}$	22 $^{0}_{-0.06}$	28.6 $^{+0.06}_{0}$	4.7	0.7以下	5～6		GS2019F0
22.4	22.4	28.4		22.4	28.4	22.4	29					GS2021F0
24	24	30		24	30	24	30.6					GS2022F0
25	25	31		25	31	25	31.6					GS2023F0
25.5	25.5	31.5		25.5	31.5	25.5	32.1					GS2024F0
26	26	32		26	32	26	32.6					GS2025F0
28	28	34		28	34	28	34.6					GS2026F0
29	29	35		29	35	29	35.6					GS2027F0
29.5	29.5	35.5		29.5	35.5	29.5	36.1					GS2028F0
30	30	36		30	36	30	36.6					GS2029F0
31	31	37		31	37	31	37.6					GS2030F0
31.5	31.5	37.5		31.5	37.5	31.5	38.1					GS2031F0
32	32	38		32	38	32	38.6					GS2032F0
34	34	40		34	40	34	40.6					GS2033F0
35	35	41		35	41	35	41.6					GS2034F0
35.5	35.5	41.5		35.5	41.5	35.5	42.1					GS2035F0
36	36	42		36	42	36	42.6					GS2036F0
38	38	44		38	44	38	44.6					GS2037F0
39	39	45		39	45	39	45.6					GS2038F0
40	40	46		40	46	40	46.6					GS2039F0

F

SPNC TYPE SPECIAL PACKINGS FOR ROD SEALS



Remark 1) To determine φB dimension, please make the maximum extrusion gap (also refer page 26) 0.4mm or below considering the eccentricity of rod.

Remark 2) Inner diameter of the housing should be φdF8 when the ground (housing for packing) is used as bearing.

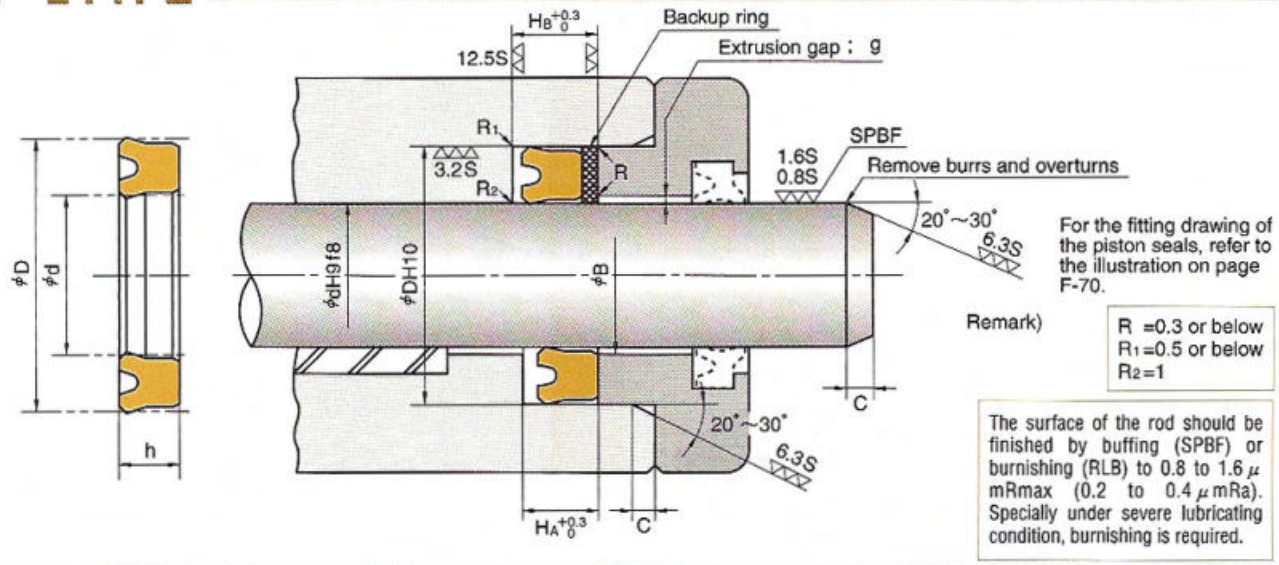
R_1=0.3 or below
For R, refer to the table below.

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

Nominal Number	Nominal Size of Packing			Housing dimensions							NOK Part Number
				For general hydraulic use		For pneumatic and hydraulic low-friction applications		H	R	C	
	d	D	h	φd	φD	φd	φD				
SPNC 150A	150	165		150	165	150	165.6				GS2080F0
155	155	170		155	170	155	170.6				GS2082F0
160	160	175		160	175	160	175.6				GS2083F0
165	165	180		165	180	165	180.6				GS2084F0
170	170	185		170	185	170	185.6				GS2085F0
175	175	190		175	190	175	190.6				GS2086F0
180	180	195		180	195	180	195.6				GS2087F0
185	185	200		185	200	185	200.6				GS2088F0
190	190	205		190	205	190	205.6				GS2089F0
195	195	210		195	210	195	210.6				GS2090F0
200	200	215		200	215	200	215.6				GS2091F0
205	205	220		205	220	205	220.6				GS2092F0
209	209	224		209	224	209	224.6				GS2093F0
210	210	225		210	225	210	225.6				GS2094F0
215	215	230		215	230	215	230.6				GS2095F0
220	220	235		220	235	220	235.6				GS2096F0
225	225	240		225	240	225	240.6				GS2097F0
230	230	245		230	245	230	245.6				GS2098F0
235	235	250		235	250	235	250.6				GS2099F0
240	240	255	10.5	240 $^{0}_{-0.10}$	255 $^{+0.10}_{0}$	240 $^{0}_{-0.10}$	255.6 $^{+0.10}_{0}$	11.0	0.8 or below	8～12	GS2100F0
245	245	260		245	260	245	260.6				GS2101F0
250	250	265		250	265	250	265.6				GS2102F0
255	255	270		255	270	255	270.6				GS2103F0
260	260	275		260	275	260	275.6				GS2104F0
265	265	280		265	280	265	280.6				GS2105F0
270	270	285		270	285	270	285.6				GS2106F0
275	275	290		275	290	275	290.6				GS2107F0
280	280	295		280	295	280	295.6				GS2108F0
285	285	300		285	300	285	300.6				GS2109F0
290	290	305		290	305	290	305.6				GS2110F0
295	295	310		295	310	295	310.6				GS2111F0
300	300	315		300	315	300	315.6				GS2112F0
315	315	330		315	330	315	330.6				GS2113F0
320	320	335		320	335	320	335.6				GS2114F0
335	335	350		335	350	335	350.6				GS2115F0
340	340	355		340	355	340	355.6				GS2116F0
355	355	370		355	370	355	370.6				GS2117F0
360	360	375		360	375	360	375.6				GS2118F0
375	375	390		375	390	375	390.6				GS2119F0
385	385	400		385	400	385	400.6				GS2120F0

F

UPI TYPE PACKINGS FOR BOTH PISTON AND ROD SEALS



For the fitting drawing of the piston seals, refer to the illustration on page F-70.

Remark)

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

The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

Nominal Size of Packing			Housing dimensions						NOK
d	D	h	φd	φD	φD1	HA	HB	C	Part Number
6.3	16.3	8	6.3	16.3	15.3				FU0024D0
7.1	17.1	8	7.1	17.1	16.1				FU0030D0
8	18	8	8	18	17				FU0043D0
9	19	8	9	19	18				FU0054D0
10	20	8	10	20	19				FU0069D0
11.2	21.2	8	11.2	21.2	20.2	9	11	2.5	FU0081D0
12	25	8	12	25	24				FU0093D0
12.5	22.5	8	12.5	22.5	21.5				FU0102D0
14	24	8	14	24	23				FU0122D0
15	25	8	15	25	24				FU0135D0
16	26	8	16	26	25				FU0157D0
	32	10	16	32	31	11	13		FU0161D0
18	28	8	18	28	27	9	11		FU0182D0
	31	10	18	31	30	11	13		FU0186D0
20	30	8	20	30	29	9	11		FU0215D0
	33	10	20	33	32	11	13		FU0221D0
	35	10	20	35	34				FU0224D0
21.5	31.5	8	21.5	31.5	30.5	9	11		FU0239D0
22	32	8	22	32	31				FU0246D0
	35	10	22	35	34	11	13		FU0249D0
22.4	30	5	22.4	30	29	5.7	7.7		FU0260D0
	32.4	8	22.4	32.4	31.4	9	11		FU0263D0
25	35	8	25	35	34			3.5	FU0282D0
	38	8	25	38	37				FU0287D0
	40	10	25	40	39	11	13		FU0292D0
	45	12	25	45	44	13	15		FU0301D0
25.5	35.5	8	25.5	35.5	34.5	9	11		FU0309D1
28	35.5	5	28	35.5	34.5	5.7	8.7		FU0320D1
	40	10	28	40	39	11	14		FU0330D0
	43	10	28	43	42				FU0340D0
30	45	10	30	45	44				FU0368D0
	46	10	30	46	45				FU0369D0
31.5	46.5	10	31.5	46.5	45.5				FU0387D0
32	46	10	32	46	45				FU0403D0
35	50	10	35	50	49				FU0437D0
35.5	45	6	35.5	45	44	7	10		FU0451D0
	50.5	10	35.5	50.5	49.5	11	14		FU0456D0
38	52	10	38	52	51			4	FU0470D0
40	55	10	40	55	54				FU0505D0
	56	10	40	56	55				FU0508D0
	60	12	40	60	59	13	16		FU0514D0
41	56	10	41	56	55	11	14		FU0523D0

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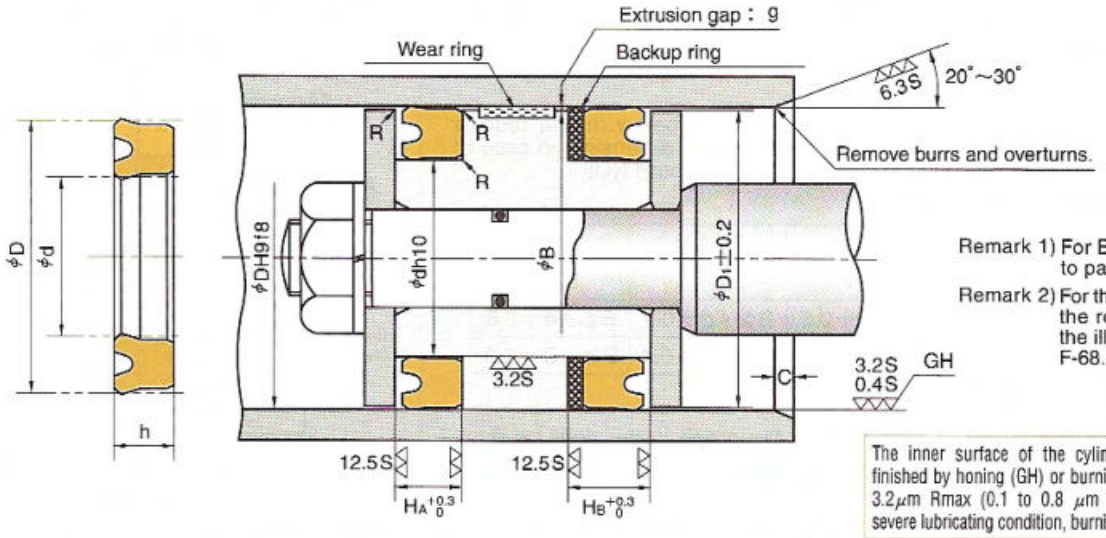
UPI TYPE PACKINGS FOR BOTH PISTON AND ROD SEALS



Remark 1) For B dimension, refer to page F-69.

Remark 2) For the fitting drawing of the rod seals, refer to the illustration on page F-68.

R=0.3 or below

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

Nominal Size of Packing			Housing dimensions						NOK
d	D	h	φd	φD	φD1	HA	HB	C	Part Number
115	135	15	115	135	133	17	20	5	FU1198D0
118	132	9	118	132	130	10	13		FU1932D0
	138	15	118	138	136	17	20		FU1207D0
120	140	15	120	140	138				FU1224D0
125	145	15	125	145	143			6.5	FU1257D0
130	150	15	130	150	148				FU1284D0
132	152	15	132	152	150				FU1292D0
135	155	15	135	155	153				FU1305D0
136	150	9	136	150	148	10	13		FU1933D0
140	160	15	140	160	158	17	20		FU1327D0
	165	15	140	165	163				FU1330D0
145	165	15	145	165	163				FU1344D0
150	170	15	150	170	168				FU1363D0
	175	15	150	175	173				FU1365D0
155	180	15	155	180	178		21		FU1391D0
160	185	15	160	185	183				FU1413D0
165	190	15	165	190	188				FU1431D0
170	195	15	170	195	193				FU1448D0
175	200	15	175	200	198				FU1461D0
180	205	15	180	205	203				FU1490D0
185	210	15	185	210	208				FU1504D0
190	215	15	190	215	213				FU1519D0
199	224	15	199	224	222				FU1532D0
200	225	15	200	225	223				FU1547D0
	225	18	200	225	223	20	24		FU1549D0
205	235	18	205	235	233				FU1565D0
210	235	18	210	235	233				FU1579D0
212	237	18	212	237	235				FU1584D0
220	245	18	220	245	243				FU1599D0
224	249	18	224	249	247				FU1612D0
225	250	18	225	250	248				FU1625D0
230	254	18	230	254	252				FU1639D0
	255	18	230	255	253				FU1641D0
236	261	18	236	261	259				FU1648D0
240	265	18	240	265	263				FU1662D0
250	275	18	250	275	273				FU1682D0
260	290	18	260	290	288			8	FU1706D0
265	295	18	265	295	293				FU1713D0
270	300	18	270	300	298				FU1722D0
280	310	18	280	310	308				FU1735D0
290	320	18	290	320	318				FU1750D0
300	330	18	300	330	328				FU1764D0

F

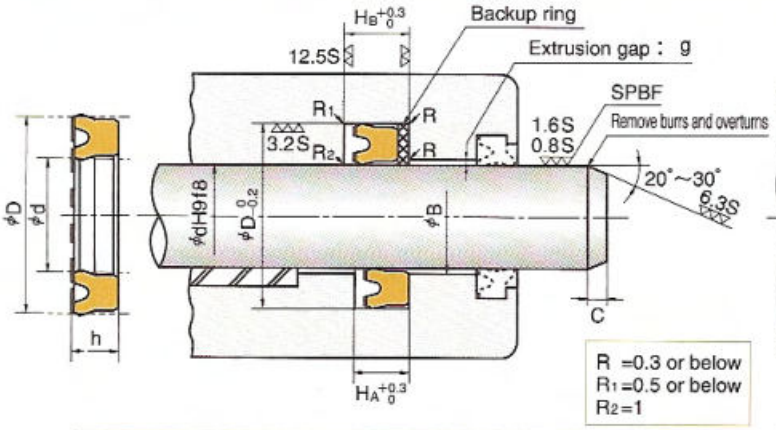
UPI TYPE
PACKINGS FOR BOTH PISTON AND ROD SEALS
Large size dimension table

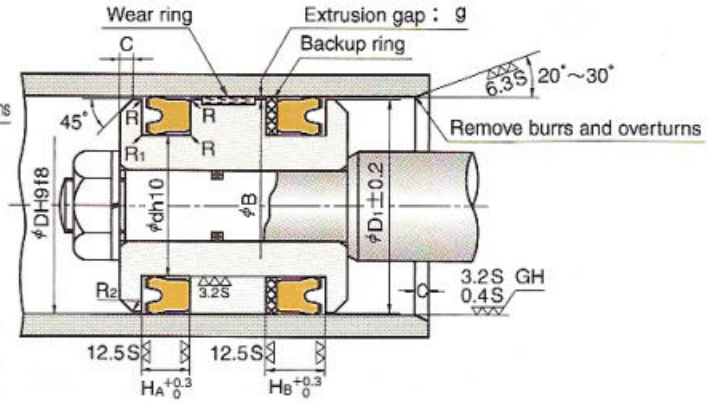
■ When using packings on this large size dimension table, please consult NOK.

Nominal Size of Packing			Housing dimensions						NOK Part Number
d	D	h	ϕd	ϕD	ϕD1	HA	HB	C	
456	490	30	456	490	488	32	37	15	FU1847D1
460	495	25	460	495	493	27	32		FU1849D0
465	500	26.5	465	500	498	28.5	33.5		FU2648D0
470	505	25	470	505	503	27	32		FU1851D0
475	510	25	475	510	508				FU1854D0
480	515	25	480	515	513				FU2025D0
490	530	25	490	530	528				FU1855D0
500	535	25	500	535	533			20	FU1856D0
	540	25	500	540	538				FU1857D0
507	547	28	507	547	545	30	35		FU1858D0
525	565	28	525	565	563				FU2743D0
530	570	25	530	570	568	27	32		FU2718D0
540	575	23	540	575	573	25	30		FU2376D0
560	600	28	560	600	598	30	35		FU1865D0
595	640	28	595	640	638				FU1986D0
600	650	32	600	650	648	34	39		FU2017D0
650	690	25	650	690	688	27	32		FU2003D0
660	700	32	660	700	698	34	39		FU1870D0
680	720	32	680	720	718				FU1871D0
695	745	32	695	745	743				FU2398D0
700	750	35	700	750	748	37	42		FU1874D0
730	750	30	730	750	748	32	37		FU2078D0
755	800	32	755	800	798	34	39		FU1876D0
800	830	20	800	830	828	22	27		FU1978D0
	850	35	800	850	848	37	42		FU1881D0
850	900	35	850	900	898				FU2219D0
870	900	20	870	900	898	22	27		FU1979D0
920	970	35	920	970	968	37	42		FU1888D1
1050	1100	30	1050	1100	1098	32	37		FU2391D0
1096	1146	30	1096	1146	1144				FU2558D0
1150	1200	30	1150	1200	1198				FU2229D0
1380	1430	30	1380	1430	1428				FU2392D0

F

USI TYPE PACKINGS FOR BOTH PISTON AND ROD SEALS (INSTALLED IN INTERNAL GROOVE)





The surface of the rod should be finished by buffing (SPBF) or burnishing (RLB) to 0.8 to 1.6 μmRmax (0.2 to 0.4 μmRa). Specially under severe lubricating condition, burnishing is required.

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

Nominal Size of Packing			Housing dimensions						NOK Part Number
d	D	h	φd	φD	φD1	HA	HB	C	
10	18	5	10	18	17	5.7	7.7	2	● FU0064S0
12	20	5	12	20	19				● FU2464S0
12.5	20	5	12.5	20	19				● FU2465S0
14	22	5	14	22	21				○ FU0116S0
16	24	5	16	24	23				○ FU0150S0
17	25	5	17	25	24				○ FU2466S0
18	26	5	18	26	25				○ FU0180S0
20	28	5	20	28	27				○ FU0212S0
	30	6	20	30	29	7	9		○ FU0214S0
22	30	5	22	30	29	5.7	7.7		○ FU2467S0
22.4	30	5	22.4	30	29				○ FU0260S0
23.5	31.5	5	23.5	31.5	30.5				○ FU0267S0
24	32	5	24	32	31				○ FU2468S0
25	33	5	25	33	32			2.5	○ FU0276S0
	35	6	25	35	34	7	9		○ FU0279S0
26	34	5	26	34	33	5.7	8.7		○ FU2469S0
27	35	5	27	35	34				FU2470S0
28	35.5	5	28	35.5	34.5				FU0320S0
	36	5	28	36	35				FU0321S0
30	38	5	30	38	37				FU0355S0
	40	6	30	40	39	7	10		FU0357S0
31.5	41.5	6	31.5	41.5	40.5				FU0382S0
32	42	6	32	42	41				FU2055S0
33	43	6	33	43	42				FU2471S0
34	44	6	34	44	43				FU2263S0
35	45	6	35	45	44				FU0424S0
35.5	45	6	35.5	45	44				FU0451S0
	45.5	6	35.5	45.5	44.5				FU0452S0
36	46	6	36	46	45				FU2472S0
38	48	6	38	48	47				FU2240S0
40	50	6	40	50	49				FU0497S0
45	55	6	45	55	54				FU0567S0
	56	7	45	56	55	8	11		FU0572S0
46	56	6	46	56	55	7	10		FU2662S0
50	60	6	50	60	59				FU0619S0
53	63	6	53	63	62				FU0679S0
55	65	6	55	65	64				FU0694S0
56	66	6	56	66	65				FU0722S0
58	68	6	58	68	67				FU2473S0
60	70	6	60	70	69				FU0746S0
	71	7	60	71	70	8	11		FU0750S0
61	71	6	61	71	70	7	10		FU2474S0

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

F