Torishima Pump Global Network

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❾ P.T. Torishima Guna Indonesia ■
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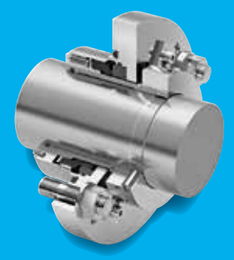
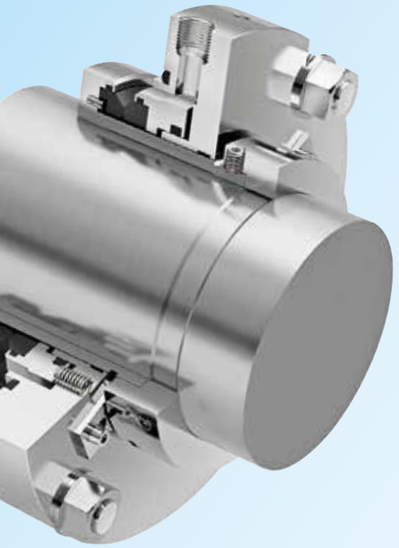
■ Manufacturing
■ Service Center

ZSC02・18/7E
'17.11.500Ⓟ

TORISHIMA

Mechanical Seals





Torishima's Mechanical Seals

Mechanical seals — the shaft seals used in rotating machinery such as pumps, hydraulic turbines, agitators and centrifuges — play an important role in maintaining the safety and economic efficiency of machinery. As a comprehensive manufacturer of pumps, Torishima has never lost sight of the importance of mechanical seals. We are the fastest in the country at moving products from the research and development phase to manufacturing and commercialization.

Today, we provide a wide range of mechanical seals for applications requiring high levels of safety and quality, such as mechanical seals for sealing high-temperature and high-pressure fluids in power plant pumps (including boiler feed pumps and boiler circulating pumps). We also manufacture mechanical seals for pumps used in sewage plants, chemical plants, and desalination plants handling slurry-rich liquid, special highly corrosive liquids, and seawater. Moreover, we have utilized our years of experience in pump manufacturing to provide eco-friendly non-flushing seals, easy-maintenance cartridge seals, and a variety of other optimal mechanical seals for a diverse range of applications.

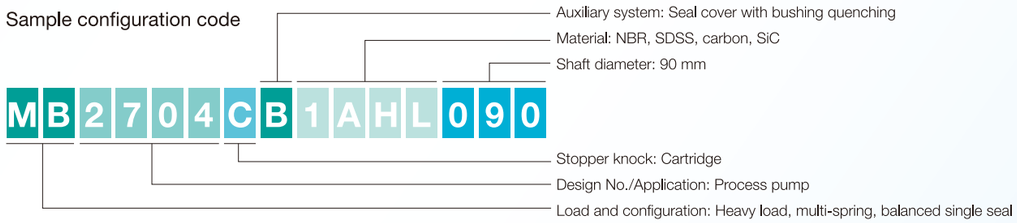
Mechanical Seal Applications

Model of Mechanical Seal / Field and Application		Power Generation				Seawater Desalination							Water Works & Sewerage				Rivers, Agriculture & Irrigation					Chemicals & Petrochemicals			General Industry, etc.							
		Boiler feed pumps	Boiler circulating pumps	Condensate pumps	Cooling water pumps	High-pressure pumps	Water filtration pumps	Back wash pumps	Brine recirculation pumps	Brine blowdown pumps	Seawater intake pumps	Product water pumps	Water transmission & distribution pumps	Sewage treatment pumps	Stormwater drainage pumps	River drainage pumps	Agricultural pumps	Agricultural drainage pumps	Irrigation pumps	Process pumps	Feed water pumps	Cooling water pumps	Process pumps	Feed water pumps	Cooling water pumps	Electro-deposition paint pumps	Submersible pumps	Sand pumps	Hydraulic turbines		
Rubber bellows seals	LU1000 Series				●		●	●	●	●		●	●	●			●	●	●	●	●	●	●	●	●						P15
	LD1000 Series (Double seal)													●													●	●				
Rotating single-spring seals	HU2000 Series (Unbalanced type)				●		●	●		●		●	●				●		●	●	●	●	●	●	●						P16
	HB2000 Series (Balanced type)	●	●	●	●	●	●	●		●		●	●				●		●	●	●	●	●	●	●						
Rotating multi-spring seals	MU2000 Series (Unbalanced type)				●		●	●	●	●		●	●							●	●	●	●	●	●						P17
	MB2000 Series (Balanced type)			●	●		●	●	●	●		●	●							●	●	●	●	●	●						
	MT2700 (Balanced type)	●	●			●																									
Stationary multi-spring seals	MB2500 (Balanced type)	●	●			●															●			●							P21
Cartridge seals	MB2704CN (Inside rotating type)	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●						P18
	MB2704CZ (Inside rotating type, with pumping ring)	●	●																												
	MB8500CN (Stationary inside type)	●	●			●							●	●			●		●				●								P19
	MB8500CZ (Stationary inside type, with pumping ring)	●	●																			●			●						
	MB2400CN (Outside rotating type)				●	●	●	●	●	●		●	●				●		●	●	●		●	●							
Split seals	MB2901 (Stationary balanced type, non-flushing)				●		●	●	●	●	●	●	●	●	●	●	●	●	●				●	●		●					P20
	MU2922 (Stationary balanced type, dry running application)															●	●	●	●												
	MT9200 (Stationary balanced type, dry running application)																●	●	●	●				●							
Stationary seals	MT4100 (Balanced type)				●				●		●			●	●	●	●	●	●				●	●		●					P21
Special-purpose seals	For hydraulic turbines																												●		
	For submersible sand pumps																											●			

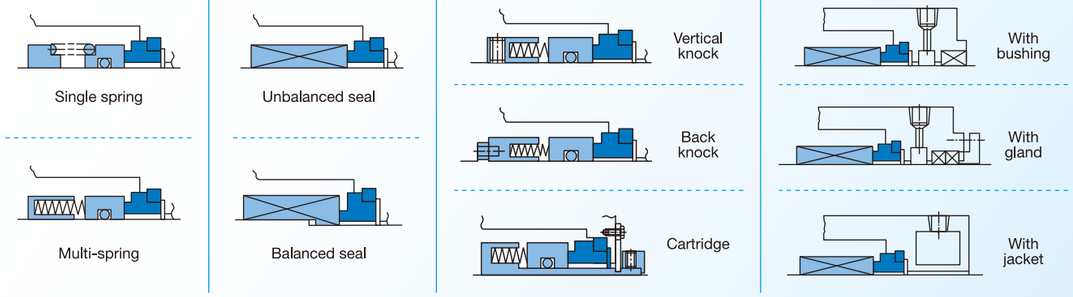
Configuration Codes for Torishima Mechanical Seals

A number and a code indicate the configuration and materials used in each Torishima mechanical seal. The seals are classified as H, M or L according to load, with H and M indicating heavy load and L indicating light load. H and L types are typically single-spring seals, while the M types are multi-spring units.

Sample configuration code



Type Codes										Material Codes										Shaft diameter
Column 1				Column 2	Column 3		Column 4			Column 5										Column 6
First letter		Second letter								First letter		Second letter		Third letter		Fourth letter				
Load	Code	Configuration	Code	Design No./Application	Stopper knock	Code	Auxiliary system	Code		Packing material	Code	Main structural material	Code	Washer end face	Code	Seat end face	Code			
Light load Single spring	L	Unbalanced single seal	U	1000/General	Vertical knock	N	No auxiliary system	A		NBR	1	SDSS	A	Common material codes are used for the third and fourth letters.						
Heavy load Single spring	H	Balanced single seal	B	2000/Process	Back knock	B	Seal cover with bushing quenching	B		EPDM (Ethylene propylene rubber)	2	SUS329J4L	B	SUS403	A	Ceramic	N			
Heavy load Multi-spring	M	Unbalanced double seal	D	3000/Marine	Cartridge	C	Seal cover with dry bushing	D		CR (Neoprene)	3	SUS329J1	C	SUS316	B	Suehiro	P			
		Balanced double seal	W	4000/Submersible pump			Seal cover with gland quenching	G		MQ (Silicon rubber)	4	SUS403	1	Carpenter 20	C	Tungsten carbide coating	Q			
		Special configuration	T	5000/Submersible bearing			Seal cover with jacket	J		FKM (Fluoro rubber)	5	SUS304	2	Special carbon	D	Ceramic coating	R			
				6000/Hydraulic turbine			Standard seal cover	N		FFKM (Perfluoroelastomer)	6	SUS316	3	Stellite	E	Standard tungsten carbide fit (including press fit)	S			
				7000/Vessel			Seal cover with oil seal quenching	R		PTFE (Polytetrafluoroethylene)	8	SUS316L	5	Special stainless steel	F	Standard tungsten carbide brazed	T	mm		
				8000/Process			Seal cover with hole for self-flushing	S		Other	9	Carpenter 20	4	Copper alloy	G	Standard solid tungsten carbide	U			
				9000/Special			Other seal cover	Z		Undefined	X	Hastelloy	7	Carbon	H	Special tungsten carbide brazed	V			
												Worthite	8	PTFE (Polytetrafluoroethylene)	I	Special tungsten carbide fit (including press fit)	W			
												Other	9	Carbon fit (including press fit)	J	Special solid tungsten carbide	Y			
												Undefined	X	Niresist	K	Other	Z			
														SiC	L	Undefined	X			
														SiC fit (including press fit)	M					

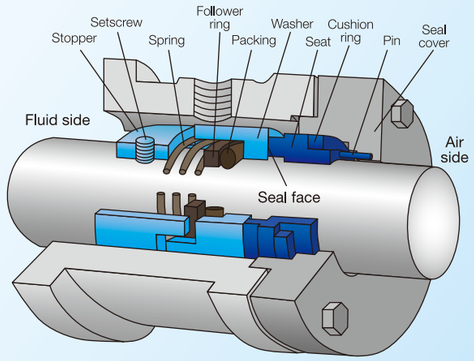


Basic Structure of Mechanical Seal

Mechanical seals incorporate a seat (stationary ring) and washer (rotating ring) that prevents leakage of the sealed fluid by rotating relative to the seal face. The washer is held in close contact with seat by spring pressure and the pressure exerted by the sealed fluid. As the seal face wears, the washer advances toward the seat to maintain close contact with the seal face.

The cushion ring prevents leakage between the seat and seal cover, while the packing prevents leakage between the washer and shaft. Both also absorb vibration and restrict transmission of vibration to the seal face.

Between the washer and shaft there is only negligible relative movement. The only vibration that occurs is between the washer and shaft. The washer advances toward the seat only very slightly as the seal face wears. Therefore, the packing remains mostly free from wear.

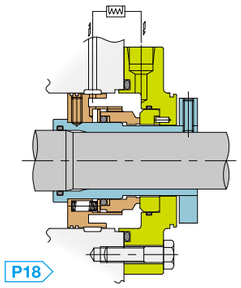


Pumps for Power Plants

Boiler feed pumps

［High-pressure multi-stage ring-section turbine pumps］

MB2704CZ

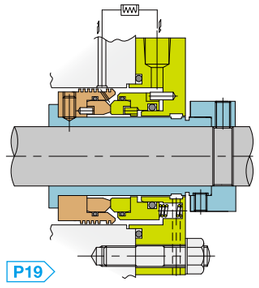


○ Pressure: 0 to 2 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P18

［Barrel-type high-pressure multi-stage turbine pumps］

MB8500CZ



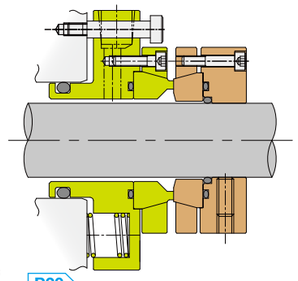
○ Pressure: 0 to 5 MPaG
○ Circumferential speed: Up to 60 m/s
○ Shaft diameter: ϕ50 to 300 mm

P19

Circulating water/cooling water pumps

［Vertical mixed-flow pumps］

MB2901

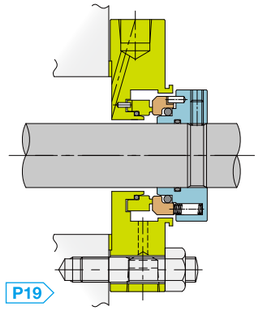


○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 300 mm

P20

［Double-suction volute pumps］

MB2400CN



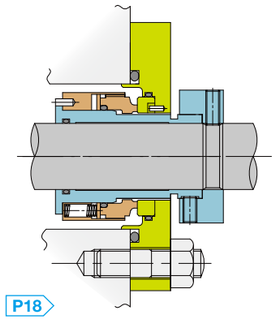
○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P19

Condensate pumps

［Vertical multi-stage high-pressure turbine pumps］

MB2704CN



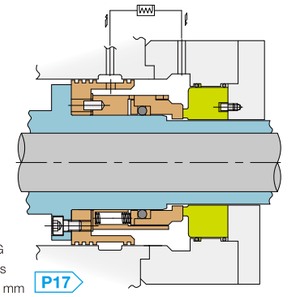
○ Pressure: 0 to 2 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P18

Boiler circulating pumps

［Hot water circulating pumps］

MT2700



○ Pressure: 0 to 8 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

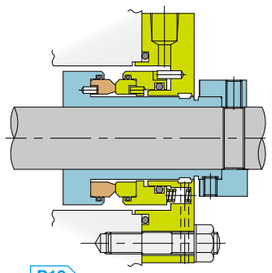
P17

Pumps for Seawater Desalination Plants

High-pressure pumps for RO systems

［Horizontal twin-suction axially split multi-stage volute pumps］

MB8500CN

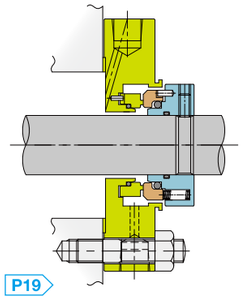


○ Pressure: 0 to 5 MPaG
○ Circumferential speed: Up to 60 m/s
○ Shaft diameter: ϕ50 to 300 mm

P19

［Horizontal axially split multi-stage volute pumps］

MB2400CN



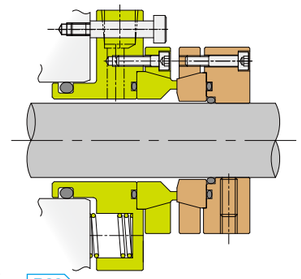
○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P19

Brine recirculation pumps for MSF systems

［Vertical double-suction barrel pumps］

MB2901



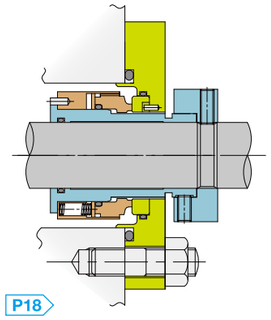
○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 300 mm

P20

Seawater intake pumps

［Vertical mixed-flow pumps］

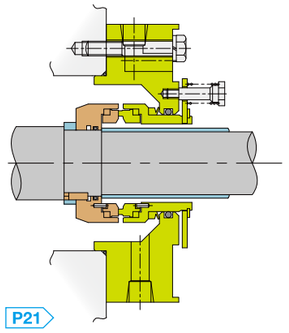
MB2704CN



○ Pressure: 0 to 2 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P18

MT4100



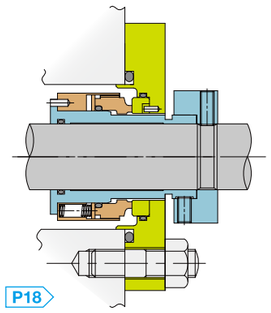
○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 500 mm

P21

Product water pumps

［Double-suction volute pumps］

MB2704CN



○ Pressure: 0 to 2 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

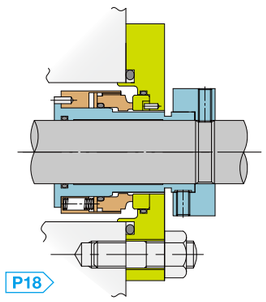
P18

Pumps for Water Works & Sewerage Plants

Water transmission & distribution pumps

［Double-suction volute pumps］

MB2704CN

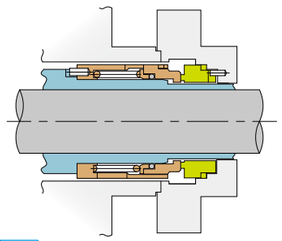


○ Pressure: 0 to 2 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P18

［Multi-stage turbine pumps］

HB2000 Series（HB2700）



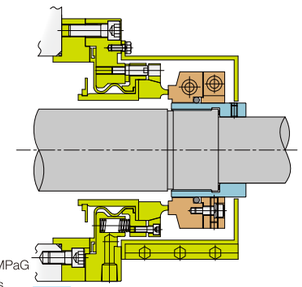
○ Pressure: 0 to 3 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 90 mm

P16

Stormwater drainage pumps

［Vertical mixed-flow pumps］

MU2922



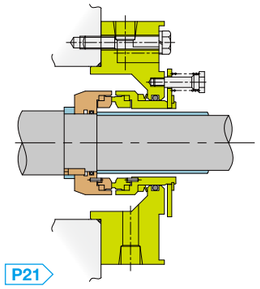
○ Pressure: −0.1 to 0.1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 300 mm

P20

Effluent pumps

［Vertical mixed-flow volute pumps］

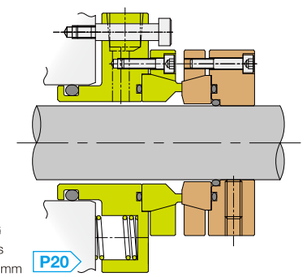
MT4100



○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 500 mm

P21

MB2901



○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 300 mm

P20

Sludge transfer pumps

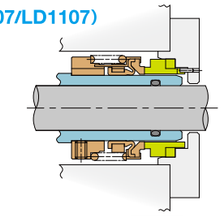
［Non-clogging volute pumps］

LU1000 and LD1000 Series（LU1107/LD1107）

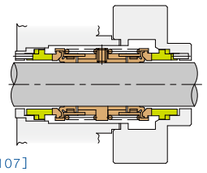
［LU1107］

［LD1107］

［LU1107］



［LD1107］



○ Pressure: 0 to 0.5 MPaG −0.1 to 0.5 MPaG
○ Circumferential speed: Up to 20 m/s Up to 20 m/s
○ Shaft diameter: ϕ20 to 80 mm ϕ14 to 80 mm

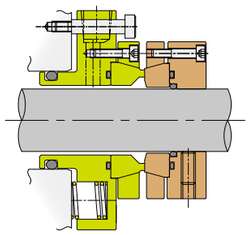
P15

Pumps for Rivers, Agricultural Pumping & Drainage, and Irrigation

River drainage pumps

［Vertical mixed-flow pumps］

MB2901

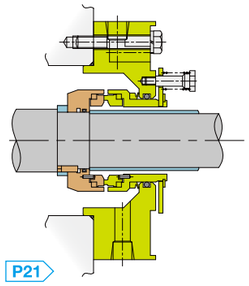


Pressure: 0 to 1 MPaG
Circumferential speed: Up to 20 m/s
Shaft diameter: ϕ50 to 300 mm

P20

［Vertical axial-flow pumps］

MT4100



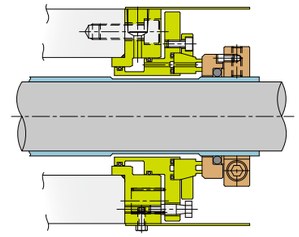
○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 500 mm

P21

Agricultural drainage pumps

［Horizontal mixed-flow pumps］

MT9200



○ Pressure: Negative pressure
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ50 to 300 mm

P20

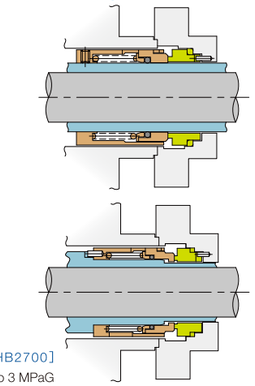
Irrigation pumps

［Double-suction volute pumps］

HU2000 and HB2000 Series（HU2700/HB2700）

［HU2700］

［HB2700］



	［HU2700］	［HB2700］
○ Pressure:	0 to 1 MPaG	0 to 3 MPaG
○ Circumferential speed:	Up to 20 m/s	Up to 20 m/s
○ Shaft diameter:	ϕ20 to 90 mm	ϕ20 to 90 mm

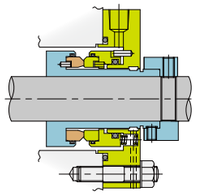
P16

Agricultural pumps

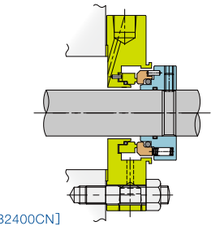
［Horizontal axially split multi-stage volute pumps］

MB8500CN/MB2400CN

［MB8500CN］



［MB2400CN］



	［MB8500CN］	［MB2400CN］
○ Pressure:	0 to 5 MPaG	0 to 1 MPaG
○ Circumferential speed:	Up to 60 m/s	Up to 20 m/s
○ Shaft diameter:	ϕ50 to 300 mm	ϕ20 to 200 mm

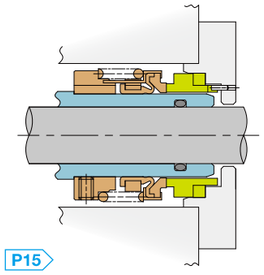
P19

Pumps for Chemical & Petrochemical Plants

Process pumps for chemical plants

［Single-suction volute pumps］

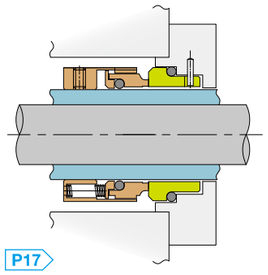
LU1000 Series（LU1107）



○Pressure: 0 to 0.5 MPaG
○Circumferential speed: Up to 20 m/s
○Shaft diameter: ϕ20 to 80 mm

P15

MU2000 Series（MU2000）



○Pressure: 0 to 1 MPaG
○Circumferential speed: Up to 20 m/s
○Shaft diameter: ϕ20 to 200 mm

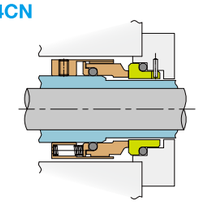
P17

Cooling water pumps for petrochemical plants

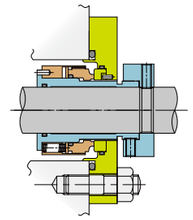
［Double-suction volute pumps］

MB2000 Series（MB2000）/MB2704CN

［MB2000］



［MB2704CN］



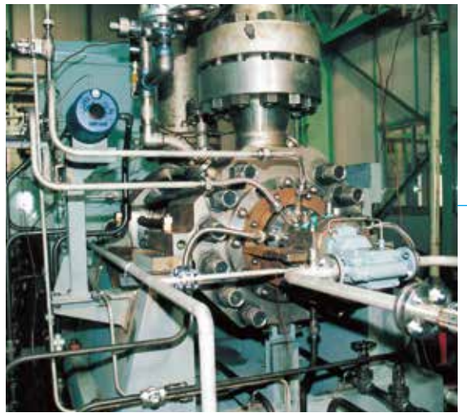
	［MB2000］	［MB2704CN］
○Pressure:	0 to 3 MPaG	0 to 2 MPaG
○Circumferential speed:	Up to 20 m/s	Up to 20 m/s
○Shaft diameter:	ϕ20 to 200 mm	ϕ20 to 200 mm

P17

P18

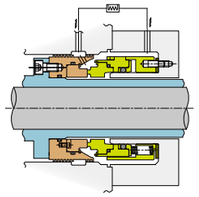
Boiler feed pumps for petrochemical plants

［High-pressure multi-stage ring-section turbine pumps］

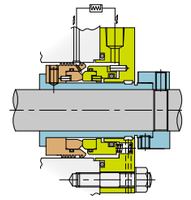


MB2500/MB8500CZ

［MB2500］



［MB8500CZ］



	［MB2500］	［MB8500CZ］
○Pressure:	0 to 8 MPaG	0 to 5 MPaG
○Circumferential speed:	Up to 60 m/s	Up to 60 m/s
○Shaft diameter:	ϕ50 to 300 mm	ϕ50 to 300 mm

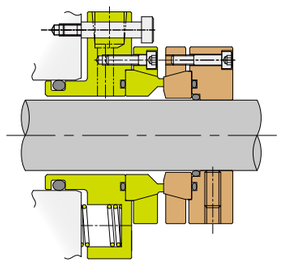
P21

P19

Cooling water pumps for oil refineries

［Vertical mixed-flow pumps］

MB2901



○Pressure: 0 to 1 MPaG
○Circumferential speed: Up to 20 m/s
○Shaft diameter: ϕ50 to 300 mm

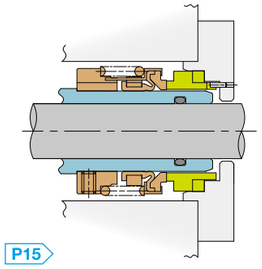
P20

Pumps for General & Specialized Industrial Plants

Process pumps for food processing plants

［Single-suction volute pumps］

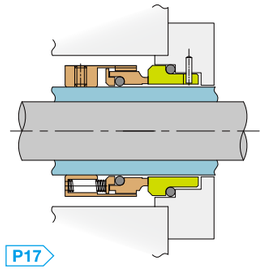
LU1000 Series（LU1107）



○ Pressure: 0 to 0.5 MPaG
○ Circumferential speed: Up to 15 m/s
○ Shaft diameter: ϕ20 to 80 mm

P15

MU2000 Series（MU2000）



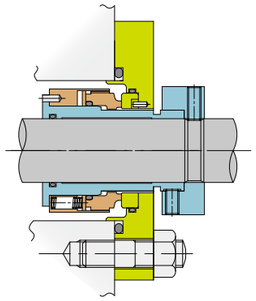
○ Pressure: 0 to 1 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P17

Cooling water pumps for paper mills

［Double-suction volute pumps］

MB2704CN



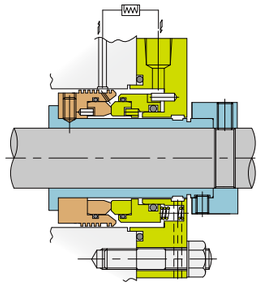
○ Pressure: 0 to 2 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm

P18

Boiler feed pumps for utility plants

［High-pressure multi-stage ring-section turbine pumps］

MB8500CZ



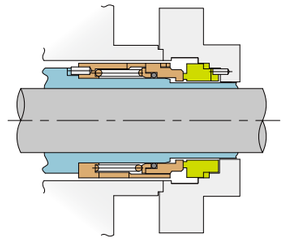
○ Pressure: 0 to 5 MPaG
○ Circumferential speed: Up to 60 m/s
○ Shaft diameter: ϕ50 to 300 mm

P19

Hot water pumps for buildings

［Multi-stage turbine pumps］

HB2000 Series（HB2700）



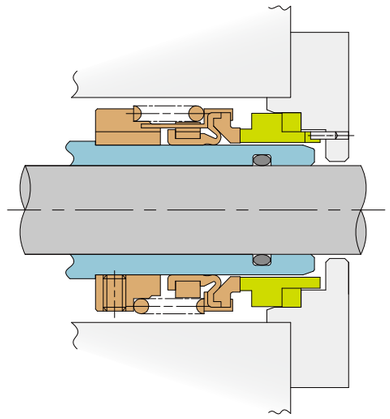
○ Pressure: 0 to 3 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 90 mm

P16

Rubber Bellows Mechanical Seals

LU1000 Series

［LU1107］



［LU1107］

Features

The rubber bellows expands to compensate for face wear and shaft movement; because the packing does not slide, the shaft does not wear. Also, it accommodates slurry deposition, thereby avoiding problems. Because the rubber packing floats the stationary ring and the rotating ring is supported by the rubber bellows, it has excellent shock-absorbing characteristics. The clutch-type rotating transmission can be used regardless of the direction of rotation.

Application

- ○Pressure: 0 to 0.5 MPaG
- ○Circumferential speed: Up to 20 m/s
- ○Shaft diameter: ϕ20 to 80 mm
- ○Target fluids: Water, oil, wastewater, warm water

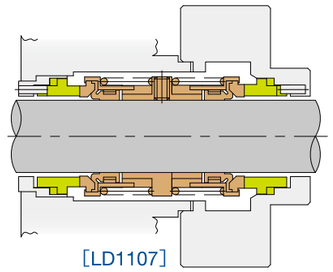
Material

- ○Seal face: SiC/SiC, SiC/carbon
- ○Packing: NBR, FKM

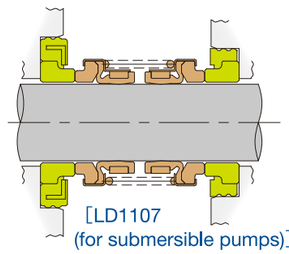
LD1000 Series (Double seal)

［LD1107］

［LD1107
(for submersible pumps)］



［LD1107］



［LD1107
(for submersible pumps)］

Features

This is a slurry-resistant rubber bellows type mechanical seal. It incorporates high-performance sealing material for long life and excellent resistance to corrosive fluids. The short mounting dimension makes it suitable for retrofitting into pumps with small housings.

Application

- ○Pressure: −0.1 to 0.5 MPaG
- ○Circumferential speed: Up to 20 m/s
- ○Shaft diameter: ϕ14 to 80 mm
- ○Target fluids: Slurries, freezable fluids, wastewater and other fluids

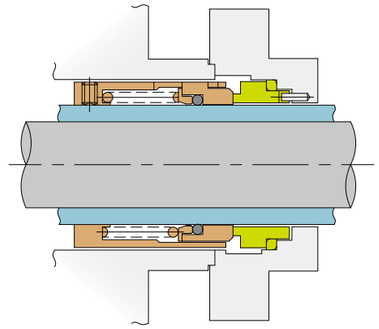
Material

- ○Seal face: (Pump side) Tungsten carbide/tungsten carbide
  (Motor side) SiC/carbon, SiC/SiC, tungsten carbide/tungsten carbide, tungsten carbide/carbon
- ○Packing: NBR, FKM

Rotating Mechanical Seals

HU2000 Series (Unbalanced type)

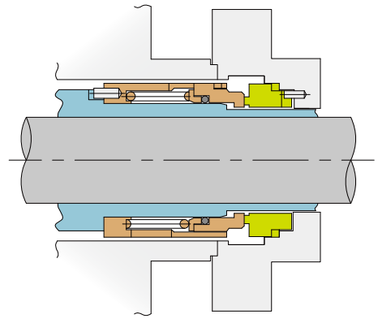
［HU2700］



［HU2700］

HB2000 Series (Balanced type)

［HB2700］



［HB2700］

Features

Can be used as a shaft seal for chemical fluids at intermediate pressure, boiler water, and oil refining equipment. The rotating side seal is made as a unit for easy handling. The projection-type clutch is used for transmission of rotation. It is best suited for fluid machinery subject to frequent start/stop switching and forward/reverse rotation.

Application

	［HU2700］	［HB2700］
○Pressure:	0 to 1 MPaG	0 to 3 MPaG
○Circumferential speed:	Up to 20 m/s	Up to 20 m/s
○Shaft diameter:	ϕ20 to 90 mm	ϕ20 to 90 mm
○Target fluids:	Water, warm water, oil, and acidic and alkaline liquids	

Material

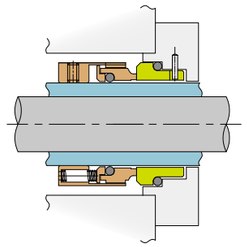
- ○Seal face: Tungsten carbide/carbon, tungsten carbide/tungsten carbide
- ○Packing: NBR, FKM, PTFE

Rotating Mechanical Seals

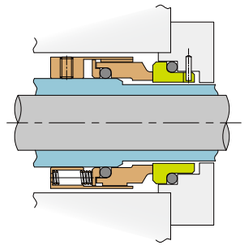
MU2000 Series (Unbalanced type)/MB2000 Series (Balanced type)

［MU2000］

［MB2000］



［MU2000］



［MB2000］

Features

Because it is a multi-spring compact rotating seal, it can be used as a double seal or tandem seal. This mechanical seal can be used in industrial process pump applications such as oil refining and industrial chemical fluids.

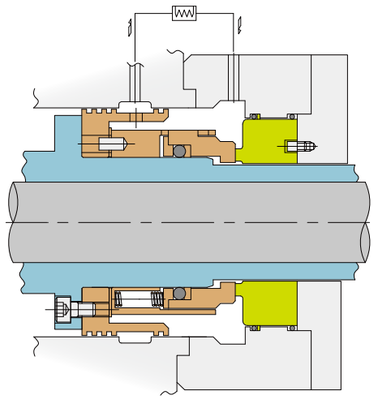
Application

	［MU2000］	［MB2000］
○ Pressure:	0 to 1 MPaG	0 to 3 MPaG
○ Circumferential speed:	Up to 20 m/s	Up to 20 m/s
○ Shaft diameter:	ϕ20 to 200 mm	
○ Target fluids:	Water, warm water, oil, acidic and alkaline liquids, chemical fluids	

Material

○ Seal face: Carbon/SiC, SiC/SiC, carbon/tungsten carbide
○ Packing: NBR, FKM

MT2700 (Balanced type)



Features

This is the optimal mechanical seal for high-load applications involving high pressure and high temperature. The multi-spring type rotating seal cools the mechanical seal through circulation in the pumping ring.

Application

○ Pressure: 0 to 8 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm
○ Target fluids: Boiler feedwater, boiler circulating water, high-pressure feedwater

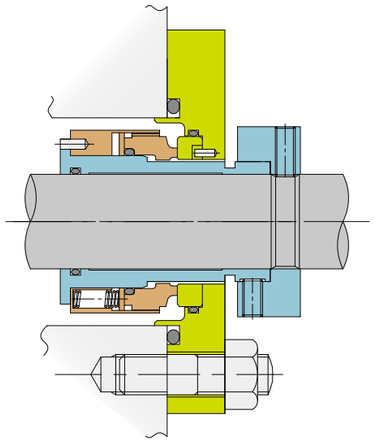
Material

○ Seal face: SiC/carbon, tungsten carbide/carbon

Cartridge Mechanical Seals

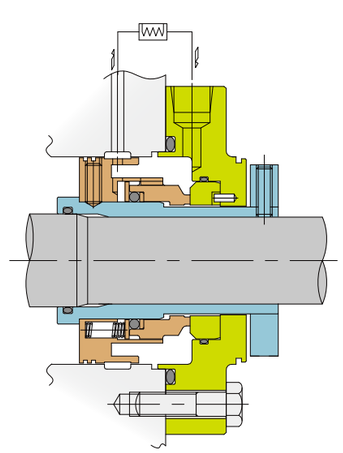
MB2704CN (Inside rotating type)/ MB2704CZ (Inside rotating type, with pumping ring)

［MB2704CN］



［MB2704CN］

［MB2704CZ］



［MB2704CZ］

Features

This is a rotating balanced-type cartridge mechanical seal. This cartridge-type seal has a simple structure that makes it easy to install.

Application

○ Pressure: 0 to 2 MPaG
○ Circumferential speed: Up to 20 m/s
○ Shaft diameter: ϕ20 to 200 mm
○ Target fluids: Water, warm water, oil, and acidic and alkaline liquids

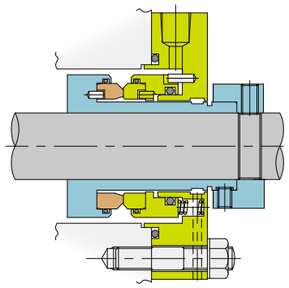
Material

○ Seal face: SiC/SiC, SiC/carbon, tungsten carbide/carbon

Cartridge Mechanical Seals

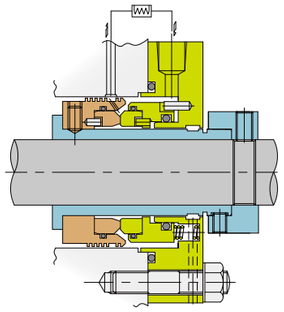
MB8500CN (Stationary inside type)/ MB8500CZ (Stationary inside type, with pumping ring)

［MB8500CN］



［MB8500CN］

［MB8500CZ］



［MB8500CZ］

Features

Stationary balanced cartridge-type mechanical seals are suitable for high-speed, high-pressure, and high-temperature fluids. Not affected by machinery distortion, these seals provide excellent sealing.

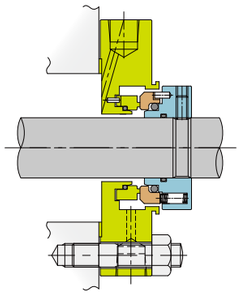
Application

- ○Pressure: 0 to 5 MPaG
- ○Circumferential speed: Up to 60 m/s
- ○Shaft diameter: ϕ50 to 300 mm
- ○Target fluids: Boiler feedwater, boiler circulating water, high-pressure feedwater

Material

- ○Seal face: SiC/SiC, SiC/carbon, tungsten carbide/carbon

MB2400CN (Outside rotating type)



Features

This is a compact outside rotating type seal. The outer dimension of the stuffing box is narrow enough to be mounted without modification.

Application

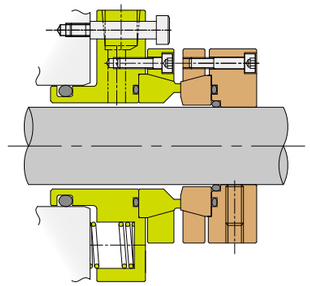
- ○Pressure: 0 to 1 MPaG
- ○Circumferential speed: Up to 20 m/s
- ○Shaft diameter: ϕ20 to 200 mm
- ○Target fluids: Water, warm water, oil, and acidic and alkaline liquids

Material

- ○Seal face: SiC/SiC, SiC/carbon, tungsten carbide/carbon

Split Mechanical Seals (Self-flushing and Dry running application)

MB2901 (Stationary balanced type, self-flushing)



Features

Split mechanical seals can be replaced without disassembling equipment. This type can be used on positive-pressure equipment.

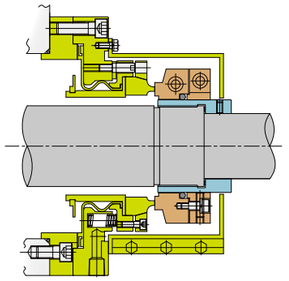
Application

- ○Pressure: 0 to 1 MPaG
- ○Circumferential speed: Up to 20 m/s
- ○Shaft diameter: ϕ50 to 300 mm
- ○Target fluids: Water, wastewater, seawater, etc.

Material

- ○Seal face: SiC/SiC, SiC/carbon, SiC/C composite/SiC/C composite

MU2922 (Stationary balanced type, dry running application)



Features

This split mechanical seal is capable of negative-pressure operation and can be used for both positive-pressure and negative-pressure applications.

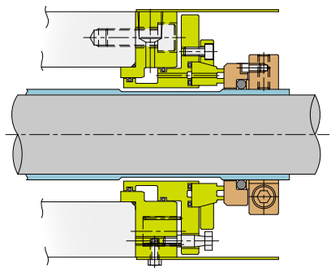
Application

- ○Pressure: −0.1 to 0.1 MPaG
- ○Circumferential speed: Up to 20 m/s
- ○Shaft diameter: ϕ50 to 300 mm
- ○Target fluids: Water, river water, etc.

Material

- ○Seal face: Carbide coating/carbon, carbide coating/resin

MT9200 (Stationary balanced type, dry running application)



Features

This split mechanical seal is capable of negative-pressure operation. It can be operated while biodegradable grease is fed to the seal face.

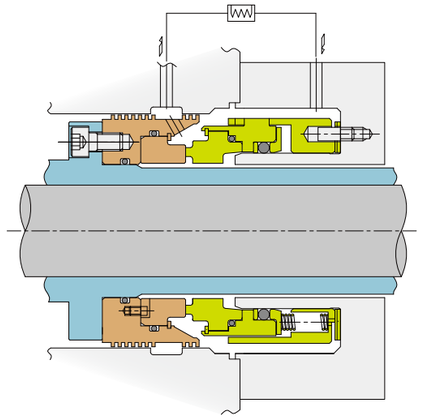
Application

- ○Pressure: Negative pressure
- ○Circumferential speed: Up to 20 m/s
- ○Shaft diameter: ϕ50 to 300 mm
- ○Target fluids: River water, etc.

Material

- ○Seal face: Carbide coating/copper alloy

MB2500 (Balanced type)



Features

Stationary balanced seals are used for heavy loads under high speed, high pressure, and high temperature. These seals remain unaffected by the centrifugal forces caused by rotation.
In addition, they demonstrate enhanced seal performance, as they remain square to the seal face and are unaffected by deterioration of equipment and heat distortion. These mechanical seals are cooled by circulation through a pumping ring.

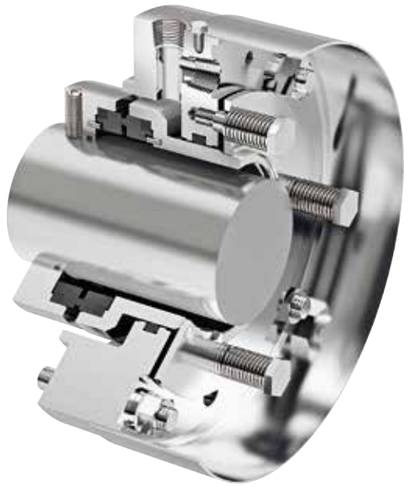
Application

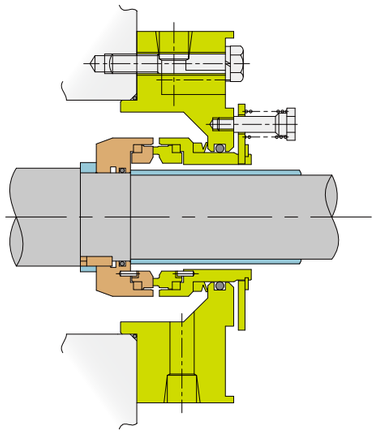
- ○ Pressure: 0 to 8 MPaG
- ○ Circumferential speed: Up to 60 m/s
- ○ Shaft diameter: ϕ50 to 300 mm
- ○ Target fluids: Boiler feedwater, boiler circulating water, high-pressure feedwater

Material

- ○ Seal face: SiC/carbon, tungsten carbide/carbon

MT4100 (Balanced type)





Features

These stationary seals incorporate highly wear-resistant materials such as tungsten carbide and SiC as seal face materials. These seals are also suitable for pumping fluid containing slurry.

Application

- ○ Pressure: 0 to 1 MPaG
- ○ Circumferential speed: Up to 20 m/s
- ○ Shaft diameter: ϕ50 to 500 mm
- ○ Target fluids: River water, etc.

Material

- ○ Seal face: Tungsten carbide/tungsten carbide, SiC/SiC

Selecting Auxiliary Equipment for Torishima Mechanical Seals

○Auxiliary Equipment for Mechanical Seals

The full performance and benefits of mechanical seals can be achieved with the proper combination of auxiliary equipment. Thus, care is required in the selection of auxiliary equipment and mechanical seals. Auxiliary equipment for mechanical seals is broadly categorized for cooling (or warming), flushing, or quenching; this equipment can be employed alone or in combination. Cooling (warming) through a cooling jacket may have to be performed when stopped depending to the fluid temperature and the nature of the fluid.

1. Cooling (Warming)

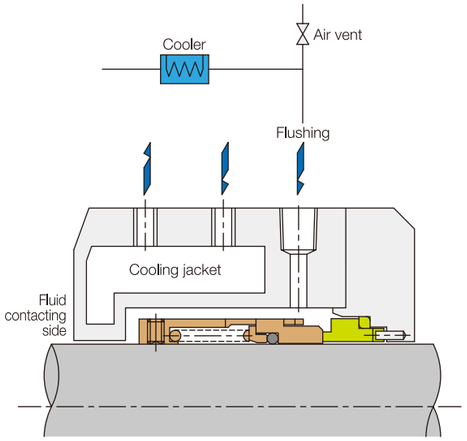
This equipment is used for cooling high-temperature sealed fluid and for maintaining the warmth of fluids that can freeze. Cooling (warming) can be achieved by either of two methods: cooling/warming the periphery of the seal face; or installing a jacket on the sealed box or seal cover.

A design for cooling should incorporate temperature adjustment of the sealed fluid within the heat tolerance and cold tolerance of the packing and should have sufficient capacity to absorb the heat generated at the seal face. Be careful that the fluid temperature does not fall excessively, as some fluids can become polymerized. When the purpose is cooling, design to reduce the saturation temperature of the sealed fluid at ambient atmospheric pressure by 20°C to 30°C. In the case of normal water, cooling is used when the temperature inside the sealed box exceeds 80°C. Because some heat is conducted by the body of the equipment, the cooling capacity must be designed to incorporate the above conditions.

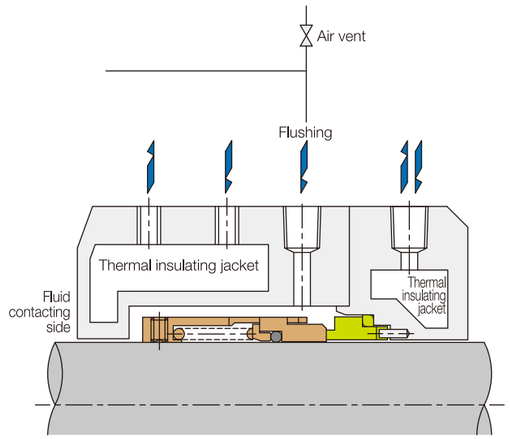
Completely purge all air inside the sealed box.

Air or gas trapped inside the sealed box reduces thermal conductivity and significantly reduces the cooling (warming) effect. This contributes to abnormal heating and premature wear of the seal face. The sealed box must be completely purged of all air and gas.

Example of Cooling (Warming)



Cooling of sealed box



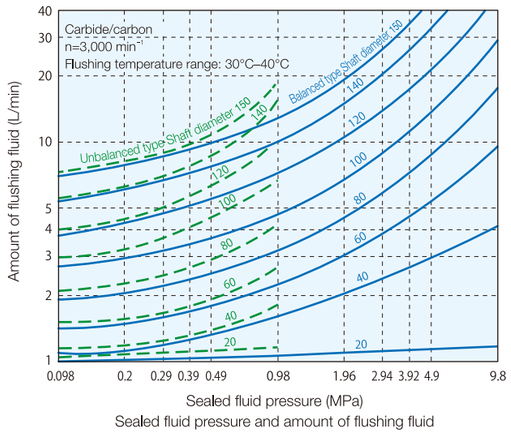
Warming of sealed box

2. Flushing

Flushing is intended to cool the seal face by causing the sealed fluid to flow, thus preventing the stagnation of foreign matter and intrusion to the seal face. Use a clear solution for the flushing fluid and inject it as close to the seal face as possible. If the injection velocity is too fast, the outer circumference will wear if the seal face material is a carbon type. The velocity should be 1–3 m/s. It is possible to use the self-flushing method (using its own fluid as an injection fluid for flushing) or to use the external flushing method (using a separate fluid). In addition, it is possible to perform cooling, heating, and slurry removal by installing auxiliary equipment such as coolers, heaters, filters, and cyclone separators at a point along the flushing piping.

When flushing in order to cool the seal face, use the following figure as a guideline because the flow of the flushing liquid differs according to the temperature inside the sealed box and the temperature of the flushing fluid.

Injection pressure should be 0.098–0.2 MPa higher than the pressure in the sealed box.



Sealed fluid pressure and amount of flushing fluid

Separating Solids from the Flushing Fluid

For fluids containing slurry, external flushing is the preferable method; however, if no other suitable source of fluid is available, the self-flushing method may be employed.

In this case, the following methods may be used to separate solids from the flushing fluid:

A) The filter method (30 to 100 mesh)

B) The magnetic filter method

Both A) and B) require monitoring to deal with mesh clogging; a safe approach is to switch between two filters positioned in parallel and to use a pressure gauge and thermometer. But these methods might not remove some of the slurry that is most harmful to the mechanical seal.

Method B) is used for removing ferrous slurry.

C) The cyclone separator method

This method is used to remove any slurry with a specific gravity higher than that of the sealed fluid.

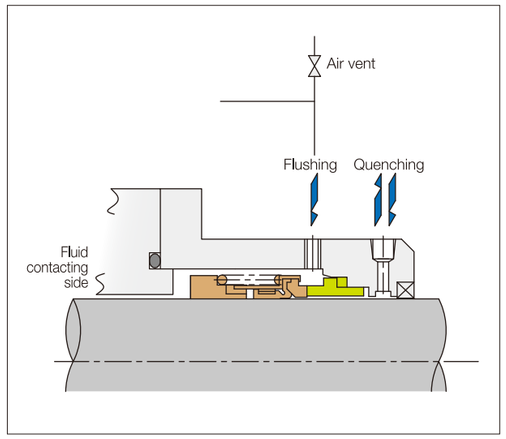
3. Quenching

Quenching is used to wash out deicers; toxic or explosive fluids; volatile fluids such as LPG; and leaked fluids that precipitate and harden when exposed to outside air. Normally, the injection fluid is clear water, but care is required because a fluid high in ion content can cause failure of the washer as minerals adhere to the seal face of the packing. It is essential that the injection fluid not react with the leaked fluid; if there is no suitable fluid, nitrogen gas or argon gas may be used.

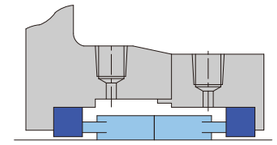
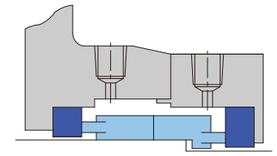
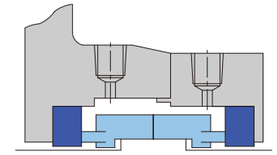
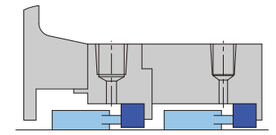
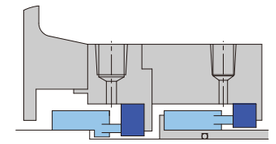
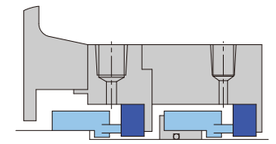
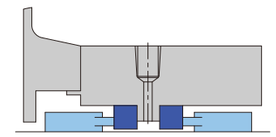
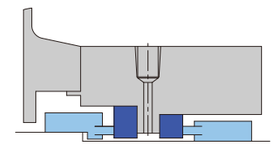
To prevent leakage of the quenching fluid, a mechanical seal may be used in addition to an auxiliary bushing, oil seal, lip seal or gland packing.

The pressure of the quenching injection fluid should be lower than that of the sealed box, typically 0.02–0.05 MPa. If the quenching flow is intended for cooling, about 70% of the flushing flow is required.

Quenching Example



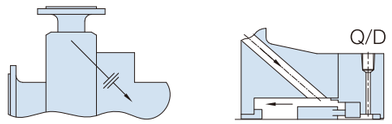
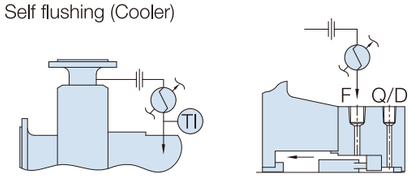
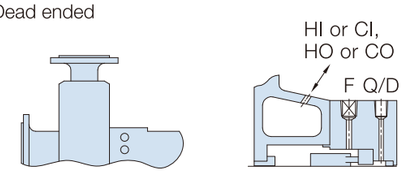
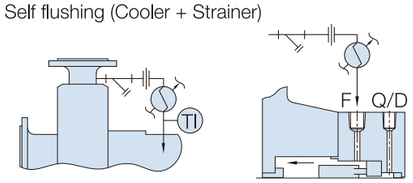
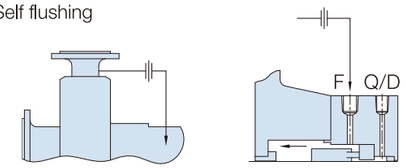
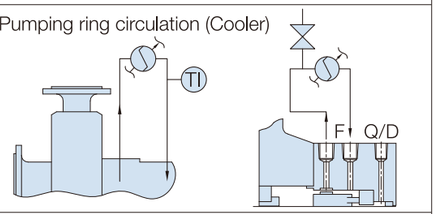
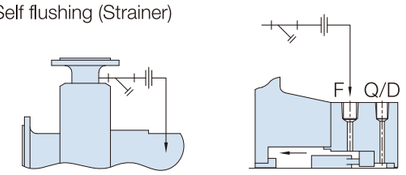
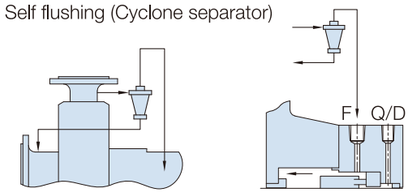
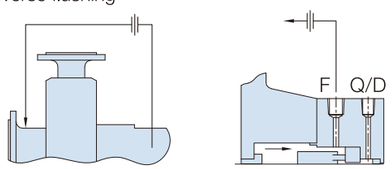
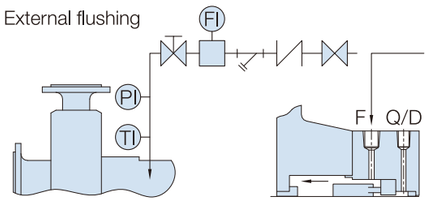
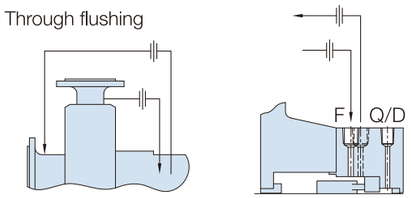
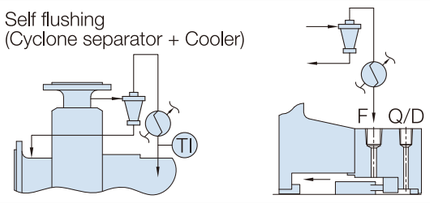
○Typical Configurations of Double Mechanical Seals

	Typical Configuration	Typical Application
Back-to-back		Applied to liquid containing gas or solid matter, toxic or corrosive liquid.
		Applied to liquid containing gas and solid matter, toxic or corrosive liquid, and liquid of high pressure that cannot be sealed with a single seal.
		Applied to super-high-pressure equipment that cannot be sealed with a single seal, and equipment with wide pressure fluctuations.
Tandem		Applied to high toxic liquid or low pressure equipment in which case leakage must be minimized or collected.
		Applied to high toxic liquid or high pressure equipment in which case leakage must be minimized or collected.
		Applied to very high pressure equipment. 1st stage seal is for pressure drop and 2nd stage is for sealing.
Face-to-face		Applied to low pressure liquid that cannot be sealed with a single seal, and in which case fitting length in axial direction is short and leakage must be collected.
		Applied to high pressure liquid that cannot be sealed with a single seal, and in which case fitting length in axial direction is short and leakage must be collected.

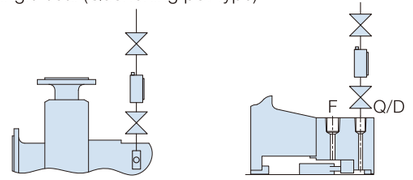
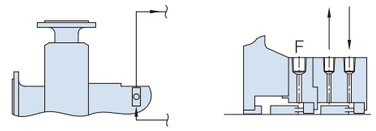
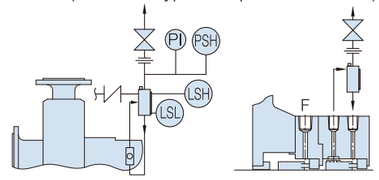
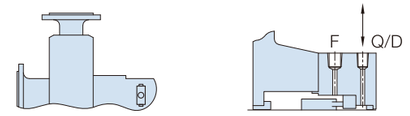
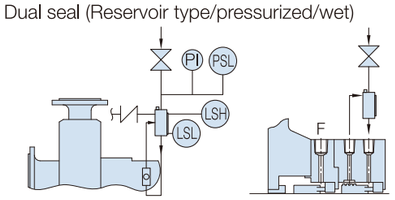
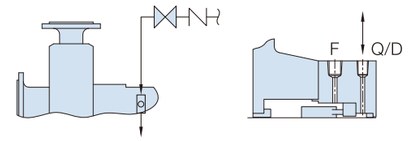
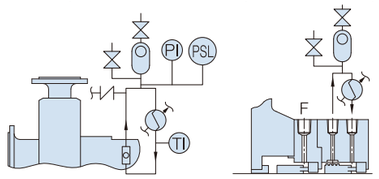
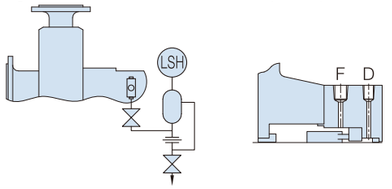
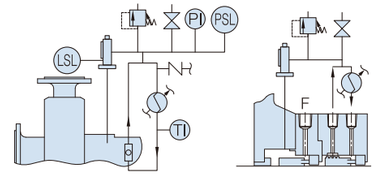
○Piping Plans for Auxiliary Equipment (API 682)

An appropriate match between piping and auxiliary equipment is required in order to maximize the performance of mechanical seals. In the piping examples shown in the diagrams below, all plans are numbered according to API standards (API682-3rd).

Flushing Plans for Single Seals

API Plan	Schematic	API Plan	Schematic
01	Self flushing (Internal flushing) 	21	Self flushing (Cooler) 
02	Dead ended 	22	Self flushing (Cooler + Strainer) 
11	Self flushing 	23	Pumping ring circulation (Cooler) 
12	Self flushing (Strainer) 	31	Self flushing (Cyclone separator) 
13	Reverse flushing 	32	External flushing 
14	Through flushing 	41	Self flushing (Cyclone separator + Cooler) 

Piping Plans for Quenching / Draining Systems and Dual Seals

API Plan	Schematic	API Plan	Schematic
51	Single seal (Quenching pot type) 	54	Dual seal (External circulation type/pressurized/wet) 
52	Dual seal (Reservoir type/non-pressurized/wet) 	61	Single seal (with no quenching provided) 
53A	Dual seal (Reservoir type/pressurized/wet) 	62	Single seal (with quenching provided) 
53B	Dual seal (Bladder accumulator/pressurized/wet) 	65	Single seal (Drain/leak detection system) 
53C	Dual seal (Piston type accumulator/pressurized/wet) 		

HI or CI : Heating fluid inlet or cooling fluid inlet
HO or CO : Heating fluid exit or cooling fluid exit
F : Hole for flushing
Q/D : Hole for quenching/draining

Piping diagram codes

- Orifice
- Strainer
- Cooler
- Stop valve
- Check valve
- Flow regulator
- Relief valve
- Flowmeter (FI)
- Cyclone separator
- Thermometer (TI)
- Pressure gauge (PI)
- Pressure switch (PS)
- Upper limit pressure switch (PSH)
- Lower limit pressure switch (PSL)
- Upper level switch (LSH)
- Lower level switch (LSL)
- Bladder accumulator
- Piston accumulator
- Drain pot
- Reservoir