FLOWSERVE

Slurry Seals

Advanced mechanical seals for the
complete range of slurry applications

Experience In Motion

Years of extensive product development, field testing and successful operation in all types of conditions allow us to offer mechanical seals and support equipment to succeed in the broadest range of demanding slurry applications.

Flowserve offers a complete range of sealing solutions for light, medium and heavy slurries

Mineral and ore processing of alumina, cement, clay, coal, copper, gold, gypsum, mineral sands, nickel, phosphate, potash, silver, trona, taconite, titanium and zinc represents the toughest machinery and sealing environments around. Taking raw material from the earth, extracting and refining finished mineral products requires rugged equipment capable of surviving abrasive and corrosive services, often at extreme pressures and temperatures.

Flowserve research and development programs have delivered advanced sealing systems to decrease maintenance expenditures, limit or eliminate water usage, maintain safety and reliability, and help reduce plant energy costs while ensuring equipment availability with increased mean time between repair and providing higher production throughput.

Flowserve slurry seal advantages

- Resistance to highly abrasive liquids and corrosive substances
- A wide range of materials of construction for long seal life
- Designs engineered to fit slurry pumps of all major OEMs
- Broadest performance window for flushless applications
- Maximum interchangeability of components to reduce inventories
- Ability to isolate highly toxic and corrosive fluids from the atmosphere
- Ability to recover from low or lost suction upset conditions
- Auxiliary systems to enhance slurry seal reliability

Materials of Construction

	Light Duty	Medium Duty	Heavy Duty
Wetted Metal Parts	316 Stainless Steel Alloy 20	316 Stainless Steel Duplex Alloy C-276	High Chrome Iron Duplex Alloy C-276
Seal Faces	Sintered Silicon Carbide Reaction Bonded Silicon Carbide Tungsten Carbide	Sintered Silicon Carbide Tungsten Carbide	Sintered Silicon Carbide Tungsten Carbide
Springs	Alloy C-276 17-7PH Steel	Alloy C-276 17-7PH Steel	Alloy C-276 17-7PH Steel
Gaskets	TFE Elastomer Fluoroelastomer	TFE Elastomer Fluoroelastomer EPDM	TFE Elastomer Fluoroelastomer EPDM
Spring Coating			TFE Elastomer Fluoroelastomer EPDM

Operating Parameters

	Light Duty	Medium Duty	Heavy Duty
Percent solids by weight	10%	20%	60%
Maximum Pressure psi (bar)	150 (10.3)	175 (12.0)	300 (20.7)
Maximum Temperature	200°F (93°C)	275°F (135°C)	300°F (149°C)

Heavy duty slurry seals

Parameters[1]

Maximum solids by weight: 60%

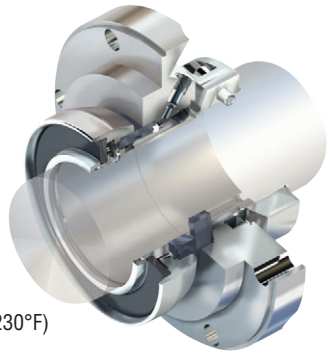
SLC

Type of Seal
Single pusher

Standard Sizes
32 to 220 mm
(1.250 to 8.661inch)

Pressure up to 20.6 bar (300 psi)

Temperature -18 to 110°C (0 to 230°F)



Designed to operate without a flush to increase plant efficiency, reduce operating costs and eliminate product dilution. Incorporates a unique non-clogging cone spring design that increases seal reliability. A self-contained single cartridge slurry seal designed to operate in tough slurry.

For more information on the SLC, see the Flowserve brochure FSD120.

Medium duty slurry seals

Parameters[1]

Maximum solids by weight: 20%

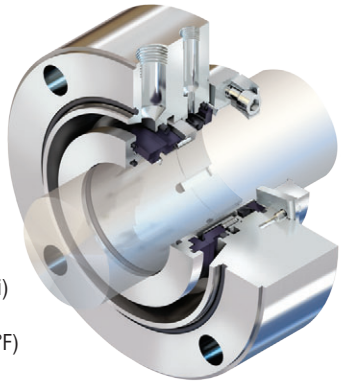
SLM-6000

Type of Seal
Single pusher

Standard Sizes
28.6 to 235.0 mm
(1.250 to 9.250 inch)

Pressure up to 17.2 bar (250 psi)

Temperature -40 to 135°C (275°F)



A single cartridge seal in a flexible stator design with rugged primary seal faces of sintered silicon carbide in a monoblock configuration. Available with a Quench Containment Device (QCD) as an outboard seal that can be run with a low pressure water closed loop barrier system or as a single seal with the Synthetic Lubrication Device (SLD) that requires no other equipment.

SLM-6100

Same rugged design as the SLM-6000 except the Quench Containment Device (QCD) is replaced with a multiple spring mechanical seal. The tandem seal must be supported by a barrier fluid of lower pressure than the process fluid.

For more information on the SLM-6000 and SLM-6100, see the Flowserve brochure FSD166.

Light duty slurry seals

Parameters[1]

Maximum solids by weight: 10%

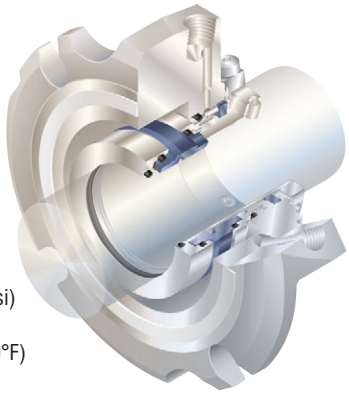
ISC2-PX

Type of Seal
Single pusher

Standard Sizes
25 to 200mm
(1.000 to 8.000 inch)

Pressure up to 20.6 bar (300 psi)

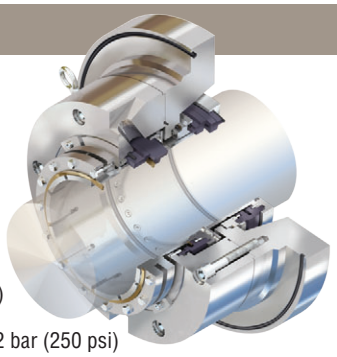
Temperature -40 to 204°C (400°F)



ISC2 standard cartridge seals are designed for a wide variety of process equipment in multiple applications including chemical leaching, extraction, water and general services. Single pusher seals with hard-on-hard seal faces are suitable for light slurries up to 10% solids by weight. The ISC2 seal's smooth geometry reduces the opportunity for erosion and the springs are located outside the process fluid to resist clogging. ISC2 seals extend reliability by tolerating dry running events with our exclusive thermal management technology.

1 These parameters are to be used as a general indication only. Slurry seal applications cover a huge range of parameters in vastly differing mineral ores. These include pressure, temperature, percent solids by weight, the size (D50) and hardness of solid particles in the slurry. The best seal selection needs to take into account all of these variables. e.g. The smallest (<10 micron) 'soft' slurry particles, like limestone, effect less damage to the seal faces than 'hard' slurry particles, like silicates. For specific seal applications contact your local Flowserve representative.

SLM-6200



Type of Seal
Dual pusher

Standard Sizes
50 to 235 mm
(2.000 to 9.25 inch)

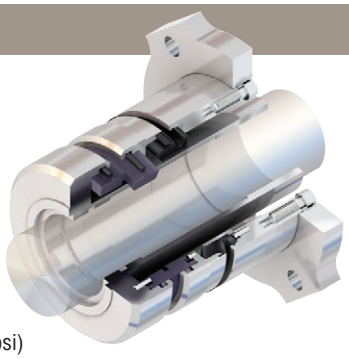
Pressure up to 17.2 bar (250 psi)

Temperature -40 to 149°C (300°F)

Ideal dual slurry seal to isolate the seal faces from the pump operating environment. A true cartridge dual seal that can be operated in a "pressure over" mode where the pressure of the fluid (water) is at a greater pressure than the pump. Simply connect the packing water line to the supply tank to create the pressure over effect. Product is not diluted as water is force circulated around the closed loop system between the seals and supply tank.

For more information on the SLM-6200, see the Flowserve brochure FSD166.

RIS



Type of Seal
Single, flexible rubber element

Standard Sizes
32 to 235 mm
(1.750 to 9.250 inch)

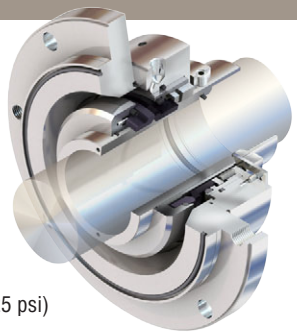
Pressure up to 10.3 bar (150 psi)

Temperature -4 to 110°C (215 to 230°F)

A unique non-clogging component seal design for Flue Gas Desulphurization (FGD) applications with no springs or bellows and does not require a flush. Seal is installed from the wet end of the pump in components, an added advantage when dealing with large shaft sizes. The stationary seal face is attached to a rubber-in-shear element which absorbs relative shaft movement.

For more information on the RIS, see the Flowserve brochure FSD151.

Allpac



Type of Seal
Single or dual pusher

Standard Sizes
20 to 300 mm
(0.750 to 9.250 inch)

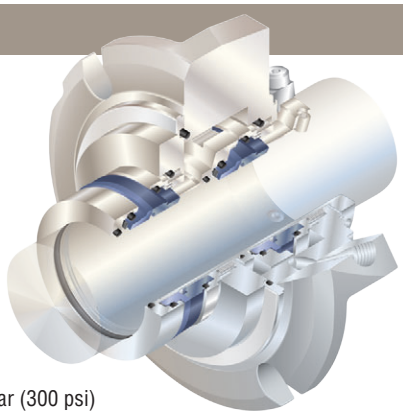
Pressure up to 50 bar (725 psi)

Temperature -40 to 220°C (430°F)

A cartridge slurry seal in a flexible stator design with rugged primary seal faces with springs isolated from the process fluid. By virtue of these design features, it enjoys a large installed base in Flue Gas Desulphurization (FGD) scrubber pumps. This seal is also available with integral bearings and is applied in FGD agitator/mixer applications.

For more information on the Allpac, see the Flowserve brochure FSD129.

ISC2-PP



Type of Seal
Dual pusher

Standard Sizes
25 to 200 mm
(1.000 to 8.000 inch)

Pressure up to 20.6 bar (300 psi)

Temperature -40 to 204°C (400°F)

Dual pressurized ISC2 seals provide zero emissions when process leakage to the atmosphere must be strictly avoided and greater tolerance to upset conditions is desired. ISC2 seals have an optimized circulating feature including an advanced design volute groove to significantly increase barrier fluid flow. High barrier fluid flow provides a cool environment for the seal faces and extends dual seal reliability. Dual pressurized seals lubricate both the inboard and outboard seal faces, keeping solids off the seals faces to minimize abrasive wear.

For more information on the ISC2 Series, see the Flowserve brochure FSD243.

Flowserve slurry seals succeed in a wide range of challenging applications

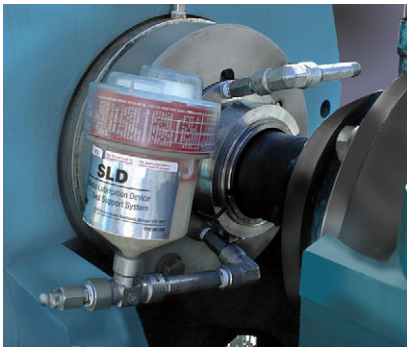
Coal Processing/Washing	
Thickener Underflow & Overflow	SLC
Uranium Processing	
Pregnant Feed, Tailings, Cyclone Feed, Pyrolusite Distribution, Underflow Thickener Feed	SLC
Copper Refining	
Concentrator Slimes Thickener Tailings	SLC
Slimes Pumps	SLM
Zinc Refining	
Thickener Overflow & Underflow	SLM
Jarosite Residue Transfer Pumps	SLM
Nickel Refining	
Slurry Transfer, Thickener Overflow	SLC & SLM
Thickener Underflow, Acid Slurry	SLC
Reactor, Autoclave & Heater Feed	SLM
Mill Hydrocyclone Feed, Tailings Transfer	SLC
Counter Current Decant "CCD" Circuit Pump	SLM
Solution Pumps (Nickel and Cobalt)	SLM
Spray Dryer Transfer Pumps	SLC
Tailings Underflow	SLM
Alumina Refining	
Digester Feed, Caustic Cleaning Preparation, Bauxite Grinding Pumps, Desilicator Discharge Pump, Seed Filtrate Pump, Coarse Seed Filter Feed Pumps, Seed Charge	SLC
Liquor to Digestion Pumps	SLM
Spent Liquor Pumps	SLM
Alumina Hydrate/Clarification	RIS
Hard Rock Mining	
Ground Dewatering	SLC
Tar Sands Extraction	
Froth, Pad Pumps, Tailings Transfer	SLC
Mineral Sands Ore Mining	
Slimes Pump, Concentrator Feed, Tailings/Tailings Booster Pumps & Mineral Sand Slurry & Concentrate	SLC & SLM
Synthetic Rutile Plant	
Slurry Transfer & Acidic Slurry Transfer Pumps	SLC
Pigment Plant	
Finished Slurry & Neutralization Feed Pumps, Chlorine Compressors (GARO)	SLC
Flue Gas Desulphurization (FGD)	
Limestone & Calcium Sulfate Slurry	SLC
Recycle Limestone/Gypsum	RIS
Gypsum Slurry	SLC & SLM
Filtrate Return	SLC
Thickener Underflow	RIS
Power	
Bottom Ash Removal	RIS
Gold Mining	
Carbon In Leach Tails	SLC
Decant & Saline Water	SLC
Concentrate & Cyanide Transfer	SLC
Conditioning Tank Feed	SLC & SLM
Conditioning Tank Discharge	SLM
Lime Slurry	SLM
Thickener Underflow	SLM
Tails Thickener Feed	SLC & SLM
Thickener Overflow	SLM
De-slime Cyclone Feed	SLM
Concentrate Storage Feed	SLM
Potash Plant	
Circulation Pumps	SLC
Phosphate Plant	
Phosphoric Acid/Gypsum	RIS
Iron Ore	
Taconite Concentrate	RIS

Auxiliary devices to increase equipment reliability

SLD - Synthetic Lubrication Device

The SLD seal support system dispenses lubrication to the atmospheric side of mechanical seals. It is ideal for seals subjected to intermittent, short periods of time when product liquid does not provide adequate film between the seal faces. The SLD is proven to greatly extend flushless seal life in harsh slurry conditions.

For more information on the SLD, see the Flowserve brochure FSD148.

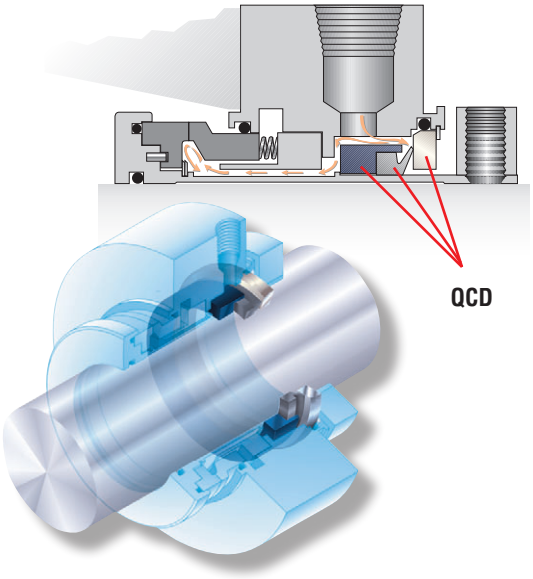


QCD - Quench Containment Device

Equipment cavitation, air ingestion, starved suction or improper venting can cause a mechanical seal to run dry and damage seal faces, resulting in leakage and potential seal failure. The hard carbide face material combinations required in single flushless seals for abrasive services are subject to thermal distortion, severe heat checking, galling, seal face fracture and eventual seal failure when operated dry. The use of a liquid (water) or synthetic lubricant quench on the atmospheric side of a seal in rugged slurry services can greatly minimize seal face damage from dry running.

Used in conjunction with a Flowserve Seal, the QCD helps quench fluid protect the seal faces in dry running slurry applications to improve equipment's Mean Time Between Repair (MTBR).

For more information on the QCD, see the Flowserve brochure FSD146.

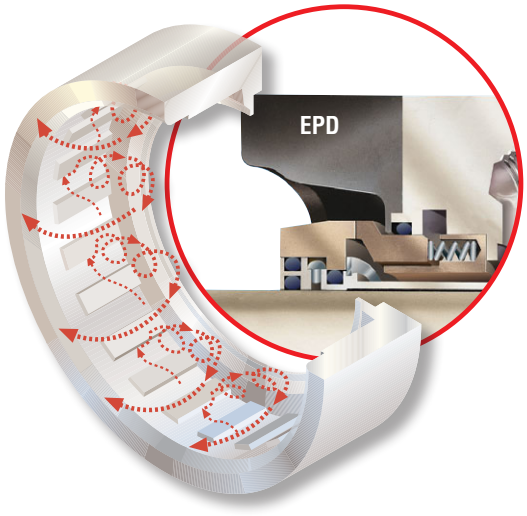


EPD - Erosion Protection Device

High impeller speeds and large or hard abrasive particles found in the pumped liquid can cause wetted equipment or mechanical seal components to wear prematurely. The EPD modifies the fluid flow pattern generated in the seal cavity located behind the impeller.

The interrupted fluid flow helps to eject particles and air bubbles to improve overall seal performance. The EPD provides a renewable surface for economical repairs and is an innovative solution to prevent abrasive wear on expensive equipment and small cross section seal components.

For more information on the EPD, see the Flowserve brochure FSD163.



FLOWSERVE

USA and Canada
Kalamazoo, Michigan USA
Telephone: 1 269 381 2650
Telefax: 1 269 382 8726

Europe, Middle East, Africa
Roosendaal, The Netherlands
Telephone: 31 165 581400
Telefax: 31 165 554590

Asia Pacific
Singapore
Telephone: 65 6544 6800
Telefax: 65 6214 0541

Latin America
Mexico City
Telephone: 52 55 5567 7170
Telefax: 52 55 5567 422

Slurry Seal Center of Excellence
55 Quill Way
Henderson, Western Australia 6166
Telephone: +61 8 9494 9200
Telefax: +61 8 9494 9201

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To find your local Flowserve representative
and find out more about Flowserve Corporation,
visit www.flowserve.com