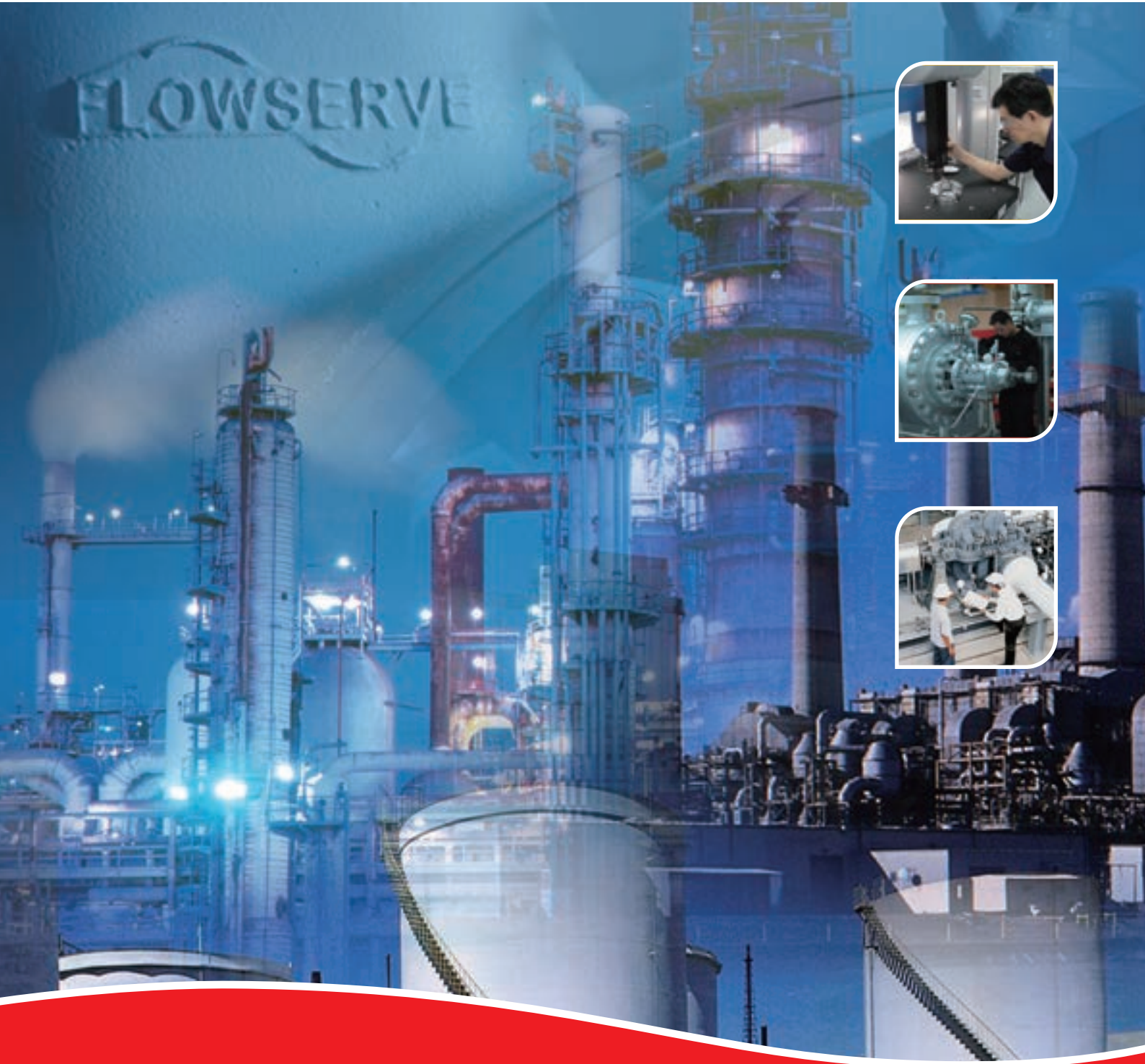




## ***Flowserve China Suzhou***

*Industrial Pump • Engineered Pump • Seal  
Parts and Components • Services and Solutions*



***Experience In Motion***



### Pump and Seal Business Network

- Manufacturing Plants
- Quick Response Centers
- ▲ Sales Offices



## Overview

Flowserve [NYSE: FLS] is the world's premier provider of industrial flow management services. The company produces engineered pumps, industrial valves, control valves, actuators and precision mechanical seals, and provides a range of related flow management services, primarily for the process industries. Flowserve has more than 20,000 employees and operates in over 55 countries.

More than one million pumps manufactured by Flowserve are serving in various industries around the world. Flowserve is the world's leading pump manufacturer in petroleum, chemical processing and power generation industries. The valve, steam trap, automatic control product and fluid management service series of Flowserve have been widely used in chemical, petrochemical, power generation, oil and gas, food and other industries. Our seal and seal system have been used in many kinds of rotary machines for preventing from fluid leakage.

Flowserve has been maintaining its consistent development strategy in China, and continues to expand regional coverage to deliver better service to local customers. Since the beginning in early 1990s, Flowserve has successfully met the most challenging requirements of our customers throughout China's oil and gas, chemical, petrochemical, power generation and fossil power industries. Opened in July 2006, the Suzhou plant represents Flowserve's first wholly owned facility to serve the China market. Afterwards, Flowserve also opened Quick Response Centers (QRCs) in Shanghai, Suzhou and Dalian. Flowserve has sales offices in Beijing, Shanghai and Shenzhen, in addition to joint venture (JV) businesses in Suzhou and Changsha. In 2013, Flowserve has put its Suzhou new plant into formal operation to provide international quality products and services to local customers.





## Flowserve China Suzhou

As part of Flowserve's global development strategy, Flowserve Fluid Motion and Control (Suzhou) Co., Ltd was founded in 2006.

Flowserve Suzhou provides a wide range of products to serve the Oil & Gas, Power, Chemical, Water and General industries. The Suzhou site expands on Flowserve's existing China presence and also creates a strong platform to support customers throughout China.

Since 2011, Flowserve has invested to construct the new plant in Suzhou Industrial Park. The new plant is designed and constructed in compliance with Flowserve's global standards and ISO quality management system standards, covering an area of 44,500 m<sup>2</sup>. It has integrated the manufacturing, processing, assembly and maintenance service of pump

and seal. The first phase of the new plant has been put into use in 2013. Construction of its second phase is anticipated to start in 2016. The new facility, which is primarily designed to serve the oil and gas and petrochemical industries, providing pump and seal manufacturing, processing, assembly, and maintenance capabilities to Flowserve customers, making it a "one-stop shop" for pumps, seals and systems. The new facility will provide a support platform for Flowserve business in China and for its global market as well. As a key part of the Flowserve global supply chain, this facility will become an excellent base to serve the current and future needs of the export market.





## Suzhou Capability

### Capability Upgrade in Full Spectrum:

- The new plant covers an area of 44,500 m<sup>2</sup>:
  - Construction area of factory building Phase I is about 12,000 m<sup>2</sup>;
  - Construction of factory building Phase II will be started in 2016 with a newly added area of 4,200 m<sup>2</sup>.
- Processing capability: original equipment, parts and components
- Testing capability: Phase I is 5,500 kW; Phase II will be improved to 14,000 kW.
- Lifting capacity: improved to 40 tons
- New product development & production
- Newly-added engineering capability
- Manufacturing and testing of high-energy pump
- Processing of spare parts of seal
- Assembly of seal system
- Providing local supplier of LCS spare parts
- Providing one-stop shop for pumps, seals and systems

### Pump Testing System:

- Adopting NI data collection system and high-accuracy test instrument ensure the correctness and reliability of test data
- High automation degree, convenient and quick application
- Performance test, cavitation test and operation test available
- Equipped with cooling tower, easy control of system temperature
- Conform to the accuracy requirement of ISO 9906 Grade 1 and HI 14.6 Grade 1
- Test tables cover an area of 1,300 m<sup>2</sup> and use closed test system; there are totally 11 test tables
- Test flow rate can reach 18,000 m<sup>3</sup>/h; total power can reach 5,500 kW
- Maximum lifting capacity is 40 tons







## ***Engineered Pump/Industrial Pump***

Flowserve has more than one million pumps in service around the world. With world-leading expertise in supply of standard pump, engineered pump, pump for special purposes and system, Flowserve's products have been widely used in oil and gas, chemical, energy, hydrocarbon treatment and water resources and general industries. Flowserve has provided ASME and ISO metallic and non-metallic pumps for the chemical industry under corrosive, toxic and other harsh environment and also supplied a variety of high-load and high-horsepower pumps for production and piping transportation of oil and gas.



### ***Product Brands of Distinction***

***ACEC™ Centrifugal Pumps***

***Aldrich™ Pumps***

***Byron Jackson® Pumps***

***Calder™ Energy Recovery Devices***

***Cameron™ Pumps***

***Durco® Process Pumps***

***Flowserve® Pumps***

***HALBERG™ Pumps***

***IDP® Pumps***

***INNOMAG® Sealless Pumps***

***Lawrence Pumps®***

***Niigata Worthington™ Pumps***

***Pacific® Pumps***

***Pleuger® Pumps***

***Scienco™***

***Sier-Bath® Rotary Pumps***

***SIHI® Pumps***

***TKL™ Pumps***

***United Centrifugal® Pumps***

***Western Land Roller™ Irrigation Pumps***

***Wilson-Snyder® Pumps***

***Worthington® Pumps***

***Worthington Simpson™ Pumps***



## **Mechanical Seals**

Flowserve is specialized in manufacturing of various kinds of mechanical seals. Our products can be widely applied to corrosive, volatile, abrasive, refined or combustible medium, as well as can be equipped on pump, compressor, mixer, steam turbine and other rotary equipment.

Flowserve provides a full series of seal products, including cartridge seal, dry running seal, metal bellow, rubber bellow, split type seal and gas barrier seal. Flowserve also provides compressor seal and bearing protection device. The creative seal design of Flowserve can generate products with low maintenance and operation cost.

The seal products of Flowserve have been widely used in petrochemical, energy, pipeline, papermaking, mining, water treatment and pharmacy industries.

### **Product Brands of Distinction**

**BW Seals®**

**Durametallic®**

**Five Star Seal™**

**HTO HydroTechnik™ Olomouc**

**Interseal™**

**Pacific Wietz™ Seals**

**Pac-Seal™**







## Flowserve Suzhou Products

Flowserve Suzhou Plant is designed and constructed in compliance with Flowserve’s global standards and ISO quality management system standards. It provides pump and seal manufacturing, processing, assembly, and maintenance capabilities to Flowserve customers, making it a “one-stop shop” for pumps, seals and systems.

Each pump is identified by its formal designation and accompanied by a full color cutaway illustration. Applicable engineering standards are listed along with performance characteristics and key features. The symbols shown at right are used to identify each pump’s primary market applications.

For more information about Flowserve pumps, visit: [www.flowserve.com](http://www.flowserve.com)



**Oil and Gas**



**Chemical**



**Power**



**Water Resources**



**Mining**



**Pulp and Paper**



**Primary Metals**



**General Industry**



**Pharmaceutical**

# Pump Selection Guide

		Oil and Gas														Chemical Processing							Power Generation (Fossil, Renewables, Nuclear)										
		Downstream							Upstream and Pipeline																								
Pump Category	Sub-Category	Distillation	Hydrotreating	Hydrocracking	Catalytic Cracking	Residuum and Heavy Oil Upgrading	Gas Treating and Sulfur Recovery	LNG	NGL and LPG	Gas to Liquids	Off-sites and Waste Treatment	Heavy Oil, Oil Sands and Shale	Crude, Product and CO <sub>2</sub> Pipeline	Drilling and Production	FPSO	Water and CO <sub>2</sub> Injection	Water Supply and Treatment	Acid Transfer	Caustic and Chlor-Alkali	Pharmaceuticals	Polymers	Renewable Fuel Production	Slurry Processing	Solvents	Volatile Organic Compounds	Waste Processing	Auxiliary	Boiler Feed	Boiler Feed Booster	Condensate Extraction	Cooling Water	Flue Gas Desulfurization	
Overhung	Chemical Process—ASME (ANSI), ISO						X	X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X							
	API Process	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X	X	X				X	X	X	X	X	X	X	X			
	Slurry and Solids Handling						X				X	X						X	X	X	X	X	X			X	X					X	
	Industrial Process										X	X		X	X		X			X			X		X		X	X	X		X		
Between Bearings	Single Case—Axially Split	X					X	X	X	X	X	X	X	X	X	X			X			X				X	X	X	X	X			
	Single Case—Radially Split	X	X	X	X	X		X	X	X	X	X		X	X							X					X	X	X		X		
	Double Case		X	X	X	X		X	X	X		X	X		X	X											X	X					
Vertical	Wet-Pit							X	X		X		X	X		X						X				X					X		
	Double Case						X	X	X		X		X			X		X										X	X				
	Deep Well Submersible Motor												X	X		X						X				X					X		
	Slurry and Solids Handling										X							X	X	X	X		X			X	X					X	
	Sump										X	X		X		X	X			X	X	X				X	X						
Positive Displacement	Gear										X							X	X	X	X		X		X								
	Screw					X				X	X	X	X					X	X	X	X		X		X	X	X						
	Multiphase										X		X																				
	Reciprocating				X	X					X	X		X	X		X						X					X					
Specialty Products	Nuclear Pumps																																
	Nuclear Seals																																
	Cryogenic Pumps							X	X																								
	Cryogenic Liquid Expander							X																									
	Geothermal Deep well Submersible Pump																																
	Hydraulic Decoking Systems					X																											
	Energy Recovery—Hydroturbine		X		X																						X						
	Energy Recovery—DWEER																																
	Thruster													X	X																		
	CVP Concrete Volute Pumps																														X		
	Barge Pump																																
Molten Salt VTP Pump																																	





## Mark 3 ASME Standard



### Standards

- ASME (ANSI) B73.1

### Operating Parameters

- Flows to 4540 m<sup>3</sup>/h (20 000 gpm)
- Heads to 215 m (700 ft)
- Pressures to 27 bar (400 psi)
- Temperatures from -73°C (-100°F) to 370°C (700°F)

### Features

- Exclusive reverse vane impeller
- Standard Mark 3A power end
  - External micrometer impeller adjustment mechanism
  - Heavy-duty radial and thrust bearings
  - Double lip oil seals
  - Constant level oiler
  - Large, reflective sight glass
- Choice of lubrication systems
- Optional ANSI 3A power end with lifetime warranty
  - Certified clean room assembly
  - Inpro/Seal® VBXX isolators
  - Magnetic drain plug
- SealSentry™ seal chambers
- Largest shaft and bearing components in ANSI standard pumps
- IPS Beacon™ electronic vibration and temperature condition monitor

### Related Configurations

- Mark 3 Lo-Flo
- Mark 3 Unitized Self-Primer
- Mark 3 Recessed Impeller
- Mark 3 Sealmatic dynamically sealed

See Bulletin PS-10-13.

## Mark 3 ISO Standard



### Standards

- ISO 2858
- ISO 5199

### Operating Parameters

- Flows to 1400 m<sup>3</sup>/h (6160 gpm)
- Heads to 220 m (720 ft)
- Pressures to 25 bar (365 psi)
- Temperatures from -80°C (-110°F) to 400°C (752°F)

### Features

- Heavy-duty casing with integral foot and multi-ribbed discharge flange
- Reverse vane impeller standard; open impeller available
- SealSentry seal chambers
- Accepts multiple seal arrangements
- External micrometer impeller adjustment mechanism
- Standard non-contacting labyrinth seal
- Heavy-duty radial and thrust bearings
- Two-piece bearing housing
- Back pullout design
- IPS Beacon electronic vibration and temperature condition monitor
- Optional ISO 3A power end with lifetime warranty
- CE marked; ATEX compliant; GOST certificate available

### Related Configurations

- Mark 3 ISO Self-Priming
- Mark 3 ISO Recessed Impeller
- Mark 3 ISO Close Coupled
- CPXV Chemical Sump
- Mark 3 ISO centerline mounted

See Bulletin PS-10-31.

## CPXV Chemical Sump



### Standards

- ISO 13709/API 610, 8th & 10th ed.
- ISO 5199

### Operating Parameters

- Flows to 1400 m<sup>3</sup>/h (6160 gpm)
- Heads to 250 m (820 ft)
- Pressures to 25 bar (365 psi)
- Temperatures from -40°C (-40°F) to 400°C (752°F)

### Features

- Heavy-duty casing with multi-ribbed discharge flange
- High-efficiency, front vane, open-style impeller
- Column lengths to 10 m (32 ft)
- Heavy-duty thrust bearings with axial adjustment above soleplate level
- Accepts multiple seal arrangements
- Elastomeric split element coupling
- Options
  - Recessed impeller
  - Suction strainer
  - Spacer coupling
  - Rectangular or circular soleplate
  - Oil lubrication to thrust bearing
  - Zone Ø hazardous area beneath soleplate configuration
- CE marked; ATEX compliant; GOST certificate available

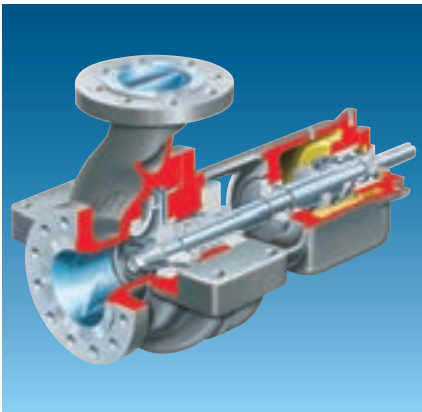
### Other Configurations

- CPXV Recessed Impeller, Sump
- Fully jacketed, molten salt design

See Bulletin PS-10-31.



## HPX (OH2) Centerline Mounted



### Standards

- ISO 13709/API 610 (OH2), latest ed.

### Operating Parameters

- Flows to 2000 m<sup>3</sup>/h (8800 gpm)
- Heads to 350 m (1100 ft)
- Pressures to 80 bar (1160 psi)
- Temperatures from -160°C (-250°F) to 450°C (842°F)

### Features

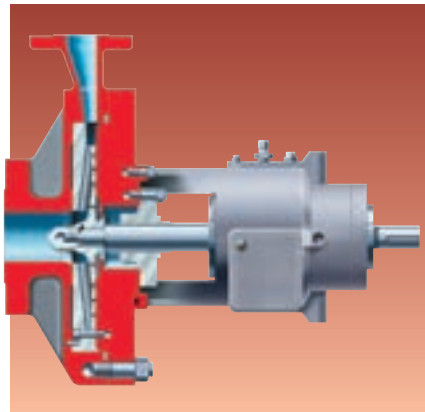
- Centerline-supported casing
- Nozzle loading capability beyond ISO 13709/API 610 requirements
- Dynamically balanced impeller
- Rugged shaft design
- ISO 21049/API 682 seal chamber accommodates multiple seal types
- Choice of bearings
  - Standard single row, deep groove, radial bearing and duplex, single row 40° angular contact thrust bearings
  - Special bearing arrangements for high suction pressures
- Bearing lubrication and cooling options
  - Oil mist and oil purge
  - Fan cooling
  - Finned cooling insert

### Related Configurations

- HPXT centerline mounted, top suction
- HPXH centerline mounted, high suction pressure
- HPXSL centerline mounted, slurry
- HPXIND centerline mounted, inducer
- HPXCC centerline mounted, coke crusher

See Bulletin PS-10-5.

## HPXM (OH2) Centerline Mounted, Low-Flow



### Standards

- ISO 13709/API 610 (OH2), latest ed.

### Operating Parameters

- Flows to 30 m<sup>3</sup>/h (130 gpm)
- Heads to 280 m (920 ft)
- Pressures to 80 bar (1160 psi)
- Temperatures from -160°C (-250°F) to 450°C (842°F)

### Features

- Low-flow, high-head design
- Replaceable volute inserts
- High-efficiency radial blade impeller
- Full interchangeability with HPX bearing assembly and mechanical seals
- Choice of bearings
  - Standard single row, deep groove, radial bearing and duplex, single row 40° angular contact thrust bearings
  - Special bearing arrangements for high suction pressures
- ISO 21049/API 682 seal chamber accommodates multiple seal types
- Bearing lubrication and cooling options
  - Oil mist and oil purge
  - Fan cooling
  - Finned cooling insert
- Optional inducer

### Related Configurations

- HPX centerline mounted

See Bulletin PSS-10-5.1.

## ERP-N Centerline Mounted



### Standards

- Flowserve

### Operating Parameters

- Flows to 1100 m<sup>3</sup>/h (4800 gpm)
- Heads to 230 m (750 ft)
- Pressures to 60 bar (870 psi)
- Temperatures to 350°C (660°F)

### Features

- Critical parameters meet ISO 13709/API 610 (OH2)
  - Vibration limits
  - Deflection limits at seal faces
  - Nozzle loading capabilities
  - Balancing grades
- ISO 21049/API 682 seal chamber accommodates multiple seal types
- Dynamically balanced, high-efficiency impeller
- Centerline-supported casing
- Double volute design for discharge flanges 80 mm (3 in) and larger
- Renewable casing and cover wear rings
- Back pullout design
- Optional inducer
- Choice of API materials

### Related Configurations

- ERP-N-O semi-open impeller
- High suction pressure: 35 bar (500 psi)

See Bulletin PS-10-20.

**DVSH (BB1)**  
**Axially Split, Double-Suction, Single-Stage**



**Standards**

- ISO 13709/API 610 (BB1), latest ed.

**Operating Parameters**

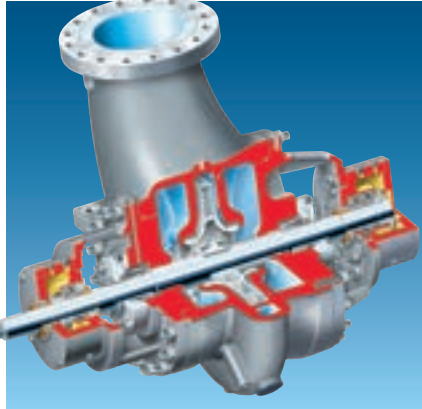
- Flows to 12 000 m<sup>3</sup>/h (52 835 gpm)
- Heads to 565 m (1854 ft)
- Pressures to 150 bar (2175 psi)
- Temperatures to 204°C (400°F)
- Speeds to 6000 rpm

**Features**

- Double volute casing
- Hydraulically balanced double-suction impeller
- ISO 21049/API 682 seal chambers accommodate multiple seal types
- Stiff shaft design
- Baseplate designs and pump packages engineered to contract requirements
- Choice of bearings
  - Ball radial and thrust
  - Sleeve radial and ball thrust
  - Sleeve radial and tilting pad thrust
- Choice of materials
  - Carbon steel
  - 12% chrome
  - Austenitic stainless steels
  - Duplex stainless steels

See Bulletin PS-20-2.

**HDX (BB2)**  
**Radially Split, Double-Suction, Single-Stage**



**Standards**

- ISO 13709/API 610 (BB2), latest ed.

**Operating Parameters**

- Flows to 4100 m<sup>3</sup>/h (18 000 gpm)
- Heads to 450 m (1500 ft)
- Pressures to 42 bar (610 psi); 100 bar (1450 psi) with HDX-H model
- Temperatures to 450°C (842°F)

**Features**

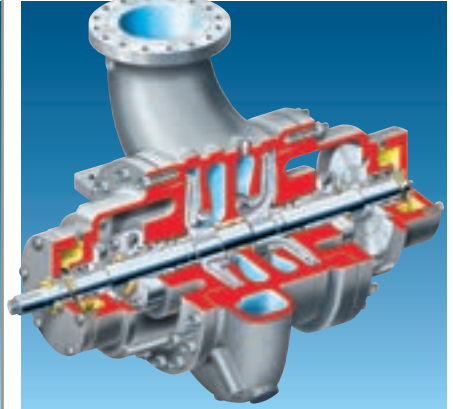
- Double volute, centerline supported, self-venting casing
- ASME (ANSI) B16.5 Class 300 flanges; optional Class 600 and 900 flanges
- Dynamically balanced, double-suction impeller
- Stiff shaft design
- ISO 21049/API 682 seal chambers
- Standard dual single-row, back-to-back mounted, angular contact thrust bearing
- Bearing options
  - Sleeve radial and ball thrust
  - Sleeve radial and tilting pad thrust
  - Lubrication systems available
- 360° supported bearing housing
- Double case covers

**Related Configurations**

- HDX-H high-pressure, radially split, double-suction
- In-line side nozzles
- Same-side nozzles (90° rotated)

See Bulletin PS-20-4.

**HED (BB2)**  
**Radially Split, Two-Stage**



**Standards**

- ISO 13709/API 610 (BB2), latest ed.

**Operating Parameters**

- Flows to 1000 m<sup>3</sup>/h (4400 gpm)
- Heads to 650 m (2100 ft)
- Pressures to 120 bar (1750 psi)
- Temperatures to 450°C (842°F)

**Features**

- Heavy-duty, double volute casing with 180° staggered volutes
- Top-top nozzle configuration
- ISO 21049/API 682 seal chambers
- Dynamic balancing and TIR verifications on assembled rotating element
- Baseplate designs and pump packages engineered to contract
- Choice of bearings
  - Ball radial and thrust
  - Sleeve radial and ball thrust
  - Sleeve radial and tilting pad thrust
- Choice of materials
  - Carbon steel
  - 12% chrome
  - Austenitic stainless steel
  - Duplex stainless steel
  - Monel lining

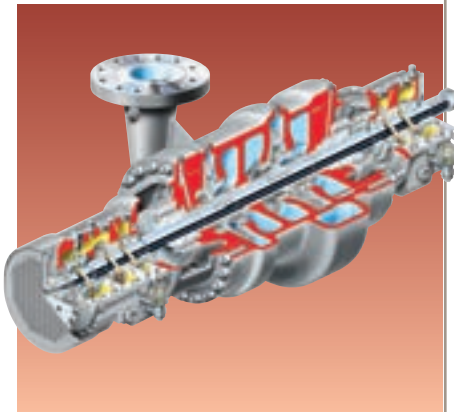
**Other Configurations**

- HED-DS radially split, double-suction, two-stage
- In-line side nozzles
- Same-side nozzles
- High-pressure

See Bulletin PS-30-4.



## HED-DS (BB2) Radially Split, Double- Suction, Two-Stage



### Standards

- ISO 13709/API 610 (BB2), latest ed.

### Operating Parameters

- Flows to 2500 m<sup>3</sup>/h (11 000 gpm)
- Heads to 750 m (2460 ft)
- Pressures to 120 bar (1750 psi)
- Temperatures to 450°C (842°F)

### Features

- Double-suction, first-stage impeller
- Heavy-duty, double volute casing with 180° staggered volutes
- Top-top nozzle configuration
- ISO 21049/API 682 seal chambers
- Dynamic balancing and TIR verifications on assembled rotating element
- Baseplate designs and pump packages engineered to contract
- Choice of bearings
  - Ball radial and thrust
  - Sleeve radial and ball thrust
  - Sleeve radial and tilting pad thrust
- Choice of materials
  - Carbon steel
  - 12% chrome
  - Austenitic stainless steel
  - Duplex stainless steel
  - Monel lining

### Other Configurations

- HED radially split, two-stage
- In-line side nozzles
- Same-side nozzles
- High-pressure

See Bulletin PS-30-4.

## DMX (BB3) Axially Split, Multistage



### Standards

- ISO 13709/API 610 (BB3), latest ed.

### Operating Parameters

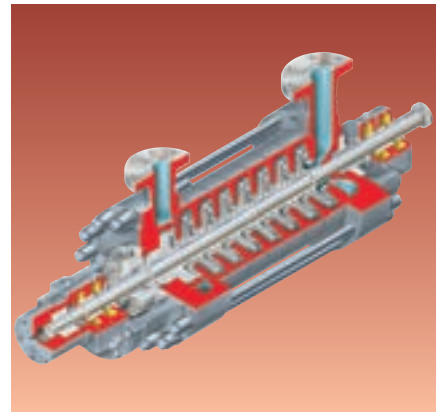
- Flows to 2950 m<sup>3</sup>/h (13 000 gpm)
- Heads to 2130 m (7000 ft)
- Pressures to 275 bar (4000 psi)
- Temperatures to 204°C (400°F)
- Speeds to 6000 rpm

### Features

- Double volute hydraulic passages
- Renewable case and impeller wear rings
- ISO 21049/API 682 seal chambers
- Axially split center bushing
- Shaft options
  - Double extension for connection to auxiliary pumps or hydraulic turbines
  - Special shaft end machining for hydraulic fitted couplings
- Interstage take-off option
- Baseplate designs and pump packages engineered to contract
- Dynamic balancing and TIR verifications on assembled rotors
- Choice of bearings
  - Ball radial and thrust
  - Sleeve radial and ball thrust
  - Sleeve radial and tilting pad thrust
- Choice of bearing lubrication systems
- Choice of bearing cooling systems
- Choice of materials

See Bulletin PS-30-3.

## WXH Radially Split, Multistage, High-Pressure, Ring Section



### Standards

- Flowserve

### Operating Parameters

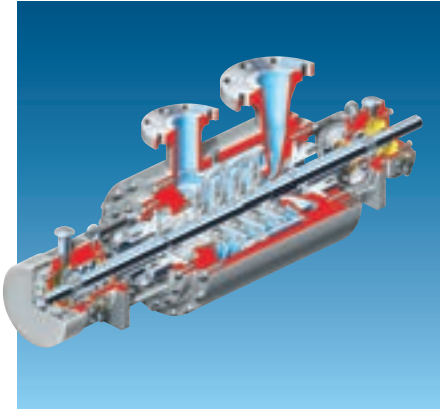
- Flows to 900 m<sup>3</sup>/h (4000 gpm)
- Heads to 2650 m (8700 ft)
- Pressures to 310 bar (4500 psi)
- Temperatures to 250°C (480°F)

### Features

- Cast suction and discharge heads with integral nozzles
- Single- or double-suction, first-stage impeller designs
- Investment cast diffusers and return channel hydraulic passages
- Compression interstage O-ring
- Separate, high-strength, sub-base
- Replaceable stationary wear parts mounted in the diffusers
- Standard flanged balance drum with serrated running clearances; optional straight balance drum
- Seal chamber accepts single, double and tandem mechanical seals
- Large diameter shaft with staggered impeller and balancing device keyways
- No pre-warming required
- Chrome steel nozzles
- Choice of bearings
  - Ball radial and thrust
  - Sleeve radial and ball thrust
  - Sleeve radial and tilting pad thrust

See Bulletin PS-30-1.

## **WXB and WXB-B Diffuser Casing, Multistage, Process Barrel**



### **Standards**

- ASME Section VIII

### **Operating Parameters**

- Flows to 300 m<sup>3</sup>/h (1320 gpm)
- Heads to 1200 m (3940 ft)
- Pressures to 150 bar (2175 psi)
- Temperatures to 200°C (390°F)

### **Features**

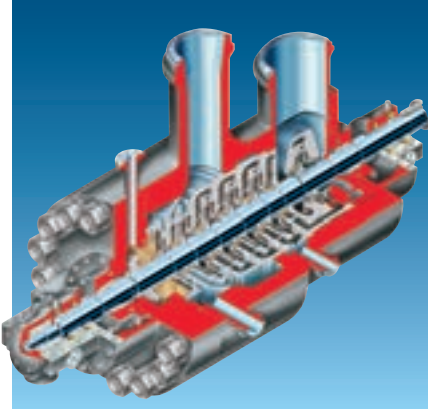
- Diffuser case construction
- Removeable cartridge inner case subassembly
- Large eye first-stage impeller
- Low-flow, high-head Barske impeller on WXB-B
- Proprietary balancing device
- Sleeve mounted deep groove radial and back-to-back mounted angular contact bearings
- High-capacity, antifriction thrust bearing
- Bearing lubrication system with oil bath, constant level oiler and sight glass
- Renewable casing and impeller rings
- High shaft diameter to bearing span ratio
- Options
  - Hydrodynamic sleeve radial bearings
  - Thrust bearing cooling system (air)
  - Labyrinth end seals

### **Available Configurations**

- WXB: standard hydraulics
- WXB-B: low-flow, high-head hydraulics

See Bulletins PS-30-6 and PSS-30-6.1.

## **CHTA Diffuser Casing, Multistage, Utility Barrel**



### **Standards**

- ASME Section VIII

### **Operating Parameters**

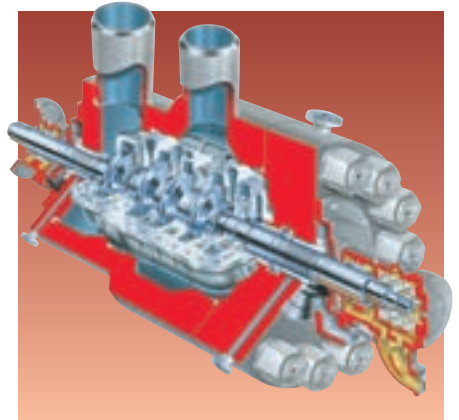
- Flows to 5220 m<sup>3</sup>/h (23 000 gpm)
- Heads to 4270 m (14 000 ft)
- Discharge pressures to 517 bar (7500 psi)
- Temperatures to 250°C (480°F)
- Speeds to 6000 rpm

### **Features**

- Internal casing with segmented stage elements
- Diffuser guide-vane construction
- Precision cast in-line impellers of high-quality chrome steel
- Heavy-duty barrel with forged steel discharge cover
- Fully enclosed or shrouded precision cast diffusers on high-energy applications
- Balance drum and sleeve made from hardened stainless steel forgings
- Tilt pad thrust and tri-land radial bearings
- Serrated running fits
- Renewable casing rings and sleeves
- Flanged balance drum design
- Chrome-plated shafting under journal bearings
- Ground forged steel shafting

See Bulletin PS-30-13.

## **HDB and HSB Volute Casing, Multistage, Utility Barrel**



### **Standards**

- ASME Section VIII

### **Operating Parameters**

- Flows to 4000 m<sup>3</sup>/h (17 610 gpm)
- Heads to 4300 m (14 000 ft)
- Discharge pressures to 450 bar (6525 psi)
- Temperatures to 425°C (800°F)
- Speeds to 9000 rpm

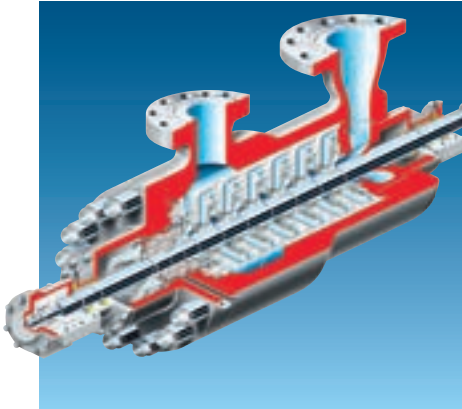
### **Features**

- Axially split inner casing
- Double volute design with symmetrical upper and lower halves
- Opposed impeller design
- Volute and impellers are cast of high-quality chrome steel
- Heavy-duty forged steel barrel and discharge cover
- Individually mounted and secured impellers
- Dynamic balancing and TIR verifications on assembled rotor
- Minimal pressure breakdowns across running clearances
- Sleeve radial and tilting pad thrust bearings
- Baseplate designs and pump packages engineered to contract requirements

See Bulletin PS-30-12.



**WCC (BB5)**  
**Diffuser Casing,**  
**Multistage, Process Barrel**



**Standards**

- ISO 13709/API 610 (BB5), latest ed.

**Operating Parameters**

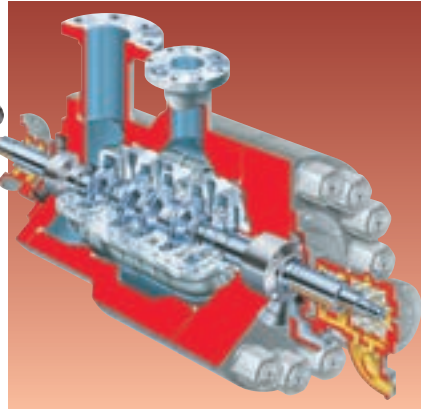
- Flows to 1000 m<sup>3</sup>/h (4400 gpm)
- Heads to 2800 m (9200 ft)
- Discharge pressures to 275 bar (3987 psi)
- Temperatures to 425°C (800°F)
- Speeds to 3580 rpm; 6000 rpm with high-speed option

**Features**

- Internal casing with segmented stage elements
- Diffuser guide-vane construction
- Multi-vane, diffuser-channel ring collectors
- Precision cast chrome steel in-line impellers
- Single- or double-suction, first-stage impeller
- Heavy-duty barrel with discharge cover
- Removable cartridge inner case subassembly
- Straight or flanged balance drum with serrated running surfaces
- Tilt pad thrust and heavy-duty journal bearings
- Force feed lubricated bearings
- Precision-ground forged steel shafting

See Bulletin PS-30-7.

**HDO and HSO (BB5)**  
**Volute Casing, Multistage,**  
**Process Barrel**



**Standards**

- ISO 13709/API 610 (BB5), latest ed.

**Operating Parameters**

- Flows to 4000 m<sup>3</sup>/h (17 610 gpm)
- Heads to 5365 m (16 000 ft)
- Discharge pressures to 450 bar (6525 psi)
- Temperatures to 425°C (800°F)
- Speeds to 9000 rpm

**Features**

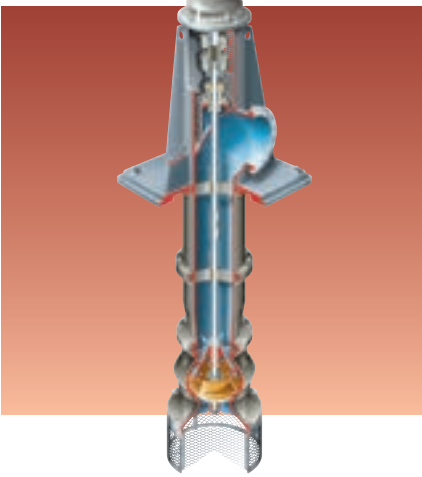
- Axially split inner casing
- Double volute design with symmetrical upper and lower halves
- Opposed impeller design
- Heavy-duty forged steel barrel and discharge cover
- Individually mounted and secured impellers
- Dynamic balancing and TIR verifications on assembled rotor
- Sleeve radial and tilting pad thrust bearings
- Baseplate designs and pump packages engineered to contract requirements
- Metallurgies per ISO 13709/API 610

**Other Configurations**

- Coke crusher (for most sizes)

See Bulletin PS-30-8.

**VTP**  
**Vertical Turbine**



**Standards**

- Flowsolve

**Operating Parameters**

- Flows to 13 600 m<sup>3</sup>/h (60 000 gpm)
- Heads to 700 m (2300 ft)
- Pressures to 100 bar (1450 psi)
- Temperatures from -45°C (-50°F) to 300°C (570°F)
- Sizes from 150 mm (6 in) to 1375 mm (54 in)
- Settings to 365 m (1200 ft)

**Features**

- Above- or below-grade discharge
- Enclosed or semi-open impellers
- Open or enclosed lineshaft construction
- Product or enclosed oil lubrication
- Flanged or threaded column pipe
- High-pressure stuffing box
- Rigid, adjustable coupling
- Drive options
  - Hollow or solid shaft motor
  - Dry or submersible electric motors
  - Variable speed drives
  - Engine with right angle gear
  - Steam turbine
- Options
  - Thrust-balanced impeller
  - O-ring bowl
  - Adjustable flanged coupling

**Related Configurations**

- VTP molten salt design
- VPC vertical turbine, double case

See Bulletin PS-40-7.

**VCT**  
**Vertical, Mixed Flow**



**Standards**

- Hydraulic Institute
- AWWA

**Operating Parameters**

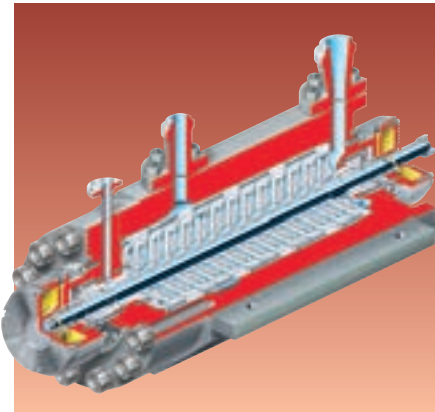
- Flows to 181 700 m<sup>3</sup>/h (800 000 gpm)
- Heads to 110 m (350 ft)
- Sizes from 1200 mm (48 in) to 3380 mm (133 in)

**Features**

- Five-mitered elbow discharge head with above- or below-grade discharge
- Pullout or non-pullout construction
- Flanged outer column with integral bearing bracket
- Enclosed or semi-open impellers
- Oil, freshwater or self-lubricating column construction
- Seal chamber accepts packing or mechanical seal
- Three-piece rigid, adjustable motor coupling
- Shaft sleeves under the bearings and seal chamber
- Options
  - Discharge head with integral axial thrust bearing assembly
  - Cast or fabricated bowl assembly
  - Integrated suction bell bearing bracket
  - Multiple stages
  - Thrust collar
  - Sand cap
- Engineered to customer specifications

See Bulletin PS-40-6.

## **CAM Nuclear Diffuser Casing, Multistage, Utility Barrel**



### **Standards**

- ASME Section III, Class 2 and 3

### **Operating Parameters**

- Flows to 60 m<sup>3</sup>/h (265 gpm)
- Heads to 1920 m (6300 ft)
- Pressures to 235 bar (3410 psi)
- Temperatures to 120°C (250°F)

### **Services**

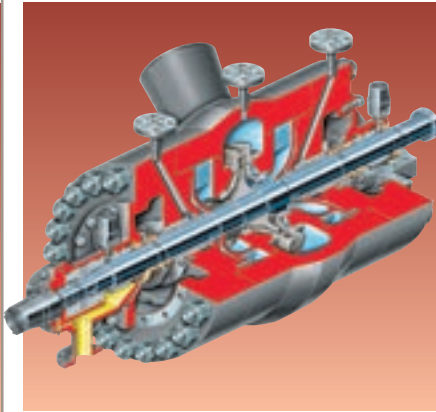
- CVCS charge
- Control rod drive

### **Features**

- Multistage, double case design
- Unique, compact design
- Modular impellers
  - Low-flow stability and reliability over a wide range of flows
  - No surging or pulsations
- Ball-ball construction
- Dry disk spacer coupling
- Flanged axial thrust balancing device
- Modularized assembly and disassembly may be conducted without the use of a torch
- Forged barrel with no attachment welds
- Cartridge mechanical seals with no attachment welds
- No auxiliary cooling required

See Bulletin FPD-2.

## **CN Nuclear Radially Split, Diffuser Casing, Single-Stage**



### **Standards**

- ASME Section VIII

### **Operating Parameters**

- Flows to 5065 m<sup>3</sup>/h (22 300 gpm)
- Heads to 800 m (2625 ft)
- Pressures to 100 bar (1470 psi)
- Temperatures to 210°C (410°F)
- Power to 11 200 kW (15 000 hp)
- Speeds to 6000 rpm

### **Services**

- Reactor and steam generator feedwater

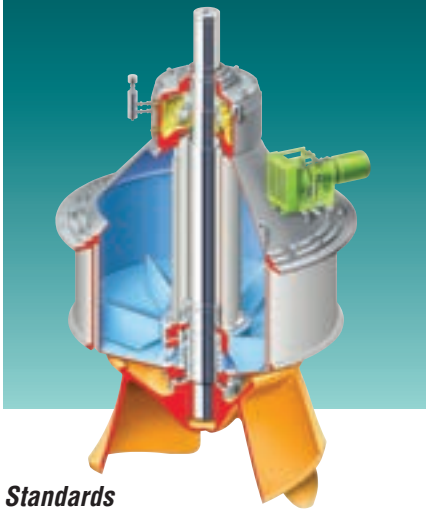
### **Features**

- Diffuser casing configuration
- Forged barrel
- High-speed pump design
- Double-suction impeller
- Special impeller designs for low NPSHA conditions
- Centerline mounted
- Pressure breakdown bushing or mechanical seal
- Sleeve radial and tilting pad thrust bearings standard

See Bulletin PS-80-4.



## **CVP** **Vertical, Concrete Volute**



### **Standards**

- Flowserve
- Hydraulic Institute

### **Operating Parameters**

- Flows to 200 000 m<sup>3</sup>/h (800 000 gpm)
- Heads to 60 m (197 ft)

### **Features**

- Vertical dry-pit design
- Removable metallic pump pullout unit within a concrete volute
- Suction bell connected to preformed high-efficiency, vortex-free concrete suction box
- Open mixed flow and closed mixed flow impeller options
- Dry shaft design
- No submerged bearings
- Bearings and sealing systems easily accessible
- Prefabricated concrete segments
- Highly corrosion and erosion resistant
- Liquidyne® or mechanical shaft seal
- Inflatable static seal
- Engineered to customer specifications

### **Available Configurations**

- BSV open mixed flow impeller design
- BCV closed mixed flow impeller design

See *Bulletin PS-40-1*.

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## Refining & Petrochemical Industry

application	category	model
general purpose, water amines, sour water non-flashing hydrocarbons	standard cartridge pusher metal bellows	ISC2-682 Series QB, QBQ BX, BXQ
caustic	metal bellows	BX, BXQ
flashing hydrocarbons	pusher	QBQ, QBQ LZ
high pressure, crude	pusher	UCQ, UOP
high temperature plan 23, boiler feed water	pusher	D
high temp non-flashing hydrocarbons	metal bellows	BXRH, BXHH
dry gas backup	containment	GSL, GSD
dual pressurized gas seal	gas barrier	GF-200
integrally geared equipment	OEM	GLS, GSS, GSG
turbomachinery	compressor	Gaspac, Circpac

## Chemical Industry

application	category	model
most low viscosity, mildly corrosive chemicals, water, process water, caustics, mild acids, non-flashing low temperature hydrocarbons	standard cartridge pusher metal bellows slurry special duty	ISC2 Series RO, Europac 600-610 BX, BXLS Allpac Pac-Seal
high temperature/heat transfer	metal bellows	BXHH, BXRH
high viscosity, slurry	slurry	SLM, Allpac
most clean, low viscosity chemicals	gas barrier	GX-200, GF-200
acids, corrosive chemicals	pusher	RA, RA-C
integrally geared equipment	OEM	GLS/GSS/GSG
mixers	mixer mixer standard cartridge	M Series, Mixerpac VRA, MSS ISC2-MW

## Power Industry

application	temperature	pressure	cooling	category	model
water, condensate	low low	low low	none none	standard cartridge special duty	ISC2 Series PSS III
boiler feed water	medium	medium	none	pusher	QBU
	medium	medium	Plan 23	pusher	Europac 615
	high	high	Plan 23	pusher	D, DP
	high	very high	Plan 23	pusher	DHTW
blowers	high	low	none	special duty	Circpac MD
flue gas desulphurization	low	low	none	slurry	SLM
	low	low	none	slurry	SLC
	low	low	none	slurry	RIS

## ***Pipeline Industry***

application	pressure	category	model
flashing light hydrocarbons	medium	pusher	QBQ, QBQ LZ
hydrocarbons, crude oil	low	metal bellows	BXQ
	medium	pusher	QBQ
	high	pusher	HSH, UOP
	very high	pusher	UHTW
dry lift-off gas back-up	medium	containment	GSL
produced water	low	metal bellows	BX
	medium	slurry	Allpac
	medium	pusher	QB
	very high	pusher	UHTW
dense phase fluids, CO <sub>2</sub>	very high	pusher	UHTW, Gaspac T

## ***Pulp & Paper Industry***

application	equipment	category	model
paper stock	pumps	standard cartridge	ISC2 Series
	pumps	special duty	PSS III
	pumps	slurry	SLM, Allpac
specialty equipment	refiners, conveyors	bellows	BX
	axial flow circulators	special duty	PSS III
	pulpers	slurry	SLM

## ***Mineral and Ore Processing Industry***

application	slurry	category	model
slurry pumps	heavy	slurry	SLC, SLM-6200
	medium	slurry	SLM-6000, Allpac
	light	standard cartridge	ISC2 Series
agitators / autoclave		mixer seal	M Series
accessories		accessories	SLD, QCD, EPD
axial flow circulators		special duty	PSS III



## Water & Wastewater Industry

application	category	model
water	standard cartridge	ISC2 Series
	pusher	RO
	pusher	Europac 600-610
	special duty	PSS III
	special duty	Pac-Seal
sludge	slurry	SLM
	slurry	Allpac

## Pharmaceutical Industry

application	category	remark	model
mixers, agitators, blenders, dryers	mixer	wet or dry dual pressurized	M Series
	mixer	CIP/SIP dry lift-off dual	Mixerpac 2568 / 2570
	standard cartridge	wet dual pressurized	ISC2-MW
	mixer	dry contacting single	VRA
	mixer	split seal	MSS
autoclaves, centrifuges	mixer	wet dual pressurized	MW-200
	mixer	dry contacting dual pressurized	MD-200
	mixer	dry lift-off dual pressurized	ML-200
bioreactors	mixer	bottom entry	ST
	mixer	side entry	Mixerpac 589
pumps	standard cartridge	single or dual	ISC2 Series
	special duty	split seal	PSS III

## ISC2-PX

Single cartridge pusher seals



### Equipment Type

- General purpose ASME, ISO, JIS pumps

### Operating Parameters

Pressure	up to 20.6 bar (300 psi)
Temperature	-40 to 204°C (400°F)
Speed	up to 23 m/s (75 fps)
Shaft Sizes	25 to 200 mm (1.000 to 8.000 inch)

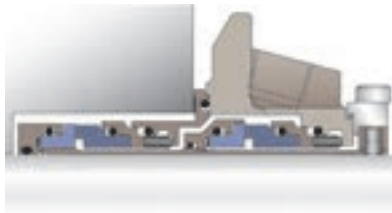
### Features

- Single cartridge pusher seals
- Applied in a wide variety of general purpose industrial applications and equipment
- Thermal management technology helps the seal run cooler and tolerate dry running events
- Stationary face support drive mechanism reduces wear in applications with high vibration levels
- For sizes larger than 70 mm (2.750 inch), the stationary support drive mechanism allows a larger range of dynamic movement commonly found in larger equipment
- Throttle bushing provides safe containment in the unlikely event of a seal failure
- Springs and pins are outside the product for reduced corrosion
- Available in a wide range of materials

Reference FSD243

## ISC2-PP

Dual cartridge pusher seals



### Equipment Type

- General purpose ASME, ISO, JIS pumps

### Operating Parameters

Pressure	up to 20.6 bar (300 psi)
Temperature	-40 to 204°C (400°F)
Speed	up to 23 m/s (75 fps)
Shaft Sizes	25 to 200 mm (1.000 to 8.000 inch)

### Features

- Dual cartridge pusher seals
- Applied in a wide variety of general purpose industrial applications and equipment
- Advanced design volute groove significantly increases barrier fluid flow to promote cool running
- The seal arrangements are tandem and double balanced to allow both pressurized and unpressurized operation
- Stationary face support drive mechanism reduces wear in applications with high vibration levels
- For sizes larger than 70 mm (2.750 inch), the stationary support drive mechanism allows a larger range of dynamic movement commonly found in larger equipment
- Springs and pins are outside the product for reduced corrosion
- Available in a wide range of materials

Reference FSD243

## ISC2-BX

Single metal bellows seals



### Equipment Type

- General purpose ASME, ISO, JIS pumps

### Operating Parameters

Pressure	up to 13.8 bar (200 psi)
Temperature	-40 to 204°C (400°F)
Speed	up to 23 m/s (75 fps)
Shaft Sizes	25 to 95 mm (1.000 to 3.750 inch)

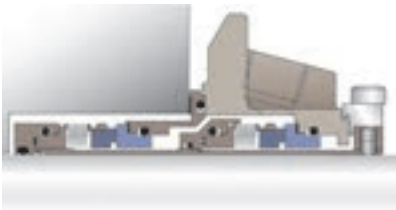
### Features

- Single cartridge metal bellows seals
- Applied in a wide variety of general purpose industrial applications and equipment
- Thermal management technology helps the seal run cooler and tolerate dry running events
- Edge-welded bellows of Alloy C-276 metallurgy are well suited for a wide range of chemical environments
- Metals bellows maintain excellent seal face loading without hanging up due to solids build-up
- Throttle bushing provides safe containment in the unlikely event of a seal failure
- Available in a wide range of materials

Reference FSD243

## ISC2-BB

Dual metal bellows seals



### Equipment Type

- General purpose ASME, ISO, JIS pumps

### Operating Parameters

Pressure	up to 13.8 bar (200 psi)
Temperature	-40 to 204°C (400°F)
Speed	up to 23 m/s (75 fps)
Shaft Sizes	25 to 95 mm (1.000 to 3.750 inch)

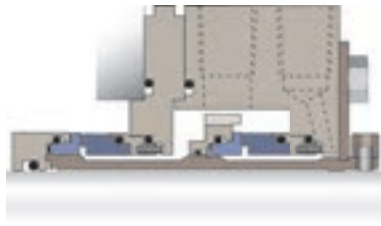
### Features

- Dual cartridge metal bellows seals
- Applied in a wide variety of general purpose industrial applications and equipment
- Advanced design volute groove significantly increases barrier fluid flow to promote cool running
- The seal arrangements are tandem and double balanced to allow both pressurized and unpressurized operation
- Edge-welded bellows of Alloy C-276 metallurgy are well suited for a wide range of chemical environments
- Available in a wide range of materials

Reference FSD243

## ISC2-682

ISC2 seals compliant to API 682



### Equipment Type

- API 610 or ASME enlarged bore pumps

### Operating Parameters

Pressure	
pusher	up to 20.6 bar (300 psi)
bellows	up to 13.8 bar (200 psi)
Temperature	-40 to 204°C (400°F)
Speed	up to 23 m/s (75 fps)
Shaft Sizes	
pusher	25 to 200 mm (1.000 to 8.000 inch)
bellows	25 to 95 mm (1.000 to 3.750 inch)

### Features

- Seals satisfy all API 682 design and qualification test requirements
- Configurable as either Type A pusher seal or Type B metal bellows seal to suit specific applications
- Available in all API 682 standard arrangements including single, dual unpressurized and dual pressurized
- Designs are built on ISC2 seal basic components, sharing the benefits of thermal management technology, volute groove design and Alloy C-276 bellows
- Built for general duty refinery and chemical plant services

Reference FSD243

## ISC2-MW

Dual pusher seal for mixer service



### Equipment Type

- Mixers

### Operating Parameters

Pressure	up to 6.9 bar (100 psi)
Temperature	-40 to 204°C (400°F)
Speed	up to 1.1 m/s (3.5 fps)
Shaft Sizes	25 to 200 mm (1.000 to 8.000 inch)

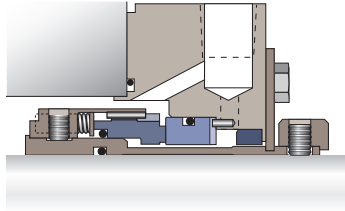
### Features

- Economical cartridge seal for top entry installations
- Dual wet design
- Thermal management technology helps the seal run cooler and tolerate dry running events
- 1.14 mm (0.045 inch) TIR on sizes up to 89 mm (3.500 inch) shaft size
- 1.52 mm (0.060 inch) TIR on sizes greater than 89 mm (3.500 inch) shaft size
- Volute groove significantly increases barrier fluid flow to promote cool running even at mixer speeds



**QB**

General purpose pusher seals



**Equipment Type**

- Pumps, including API 610

**Operating Parameters**

Pressure up to 51.7 bar (750 psi)  
 Temperature -40 to 204°C (400°F)  
 Speed up to 23 m/s (75 fps)  
 Shaft Sizes 12.7 to 139.7 mm  
 (0.500 to 5.500 inch)

**Features**

- General industry single, balanced, multi-spring, pusher seal
- Welded keys drive rotating seal face providing robustness to high torque scenarios
- A wide range of available features enable improved performance in challenging applications
- Choice of throttle bushing design: fixed, floating, segmented

**Other Configurations**

**QBQ**

- Standard API 682 Arrangement 1 Type A seal
- High balance seal face design for low emissions. Faces designed to suppress flashing and minimize heat generation in hydrocarbon applications

**QBS**

- Single spring design provides the highest resistance to clogging and corrosion

**QBU**

- Grooved face option designed for hot water applications where cooling water is not available

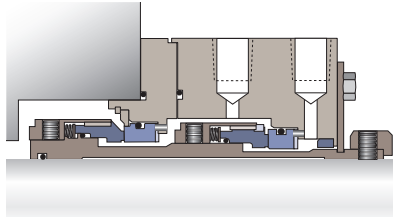
**QBR**

- Reverse configuration with stationary flexible element. Standard hydraulic decoking jet pump seal

Reference FSD152, FSD175

**QBB/QB**

Dual pressurized pusher seals capable of zero emissions



**Equipment Type**

- Pumps, including API 610

**Operating Parameters**

Pressure up to 51.7 bar (750 psi)  
 Temperature -40 to 204°C (400°F)  
 Speed up to 23 m/s (75 fps)  
 Shaft Sizes 20 to 127 mm  
 (0.787 to 5.000 inch)

**Features**

- Standard API 682 Arrangement 3 Type A seal for pressurized barrier configurations
- Extremely robust to reverse pressurization with reverse pressure handling capabilities that far exceed conventional balanced seals
- Seal face geometry enables use of face to back configuration which is preferred in many dual seal applications
- Integral pumping ring

**Other Configurations**

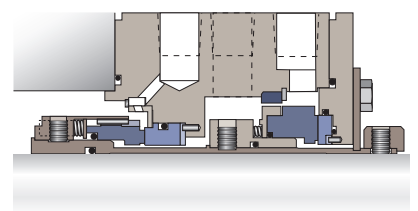
**QBQ/QBQ**

- Standard API 682 Arrangement 2 Type A seal for use with a liquid buffer fluid
- High balance low emissions for hydrocarbon down to 0.45 specific gravity

Reference FSD152

**QBQ LZ/GSL**

Dual unpressurized pusher seals with containment seals



**Equipment Type**

- Pumps, including API 610

**Operating Parameters**

Pressure up to 51.7 bar (750 psi)  
 Temperature -40 to 204°C (400°F)  
 Speed 6.1 to 23 m/s (20 to 75 fps)  
 Shaft Sizes 20 to 116 mm  
 (0.787 to 4.567 inch)

**Features**

- API 682 Arrangement 2 Type A seal for use with a buffer gas
- Specially designed for light hydrocarbons at low vapor pressure margin
- Precision face topography combats vaporization by increasing fluid pressure between the seal faces and reducing heat generation
- Specific gravities between 0.4 and 0.6
- Dry-running lift-off containment seal provides near zero emissions and safety backup

**Other Configurations**

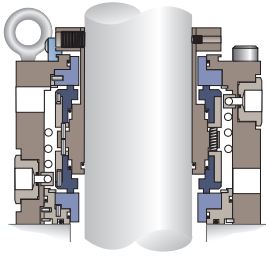
**QBQ LZ/QBQ**

- API 682 Arrangement 2 Type A seal for use with a liquid buffer fluid

Reference FSD216, FSD143

## MW-200

Top entry, wet mixer seals



### Equipment Type

- Mixers, agitators, filters, filter dryers

### Operating Parameters

Pressure vacuum to 35 bar (500 psi)

Temperature -40 to 200°C (390°F)

Speed up to 4 m/s (13 fps)

Shaft Sizes 40 to 220 mm  
(1.575 to 9.000 inch)

### Features

- Liquid lubricated seal
- Product side seal has reverse pressure capability
- Balanced dual pressurized seal
- Cooling coil options for higher temperatures available
- Cooling flange for higher temperatures up to 300°C (570°F) available
- Available with or without bearing
- Designed for steel or glass lined vessels
- Optional materials compliant with FDA CFR 21, USP Class VI, ADI Free Components and similar specifications

### Other Configurations

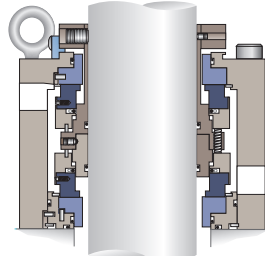
#### MW-200 DIN

- Dimensions and flange connections to DIN for steel or glass lined flanges
- With or without bearing

Reference FSD104

## ML-200

Top entry, lift-off mixer seals



### Equipment Type

- Mixers, agitators, filters, filter dryers

### Operating Parameters

Pressure vacuum to 6.7 bar (100 psi)

Temperature -40 to 200°C (390°F)

Speed up to 10 m/s (33 fps)

Shaft Sizes 40 to 220 mm  
(1.575 to 9.000 inch)

### Features

- Noncontacting, lift-off gas barrier seal
- Advanced lift-off technology avoids wear from seal face contact
- Barrier leakage does not affect product quality
- Low drag design for the dynamic O-ring (no hang-up)
- Operates with a simple gas barrier support system
- Optional with or without bearing
- Cooling flange for higher temperatures up to 300°C (570°F) available
- Sanitary gland option for sterilization purposes
- Available for steel or glass lined vessels
- Optional materials compliant with FDA CFR 21, USP Class VI, ADI Free Components and similar specifications

### Other Configurations

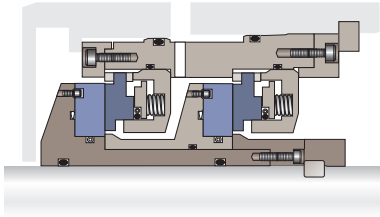
#### ML-200 DIN

- Dimensions and flange connections to DIN for steel or glass lined flanges
- With or without bearing

Reference FSD104

## Gaspac T

Tandem compressor seals



### Equipment Type

- Compressors

### Operating Parameters

Pressure	up to 425 bar (6160 psi)
Temperature	-100 to 230°C (-150 to 450°F)
Speed	1 to 250 m/s (3 to 820 fps)
Shaft Sizes	40 to 360 mm (1.500 to 14.125 inch)

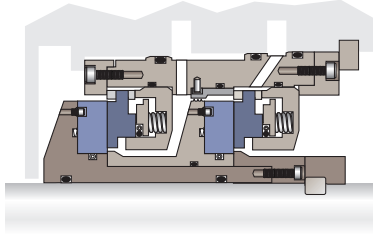
### Features

- Tandem arrangement cartridge seal
- Both inboard and outboard seals have full product pressure capability
- Outboard seal normally operates under low pressure. In the event of an inboard seal failure, the outboard seal acts as an installed spare
- Process gas has controlled leakage across both sets of seal faces
- Choice between T-Groove face geometry for bidirectional rotation or Advanced Pattern Groove for unidirectional rotation
- Seal faces are noncontacting from slow roll up to the highest speeds
- Spring energized O-ring provides low drag for excellent seal face tracking
- Optional PTFE dynamic sealing element extends the temperature range and chemical resistance
- Standardized inboard and outboard seal parts for easy interchangeability
- Higher pressures and larger sizes available on request

Reference FSD113

## Gaspac L

Tandem seal with interstage labyrinth



### Equipment Type

- Compressors

### Operating Parameters

Pressure	up to 425 bar (6160 psi)
Temperature	-100 to 230°C (-150 to 450°F)
Speed	1 to 250 m/s (3 to 820 fps)
Shaft Sizes	40 to 360 mm (1.500 to 14.125 inch)

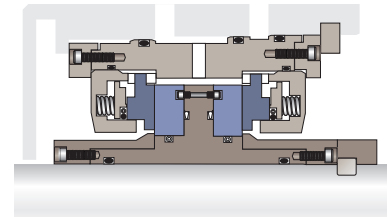
### Features

- Interstage labyrinth keeps process gas from migrating to outboard seal faces
- Eliminate process leakage gas to atmosphere with interstage purge
- Both inboard and outboard seals have full product pressure capability
- Outboard seal acts as an installed spare with full pressure capability
- Choice between T-Groove face geometry for bidirectional rotation or Advanced Pattern Groove for unidirectional rotation
- Seal faces are noncontacting from slow roll up to the highest speeds
- Spring energized O-ring provides low drag for excellent seal face tracking
- Optional PTFE dynamic sealing element extends the temperature range and chemical resistance
- Standardized inboard and outboard seal parts for easy interchangeability
- Higher pressures and larger sizes available on request

Reference FSD113

## Gaspac D

Double compressor seals



### Equipment Type

- Compressors

### Operating Parameters

Pressure	up to 60 bar (870 psi)
Temperature	-100 to 200°C (-150 to 400°F)
Speed	1 to 140 m/s (3 to 460 fps)
Shaft Sizes	40 to 360 mm (1.500 to 14.125 inch)

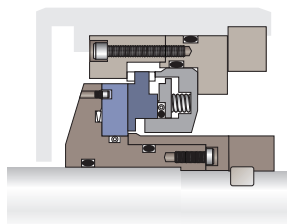
### Features

- Dual pressurized opposed arrangement seal configuration
- Inboard and outboard seals run at barrier pressure set higher than the process pressure
- For toxic and/or flammable process gases where zero process emissions are required
- For process gas contaminated with particles
- For very low pressure applications where a tandem seal can not be used
- Choice between T-Groove face geometry for bidirectional rotation or Advanced Pattern Groove for unidirectional rotation
- Seal faces are noncontacting from slow roll up to the highest speeds
- Spring energized O-ring provides low drag for excellent seal face tracking
- Optional PTFE dynamic sealing element extends the temperature range and chemical resistance
- Standardized inboard and outboard seal parts for easy interchangeability
- Higher pressures and larger sizes available on request

Reference FSD113

## Gaspac S

Single compressor seals



### Equipment Type

- Compressors

### Operating Parameters

Pressure up to 250 bar (3600 psi)

Temperature -100 to 230°C  
(-150 to 450°F)

Speed 1 to 250 m/s (3 to 820 fps)

Shaft Sizes 40 to 360 mm  
(1.500 to 14.125 inch)

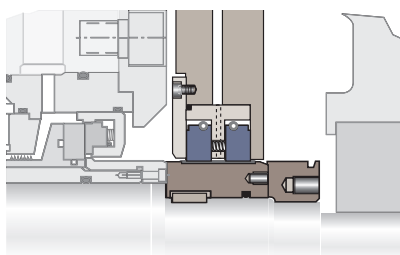
### Features

- Single cartridge seal with controlled process gas leakage to the atmosphere
- For clean applications where the gas sealed is neither flammable nor harmful to the atmosphere
- Circpac or labyrinth seals may be integrated to reduce the amount of process leakage
- Choice between T-Groove face geometry for bidirectional rotation or Advanced Pattern Groove for unidirectional rotation
- Seal faces are noncontacting from slow roll up to the highest speeds
- Spring energized O-ring provides low drag for excellent seal face tracking
- Optional PTFE dynamic sealing element extends the temperature range and chemical resistance
- Higher pressures and larger sizes available on request

Reference FSD113

## Circpac CB

Carbon ring seals



### Equipment Type

- Compressors

### Operating Parameters

Pressure up to 5 bar (70 psi)

Temperature -40 to 80°C (180°F)

Speed up to 140 m/s (460 fps)

Shaft Sizes 40 to 360 mm  
(1.500 to 14.125 inch)

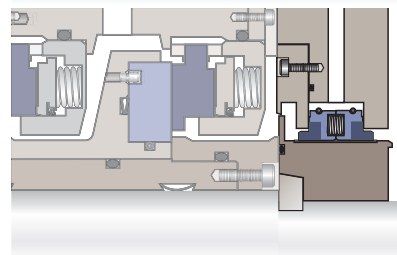
### Features

- Carbon ring seals for continuous noncontacting operation and no wear
- Helps protect the Gaspac seal from bearing oil mist
- Applied to the front of a Gaspac seal, works to separate process gas from the Gaspac seal
- Designed to prevent process gas leakage into the bearing oil
- Bidirectional design handles reverse rotation which means less spare parts inventory
- No dewpoint limitation for separation gas
- High operational safety and reliability

Reference FSD113

## Circpac LO

Carbon ring seals



### Equipment Type

- Compressors

### Operating Parameters

Pressure up to 5 bar (70 psi)

Temperature -40 to 140°C (-40 to 280°F)

Speed up to 140 m/s (460 fps)

Shaft Sizes 40 to 360 mm  
(1.500 to 14.125 inch)

### Features

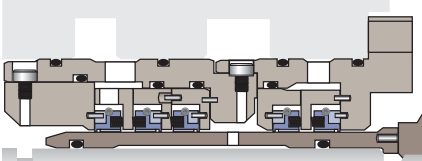
- Balanced floating carbon ring design
- Bidirectional T-Groove technology on the inside diameter provides noncontacting operation and no wear
- Helps protect the Gaspac seal from bearing oil mist
- Helps prevent process gas leakage from entering the bearing oil chamber
- Precision mortise joint design provides low joint bypass leakage
- Minimized clearance for low gas consumption
- Same gas consumption under static and dynamic conditions
- No dewpoint limitation for separation gas

Reference FSD113



**Circpac HP**

Carbon ring seals

**Equipment Type**

- Compressors

**Operating Parameters**

Pressure up to 10 bar (145 psi)

Temperature -40 to 180°C (350°F)

Speed up to 90 m/s (300 fps)

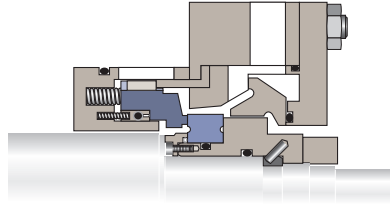
Shaft Sizes 25 to 280 mm  
(1.000 to 11.000 inch)**Features**

- Carbon ring seals for stand alone operation
- Cost effective sealing solution for low pressure applications where the very low leakage of a conventional gas seal is not required
- Any ring combination can be arranged in a Circpac seal to meet specific application requirements
- Additional features such as labyrinths, face seals, pressure sensing ports and purge/vent/drain ports are available

Reference FSD113

**Turbopac 378**

Turbo compressor seals

**Equipment Type**

- Compressors

**Operating Parameters**

Pressure up to 100 bar (1450 psi)

Temperature -40 to 180°C (360°F)

Speed up to 90 m/s (300 fps)

Shaft Sizes 40 to 260 mm  
(1.500 to 10.250 inch)**Features**

- Balanced single or dual seal
- Bidirectional seal face technology
- Designed for optimized operational safety and reliability for higher speed and pressure applications
- Non-rotating spring assembly for higher rotational speed
- Reverse pressure capability
- Cartridge design available for easy installation
- Solid stationary face
- Optimized heat transfer
- Handles emergency shut downs
- Available in face to face arrangement

**Other Configurations****Turbopac 2100**

- Dual pressurized seal for high pressure applications up to 100 m/s (330 fps) and 300 bar (4350 psi)

Reference FSD113

**Supplypac™**

Dry gas seal support system

**Equipment Type**

- Compressors

**Operating Parameters**

Pressure up to 413.6 bar (6000 psi)

Temperature up to 204°C (400°F)

**Features**

- Eliminates NDE required with welded systems
- Enhanced safety over welded systems
- Shortened delivery cycles through reduction in engineering, manufacturing and assembly time
- Flexible, modular design, key for offshore installations with space limitations
- Accommodates bolt-on seal gas conditioning equipment whether added at the factory or in the field
- Allows for individual component packaging and shipping to accommodate field assembly

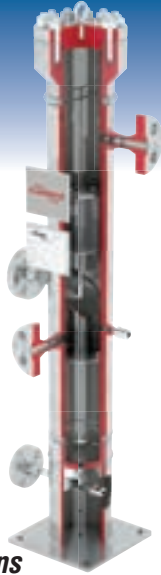
**Design Specifications**

- Meets API 614 design criteria and is ASME B31.3 certified
- Utilizes proprietary Flowserve flanges
- Effective bore comparable to 1 inch XXS pipe
- Flow paths are scalable for lower pressure, larger bore, and higher flow rates
- Materials: 316/316L stainless steel, monel, and others as required
- Gaskets: FKM, FFKM, PTFE, RTJ, spiral wound
- Industry standard material certification available for components

Reference FSD113

## Cleanpac™ D

Liquid removal system



### Equipment Type

- Compressors

### Design Specifications

Type of filtration	Bulk liquid removal
Bulk liquid removal	Plate / mesh pad
Efficiency	10µ particles @ 99%
Maximum flow rate	622 ALM (22 ACFM)
Lower chamber liquid holding capacity	5 liter (1.3 gallon)
Maximum design pressure	350 bar (5076 psi)
Maximum design temperature	204°C (400°F)

### Features

- Largest single purpose liquid removal vessel in the Flowserve inventory
- Incorporates dual stage technology to insure maximum efficiency
- Mesh pad removes large particles (>10 µm) and coalesces fine mists and liquids that are entrained within the gas stream

### Other Configurations

#### Cleanpac DC

- Employs all of the liquid removal capabilities of the Cleanpac D in a highly compact design

Reference FSD113

## Cleanpac™ F

Pre-filter



### Equipment Type

- Compressors

### Design Specifications

Type of filtration	Coalescing
Bulk liquid removal	Vane pack
Efficiency	0.3µ Absolute
Maximum flow rate	622 ALM (22 ACFM)
Lower chamber liquid holding capacity	3.5 liter (0.9 gallon)
Upper chamber liquid holding capacity	2.6 liter (0.68 gallon)
Maximum design pressure	350 bar (5076 psi)
Maximum design temperature	204°C (400°F)

### Features

- Dual stage liquid knockout and fine particulate filter
- Benefits of a pre-filter liquid removal system and a final coalescing filter in one complete package
- Larger coalescing element allows for extended operational periods between change-outs or accommodates extremely high levels of particulate contamination

Reference FSD113

## Cleanpac™ DL

Single and dual coalescing filters



### Equipment Type

- Compressors

### Design Specifications

Type of filtration	Coalescing
Efficiency	0.3µ Absolute
Maximum flow rate	368 ALM (13 ACFM)
Lower chamber liquid holding capacity	0.213 liter (0.05 gallon)
Maximum design pressure	350 bar (5076 psi)
Maximum design temperature	204°C (400 °F)

### Features

- A general service coalescing filter assembly designed to protect dry gas seals and other sensitive equipment from particles and fine liquid mists
- The simple design is focused on the safety of continuous flow and ease of use
- Can be configured in single, dual arrangements (with or without transfer valve) and in a double block and bleed arrangement
- With the addition of actuated transfer valves the versatility of the Cleanpac DL is expanded to include utilization in unmanned stations
- The typical application of the Cleanpac DL is a combination of the transfer valve and two single housings, creating an assembly that is reliable and effective

Reference FSD113

## Ampliflow™

Ensures adequate supply of clean, filtered gas



### Equipment Type

- Compressors

### Operating Parameters

Pressure up to 345 bar (5000 psi)

Temperature up to 200°C (400°F)

### Design Specifications

Materials of construction Marine grade aluminum or stainless steel

End connections NPT, flanged or butt weld

Booster drive media Air, N<sub>2</sub> or clean process gas

### Features

- Helps ensure that an adequate supply of clean, filtered gas is provided to the seals during periods of low differential across the compressor
- Can be configured as a portable unit, a stand alone panel or integrated with a Flowserve dry gas seal control panel or a Flowserve filter gas conditioning panel

Reference FSD113

## Drypac™

Gas dryer



### Equipment Type

- Compressors

### Features

- Reduce the potential of liquid formation between the seal faces by lowering the dew point of the gas and raising the temperature of the seal supply gas at least 20°C (36°F) above the dew point as recommended by API standards
- Helps increase the MTBF of dry gas seals when the dew point of the gas is a potential issue
- Simplified installation, operation and maintenance
- Can be integrated with an existing gas seal control panel

Reference FSD113

## N2 Genpac™

Nitrogen generator



### Equipment Type

- Compressors

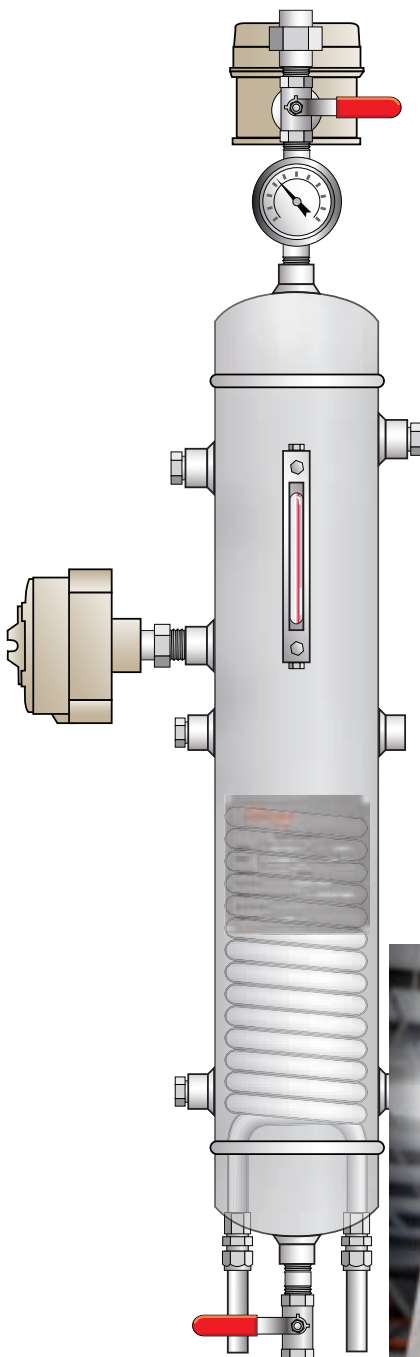
### Features

- Generates nitrogen gas from compressed air in hazardous conditions or remote locations
- Each unit provides dual parallel filtration for nitrogen flow without interruption
- Designed as an independent system and can also be integrated with the Flowserve Dry Gas Seal Panel or Flowserve Cleanpac™ and Drypac™ gas conditioning system
- Nitrogen purities between 97% and 99%
- Oxygen analyzer available
- Monitored filter performance with differential pressure indicating transmitters and inlet/outlet pressure gauges
- Designed for ease of maintenance
- Stainless steel and aluminum designs

Reference FSD113

## Seal Support Systems

Fluid control over the sealing environment is very important to achieve effective and dependable sealing performance. Seal support systems are used to create that favorable environment around the mechanical seal. The appropriate selection of a seal support system will deliver years of reliable service and operating cost savings.



Single seals running in hot environments or with little vapor pressure margin may require extra cooling to remove seal face heat and avoid product vaporization between the seal faces.

Pressurized and unpressurized dual seals require a barrier fluid at the correct pressure, flow, temperature and level to ensure proper functioning of the seals. This requires reservoirs, Plan 53B, Plan 53C systems and pressurizers. Gas barrier seals need gas supply panels for reliable performance.

Flowserve employs a specialized engineering team with years of experience and knowledge designing and selecting seal support systems to suit specific applications, specifications, and unique customer requirements. With a full range of products that meet ASME, API, PED, ISO, and NR13 design criteria, Flowserve addresses the global needs of the oil and gas, petrochemical, chemical, power, pharmaceutical, pulp and paper, and general industries.



## Buffer/Isolating Gas Control Panel

Plan 72/74



### Operating parameters

Pressure up to 34.4 bar (500 psi)  
Temperature up to 93°C (200°F)  
Flow rate up to 14.2 L/min (30 SCFH)

### Features

- The buffer/isolating gas control panel has integrated the flow monitoring element and control element in one independent and easy-to-use device
- Applicable to Flowserve seals with or without pressure
- Buffer control panel has provided double seal with gas purging system, the leakage of purging machine will flow to recovery system
- Isolating gas control panel has provided a gas system with a pressure higher than the side processing pressure for double seal. Therefore, only a few amount of gas will be leaked to processing system, and no processing gas will be leaked to atmosphere
- Conform to design standard of API 682, ASME B 31.3 and PED
- Flowserve also provides control system for other configurations with simple standardized design or complicated customized design



## Mechanical Seal Piping Plans

Flowserve recognizes that one of the most effective ways to achieve long, uninterrupted mechanical seal life is to create a healthy environment around the seal faces. Piping plans help keep mechanical seals running cool and clean, promote safe handling of dangerous fluids, and extend the operational availability of rotating equipment. The following pages provide a concise summary of the most essential piping plans used successfully in today's process plants.

Each plan shows all the standard and optional components referenced in API 682 and recommended by Flowserve. Consult your local Flowserve sales engineer to identify the right solution that satisfies your application requirements.

### Good Piping Practices

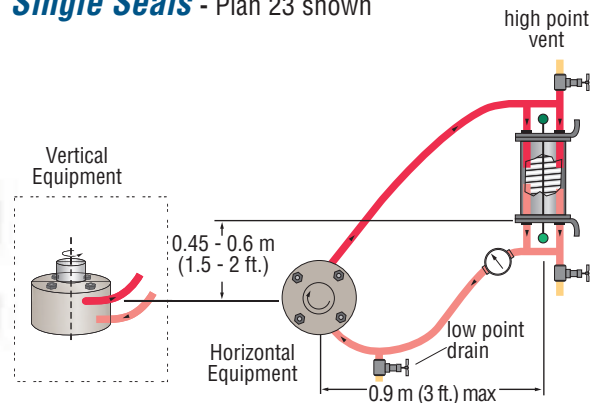
Pipe size should be selected in relation to the seal size and cooling requirements. A minimum of 0.500 NPS should be used in general services and at least 0.750 NPS for API or heavy duty seals. Pipe runs should be sloped for proper venting and draining, making sure the entire loop (including the seal gland) does not include vapor traps. Vertical pumps require special attention to achieve proper venting.

Piping should be as short as possible to avoid high pipe friction losses, especially with higher viscosity barrier liquids such as oils. Sharp radius bends and gate valves in the loop must be avoided. The top of the seal gland should contain the flow outlet, while the inlet should be at the bottom or lower than the outlet.

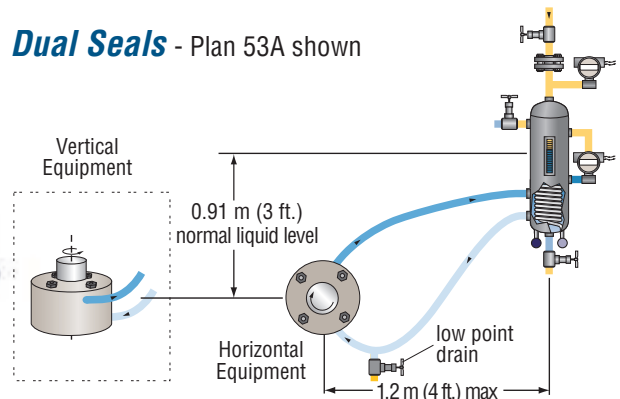
Reference FTA160



### Single Seals - Plan 23 shown



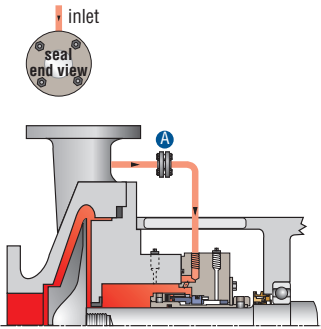
### Dual Seals - Plan 53A shown



### Plan 11

Seal flush from pump discharge through orifice.

Default single seal flush plan.

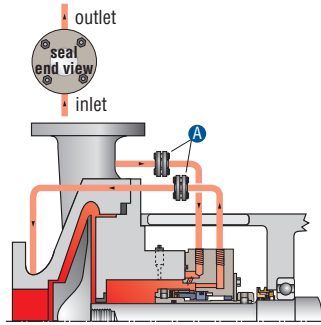


A - orifice

### Plan 14

Seal flush from pump discharge and recirculation to pump suction with orifices.

Combination of Plan 11 and Plan 13.

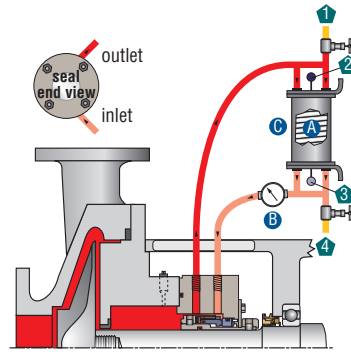


A - orifice

### Plan 23

Seal flush from internal pumping device through cooler.

Standard flush plan in hot water services.

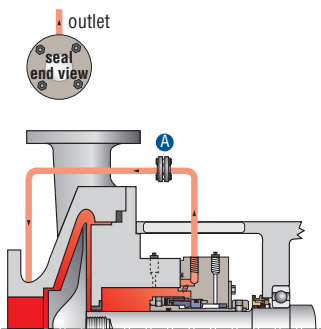


- A - cooling coils
- B - temperature indicator
- C - cooler
- 1 - vent, normally closed
- 2 - cooling out
- 3 - cooling in
- 4 - drain, normally closed

### Plan 13

Recirculation from seal chamber to pump suction through orifice.

Standard flush plan on vertical pumps.

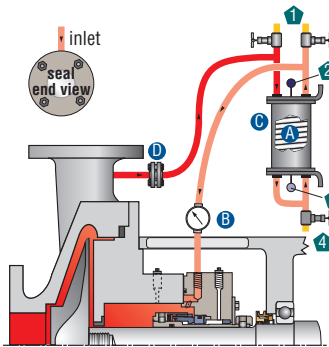


A - orifice

### Plan 21

Seal flush from pump discharge through orifice and cooler.

Cooler added to Plan 11 flush increases heat removal.

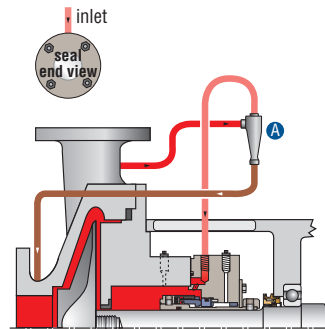


- A - cooling coils
- B - temperature indicator
- C - cooler
- D - orifice
- 1 - vents, normally closed
- 2 - cooling out
- 3 - cooling in
- 4 - drain, normally closed

### Plan 31

Seal flush from pump discharge through cyclone separator.

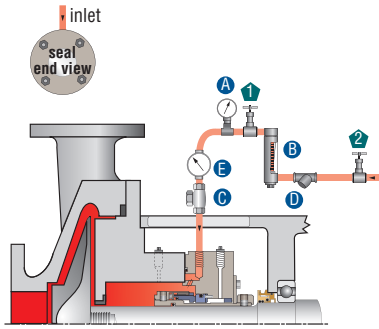
Centrifuged solids are returned to pump suction.



A - cyclone separator

### Plan 32

Seal flush from an external clean source.

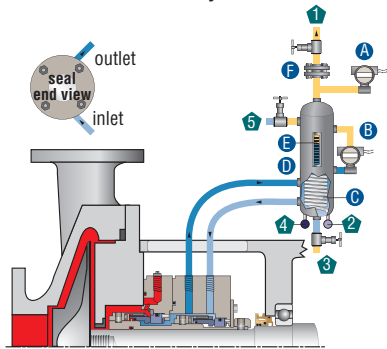


- A - pressure indicator
- B - flow indicator (optional)
- C - check valve
- D - strainer
- E - temperature indicator (optional)
- 1 - flow control valve
- 2 - from clean source, normally open

### Plan 52

Unpressurized buffer fluid circulation through reservoir.

Fluid is circulated by a pumping ring in the dual seal assembly.

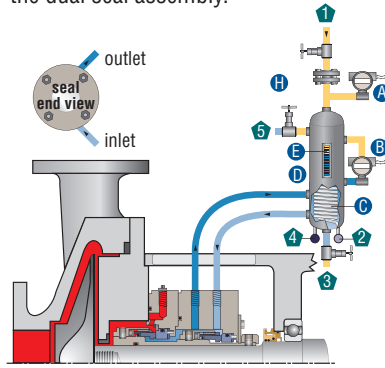


- A - pressure transmitter
- B - level transmitter
- C - cooling coils
- D - reservoir
- E - level indicator
- F - orifice
- 1 - vent, normally open
- 2 - cooling in
- 3 - drain, normally closed
- 4 - cooling out
- 5 - liquid fill, normally closed

### Plan 53A

Pressurized barrier fluid circulation through reservoir.

Fluid is circulated by a pumping ring in the dual seal assembly.

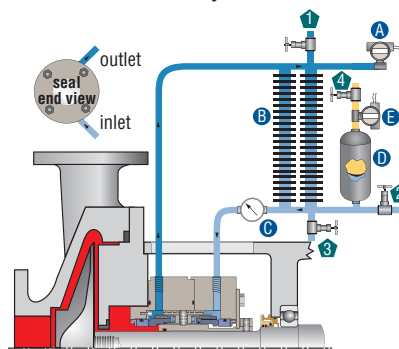


- A - pressure transmitter
- B - level transmitter
- C - cooling coils
- D - reservoir
- E - level indicator
- F - reservoir
- G - level indicator
- 1 - pressure source, normally open
- 2 - cooling in
- 3 - drain, normally closed
- 4 - cooling out
- 5 - liquid fill, normally closed

### Plan 53B

Pressurized barrier fluid circulation with bladder accumulator.

Fluid is circulated by a pumping ring in the dual seal assembly.

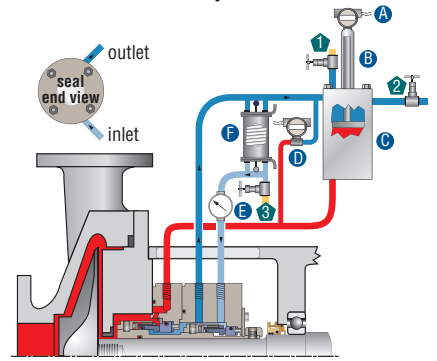


- A - pressure transmitter
- B - finned pipe (alternative reservoir)
- C - temperature indicator
- D - bladder accumulator
- E - temperature transmitter
- 1 - vent, normally closed
- 2 - liquid fill, normally closed
- 3 - drain, normally closed
- 4 - pressure source, normally closed

### Plan 53C

Pressurized barrier fluid circulation with piston accumulator.

Fluid is circulated by a pumping ring in the dual seal assembly.

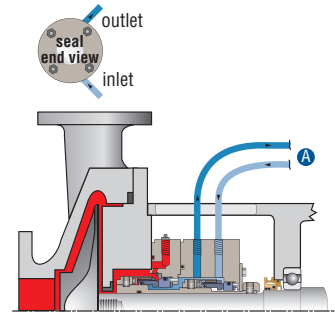


- A - level transmitter
- B - level indicator
- C - piston accumulator
- D - differential pressure transmitter
- E - temperature indicator (optional)
- F - cooler
- 1 - vent, normally closed
- 2 - liquid fill, normally closed
- 3 - drain, normally closed

### Plan 54 & 55

**Plan 54** - Pressurized barrier fluid circulation by external system.

**Plan 55** - Unpressurized barrier fluid circulation by external system.

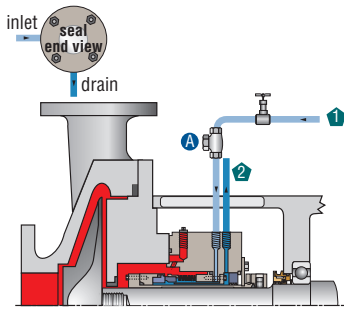


- A - from / to external circulating system

### Plan 62

External quench on atmospheric side of seal.

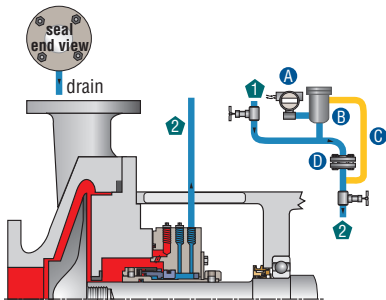
Quench fluids typically steam, nitrogen, or water.



- A - check valve
- 1 - quench, normally open
- 2 - drain, see end view for proper orientation

### Plan 65A

External drain with leakage detection on atmospheric side of seal.

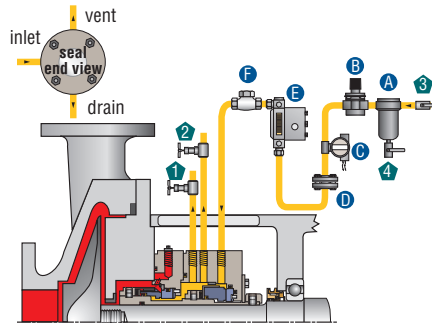


- A - level transmitter
- B - overflow chamber
- C - bypass line
- D - orifice
- 1 - block valve, normally open
- 2 - drain, normally open, see end view for proper orientation

### Plan 72

Unpressurized buffer gas control system.

Containment seal support typically with nitrogen buffer gas.

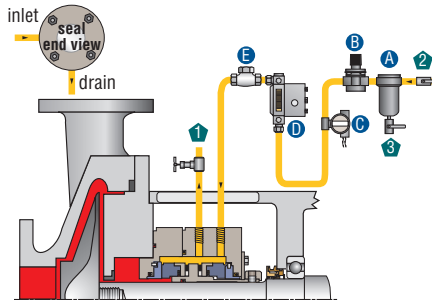


- A - coalescing filter
- B - regulator
- C - pressure indicator
- D - orifice
- E - flow transmitter
- F - check valve
- 1 - drain
- 2 - vent
- 3 - gas inlet, normally open
- 4 - filter drain, normally closed

### Plan 74

Pressurized barrier gas control system.

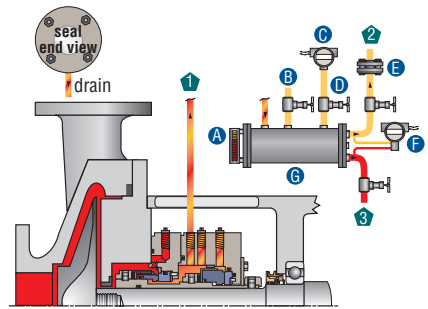
Gas seal support typically with nitrogen barrier gas.



- A - coalescing filter
- B - regulator
- C - pressure transmitter
- D - flow transmitter
- E - check valve
- 1 - drain, normally closed
- 2 - gas inlet, normally open
- 3 - filter drain, normally closed

### Plan 75

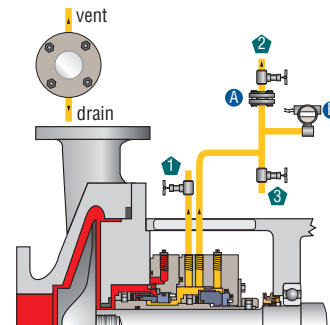
Drain from containment seal cavity to collector and vapor recovery.



- A - level indicator
- B - test connection
- C - pressure transmitter
- D - isolation valve
- E - orifice
- F - level transmitter
- G - reservoir located below seal drain port
- 1 - drain, see end view for proper orientation
- 2 - vent, normally open
- 3 - drain, normally closed

### Plan 76

Vent from containment seal cavity to vapor recovery.



- A - orifice
- B - pressure transmitter
- 1 - drain, normally closed
- 2 - vent, normally open
- 3 - drain, normally closed





## ***Global Experience, Local Service***

### ***Quick Response Centers***

Flowserve's Quick Response Centers are strategically located to ensure that a QRC is within hours of most major industrial customer locations. This allows rapid response to customer needs by providing same day delivery of standard parts. Special parts can be delivered in days instead of weeks. With the help of Flowserve QRCs, plant managers are able to maximize plant uptime and profitability.

### ***Shanghai Seal QRC***

Flowserve Seal Quick Response Center provides multiple kinds of service to maintain the reliability of mechanical seal and improve its performance:

- Clean equipment
- Seal surface lapping
- Repair and replacement of worn parts
- Parts testing and measuring equipment
- Seal testing equipment – conform to API 682 standard
- Packaging equipment

### ***Dalian Pump QRC***

Flowserve Quick Response Center can provide the following services to end users:

- On-site installation of pump, starting-up and adjustment
- On-site maintenance and overhaul of pump
- On-site midline inspection and adjustment of pump
- Upgrade and transformation of pump impeller
- Power end updating of vertical pump
- Providing various repair services and upgrading for Flowserve's mechanical seals
- Producing OEM spare parts for Flowserve pumps
- Providing test report for domestic spare parts
- Technical support





## ***Engineering and Technical Support***

Flowserve Engineering and Service Department focuses on meeting the demand of customers and provides high-quality service and support for customers anytime anywhere. This department has integrated hydraulic, mechanic and material engineering knowledge with creative solutions and devoted to provide high-quality support for customers.

Our worldwide service and maintenance center network has experience engineers and technicians; they can provide consulting service, assess failures and provide reliable solutions for customers around the clock, seven days a week.

- Oil & Gas
- Hydrocarbon Process
- Chemical Process
- Water Resources
- Power Generation
- Nuclear
- Mining
- Pulp and Paper
- General Industry

### ***Power of Experience, High-quality Commitment***

For a long time, Flowserve has provided service for industries which need excellent equipment performance and service life.







### ***Suzhou Training Center***

Training Center not only serves Flowserve staff, but also customers. By combination of creative lecturing and manual operation, the center has achieved leading training results in the industry. In lab of the training center, the trainees can fully experience the operation of pump, seal and related system in actual operation system.

Training courses include:

- Pump Fundamental/Seal Fundamental (PF/SF)
- Pump & Seal Specialist Level 2 (PSS2)
- Pumping System Analysis (PSA)
- Root Cause Analysis (RCA)
- Multi-stage Pump Repair (MPR)





### **Objectives of Pump Courses**

- Identifying and describing the design of basic centrifugal pump and hydraulics of pump system
- Identifying standard cavitation, backflow and net positive suction head (NPSH)
- Describing the acceptable operation range and recommended operation range of pump, including minimum flow rate
- Describing the design of impeller and the relation between impeller and specific speed and the inlet specific speed
- Describing the interaction of pump and system
- Describing the actual cases of pump inlet piping
- Understanding the influence of immersion depth on pump performance
- Describing the bearing designation and lubrication of pump
- Understanding how the vibration influence on performance of pump
- Understanding standards for selection of actuator

### **Objectives of Seal Courses**

- Describing seal requirements of modern rotatory shaft equipment
- Describing the basic principles and related terms of seal design and operation
- Describing the difference of single end face, dual end face, wet seal and dry running seal
- Describing the correct selection, application and operation of pump and seal, and consider the products, reliability and environmental influence in the meantime
- Describing the relation between running status and running reliability of equipment
- Describing how to change or enhance seal environment by various kinds of auxiliary purging programs
- Understanding the rationale and features of fluid so as to operate and realize the seal performance
- Understanding how to interpret the assembly drawings of seal
- Demonstrating how to install and test various kinds of seals
- Training the operators and test personnel to operate the pump correctly, identify the situations which are adverse to machine and seal safety, reliability and sustained performance







## ***A Commitment to Excellent Aftermarket Services***

As one of the world's leading manufacturers of fluid motion and control equipment, Flowserve is keenly aware that the key to customer satisfaction and loyalty is unmatched aftermarket service. To this end, Flowserve has dedicated considerable resources to addressing its customers' aftermarket needs.

Investments in well-equipped Quick Response Centers, mobile service fleets and advanced manufacturing technologies along with the unrivaled expertise of its engineers, technicians and craftsmen enable Flowserve to address virtually every service requirement for process equipment, on- or off-site, regardless of OEM.

### **Repair and Maintenance:**

- Machining and repair welding
- Piping services
- Mechanical upgrades and retrofits
- Installation and start-up
- Push-pull services
- Preventive and scheduled maintenance
- Turnkey maintenance
- Troubleshooting, equipment testing and non-destructive examination
- Supervision and project management
- Scheduled inspections and outage services





### Quality Parts, Fast

The Flowserve parts distribution network includes more than 140 stocking locations across the globe. Flowserve manufacturing centers, service centers and authorized distributors are strategically located to rapidly respond to virtually any process pump part inquiry. Through quick response programs, rapid prototyping and other innovative approaches, Flowserve is able to supply customers with the quality parts they need to keep their operations running smoothly and profitably.

### The Flowserve Quality Advantage

The use of replicated or locally machined parts can compromise mechanical integrity, hydraulic efficiency and personnel safety.

Quality parts from Flowserve offer significant benefits to customers. As an OEM, Flowserve with its engineering and manufacturing operations understands the critical

elements involved in designing and producing high-quality parts. Whether cast or machined, Flowserve manufactured parts and components result in superior performance, lower total operating costs and increased personnel safety.

- Flowserve casting quality is superior. Poor surface finish, internal shrinks, tolerance deviations and non-compliant compositions are commonly found in non-OEM parts. These result in poor hydraulic efficiency, high power consumption, premature failure and increased operating costs.
- Flowserve parts incorporate the latest design changes that are routinely implemented to improve operating efficiency and extend equipment life.
- Customers benefit from ongoing research and development of new materials, overlay techniques and mechanical and hydraulic improvements.







### ***Flowserve Suzhou Components Technology Group***

Flowserve Suzhou Components Technology Group (CTG) uses state-of-the-art 3D scanning instrument to scan the parts, generates 3D effect picture, and after comparing with the hydraulic database, optimizes and upgrades customers' products and meets the customized requirements of customers. With the support of CTG team, the customers can:

- Improve operating efficiency of products
- Improve machine operation and hydraulic performance
- Reduce maintenance frequency and improve system stability
- Reduce the operation and maintenance cost of factory



### ***From Laser Model to Finished Parts – Three Steps***



*Using the powerful laser scanning to set up digital files of rotatory equipment parts*



*Using the digital files to set up 3D model of parts*



*Transforming 3D model into a kind of man-made die for producing various kinds of metal castings*



## ***Compressor Seal Maintenance Service***

Flowserve has complete compressor seal maintenance facilities in all strategic areas around the world. All of our compressor seal testing equipment have the same configuration, so the fixture of seal testing is replaceable around the world.

### ***Completely Reliable Seal Reassembly***

Flowserve has maintenance center to provide seal cleaning and inspection service in all strategic areas around the world. Based on our quality standard, we identify the parts which shall be replaced, reassemble and conduct strict static and dynamic test. Only the seal which can meet our precise parameter requirements can leave the factory. We also have experienced gaspac seal experts to provide emergency field service and maintenance.

### ***Experience to Modify the Premature Seal Failure***

As the pioneer in turbine seal technology, Flowserve completely understands the causes for premature failure of equipment and is devoted to improve service life of your equipment. Through maintenance, we can identify the causes for seal failure and make joint effort with you to improve the service life and equipment reliability. Under many situations, our compressor seal experts can help you solve the seal failure and pollution problems, even the competitive seals.







**Suzhou**

No.26 Lisheng Road, Suzhou Industrial Park,  
Suzhou 215021, Jiangsu Province, P.R. China  
Tel: (86 512) 6255 2388  
Fax: (86 512) 6255 3702

**Shanghai**

Block B, 255 Guiqiao Road, Jinqiao  
Development Zone (Jinqiao Science Park),  
Shanghai, 201206, China  
Tel: (86 21) 3865 4800  
Fax: (86 21) 5081 1781

**Beijing**

Unit A1/A2, Hanwei Plaza, No.7 Guanghua  
Road, Chaoyang District, Beijing, 100004,  
China  
Tel: (86 10) 5921 0601  
Fax: (86 10) 6561 3863

**Dalian**

No.5-2, Fenghui Int'l Ind. Park, No. III B2,  
Dalian Free Trade Zone, Dalian, Liaoning  
Province, 116600, China  
Tel: (86 411) 3924 1919  
Fax: (86 411) 3924 1991

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***To find your local Flowserve representative:***

For more information about Flowserve Corporation, visit  
[www.flowserve.com](http://www.flowserve.com) or call +1 937 890 5839.