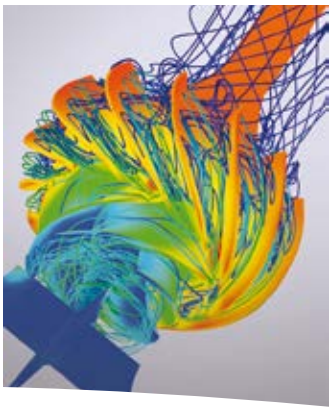
FLOWSERVE

SIHI® Multi
Modular Multistage Pumps

Experience In Motion






Pump Supplier to the World

Flowserve is the driving force in the global industrial pump marketplace. No other pump company in the world has the depth or breadth of expertise in the successful application of pre-engineered, engineered, and special purpose pumps and systems.

Life Cycle Cost Solutions

Flowserve provides pumping solutions that permit customers to reduce total life cycle costs and improve productivity, profitability and pumping system reliability.

Market-Focused Customer Support

Product and industry specialists develop effective proposals and solutions directed toward market and customer preferences. They offer technical advice and assistance throughout each stage of the product life cycle, beginning with the initial inquiry.

Broad Product Lines

Flowserve offers a wide range of complementary pump types, from pre-engineered process pumps to highly engineered and special purpose pumps and systems. Pumps are built to recognized global standards and customer specifications.

Pump designs include:
- Single-stage process
- Between bearings single-stage
- Between bearings multistage
- Vertical
- Submersible motor
- Positive displacement
- Vacuum & Compressor
- Nuclear
- Specialty

Product Brands of Distinction

ACEC™ Centrifugal Pumps

Aldrich™ Pumps

Byron Jackson® Pumps

Calder™ Energy Recovery Devices

Cameron™ Pumps

Durco® Process Pumps

Flowserve® Pumps

IDP® Pumps

INNOMAG® Sealless Pumps

Lawrence Pumps®

Niigata Worthington™ Pumps

Pacific® Pumps

Pleuger® Pumps

Scienco™ Pumps

Sier-Bath® Rotary Pumps

SIHI® Pumps

TKL™ Pumps

United Centrifugal® Pumps

Western Land Roller™ Irrigation Pumps

Wilson-Snyder® Pumps

Worthington® Pumps

Worthington Simpson™ Pumps

SIHI® Multi – Reliable under Pressure…

Design and manufacture of high quality multistage pumps for almost 100 years strengthens the ability of SIHI® to provide customer centric solutions on a global scale.

Application knowledge and consultation form the basis of optimized product selection, simple process integration, and long-term reliability.

Life-Cycle Cost understanding is fundamental to the optimization of: Power consumption; Integration; Reliability, and; Maintenance, throughout the concept-to-integration process.

Ongoing innovation underpins customer satisfaction, continual improvement, and ensures that the strong SIHI® client base benefits from the latest proven technology.

Senior-level project management, communication, and product excellence results in simple and timely integration of any engineered systems.

Customised high-quality systems range from small boiler feed skids through to extensive power-station systems complete with onerous instrumentation, FAT testing, documentation, and site commissioning.

Industries/Markets

- Bio-Energy
- Power Generation
- Water Distribution
- Steel Production
- Geo-Thermal
- Solar Energy
- Irrigation
- Bio-Fuels
- Oil Transfer
- Chemical Processing

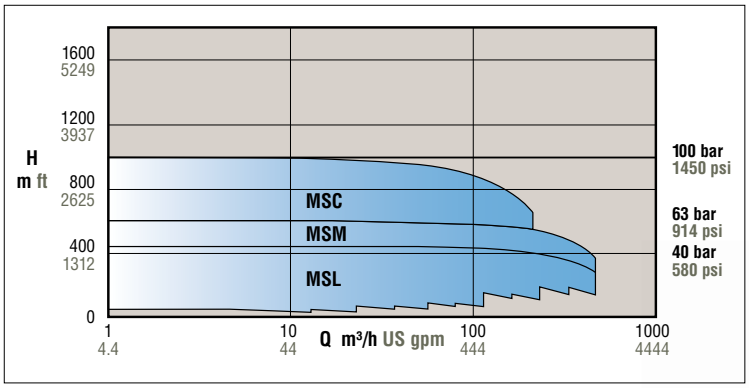
Applications

- Boiler Feed
- Pressure Boosting
- Cleaning
- De-scaling
- Cooling
- Vehicle washing
- Drainage
- District Heating
- Condensate Systems

Flexible options

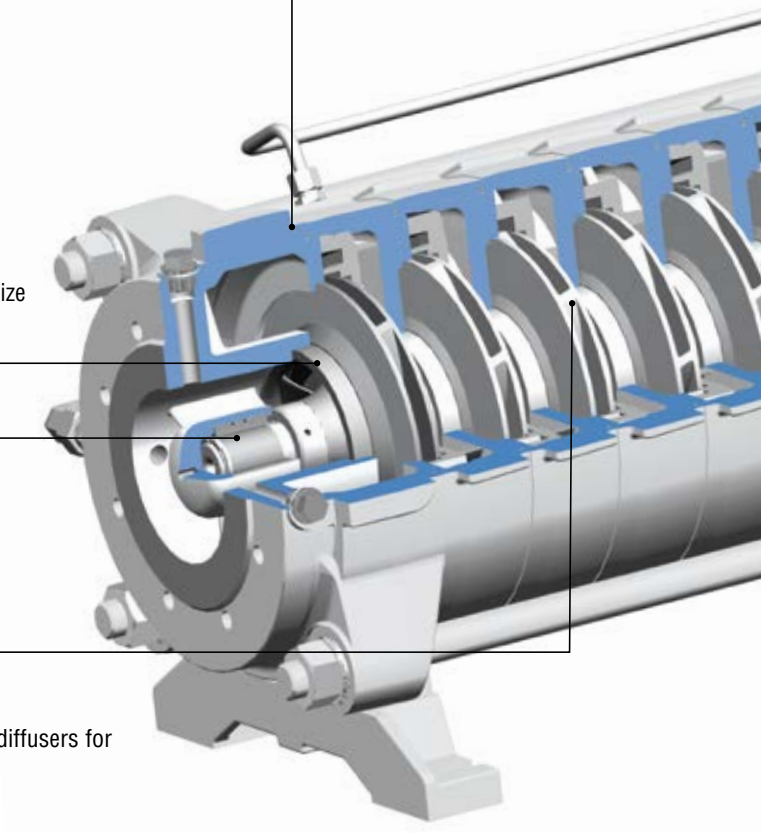
- Variable speed drive
- Condition monitoring IPS Detect
- Interstage discharge
- Mechanical sealing
- High end sealant systems
- Bypass valves
- Distributed Control System (DCS)
- ...

SIHI® Multi – Type MSL, MSM, MSC



End-suction or radial connection

- Adaptable suction flange position.



Reliability with low NPSH

- Enhanced first stage suction impeller size and geometry.

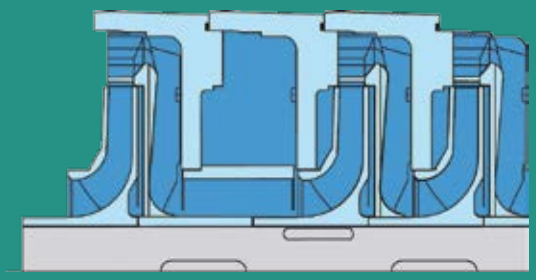
Only one shaft seal

- Self-adjusting sleeve bearing with forced product lubrication.

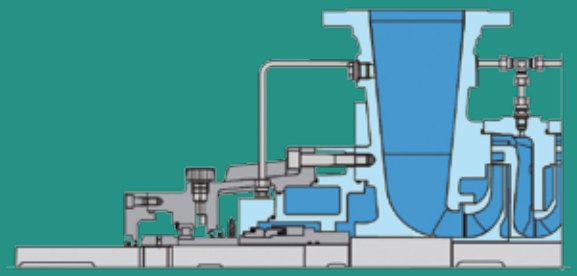
Optimum process fit

- Modular sets of impellers & diffusers for perfect duty match.

Options



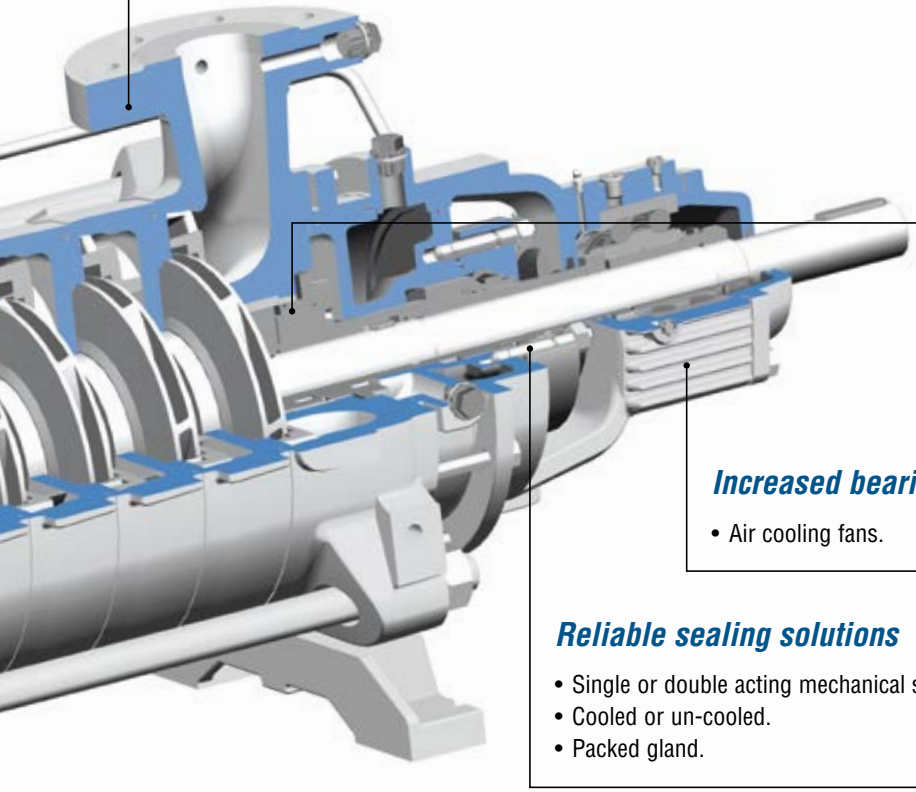
Blank Stage



In-and-Outboard Anti-Friction Bearing
(Drive-end suction side)

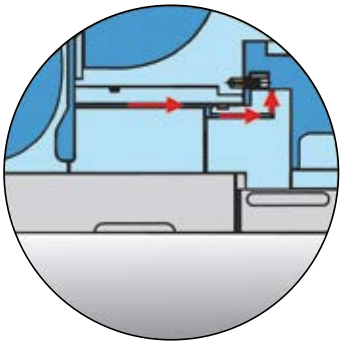
Adaptable discharge connection

- Varying radial flange positions.



Long-term premium efficiency

- Patented drum-and-disc style of axial thrust balancing.
- Reduced internal bypass flow, and associated losses.
- Long-term bypass flow regulation.
- Eliminated tight wear-sensitive clearances.



Increased bearing life time

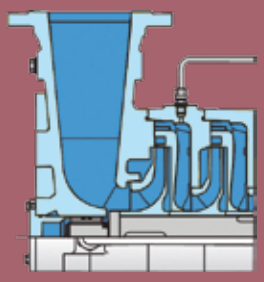
- Air cooling fans.

Reliable sealing solutions

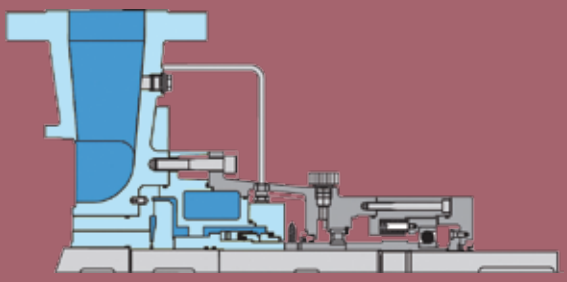
- Single or double acting mechanical seals.
- Cooled or un-cooled.
- Packed gland.

Combining the benefits of balance drum and disc… Patented by SIHI®

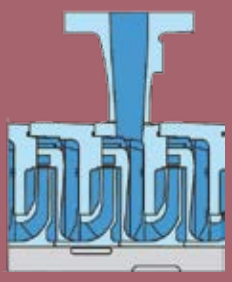
Options



Radial Inlet

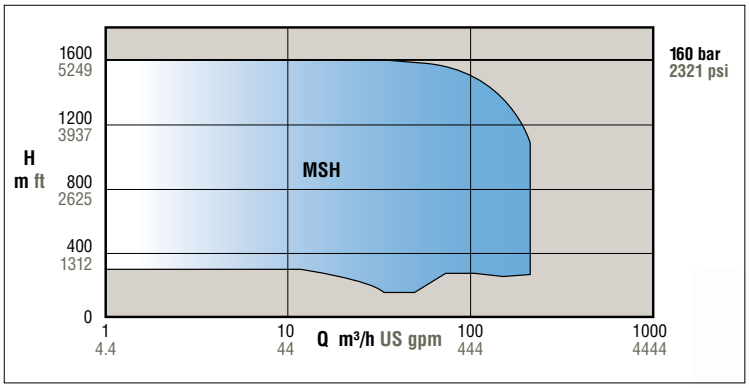


Balance Disc Lift-Off Device



Interstage Discharge

SIHI® Multi – Type MSH



End-suction or radial connection

- Adaptable suction flange position.

Reliability with low NPSH

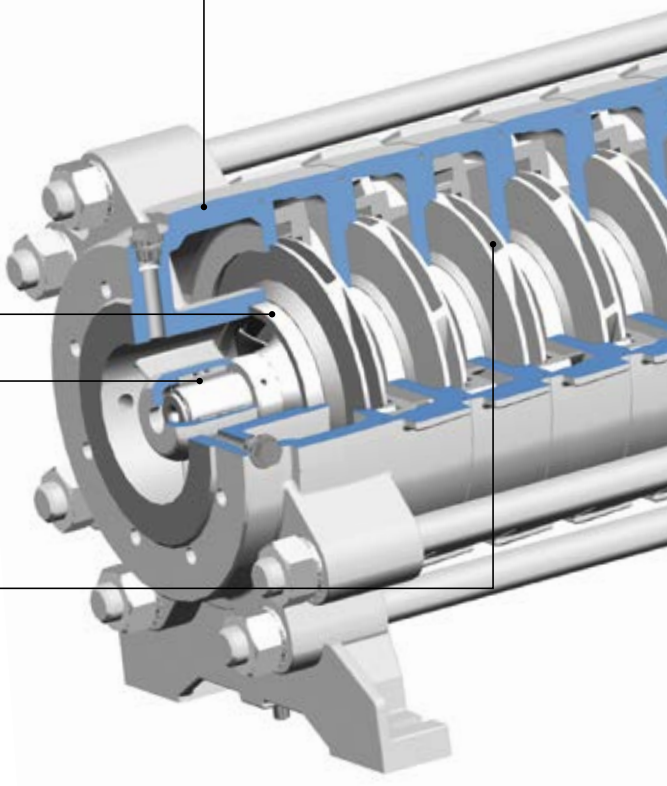
- Enhanced first stage suction impeller size and geometry.

Only one shaft seal

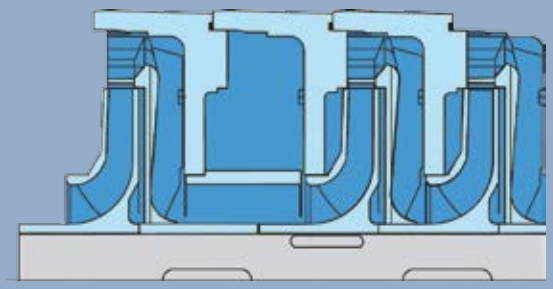
- Self-adjusting sleeve bearing with forced product lubrication.

Optimum process fit

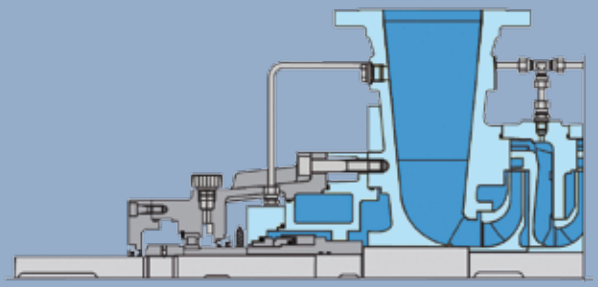
- Modular sets of impellers & diffusers for perfect duty match.



Options



Blank Stage



In-and-Outboard Anti-Friction Bearing
(Drive-end suction side)

Adaptable discharge connection

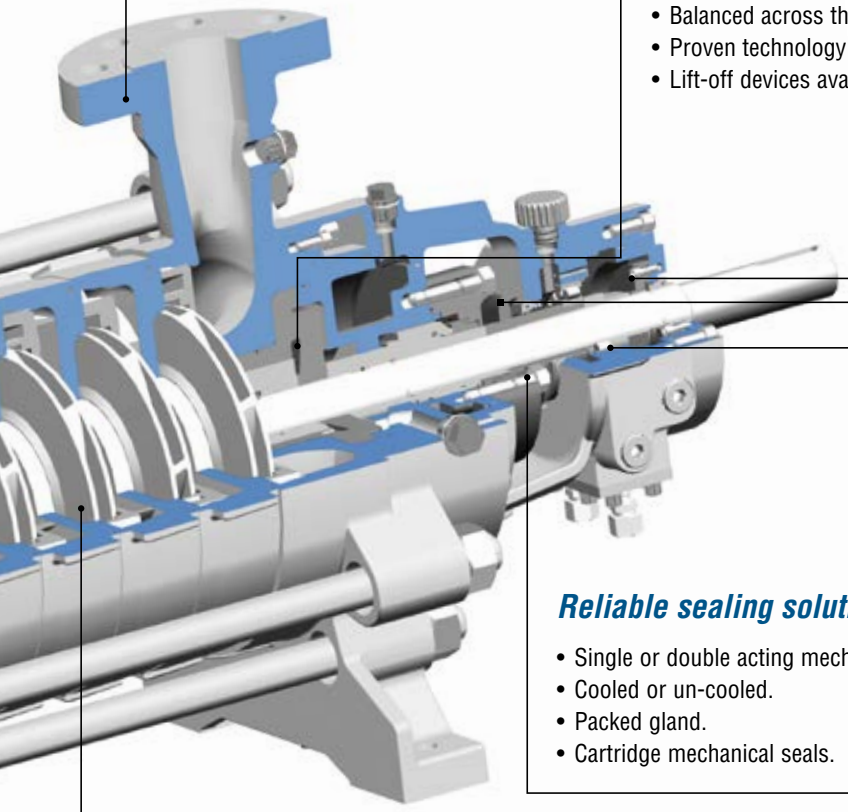
- Varying radial flange positions.

Long-term premium efficiency

- Combining drum and disc technology
- Balanced across the operating range
- Proven technology
- Lift-off devices available for frequent start-stops

Labyrinth Seals

- Bearing protection for extended life.



Extended bearing life at elevated temperatures

- Oil lubricated roller bearing.
- Labyrinth seals.

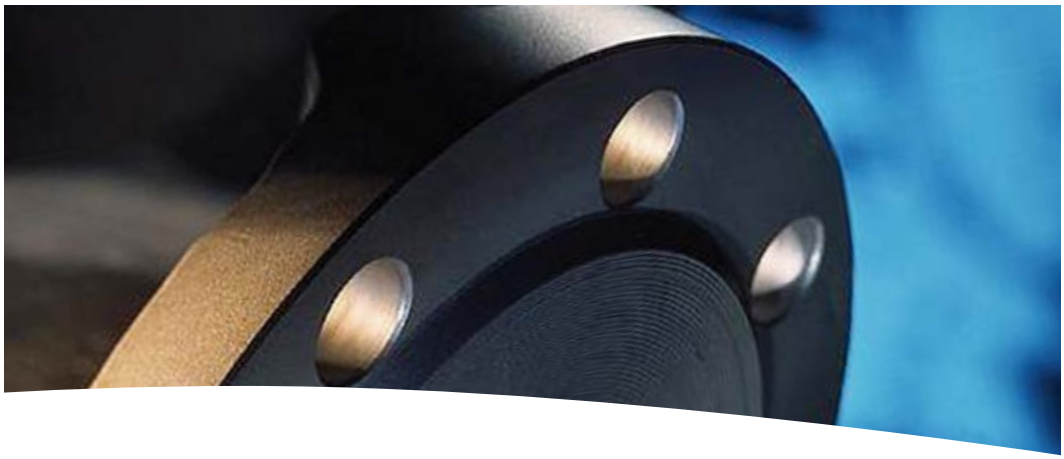
Reliable sealing solutions

- Single or double acting mechanical seals.
- Cooled or un-cooled.
- Packed gland.
- Cartridge mechanical seals.

Long-term impeller balance and smooth operation

- Extended impeller neck-journals.
- Fully machined external impeller surfaces.

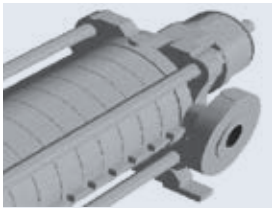
Nozzle Position
MSL, MSM, MSC, MSH



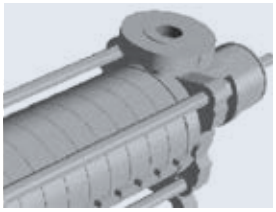
SIHI® Multi Options

Every combination of suction and discharge casing is available

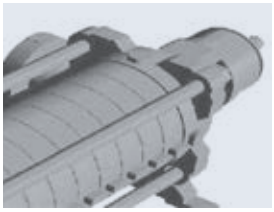
Discharge Casing



radial horizontal left



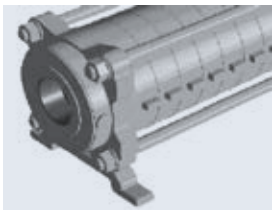
radial top



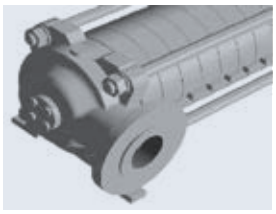
radial horizontal right

Special flow-harmonizing profile for stable NPSH

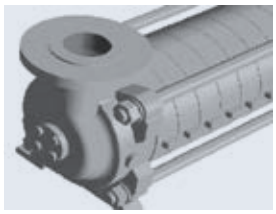
Suction Casing



axial



radial horizontal left



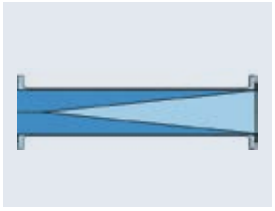
radial top

radial horizontal right

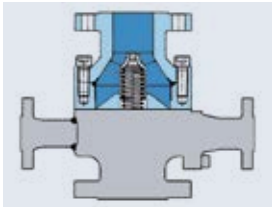
Stable NPSH

Mechanically operated without needing external energy

Ancillaries



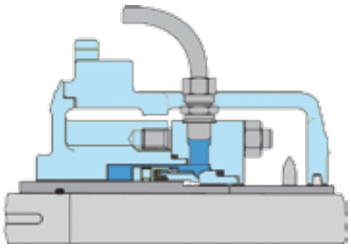
Low pressure-drop suction filter.



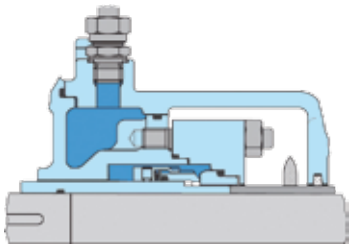
Minimum flow by-pass valve.

Performance Range	MSL	MSM	MSC	MSH
Capacity	max 450 m³/h (1981 US gpm)	max 450 m³/h (1981 US gpm)	max 250 m³/h (1101 US gpm)	max 250 m³/h (1101 US gpm)
Head	max. 400 m (1312 ft)	max. 630 m (2067 ft)	max. 1000 m (3281 ft)	max 1600 m (5249 ft)
Speed	max. 3600 rpm	max. 3600 rpm	max. 3600 rpm	max. 3600 rpm
Temperature	- 10 to +180 °C (14 to 356 °F)	- 10 to +180 °C (14 to 356 °F)	- 10 to +180 °C (14 to 356 °F)	- 10 to +180 °C (14 to 356 °F)
Pressure Rating	max. 40 bar (580 psi)	max. 63 bar (914 psi)	max. 100 bar (1450 psi)	max. 160 bar (2321 psi)

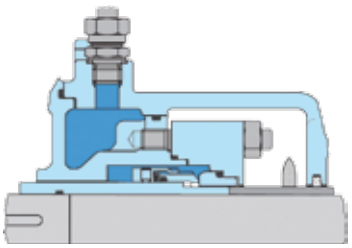
Shaft Sealing: Single and double cartridge seal



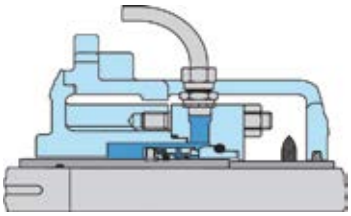
un-cooled, balanced



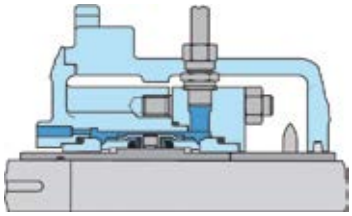
cooled, balanced



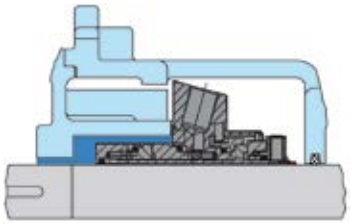
un-cooled, unbalanced



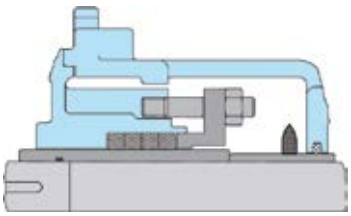
un-cooled, balanced SIHI® GZN seal



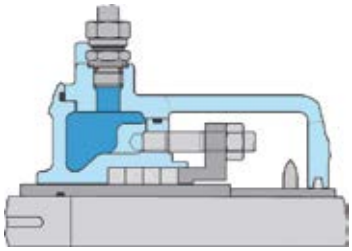
un-cooled double back-to-back



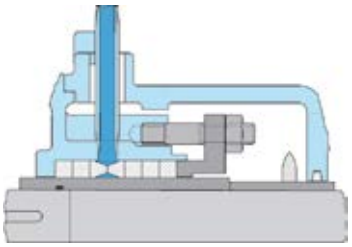
Cartridge seal



un-cooled



with jacket-cooling



with external flushing

Materials	
Suction Casing	Cast Iron, Ductile Iron, Stainless Steel, Chrome Steel
Stage Casing	Cast Iron, Ductile Iron, Stainless Steel, Chrome Steel
Discharge Casing	Cast Iron, Ductile Iron, Stainless Steel, Chrome Steel
Impeller, Diffuser	Cast Iron, Stainless Steel

The SIHI® Multi range of horizontal, ring-section multistage pumps have been designed for long-term reliability when pumping high pressure liquids.

Patented design features within this range of high pressure pumps, provide our customers with unique solutions to long term concerns about power consumption, efficiency, and reliability.

Meeting the technical requirements of ISO 5199/EN25199, they have a modular concept in order to reduce the number of parts, and consequently our customers' inventory.

Premium levels of efficiency are available by selecting an appropriate set of impellers and diffusers that give an ideal fit to the process requirement.

Unique to the multi-stage arena is the, SIHI patented drum-and-disc style of axial thrust balancing. The MSL, MSM, and MSC all employ a device that reduces the bypass flow to an absolute minimum, while not being susceptible to long(er) term wear-sensitive clearances.

With pressures up to 160 bar (2321 psi), the MSH range accommodates axial thrust by a design that combines a balance drum and disc. Lift-off device options are available for applications with frequent stop-starts.

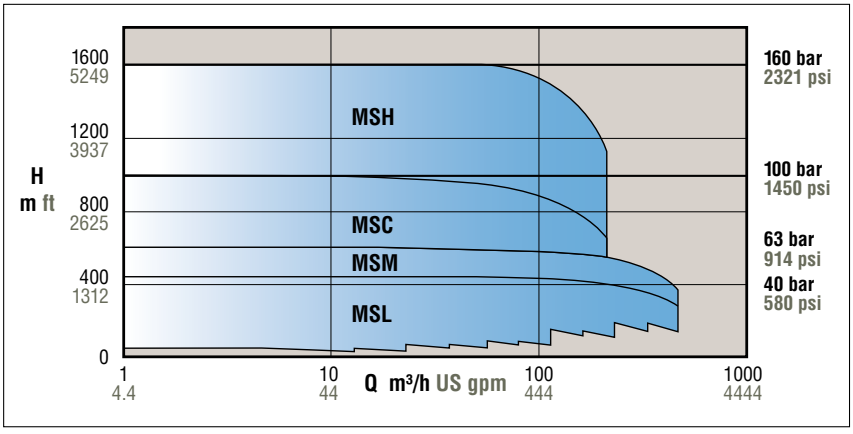
Reducing Life-Cycle Costs...

Reduced Power Consumption
- Enhanced hydraulic efficiency
- innovative axial thrust balancing device

Improved Reliability
- Minimised wear
- Reduced inventory
- Low NPSH
- Low velocity sleeve bearing
- High stage quantity vs diameter ratio

Easy Maintenance and Operation
- Simple dismantling and assembly
- Only one shaft seal
- Easy commissioning

Performance Range



Global Service and Technical Support

Life Cycle Cost Solutions

Typically, 90% of the total life cycle cost (LCC) of a pumping system is accumulated after the equipment is purchased and installed. Flowserve has developed a comprehensive suite of solutions aimed at providing customers with unprecedented value and cost savings throughout the life span of the pumping system. These solutions account for every facet of life cycle cost, including:

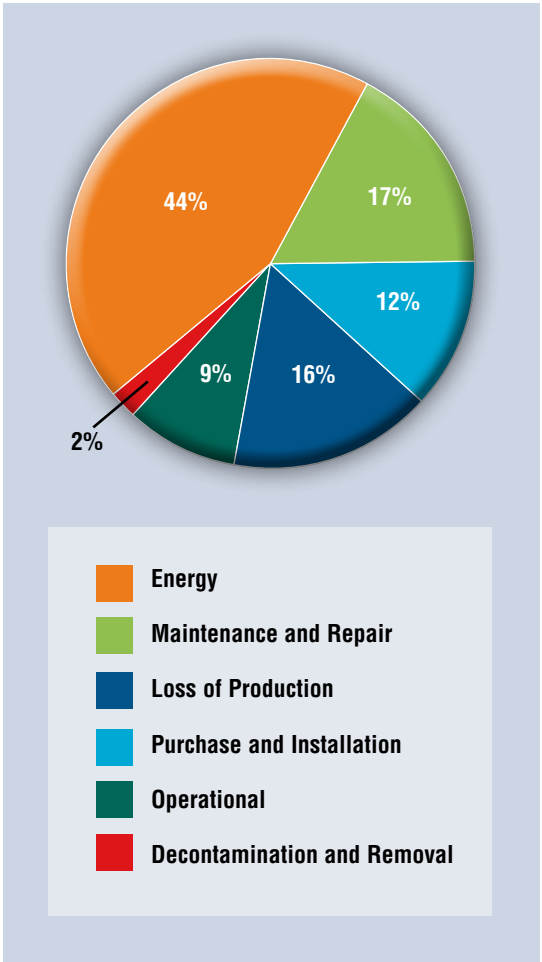
Capital Expenses
- Initial purchase
- Installation

Operating Expenses
- Energy consumption
- Maintenance
- Production losses
- Environmental
- Inventory
- Operating
- Removal

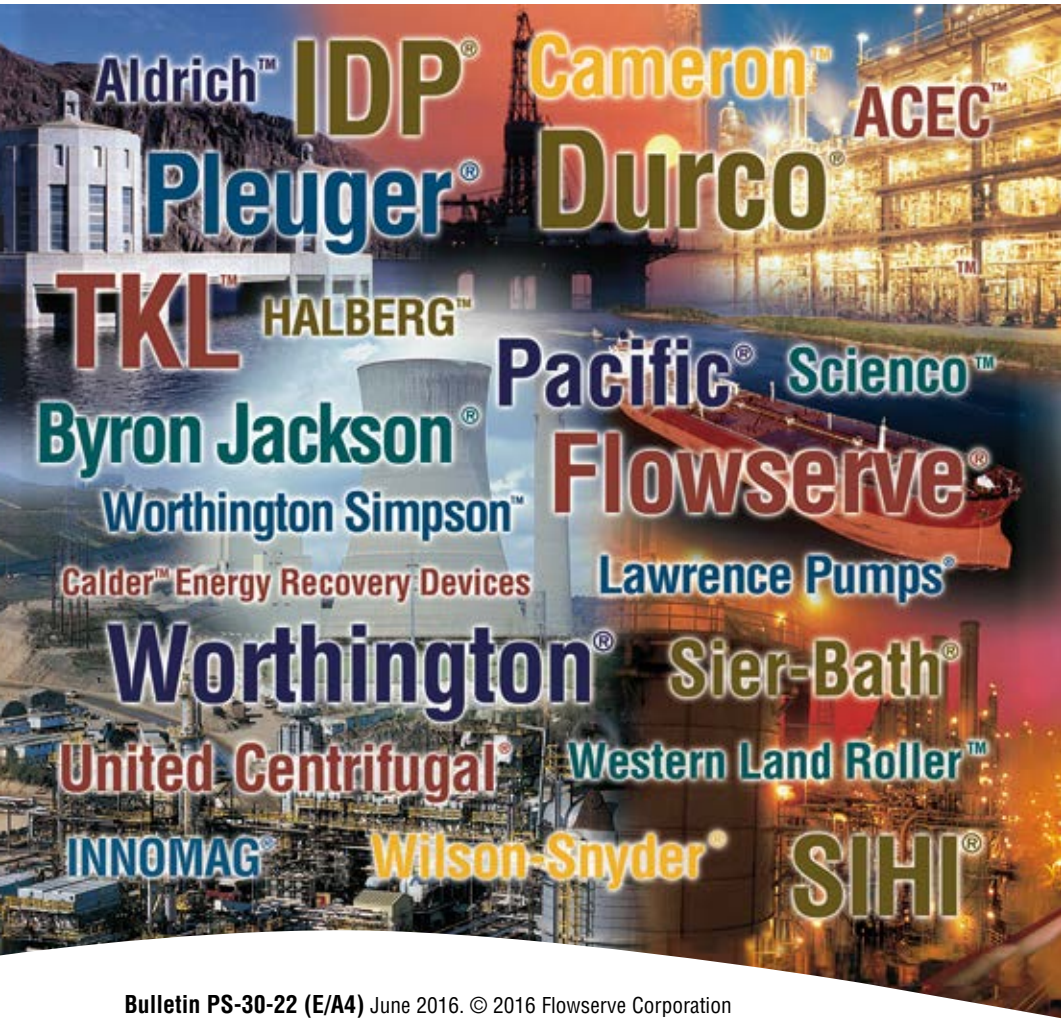
Innovative Life Cycle Cost Solutions

- New Pump Selection
- Turnkey Engineering and Field Service
- Energy Management
- Pump Availability
- Proactive Maintenance
- Inventory Management

Typical Pump Life Cycle Costs[1]



[1] While exact values may differ, these percentages are consistent with those published by leading pump manufacturers and end users, as well as industry associations and government agencies worldwide.



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