



# **SIHI® LPH/KPH** **Liquid Ring Vacuum** **Pumps and Compressors**



*Experience In Motion*



## Vacuum technology at the heart of gas-handling systems

The SIHI LPH/KPH range of liquid ring vacuum pumps and compressors from Flowserve is a proven and cost-effective solution for a wide variety of industrial gas-handling processes. The product line offers vacuum capabilities from atmosphere down to 25 Torr (28.9 in Hg) or compression from atmosphere to 10.3 barg (150 psig).

### Proven liquid ring performance

Many pump and compressor systems become unreliable when liquid or vapor are present in a gas element. The liquid ring technology used in SIHI LPH pumps and KPH compressors is a proven economical alternative.

By creating a continuous “ring” of fluid, liquid ring pumps and compressors enable the efficient handling of gases for a wide range of industrial processes. Liquids and condensed vapors separated out of the process can be discharged, recirculated or recovered.

*(For more details about liquid ring operating principles, see page 5.)*

### Benefits

- Near isothermal compression
- Oil free; no internal lubrication required
- Handles almost all gases and vapors
- Tolerant to some liquid carryover
- Low maintenance and safe operation
- Low noise and almost vibration free
- Available in a wide range of materials
- No metallic contact of the rotating parts



## Ideal for demanding industrial processes

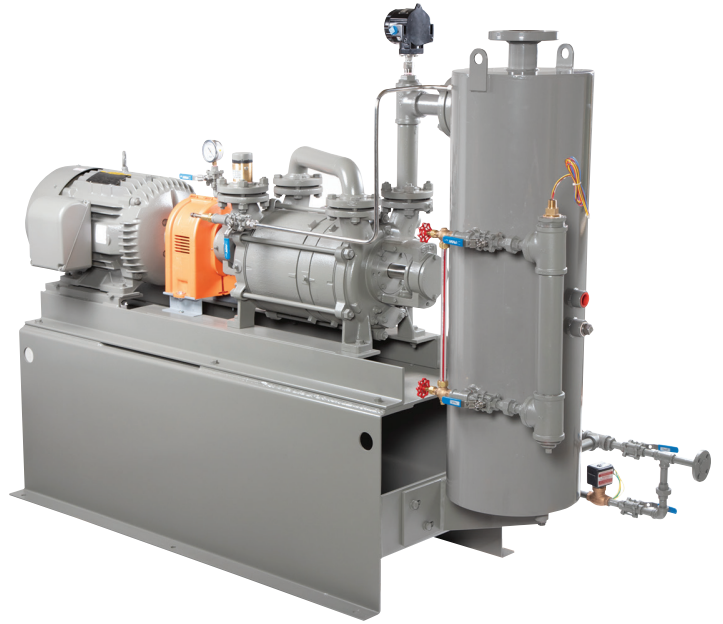
SIHI LPH pumps and KPH compressors are engineered to operate in the most demanding gas-handling applications. A broad selection of alloys is available for corrosive applications.

### Principle industries

- Chemical
- Pharmaceutical
- Food and beverage
- Medical
- Power generation
- Oil and gas
- Environmental
- Plastics
- General industry

### Key vacuum applications

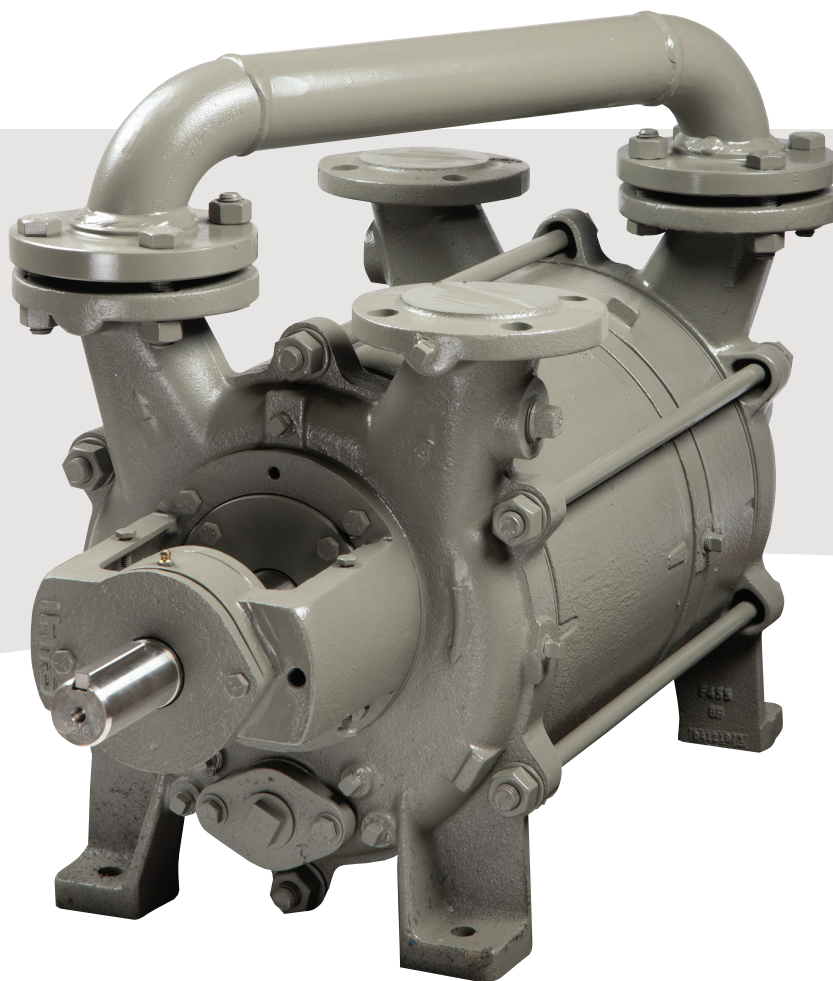
- Drying
- Distillation
- Filtration
- Sterilization
- Deaeration and gasification
- Forming and extrusion
- Vacuum chucking
- Scrubbing and vapor recovery
- Packaging and bottling
- Poultry processing
- Batch reactors



## Operating parameters

	LPH	KPH
<b>Flows to</b>	3,653 m <sup>3</sup> /h (2,150 cfm)	3,400 m <sup>3</sup> /h (2,000 cfm)
<b>Pressures to</b>	Suction — 25 Torr (0.5 psia)	Discharge — 10.3 barg (150 psig)
<b>Hydraulic overpressure test*</b>	—	up to 10.3 barg (150 psig)
<b>Temperatures to</b>	100°C (212°F)	100°C (212°F)
<b>Service liquid temperatures to</b>	60°C (140°F)	80°C (183°F)
<b>Size range</b>	DN 40 to 250 (1.5 to 10 in)	DN 50 to 200 (2 to 8 in)

\* Dependent on model



## Reliable vacuum performance

### Liquid ring reliability

Liquid ring pumps and compressors are less sensitive to conditions that can cause other systems to fail. Liquid carryover and process gas condensables pass through the system without damaging the equipment. These and other performance factors have made liquid ring technology widely accepted as an industry standard for more than 100 years.

### Low noise and vibration

With no reciprocating parts, SIHI LPH pumps and KPH compressors operate quietly with low vibration. This eliminates the need for special foundations while helping you to comply with industry noise standards.

### Minimal routine maintenance

The simple construction of liquid ring pumps or compressors enables service with minimum downtime. LPH and KPH units feature a globally accepted port plate design, which has no valves, gears or metal-to-metal contact of any kind. There is only one moving part, thus requiring no internal lubrication. This enables long service life with very little maintenance for the pump or compressor itself while extending the useful life of mechanical seals.



## Application versatility

SIHI LPH/KPH pumps and compressors have the capability to span pressures above and below atmospheric level. This unique attribute of liquid ring principles enables a wide range of differential pressures with a single technology. Service liquids are selected from those compatible with the process gas, enabling you to select the option that best suits the needs of your process.

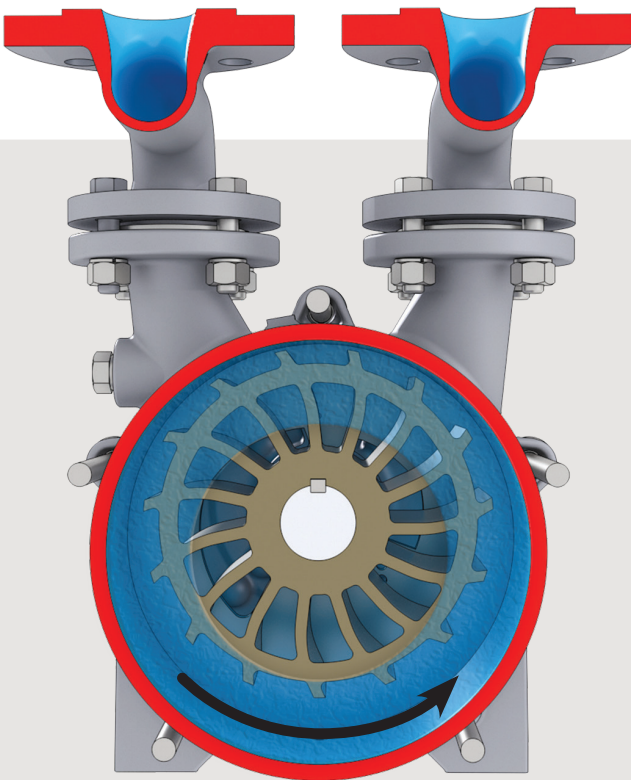
In addition, LPH and KPH models are available with a variety of shaft seals and materials, including cast and ductile iron, bronze, stainless steel, Hastelloy®, titanium and other alloys.

## Broad vacuum range

The effect of a cool liquid ring to absorb condensable process gas and vapor increases capacity, enhancing vacuum performance. SIHI LPH liquid ring vacuum pumps and KPH liquid ring compressors are available in one- and two-stage models with a wide range of vacuum and compression capabilities.

## Ideal for harsh and hazardous processes

The non-sparking design of the LPH/KPH product range coupled with the low-temperature rise of the liquid ring principle ensure the safest isothermal compression of hazardous, flammable or explosive process gases.



*Simplified diagram of liquid ring pump and compressor operation*

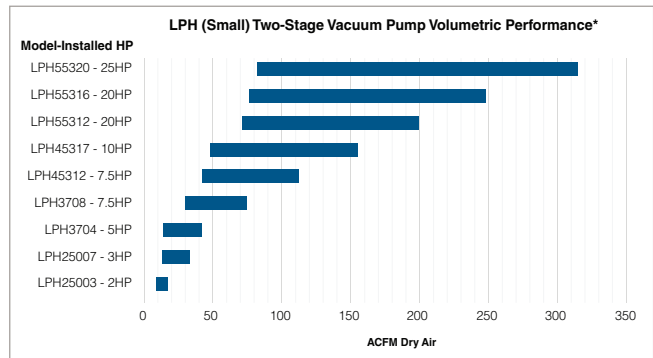
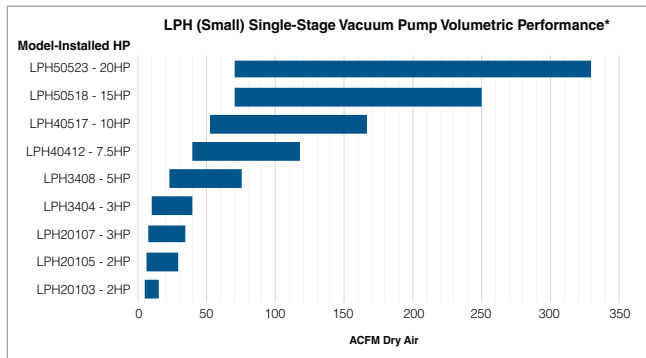
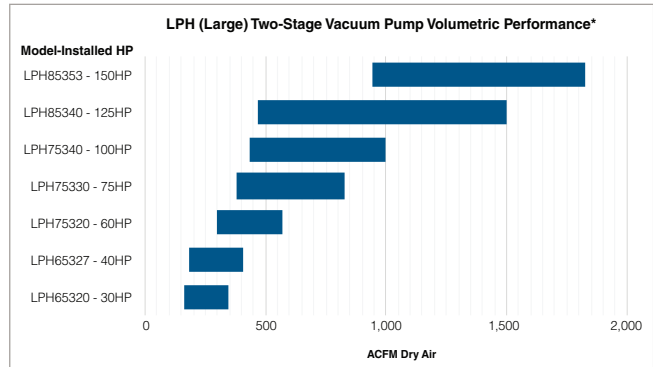
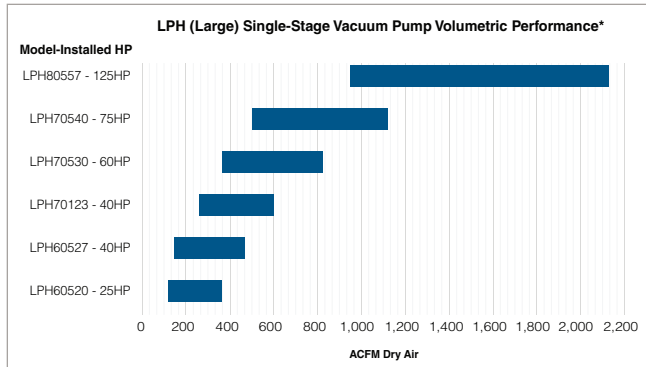
## Liquid ring operating principles

A rotating element (impeller) is eccentrically mounted within a round center body. Service liquid is centrifuged into a uniform liquid ring around the circumference of the center body.

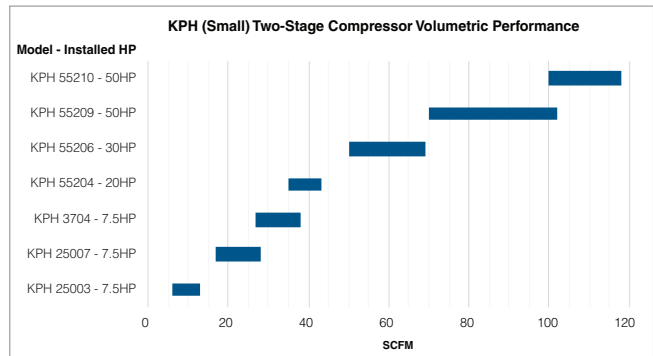
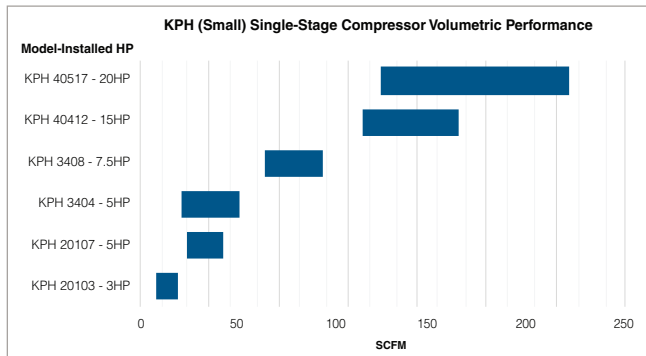
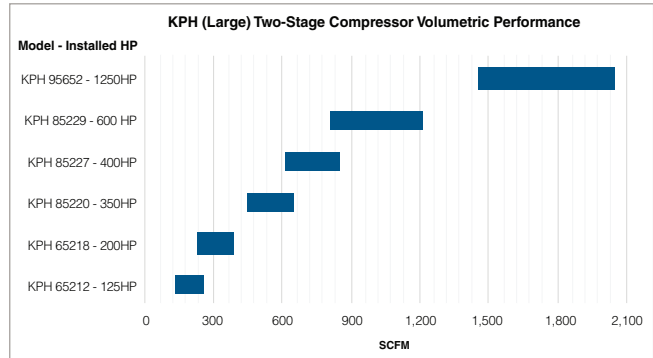
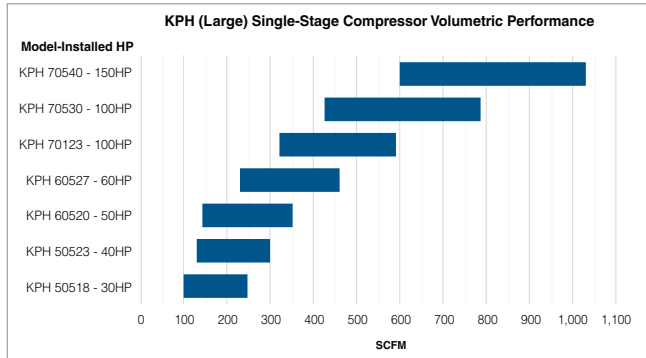
Volume between each of the impeller blade sections varies, relative to the liquid ring, as the impeller rotates. This creates a reciprocating piston action on the volume of gas contained within each of the blade sections. As volume increases, vacuum is created; as volume reduces, compression occurs.

# Performance data

## LPH range



## KPH range



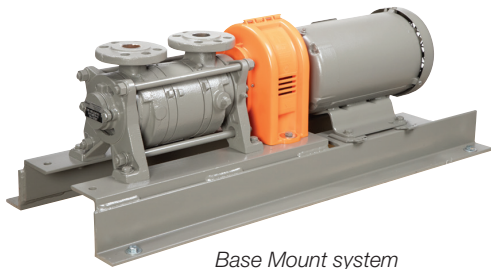
\* HP shown is the maximum installed motor HP based on standard running operating conditions at maximum speed. Performance based on 15°C (60°F) water as the service liquid.

# Vacuum and compressor systems

The LPH vacuum pump and KPH gas compressor are the heart of gas-handling systems. Pumps are driven with industry standard motors, and discharge gases are processed with a host of engineered components. Flowserve offers pre-engineered and custom engineered vacuum systems to ensure peak performance in your process.

## Pre-engineered vacuum systems

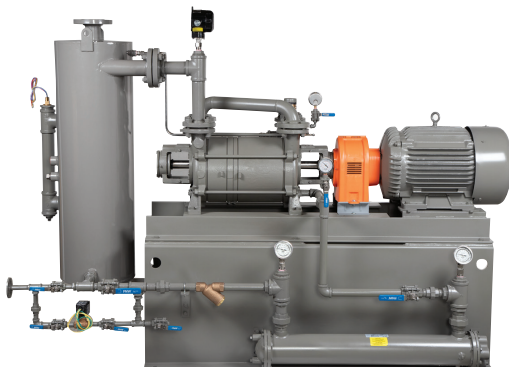
SIHI pre-engineered packages offer fast, turnkey commissioning of complete and fully integrated systems. All packages come factory pre-assembled and quality tested, with full system documentation and single-source accountability. Once-through, partial recirculation and total recirculation service liquid arrangements. Refer to the *SIHI Pre-engineered Liquid Ring Vacuum Systems* brochure (PUBR000027) for more details.



Base Mount system



XBAR system

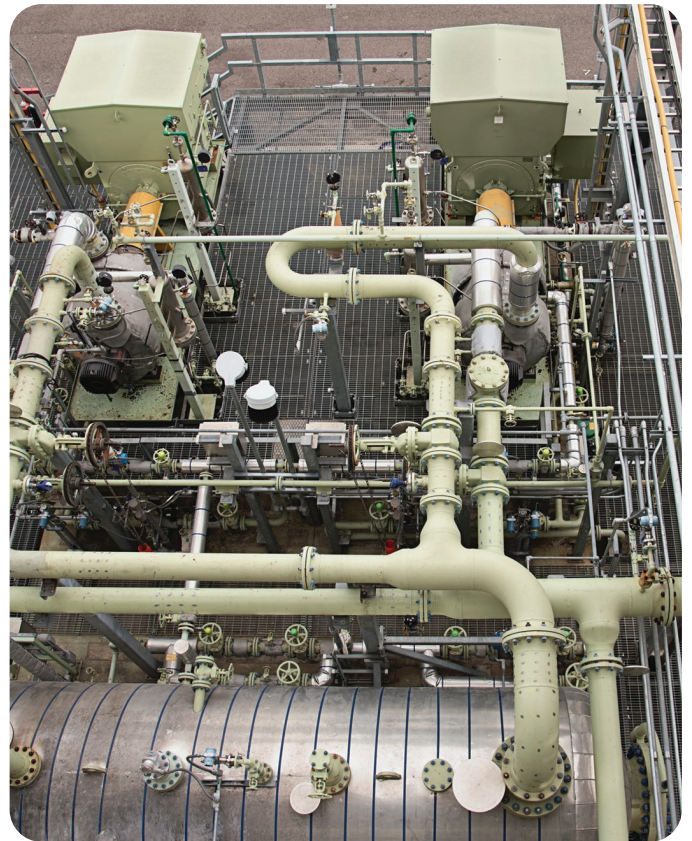


TRS system

## Custom engineered gas-handling systems

For processes with more complex gas-handling requirements, Flowserve can provide custom SIHI engineered systems. Our experienced application engineers have the capability to design complete systems to your specifications from the ground up. We can also collaborate with EPCs to develop vacuum systems for greenfield projects or integrate new vacuum packages in existing systems.

With our custom gas-handling systems, you can expect highly efficient performance and our turnkey service, inclusive of engineering, commissioning and aftermarket support.





## Succeed with Flowserve SIHI

With a century of experience engineering liquid ring vacuum pumps and compressors for diverse industries and applications, Flowserve SIHI offers a higher level of system design, manufacturing and operation expertise.

- **Manufactured in North America** — SIHI is one of the few brands of liquid ring vacuum pumps and compressors still manufactured in a North American, ISO 9001 facility. We also have application engineering, system design and aftermarket support teams based in North America.
- **Experienced and trusted supplier** — Flowserve SIHI has been an established supplier to North America's major industrial and process markets for more than six decades.
- **Designed to meet your needs** — From pre-engineered process pumps to special purpose designs, SIHI can construct gas processing equipment in a wider range of materials than other manufacturers.
- **Quality control** — All SIHI vacuum pumps, compressors and pre-engineered systems undergo rigorous factory testing to ensure reliable, high-quality performance.
- **Local support from a knowledgeable partner** — Whether you're installing all-new equipment or upgrading existing systems, Flowserve SIHI offers you industry-leading experience and support.

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