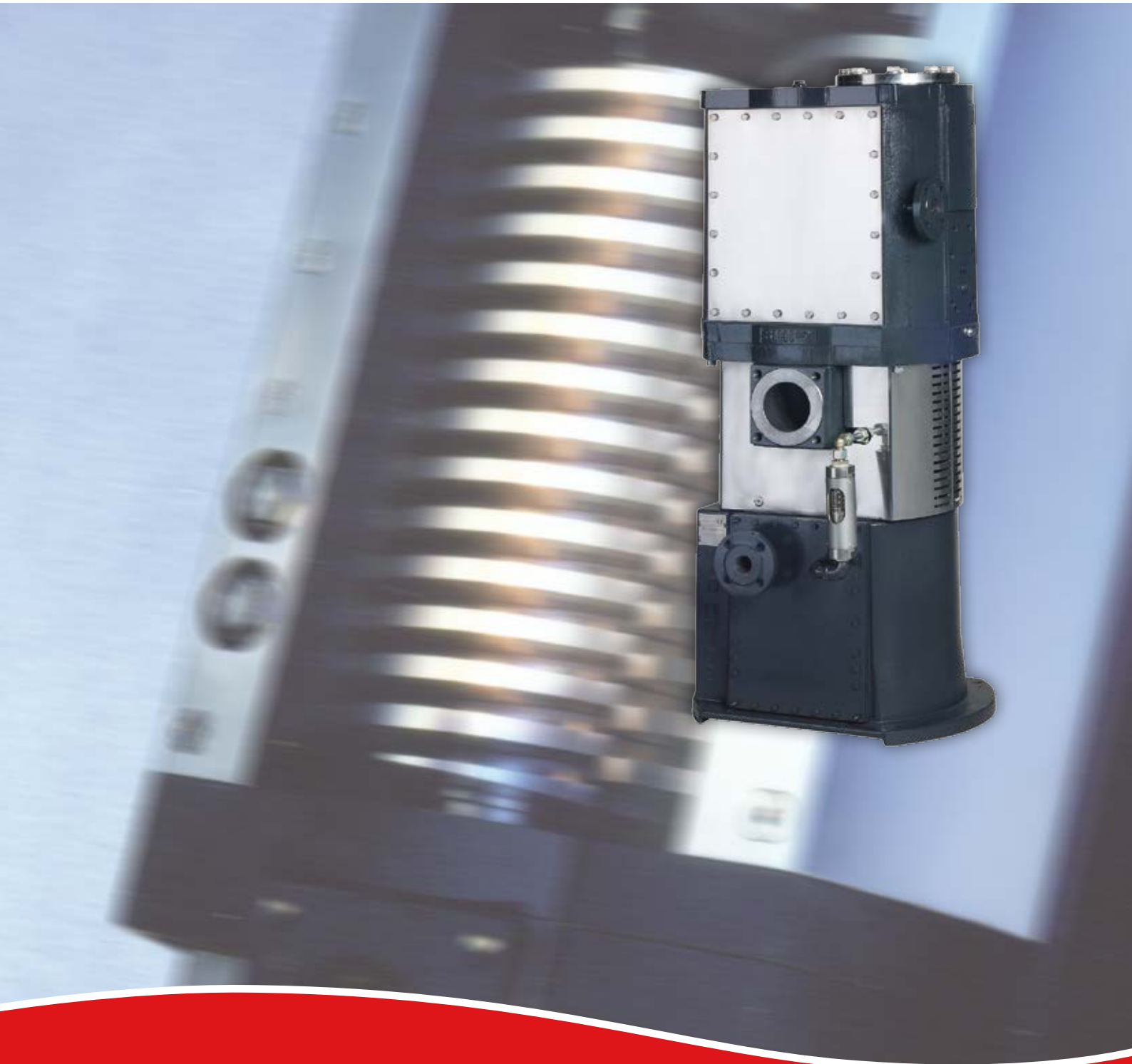
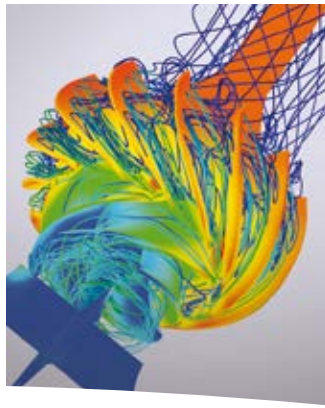




***SIHI® Dry  
Dry Running Vacuum Pumps for the  
Chemical and Pharmaceutical Industry***



***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® Dry – Simple, Dry and Reliable...

*SIHI® Dry is a vertically oriented and self draining vacuum pump with no mechanical shaft seals. It is an ideal choice for chemically related processes where there is a high possibility of liquids or solids carry-over. This award winning solution can accommodate corrosive gases and vapours, and has superior resistance to heat-accelerated deposition.*

The Basic layout provides the platform for an extensive range of intelligent modules which can be incorporated in order to match dynamic process requirements, simple DCS integration, and remote monitoring.

Integrated within the pump is the intelligent drive system that performs ongoing rotor diagnostics, while giving an energy efficient platform for variable speed/pressure control. Moreover, this method of rotor synchronisation permits gearbox-free operation in which to run extremely quietly, and without any lubrication.

Eight sizes of SIHI® Dry were developed for operation with explosive media, both internally and externally, and offer volumetric flow rates up to 1000 m<sup>3</sup>/h (589 cfm). Dramatic increases to flow and pressure are available with integrated lobular blowers.

### Low Life Cycle Costs

#### No need for service liquids

- Totally dry principle of operation
- No gears for rotor synchronisation
- No waste disposal

#### Low energy costs

- Reduced power consumption

#### Wear free

- Non contacting rotors
- No mechanical shaft seals
- Electronic rotor synchronisation
- No rotor coatings

### Robust and Reliable

#### For wet processes

- Vertical, self-draining
- No stagnant areas in pump casing
- Liquid carry-over/flushing capability

#### For tough operating conditions

- Optimised rotor clearance
- Torque monitoring
- Liquid flushing during operation
- Cleaning without dismantling pump

#### For explosive gases

- Low internal gas temperature
- Ex-rating
- Explosion proof design
- ATEX certified

#### For thermally sensitive substances

- Optimum temperature/compression profile
- Uniform temperature profile

### Quiet

#### No gear box

**SIHI® Dry –  
Simple, Dry  
and Reliable**



### **Optimised Gas Temperature**

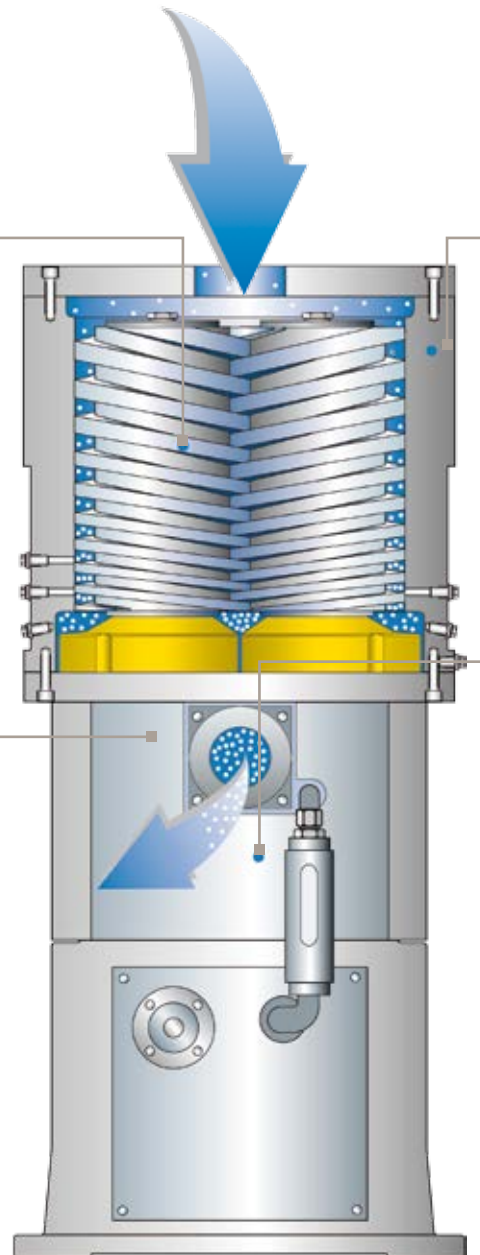
A key requirement for the effective and safe evacuation of corrosive media is the prevention of condensation in the pump. This requires the gas temperature to be maintained above its dew-point. Conversely, many gases polymerise or 'crack' at elevated temperatures.

This can lead to deposition inside the pump, which seriously compromises pump performance. For reliable pump operation it is necessary to have a stable temperature profile within the operating chamber, avoiding both 'hot spots' and 'quench' zones. The SIHI® Dry achieves this by cooling both the pump casing and the rotors.

### **ATEX Certified**

The ATEX guidelines on risk assessment were a key element in the development of SIHI® Dry. In contrast to typical dry running pumps, SIHI® Dry was designed in order to eliminate any potential ignition sources in both normal operation and upset conditions. Certified as a Category 2 machine, the standard SIHI® Dry can be used without flame arresters.

Where potential sources of ignition must be eliminated for occasional upset conditions, Category 1 units are available with EC type-test certification.





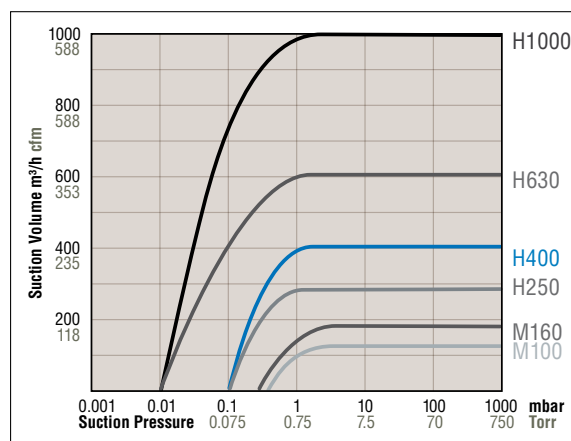
### Simple to Service and Easy to Schedule

Cleaning the pumping chamber can be undertaken by plant operating personnel. Moreover, removal of the pump chamber can be done without disturbing the bearings. Hence a basic service can be achieved 'in situ' in just a few minutes. Early warning of any upset conditions is possible since the primary pump parameters are constantly monitored. This enables remedial actions such as automatic cleaning regimes to be incorporated into the process, thereby helping to maximise 'uptime'.

### Optional Drive Capabilities

The innovative drive concept of SIHI® Dry and its modularity enable it to be supplied as a basic unit for stand-alone operation or as an 'intelligent' unit in order to integrate with the customer's system.

### Performance Range SIHI® Dry



### Technical data

SIHI® Dry Size	M100	M160	H250	H400	H630	H1000
Suction volume m³/h cfm	100 59	160 94	290 171	400 235	600 353	1000 589
End pressure mbar Torr	<0.7 <0.53	<0.5 <0.37	<0.1 <0.07	<0.1 <0.07	<0.01 <0.007	<0.01 <0.007
Power consumption at ultimate pressure kW hp	2.5 3.4	3.5 4.6	5.0 6.7	7.0 9.4	10.0 13.4	18.0 24.1
Sound level as per DIN (dB(A))	54	54	63	64	70	74



Simple operation and long-term reliability are at the centre of the SIHI® Dry design. Completely free from oil lubrication, no mechanical seals, and wide internal clearances, underpin the robust nature of this completely dry running vacuum pump.

### *The result...*

- Ability to handle highly corrosive gasses and vapours
- No effluent or waste disposal costs of any service liquid
- Suitable for explosive areas
- Low operating pressures
- Flexible operation for batch process operations
- Ease of maintenance and cleaning together with integrated self diagnostics
- Extremely Quiet
- Low life-cycle costs

SIHI® Dry satisfies the demand for a robust high-vacuum pump, which can adapt to rapidly changing process conditions which could include explosive, corrosive, and/or thermally sensitive media.

### *Capabilities*

- Corrosive gases & vapours
- Toxic and odorous gases
- Explosive gases & vapours
- Dust and liquid carry-over  
... and many more

### *Applications*

- Drying
- Reactor charging
- Vacuum distillation
- Inert gas blanketing
- Product transfer
- General process vacuum
- Central vacuum  
... and many more



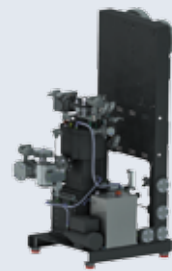
#### **Standard**

- Dry Screw Vacuum Pump:
- Variable speed drive on board
  - Purge Gas System with Ex-Certificate
  - Temperature switch
  - Pressure switch discharge
  - Strainer with insert



#### **Configured**

- Standard** plus:
- Valves
  - Pressure transmitter
  - Gas dilution
  - Coolant loop with overload protection
  - Frame



#### **Premium**

- Configured** plus:
- Advanced Sensoric
  - Full controlled
  - HMI display  
(human machine interface)

**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

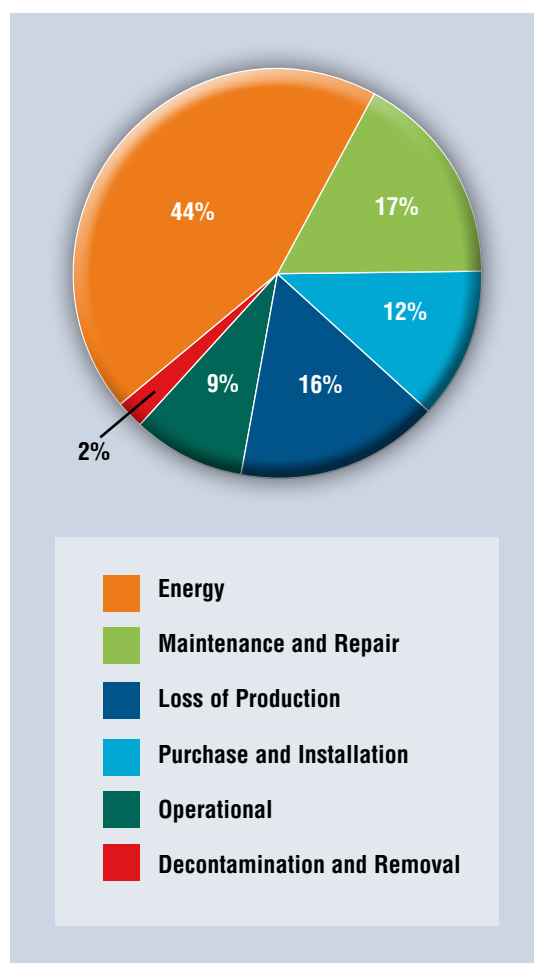
### Operating Expenses

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

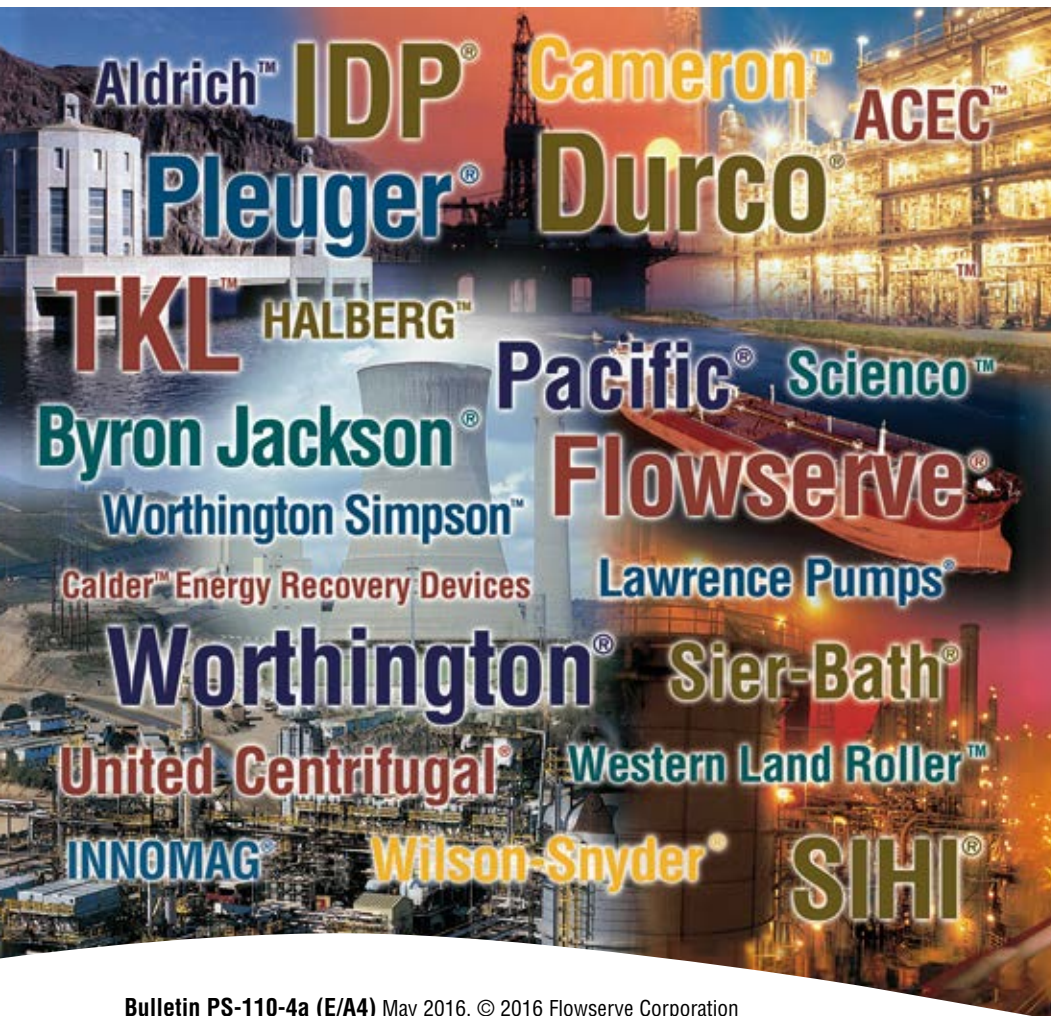
### Innovative Life Cycle Cost Solutions

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

### Typical Pump Life Cycle Costs<sup>1</sup>



<sup>1</sup> 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.



Bulletin PS-110-4a (E/A4) May 2016. © 2016 Flowserve Corporation

***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.

**USA and Canada**

Flowserve Corporation  
5215 North O'Connor Blvd.  
Suite 2300  
Irving, Texas 75039-5421 USA  
Telephone: +1 937 890 5839

**Europe, Middle East, Africa**

Flowserve Corporation  
Parallelweg 13  
4878 AH Etten-Leur  
The Netherlands  
Telephone: +31 76 502 8100

**Latin America**

Flowserve Corporation  
Martín Rodríguez 4460  
B1644CGN-Victoria-San Fernando  
Buenos Aires, Argentina  
Telephone: +54 11 4006 8700  
Telefax: +54 11 4714 1610

**Asia Pacific**

Flowserve Pte. Ltd.  
10 Tuas Loop  
Singapore 637345  
Telephone: +65 6771 0600  
Telefax: +65 6862 2329