



# SIHI® Dry Dry-running vacuum pumps for general-duty applications

GD-S450 and GD-S650 Series for North America



*Experience In Motion*

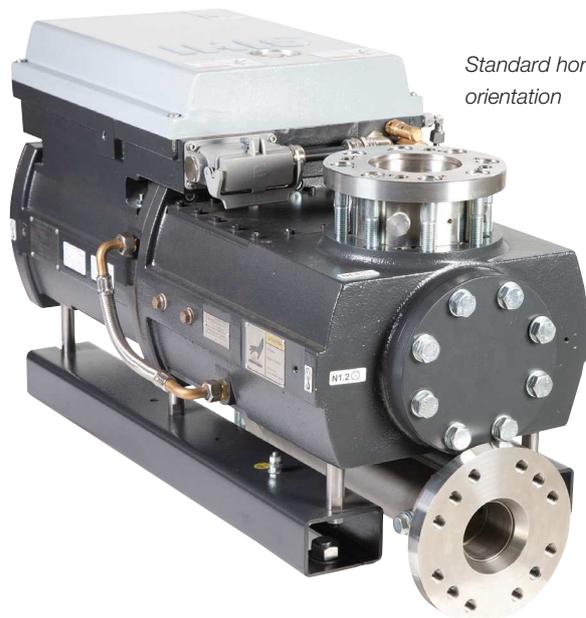
## Deep vacuum for general-duty systems

SIHI Dry GD-S450 and GD-S650 vacuum pumps are designed specifically for non-classified general industrial applications. Unlike conventional twin-screw vacuum pumps, these extremely quiet, durable systems function without lubricating fluids or sealing oils, and as a result, do not use costly mechanical seals. In addition to eliminating your acquisition and disposal costs for these fluids, this non-contacting, non-wearing design minimizes maintenance costs and downtime while improving service life and overall efficiency. These benefits are made possible with high-speed motors that eliminate the need for a gearbox.

### Electronic synchronization delivers operational benefits

The key to the SIHI Dry pumps' dry-running design is that their screws are individually driven, VFD-controlled and electronically synchronized, rather than the conventional "master-slave" drive arrangement with a gearbox. This innovative design eliminates the need for sealing and lubricating fluids and enables numerous operational benefits.

- **Top-down flow in either orientation** — SIHI Dry GD-S450 and GD-S650 vacuum pumps can be oriented horizontally or vertically. Both mounting options feature a top-down process flow that uses gravity to help drain process carryover from the pump chamber to the discharge port.
- **Larger clearances** — As a result of their high-speed, electronically synchronized drive system, the clearances between the screws of SIHI Dry pumps are larger than those of conventional screw-type vacuum pump designs. The larger clearances improve the pumps' ability to handle process carryover. Aided by gravity, liquids and particulates drain from the pump chamber to the discharge port.
- **Quiet operation** — With their unique drive system, SIHI Dry pumps have no discernable vibration, making them the quietest on the market.
- **High performance** — The unit provides high capacity with ultimate vacuum pressures down to  $1 \times 10^{-3}$  Torr.
- **Compact design** — In either horizontal or vertical\* orientation, the GD-S450 and GD-S650 pumps minimize footprint for optimal facility utilization.
- **On-site serviceability** — The cantilever design of SIHI Dry pumps allows you to perform most routine service and repair work where the pump is mounted, so you can get your process back up and running with the least possible downtime.



Standard horizontal orientation



\*Optional vertical orientation



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## General technical data

### SIHI Dry GD-S

Non-classified Areas	S450 Pump Horizontal or Vertical	S650 Pump Horizontal or Vertical
Maximum efficient pump speed, m <sup>3</sup> /h (cfm)	450 (265)	700 (412)
Ultimate pressure, Mtorr a (mbar a)	<3.75 (<5x10 <sup>-3</sup> )	<7.5 (< 1x10 <sup>-3</sup> )
Power consumption at ultimate pressure, kW (hp)	≤ 4 (5)	≤ 6 (8)
Maximum discharge pressure, Torr g (mbar g)	75 (100)	
Gas inlet temperature, °C (°F)	0 to 100 (32 to 212)	
Gas outlet temperature, °C (°F)	< 200 (< 392)	< 275 (< 527)
Temperature of cooling water, °C (°F)	10 to 40 (50 to 95)	
Noise emission, dB (A)	< 68	< 75
Weight, approximate, kg (lb)	400 (882)	
Power system	L1, L2, L3, PE (without N)	
Voltage, V AC	380 to 500 ± 10%	
Frequency, Hz	50 to 60	
Control voltage / max. control current, V DC / A	24 / 4	
Protection class (DIN EN 60529)	IP54	
Maximum power consumption, kW	12	
Fuse protection — all poles, A	32	
Purge gas supply (N <sub>2</sub> , CO <sub>2</sub> , dry air), nL/min (scfm)	20 (0.71)	
Cooling water supply, lpm (gpm)	<7 (1.85)	

### Application versatility

SIHI Dry GD-S450 and GD-S650 dry-running vacuum pumps are suitable for industrial applications where a robust and highly reliable dry vacuum pump is required. The innovative drive system delivers fast volume evacuation at high pressure, while consuming considerably less power than conventional twin-screw vacuum pumps.

Models are available for Class 1, Division 1 or 2 classified areas.\*

\* Class 1, Division 1 and 2 models: Mi450, Mi650

### Principle industries

- General industry
- Food and beverage
- Materials science
- Commercial glass
- Solar energy
- Universities
- Metallurgy

### Key vacuum applications

- Drying
- Evaporation
- Heat treatment
- Laboratory services
- Deaeration and degasification
- Thin film coatings
- Packaging

## Operational benefits

### Wider range of performance with greater tolerance to carryover

SIHI Dry GD-S Series vacuum pumps are driven by a matching pair of electronically synchronized, high-speed, VFD-controlled motors. This design enables far higher speeds than standard industrial motors with a substantially wider breadth of performance. The contact-free design employs larger clearances between screws and throughout the pump chamber.

By contrast, conventional rotating screw pumps use a single motor to drive both screws in a master-slave configuration. This design creates significant motor speed restrictions and requires much tighter screw clearances to achieve the required levels of vacuum. The tighter tolerances can be easily overloaded by process carryover. The horizontal process flow of these units also allows carryover to build up inside the pump, impeding process flow and over-stressing drive components and seal integrity.

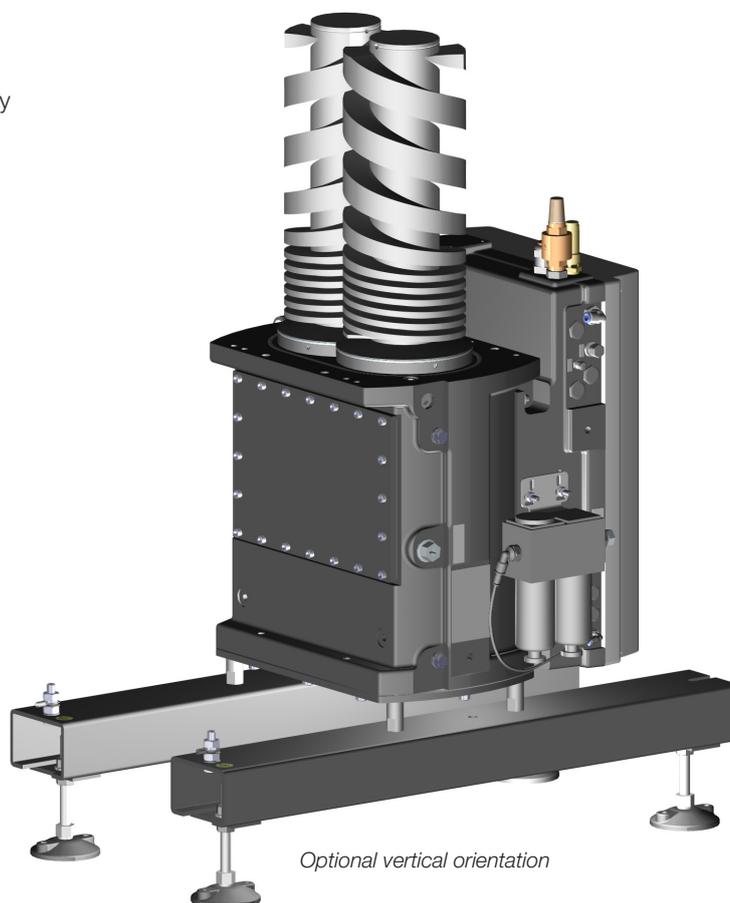
### Improved uptime

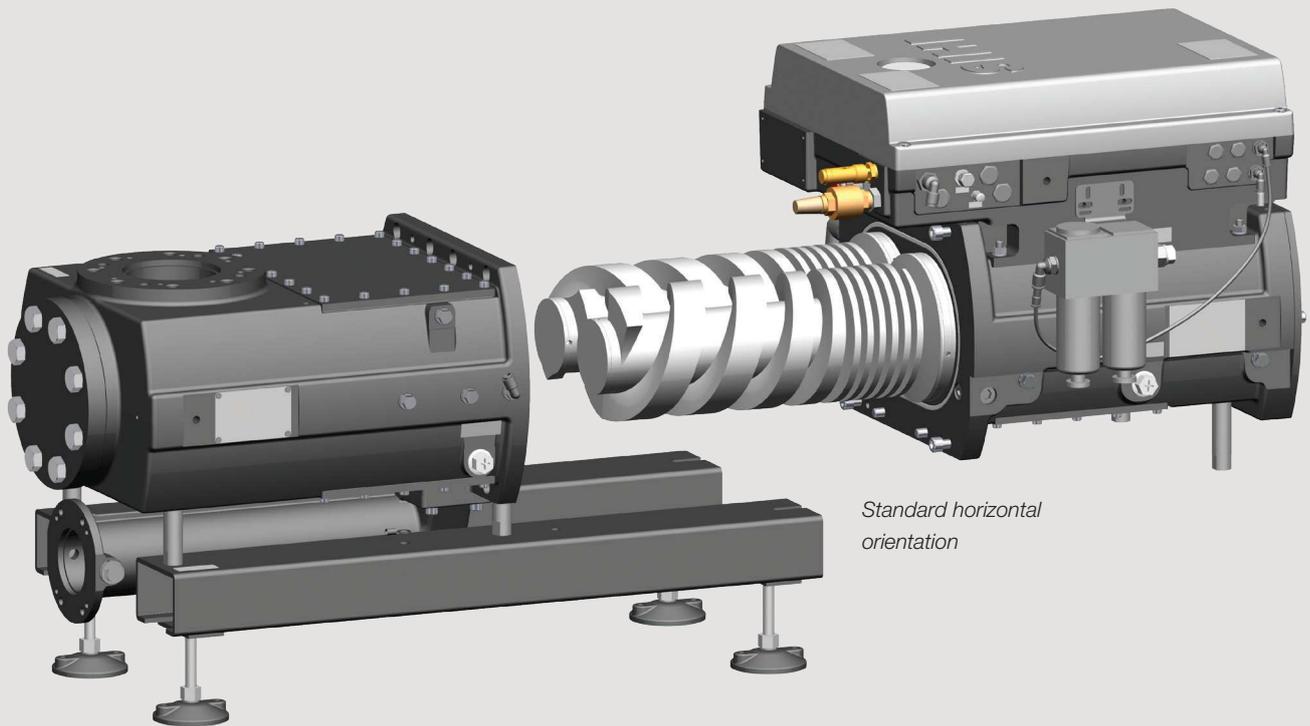
The self-draining, top-down flow of the SIHI Dry GD-S450 and GD-S650 pumps — whether oriented horizontally or vertically — minimizes particle buildup inside the pumps' chambers. In the event excessive process carryover or condensation enters the screw assembly, the pump automatically senses unusual process loading through changes in torque. The system reduces speed, allowing a potential blockage to clear without danger of damage. These factors significantly reduce the potential for catastrophic failure that could shut down your process.

An onboard monitoring system offers the industry's fastest failure analysis.

### Minimize environmental impact

SIHI Dry vacuum systems operate without oil or service liquids, eliminating the possibility of contaminating your process and/or discharge streams. This design enables you to recover uncontaminated solvent and process vapors downstream.





## Zero scheduled maintenance and minimal downtime

SIHI Dry vacuum pumps don't require scheduled maintenance. Condition monitoring ensures cleaning is performed only when needed. Their advanced load control system with integrated VFD continuously monitors and adjusts to real-time changes in temperature, torque and other parameters. This enables remedial actions such as automatic flushing without the need to shut the system down, maximizing your uptime.

When maintenance is needed, SIHI Dry units can be flushed in place and are specifically designed to be easy to strip and clean. Most repairs can be performed without removing the pump from the system. The pump casing is easily removed without disturbing the bearings, providing access to the screws. The screws are easily accessed on-site — often in just a few minutes — for steam cleaning or other basic service.

## Best-in-class ROI

SIHI Dry pumps provide faster pump-down from atmosphere, improving cycle times and productivity. They also significantly reduce maintenance costs and process downtime by eliminating mechanical seals, gear oil and process liquids. No oil checks, changes or disposals are required.

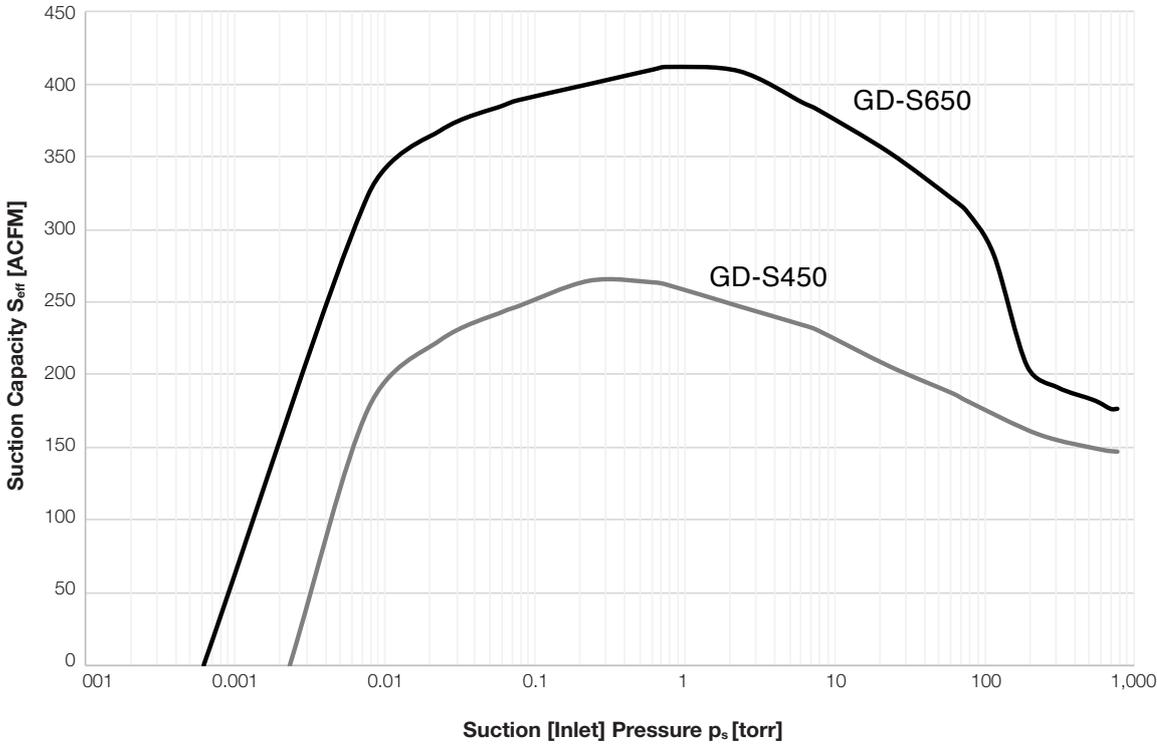
In addition, the energy-efficient design of the pumps consumes approximately 10% less power than conventional dry pumps. These and other cost-saving innovations ensure SIHI Dry pumps deliver best-in-class ROI.

## Low noise and vibration

With maximum operating noise levels less than 75 dB(A), the twin-screw design of SIHI Dry vacuum pumps is the quietest on the market.

The twin-fluted design of the screws eliminates radial forces across each screw, achieving a virtually vibration-free installation. These benefits eliminate the need for special foundations while helping you comply with industry noise standards.

## Performance range



NOTE: Every operating point below the maximum characteristic curve is achievable by varying the speed.

## Installation versatility

The standard horizontal mount minimizes integration and piping costs in existing systems while minimizing overall installation height. The vertical mounting option offers the smallest possible footprint. Both orientations offer the benefits of “top-down” process flow.

## Easy integration

Fast installation and startup are made possible by pre-engineered modules that are assembled and tested as a single vacuum system. No pressure regulator valve is necessary because the unit’s variable speed enables adjustable suction capacity. All industry-standard communication protocols and I/O interface options are available.

## Integrated drive control

The innovative drive concept of SIHI Dry pumps enables the pumps to be configured to operate in a basic on/off fashion or provide fully integrated control for the needs of specific processes.

## Lower waste treatment costs

SIHI Dry vacuum pumps use no lubricating or sealing fluids. This design reduces operating expenses by eliminating procurement and disposal costs. It also means process gas is not contaminated during process operation.

## Process tolerant

Occasional process carryover can be tolerated without the need for suction-side filters. Coupled with a torque-sensing VFD, the unit’s top-down, gravity-assisted flow prevents particle buildup inside the pump and ensures that carryover won’t damage any seals. Corrosive and condensable media handling, integrated liquid cleaning, particle carryover and pump drying are possible with optional modules.

## Options and accessories

### Vertical frame

SIHI Dry GD-S450 and GD-S650 vacuum pumps come in the horizontal orientation as standard. As an option, you may specify the vertical orientation. This configuration optimizes top-down flow while conserving valuable floor space.

### Cooling methods

#### Direct cooling

Enables the vacuum pump to be connected directly to your site's cooling system. Supplied coolant quality must conform to the vacuum system's specification. Not suitable for deionized (DI) water systems.

#### Secondary cooling with circulation pump

In this configuration, the customer's cooling circuit is separated from the vacuum pump by a heat exchanger. A thermostatic valve in the cooling circuit of the vacuum pump allows the pump chamber temperature to be adjusted, avoiding or minimizing process particle deposition and condensation.

Upon request, this option enables special coolants such as DI water to be used.

### Gas dilution

Optional gas dilution can be added for applications with higher particle quantities or excessive amounts of condensable vapor.

### Pump control

Additional communication protocols and monitoring features can be added with SIHI Control FX or SIHI Control FX BUS sequence control. Consult your Flowserve representative for more details.

### Suction-side accessories

Suction-side accessories are available to add functions, manage particles, prevent gas flow inversion, reduce noise emissions, and more. Contact your Flowserve representative for recommendations based on your organization's unique needs.





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