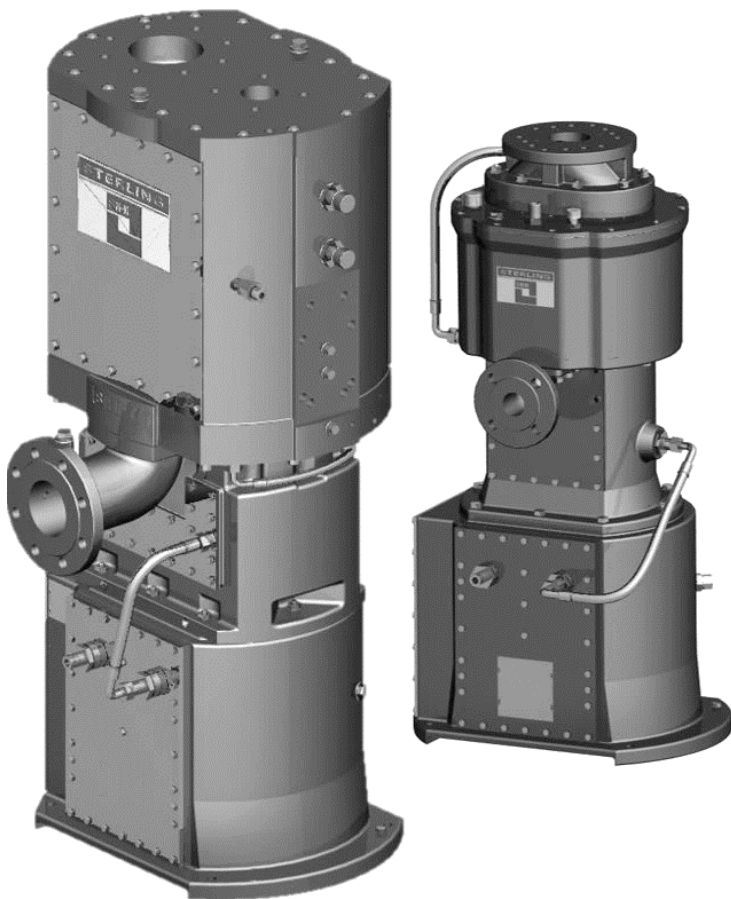




# SIHI<sup>®</sup> Dry GD S / SIHI<sup>®</sup> Dry GD V

## Sizes S160, S400, S630, S1000 and V250, V400

Single Stage Vacuum System - General Design  
Dry Running Screw Vacuum Pump



**Pressure range:** < 0.001 to 1013 mbar  
0.00075 to 760 torr

**Pumping Speed:** 160 to 1000 m<sup>3</sup>/h  
94 to 588 cfm

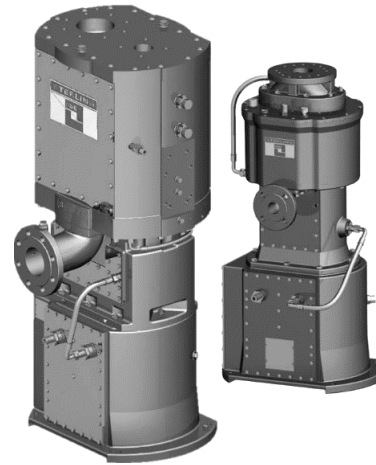
## DESIGN

**SIHI® Dry** vacuum systems have been especially developed for use in industrial applications. It is based upon a dry running twin screw principle working as a single stage vacuum pump.

- No wear parts / contact-free shaft sealing
- Low ultimate pressures with only one stage vacuum pump
- High resistance regarding particles due to big gaps and Top Down flow
- Very silent operation
- Lowest vibration level
- Absolutely free of oil / no gear oil
- Plug & Pump for shortest commissioning
- Permanent pump protection by electronically overload
- Disassembly and assembly of the pump chamber can be done insitu by own staff members
- Bluetooth, CANopen and I/O interface already included
- Various bus communication protocols available

The **SIHI® Dry S-Version** has been designed to perform maximum pumping speed already at atmospheric pressure. This offers fast volume evacuation coming from higher pressure.

The **SIHI® Dry V-Version** has been designed to perform high pumping speed at low suction pressure with lowest power consumption. This offers lowest cost of ownership.



## APPLICATION

Used for all industrial applications, where a robust and high reliable dry vacuum pump is required.

The flexibility of the modular system allows to be adapted to any process conditions. Thus the innovative drive concept and its optional additional features, such as the regulation of the speed to meet the requirement of the system, offers the possibility to considerably reduce the power absorption.

## NOTE

In contradiction to conventional pumps with mechanical gear box shaft synchronisation, **SIHI® Dry** spindles are electronically synchronized. This well established, innovative concept enables a silent operation of the vacuum system; it also makes all efforts for maintaining and changing gear oil obsolete.

## GENERAL TECHNICAL DATA

SIHI® Dry		S160	V250	V400	S400	S630	S1000
Max. eff. Pump Speed	m <sup>3</sup> /h (cfm)	160 (94)	250 (147)	400 (235)	400 (235)	630 (370)	1000 (588)
Ultimate pressure	mbar a (mtorr)	< 0.05 (37.5)	< 0.005 (3.76)	< 0.001 (0.75)	< 0.01 (7.5)		
Power consumption at ultimate press.	kW (hp)	3.5 (4.7)	2 (2.7)	2.5 (3.3)	7 (9.4)	10 (13.4)	16 (21.5)
Max. discharge pressure	mbar g (torr g)	100 (75)					
Gas inlet temperature	°C (°F)	0 to +100 (0 to +212)					
Gas outlet temperature	°C (°F)	< 135 (< 275)			< 180 (< 356)		
Temperature of cooling water	°C (°F)	+10 to +35 (+50 to +95)					
Noise emission <sup>1</sup>	dB (A)	< 54			< 64	< 73	< 75
Weight, approx.	kg (lbs)	260 (573)			580 (1280)		

<sup>1</sup> DIN ISO 9614 / 21680

## ELECTRICAL DATA

SIHI® Dry		S160	V250	V400	S400	S630	S1000
Power system	-	L1, L2, L3, PE (without N)					
Voltage	V AC	400 to 500 ± 10%					
Frequency	Hz	47 to 63					
Protection class (DIN EN 60529)	-	IP42					
Power consumption at ultimate pressure	kW (hp)	3.5 (4.7)	2 (2.7)	2.5 (3.3)	7 (9.4)	10 (13.4)	16 (21.5)
Max. power consumption	kW (hp)	7.5 (10)	5 (6.7)		10 (13.4)	20 (26.8)	30 (40.2)
Fuse protection - all poles	A	25				50	63

## PURGE GAS

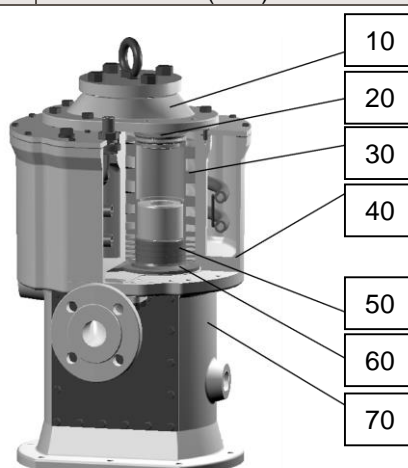
SIHI® Dry		S160	V250	V400	S400	S630	S1000
Medium	-	N <sub>2</sub> , Ar <sup>(2)</sup>	CDA, N <sub>2</sub> , Ar				
Gas purity		min Class 2.4.1 (following ISO 8573-1:2010)					
Consumption sealing gas (in operation)	NI/min (SCFM)	20 (0.71)					
Pressure	bar g (psi)	6 to 8 (87 to 116)					

## COOLING WATER

SIHI® Dry		S160	V250	V400	S400	S630	S1000
Medium	-	Water conductivity > 50 µS ( DE water on request)					
Cooling water temperature	°C (°F)	+10 to +35 (+50 to +95)					
Max. adm. static pressure	bar g (psi)	6 (87)					
Min. flow	l/min (gpm)	3 (0.79)			8 (2.11)		

## MATERIAL DESIGN

In contact with process medium / coolant



SIHI® Dry		S160	V250	V400	S400	S630	S1000
Casing cover	10	EN-GJS-400-18-LT			1.0553		
Twin screw cover	20						
Twin screw	30	1.4122					
Casing	40	EN-GJS-400-18-LT					
Shielding gas throttle	50	EN-GJL-250					
Bearing cartridge	60	1.4122					
Intermediate plate	70	EN-GJS-400-18-LT					
Cooling circuit (not shown)		brass nickel plated, EPDM / stainless steel, copper / GJS					

<sup>2</sup> CDA on request

# NOT JUST A PUMP! YOUR SOLUTION FOR ...

## Engineering / Integration

### ... LOW EFFORTS IN ENGINEERING & INTEGRATION OF SYSTEM COMPONENTS

#### Customized solutions

- + Pre-engineered modules matches all individual process needs

#### No acoustic cover necessary

- + Contact free principle offers quiet operation and comfortable environmental conditions

#### No pressure regulator valve necessary

- + Adjustable suction capacity by variable speed

#### More an integrated solution than just a pump

- + Pre-engineered modules are assembled & tested in one vacuum system
- + Small foot print design saves useful space

#### Easy communication integration due industrial standards

- + Availability of all Bus standards as well as I/O interface

## Installation

### ... FASTEST INSTALLATION & START UP

#### Plug & pump concept

- + Equipped with quick connectors for process and supply media as standard

## Cleaning

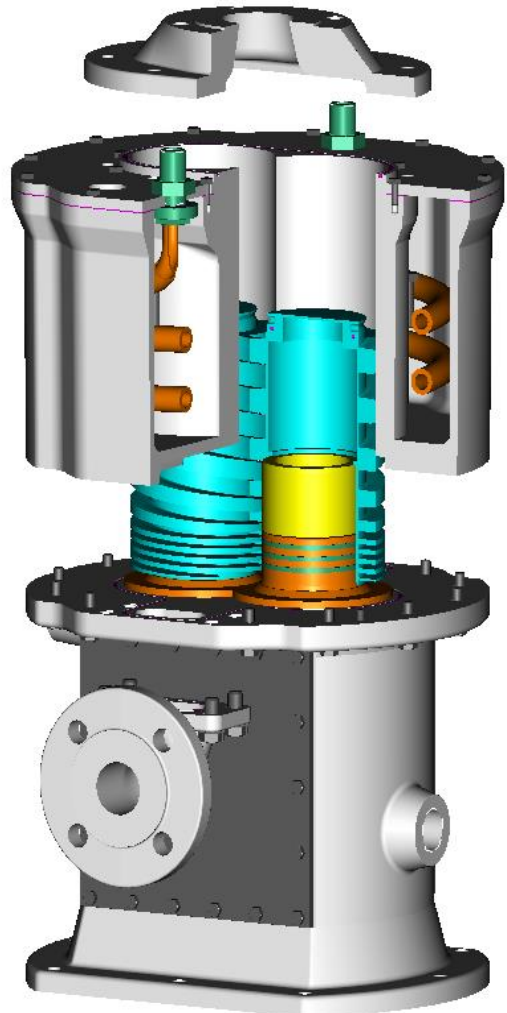
### ... LOWEST DOWN TIME

#### Only cleaning on demand

- + Condition monitoring by independent data record of both shafts

#### Designed for in situ cleaning

- + Easy dismantling without bearing removal
- + No high-tech workshop required
- + Can be done on site by own staff
- + Independency on 3rd party service performance



## Maintenance

### ... LOWER COST FOR MAINTENANCE & LOWEST DOWN TIME

#### No oil checks, exchanges and disposals required

- + Free of oil as service liquid
- + No gear oil

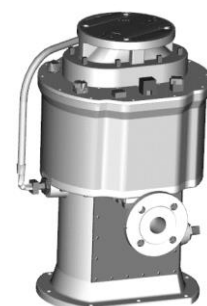
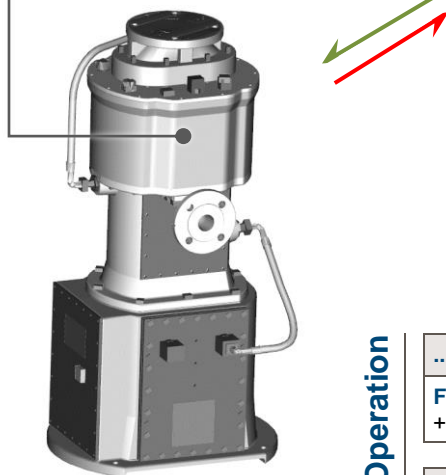
#### No wearing

- + Consequent touch-less principle
- + Long life bearings
- + Contact-free sealings

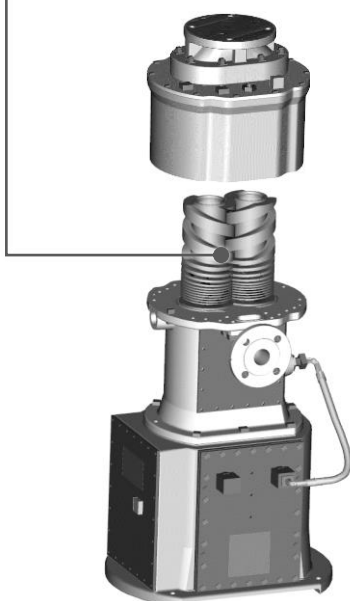
#### Continuous condition analysis

- + Data logging
- + Online monitoring of pump status
- + Simple failure codes

Easiest service on site



Easiest cleaning on site



**Operation**

**... INCREASED PRODUCTIVITY**

**Fast pump down**  
+ High pump speed at high pressure

**... INCREASED PRODUCT QUALITY**

**High pumping performance**  
+ Remarkably high pump speed at low pressure allows higher flow rate of process gases  
+ Better ultimate pressure

**Zero process contamination**  
+ Truly dry and touch-less principle with free of any service liquids  
+ Absolutely free of gear oil due to electrical synchronised shafts

**... LOWER COST FOR OPERATION**

**Low power consumption**  
+ High-tech screws design is aimed to run with most energy efficiency  
+ Frequency control allows to improve energy efficient operation by operators

**Robust & reliable**  
+ Pump design without any coating on screws

**... CAPABILITY FOR USE IN HARSH PROCESSES**

**Tolerates particle & liquid carry over without any suction side filter**  
+ Top Down flow avoids particle deposits inside of the pump  
+ Carrying particles does not result in wear due to consequential contact free principle  
+ Optional integrated liquid cleaning by flushing module  
+ Particle carry over & pump drying by optional integrated gas dilution module

**Handles condensable & corrosive media**  
+ Prevention of condensation inside of the pump by optional integrated gas dilution module  
+ Optional integrated liquid cleaning by flushing module  
+ Reduction of condensation by temperature controlled operation

**Trouble free pumping of sensitive media**  
+ Temperature controlled operation

**Service**

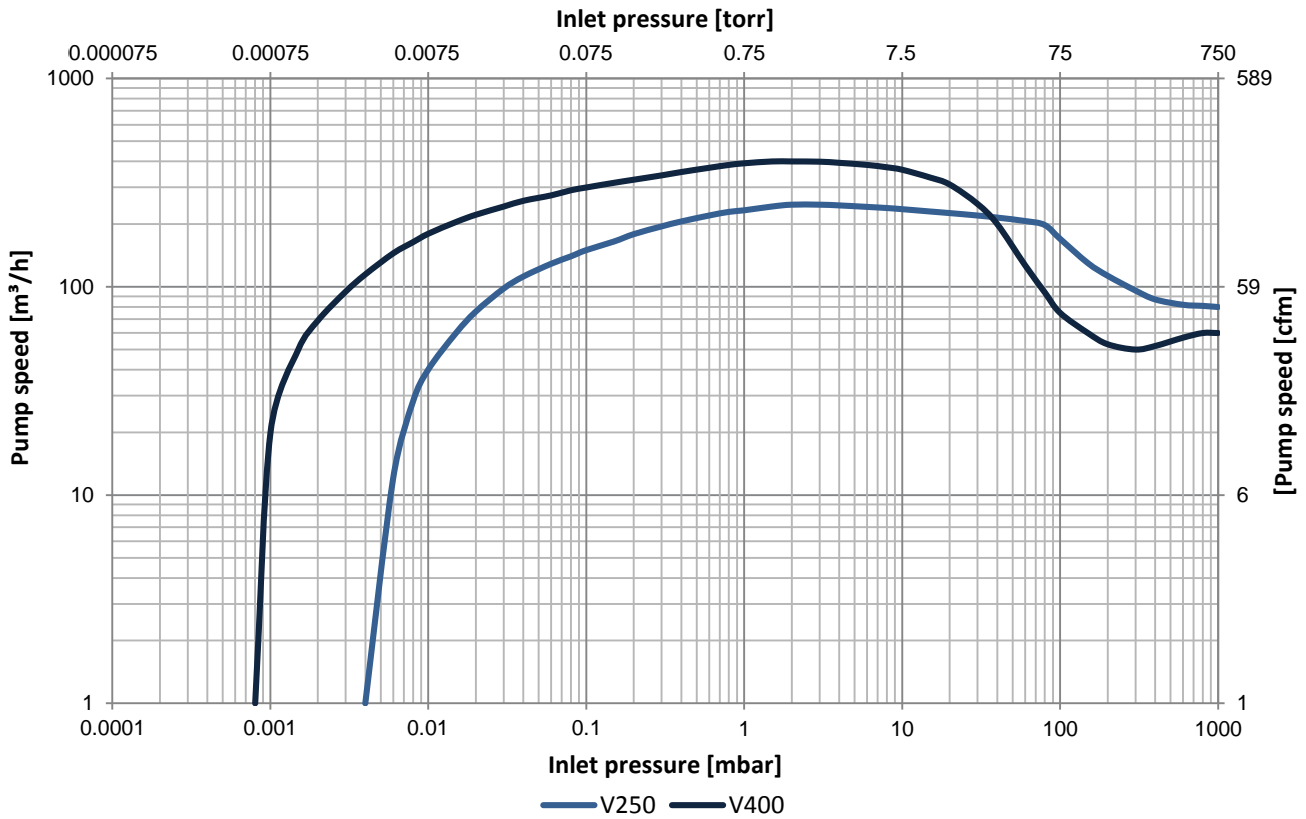
**... LOWEST DOWN TIME**

**Fastest exchange of vacuum system on site**  
+ Fast exchange of vacuum system  
+ Can be done on site by own staff  
+ Quick connectors offers Plug & pump

**Designed for On-site service**  
+ Standard spindle exchange modules  
+ No high-tech workshop required  
+ Can be done on site by own staff  
+ Independency on 3rd party service performance

**Fastest remote failure analysis**  
+ Continuous data logging allows comprehensive understanding of system conditions  
+ Prepared for online condition monitoring  
+ Simple failure codes

## PUMP SPEED CURVE - SIHI® Dry V250 – V400



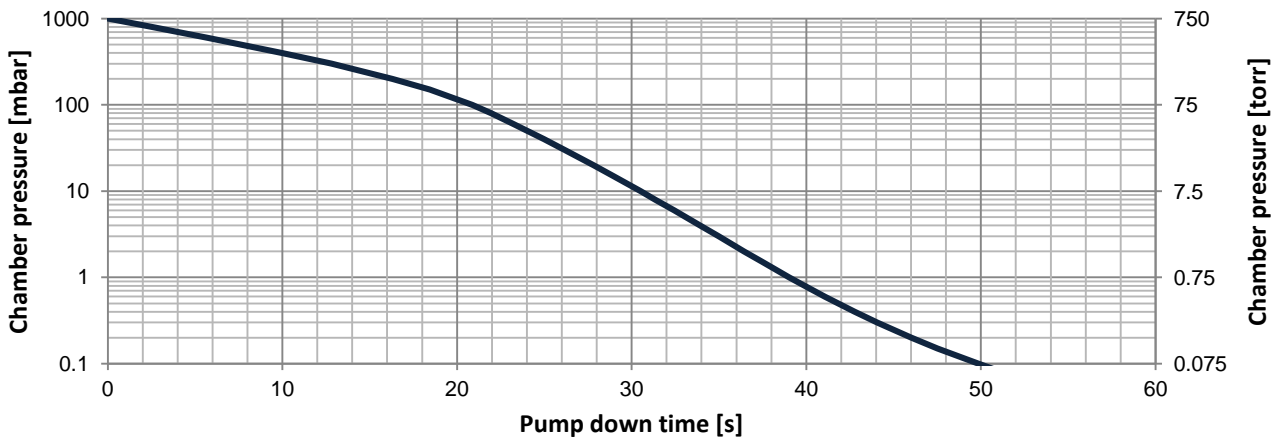
The operating Data is valid under following conditions:

- Process media : dry air 20°C (68°F)
- Discharge pressure : 1013 mbar (760 torr)
- The suction volume is related to the suction pressure

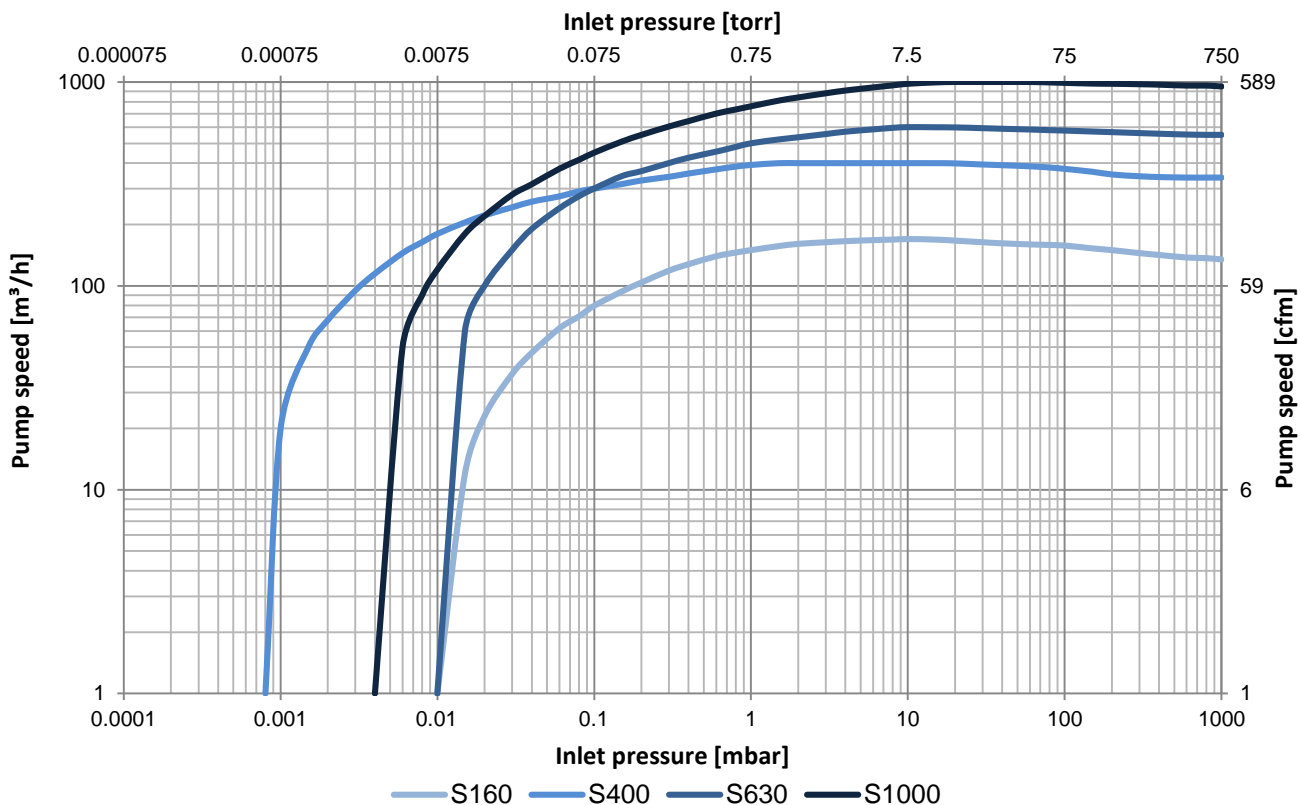
Tolerance on operating data is 10%

## Pump down curve - SIHI® Dry V250

Example: 250l chamber



### PUMP SPEED CURVE - SIHI® Dry S160 – S1000



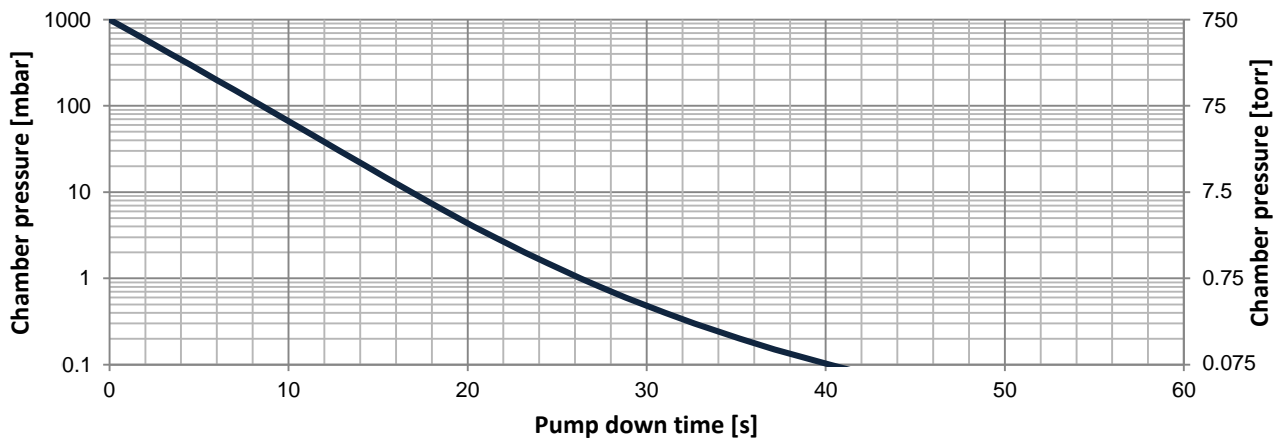
The operating Data is valid under following conditions:

- Process media : dry air 20°C (68°F)
- Discharge pressure : 1013 mbar (760 torr)
- The suction volume is related to the suction pressure

Tolerance on operating data is 10%

### Pump down curve - SIHI® Dry S1000

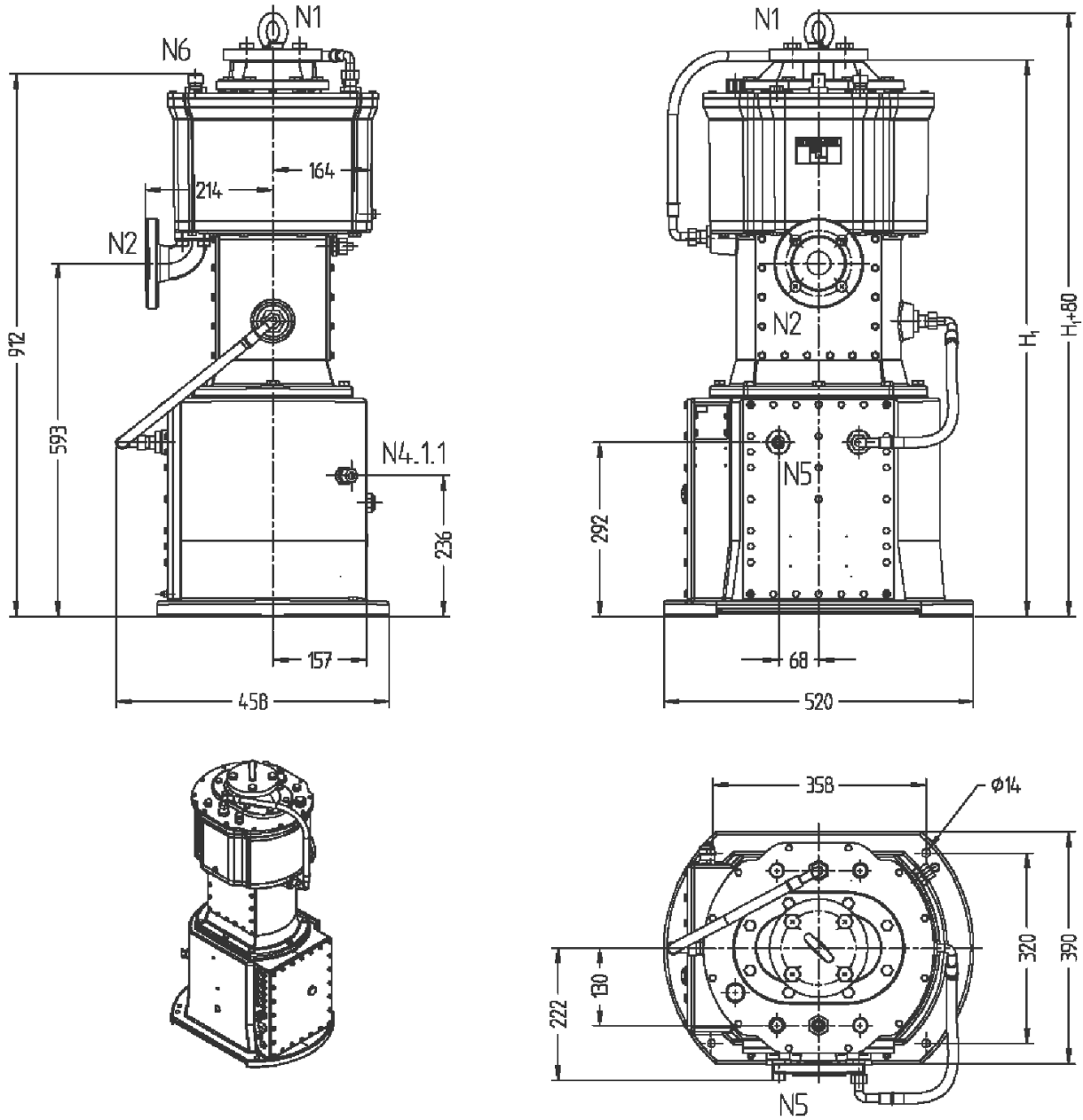
Example: 1000l chamber





## DIMENSIONS SIHI® Dry GD S160 / V250 – V400

Dimensions in mm



$H_1 = 995$  mm

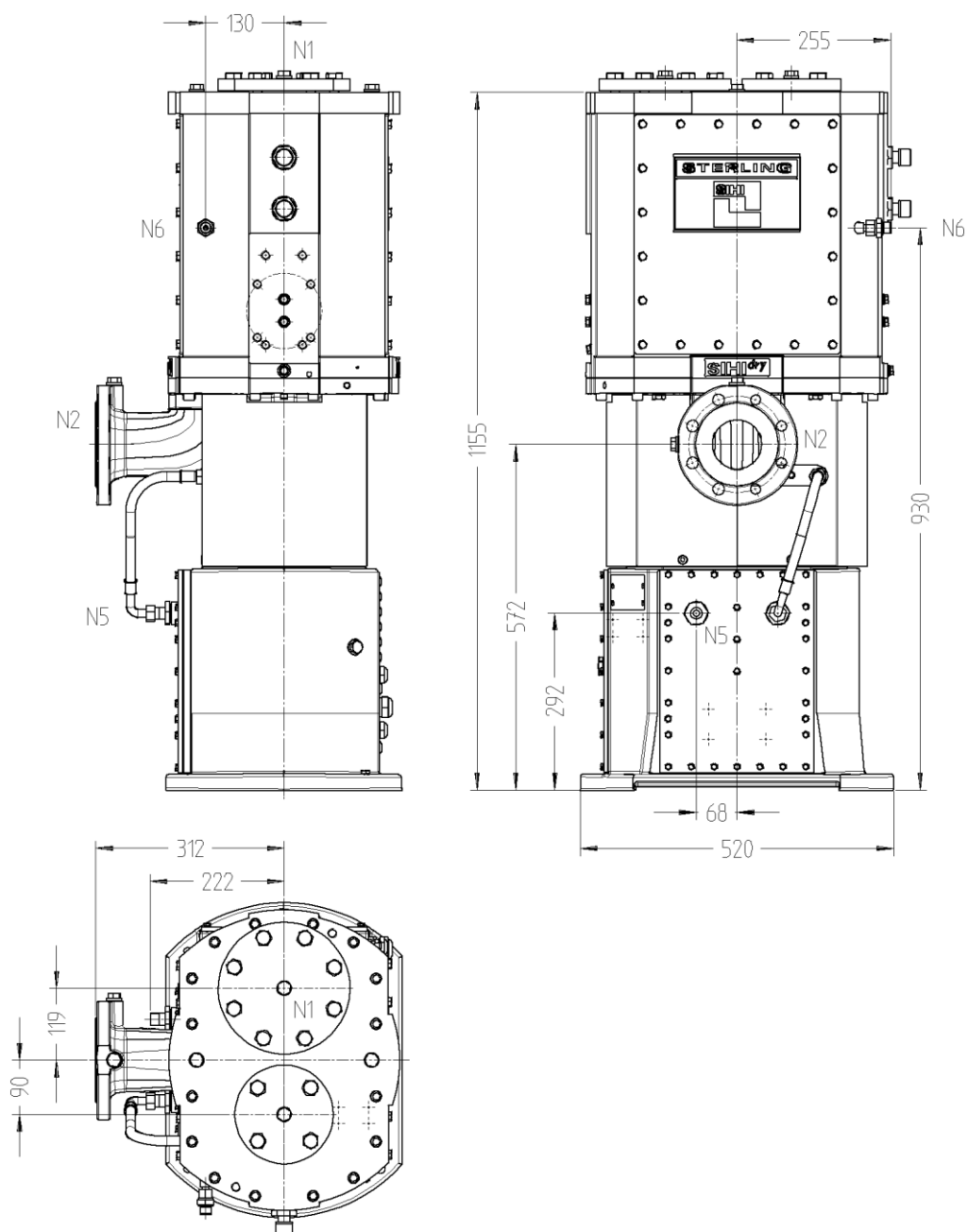
SIHI® Dry		S160	V250	V400
Inlet	N1	DN80 / ISO-F DN63	DN100 / ISO-F DN100	
Outlet	N2	ISO-KF DN40		
Gas supply inlet	N4.1.1	G-1/4" internal thread - quick coupling		
Coolant inlet	N5	G-1/2" internal thread - quick coupling		
Coolant outlet	N6	G-1/2" internal thread - quick coupling		

NPT / ANSI on request



## DIMENSIONS SIHI® Dry GD S400 – S1000

Dimensions in mm



SIHI® Dry		S400	S630	S1000
Inlet	N1	DN100 / ISO-F DN100		
Outlet	N2	DN80 / ISO-F DN100		
Gas supply inlet	N4.1	G-1/2" internal thread - quick coupling		
Coolant inlet	N5	G-1/2" internal thread - quick coupling		
Coolant outlet	N6	G-1/2" internal thread - quick coupling		

NPT / ANSI on request

## STANDARD COMPONENTS and ACCESSORIES

COMPONENT	DESCRIPTION
Drive	<ul style="list-style-type: none"> <li>• <b>Variable Speed</b> Operation with variable speed is possible in different operation modes. At Vacuum Mode the pump speed can be given at any point within its technical limits. Variable Speed is available for pressure regulation and operation at best efficiency point. <ul style="list-style-type: none"> <li>- Standby</li> <li>- Vacuum Mode with variable speed</li> </ul> </li> </ul>
Communications	On customer demand, the pump can be equipped with the following control modules: CANopen, I/O interface, Profibus, PROFINET, EtherCAT, Modbus-TCP, EtherNet/IP, DeviceNET
Gas supply <ul style="list-style-type: none"> <li>• Gas sealing</li> <li>• Gas dilution</li> <li>• Control of devices</li> </ul>	<p><b>SIHI® Dry</b> is using one supply connection to feed all pneumatic devices and it is generally equipped with quick-couplings.</p> <p><b>SIHI® Dry</b> is using wear free static labyrinth seals between shaft and working chamber. These seals are purged with sealing gas.</p> <p>Important: Supplied gas quality must conform to the vacuum system specifications.</p>
Gas dilution	<p>This optional, additional gas dilution can be added in order to handle larger amounts of particles or excessive amounts of condensable vapour. In order to prevent too high purge gas consumption, this option only gets activated by the control in „Vacuum Mode“.</p> <p>The gas dilution has no impact on the suction capacity.</p>
Cooling circuit	<ul style="list-style-type: none"> <li>• <b>Direct Cooling</b> The vacuum pump is directly connected to the customers cooling system (no DI water).</li> <li>• <b>Direct Cooling with Thermostatic Control</b> The vacuum pump is directly connected to the customers cooling system (no DI water). For minimized coolant consumption and for adjusting the working chamber temperature, the cooling circuit is equipped with a thermostatic valve.</li> <li>• <b>Secondary Cooling with Magnet Coupled Circulation Pump</b> The vacuum pump is not directly connected to the customers cooling system. The cooling circuit of the vacuum pump and the customers cooling circuit are decoupled by a plate heat exchanger. It is possible to use special coolants e.g. DI water. In the cooling circuit of the vacuum pump, a thermostatic valve is installed for adjustable working chamber temperature to avoid process particle deposition and condensation.</li> </ul> <p>The vacuum system is generally equipped with quick-couplings.</p> <p>Important: Supplied coolant quality must conform to the vacuum system specifications.</p>
Sensors	<ul style="list-style-type: none"> <li>• <b>Basic variant</b> Measurement of coolant temperature, backpressure and sealing gas pressure <ul style="list-style-type: none"> <li>- To measure the max. coolant temperature of the <b>SIHI® Dry</b> and to perform a target warm-up, a temperature sensor (Pt 100) is installed inside the cooling jacket of the vacuum pump.</li> <li>- To measure the max. permissible back pressure, a pressure transmitter is installed on the vacuum pump's discharge side. Based on increasing back pressure, layer building or blockages can be recognized at the discharge pipe work.</li> </ul> </li> <li>• <b>SIHI® Dry</b> is using wear free static seals where gaps are purged with sealing gas. To react in case of insufficient gas supply, the pressure of sealing gas can be measured by a pressure switch.</li> <li>• <b>Enhanced variant</b> Like Basic Variant with additional monitoring of the suction side pressure</li> </ul>

COMPONENT	DESCRIPTION
	<ul style="list-style-type: none"> <li>- To measure the suction side pressure a pressure transmitter is installed.</li> <li>• <b>Fully equipped variant</b> Like Enhanced Variant with additional monitoring of the suction side temperature and the discharge side temperature:               <ul style="list-style-type: none"> <li>- To measure the inlet temperature, a temperature sensor (Pt100) is installed at the suction side of the vacuum pump.</li> <li>- To monitor the discharge temperature, a temperature sensor (Pt100) is installed at the discharge side of the vacuum pump.</li> </ul> </li> </ul>
Suction side accessories	<ul style="list-style-type: none"> <li>• <b>Centring Ring with Coarse Sieve</b> Suction side sieve can reduce mechanical damages which occur in case of bigger particles might enter the working chamber of the pump. Mesh size: 4 mm; wire diameter: 0.9 mm</li> <li>• <b>Centring Ring with Fine Sieve and Centring Ring with Coarse Sieve</b> Suction side sieve can reduce mechanical damages which occur in case of bigger particles might enter the working chamber of the pump. For the commissioning, an additional fine-meshed sieve is added to the scope of supply. After commissioning it has to be replaced by the coarse-meshed sieve. Mesh size: 1.2 mm; wire diameter: 0.33 mm</li> <li>• <b>Suction Side Shut-Off Valve</b> A pneumatic driven butterfly shut-off valve on the suction side isolates the pump from the recipient. Backflow through the pump and ventilation of the reactor are avoided. When power and gas supply fails, the valve is automatically closed by an internal spring return (NC). Especially for parallel pump operation, it is recommended to equip each pump with an isolation valve to avoid damages in case of any failures.  The valve is fully mounted and integrated into the vacuum system. Two different actuator types are available: 3-6 bar g and 6-8 bar g.  Note: The discharge side shut-off valve as well as the suction side shut-off valve need be designed for the available supplied gas pressure.</li> </ul>
Discharge side accessories	<ul style="list-style-type: none"> <li>• <b>Discharge Side Shut-Off Valve</b> A pneumatic driven butterfly valve on the discharge side isolates the pump from the exhaust pipe work. Backflow through the pump and ventilation of the reactor are avoided. When power and gas supply fails, the valve is automatically closed by an internal spring return (NC).  The valve is fully mounted and integrated into the vacuum system. Two different actuators types are available: 3-6 bar g and 6-8 bar g  Note: The discharge side shut-off valve as well as the suction side shut-off valve need be designed for the available supplied gas pressure.</li> <li>• <b>Silencer</b> Discharge side absorption silencers reduce the exhaust noise emissions to a minimum. The silencers are designed for the relevant pump size and pump accessories.</li> </ul>



**Cat SIHI Dry GD S V EN 04/2019 133.76170.51.01**

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