

SIHI[®] Dry CD S / SIHI[®] Dry CD V

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

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



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

Pumping Speed: 160 to 1000 m³/h
94 to 588 cfm

DESIGN

SIHI® Dry vacuum systems in compact design 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
- Condition monitoring
- Pre failure detection
- Disassembly and assembly of the pump chamber can be done insitu by own staff members

The compact design of **SIHI® Dry CD** Vacuum systems have been especially designed for user-optimised handling and connection. With its superior and fully-integrated control, **SIHI® Control** offers:

- Autonomous supervision and control of all integrated actors and sensors
- Local control via HMI touch interface
- Condition monitoring options adaptable

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.

GENERAL TECHNICAL DATA

SIHI® Dry		S160	V250	V400	S400	S630	S1000
Max. eff. Pump Speed	m ³ /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 ¹	dB (A)	< 54			< 64	< 73	< 75
Weight, approx.	kg (lbs)	400 (880)			750 (1653)		

¹ DIN ISO 9614 / 21680



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

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			IP54		
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

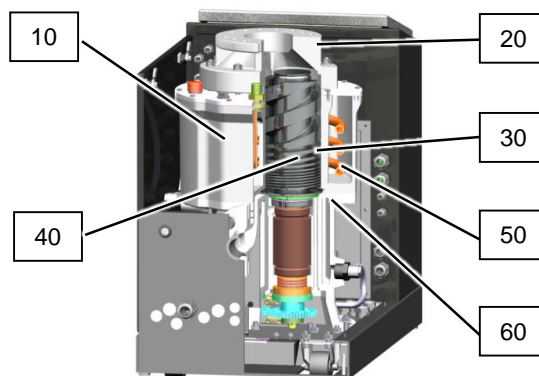
SIHI® Dry		S160	V250	V400	S400	S630	S1000
Medium	-	N ₂ , Ar ⁽²⁾	CDA, N ₂ , Ar				
Gas purity		min Class 2.4.1 (following ISO 8573-1:2010)					
Consumption sealing gas (in operation)	NI/min (SCFM)	20 (0.71)					
Pressure	bar g (psi)	6 to 8 (87 to 116)					

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. 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	10	EN-GJS-400-18-LT					
Casing cover	20	EN-GJS-400-18-LT			1.0553		
Twin screw spindle	30	1.4122					
Bearing cartridge	40	1.4122					
Cooling circuit	50	brass nickel plated, EPDM / stainless steel, copper / GJS					
Motor casing	60	EN-GJS-400-18-LT					
Shielding gas throttle (not shown)		EN-GJL-250					
Suction side sieve (not shown)		stainless Steel / FKM / aluminium					

² 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

No PLC control for pump necessary

- + Pre-engineered modules are self-controlled by integrated system control
- + Local control via Human Machine Interface (HMI) touch panel
- + Data communication via Ethernet

Easy communication integration due industrial standards

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

Installation

... FASTEST INSTALLATION & START UP

Plug & pump concept

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

Cleaning

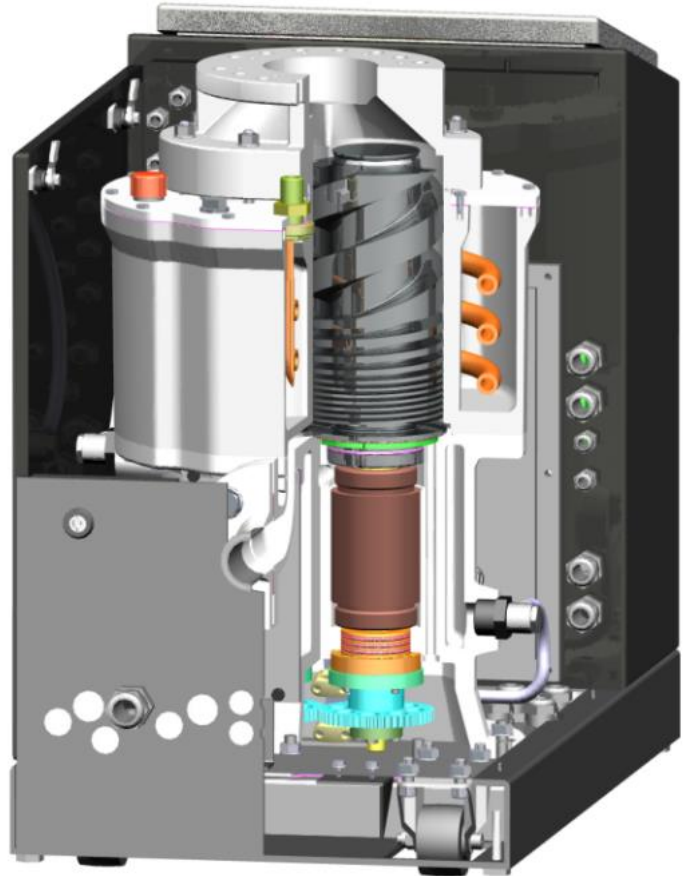
... LOWEST DOWN TIME

Only cleaning on demand

- + Condition monitoring by independent data record of both shafts
- + Pre failure detection

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



Pump System Control with HMI



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



Service

... LOWER COST FOR SERVICE

Avoiding consequential damages
+ Pre failure detection

... 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
+ Equipped with wheels and levelling feet

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

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

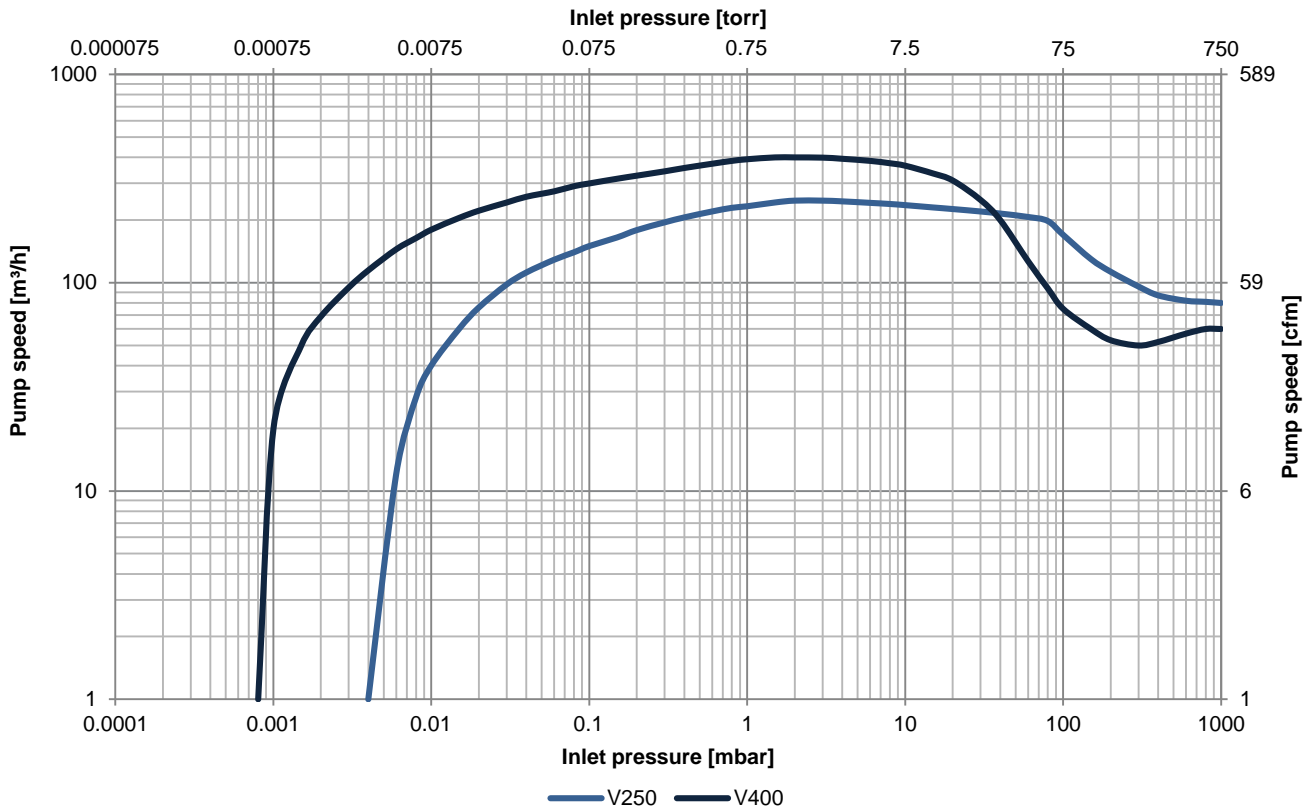
Handles condensable & corrosive media

+ 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

PUMP SPEED CURVE - SIHI® Dry V250 – V400



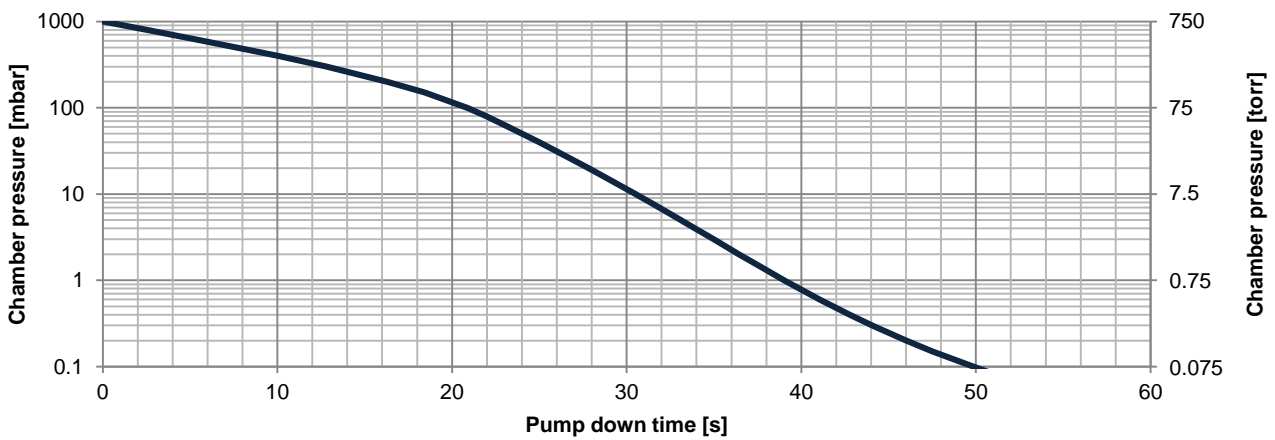
The operating Data is valid under following conditions:

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

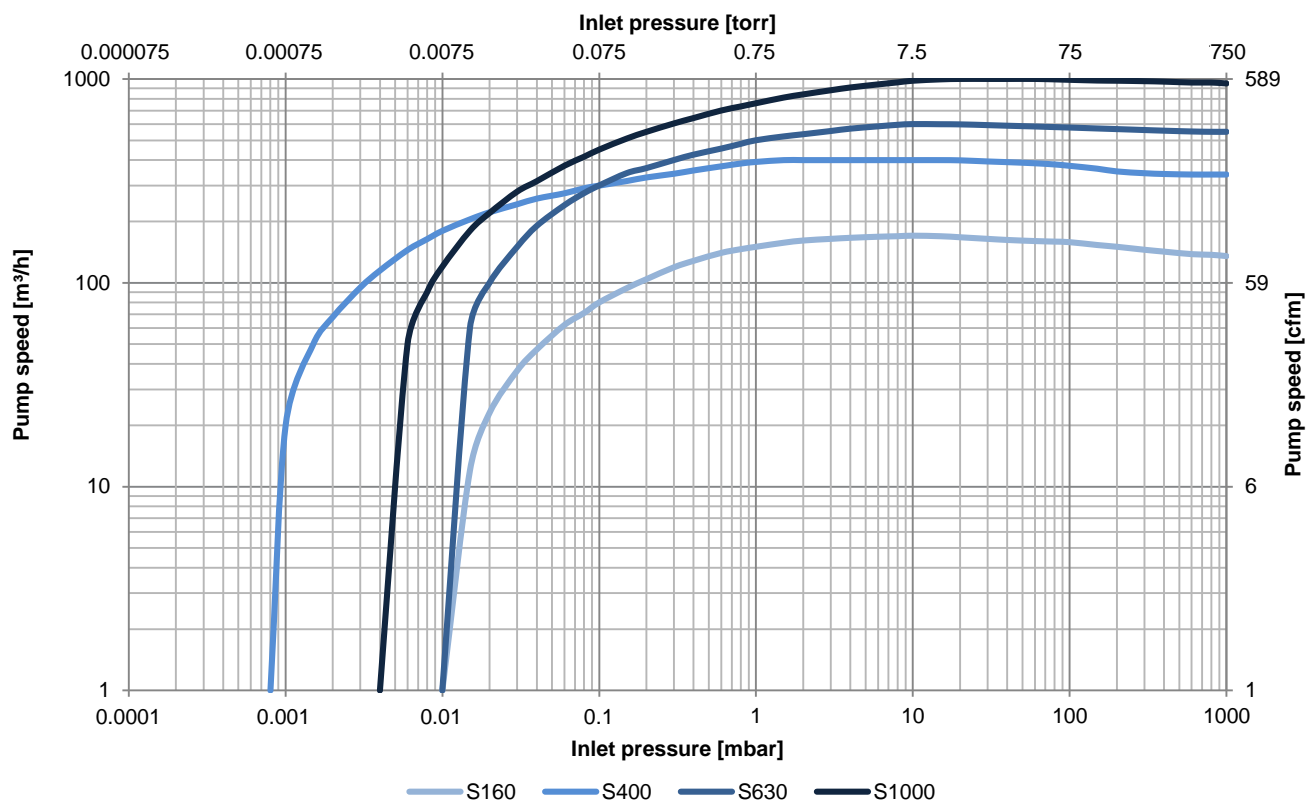
Tolerance on operating data is 10%

Pump down curve - SIHI® Dry V250

Example: 250l chamber



PUMP SPEED CURVE - SIHI® Dry S160 – S1000



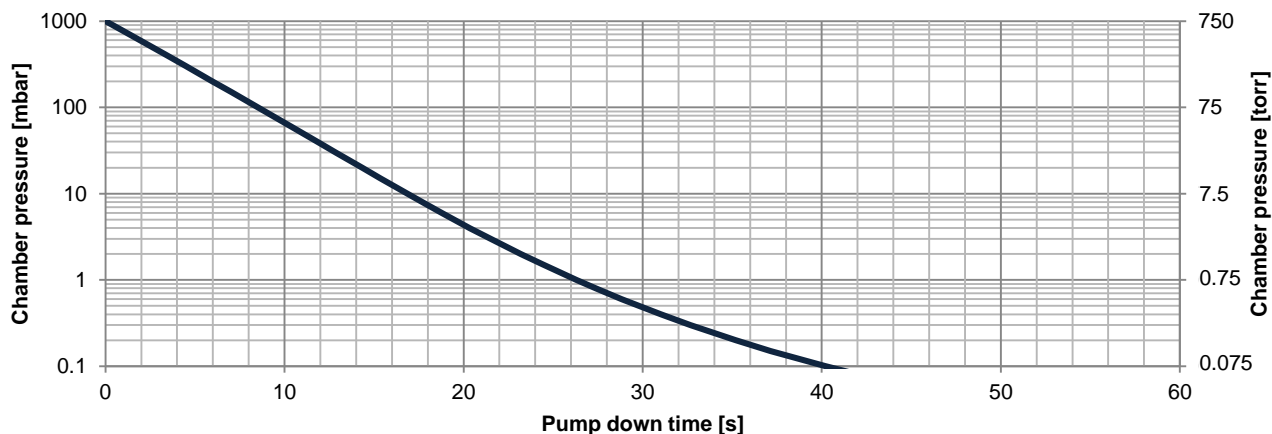
The operating Data is valid under following conditions:

- 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%

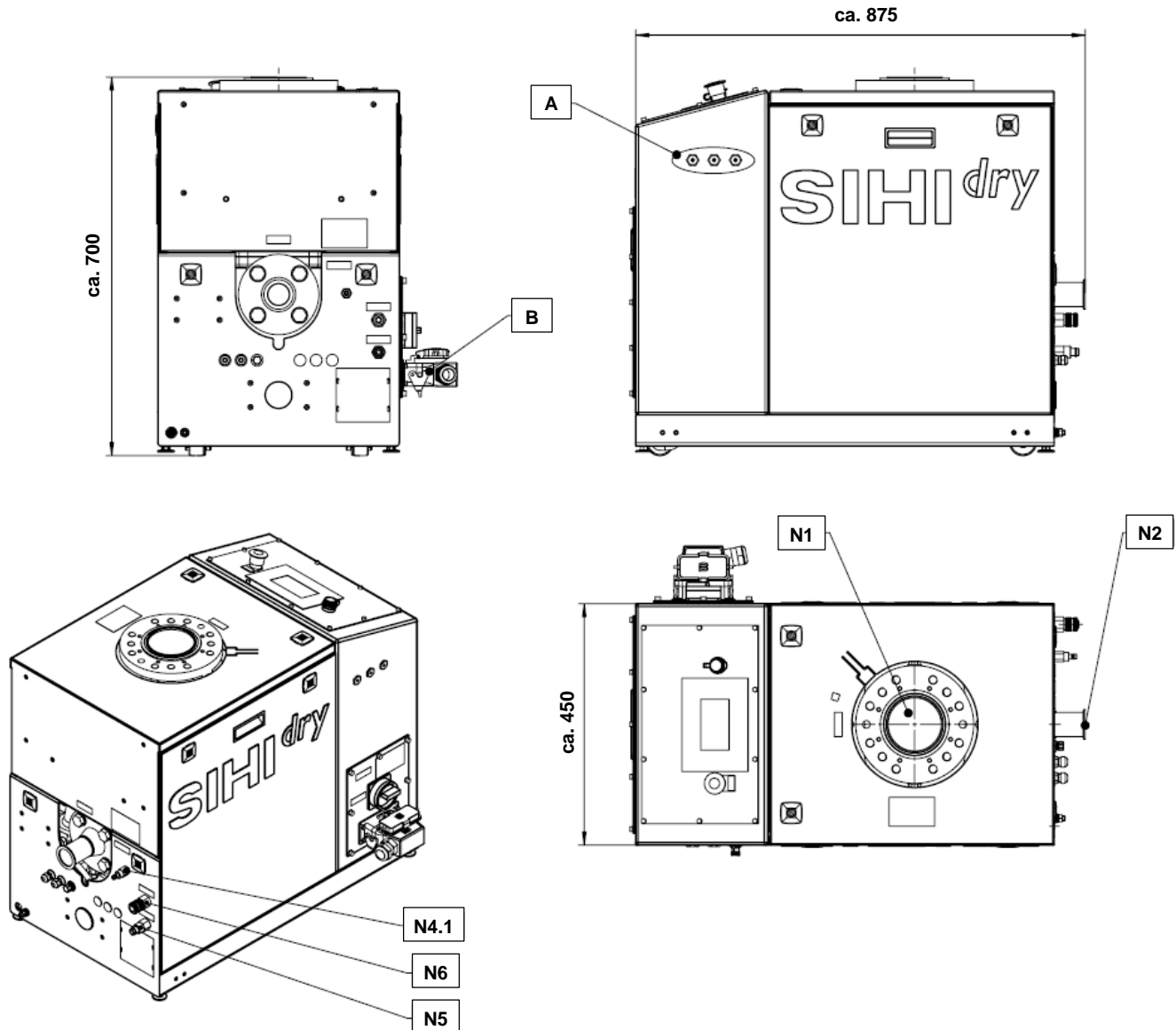
Pump down curve - SIHI® Dry S1000

Example: 1000l chamber



DIMENSIONS SIHI® Dry CD S160 / V250 – V400

Dimensions in mm

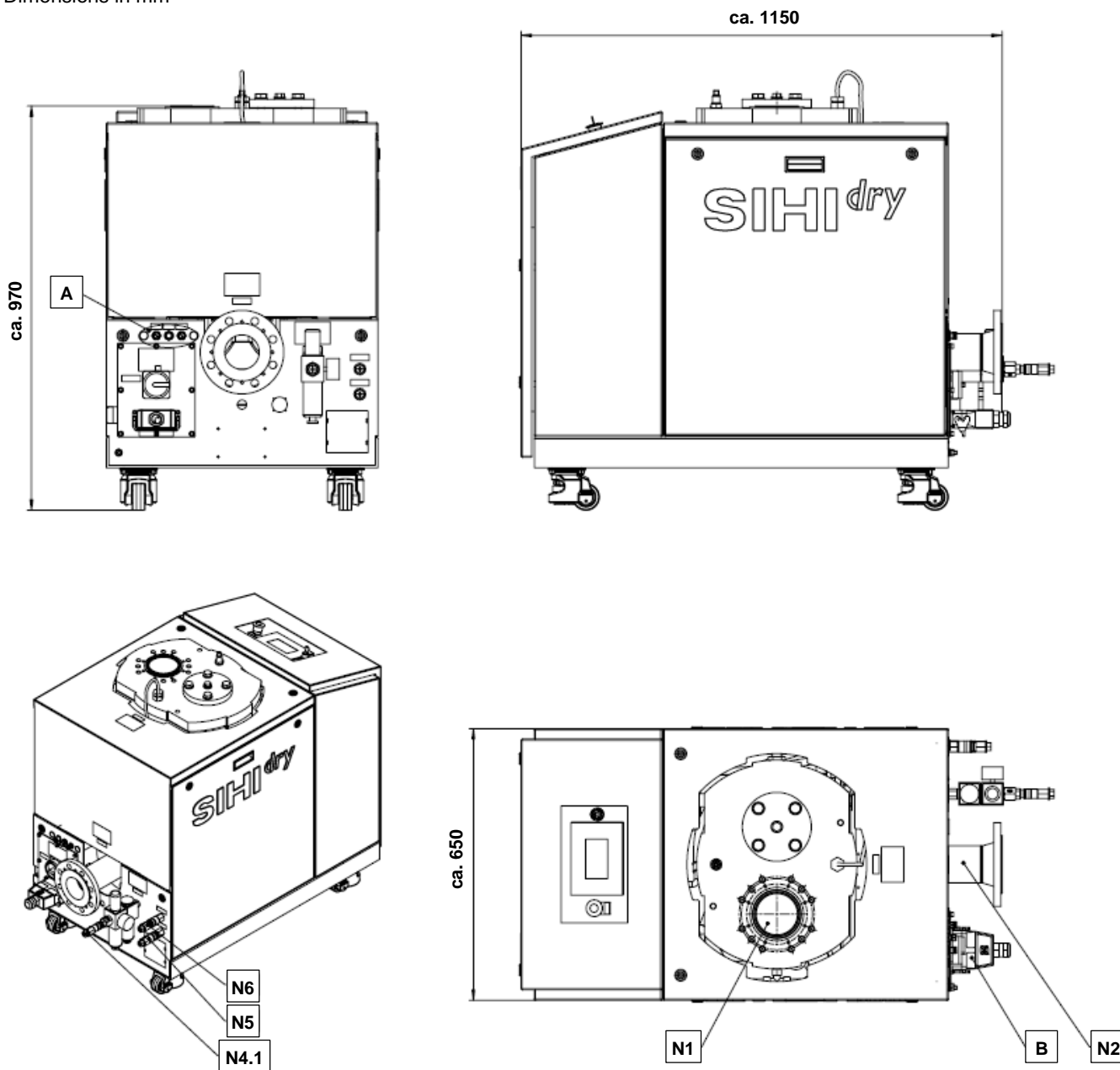


SIHI® Dry		S160	V250	V400
Inlet	N1	DN80 / ISO-F DN63	DN100 / ISO-F DN100	
Outlet	N2	ISO-KF DN40		
Gas supply inlet	N4.1	G-1/4" internal thread - quick coupling		
Coolant inlet	N5	G-1/2" internal thread - quick coupling		
Coolant outlet	N6	G-1/2" internal thread - quick coupling		
Communication / Ethernet interfaces	A	M12 connector		
Power supply	B	Plug insert 6 HSB – ST1 Housing B16, single lever		

NPT / ANSI on request

DIMENSIONS SIHI® Dry CD 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		
Communication / Ethernet interfaces	A	M12 connector		
Power supply	B	Plug insert 6 HSB – STI Housing B16, single lever	Plug insert K6/6 Housing B24, single lever	

NPT / ANSI on request

STANDARD COMPONENTS and ACCESSORIES

COMPONENT	DESCRIPTION
Drive	<ul style="list-style-type: none"> • Fixed Speed Operation with fixed speed is possible in different operation modes. The relevant speed can be set within its technical limits. <ul style="list-style-type: none"> - Standby - Vacuum Mode • Variable Speed 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"> - Standby - Vacuum Mode with variable speed
Control unit	On customer demand, the pump can be equipped with the following control modules: I/O interface, Profibus, PROFINET, EtherCAT, Modbus-TCP, EtherNet/IP, DeviceNET
Gas supply <ul style="list-style-type: none"> • Gas sealing • Gas dilution • Control of devices 	<p>SIHI® Dry is using one supply connection to feed all pneumatic devices and it is generally equipped with quick-couplings.</p> <p>SIHI® Dry 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 silution	<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"> • Direct Cooling The vacuum pump is directly connected to the customers cooling system (no DI water). • Direct Cooling with Thermostatic Control 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. • Secondary Cooling with Magnet Coupled Circulation Pump 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. <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"> • Basic variant <ul style="list-style-type: none"> - Monitoring of the coolant temperature, the backpressure and the sealing gas pressure - To monitor the max. coolant temperature of the SIHI^{dry} and to perform a target warm-up, a temperature sensor (Pt 100) is installed inside the cooling jacket of the vacuum pump. To avoid mechanical damages caused by insufficient cooling water supply, the pump shuts down in case of exceeding the max. permissible temperature. - To monitor 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. The pump shuts down in case of exceeding the max. permissible back pressure. - The SIHI® Dry is using wear free static labyrinth seals between shaft and working chamber. These seals are purged with sealing gas. To react in case of

COMPONENT	DESCRIPTION
	<p>insufficient gas supply, a pressure switch is permanently monitoring the pressure of the sealing gas. The pump automatically shuts down in case of insufficient sealing gas supply.</p> <ul style="list-style-type: none"> • Enhanced variant Like Basic Variant with additional monitoring of the suction side pressure <ul style="list-style-type: none"> - To monitor the suction side pressure a pressure transmitter is installed. • Fully equipped variant Like Enhanced Variant with additional monitoring of the suction side temperature and the discharge side temperature: <ul style="list-style-type: none"> - To monitor the inlet temperature, a temperature sensor (Pt100) is installed at the suction side of the vacuum pump. The pump shuts down in case of exceeding the max. permissible inlet temperature. Defined warning values can be preset. - To monitor the discharge temperature, a temperature sensor (Pt100) is installed at the discharge side of the vacuum pump. The pump shuts down in case of exceeding the max. permissible discharge temperature. Defined warning values can be preset.
Suction side accessories	<ul style="list-style-type: none"> • Centring Ring with Coarse Sieve 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 • Centring Ring with Fine Sieve and Centring Ring with Coarse Sieve 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 • Suction Side Shut-Off Valve 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.
Discharge side accessories	<ul style="list-style-type: none"> • Discharge Side Shut-Off Valve 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. • Silencer Discharge side absorption silencers reduce the exhaust noise emissions to a minimum. The silencers are designed for the relevant pump size and pump accessories.



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