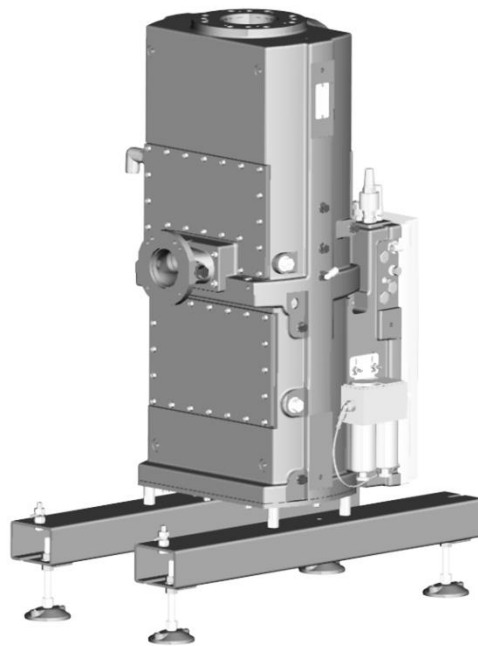




SIHI[®] Dry GD S

Sizes S450, S650

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



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

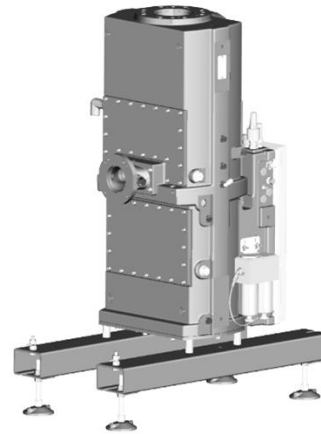
Pumping Speed: 450 to 650 m³/h
265 to 383 cfm

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
- Silent operation
- Lowest vibration level
- Absolutely free of oil / no gear oil
- Plug & Pump for shortest commissioning
- Permanent pump protection by electronically overload function
- 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.



APPLICATION

The **SIHI® Dry** is 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 | | S450 | S650 |
|--------------------------------------|-------------------------|--------------------------|---------------|
| Max. eff. Pump Speed | m ³ /h (cfm) | 450 (265) | 700 (412) |
| Ultimate pressure | mbar a (mtorr a) | < 0.005 (3.75) | < 0.001 (7.5) |
| Power consumption at ultimate press. | kW (hp) | ≤ 4 (≤ 5.4) | ≤ 6 (≤ 8) |
| Max. discharge pressure | mbar g (torr g) | 100 (75) | |
| 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 bis +40 (+50 to +95) | |
| Noise emission ¹ | dB (A) | < 75 | |
| Weight, approx. | Kg (lbs) | 400 (882) | |

¹ DIN ISO 9614 / 21680

ELECTRICAL DATA

| SIHI® Dry | | S450 | S650 |
|--|----------|----------------------------|-----------|
| 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 | |
| Power consumption at ultimate pressure | kW (hp) | ≤ 4 (≤ 5.4) | ≤ 6 (≤ 8) |
| Max. power consumption | kW (hp) | 12 (16) | |
| Fuse protection - all poles | A | 32 | |

PURGE GAS (SEALING GAS)

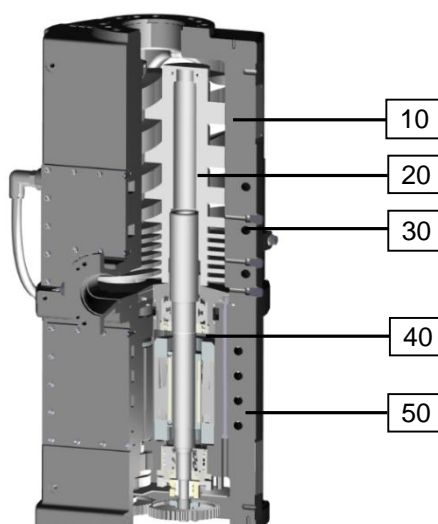
| SIHI® Dry | | S450 | S650 |
|--------------------------|---------------|---|------|
| Medium | - | N ₂ , CDA, CO ₂ | |
| Gas purity | | min Class 2.4.2 (following ISO 8573-1:2010) | |
| Consumption in operation | NI/min (SCFM) | 20 (0.71) | |
| Pressure | bar g (psi g) | 6 bis 8 (87 to 116) | |

COOLING WATER

| SIHI® Dry | | S450 | S650 |
|---------------------------|---------------|--|------|
| Medium | - | Water conductivity > 50 µS (DI water on request) | |
| Cooling water temperature | °C (°F) | 10 to 40 (50 to 104) | |
| Max. adm. static pressure | bar g (psi g) | 6 (87) | |
| Min. flow | l/min (gpm) | 7 (1.85) | |

MATERIAL DESIGN

In contact with process medium / coolant



| SIHI® Dry | | S450 | S650 |
|--------------------|----|---|------|
| Casing | 10 | EN-GJS-400-18-LT | |
| Twin screw spindle | 20 | EN-GJS-500-14 | |
| Cooling circuit | 30 | brass, brass nickel plated, PUN, 1.4021, EN-GJS-400-18-LT, EN-GJL-250 | |
| Bearing cartridge | 40 | 1.4021 | |
| Motor casing | 50 | EN-GJL-250 | |

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

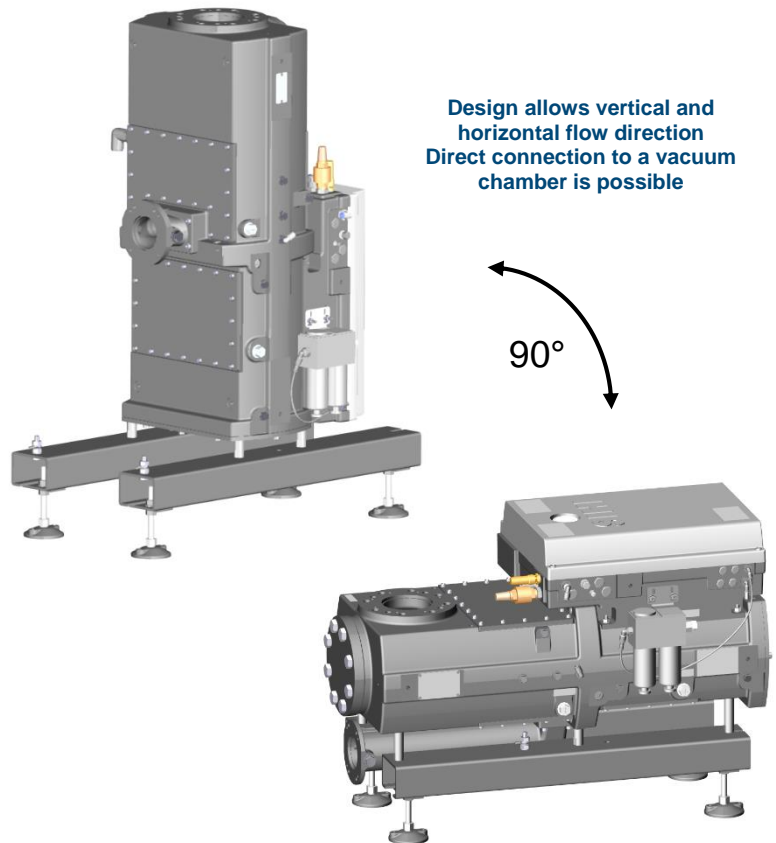
- + Adjustable suction capacity by variable speed

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 (optional)

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

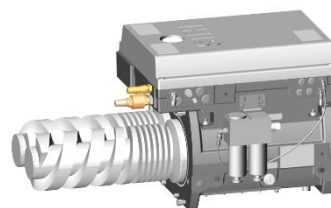
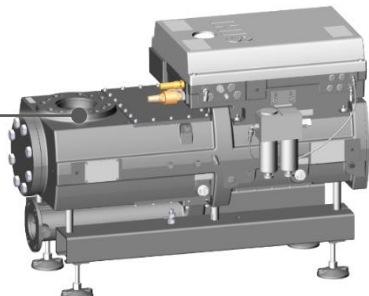
NO WEARING

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

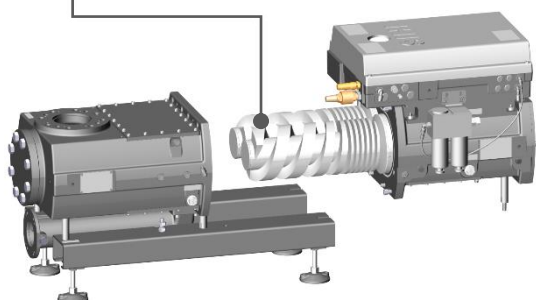
CONTINUOUS CONDITION ANALYSIS

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

Easiest service on site



Easiest cleaning on site



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

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

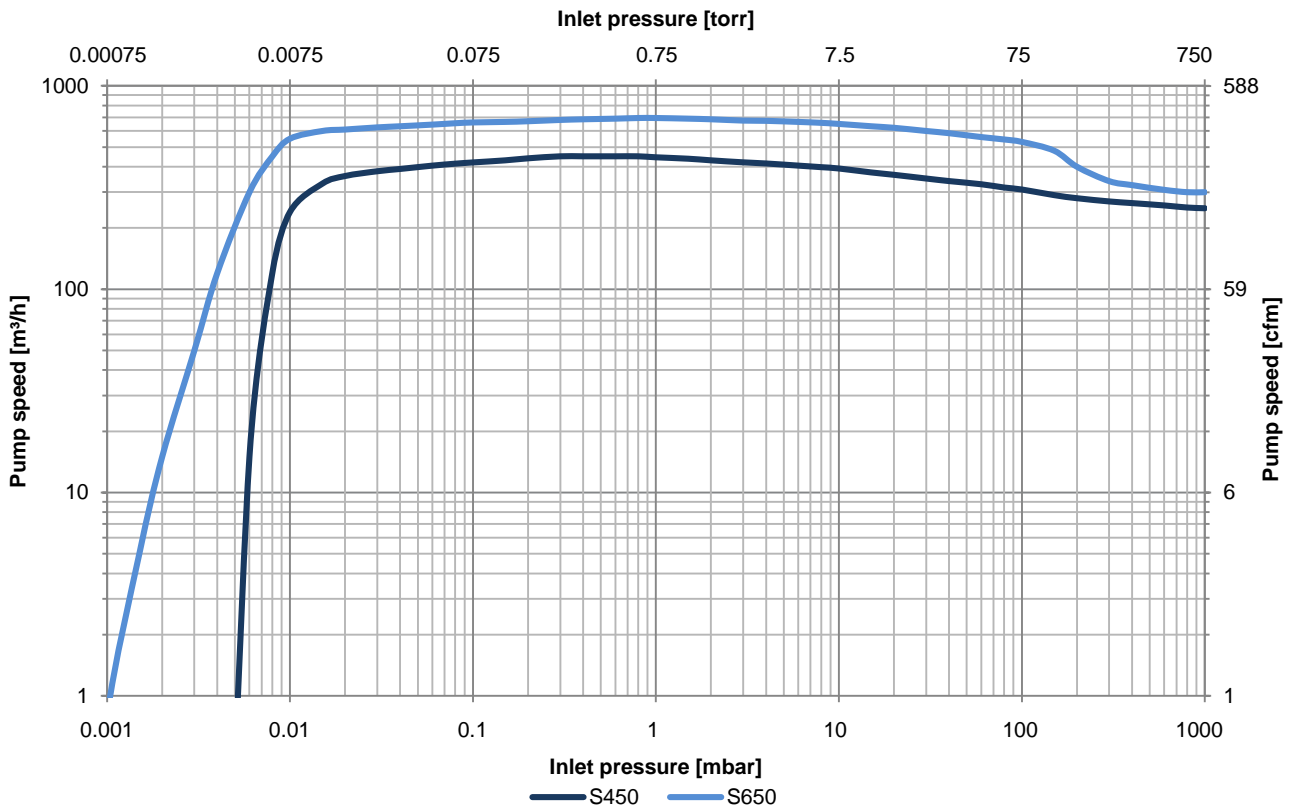
HANDLES CONDENSABLE & CORROSIVE MEDIA

- + 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



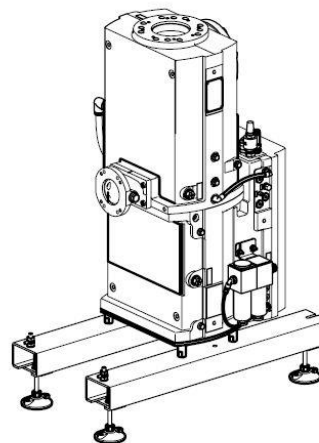
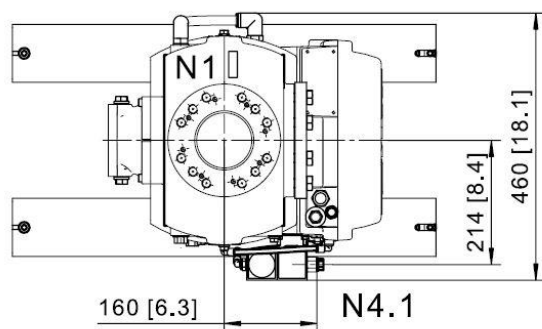
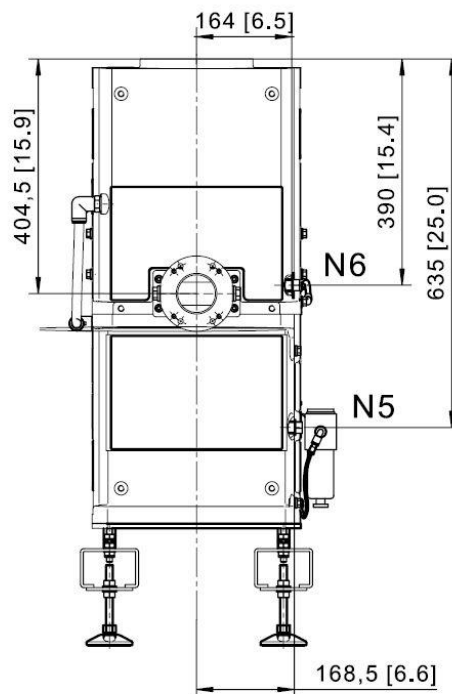
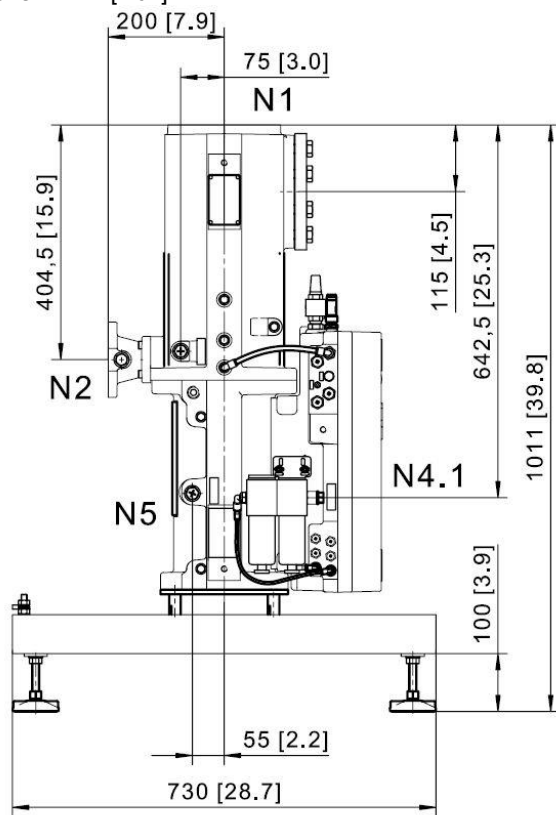
The operating Data is valid under following conditions:

- Process media : dry air 20°C (68°F)
- Coolin water inlet : water: 25°C (77°F)
- Discharge pressure : 1013 mbar (760 torr)
- The suction volume is related to the suction pressure

Tolerance on operating data is $\pm 10\%$

DIMENSIONS – vertical orientation

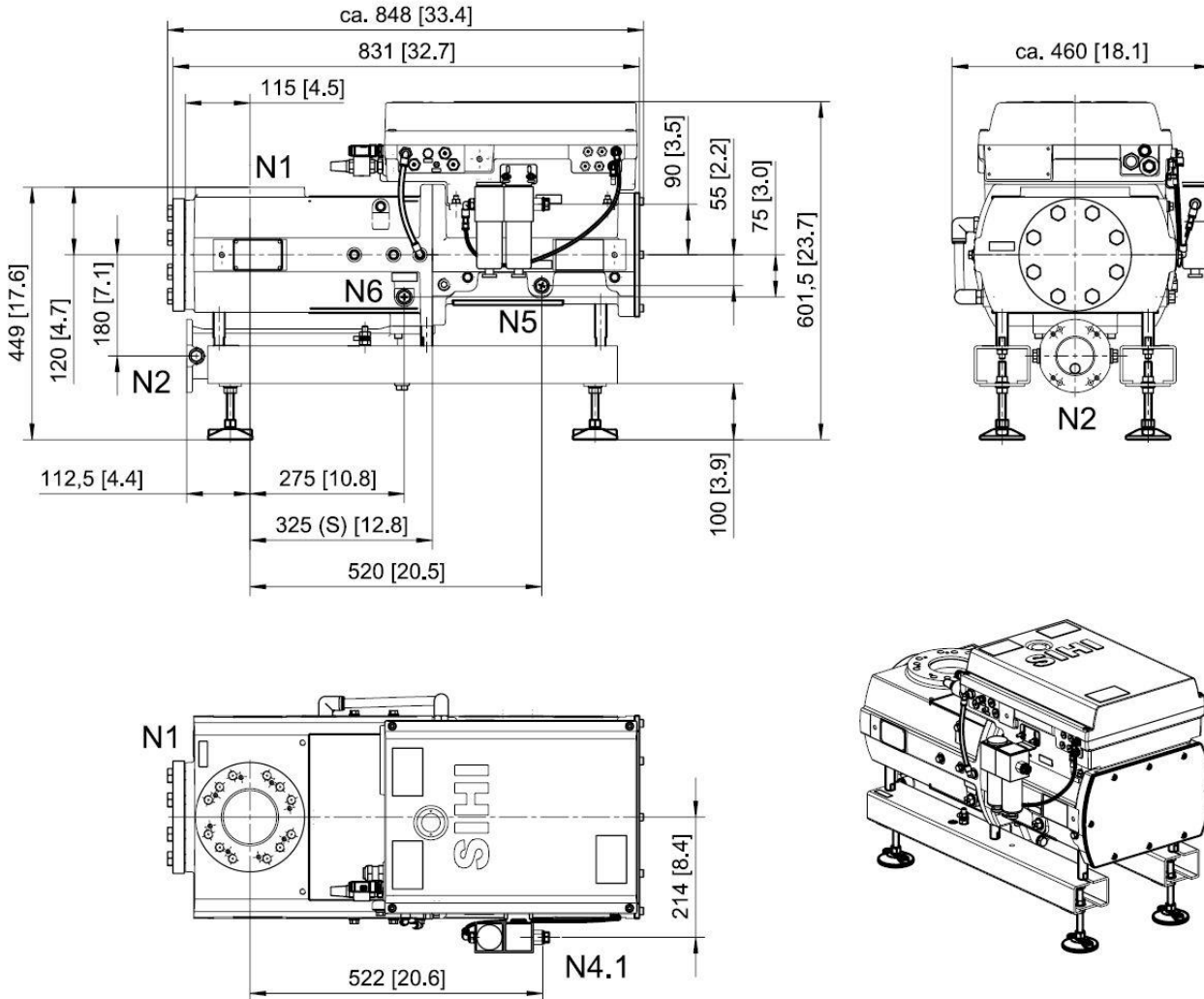
Dimensions in mm [inch]



| SIHI® Dry | | S450 | S650 |
|------------------------|------|--|------|
| Inlet | N1 | DN 80 / ISO-F 100 / ANSI 3" | |
| Outlet | N2 | ISO-F 63 | |
| Purge gas supply inlet | N4.1 | NPT 3/8" internal thread - quick coupling (optional) | |
| Coolant inlet | N5 | NPT 1/2" internal thread - quick coupling (optional) | |
| Coolant outlet | N6 | NPT 1/2" internal thread - quick coupling (optional) | |

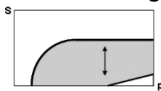
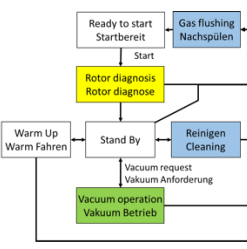
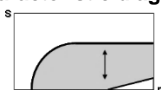
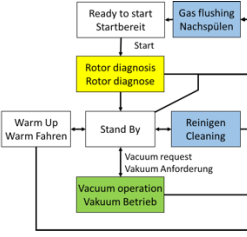
DIMENSIONS – horizontal orientation

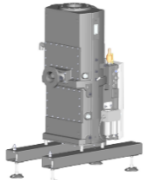
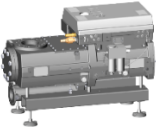

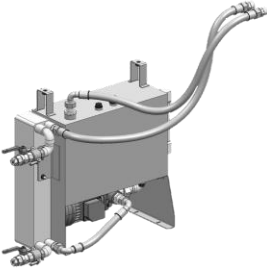
Dimensions in mm [inch]

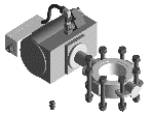









| SIHI® Dry | | S450 | S650 |
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| Coolant outlet | N6 | NPT 1/2" internal thread - quick coupling (optional) | |

STANDARD MODULS and ACCESSORIES

| MODULS AND ACCESSORIES | FEATURES |
|--|--|
| VACUUM PUMP | |
| SIHI® Dry S450 / S650 | <ul style="list-style-type: none"> - Pump unit - integrated drive motors - integrated drive control unit - integrated monitoring of power and media supply <p>Double shafted screw spindles / displacers rotate contact free in reverse direction. Integrated monitoring of cooling water supply and compressions and seal gas pressure.</p> |
| PUMP CONTROL | |
| BASIC | <ul style="list-style-type: none"> - In Pump integrated pump control - Monitoring and Control of internal temperature - Monitoring and Control of torque - Monitoring of seal gas pressure - Monitoring of back pressure (exhaust) - Electronically overload protection - On-site operation via Tablet-PC, SIHI® BT-Remote App via Bluetooth® communication <p>Commands: Start, Stop, Reset 24V supply voltage</p> <p>Communications: signal output (4 pins)</p> <p>Status Messages: Operation and failure signal</p> <p>NO valve actuation / control</p> <p>NO sensor analysis</p> |
| SIHI Control FX Characteristic diagram:  Process flow diagram:  | <p>Like control variant BASIC, additionally:</p> <ul style="list-style-type: none"> - ... - variable speed via integrated frequency converter - On-site operation via Tablet-PC, SIHI® BT-Remote App via Bluetooth® communication and Vacuum pump integrated SIHI Control FX sequence control - FX = Fixed parameter - Data logger - Display of operation mode - Programmed valve control (for all standard valves) - Input for analog signals - Digital status messages <p>Commands: Start, Stop, Vacuum, Shut Down, Reset</p> <p>Communications: IO interface (17 pins)</p> <p>Speed set point: Analog (4-20mA)</p> <p>Status Messages: Operation, Warning, Failure, Failure signal, Vacuum, Shut Down, Actual speed (4-20mA)</p> <p>Control of following valves:</p> <ul style="list-style-type: none"> - Shut-Off Valve (suction side) - Seal gas - Gas dilution - Cleaning / Flushing <ul style="list-style-type: none"> - Liquid purge - Gas purge <p>Analysis of following sensors:</p> <ul style="list-style-type: none"> - Pressure switch - Temperature sensor |
| SIHI CONTROL FX BUS Characteristic diagram:  Process flow diagram:  | <p>Like control variant SIHI Control FX, additionally:</p> <ul style="list-style-type: none"> - ... - Electrical connection via BUS interface - Detailed status messages via BUS interface - Detailed warning messages via BUS interface - Detailed failure messages via BUS interface - Speed settings via BUS interface <p>Commands ..., Cleaning</p> <p>Communications: PROFIBUS PROFINET EtherCAT Ethernet IP Modbus TCP</p> <p>Speed set point : Digital</p> <p>Status Messages: Operation, Vacuum Mode None Failure, Warning, Failure, Cleaning, Actual speed</p> |

| MODULS AND ACCESSORIES | | FEATURES |
|---|---|--|
| FRAME | | |
|  | <p><u>Vertical Version</u></p> <p>In this version the whole pump unit is mounted in vertical position to optimize the Top Down Flow. Thus the pump can be integrated in each customer machinery concept with the lowest floor-footprint.</p> | |
|  | <p><u>Horizontal Version</u></p> <p>In this version the whole pump unit is mounted in horizontal position. Thus the pump can be integrated in each customer machinery concept with the lowest installation height.</p> | |
| COOLING | | |
| | <p><u>Direct Cooling</u></p> <p>The vacuum pump is directly connected to the customers cooling system (no DI water).</p> <p><u>Important:</u> Supplied coolant quality must conform to the vacuum system specifications.</p> | <p>Material Design: Cooling media-accessible components: Brass, brass nickel plated, PUN, stainless steel, GJL, GJS</p> <p>cooling water connections: Standard :NPT 1/2" (IG) Optional :quick coupling</p> |
|  | <p><u>Direct Cooling with Thermostatic Valve (3-Way)</u></p> <p>The vacuum pump is directly connected to the customers cooling system (no DI water). For adjusting the working chamber temperature, the cooling circuit is equipped with a thermostatic valve (3-Way) optionally.</p> <p>Within certain technical limits, deposition layers and condensation can so be avoided.</p> | <p>Material Design: Cooling media-accessible components: as described in Direct Cooling + thermostatic valve: Brass</p> <p>cooling water connections: Standard :NPT 1/2" (IG) Optional :quick coupling</p> |
|  | <p><u>Secondary Cooling with Circulation Pump</u></p> <p>The vacuum pump is not directly connected to the customers cooling system.</p> <p>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 (on request).</p> <p>In the cooling circuit of the vacuum pump, a thermostatic valve is installed for adjustable working chamber temperature to avoid or minimize process particle deposition and condensation.</p> <p>The vacuum system is generally equipped with quick-couplings.</p> | <p>Material Design: water-accessible components Brass, brass nickel plated, stainless steel</p> <p>cooling water connections: Standard :NPT 1/2" (IG) Optional :quick coupling</p> |

| MODULS AND ACCESSORIES | | FEATURES |
|---|---|---|
| SUCTION SIDE ACCESSORIES | | |
|  | <p>Shut-Off Valve</p> <p>Isolation of the vacuum pump from the inlet line. 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.</p> <p>When power and gas supply fails, the valve is automatically closed by an internal spring return (NC).</p> <p><u>Note:</u> Sieve flange adaptor needed!</p> | <p>Scope of Supply</p> <ul style="list-style-type: none"> - Shut-Off Valve, GJL/stainless steel/ FKM - Actuator is designed for a pressure of 6 bar g (87 psi g), spring return - The valve is fully mounted and integrated into the vacuum system. |
|  | <p>Sieve flange adaptor</p> <p>Optional adapter for installation of sensors and/or purge/flushing valves on suction side on systems with flame arresters.</p> | <p>Material: Stainless Steel</p> |
|  | <p>Coarse strainer</p> <p>Mechanical damages caused by bigger particles can be prevented by an optionally installed Coarse Screen or Sieve</p> <p><u>Note:</u> Sieve slot / flange adaptor needed when DIN flange connector is used!</p> | <p>Material: Stainless Steel Mesh size: 4.0 mm [0.16 inch] Wire thickness: 0.9 mm [0.0354 inch]</p> |
|  | <p>Fine strainer</p> <p>Mechanical damages caused by smaller particles or process flakes can be prevented by an optionally installed Fine strainer. Recommended for commissioning start up purposes.</p> <p><u>Note:</u> Sieve flange adaptor needed when DIN flange connector is used!</p> | <p>Material: Stainless Steel Mesh size: 1.2 mm [0.0472 inch] Wire thickness: 0.33 mm [0.013 inch]</p> |
| GAS SEALING | | |
| | <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 DILUTION | | |
| | <p>This optional, additional gas dilution can be added in order to handle larger amounts of particles or excessive amounts of condensable vapor. In order to prevent too high purge gas consumption, this option only gets activated by the control in „Vacuum Mode“.</p> <p><u>Note:</u> The pressure of gas dilution complies with the pressure of gas sealing</p> | <p>Scope of Supply</p> <ul style="list-style-type: none"> - 2-way, 2-position valve, NC direct-acting solenoid valve, designed for CDA pressure of 6 bar g (87 psig), spring return, brass - Flow meter 400 – 4000 NI/h (14.1 – 141 cfh), adjustable by a needle valve |

| MODULS AND ACCESSORIES | | FEATURES |
|---|--|--|
| GAS- AND LIQUID FLUSHING | | |
|  | <p>The optional, additional gas purge by any type of inert gas can be added in order to dry and / or to get all residual process gases or condensable vapor out of the pump's suction chamber.</p> <p>An optional, additional liquid purge can help to rinse all particles / flakes or depositions out of the pump.</p> <p>This function can be activated by the software.</p> <p>Note: Sieve flange adaptor needed!</p> | <p>Scope of Supply</p> <ul style="list-style-type: none"> - 2-way, 2-position valve, NC direct-acting solenoid valve, designed for CDA pressure of 6 bar g (87 psig), spring return, brass - Magnetic valve - Pressure reducer - Needle valve |
| DISCHARGE SIDE ACCESSORIES | | |
|  | <p><u>Wafer Type Lift Check Valve</u></p> <p>Separation of vacuum pump and exhaust line</p> <p>The pump is isolated to the exhaust line to avoid condensation of process gases after the pump is switched off.</p> | <p>Scope of Supply</p> <ul style="list-style-type: none"> - Wafer Type Lift Check Valve - Spring return <p>Material: Stainless Steel</p> |
|  | <p><u>Silencer</u></p> <p>Discharge side absorption silencers reduce the exhaust noise emissions to a minimum.</p> | <p>Material: Stainless Steel</p> |
|  | <p><u>Adaptor flange discharge side</u></p> <p>ISO-F63 auf DN 80 PN16 / ANSI 3"</p> | <p>Material: Stainless Steel</p> |



NOTE!

The above information is intended for guidance only and the company reserves the right to change any data herein without prior notice!

Cat SIHIDry GD S450 S650 EN 2017 07 133.76155.50.01

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