

CS CLEAN
SOLUTIONS

Product Information and Specifications

CLEANSORB® PRIMELINE PD Series

Model: CS200PD



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CLEANSORB® Service and Support

- High quality refillable stainless steel absorber columns, UN-approved transport vessels
- Worldwide network of local service partners for column refill and associated logistics
- Service contracts for annual preventive and general on-site maintenance

CLEANSORB® Dry Bed Chemisorber Technology

- Safe conversion of hazardous gases to stable solids at ambient temperature
- Unsurpassed gas removal to ppm levels and below
- Passive operating principle, does not require electricity, heating, etc.
- Low facilities requirement, inexpensive installation, simple to operate
- No hidden costs for 3ph power, fuel lines, D.I. water or acid drain
- Low maintenance: no specialized on-site service personnel required
- Gas bound in dry, compact form: not transferred to waste water

CLEANSORB® PRIMELINE PD Series

Every single hour of process time lost to exhaust and scrubber maintenance can add thousands of dollars to product manufacturing costs. The CLEANSORB PRIMELINE series brings unsurpassed cost-of-ownership to high volume manufacturing. Designed for 24/7 continuous operation, even during column change, the PRIMELINE CS200PD houses

two full-size absorber columns plus a back-up column; one column can remain active absorbing exhaust gas with full SEMI S2-compliant safety protection, while the second column is independently purged prior to removal from the cabinet for refilling. The system can otherwise be run with the two main columns in series. All gas-bearing components and

their connections are enclosed in a cabinet with monitored air extraction to ensure adequate ventilation in the unlikely event of internal leakage. Separate, individually air-extracted compartments are provided for the two main and back-up absorber columns, allowing a column to be exchanged during production without compromising ventilation. System safety design ensures that the gas path through the system is always open. In the event of an emergency, gas can be routed through the back-up absorber column, which is always kept in stand-by, to return the system to a pre-defined, safe state. Should a build-up of pressure occur, mechanical valves open to release the gas to the system outlet. Unique safeguard and control functions include an infra-red array which monitors the temperature profile of the absorber column, as well as an inert gas cooling mechanism. Integrated electrochemical gas sensors with multi-point sampling monitor the absorber columns for gas breakthrough (end of absorber capacity).

A safety PLC, a series of sensors and automatic safety routines ensure that the system can always be switched to the safe state – even in the event of failure of electrical power or pneumatic supply. All critical warning and alarm states are provided in the form of interface signals. In view of the safety risks associated with MOCVD and similar epitaxy and CVD processes, it is mandatory that these interlock signals be used for safety protection, e.g. to shut-off gas supply, should a critical situation arise.

A color touch screen with three authorization levels and flow schematic displays key system parameters such as operating mode, valve positions, pressure and temperature. It enables selection of pre-defined operating modes such as single column operation, columns in-series, safe bypass mode, inert gas purge, automated pressure decay leak test, and on-screen, step-by-step instructions for column exchange and service routines.

Important!

Our products are configured and specified on the basis of the process data provided in written form by you. These process details are taken to be accurate and complete. Future alterations to these process details must first be clarified with CS CLEAN SOLUTIONS AG prior to further operation of the products.

Before requesting a system recommendation or quotation, please ask your authorized CS CLEAN SOLUTIONS sales and service partner to provide you with a Process Definition sheet so that we can recommend a model and configuration which is optimized for your process.

Unless otherwise agreed upon in writing, the warranty on newly-manufactured products is for a period of 12 months following shipment. It does not extend to consumables, parts which are subject to wear or adverse climatic conditions, or components exposed to corrosive media.



Available Models	Column Size
CS200PD	2 x 200 liter + 1 x 25 liter

Basic System Configuration

Housing	<p>Powder-coated steel cabinet as enclosure for the absorber columns, system electronics and components. Dimensions (mm, HxWxD): 2,185 x 1,510 x 1,100. Separate, individually air-extracted compartments for the two main and back-up absorber columns. Collected air extract on cabinet roof. Two doors at cabinet front, key-lockable, with air intake vents. Door open monitor with interlock to safety control system and electronic disable open function. Bolt holes for seismic anchoring of cabinet.</p>
Absorber Columns	<p>Two main absorber columns, C1 and C2. Type: CLEANORB column, model CC200SA. Absorber column and ADR-authorized transport vessel with UN code number. Constructed from corrosion-resistant 316L stainless steel. Ø 560mm. Incorporating:</p> <ul style="list-style-type: none"> - Caster wheels on base; - Swagelok® quick connector, Ø 3mm, for capacity endpoint sampling; - Integrated ball valves at column inlet and outlet, DN40 ISOKF; - Hand lever tool for opening and closing of ball valves. <p>One backup column, C3. Type: CLEANORB column, model CC025SA. Absorber column and ADR-authorized transport vessel with UN code number. Mounted at rear of cabinet. Constructed from corrosion-resistant 316L stainless steel. Ø 250mm. Incorporating:</p> <ul style="list-style-type: none"> - Integrated ball valves at column inlet and outlet, DN40 ISOKF; - Swagelok® quick connector, Ø 3mm, for capacity endpoint sampling; - Hand lever tool for opening and closing of ball valves.

<p>Pipework and Components</p>	<p>Internal gas lines constructed from solid 316L stainless steel piping and flexible bellows tubing.</p> <p>Three pressure transducers, -500 ~ + 500 mbar, to enable independent monitoring of inlet pressure, as well as automatic pressure-decay leak test, for the main and back-up columns.</p> <p>Four gas sampling cocks, one at every main absorber column outlet, one at 50 % of backup column and one at system outlet, Swagelok® Quick Connect port, Ø 3mm.</p> <p>Assembly of pressure regulators, flowmeters and ball valves to enable automated (PLC- and Safety PLC-controlled and guided) inert gas purging of absorber column and gas lines.</p> <p>Assembly of pressure regulators, flowmeters and ball valves to enable automated (PLC- and Safety PLC-controlled and guided) pressure-decay leak testing of absorber column and gas lines.</p> <p>Inductive “Column in Place” switches. Proximity switches to monitor position of critical valves. Pressure switches to monitor supply pressure of N2. Sensors to monitor flowrate of N2 during Dilution and Cooling modes.</p> <p>Backwall-mounted rail with two perpendicularly facing arrays of infrared sensors. Allows temperature profile of all columns to be monitored independently of each other.</p> <p>Assembly of pressure regulators, flowmeters and ball valves to enable automated (PLC- and Safety PLC-controlled and guided) inert gas purging of absorber column and gas lines (“Dilution”).</p> <p>Assembly of pressure regulators, flowmeters and ball valves to initiate cooling with N2 if a temperature set-point is exceeded at the surface of either absorber column (“Cooling”).</p> <p>Assembly of pressure regulators, flowmeters and ball valves to enable automated (PLC- and Safety PLC-controlled and guided) pressure-decay leak testing of absorber column and gas lines.</p> <p>Electrical trace heating of inlet pipework and components, as required to minimize build-up of solid deposits. 2-step control with safety shutdown.</p>
<p>Endpoint Detection</p>	<p>Electrochemical gas sensor to indicate when the column has reached its capacity endpoint. Timer-controlled piston pump with user-selectable sampling frequency for gas sampling to endpoint detector. Gas measurement is made from up to four sampling points, typically with three points being monitored, depending on the column configuration which is currently active:</p> <ul style="list-style-type: none"> - 100 % lifetime of C1 - 100 % lifetime of C2 - 50 % lifetime of C3 - At main system outlet. <p>Gas sampling and measurement are conducted within a closed circuit. Upon detection of gas at a given sampling point, the electrochemical cell is automatically purged, and the sampling positions adjusted accordingly.</p> <p>The purpose of the endpoint detection sensor is to signal end of column lifetime only. It is expected that the customer installs a separate gas detection unit to independently monitor the working area for gas leaks.</p>

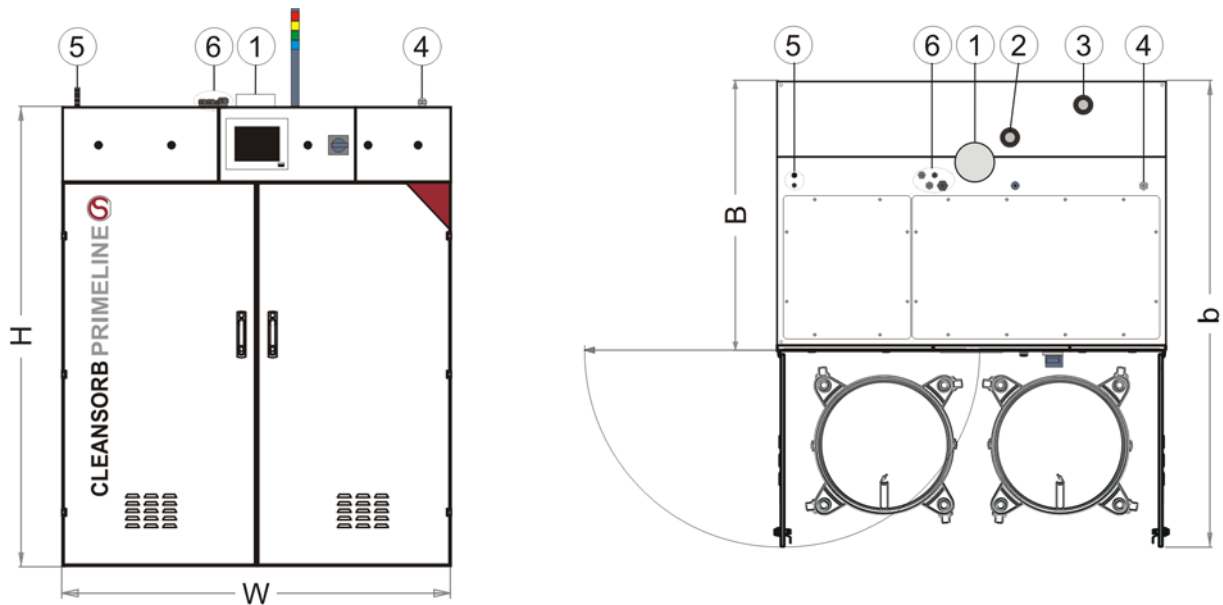
Operating Panel and Controls	<p>Touchscreen operating panel at front of cabinet. Colored flow diagram with schematic depiction of main system components. Display of key system parameters such as operating mode, valve positions, pressure, temperature, etc. Menu-based selection of pre-defined operating modes such as: C1 > C3 (solo), C2 > C3 (solo), C1 > C2 in series, C2 > C1 in series, Safe mode bypass, inert gas purge, automated pressure decay leak test, etc.</p> <p>Personalized log on and log off with 3 authorization levels of user access to operational functions and system control.</p> <p>On-screen, step-by-step instructions for column exchange and service routines.</p> <p>PLC-controlled electronics with warning and alarm-level signals for:</p> <ul style="list-style-type: none">- Over-pressure at inlet, central line- Pressure release failure- Over-temperature- Leak test error- Inert purge error- Valve malfunction- Outlet gas concentration high- Gas sampling activated/ deactivated- Column (not) in place- Sensor break- Low N2 supply pressure <p>Light stack (signal tower) on cabinet roof, and buzzer, to signal warning and alarm states.</p> <p>Parameter history logging of sensor signals and system events. Up to 10,000 stored measurement cycles downloadable for diagnostics purposes.</p> <p>USB interface, Ethernet connector and hardwired volt-free contacts.</p>
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Safety Concept and Functionality	<p>The CLEANSORB PRIMELINE CS200PD system is designed for failsafe operation based on the principle of limited error propagation. If the controller detects errors or malfunctions, the system is set to a safe state. Notable safety features include:</p> <ul style="list-style-type: none"> - All gas-bearing components in air extracted enclosure; - Separately extracted enclosures for 3 columns to allow change-out of a main column while process is running; - Cabinet air extract monitored to ensure ventilation; - A safety PLC monitors all safety-relevant sensor signals and ensures that the CS200PD is at all times operated in the correct mode; - Factory-defined operating modes to avoid user errors; - Gas path through the CS200PD at all times unrestricted; - In the default safe state, the gas route is through the back-up absorber column, C3; - System reverts to the safe state during N2 or power failure, or if door is opened; - A reserve pressure tank ensures pneumatic valves can be set to the safe state even in the event of pneumatic air supply failure; - Separate infra-red arrays to independently monitor temperature of the main columns; - Automatic inert gas dilution to cool columns in the event of overheating; - 2 alarm signals to shut off process gas in critical situations: NTG (Non Toxic Gas, e.g. carrier gas); HPM (Hazardous Process Material). <p>SIL certified components for monitoring of:</p> <ul style="list-style-type: none"> - Inlet pressure - Ventilation failure - Nitrogen pressure tank - Inlet heating temperature - Nitrogen purge - Hazardous Process Materials (HPM) Signal. <p>Designed in accordance with SEMI-S2 safety guidelines.</p>
Signal Tower	Signal tower for external display of status, warnings and alarms as green, amber or red lights. Roof-mounted on cabinet.
SEMI-S2 Compliance	Designed in accordance with SEMI-S2 safety guidelines.
Documentation	Operating manual in English or German language with customer-specific specifications.

Available Options

Power Supply Options	<p>120 VAC/ 50/60 Hz/ 1-Phase (UL) Cables and components compliant with UL standards (Single phase, grounded midpoint, 3 wire)</p>
	<p>230 VAC/ 50/60 Hz/ 1-Phase (CE) Cables and components compliant with CE standards (Single phase, L, N, PE)</p>
	<p>120 VAC/ 50/ 60 Hz/ 1-Phase (CE) Cables and components compliant with CE standards (Single phase, L, N, PE)</p>
	<p>230 VAC/ 50/60 Hz/ 1-Phase (UL) Cables and components compliant with UL standards (Single phase, grounded midpoint, 3 wire)</p>

System Specifications



- 1 Cabinet Air Extraction
 Connection: Ø152 mm (6 in)

To be set in accordance with local fire codes or other applicable state, country, factory or industry standards.
 Minimum -0.5 mbar (-0.5 " wc) to ensure a minimum of 95 cabinet volume changes per hour (275 m³/h / 162 cfm).

- 2 System inlet connection

DN40 ISO-KF (recessed); 5...100 °C (41...212 °F);
 -100...+100 hPa

- 3 System outlet connection

DN40 ISO-KF (recessed); 5...70 °C (41...158 °F);
 ~ -500 Pa (-0.07 psi) relative to pressure at system inlet required

- 4 Power

Single phase, 100...240 VAC, 50/60 Hz

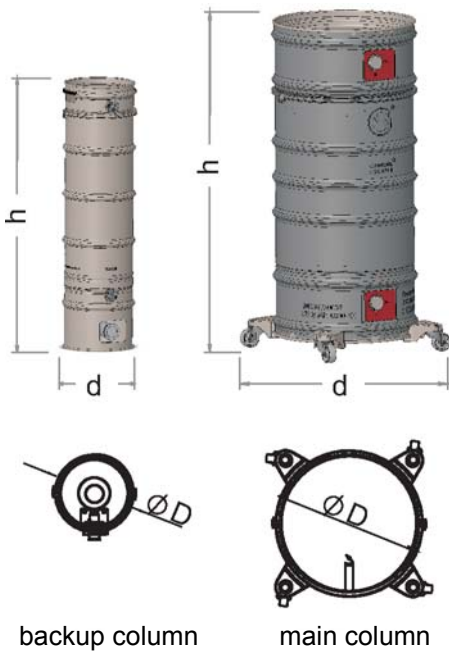
- 5 Nitrogen supply

pneumatic: Swagelok® 6 mm or ¼"; 6...7 bar (85...100 psi)
 purge gas: Swagelok® 10 mm or ¾"; 2...8 bar (29...116 psi)

- 6 Signals

volt-free contacts for reliable interruption of (process) gas supply; see also "Communication Interfaces" below

Model	H	W	B	b	weight
CS200PD	1800 mm (71 in)	1510 mm (60 in)	1100 mm (44 in)	1845 mm (73.3 in)	~500 kg (1100 lb)
	+ signal tower 385 mm (15 in)				



Column	h	d	D	weight
CC200SA main column	1350 mm (53.1 in)	804 mm (31.6 in)	560 mm (22.0 in)	max. 334 kg (736 lb)
CC025A for CS070LS	830 mm (3.7 in)	260 mm (10.2 in)	240 mm (9.4 in)	max. 68 kg (150 lb)

Pressure drop over column
 at max. volumetric flow max. 10 mbar (0.145 psi)

Gas sampling point Sampling at 90 % or 100 % of
 absorber bed height

Communication Interfaces

Interface type	TCP/IP
Ports	RJ45 (Ethernet) USB 2.0, Type A (full speed 12 Mbit/s)
Functionalities (optional)	FTP (File Transfer Protocol) NTP (Network Time Protocol) OPC (Open Platform Communications)
Usage	FTP: export of machine data and log-files NTP: synchronization of time and date OPC: communication with remote process control system

Volt-free Contacts for External Evaluation

Outlets	signal HPM Off (HPM: Hazardous Process Material) signal NTG Off (NTG: Non-Toxic Gas) Both contacts fail to open. The signals are provided with a reliability of SIL2 and must be processed externally for safety reasons.
Electrical Specification	24 VDC max., 3 A
Usage	signals for the remote process control system

Lifting Attachments


Mounting parts	4x M12 lifting eyes, included in scope of delivery
Location of threads	lifting eyes can be set in at the four corners, top of cabinet
Specifications	steel C15E galvanized (DIN 580); WLL 0,34 t

Anchoring of Cabinet

Location of anchoring points	bolts can be set in at the four corners, bottom of cabinet
Heavy load dowels	tractive force ≥ 270 kg (595 lb) per dowel
Bolts	max. Ø 12 mm (~ ½ in)
Washer	outer Ø 70 mm (~ 2¾ in); thickness 6 mm (~ ¼ in)


Anchoring of Cabinet

- temperature range 5...25 °C (41...77 °F)
- max. 80 % rel. humidity (non-condensing)
- under clean, dry conditions,
- protected from uni-directional heating and sunlight
- in upright position,
- protected from unauthorized access.

 Contact the manufacturer CS CLEAN SOLUTIONS AG, if a different specification is required.

On-site Conditions for System Operation

Temperature range	5 ... 35 °C (41 ... 95 °F)
Humidity	80 % relative humidity (non-condensing!)
Installation site	indoors; illumination > 270 lux, mechanical ventilation
Altitude	max. 2000 m (6600 ft) above mean sea level
Floor space	absolutely level; according to DIN 18202

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SOLUTIONS**

CS CLEAN SOLUTIONS AG

Fraunhoferstrasse 4

85737 Ismaning, Germany

Phone: +49 (89) 96 24 00-0

Fax: +49 (89) 96 24 00-122

E-mail:

General: welcome@csclean.com

Distribution: sales@csclean.com

URL: www.csclean.com