

Effective fermentation gas cleaning

SILOXA GRW systems are designed for adsorption of organosilicon compounds (siloxanes) and optionally hydrogen sulphide (H_2S) from fermentation gases. Whereas GRW 50 has a single compact replaceable filter unit, the variants GRW 100, GRW 200 and GRW 450 each have two activated carbon filters connected in series on the gas side.

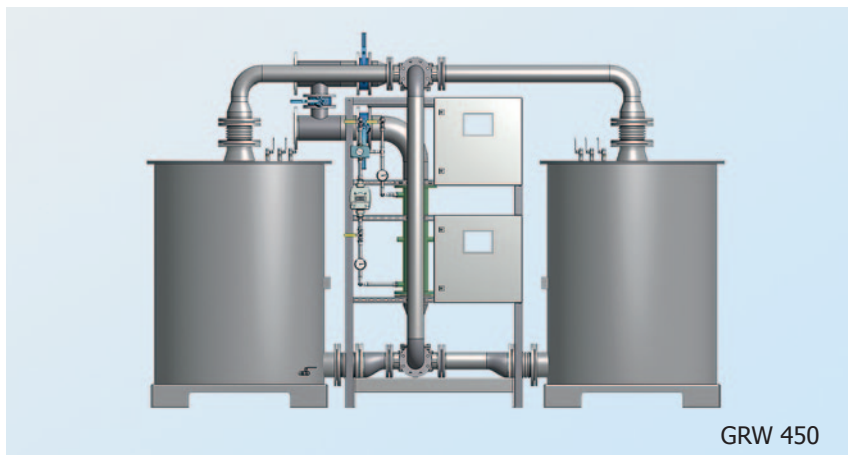
In GRW 100 to GRW 450 systems, gas cleaning is performed in the first activated carbon filter (working filter). The second filter is a safety filter which only adsorbs contaminants when the first filter's absorption capacity is exhausted and filter breakthrough is not detected in time. The customer is responsible for checking the load status through regular gas sample testing between stages.

It is essential for the adsorption process that the fermentation gas to be cleaned has a defined gas humidity. For this purpose, the systems come equipped with a tube bundle heat exchanger in which the saturated gas is heated before it enters the activated carbon filters in order to achieve the desired relative gas humidity.

The gas cleaning systems are delivered mounted ready for use, complete with pipework and cabling, on a stainless steel base frame for installation at ground level. All system components that come into contact with the gas are made of corrosion-resistant stainless steel.

With regard to safety, all components have permanent technical leakproofness. The systems are also designed for optimum efficiency, in order to keep long-term operating costs to a minimum.

The GRW series is rounded off by extensive services from SILOXA, consisting of regular maintenance and an exceptional spare parts service.



Gas cleaning – the ideal solution for preventing consequential damage.

Technical description

Features

- Significant lengthening of CHP maintenance intervals
- Prevention of deposits in the combustion chamber
- High availability of gas utilisation system, operational reliability, low maintenance
- Compact design, modular structure
- Opportunity for upgrading with further options

Frame

- Made of square tubes, stainless steel 1.4301
- Dimensions according to structural requirements

Gas heating

- Flanged tube bundle heat exchanger for heating fermentation gas, material in contact with gas media 1.4571
- Pressure resistance, gas-side 0.5 bar (gauge)
- Pressure resistance, jacket-side 6 bar (gauge)
- Gas connection DN 50, DN 125 or DN 150 DIN 2527 PN 16, depending on the size of the plant
- Heating connection 1/2" Rp
- Hot water supply 700 kg/h, 70-90°C, provided by customer
- Integration into gas supply is the responsibility of the customer

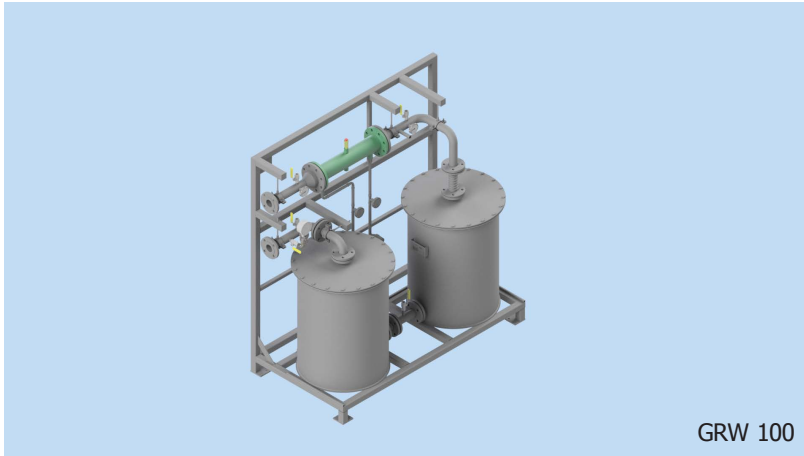
Hot water circuit

- Temperature regulator for setting a constant gas temperature
- Pipework material: steel DN 15. Two bimetallic thermometers 0 to 120°C
- Hot water: appropriate pipework from producer to consumer and insulation are the responsibility of the customer.

Activated carbon filter

- Replaceable filter design, stainless steel 1.4301
- GRW 50 model: one MAK A 200
- GRW 100 model: two MAK A 200
- GRW 200 model: two MAK A 700
- GRW 450 model: two MAK A 1100
- 2 gas connections (gas inlet and gas outlet) DN 50/PN 10 (MAKA 200), DN 125/PN 10 (MAKA 700) or DN 150/PN 10 (MAKA 1100)
- Connecting piece with ball valve for inertisation and taking gas samples
- Interior heat insulation
- Pipework for activated carbon filters





**Two activated carbon filters
connected in sequence – ensuring
reliable adsorption of siloxanes.**

- 2 stainless steel compensators per filter DN 50 (MAKA 200), DN 125 (MAKA 700) or DN 150 (MAKA 1100)
- 6 manual butterfly valves for switching the filter sequence (for GRW 450 and optionally GRW 200)
- Pipework stainless steel 1.4571 with aluminium loose flange DIN 2642

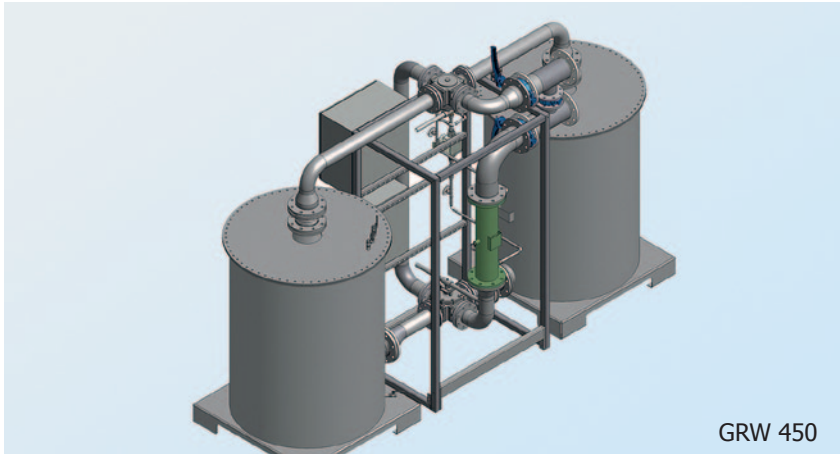
Factory assembly

- All components supplied with pipework ready for use
- Capsule element manometer nominal size 63.0 to 160 mbar
- Connection to filter via stainless steel compensators

**Technical
documentation**

- Operating instructions, installation drawing/shop drawing
- Piping and instrumentation diagram, circuit diagram, list of assemblies
- Spare parts lists and individual documentation for the installed components
- In German or English as required (other languages at additional cost)





GRW 450

Compact systems pre-mounted
complete on a frame: plug`n play!

Available options

Version for simultaneous removal of hydrogen sulphide (H₂S)

- Use of ACO[dot]ert[s] activated carbon for simultaneous removal siloxanes and H₂S, instead of ACO[sorb[si]] carbon

Autonomous hot water supply

- Only in connection with differential temperature control mounted on the system
- Rod-type heating element and diaphragm expansion tank

Deflagration flame

- 2 flame arresters
- EC type examination certification as per Directive 94/9/EC in accordance with ATEX 95 and EN12874
- Equipped with PT100 resistance thermometer

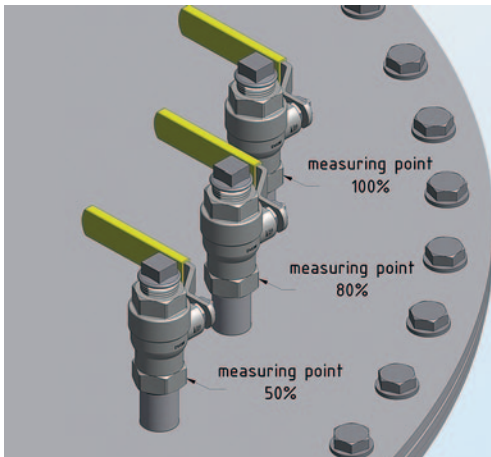
Differential temperature control on mounting plate

- For defined heating of gas in case of seasonally fluctuating gas entry temperatures
- Control cabinet and heating circuit for separate installation supplied on mounting plate and cabled ready for use. If the distance between GRW and the assembly point is ≤ 6.0 m, cabling is included in the price
- Control cabinet with microprocessor control system
- Two floating contacts, remote start, two resistance thermometers
- Hot water circuit consisting of: circulating pump, three-way control valve with electric control drive, thermometer, ball valves
- Connections to the hot water circuit as well as between the mounting plate and heat exchanger, control cabinet and resistance thermometer are to be provided by the customer
- Integrated Ethernet interface for integration into the customer's process control system

Outdoor installation

- Insulation of the complete piping
- Indicating instruments suitable for outdoor installation





Loading of hydrogen sulphide easily performed at the measurement between the filter.

Differential temperature control mounted on system

- For defined heating of gas in case of seasonally fluctuating gas entry temperatures
- Control cabinet with microprocessor control system
- Two floating contacts, remote start, two resistance thermometers
- Hot water circuit consisting of: circulating pump, three-way control valve with electric control drive, thermometer, ball valves
- Connections to the heating water circuit are performed by the customer in the same way as for the supplied resistance thermometer ahead of the heater
- Integrated Ethernet interface for integration into the customer's process control system

H₂S online analysis

- Gas sensor 0-100 ppm
- Condensate trap
- Evaluation unit with 4 floating contacts and analogue output, illuminated 4-line display, 2 alarm thresholds, 2 alarm, buzzer and fault relays
- Power supply and communication must be connected, and if necessary evaluated, by the customer
- Indoor and outdoor installation possible

Air metering unit (required if the gas contains less than 0.5 % O₂ by volume)

- Diaphragm pump
- Flow rate indicator with regulating valve
- Activation is the customer's responsibility
- TÜV (Technical Inspection Agency) Safety Test Report

Container

- External dimensions: L x W x H approx. 3,050 x 2,500 x 2,600 mm, or in case of GRW 450, approx. 6,100 x 2,500 x 2,600 mm
- Aluminium tread plate floor
- Double door, external hinges, all-round rubber seal, door opening 2,310 x 2,280 mm
- Primed inside and outside, exterior painted in RAL 6005, custom colour possible if desired at additional cost
- Electrical installation: 1 light switch, 2 sockets: 230 V 16 A, 2 strip lights, 1 thermostat-controlled ventilator with axial flow fan
- Methane sensor with evaluation unit for room air monitoring





Remove the saturated filter, insert a fresh filter and resume gas cleaning: this is only possible with SILOXA replacement filters.

Assembly and commissioning

- Installation of gas treatment system on foundation provided by customer
- Commissioning and training

Room air monitoring

- Methane sensor with evaluation unit

Bypass line

- For re-routing gas cleaning during filter replacement
- 3 butterfly valves with DVGW-Gas permit
- 2 T-pieces and 4 flanges

Reinforced version

- For operating pressure of max. 250 mbar

2 shut-off valves

- with DVGW-Gas permit for shutting off the gas cleaning system

Installation in EX area

- (on request)

Safety temperature monitors

- (on request)

Safety overpressure valve

- (on request, design dependent on the customer's pressure generator)

Vacuum protection

- (on request, design dependent on the customer's pressure generator)





**SILOXA – a top name for efficient,
cost-effective gas cleaning solutions.
Made in Germany.**

Notes on container

We use standard maritime containers for our systems. These containers are subject to international standards for building quality and design and have the best properties in relation to craftsmanship, stability and corrosion protection. Our containers are made in Asia and upon arrival at our workshop they are fitted out for use with the biogas system and then painted. The paintwork includes professional-standard primer and two top coats. Coating thickness is on average approx. 120-140 µm. Please note that light and environmental factors, as well as small blisters and scratches (assuming sufficient paint coverage), are not considered to be a defect as they do not affect the function and durability of the container.

Certification: Germanischer Lloyd

Operating information

When using activated carbon adsorbers for cleaning hydrogen sulphide, please observe the following: if hydrogen sulphide is to be removed, the gas must have an oxygen content of at least 0.5 and no more than 3 vol. %. Adsorber function must be monitored by the operator. Siloxa Engineering AG accepts no liability for damage arising from insufficient monitoring of the adsorber function. It is also assumed that the gas will contain < 100 mg/m³ longer-chain hydrocarbons (>C₅).



Technical Data

Design parameters	GRW 50	GRW 100	GRW 200	GRW 450
Gas medium	Biogas/fermentation gas			
Gas flow rates (max.)	50 Nm ³ /h	100 Nm ³ /h	200 Nm ³ /h	450 Nm ³ /h
Operating pressure	0-100 mbar/gauge			
Operating temperature (max.)	60°C			
Connections	DN50 / PN10	DN50 / PN10	DN125 / PN10	DN150 / PN10

Hot water circuit

Required supply temperature	70 - 90°C; 700 kg/h			
Return temperature	60 - 90°C			
Max. operating pressure heating circuit	3,5 bar			
Max. operating temperature heating circuit	90°C			
Connection	1/2" Rp			

Electrical operating data

Nominal voltage with differential temperature control	230 V			
Connected load with differential temperature control	0,3 kW			
Connected load with independent heating water supply	1,8 kW	1,8 kW	1,8 kW	3,3 kW

Gas composition

Methan CH ₄	approx. 60 vol. %			
Carbon dioxide CO ₂	approx. 40 vol. %			
Hydrocarbons > C ₅	< 100 mg/m ³			
Hydrogen sulphide (H ₂ S)	< 500 ppm	< 1000 ppm	< 1000 ppm	< 1000 ppm
Oxygen content	< 3 Vol. %			
Necessary oxygen content for desulphurisation	> 0.5 & < 3 Vol. %			

Physical properties

Gas density	approx. 1.2 kg/Nm ³			
Specific heating capacity C _p	approx. 1.6 kJ/Nm ³ K			

Installation conditions

Installation site	Indoors (outdoor installation optional)			
Permissible temperature at the installation site	0-35 °C			
Danger area	Installation outside of EX zones			
Operating weight in kg	approx. 430	approx. 760	approx. 2,050	approx. 2,600
Dimensions (LxWxH) in mm	approx.1120x900x1800	approx.1770x900x1800	approx.3000x1250x2200	approx.4000x1250x2550
Electrical connection	--- 230 V / 50 Hz		230 V / 50 Hz 230 V / 50 Hz	
Gas inlet	DN50 / PN10	DN50 / PN10	DN125 / PN10	DN150 / PN10
Gas outlet	DN50 / PN10	DN50 / PN10	DN125 / PN10	DN150 / PN10

