

SILOXA container-based gas supply system for biogas with gas drying module, gas compression module and controller, GCKV model



Attributes

- Compact design, modular structure
- High availability, operational reliability, low maintenance
- Possibility of upgrading with further modules/options
- Defined interfaces to fermenters, gas utilisation system and the customer's process control system

Container

- External dimensions: L x W x H
approx. 3,050 x 2,500 x 2,600 mm
or approx. 6,100 x 2,500 x 2,600 mm
(depending on the flow rate)
- 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 subject to a surcharge
- Electrical installation: 1 light switch, 2 sockets: 230 V/16 A, 2 strip lights, 1 thermostat-controlled ventilator with axial flow fan
- Side entrance door

Ambient air monitoring

- Sensor for ATEX Zone II 2G (Ex Zone 1 and 2), measuring principle: evolution of heat, measuring range: CH₄ 0...100 %LEL
- Evaluation unit in control cabinet on the container which triggers an alarm and switches off the power supply to the assemblies in the container if the limit value is exceeded; power supply provided by customer

Gas cooler

- Tube bundle heat exchanger
- Max. permissible operating pressure: tube side approx. 0.5 bar, shell side approx. 6 bar, pressure loss on gas side approx. 15 mbar

Water cooler

- Air-cooled condensers for outdoor installation and all-year operation
- Compact, commercially produced standard unit

Liquid coolant circuit

- Pipework material: steel incl. flange, screws and gaskets
- Required manual and safety valves and local-readout thermometer and manometer

Condensate trap

- Moulded piece, material No. 1.4571, for flange-mounting on gas cooler DN 150-400
- Demister, material No. 1.4571
- Condensate outlet via liquid shut-off valve
- Monitoring of liquid shut-off valve via rod probe with 2 switching contacts

Cold insulation

- Vapour-diffusion-proof insulation for gas drying system, condensate trap, condensate outlet and liquid coolant circuit

Compressor

- 1 centrifugal fan (multistage)
- Pressure increase 160 mbar
- V-belt drive with aluminium drive guard
- Permanently technically leakproof, ATEX approved for Zone 2
- 1 pressure monitor on the suction side of the compressor and 1 on the pressure side
- 1 temperature monitor
- To limit the discharge pressure and ensure a minimum flow rate (surge limit):
 - Pressure regulator including bypass up to 600 Nm³/h
 - Frequency converter from 750 Nm³/h



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Control cabinet

- With microprocessor control system for controlling the gas compressor and the monitoring devices

Factory assembly

- All components supplied ready for use, with pipework and cabling
- External interfaces

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
- Inspection/testing reports and certificates

Available options

Activated carbon adsorber 1 – MAKA 700 MODEL

- Integrated in the container with pipework
- Replaceable filter design, stainless steel 1.4301
- 2 gas connections (gas inlet and gas outlet) DN125 PN10
- Connecting piece with ball valves for inertisation and taking gas samples
- Heat insulation, internal, 20 mm aluminised polystyrene rigid foam
- Pipework for the first activated carbon filter
- 2 stainless steel compensators DN125,
- 1 bypass
- Please observe operating instructions (MAKA 700 Technical Datasheet)

Activated carbon adsorber 2 – MAKA 700 MODEL

- Integrated in the container with pipework
- Replaceable filter design, stainless steel 1.4301
- 2 gas connections (gas inlet and gas outlet) DN 150 PN10
- Connecting piece with ball valves for inertisation and taking gas samples
- Heat insulation, internal, 20 mm aluminised polystyrene rigid foam
- Pipework for the second activated carbon filter (use of one filter while replacing the other filter)

- 2 stainless steel compensators DN125
- 4 flaps DN125 acc. to DVGW (German Technical and Scientific Association for Gas and Water)
- 2 T-pieces DN125
- Please observe operating instructions (MAKA 700 Technical Datasheet)

Autonomous heating water supply

- Hot water supply for gas heating, if no external heating water is available from the CHP

Biogas analysis

- Analysis of the biogas for CH₄, H₂S, O₂ and CO₂
- Automatic measurement at programmable time intervals; separate measurements for the individual gas components and manual start of measurement also possible at any time
- Measuring gas conditioning with deflagration flame arrester acc. to EN 12874, protective filters

Temperature differential control

- For regulating the temperature difference between the gas inlet and outlet of the gas heater
- 2 resistance thermometers with transducer
- 1 hot water circulating pump
- 1 three-way regulating valve DN15 with 230 V electric 3-point actuator
- Shut-off valves and butterfly valve DN15

Compressed air supply

- Air compressor
- Compressed air monitoring system, switch with connection to the PLC
- Air service unit
- Pneumatic and electrical connections

E, I&C/PLC controller

- Fitting for the gas container with additional pressure and temperature measuring points for regulating the system and visualising the measured values
- Siemens Simatic S7-300 or S7-1200 models
- Profibus DP, others on request
- Touchpanel



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Frequency converter

- Regulates the final compression pressure by changing the engine speed
- From 750 Nm³/h in the standard installation
- Up to 600 Nm³/h pressure regulator incl. bypass in the standard version

Gas heating

- Tube bundle heat exchanger
- Heating water provided by customer/ optionally autonomous

H₂S online analysis

- Electrochemical gas sensor 0-100 ppm
- Condensate trap and adapter for pipeline
- Evaluation unit with analogue output 4 to 20 mA and 4 floating contacts

Assembly and commissioning

- Mounting of the container on base constructed by the customer
- Commissioning

Smoke detector

- Base, power supply and triggering device, optical smoke detector
- Installation on container ceiling

Pipe with manual butterfly valve extending 10 cm above ground level

- DN 100-400

Pipe, pneumatically driven butterfly valve, 10 cm above ground level

- DN 100-400

Oxygen monitoring inside the pipe

- 1 central evaluation device for 2 channels O₂, output 4 to 20 mA
- Measuring-gas transportation, conditioning and analysis are redundant

- Sensor and evaluation unit meet the requirements of directive 94/9/EC on equipment and protective systems intended for use in potentially explosive atmospheres and carry an EC type examination certificate

Sound and heat insulation

- Container lining with sound insulation elements consisting of mineral wool and perforated metal plate

TÜV certification of the pipework

- Inspection of the pipework included in the supply package by a certified TÜV engineer
- In line with RL 97/23/EC by TÜV-Nord

Compression by 200 or 280 mbar

- 1 centrifugal fan (multistage)
- Pressure increase 200/280 mbar
- V-belt drive with aluminium drive guard, permanently technically leakproof, ATEX approved for Zone 2

Biogas flow rate measurement

- ATEX design
- Measuring principle: oscillator caused to oscillate by the gas flow
- Measuring range 50 to 650 m³/h, pressure loss 6 mbar (at 200 m³/h)

Pre-cooling

- The biogas entering the unit is pre-cooled in a tube bundle gas cooler, which is charged with cooling water (water/glycol) on the shell side. The heat absorbed by the cooling water is discharged into the surroundings via the air-cooled plate cooler.

Weld neck flange instead of loose flange

- Required for TÜV certification acc. to VP 265



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Information on the container

We use standard sea containers for our systems. These containers comply with international norms regarding building quality and construction and have excellent properties with regard to processing, stability and corrosion protection. Our containers are manufactured in Asia then delivered to our factory, where they are equipped for use in a biogas plant

and painted. The paint consists of professional undercoat and two top coats. The coats are approx. 120-140 µm-thick on average. Please note that light and environmental factors and small blisters and scratches (with sufficient paint coverage) do not represent defects, as they do not influence the functioning or durability of the container.

Certification: Germanischer Lloyd.

Technical specifications:

Technical data	GCKV 180	GCKV 260	GCKV 320
Gas medium	Biogas	Biogas	Biogas
Gas flow rate	180 Nm ³ /h	260 Nm ³ /h	320 Nm ³ /h
Gas inlet temperature	max. 40°C	max. 40°C	max. 40°C
Gas outlet temperature	3 °C to 4°C	3 °C to 4°C	3 °C to 4°C
Saturation temperature	max. 40 °C	max. 40 °C	max. 40 °C
Gas pressure at gas inlet	max. 10 mbar/gauge	max. 10 mbar/gauge	max. 10 mbar/gauge
Quantity of condensate	approx. 10 l/h	approx. 14 l/h	approx. 17 l/h

Technical data for cooling device

Electricity supply	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz
Coolant compressor	1 scroll compressor	1 scroll compressor	1 scroll compressor
Number of cooling circuits	1	1	1
Condensers	1 air-cooled	1 air-cooled	2 air-cooled
Rated cooling capacity *1	14.5 kW	18.7 kW	22.5 kW
Rated input power *1	6.5 kW	10.1 kW	10.5 kW
Mean elec. power consumption with design parameters and 15 °C ambient temperature *2	2.7 kW	3.8 kW	4.3 kW
Rated current	13.0 A	19.0 A	19.4 A
Starting current	73.0 A	76.0 A	101.0 A

Gas compressor

Gas pressure at gas outlet	max. 160 mbar	max. 160 mbar	max. 160 mbar
Gas inlet temperature	3 °C to 4°C	3 °C to 4°C	3 °C to 4°C
Gas outlet temperature	approx. 35 °C	approx. 35 °C	approx. 35 °C
Gas compressor motor output	4.0 kW	5.5 kW	7.5 kW

Gas composition

Methane CH ₄	approx. 60 % v/v	approx. 60 % v/v	approx. 60 % v/v
Carbon dioxide CO ₂	approx. 40 % v/v	approx. 40 % v/v	approx. 40 % v/v
Hydrocarbons > C ₅	< 100 mg/m ³	< 100 mg/m ³	< 100 mg/m ³
Sulphur H ₂ S	< 1,000 ppm	< 1,000 ppm	< 1,000 ppm
Oxygen O ₂	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v

Physical properties

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

Installation conditions

Installation site	O outside	Outside	Outside
Permissible temperature	-15 to +35°C	-15 to +35°C	-15 to +35°C
Danger area	Outside of Ex Zones	Outside of Ex Zones	Outside of Ex Zones
Dimensions (LxW xH)	3,050 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm
Electrical connection	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz
Connected load	14.5 kW	19.6 kW	22 kW

*1 Rating according to Eurovent: Coolant 12°C to 7°C at 35°C ambient temperature. The annual mean temperature at our latitudes is 11 °C.

*2 This value is to be used for calculating the energy requirement of the gas cooler.



SILOXA container-based gas supply system for biogas with gas drying module, gas compression module and controller, GCKV model

Technical specifications:

Technical data	GCKV 420	GCKV 500	GCKV 600
Gas medium	Biogas	Biogas	Biogas
Gas flow rate	420 Nm ³ /h	500 Nm ³ /h	600 Nm ³ /h
Gas inlet temperature	max. 40°C	max. 40°C	max. 40°C
Gas outlet temperature	3 °Cto 4°C	3 °Cto 4°C	3 °Cto 4°C
Saturation temperature	max. 40 °C	max. 40 °C	max. 40 °C
Gas pressure at gas inlet	max. 10 mbar/gauge	max. 10 mbar/gauge	max. 10 mbar/gauge
Quantity of condensate	approx. 23 l/h	approx. 27 l/h	approx. 32 l/h
Technical data for cooling device			
Electricity supply	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz
Coolant compressor	1 scroll compressor	1 scroll compressor	1 scroll compressor
Number of cooling circuits	1	1	1
Condensers	2 air-cooled	2 air-cooled	2 air-cooled
Rated cooling capacity *1	29.7 kW	38.7 kW	44.2 kW
Rated input power *1	13.3 kW	17.8 kW	19.7 kW
Mean elec. power consumption with design parameters and 15 °C ambient temperature *2	5.3 kW	6.7 kW	7.9 kW
Rated current	24.2 A	32.7 A	38.1 A
Starting current	132.0 A	161.0 A	163.0 A
Gas compressor			
Gas pressure at gas outlet	max. 160 mbar	max. 160 mbar	max. 160 mbar
Gas inlet temperature	3 °Cto 4°C	3 °Cto 4°C	3 °Cto 4°C
Gas outlet temperature	approx. 35 °C	approx. 35 °C	approx. 35 °C
Gas compressor motor output	7.5 kW	11.0 kW	15.0 kW
Gas composition			
Methane CH ₄	approx. 60 % v/v	approx. 60 % v/v	approx. 60 % v/v
Carbon dioxide CO ₂	approx. 40 % v/v	approx. 40 % v/v	approx. 40 % v/v
Hydrocarbons > C ₅	< 100 mg/m ³	< 100 mg/m ³	< 100 mg/m ³
Sulphur H ₂ S	< 1,000 ppm	< 1,000 ppm	< 1,000 ppm
Oxygen O ₂	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v
Physical properties			
Gas density	approx. 1.2 kg/Nm ³	approx. 1.2 kg/Nm ³	approx. 1.2 kg/Nm ³
Specific heat capacity C _p	approx. 1.6 kJ/Nm ³ K	approx. 1.6 kJ/Nm ³ K	approx. 1.6 kJ/Nm ³ K
Installation conditions			
Installation site	O outside	Outside	Outside
Permissible temperature	-15 to +35°C	-15 to +35°C	-15 to +35°C
Danger area	Outside of Ex Zones	Outside of Ex Zones	Outside of Ex Zones
Dimensions (LxWxH)	6,100 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm
Electrical connection	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz
Connected load	24.8 kW	32.8 kW	38.7 kW

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SILOXA container-based gas supply system for biogas with gas drying module, gas compression module and controller, GCKV model

Technical specifications:

Technical data	GCKV 750	GCKV 850	GCKV 1000
Gas medium	Biogas	Biogas	Biogas
Gas flow rate	750 Nm ³ /h	850 Nm ³ /h	1000 Nm ³ /h
Gas inlet temperature	max. 40°C	max. 40°C	max. 40°C
Gas outlet temperature	3 °Cto 4°C	3 °Cto 4°C	3 °Cto 4°C
Saturation temperature	max. 40 °C	max. 40 °C	max. 40 °C
Gas pressure at gas inlet	max. 10 mbar/gauge	max. 10 mbar/gauge	max. 10 mbar/gauge
Quantity of condensate	approx. 40 l/h	approx. 45 l/h	approx. 53 l/h
Technical data for cooling device			
Electricity supply	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz
Coolant compressors	2 scroll compressors	2 scroll compressors	2 scroll compressors
Number of cooling circuits	1	1	1
Condensers	2 air-cooled	2 air-cooled	2 air-cooled
Rated cooling capacity *1	52.0 kW	59.9 kW	66.6 kW
Rated input power *1	24.1 kW	27.0 kW	30.5 kW
Mean elec. power consumption with design parameters and 15 °C ambient temperature *2	10.3 kW	15.9 kW	15.4 kW
Rated current	41.0 A	45.8 A	51.0 A
Starting current	149.0 A	154.0 A	159.0 A
Gas compressor			
Gas pressure at gas outlet	max. 160 mbar	max. 160 mbar	max. 160 mbar
Gas inlet temperature	3 °Cto 4°C	3 °Cto 4°C	3 °Cto 4°C
Gas outlet temperature	approx. 35 °C	approx. 35 °C	approx. 35 °C
Gas compressor motor output	15.0 kW	15.0 kW	15.0 kW
Gas composition			
Methane CH ₄	approx. 60 % v/v	approx. 60 % v/v	approx. 60 % v/v
Carbon dioxide CO ₂	approx. 40 % v/v	approx. 40 % v/v	approx. 40 % v/v
Hydrocarbons > C ₅	< 100 mg/m ³	< 100 mg/m ³	< 100 mg/m ³
Sulphur H ₂ S	< 1,000 ppm	< 1,000 ppm	< 1,000 ppm
Oxygen O ₂	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v
Physical properties			
Gas density	approx. 1.2 kg/Nm ³	approx. 1.2 kg/Nm ³	approx. 1.2 kg/Nm ³
Specific heat capacity C _p	approx. 1.6 kJ/Nm ³ K	approx. 1.6 kJ/Nm ³ K	approx. 1.6 kJ/Nm ³ K
Installation conditions			
Installation site	Outside	Outside	Outside
Permissible temperature	-15 to +35°C	-15 to +35°C	-15 to +35°C
Danger area	Outside of Ex Zones	Outside of Ex Zones	Outside of Ex Zones
Dimensions (LxWxH)	6,100 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm
Electrical connection	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz
Connected load	43.1 kW	46 kW	49.5 kW

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Technical specifications:

Technical data	GCKV 1200	GCKV 1500	GCKV 2100
Gas medium	Biogas	Biogas	Biogas
Gas flow rate	1200 Nm ³ /h	1500 Nm ³ /h	2100 Nm ³ /h
Gas inlet temperature	max. 40°C	max. 40°C	max. 40°C
Gas outlet temperature	3 °Cto 4°C	3 °Cto 4°C	3 °Cto 4°C
Saturation temperature	max. 40 °C	max. 40 °C	max. 40 °C
Gas pressure at gas inlet	max. 10 mbar/gauge	max. 10 mbar/gauge	max. 10 mbar/gauge
Quantity of condensate	approx. 64 l/h	approx. 80 l/h	approx. 111 l/h
Technical data for cooling device			
Electricity supply	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz	400 V / 3Ph+PE / 50 Hz
Coolant compressors	2 scroll compressors	4 scroll compressors	4 scroll compressors
Number of cooling circuits	1	2	2
Condensers	2 air-cooled	2 air-cooled	2 air-cooled
Rated cooling capacity *1	82.7 kW	114.8 kW	143.3 kW
Rated input power *1	38.0 kW	55.0 kW	66.0 kW
Mean elec. power consumption with design parameters and 15 °C ambient temperature *2	15.5 kW	20.4 kW	26.9 kW
Rated current	66.0 A	96.0 A	117.0 A
Starting current	206.0 A	216.0 A	256.0 A
Gas compressor			
Gas pressure at gas outlet	max. 160 mbar	max. 160 mbar	max. 160 mbar
Gas inlet temperature	3 °Cto 4°C	3 °Cto 4°C	3 °Cto 4°C
Gas outlet temperature	approx. 35 °C	approx. 35 °C	approx. 35 °C
Gas compressor motor output	18.5 kW	18.5 kW	30.0 kW
Gas composition			
Methane CH₄	approx. 60 % v/v	approx. 60 % v/v	approx. 60 % v/v
Carbon dioxide CO₂	approx. 40 % v/v	approx. 40 % v/v	approx. 40 % v/v
Hydrocarbons > C₅	< 100 mg/m ³	< 100 mg/m ³	< 100 mg/m ³
Sulphur H₂S	< 1,000 ppm	< 1,000 ppm	< 1,000 ppm
Oxygen O₂	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v	>0.5 & < 3 %-v/v
Physical properties			
Gas density	approx. 1.2 kg/Nm ³	approx. 1.2 kg/Nm ³	approx. 1.2 kg/Nm ³
Specific heat capacity C_p	approx. 1.6 kJ/Nm ³ K	approx. 1.6 kJ/Nm ³ K	approx. 1.6 kJ/Nm ³ K
Installation conditions			
Installation site	Outside	Outside	Outside
Permissible temperature	-15 to +35°C	-15 to +35°C	-15 to +35°C
Danger area	Outside of Ex Zones	Outside of Ex Zones	Outside of Ex Zones
Dimensions (LxWxH)	6,100 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm	6,100 x 2,500 x 2,600 mm
Electrical connection	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz	400 V / 3Ph+N / 50 Hz
Connected load	60.5 kW	77.5 kW	100 kW

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*2 This value is to be used for calculating the energy requirement of the gas cooler.

Issued: 03/2014, subject to technical modifications.



SILOXA
Take out what doesn't belong.

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