

# Datasheet Gas upgrading

Membrane separation



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## Future-proof resource economy

A comprehensive, reliable supply of renewable energy and the ability to produce regenerative fuels such as bio-LNG and bio-CNG are key to decarbonisation and energy transition efforts. Whether it's combined with a Kompogas™ plant to create a complete solution or deployed on a standalone basis, biomethane gas upgrading technology completes the range of Kanadevia Inova products enabling energy to be produced from any sort of waste or biomass. In this case it employs an upgrading process to convert raw biogases into high-purity biomethane that can be used as a versatile energy source.

A by-product of the process is carbon dioxide, which can be used to generate additional revenue in the form of gaseous, liquefied or solid carbon dioxide deployed as an industrial product gas – for example in plant breeding, as an extinguishing agent or refrigerant, or as a raw material in the chemical industry.

Our biomethane technology thus makes a major, direct contribution to efforts to increase the use of renewable energy, phase out fossil fuels and decarbonise the society in which we live.

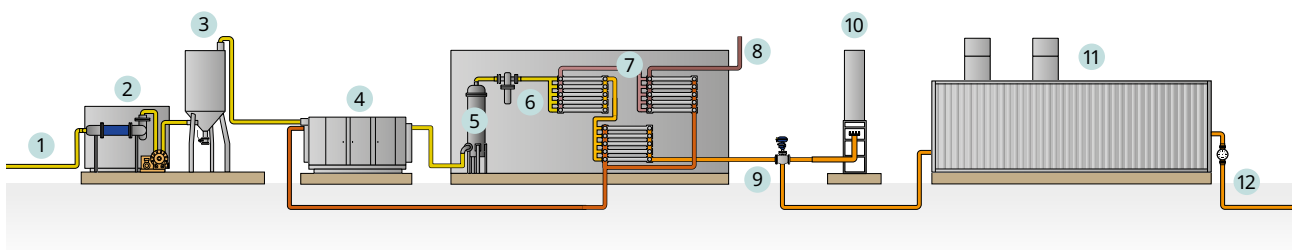
## Advantages of biomethane technology

Raw gases from a wide range of different sources are suitable for upgrading: the digestion of municipal green waste, organic household waste or agricultural biomass. Sewage and landfill gas can also be converted into energy. This extends a plant's value chain and promotes the circular economy. Depending on the composition, raw gas pretreatment may be required. Then comes the main process, where the carbon dioxide in the stream of gas is separated from the methane, with the resulting biomethane conditioned to the desired quality parameters.

## Technical description

In the first step of the process, the raw gas is pretreated and compressed to operating pressure. After drying, heating and fine purification, the gas is fed into the membrane modules. The carbon dioxide is separated from the methane by selective gas permeation, with the CO<sub>2</sub> passing through the surface of the membranes more quickly than the methane, which is retained in the membranes and removed from the modules as product gas. This is a plug-and-play process technology requiring no additional operating resources such as water or heat.

## Schematic of principal setup



### Pretreatment

- 1 Raw gas piping
- 2 Drying and precompression
- 3 Desulphurisation
- 4 Main compression

### Raw gas upgrading

- 5 Activated carbon filter
- 6 Particle filter
- 7 Membrane stages
- 8 CO<sub>2</sub> for further use
- 9 Methane

### Energetic utilisation

- 10 Safety flare
- 11 Gas grid injection
- 12 Gas grid

## Biogas upgrading: M-Series

|                 |                           | Model S | Model M   | Model L     |
|-----------------|---------------------------|---------|-----------|-------------|
| Upgrading range | Nm <sup>3</sup> /h biogas | 200–500 | 500–1,200 | 1,200–2,000 |

| Technical data               |       |                   |              |                    |
|------------------------------|-------|-------------------|--------------|--------------------|
| Container                    |       | 1 x 40' container |              | 1 x 40'<br>1 x 20' |
| Length of container          | mm    | 12,192            | 12,192       | 12,192<br>6,058    |
| Width of container           | mm    | 2,438             | 2,438        | 2,438<br>2,438     |
| Height of container          | mm    | 2,896             | 2,896        | 2,896<br>2,896     |
| Area of outdoor installation | m x m | 20.1 x 8.50       | 23.15 x 9.50 | 29.50 x 11.00      |
| Connection RBG               | DN    | 150               | 200–300      | 300–400            |
| Connection BM                | DN    | 40                | 50           | 80                 |

| Performance data                                    |                         |            |       |       |
|---|-------------------------|------------|-------|-------|
| Voltage   | V                       | 400        |       |       |
| Frequency   | Hz                      | 50/3 ph    |       |       |
| BM quality  | Vol.% CH <sub>4</sub>   | Up to 98.5 |       |       |
| Inlet pressure BG <sup>1)</sup>                     | mbarg                   | 50–150     |       |       |
| Dew point BM <sup>2)</sup>                          | °C                      | ≤ -55      | ≤ -55 | ≤ -55 |
| Specific power demand of upgrading <sup>3)</sup>    | kWh/Nm <sup>3</sup> RBG | 0.23–0.27  |       |       |
| Specific power demand of pre-cleaning <sup>3)</sup> | kWh/Nm <sup>3</sup> RBG | 0.03       |       |       |
| Heat extraction (60°C–80°C)                         | kWh/Nm <sup>3</sup> RBG | 0.20       | 0.15  | 0.15  |
| Max. inlet temperature cooling water                | °C                      | 8          | 8     | 8     |
| Max. outlet temperature cooling water               | °C                      | 2          | 2     | 2     |
| Water demand  | m <sup>3</sup>          | n.A.       |       |       |
| Resulting waste water                               | m <sup>3</sup>          | n.A.       |       |       |
| Designed for temperatures                           | °C                      | -15 to +35 |       |       |
| Condensate <sup>4)</sup>                            | kg/h                    | 50         | 120   | 200   |

| Emissions  |       |      |     |     |
|--|-------|------|-----|-----|
| CH <sub>4</sub> slip                                   | %     | ≤0.5 |     |     |
| Sound pressure level at 1 m distance                   | dB(A) | ≤85  | ≤89 | ≤93 |
| Sound pressure level including silencer for compressor | dB(A) | 75   | 75  | 75  |

<sup>1)</sup>optional increase possible, <sup>2)</sup>@norm conditions, <sup>3)</sup>tolerance of ± 10% according to DIN 1945/VDI 2045/ISO 5389. Electrical consumption depends on operating parameters and environmental conditions, as well as the gas specification. The requirement is specified for an ambient temperature of 15 °C as well as standard gas input parameters (30 °C, atmospheric pressure). <sup>4)</sup>condensate at full load, Abbreviations: RBG = raw biogas, BG = biogas, BM = biomethane

**Kanadevia Inova AG**

Hardturmstrasse 127  
8005 Zurich  
Zurich  
P +41 44 277 11 11  
[info@kanadevia-inova.com](mailto:info@kanadevia-inova.com)  
[www.kanadevia-inova.com](http://www.kanadevia-inova.com)