



FORNOVOGAS
WE MOVE ENERGY

**European Leader in Biogas
and Biomethane compression**

SUMMARY

- **Brief history in the Biogas industry**
- **Compressor features and advantages**
- **Focus on RNG application**
- **Experience**



FORNOVO GAS HISTORY

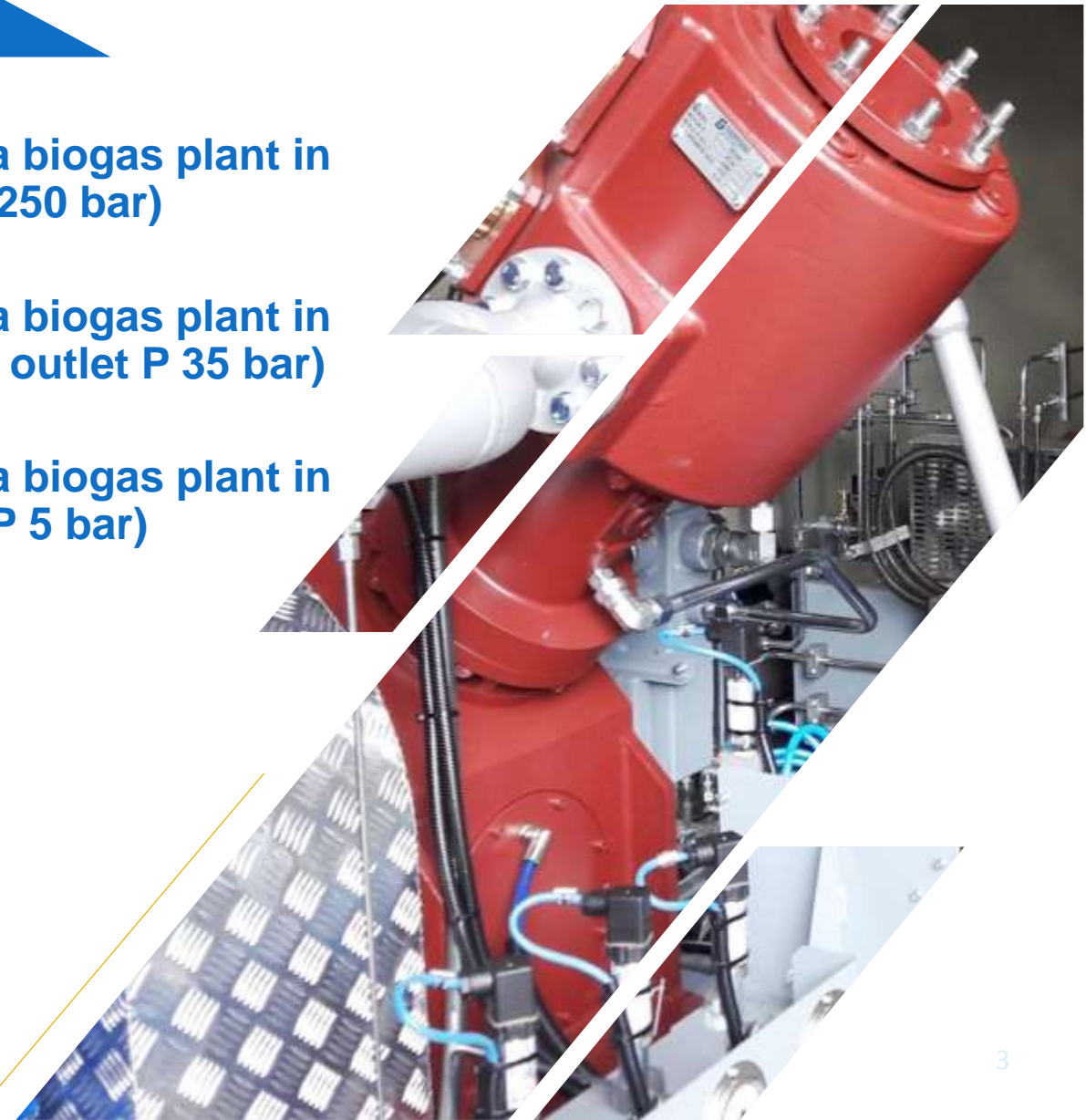
2005 – FORNOVO GAS supplied the first compressor in a biogas plant in Iceland to compress biomethane (inlet P 15 bar, outlet P 250 bar)

2009 – FORNOVO GAS supplied the first compressor in a biogas plant in Germany to inject biomethane into the grid (inlet P 6 bar, outlet P 35 bar)

2010 – FORNOVO GAS supplied the first compressor in a biogas plant in Sweden to compress raw biogas (inlet P 0,20 bar, outlet P 5 bar)

2019 - Launch of new compressor DA500 up to 1.2MW

- More than 1.300 Compressors installed worldwide
- 90 Employees
- >30M€ Turnover / Year



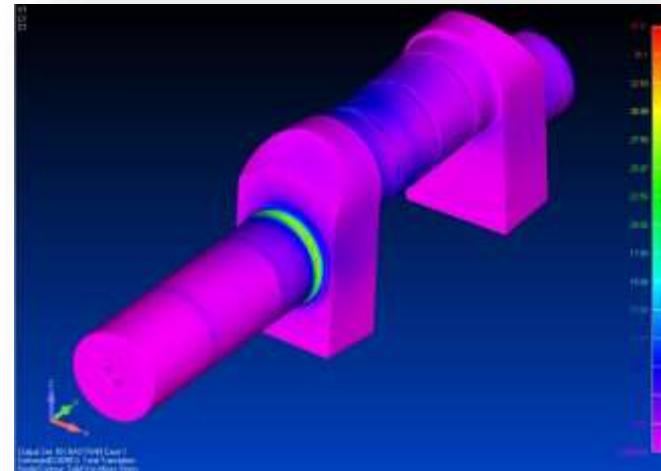
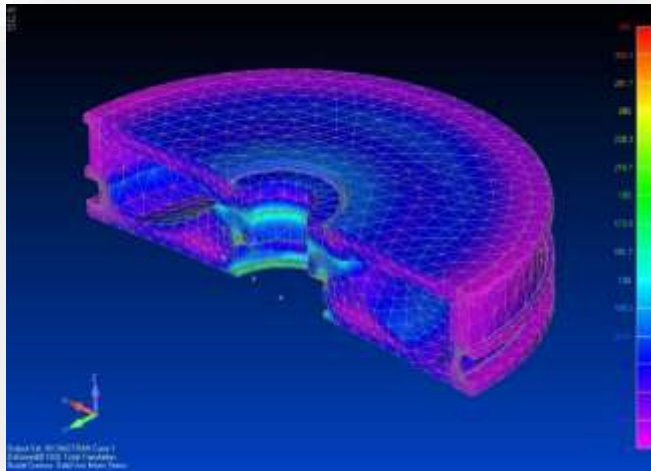
COMPRESSOR FEATURES

FORNOVO GAS technology is one of the most advanced in the CNG compressor market, thanks to the FEA (Finite Element Analysis) of each component

This in depth study allows FORNOVO GAS to reach high levels of performance in line with the best compressors manufacturer in the world in terms of durability, stability and vibration control



COMPRESSOR FEATURES



Hollow Piston optimization

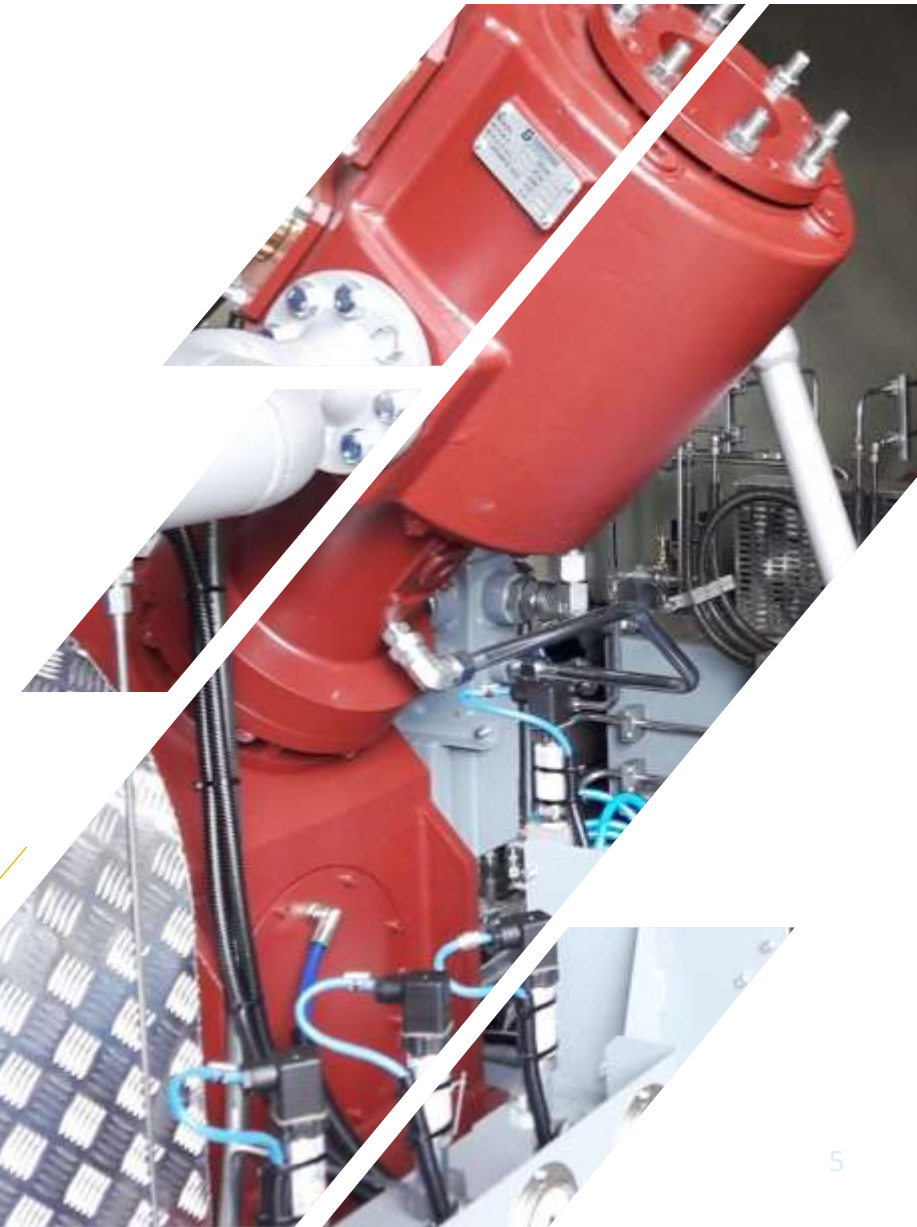
=

Strength increase
Strain containment
Weight saving

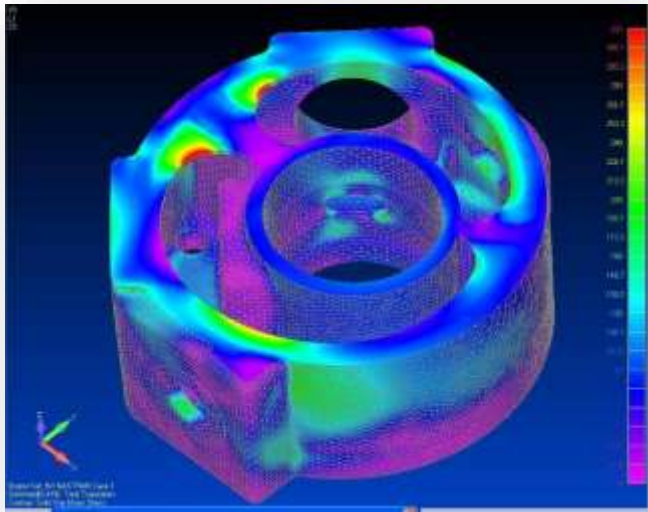
Crankshaft optimization

=

Strength increase
Strain containment
Weight saving



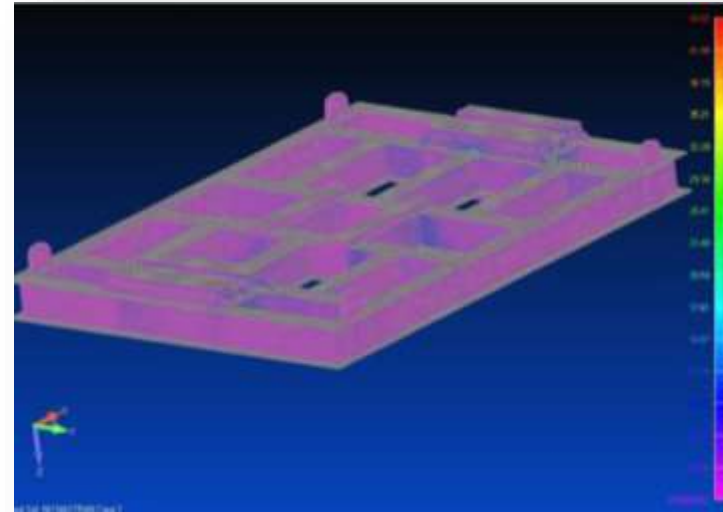
COMPRESSOR FEATURES



Cylinder optimization

=

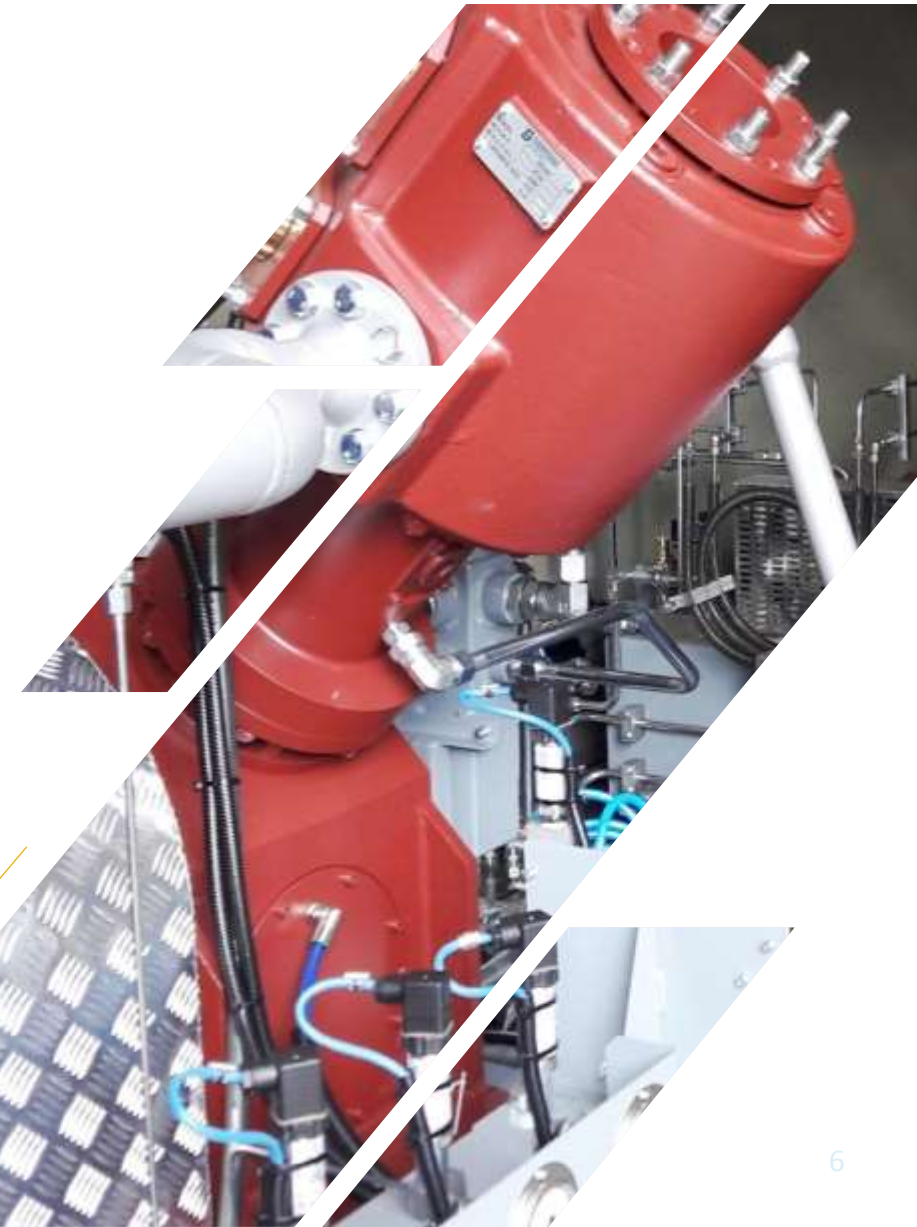
Strength increase
Reduction of vibration
**Increased range of inlet
pressure up to 90 bar**



Baseplate optimization

=

Strength increase
Perfect balance
Weight saving



COMPRESSOR FEATURES

- Non lubricated cylinders
- Two or three cylinders, V or W shape configuration
- Cylinders for very low suction pressures as well as for 375 bar (g) MAWP are available
- Extremely low vibration amplitudes, velocities and accelerations
- Sturdy yet compact design
- Direct coupling (electrical or gas engine driven)
- Speed range from 700 to 1800 rpm
- Up to four compression stages (no need of booster)
- Up to 1200 kW (DA500 model)
- Large rate of inlet pressure, from 0.02 until 90 bar (g)
- Oil free option available



COMPRESSOR FEATURES

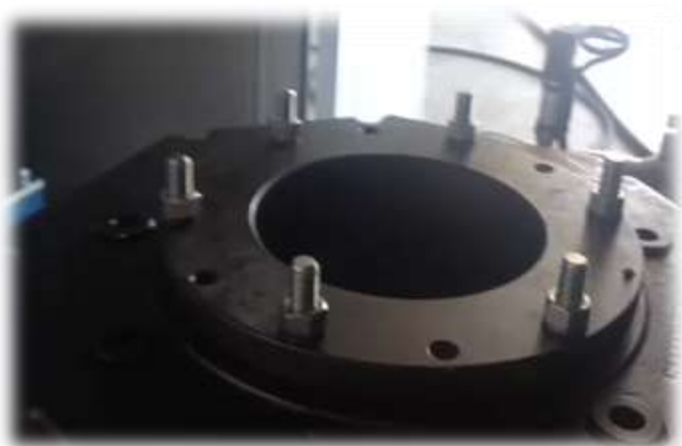
The **Direct Coupling** is the best available in the field of mechanical transmission as the mechanical efficiency is the highest possible. It is undoubtedly more efficient than traditional belts, which also have to be replaced frequently, and is therefore ideal for this type of application.



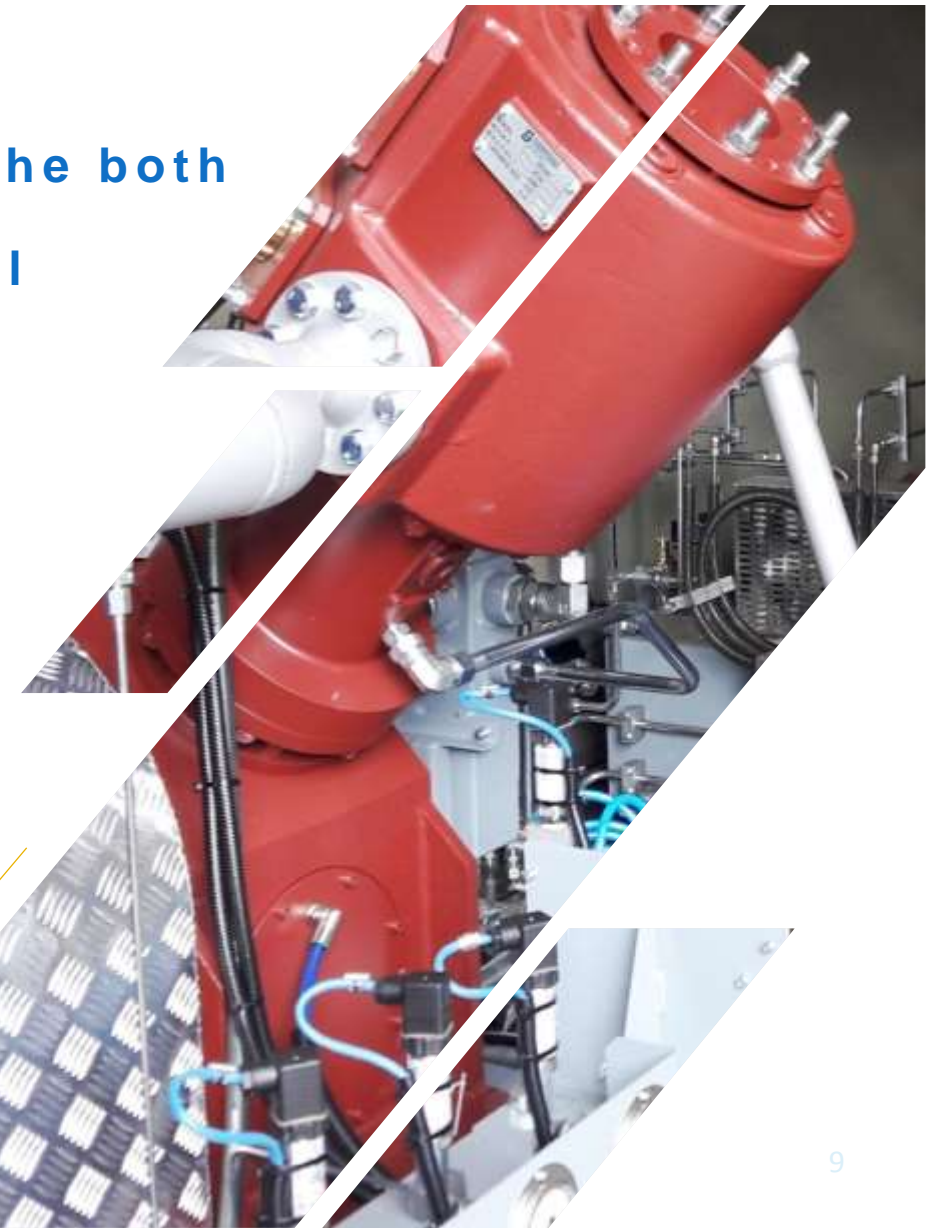
COMPRESSOR FEATURES

The specifically designed skid baseplate ensures the both elasticity and rigidity adequate to keep the system balanced at any time, from start to operation at full capacity.

We guarantee a vibration speed of <5 mm/s
Setting of the masses at the lowest possible level, containment of the maximum height and the arrangement at $V 90^\circ$ or $W 120^\circ$ of the cylinders brings additional mechanical advantages.

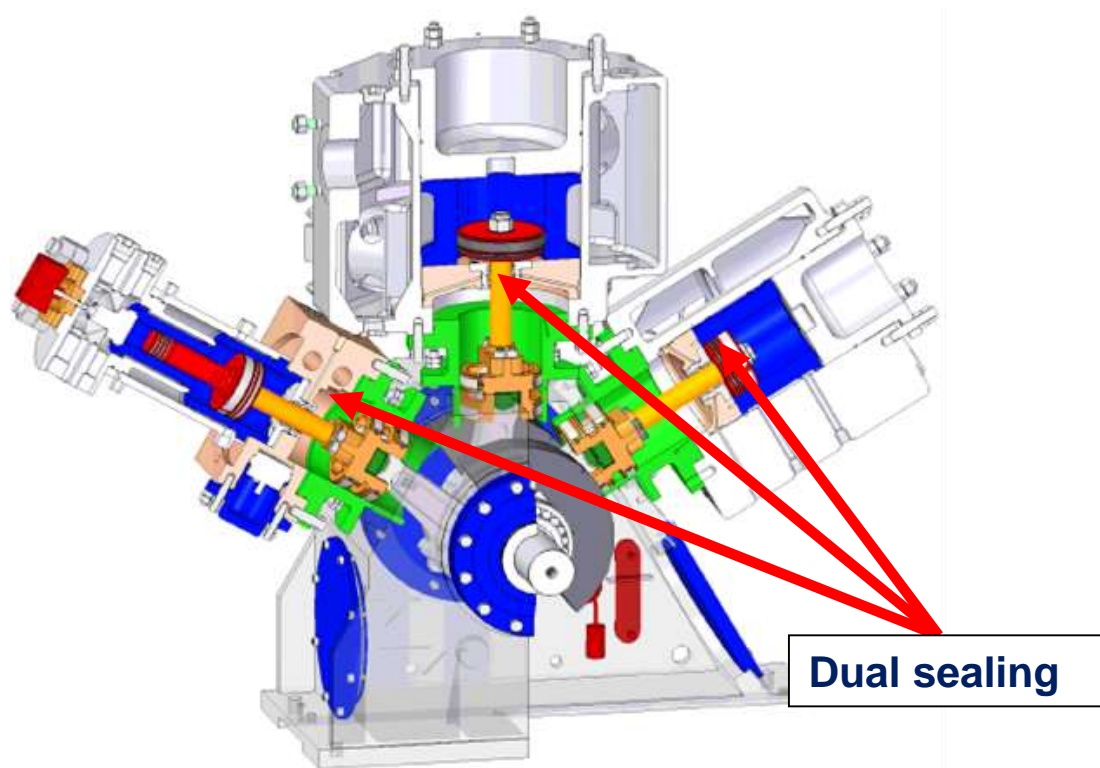


Coin test

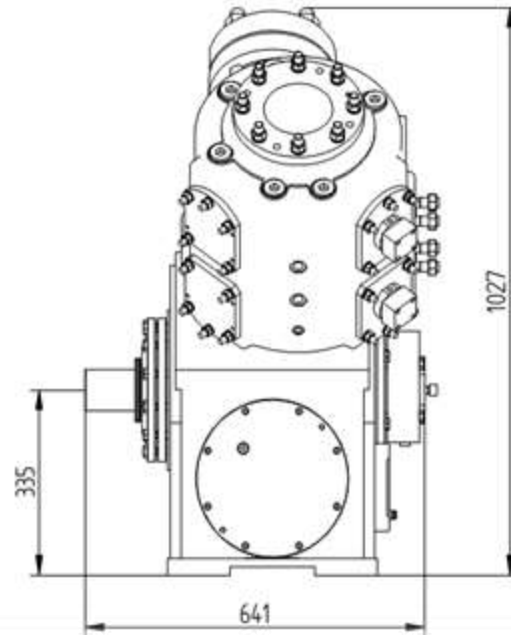
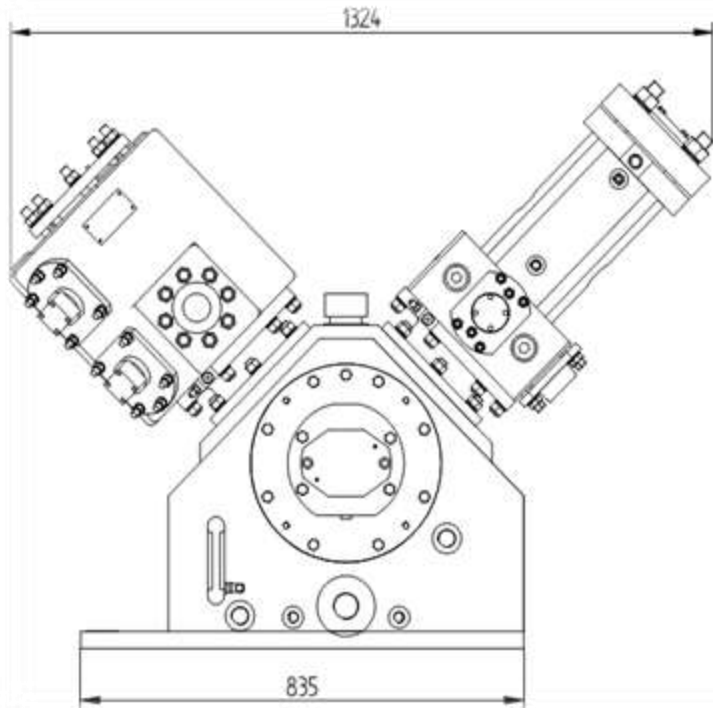


COMPRESSOR FEATURES

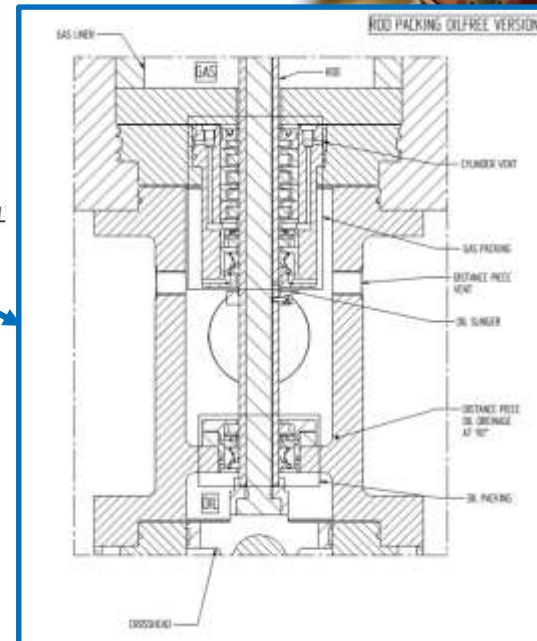
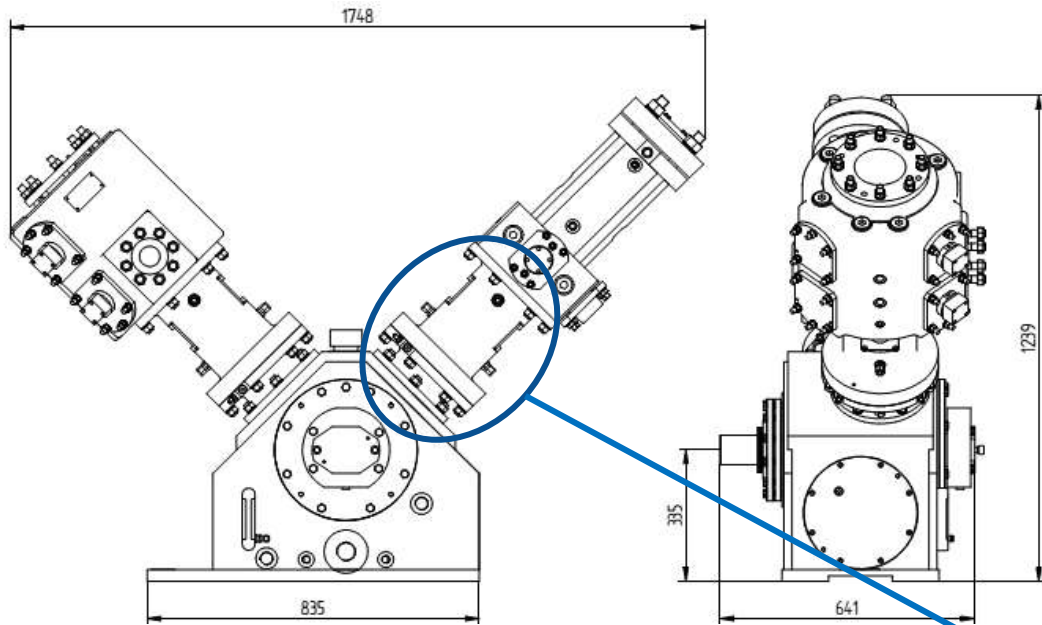
A basic characteristic of the FORNOVO GAS compressors is the adoption of a system of dual sealing on the piston rod and the absence of forced lubrication of the cylinders. The latter becomes possible with the adoption of self-lubricating sealing elements.



NOT LUBRICATED CONFIGURATION



OIL FREE CONFIGURATION



**Distance Piece TYPE B
according to API 618 Norms**

QUALITY CONTROL

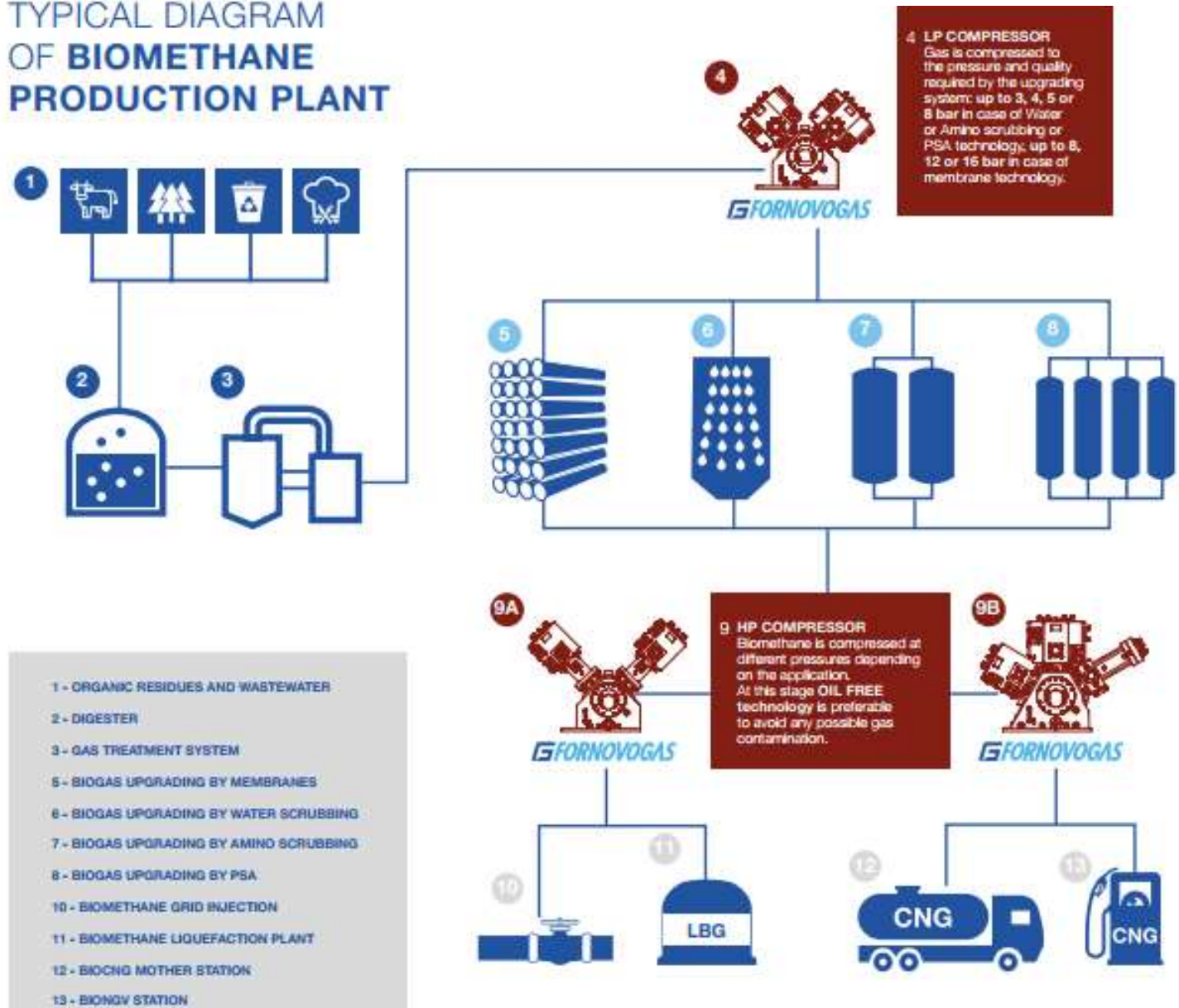
- **Quality Management system certified ISO9001:2015**
- **Environmental Management certified ISO14001:2015**
- **Health and Safety Management certified OHSAS18001:2007**
- **3D quality control on each critical component through Carl Zeiss technology**
- **Hydraulic test performed on all pressure equipment**
- **Regular audit done on our main suppliers**
- **FAT performed on each compressor (with third body inspector when necessary)**



APPLICATIONS

- FORNOVO GAS compressor units can be installed in any type of upgrading plant, independent of the type of upgrading used like Water scrubbing, PSA, Membranes, Amino (Chemical) Scrubbing or Cryogenic process

TYPICAL DIAGRAM OF BIOMETHANE PRODUCTION PLANT



PRODUCT RANGE RNG

SA50



- Power: 2,2 kW
- Inlet P range: 0,1 – 5 bar(g)
- Outlet P range: up to 40 bar(g)

DA300



- Power: 75 - 355 kW
- Inlet P range: 0 – 220 bar(g)
- Outlet P range: up to 375 bar(g)
- Flow rate: up to 8.000 Sm³/h

SA200



- Power: 22 - 55 kW
- Inlet P range: 0,3 – 220 bar(g)
- Outlet P range: up to 290 bar(g)
- Flow rate: up to 2.000 Sm³/h

DA500



- Power: 300 - 1000 kW
- Inlet P range: 0,1 – 50 bar(g)
- Outlet P range: up to 275 bar(g)
- Flow rate: up to 20.000 Sm³/h

PRODUCT RANGE RNG

GASVECTOR CITY

- Power: 22 - 55 kW
- Throws: 2-3
- Stages : 1-4
- Inlet P range: 0,3 – 220 bar (g)
- Outlet P range: up to 290 bar (g)
- Dimension 1,15 x 2,9 x 2,8 (h) m
- Suitable for forklift and small private fleet station



PRODUCT RANGE RNG

- Enclosure with 1st level safety certification
- Plug and play solution
- Roof mounted air cooler using special fixing brackets
- Maximum noise level 60dB(A) at 1 meter
- Door, walls and roof fully clad to guarantee total insulation
- Single or twin version
- Easy access for maintenance
- CE certified
- Several noise level insulation available:
 - 75dB(A) at 3 meter
 - 75dB(A) at 1 meter
 - 70dB(A) at 1 meter
 - 60dB(A) at 1 meter

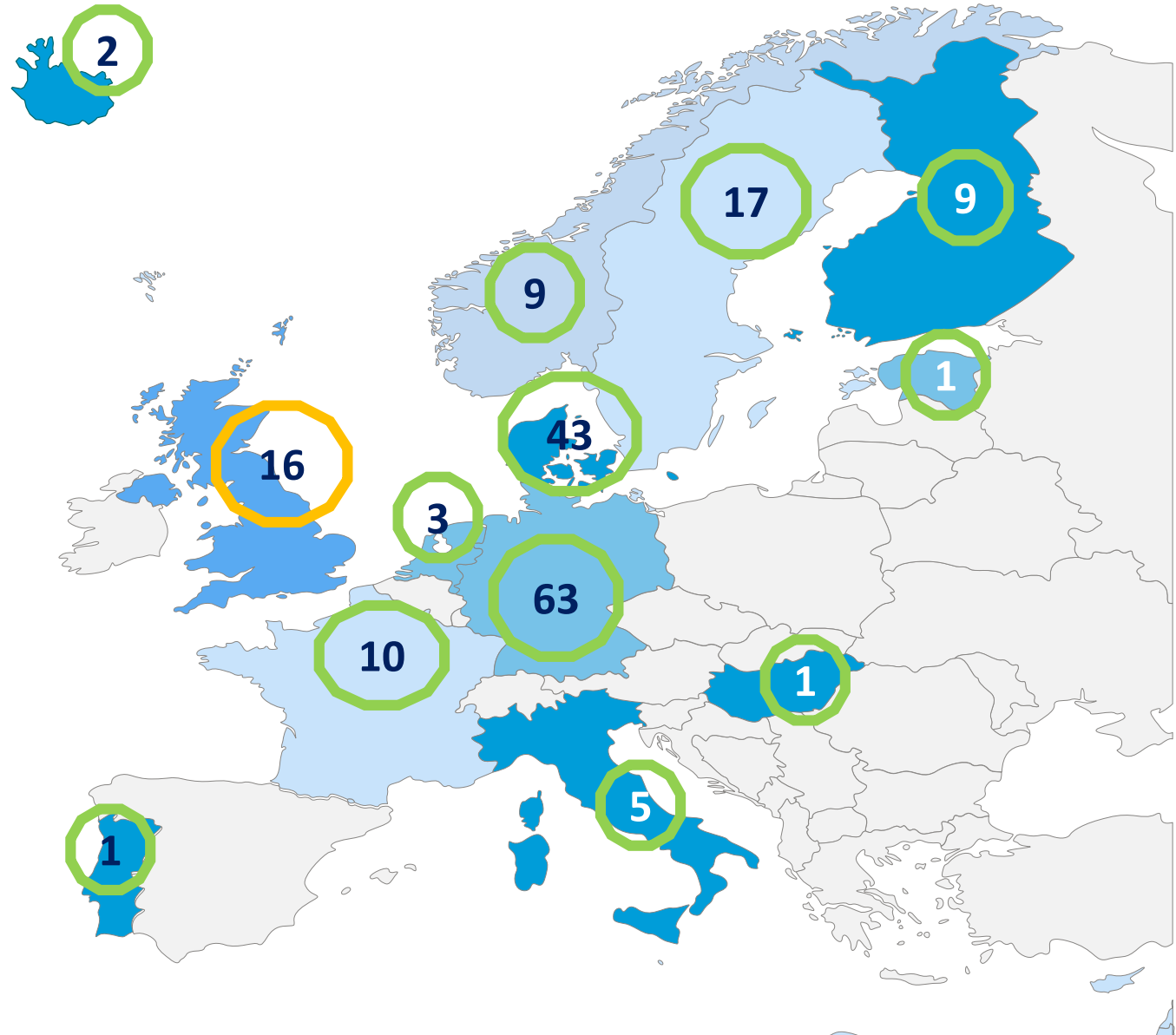
GASVECTOR



EXPERIENCE

180 compressors already operational in Biomethane production plant in Europe

41 new compressors to be commissioned in 2020



EXPERIENCE

Some of our customers

AGA

HMN
NATURGAS

avacon

 **Gas
Networks
Ireland**

NGF
**nature
energy**

Gasum

e.on

**ENGIE**

GRTgaz

APPLICATIONS

**Biomethane upgrading plant
(primary compression)**

LINKÖPING (Sweden)

Model: 2DA300 skid

Service: Biogas plant primary compressor

Gas: wet biomethane

Features:

- Inlet pressure 0-0.2 bar
- Outlet pressure 5-6 bar
- Flowrate 500-950 Nm³/h
- Power 132 kW



ZALAEGERSZEG (Hungary)

Model: 2SA200 in Gasvector cabinet

Service: Biogas plant primary compressor (CNG station and CHP gas feeding)

Gas: Raw biogas

Features:

- Inlet pressure 0.035 bar
- Outlet pressure 10 bar
- Flowrate 100 Nm³/h
- Power 30 kW



CROUCHLAND (Great Britain)

Model: 2DA300 skid

Service: Biogas plant primary compressor

Gas: wet biomethane

Features:

- Inlet pressure 0.05-0.7 bar
- Outlet pressure 5 bar
- Flowrate 395-1420 Nm³/h
- Power 132kW



APPLICATIONS

Biomethane grid injection

NORDERSCHUBIFELD (Germany)

Model: 3DA300 skid

Service: Gas injection

Gas: Dry biomethane

Features:

- Inlet pressure 2-6.5 bar
- Outlet pressure 84 bar
- Flowrate 650-1150 Nm³/h
- Power 160kW



SUOMENOJA (Finland)

Model: 2DA300 OIL FREE in GASVECTOR cabinet

Service: Gas injection

Gas: Dry biomethane

Features:

- **Inlet pressure 4-5 bar**
- **Outlet pressure 54 bar**
- **Flowrate 400 Nm³/h**
- **Power 75kW**



JORDBERGA (Sweden)

Model: 3DA300 OIL FREE in GASVECTOR cabinet

Service: Gas injection

Gas: Dry biomethane

Features:

- **Inlet pressure 4 bar**
- **Outlet pressure 80 bar**
- **Flowrate 975 Nm³/h**
- **Power 160kW**



WANZLEBEN (Germany)

Model: 4DA300 TANDEM skid

Service: Gas injection

Gas: Dry biomethane

Features:

- Inlet pressure 0.08-1 bar
- Outlet pressure 16 bar
- Flowrate 850 Nm³/h
- Power 160kW



HJORRING (Denmark)

Model: 2DA300 OIL FREE in Gasvector cabinet

Service: Gas injection

Gas: Dry biomethane

Features:

- Inlet pressure 5 bar
- Outlet pressure 45 bar
- Flowrate 1100 Nm³/h
- Power 132kW



MINWORTH (Great Britain)

Model: 1DA300 OIL FREE in Gasvector cabinet

Service: Gas injection

Gas: Dry biomethane

Features:

- **Inlet pressure 4.5-6 bar**
- **Outlet pressure 21 bar**
- **Flowrate 500-1000 Nm³/h**
- **Power 110kW**



SONDERIYSK (Denmark)

Model: 3DA300 OIL FREE in Gasvector cabinet

Service: Gas injection

Gas: Dry biomethane

Features:

- Inlet pressure 3-4 bar
- Outlet pressure 47-80 bar
- Flowrate 1000-2800 Nm³/h
- Power 450kW



FAENZA (Italy)

Model: 2DA300 OIL FREE in Gasvector cabinet

Service: Gas injection

Gas: Dry biomethane

Features:

- Inlet pressure 12 bar
- Outlet pressure 63 bar
- Flowrate 300-1000 Nm³/h
- Power 110kW



ARCYS (France)

Model: 3DA300 skid

Service: Gas injection

Gas: Dry biomethane

Features:

- Inlet pressure 3 bar
- Outlet pressure 68 bar
- Flowrate 220-520 Nm³/h
- Power 110kW



APPLICATIONS

Mother or BIONGV station

REYKJAVIK (Iceland)

Model: 3SA200 skid

Service: Mother station

Gas: Dry biomethane

Features:

- **Inlet pressure 15 bar**
- **Outlet pressure 250 bar**
- **Flowrate 155 Nm³/h**
- **Power 30kW**



GRANVILLE (Great Britain)

Model: 4DA300 in GASVECTOR cabinet

Service: Mother station

Gas: Dry biomethane

Features:

- **Inlet pressure 4 bar**
- **Outlet pressure 250 bar**
- **Flowrate 900 Nm³/h**
- **Power 160kW**



MORTAGNE SUR SÈVRE (France)

Model: 4DA300 in GASVECTOR cabinet

Service: NGV station

Gas: Dry biomethane

Features:

- Inlet pressure 4 bar
- Outlet pressure 250 bar
- Flowrate 500 Nm³/h
- Power 110kW



WHY FORNOVO GAS?

- More than ten years of experience in compressing biogas and biomethane
- From 0 bar(g) to 90 bar(g) inlet pressure and up 10.000 Sm³/h flow rate (according to the inlet pressure)
- Heavy duty, dry cylinder, dedicated, designed and tested piston glyds for 8.000 working hours without substitutions
- No oil in customer's CNG storages
- Modular technology, high quality equipment (certified process), plug and play or customized solutions
- Lowest maintenance activity
- Around 200 compressors working in European Biogas plants



THANK YOU FOR YOUR ATTENTION

www.fornovogas.it

Follow us on Facebook, LinkedIn and YouTube

